

Using Digital Trading Platforms to Address International Market Access Challenges Faced by South-West Nigerian Farmers

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ABSTRACT: In South-West Nigeria, small-holder farmers are disempowered and continue to face an inefficient supply chain that includes, a fragmented distribution network driven by exploitative practices by middlemen, price opacity, unreliable market information that prevents competitiveness in the global market despite an increase in demand for high quality agricultural produce. This study investigated how digital trading platforms could be purpose-built to address these challenges, by harnessing the principles of digital transformation to enhance the supply chain and international market access.

Rooted in the research philosophy of pragmatism, this research utilized qualitative approach that utilized a questionnaire survey of 35 farmers in South-West Nigeria to provide insights.

Key research findings revealed that over 80% of respondents identify limited market information, unstable pricing and poor distribution infrastructure as major barriers, with 74% of farmers relying on intermediaries. The study showed digital readiness with 89% smart phone ownership and 80% of farmers than own smartphones confirming daily internet usage, however, 57% said they were not comfortable with digital platform usage. Voice-enabled prompts, USSD optimization, escrow services, and partnerships with local cooperatives are some of the critical features identified to facilitate successful implementation.

The significance of this research lies in advancing a framework for inclusive implementation of digital transformation in emerging economies by building pragmatic context specific solutions (low-tech interface, lo-fi connection, local cooperative partnership, language options) that considers unique challenges of small-holder farmers before introducing an Agri-tech platforms.

The research emphasizes the potential of digital platforms in fostering an efficient supply chain and progressing the Sustainable development goals (SDG) on Zero hunger, No poverty, Reduced inequality and Industry, innovation and infrastructure. This framework provides a pragmatic model for Agri-tech developers, Policy makers and other emerging markets dealing with similar agricultural market challenges.

KEYWORDS: Digital Trading Platforms, International Market, Agri-food supply chains, Rural Farmers, Emerging markets, Nigerian Economy

INTRODUCTION

Agriculture remains a major source of livelihood for majority of Nigeria's workforce (FAO, 2018). Across all value chains, the sector contributes 50% of Jobs, and more than 35% to the nation's gross domestic product (GDP) (Mghenyi et al., 2022), highlighting its significance to national economy. Despite this importance, farmers in South-West Nigeria, a region historically prominent for its production of major export commodities such as cocoa, cashew, cassava, oil palm have been unable to access new markets and integrate efficiently into the international supply chain system. The farmers deal challenges ranging from infrastructure deficit and unreliable distribution networks to Inefficient traceability systems, lack of transparency, long and inefficient supply chain driven by third parties and intermediaries, communication gap and slow technology adoption. Concurrently, there is an increase in global demand for traceable agricultural products driven by consumer trends and growing advocacy for sustainable practices. NCC (2024)

annual report of over 160 million internet subscribers presents an opportunity to explore how digital technology can facilitate the necessary connection of South-West Nigerian farmers to the global market (see figures 1 and 2).

However, there are barriers to technology adoption, especially in the rural areas of South-West Nigeria (Nwangwu et al., 2024; Sadiq et al., 2022). This research identifies key challenges in the traditional agricultural value chain (AVC) and assess how contemporary solutions such as digital platforms can address these issues, and lead to growth and development of the sector. Arthur et al. (2024) asserts that digital trading platforms can link different levels of agricultural activities and connect farmers in South-West Nigeria with stakeholders across the AVC. Benyam et al. (2021) also discussed how digital agricultural technologies fosters supply chain efficiency and reduces post-harvest losses caused by lack of storage infrastructure. Papadopoulos et al. (2024) confirmed that application of technology helps farmers maximize their profits. However, Ferrari et al. (2022)

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argues that there are current socio-economic and technological challenges that must be explored to ascertain the effectiveness of such platforms in a rural context.

A productive agricultural sector is essential for the alleviation of poverty in South-West Nigeria. According to a World bank (2023) report, poverty reduction and increase in food security correlates with growth in the agricultural sector's performance. Agriculture if approached efficiently could foster eradication of rural poverty and serve as a means of providing employment to the community. In alignment with SDG goals by developing innovative infrastructure to reduce poverty and ultimately promote equality. When farmers maximize profit due to an efficient supply chain, extra resources can be re-distributed to other areas in the local economy. Tunji (2024) highlighted the importance of Agribusiness in Nigeria's local economy, with Agricultural products accounting for the third highest export category after Crude oil and other oil related products. Top agricultural exports from Nigeria include superior quality Cocoa Beans, Cashew nuts, standard quality cocoa bean, sesame seeds and natural cocoa butter (Tunji, 2024). South-West Nigeria is the largest producer of Cocoa with an export value of \$489 million as reported by (Adeleye, 2024a). This is a major source of foreign exchange, not just for the farmers, but for Nigeria's economy. NBS (2024a)'s foreign trade in good statistics report detail export profile of critical sectors, Nigeria's ministry of Agriculture put the total value of Agri-export at N973.68 billion for the year 2024.

This indicates an increase in demand for food products from South-West Nigeria and Africa as a whole, it is imperative for researchers to investigate the potential of agricultural technologies and digital transformation reforms. This paper explored the systemic issues and how implementation of digital trading platform can serve as a transformational solution to close these structural gaps.

The need for transformation has never been more important. macro-economic factors such as the fluctuation of oil prices, inability to meet oil production quotas due to vandalism, and depletion of Nigeria's reserves has meant that the government needs to look to other sectors to bring in the required foreign direct investment (FDI) and foreign exchange to meet the nation's economic requirements. The Agricultural sector has the potential to significantly rise to this challenge, however, issues relating to inefficiencies in the Agrifood Supply chain has led to a stagnation of the industry.

This research explores digital transformation, and how technologies have been applied to solve these challenges in other geographies especially nations with similar operational challenges to South-West Nigeria. Using examples from ASEAN countries, the paper examined some of the successes and application of digital platforms to revitalize the agricultural sector.

Traceability is an important factor for the international market; it is essential for an efficient supply chain system to assure food quality and safety. A transparent supply chain will address some of the food security concerns of international markets. There is a growing customer awareness of sustainability, hence, they demand for certified sustainably produced food items. Digital technology can be used to show the field to fork journey of the products, it builds trust between the farmers and customers (Manning, 2021).

These platforms can help close the social distance between the farm and the consumers. Consumers want more information about their food, regarding how physical, natural and social resources have been allocated to produce it. For example, digital trading platforms can address supply chain challenges faced by cash crop farmers in West Nigeria by connecting them directly with buyers and investors, reducing intermediaries and improving transparency.

Number of Internet Subscribers Per Region - 2023	Total	Percentage
South-South	17,506	6.7%
South-West	186,557	71.1%
South-East	3,123	1.2%
North-West	8,308	3.2%
North-East	2,133	0.8%
North-Central	44,579	17%
Total	262,206	100.00%

Figure 1: number of internet subscribers in South-West Nigeria (NCC, 2024)

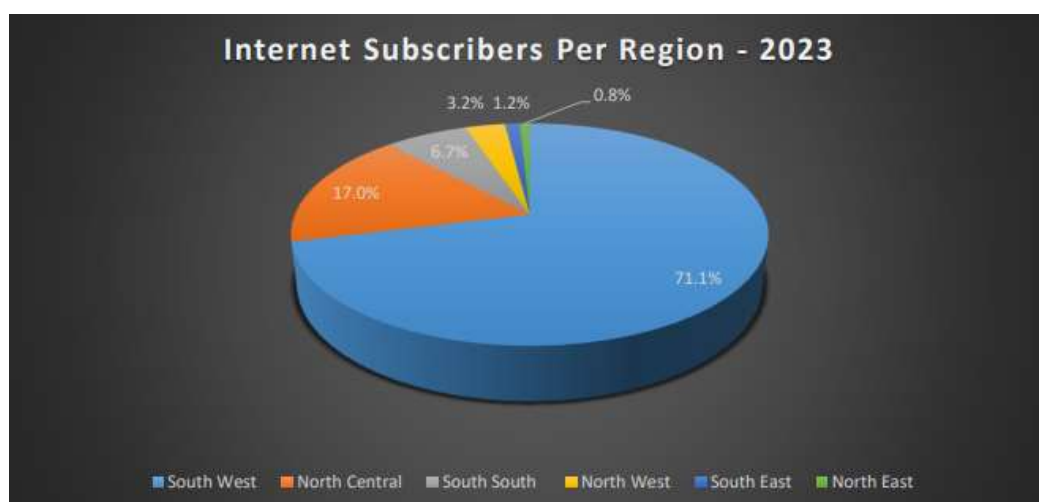


Figure 2: Showing number of new Internet subscribers per region in 2023. Data from the Nigerian Communications Commission 2024 annual report (NCC, 2024).

This paper aim is focussed on providing critical understanding and further identify the specific challenges and barriers within the current international supply chain that prevents farmers in South-West Nigeria from accessing international markets. This will be structured into the following sections. Section 2 will examine the extant literatures on supply chain in the international market, specific challenges with South-West Nigerian rural farmers. The section 3 will focus on the research methodology. The findings and discussions will be in section 4 and the last section will make robust recommendations and conclusions.

LITERATURE REVIEW

This literature review chapter synthesizes scholarly work to investigate the current state of affair of the Agrifood ecosystem in South-West Nigeria. The review interrogates the unique intersection of Agricultural supply chain, farmer empowerment and adoption of digital transformation. It evaluates the traditional distribution system and identifies intermediate stakeholders within the supply chain, critically analyses the influence and role of these stakeholders, evaluates successful digital technology interventions in comparable realms, and identifies gaps in existing literature (Particularly the rarity of research addressing international market access of farmers in South-West Nigeria). This review anchors its analysis in frameworks such as Agriculture 4.0 and Information and Communication Technology for Development (ICT4D) to align academic discourse with real world challenges, establishing a rationale to inquire about how digital trading platforms can facilitate market access for farmers in South-West Nigeria.

The review of themes from literature contextualizes the research problem and reinforces the urgency required to develop digital transformational reforms to unlock the socio-economic potential of the regions agricultural sector.

Agriculture and South-West Nigeria

Role of Agriculture in Nigeria Economy

Agriculture remains a critical sector for Nigeria's economy, contributing significantly to the nominal gross domestic product (GDP) and 36% of the labour (NBS,2024; PWC, 2020) see figure 3. Poor market access has stagnated productivity in the sector, affecting Nigeria's ability to generate (FDI), and food security, this has led to an increase in food import reliance and continuous decline in rate of employment (Ikueomonisan, 2024; Owutuamor & Arene, 2018; Villacis et al., 2022). While Nigeria leads in global production of products like cassava (producing 20% of global production), Cowpea (46% of global production) (FAO,2022, IITA, 2017), the country continues to experience unsustainable food prices and skyrocketing food inflation, driven by a dwindling foreign reserve which has necessitated the government to devalue the local currency on multiple occasions (International Trade Administration, 2023a).

Although the government has initiated several interventions such as the Anchor's borrowers programme (ABP) and National Agricultural Technology and Innovation Policy (NATIP) to reform the sector; however structural challenges have hindered successful implementation particular in the rural areas (FMARD, 2022). These challenges are exacerbated by the effects of climate change and poor farmer education (Ahmed Kabiru & Arshad, 2019; Ani et al., 2021).



Figure 3: Showing Key agricultural statistical contribution to economy (PWC, 2020)

Supply Chain Inefficiencies

Traditional Supply Chain- The Middlemen

The current supply chain model in South-West Nigeria agriculture is dominated by middlemen, a network of intermediaries spread across the value chain and control market access for farmers. This traditional system while providing proximity, logistic support to farmers, continue to perpetuate inefficiencies that ultimately decreases farmer income (Kalejaiye et al., 2021).

Multi-layer distribution channel: Typically, the first level of middlemen are the local aggregators, who purchase from farm gate at below market price, collate products from several small-holders and sell to warehouses or local processors in urban markets. This is then followed by commodity traders, who buy from local processors before selling to exporters. These multiple layers of distribution channels add cost across the value chain, but farmers are not in the position to maximize profit (Abdulsalam, 2022; Imam et al., 2014; Onwude et al., 2023).

Practices by middlemen: Farmers revenue is controlled by activities of middlemen, who determine the prices the farmer can sell their product, and the cost the consumer should incur to purchase said product (Kalejaiye et al., 2021). The middlemen take advantage of farmer's poor market participation cause by distance, poor infrastructure, high transport cost (Donkor et al., 2018; Gani & Adeoti, 2011).

Cash-based: Another feature of the traditional supply chain is the cash-based transaction. Due to poor storage infrastructure and fear of post-harvest loss, farmers are forced to exchange their products for immediate cash, often at less

than market price. This creates a security risk for the farmers because they are susceptible to fraud, poor financial record keeping and payment disputes (Olusegun, 2023).

Market Impact of Supply Chain: Postharvest loss, Farmer Income

The traditional Supply chain system inefficiency impacts the sector by generating substantial economic loss across the value chain, with post-harvest loss caused by poor storage infrastructure and inefficient distribution resulting in over 20 to 40% for all food products in Nigeria (Mada et al., 2014). Haruna et al. (2023) noted that food waste contributes to Nigeria's greenhouse gas emissions.

Access to Information: Price

The length of the supply chain affects information asymmetry, with significant information gap between farmer and the end consumer. Ezeudu & Obimbua (2024) identified inefficient market information dissemination as a major constraint to sustainable agriculture development in Nigeria. Farmers lack access to real-time market data on price, demand and buyer requirements (Worldbank, 2025). Middlemen exploit information gaps by creating artificial scarcity, buy low and to create a glut season, hoard product to create shortage then sell high.

The gap between farmers and consumers also affect standardization of quality. Farmers can't verify what the international market require and rely on middlemen for information. Middlemen can misrepresent details to influence price of product.

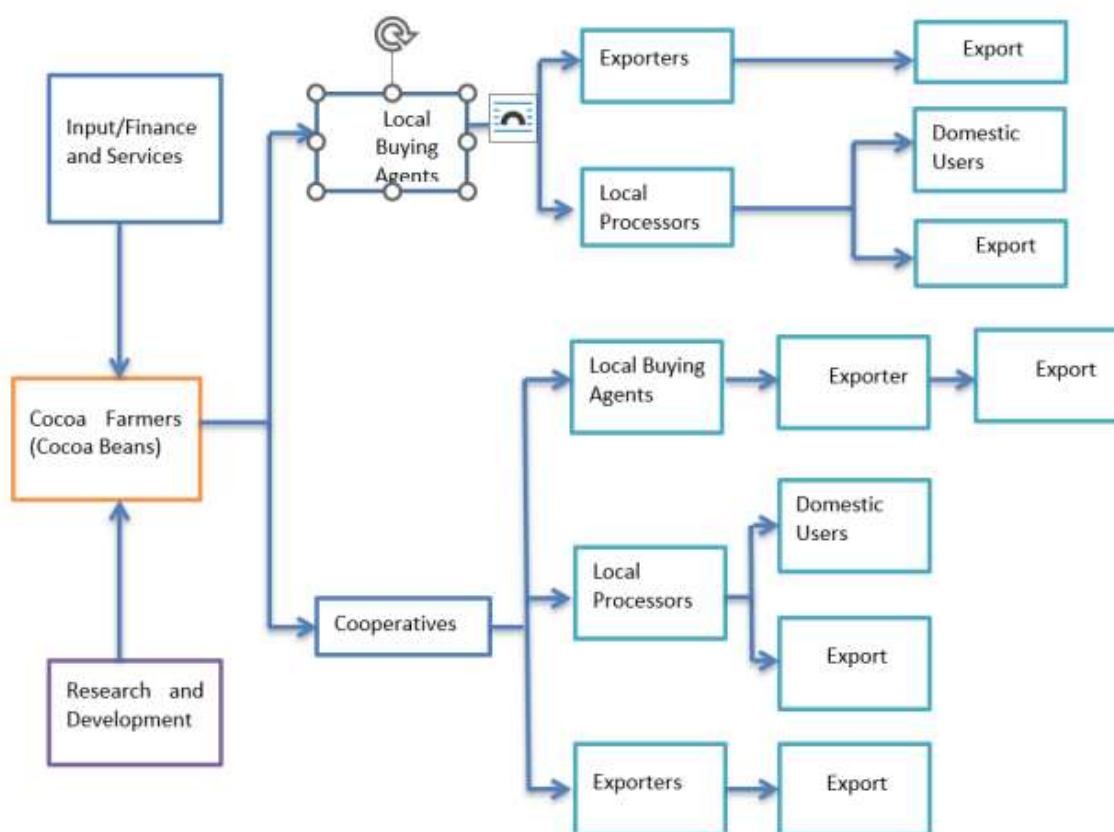


Figure 4: Showing a typical Coca value chain (adopted from an EU report by Adeleye (2024)

Digital Transformation in Agriculture Supply Chains

The digitalization of agrifood supply chain is reshaping how agriculture products move from farm to plate (Arthur et al., 2024). These online connections can address the physical constraints that have limited agricultural engagements across international supply chains faced by farmers in South-West Nigeria (Parth Kundlik Sankpal et al., 2023). By integrating innovative information and communication technology (ICT) across the chain, stakeholders can operate more efficiently with better transparency and resilience. Digital transformation is taking a holistic approach to reform and engineer processes, procedures and models through innovative technology (Jing & Fan, 2024). In Agriculture this would refer to moving away from informal market structures, traditional supply chain networks to optimized, data-augmented platforms that connects farmers to the market. Platforms that provide accurate verifiable information about price, logistics, traceability and end-buyers in real-time (OECD, 2025). For example, Abubakar & Ishak (2024) explored how Innovative systems such as digital marketing, blockchain technology, data analytics and robotics have improved efficiency across the production process and enhanced the ability of oil palm farmers to reach the target audience, as well as overcoming distribution barriers, however, they assert that high cost of these technologies, limits rate of adoption.

Typology- Key Digital Trading Platforms

Mobile Apps/Farm-to-consumer (FTC) platforms: These platforms enable smallholder farmers to display their products and offer last mile delivery channels through integration of local logistic partners. It bypasses traditional distribution systems like physical marketplaces and gives the farmer access to urban markets (Donaldson, 2021).

B2B marketplace: Digital marketplaces allow farmers list their produce and connect directly with bulk buyers. Zhang et al. (2009) identified some of the important features such as commodity and price indexes that are subject to quality verification in a case study of Shandong Shouguang Vegetable Trading Market Online (SSVTMO), a B2B e-marketplace dedicated to agricultural produce.

Blockchain secure supply chain management system (SCMS): These systems use blockchain technology, which Susnjara & Smalley (2021) describe as “a shared, immutable digital ledger”, to track, collect and secure agricultural transaction data. It was confirmed by El Mane et al. (2022), that these systems enhance traceability, food security and quality assurance.

Success stories from similar emerging markets

Digital platforms and Coffee: Banker et al (2011) conducted research that compared the commodity prices of coffee sold through a digital trading platform with prices of coffee sold

through traditional supply chain models in Indian communities. The result concluded that the producers earned significant higher prices while trading on the platform compared to producers selling at the farm gate through brokers and other middlemen. However, it was also observed that coffee products that are of premium grade and require further physical examination before confirmation of quality faced difficulty to attract premium pricing on the platform. Interestingly, Agricultural technology platforms now have the capabilities of integrating artificial intelligence (AI) tools for visual image and virtual quality checks (Padhiary et al., 2024).

Vietnam Cashew story: In a World bank policy that benchmarked Nigeria’s cashew value chain against Vietnam, Wamboka (2024) found that Technology driven transformation contributed to the success story of Vietnam’s Cashew production. It was reported that Nigeria was one of the largest cashew nut producers in the world in the early 2000s but now ranks 8th in Africa. In contrast, Vietnam implemented structural reforms that has improved its access to export markets and is now one of the largest exporters of cashew nut in the world accounting for 45 percent of global production (World bank, 2024). This has contributed 75 percent of the poverty reduction in rural areas between 2010-2018. This example shows the potential of technology driven transformation in emerging economies can foster access to remunerative international markets.

Africa and Agricultural Technology Trends

Africa’s agricultural technology landscape is evolving and adopting innovation at scale (Oruma et al., 2021; World Bank, 2025). Atuahene-Gima & Amuzu (2019) explored the business model of Farmcrowdy-an agricultural digital platform- and how it uses digital innovation to empower Nigerian farmers by connecting them to potential investors, this platform uses essential data points to inform investors about agricultural investments and connects them directly to farmers across Nigeria. This is an example of how digital technology has solved a challenge in the sector by providing financing to farmers. In Kenya, Ogutu et al. (2014) reviewed how Pride of Africa’s DrumNet initiative used ICT to solve the challenge of information asymmetry by providing small-holder farmers, suppliers, and other stakeholders in the supply chain with end-to-end solution from procuring inputs to finalizing credit and payments.

In a report conducted by researchers from Harvard business school, that explores intermediation in the supply chain of agricultural produce in developing countries, it was observed that e-intermediaries like digital trading platforms provide price transparency to influence fair trade, and by offering alternatives to the traditional channels of sale for the farmers some of the supply chain challenges faced by farmers can be alleviated (Ferreira et al., 2017b). To cope with a growing trend of trade barriers and supply chain resilience, the

agricultural sector in Africa must invest significantly in research that can enhance its technological capabilities, this can establish a linkage with the global system and further productive transactions (Oyejide, 2010).

Barriers associated with Technology Adoption

One of the main areas for public sector interventions include designing policies that lay the foundations for innovation and scaling up of digital technologies, expansion of rural broadband and supporting infrastructure, and collecting and digitizing plot-level data on farmers to provide the foundations for building platforms and innovations for service delivery (Moghayedi et al., 2022).

Level of Digital Literacy

Digital literacy can be described as an individual’s ability to find, process, and communication, and deliver information using digital platforms (Gilster, 1997). Digital literacy skills range from complex task like interpreting data, to simpler smart phone skills (Pappa, 2024). Choruma et al. (2024) noted the challenge of digital literacy among small-holder farmers in sub-Saharan Africa and how this barrier excludes farmer from benefitting from the potential of agricultural technology. Language barriers could exacerbate this challenge. For example, in the Context of South-West Nigeria where Yoruba language is predominately used for trade, a platform built to interface in English language will be a challenge and can drive the farmers back to more familiar traditional channels. However, there are opportunities, South-west Nigeria’s literacy rate is above 80% compared to the national average (Sasu, 2022). This level of literacy can be translated to digital if the right framework is implemented to upskill farmers by integrating local features to the technology design. Nigeria is already among the leading adopters of digital technologies in agriculture, ranking third behind Kenya and South Africa in 2018 in terms of the number of scalable, disruptive Agri-tech hubs (Kim et al. 2020), and second behind South Africa in 2018 in terms of the number of technology incubators and accelerators (Bayen 2018).

Current State of Infrastructure: Connectivity

There is currently a digital infrastructure deficit in most states in Nigeria, including South-Western region. A 2018 pew research centre article reported mobile penetration with a smartphone was at 32% (Silver & Johnson, 2018). There is also the issue of internet speed in rural areas, which is currently at 5Mbps according to (Nigerian Communications Commission, 2018), this is not competitive compared to internet speeds in other emerging economies. Poor electricity and power infrastructure also significantly affect the rate of technology adoption. For example, in a survey of tech startups carried out by Ramachandran et al. (2019), 57% identified electricity as a major barrier to their business. This barrier impacts phone usage of rural dwellers.

However, in a world bank report assessing the role of mobile broadband on poverty reduction in Nigeria, Bahia et al., (2020) found that 3G internet coverage increased from 21% in 2010 to 78% in 2020. This indicates a potential for internet penetration to facilitate adoption of digital solutions in the future.

Developers designing platforms for smallholder farmers must consider these infrastructural barriers. Building entry level solutions such as low bandwidth access, Unstructured Supplementary Service Data (USSD) and offline functionality could encourage farmer adoption despite of poor connectivity issues (GSMA, 2024).

Level of Trust and Transparency

There is a lack of trust with faceless digital platforms exacerbated by experiences with fraudulent buyers online and payment delays. Farmers have complained about fear of hidden charges. To mitigate the challenges with transparency and trust. Digital solutions must incorporate escrow payment systems to secure transactions, visible pricing index, data protection, transparent verification process (Putrevu & Mertzanis, 2023). A study done by Smidt (2021), asserts that farmers perception to cost of digital technology changed overtime as they begun to experience the potential of digital platforms to maximize profit.

In the article addressing Technology for Social Good Foundations, Quayson et al. (2020) explored the social sustainability problems farmers in emerging economies face such as corruption, financial exclusion, lack of infrastructure etc and how innovative technologies like blockchain, digital trading platforms can be implemented within the supply chain to foster productivity which enables sustainability of the process. Addressing these barriers is critical to the successful implementation of digital solutions to address challenges in a rural context. ICTs for agriculture (ICT4Ag)’s recommendations include building systems foregrounded by digital literacy, and a design that considers the unique characteristics of the intended users (FAO, 2025). If these conditions are addressed, a digital platform has the potential of facilitating market access for South-West Nigerian farmers.

Government Policy

The role of government and policy makers is central to the successful implementation of digital trading platforms in agricultural supply chains. The government is responsible for creating an ecosystem that encourages public-private partnerships needed to reform the sector through innovative thinking (Ehlers et al., 2021).

The Nigerian government setup the National agricultural technology and innovation policy in 2022 to address food insecurity and modernize agricultural practises. The policy framework stated “Market development” as one of its Ten core interventions, however, it fails to address the issue of fair

pricing for farmers especially when it comes to international transactions (Federal Ministry of Agriculture and Rural development, 2022).

The Anchor Borrower’s Programme was another political vehicle setup by the government to promote rural agriculture (Nasiru, 2022). The programme was designed to provide medium-term loans to farmers, However, poor record keeping and accounting led to majority of the loans not being repaid (Olayinka et al., 2024). The programme was also heavily politicized, and some local politicians used it as a political tool to reward supporters (Ukpe, 2023).

The government set up the Nigeria digital economy strategy for 2020-2030 to promote internet connectivity and broadband penetrations, however, this policy does not fully implement strategies to integrate rural agricultural supply chains (International Trade Administration, 2024). Another government policy to promote technology and innovation is the Startup act 2022 which was designed to incentivize innovation Agric-tech and other sectors (PWC, 2022), but the policy lacks clarity in terms of funding designated specifically for the agricultural sector. More collaborations and synergy are required from the Agriculture and Digital technology ministries to fund and develop innovations in the Agri-tech ecosystem. Lack of enforcement and underutilization of existing ACTS of the policy is also a challenge. Particularly for farmers located in the rural communities of the SW region, the policy and intervention programmes are often time accessible to urban organizations (Degila et al., 2023).

Gaps in Literature

Despite growing interest in the digitization of Agricultural processes, the review identified critical gaps in literature, particularly in South-West Nigeria agricultural sector. The review found that most existing literature focus on production technology or domestic challenges such as financing and agronomy. Abbasi et al. (2022), conducted a review of 148 articles, analysing implementation in Agriculture and found that, majority of research studies are around production level, and there are limited literatures addressing supply and delivery phase (see figure 5).

Literature addressing supply chains predominantly focus on local or domestic market linkage, and there are inadequate materials investigating international market access for Nigerian farmers. While the literature review found studies from ASEAN market that explore digital platforms like Tanihub in Indonesia (integrating local logistic for last mile delivery), Nigerian case studies are rare. There are almost no studies reporting critical analysis of how implementation of digital platforms that can be leveraged to meet international market requirement, access global buyer networks, navigate export procedures, or simplify commodity pricing model. These gaps leave developers and policy makers without a

workable framework to build platforms that address international market access challenges of Nigerian farmers. Moreover, majority of existing literature emphasized high-tech solution that are more suited to urban areas, the solutions are not considerate of the current Infrastructural deficit such as poor electricity, low internet bandwidth, which characterize in the rural areas where most small-holder

farmers are located. Few studies have explored the potential of combining low-tech features with the digital systems to address the unique challenges of farmers operating in rural areas. For example, integration of local languages and voice aided interface could bridge digital literacy barriers, yet few studies have explored these hybrid approaches.

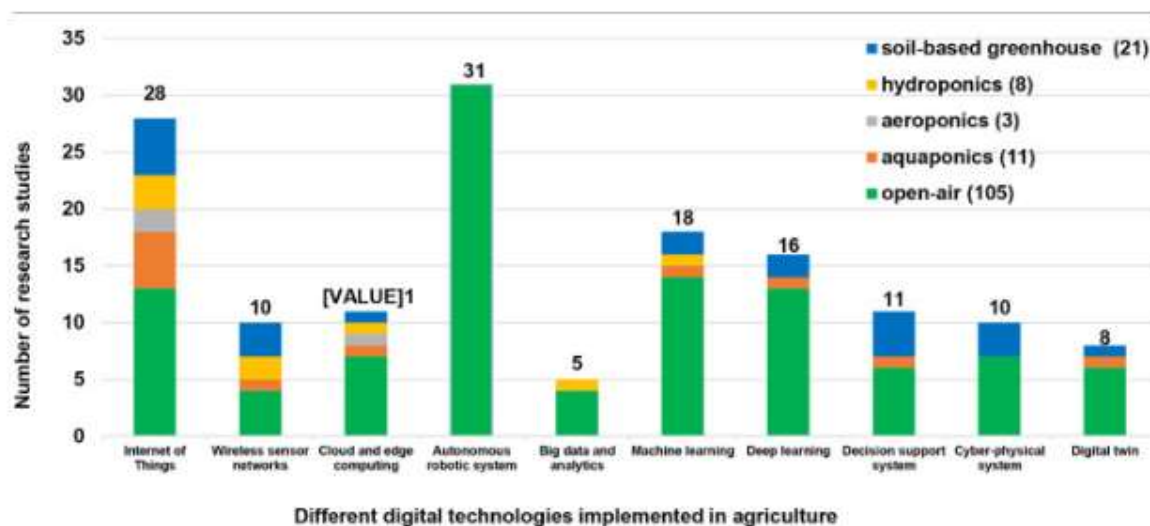


Figure 5: Showing results of study of digital technology implemented in agriculture

By evaluating knowledge and works in these domains, the literature review provides clarity into the underexplored challenges faced in South-west Nigeria’s agri-food sector. These challenges build a justifiable context for approaching the research problem.

Research Methodology

This section details methodological framework employed to meticulously address research aim and objectives of this paper. Due to the complex intersections of factors including Technological, Socio-economical, and critical infrastructure within this specific context (rural Agriculture) and focus area, it was deemed important to employ a qualitative approach to properly capture a nuanced perspective of the issues under investigation (Strijker et al., 2020). This approach is appropriate because it allows for a comprehensive research model that combines data collection with qualitative insights through questionnaire (Regnault et al., 2018). This allows the complex dynamics and interplay between a broad range of stakeholders within the supply chain (Kinnebrew et al., 2020).

Given diverse interests of stakeholders within South-West Nigeria agricultural supply chain, it is vital to gain contextual understanding of their experiences and opinions across the chain, the use of farmers’ survey, facilitates the understanding of the complex dynamics at play. This approach is further supported by Heeks (2008) for investigating the intersection of technological innovation and socio-economic realities. Pragmatism is an appropriate philosophy for this research as

the focus is on exploring practical solutions to real-world challenges in this specific context, rather than being focused on a central worldview as is often the case using an interpretivism or positivism paradigm (Kaushik & Walsh, 2019).

A questionnaire survey of famers in South-west Nigeria was used to obtain empirical insights of the challenges they face regarding market access and international distribution, digital literacy and technology adoption, perspective on fair pricing and economic inequality. This was followed by a qualitative phase which was necessitated by the need to get a deeper perspective from other key stakeholders in the supply chain. This methodology approach ensured in-depth understanding and contextualization of the results from the statistical data. It aligns with the pragmatic principle of the research objectives, to focus on practicality and humanize the data (Morgan, 2007).

The questionnaires were distributed to a sample of farmers across South-West Nigeria. The survey questions were designed following critical review of existing literature and aims to address the unresolved research question. To achieve this, the questionnaire aimed to collect data on farmers years of experience, farm size and type of crop produced, distribution challenges, barriers to international market access, pricing and payment issues, use of technology and digital platform awareness/literacy. To adhere to best practices in statistical data analysis, the quantitative research employed a combination of Likert scale (for level of

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agreement or disagreement), multiple-choice (pinpointing challenges faced) and scaled responses questions (to assess severity) (Gehlbach & Artino, 2018; Imperial College London, 2018; Swain et al., 2008).

This choice of data collection method was essential for quantifying research findings and identifying recurring patterns across the target population (Marshall, 2005). It sets a baseline to evaluate the extent and scale of challenges faced by South-West Nigerian farmers can be measured. It also provides insights into proportion of farmers aware of digital platforms, their level of digital literacy and readiness for adoption.

The target population comprises small-holder farmers across the six states of South-West Nigeria. The Purposive sampling approach was used to target Farmer's Associations and Cooperatives based on their presence of social media platforms, and organizational structure, which allowed access to members across the population area. Snowballing sampling was subsequently employed to extend the reach of the survey to farmers who might be less accessible through formal channels. Initial respondents that were surveyed through the Purposive sampling technique (cooperative, Associations, social media) were encouraged to refer farmers, particular those in the hinterland and rural communities. This facilitated inclusion of a wide range of respondent and aimed to improve representation of the sample. Although generalizability as a limitation of snowballing sampling expressed by (Ahmed, 2024; Sadler et al., 2010; Simkus, 2023).

The survey questionnaire was designed using Microsoft office form, followed by pilot testing to identify and fix any

technical issues. Data was collected over 66 days. The collection process employed multiple channels to reach the sample of farmers across South-West Nigeria. Links to the survey were shared on social media (Facebook, twitter) platforms with active participation of South-West Nigerian farmers. This process generated a total of 35 survey respondents.

FINDINGS AND DISCUSSIONS

This section presents, evaluates and interpret empirical data gathered to address the research question in this paper. Utilizing questionnaire surveys completed by 35 farmers in South-West Nigeria. The findings are centred around the following key themes including South-West Nigeria's Supply chain inefficiency and systemic barriers. This Theme directly addresses the research question and aligns with the overall aim of the research which is to.

“Identify the key barriers within the traditional supply chain, critically explore the feasibility and effectiveness of digital solutions to mitigate said barriers and propose a framework for implementation of such platforms to enhance market access, improve logistics, and increase global trade participation for smallholder farmers in South-West Nigeria.”

Questionnaire Survey Data Analysis

Drawing upon research methodology outlined, the section focusses on empirical findings from survey of 35 farmers South-West Nigeria. Descriptive statistics, cross-tabulation and frequency distribution are utilized to explore relationships of variables.

Table 1: Showing profile of survey participants

Variables	Description	Statistic
Age range	18-60	• 18-30 ,3 (9%) • 31-45, 18 (51%) • 46-40, 14 (40%) • Above 60, (0%)
Years of farming experience	0-20+ years	• 0-5 (11%) • 6-10(23%) • 11-20(29%)
Level of education	• Primary • Secondary • Tertiary • Others	• Primary, 7 (20%) • Secondary, 6 (17%) • Tertiary, 6 (17%) • Others, 16 (40%)
Phone use	• Smartphone • Non-smartphone	• Smartphone (89%) • Non-smartphone (11%)

Source: Compiled by the authors

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Barriers to Market Access

As part of the survey, farmers were asked to select the top 3 challenges they face when selling crops. The responses were standardized to analyse frequency of individual barriers mentioned is shown in Figure 10 below.

When farmers were asked the percentage of crop value lost to middlemen, the response range from 5%-56% with a mean of

21.9%, median of 20% and mode of 20%. Indicating farmers loss significant amount of potential income to the action of middlemen. 29 of 35 farmers receive payment 1-7 days after sale, with 6 farmers experiencing delays of 8 days or more.

Table 2: Showing Frequency of Individual Market Barriers identified by Farmers.

Barriers	No of mentions	% of respondents that mention
Market information	28	80%
Finding Buyers	27	77%
Transportation	26	75%
Storage	15	43%
Price negotiation	5	14%
Payment collection	4	11%

Source: Compiled by the Authors

Access to International markets

Farmers were asked to name What challenges they faced in accessing international markets. The table below summarizes

the most prominent international market barriers identified by farmers.

Table 3: Showing Top Barriers to International Market Access

Barriers	Ratings
Distribution	18 (43%)
Access to information	15 (43%)
Finding buyers/Access to buyer	12 (34)
Infrastructure	6 (17)

Source: Compiled by the Authors (2025)

Distribution barriers and Access to reliable information emerged as the most prominent barriers to accessing

international market, notably, 12 of the respondents also identified Lack of Access to buyers as a Barrier.



Figure 6: Word cloud of response to question - What challenges do you face in accessing International Markets?

Research Discussions

This section provides robust interpretations of the key findings discussed above in relation to the research question proposed at the beginning of this study. The section examines the practicality of this research and the implications on South West farmers welfare, national and regional agricultural policy, and digital platform design. The research aimed to answer the following questions.

What are the specific challenges and barriers within the current international supply chain that prevents farmers in South-West Nigeria from accessing international markets?

Key findings to Research questions:

Based on the data analysis from this research, the followings are the key findings;

Poor distribution infrastructure, including road networks in rural area, logistics, no proximity to shipping ports in Lagos hinder distribution of agricultural products both locally and internationally. Limited contact or access to market information. The farmers really don't have the know-how to contact verified buyers, and there is no central database of directory for the international buyers to contact the farmers, and most use unreliable social media platforms. The current pricing model is unstable; the farmers don't have access to real-time market index. This information asymmetry Favors the intermediaries in way that they primarily become the principal, and the farmers are agents in this dynamic (Richards et al., 1998). Immediate cash needs of the smallholder farmers is a major factor for continuance of this relationship

The challenges discovered through the research highlights systemic inefficiencies, with a combination of poor physical infrastructure and lack of transparent supply and demand process leaves the vulnerable and at the low end of the bargain. These issues can be addressed by a digital platform designed with appropriate consideration of the “SW farmer” User experience.

Factors that can lead to failure:

Physical infrastructure failure: It is essential to consider the integration of local logistics into the model, although a digital platform connects the stakeholders, there is still needed to move the products from one point to the next (Moldabekova et al., 2021). Implementing a pure APP-based technology

without considering the unavailability of resources like electricity, and internet could also lead to failure.

Digital literacy and training: A top-down rollout approach that ignores the level of literacy of the farmers could also lead to failure. For example, the NAFDAC e-registration programme failed because it ignored the literacy of farmers before rollout, adequate training and onboarding needs to put in place. To ensure inclusivity of the platforms, voice-based instructions, as well as options to select local languages is also a necessary consideration. The design of the platform must be careful not to create misalignment between the technology and the intended pool of users.

Lack of a consistent Digital agriculture policy: Lack of synergy between the state and private agritech stakeholders could affect the national framework for digital Agriculture. Without a standardized national framework for traceability and record compliance in the agricultural sector, scaling up platforms that do business in the global market will be affected.

CONCLUSION AND RECOMMENDATION

This research critically evaluated the how a digital trading platform can address systemic challenges faced by farmer in South-West Nigeria. Employing a qualitative approach and critically constructed research objectives aimed and providing depth and clarity to the research question. The research identified barriers such as poor distribution infrastructure, fragmentation of the supply chain model, information asymmetry as top challenges etc that limits farmer's ability to connect to the international market networks. The paper further showed that farmer interest in trading on digital platforms predicated on functionality of these platforms augmented to meet local requirements. Adoption of digital platforms is contingent on the developers' integrating context-specific features that consider the unique characteristics of small-holder farmers in a rural setting.

Recommendation to stakeholders

To unlock the potential of digital technology for SW Nigerian farmers, a cross-sector approach is required to include policy makers, agricultural organizations, and the private sector.

Policy actions

Policy must address the issue of limited internet penetration in the rural areas. The government should form a task force that will ensure the implementation of rural coverage outlined in the NATIP 2022-2027 policy. Government must facilitate strategic investment in infrastructure like broadband and data centres that will lay the foundation for future technology implementation.

Empowering Cooperatives

Cooperatives are essential to the agriculture ecosystem and must be empowered with grants and training to continue to deliver extension services to farmers in the rural area (Boye et al., 2024). Cooperatives and Farmer's associations are now setting up mechanisms to increase farmer's negotiation powers, by pooling resources together for collective bargaining, they can demand fair pricing for their members. However, smallholder farmers are unable to afford membership fees to join associations don't benefit. The bigger farms also have access to higher yields and can outprice smaller farmers from the market. Agritech platforms like farmcrowdy now operate in these areas, but their focus is on Agric-financing, and connecting farmers to funding, these also promotes inequality, as only farmers with certain resources can attract necessary financing opportunities.

Limitation to study

This research provided valuable insights; however, it did experience limitations. The unavailability of a central database to extract reliable information was a challenge, and this necessitated the use of non-probability sampling technique. Furthermore, the research initially aimed to interview international buyers to gain broader understanding of international market requirements and quality standard, however, this could not be achieved within the timeframe of the study.

Suggestions for future research

Implementing a prototype digital trading platform in selected communities could further interrogate findings from this research. The pilot could be significant for longitudinal studies to evaluate impact on farmer income, market access and price optimization.

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