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Transforming Nigeria's Agricultural Value Chains: The Role of Digital Platforms in Market Access and Price Transparency

Abdulquadri, Abdulazeez Olamide[1†]; Aliyu, Abdulrafih Olokonla[2]; Suleiman, Wisdom Onimisi[3]; Yahaya, Bilikisu Olaitan[4]

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Abstract

The agricultural industry has long grappled with the issue of unfair pricing, which affects both farmers and the entire value chain. Farmers have often suffered from the discrepancies in pricing, caused by intermediaries and end-users. This recurring problem has led to significant revenue losses for farmers, posing a pressing challenge for the agricultural sector. This study examines how digital platforms improve market connections and price transparency in Nigeria's agricultural value chains. The study was anchored on three objectives, which were to: investigate the mechanisms through which digital platforms enhance price transparency in agricultural value chains; assess the extent to which digital platforms contribute to improving the efficiency of agricultural value chains; and explore how the adoption of digital platforms in agricultural markets influences gender dynamics and social inclusion. A positivism research approach, quantitative research strategy was adopted. Online survey was used to solicit responses from 150 farmers residing in both Lagos and Ogun States respectively which were randomly selected. It was revealed from the analysis that the adoption of digital platforms significantly enhanced price transparency. Furthermore, it was revealed that digital platforms bring to value chains numerous efficiencies such as: streamlining transactions, reducing intermediaries, and optimizing the flow of goods and information. Lastly, it was established that digital platforms contribute to fostering gender equity by enhancing women's participation, decision-making power, and access to market opportunities. It was concluded that digital platforms substantially impact agricultural value chains, focusing on price transparency enhancement, operational efficiency improvement, and gender dynamics transformation.

Introduction

In recent years, the global agricultural sector has undergone significant transformation driven by technological advancements and digital innovations (Klerkx, Jakku, & Labarthe, 2019). One of the most impactful changes has been the emergence

affiliation: [1,] Abazol Digital, Lagos, Nigeria;
[2, 3 & 4] Department of Marketing, School of Business and Management Studies, Offa Polytechnic, Offa Kwara State.

email: Olamide.abdulazeez@yahoo.com[1]; [2]abdulrafih.aliyu@fedpoffaonline.edu.ng; [3]wisdom.suleiman@fedpoffaonline.edu.ng; [4]yahayatanimola@gmail.com

† *corresponding author*

and widespread adoption of digital platforms within agricultural value chains. These platforms have played a pivotal role in reshaping how agricultural products are marketed, traded, and distributed (Borrella, Mataix, & Carrasco-Gallego, 2015). They have not only facilitated improved market linkages but also enhanced price transparency, thereby addressing longstanding challenges in the sector.

Digital platforms, including e-commerce websites, mobile applications, and online marketplaces, have rapidly gained traction in agriculture (Balakrishnan, Kumar, Rao, & Soam, 2018). These platforms serve as virtual marketplaces where farmers connect with buyers, traders, and consumers, breaking down geographical barriers and facilitating the safe exchange of information and goods between all parties. Even in rural areas of Africa, Asia, and beyond, access to computers or an internet connection is now more feasible than it was decades ago, thanks to the rise in smartphone penetration (Qaim & Andersson, 2020).

Traditional agricultural markets often suffer from information asymmetry, limited engagement, and inefficient intermediaries. Digital platforms help mitigate these issues by providing real-time access to market trends, buyer-seller interactions, and transactions. Consequently, farmers can now showcase their produce to a broader audience and establish direct connections with potential buyers, reducing their reliance on intermediaries and ensuring better returns (Minten et al., 2018). This direct connection empowers smallholder farmers and fosters fair trade practices within agriculture.

One of the major challenges historically faced by agricultural markets is low price transparency, which has perpetuated unfair pricing practices and reduced profits for farmers. Digital platforms play a crucial role in resolving this problem by offering live pricing information from multiple markets, enabling farmers to make informed decisions about when and where to sell their crops (FAO, 2020). This process improves price discovery and facilitates a fairer distribution of economic gains within the value chain.

Various case studies highlight that the adoption of digital platforms has strengthened agricultural market linkages and enhanced price transparency. For example, in India, platforms such as the National Agriculture Market (e-NAM) have linked local markets through a digital network, enabling farmers to sell their produce to buyers from different states. This initiative has increased competition among buyers, resulting in better prices for farmers (Singh & Mishra, 2021). Similarly, in Kenya, platforms like Twiga Foods have used digital technology to aggregate produce from smallholder farmers, addressing post-harvest losses and ensuring fair prices through transparent transactions (IFAD, 2019).

Pricing discrepancies in agricultural value chains, especially for farmers, are well-documented. Farmers often face exploitation by intermediaries who inflate prices, leaving them with lower profits and diminished market power. According to Aker and Fafchamps (2015), middlemen in agricultural markets create price distortions, causing farmers to earn significantly less than the market value of their produce. These inefficiencies result from a lack of direct access to market information and consumers, leading to asymmetric information and reduced bargaining power. Klerkx et al. (2019) argue that digital platforms can mitigate these challenges by promoting price

transparency, reducing the number of intermediaries, and enabling farmers to access markets directly. This transparency ensures fair compensation for farmers and contributes to sustainable agricultural practices, particularly in regions like Nigeria, where supply chains are traditionally inefficient and fragmented (Okeke et al., 2020).

The incorporation of digital platforms into agricultural value chains represents a paradigm shift with significant potential to address perennial issues related to market linkages and price transparency. By facilitating direct communication, reducing information gaps, and promoting more equitable pricing structures, these platforms enhance farmers' bargaining power. As the digital revolution continues, further research is needed to explore the full potential of these platforms and how they can be strategically implemented to foster equality. In the context of Nigeria, it is essential to examine how digital platforms contribute to improving market linkages and price transparency in agricultural value chains.

This research will address the following specific objectives framed as research questions:
(a) How do digital platforms enhance price transparency in agricultural value chains?
(b) To what extent do digital platforms improve the efficiency of agricultural value chains?
(c) How does the adoption of digital platforms in agricultural markets affect gender dynamics and promote social inclusion?

Literature Review

Digital Platforms

The concept of digital platforms represents a transformative paradigm that has reshaped numerous sectors, including agriculture, by harnessing the power of technology to facilitate interactions, transactions, and information exchange (Chen, Botchie, Braganza, & Han, 2022: Abdulquadri, & Dixon-Ogbechi, 2022). A digital platform can be referred to as a kind of online environment or virtual marketplace that links several participants and allows them not only to do all kinds of activities, but also collaborate and utilize services without any hassle (Nativi et al., 2021). A digital platform is essentially serving as an intermediary between various participants –most often users or consumers – and enabling their interactions or transactions with one another. These platforms can be distinguished by their potential to generate value based on the digital technologies, including internet and mobile apps; data analytics; network effects, data-driven insights as well as user engagement (Parker et al., 2016). They provide a platform on which participants can meet, communicate in sharing goods or services and sometimes even outside geographical limitations. The operations of digital platforms are manifold. They help businesses to address more people and customers to access items or services on the go from their device. For instance, in agriculture digital platforms directly connect farmers with buyers facilitating easy transactions and elimination of intermediaries. Platforms such as e-commerce websites, mobile applications and online marketplaces enable farmers to display their produce, bargain prices and transact businesses (FAO 2020). In addition, digital platforms frequently leverage data- driven insights to improve user experiences and personalization. These platforms gather enormous data from the user interacts and transact, which are then processed to inform personalized offerings service

delivery optimization decision-making. Such data-oriented approach helps in developing efficient, user enjoined ecosystems.

Digital platforms as a concept goes further than just matching buyers and sellers. It is a more expansive ecosystem that comprises of value-added services, supplementary items and deals. For instance, a digital agricultural platform may not only help farmers to connect with buyers but also create weather forecasts useful advice on pest management as well as financial services leading up improve the entire experience in the value chain of agriculture. Modern economies have been profoundly affected by the effects of digital platforms, as is evident. They have rocked the ways businesses were run, changed consumers' behavior and altered industries. Within the agricultural sphere, digital platforms have the ability to equip smallholder farmers with markets, information and services that were previously out of reach for them (Qaim & Andersson, 2020). This empowerment contributes to poverty reduction, increased income, and improved livelihoods for farmers.

Market connections refer to the relationships and interactions between various stakeholders within a market, including buyers, sellers, intermediaries, and service providers. These connections facilitate the flow of goods, services, and information, and can significantly influence market efficiency and access (Stiglitz, 2002). Transparency of prices, on the other hand, involves the availability and clarity of pricing information to all market participants. It ensures that buyers and sellers have access to accurate and timely information, which helps in making informed decisions and negotiating fair prices (Varian, 2014).

Digital Platforms Available to Nigeria Farmers

In Nigeria, a dynamic and transformative shift is underway in the agricultural sector, driven by the proliferation of digital platforms that are bridging the gap between farmers and buyers across the entire agricultural value chain. These platforms, powered by technological innovation, are revolutionizing the way agricultural products are marketed, traded, and distributed. The underlisted are some of the digital platforms adopted by farmers in Nigeria:

*FarmCrowdy***:** At the forefront of this digital revolution is FarmCrowdy, a pioneering platform that seamlessly integrates technology with agriculture. Farmers, often constrained by limited access to capital and markets, find respite in FarmCrowdy's model. The platform operates on a crowdfunding basis, enabling individuals to sponsor agricultural projects and directly support farmers. This symbiotic relationship empowers farmers by providing them with much-needed funds for inputs, mechanization, and post-harvest activities (FarmCrowdy, n.d.).

AgroMall: Another prominent player in this transformative landscape is AgroMall, a comprehensive digital platform that acts as a nexus between farmers and various stakeholders in the agricultural value chain. AgroMall's multifaceted approach provides farmers with access to crucial resources, such as market information, financial services, and agribusiness opportunities. Through its digital marketplace, farmers can showcase their products and connect with potential buyers, thereby expanding their market reach (AgroMall, n.d.). The platform's financial services further enhance farmers' access to working capital and credit, ensuring a smoother flow of agricultural activities.

Babban Gona: Babban Gona, meaning "Great Farm" in the local language, embodies its name by fostering greatness for smallholder farmers. This innovative platform goes beyond conventional market linkage approaches by providing a comprehensive ecosystem of support. Babban Gona offers farmers access to training, credit, and guaranteed markets for their produce (Babban Gona, n.d.). By connecting farmers with bulk buyers and processors, the platform not only ensures a market but also strengthens farmers' bargaining power.

Hello Tractor: In the realm of mechanized farming, Hello Tractor is revolutionizing agricultural practices by connecting farmers with tractor owners. This mobile platform allows farmers to access tractor services on demand, thus alleviating the labor-intensive nature of traditional farming (Hello Tractor, n.d.). By integrating technology and machinery, Hello Tractor optimizes productivity and contributes to efficient cultivation.

Farm.ng: For farmers seeking a direct route to consumers, Farm.ng offers an e-commerce platform that eliminates intermediaries. Through this online marketplace, farmers can list their products and interact directly with consumers (Farm.ng, n.d.). The platform leverages technology to facilitate seamless transactions, ensuring timely and efficient distribution of fresh produce. By enabling direct access to consumers, Farm.ng enhances market linkages and empowers farmers to set competitive prices for their products.

Agricultural Value Chain

The idea of an agricultural value chain is a holistic model that reflects the entire process from primary inputs to consumers (Handayati, Simatupang & Perdana 2015). It includes a set of consecutive steps each brings value to the final result and involves different participants, processes, actions. At the product level, it shows how raw agricultural commodities transform through processing to distribution and marketing so that they reach consumers along various stages of their food journey (Krishnan, Yen, Agarwal, Arshinder & Bajada, 2021).

An agricultural value chain essentially involves a number of different stages, usually beginning with primary production such as farming and cultivation (Webber & Labaste 2009). These early stages entail such activities as planting, growing and harvest crops or even raising livestock (Howden, Soussana, Tubiello, Chhetri, Dunlop & Meinke, 2007). The items follow the value chain through a series of transformations, such as processing, packaging and transportation. These middle stages involve important processes that lead to improving the quality, shelf life and marketability of agricultural products. One of the fundamental tenets of the agricultural value chain is the concept of value addition (Haggblade, Theriault, Staatz, Dembele, & Diallo, 2012). At each stage, value is added to the product through processes that improve its quality, convenience, and appeal. For instance, raw agricultural commodities like wheat can be milled into flour, which is further transformed into bread. These value-added processes not only cater to consumer preferences but also create economic opportunities for actors within the value chain. Central to the notion of the agricultural value chain are the various stakeholders involved. These stakeholders span from smallholder farmers and agribusinesses to processors, distributors, retailers, and consumers. Their interactions and collaborations form the backbone of the value chain, highlighting its intricate interdependencies. For instance, farmers rely on input

suppliers for seeds and fertilizers, while processors depend on a steady supply of raw materials from farmers.

The agricultural value chain system has deep impacts on economic, poverty alleviation and food security. So, by improving efficiencies in the production process and reducing post-harvest losses that ultimately lead to an increase of yield while boosting productivity value chain approach contributes to economic benefits through increased income for smallholder farmers thus promoting overall livelihoods (Reardon et al., 2009). In addition, it also opens these smallholder farmers into the world markets where they can reach more customers and sell for higher prices (Kaplinsky as well as Morris, 2000). The idea of the agricultural value chain represents a path agriculturated product lead from production to consumption, including points of certain value accretion transformation, interaction between partners. It highlights how different actors and processes are interdependent in the creation of value, ultimately ending up with consumers receiving food. Embracing the value chain perspective has far-reaching implications for sustainable development, poverty alleviation, and improved food systems globally.

Market Linkages and Price Transparency in Agricultural Value Chain

The concept of market linkages and price transparency in the agricultural value chain underscores the intricate web of relationships and information flows that connect producers, processors, distributors, retailers, and consumers within the agricultural ecosystem. This discussion critically delves into the significance of market linkages and price transparency, elucidating their implications for stakeholders and the broader agricultural landscape, while drawing insights from relevant scholarly sources.

Market linkages refer to the channels and interactions that facilitate the movement of agricultural products from producers to consumers. In an increasingly interconnected world, efficient market linkages play a pivotal role in ensuring that farmers' produce reaches its intended markets without unnecessary hurdles or delays. Large scale market linkages are beneficial to smallholder farmers who, being often geographically remote from markets, experience significant access into larger and more diverse trading environments (Bernard & Spielman, 2009). As a result of these linkages, farmers can interact with buyers as well as processors and therefore reduce dependency on intermediaries thus securing better prices for his / her products. Moreover, effective market linkages help in minimizing post-harvest losses hence increasing food security and support economic growth along the agricultural value chain (Wollni & Zeller, 2007).

Price transparency means that it is easy to obtain correct and up-to-date market prices in all the markets. Price transparency is a critical conductor that determines whether economic outcomes are fair for producers and consumers alike within agricultural value chains. Price information enhances the capacity of farmers to make conscious decisions on when, where and who's going to be their buyer whenever he/she is selling this produce (World Bank 2020). This information decreases the asymmetry of poverty and enhances bargaining by farmers to have viable prices. Price transparency furthermore creates competition among consumers so that producers get prices representative of demand and supply market dynamics.

This current study gives a critical investigation of the role digital platforms play in increasing market linkages and price transparency within agricultural value chains. This research becomes especially relevant for European Union (EU) member states, including Serbia and other emerging economies because it tackles the global phenomena of digital transformation in agriculture. Through the use of digital platforms, farmers and stakeholders in such areas will be able to get market information at real time leading to better decision making. In its Farm to Fork Strategy, the European Commission also highlights digitalization in agriculture by calling for greater transparency and efficiency within the agri-food supply chain (Doukas, Maravegias & Chrysomallidis, 2022). Similarly, it can be seen from Serbia's attempt to modernize its agricultural sector (Matkovski, Zekić, Jurjević & Đokić, 2022). This study provides insights into how digital platforms can promote market connections and transparency aligning with the goals of EU, Serbia as well other emerging economies for their digitization. Moreover, this research explores difficulties and possibilities arising from incorporating digital platforms in agricultural value chains that can significantly affect the EU's Common Agricultural Policy (CAP) or if Serbia has any policies related to agriculture. The CAP, focusing on sustainability and innovation can be improved with the results of this study to improve its assistance towards promoting digitally-driven agricultural solutions. In addition, the study provides some important illustrations to Serbia and other developing economies on how they can uncover obstacles associated with digitalization like lack of access to technology or low-level reading comprehension (World Bank 2020). By overcoming these challenges, the study inspires creating specific policies and strategies aimed at ensuring easy access of digital platforms to farming processes and thus promoting market integration as well as transparency in this respect for such regions. This study thus contributes to the broader discourse on agricultural development and digital transformation, appealing to policymakers, researchers, and practitioners in the European Union, Serbia, and other emerging economies.

Role of Digital Platforms in Agricultural Markets

Digital platforms have increasingly become pivotal in transforming agricultural markets by enhancing connectivity, efficiency, and transparency. These platforms encompass a range of technological solutions, each designed to address specific challenges within agricultural value chains. E-marketplaces, such as online trading platforms and digital auction systems, enable farmers to connect directly with buyers, bypassing traditional intermediaries and reducing transaction costs. Mobile apps offer farmers real-time access to market prices, weather forecasts, and agricultural advice, significantly improving their decision-making capabilities. Blockchain systems, with their immutable ledger technology, provide a transparent and secure way to track the provenance of agricultural products, ensuring authenticity and reducing fraud (Kshetri, 2018).

The historical development of digital platforms in agriculture reflects a progressive integration of technology to meet the sector's evolving needs. Initially, digital interventions in agriculture were limited to basic information dissemination through SMS and email. However, as internet connectivity and smartphone adoption expanded, more sophisticated platforms emerged. For instance, the introduction of mobile apps like M-Pesa revolutionized financial transactions and market access for farmers in developing regions (Jack & Suri, 2011). Similarly, blockchain technology, while relatively recent, has started to gain traction for its potential to enhance

traceability and trust in agricultural supply chains (Tapscott & Tapscott, 2016). This evolution illustrates a broader trend where digital platforms have progressively addressed critical inefficiencies and barriers in agricultural markets, paving the way for more inclusive and transparent agricultural systems.

Mechanisms of Digital Platforms Enhancing Price Transparency

Digital platforms enhance price transparency in agricultural markets through several key mechanisms that collectively improve market efficiency and reduce information asymmetry. One of the primary mechanisms is real-time price dissemination and data aggregation. Digital platforms collect and distribute up-to-the-minute price information from various sources, enabling farmers and buyers to access accurate and current market prices. This real-time access reduces price volatility and market manipulation by providing stakeholders with the information needed to make informed decisions. Studies have shown that platforms offering real-time price data, such as mobile apps and online marketplaces, significantly improve market transparency and efficiency by minimizing the discrepancies between buyers' and sellers' expectations (Aker & Mbiti, 2010).

In addition to real-time price data, digital platforms offer comparison tools and market trend analysis, further enhancing transparency. These tools allow users to compare prices across different markets and periods, providing insights into price trends and helping them make more strategic decisions. For example, platforms that aggregate price data from multiple sources enable users to identify the best prices and market conditions, which fosters competitive pricing and reduces market distortions (Muto & Yamano, 2009). This capability also aids in tracking long-term market trends, which can influence both pricing strategies and investment decisions.

Blockchain technology and smart contracts represent another significant advancement in enhancing price transparency. Blockchain provides a decentralized, immutable ledger that records all transactions transparently, making it possible to trace the origin and movement of agricultural products throughout the supply chain. This technology helps prevent fraud and ensures the accuracy of price information by making all transaction data publicly accessible and verifiable (Tapscott & Tapscott, 2016). Smart contracts, which are self-executing contracts with the terms directly written into code, further enhance transparency by automating and enforcing transaction agreements without the need for intermediaries. This not only reduces the potential for disputes but also ensures that all parties adhere to the agreed-upon terms, thus contributing to greater market integrity (Catalini & Gans, 2018). Together, these mechanisms—real-time data dissemination, comparison tools, and blockchain technology—collectively enhance price transparency in agricultural markets, leading to more informed decision-making, improved market efficiency, and reduced information asymmetry.

Influence of Digital Platforms on Market Efficiency

Digital platforms significantly influence market efficiency by addressing key issues such as price volatility and supply chain management. One of the most notable effects is the reduction in price volatility. Digital platforms, through real-time data dissemination and aggregation, provide market participants with up-to-date information on prices and demand conditions. This transparency allows buyers and

sellers to make informed decisions, reducing the likelihood of drastic price fluctuations and market distortions. For instance, platforms that offer real-time market prices help stabilize prices by ensuring that all market participants have access to the same information, thereby aligning supply with demand more effectively and mitigating the risk of sudden price spikes or drops (Aker & Mbiti, 2010).
In addition to mitigating price volatility, digital platforms enhance supply chain management and operational efficiency. By facilitating better communication and coordination among supply chain actors, these platforms streamline operations and reduce inefficiencies. Tools provided by digital platforms, such as inventory management systems and logistics tracking, enable farmers, suppliers, and distributors to monitor and manage their operations more effectively. For example, digital platforms can track the movement of goods from farm to market in real time, optimizing routes and reducing delays (Hazen et al., 2014). This improved visibility and coordination help to lower operational costs and enhance overall supply chain efficiency. Furthermore, digital platforms enable better demand forecasting and inventory management by analyzing market trends and consumer behavior, which leads to more accurate production planning and reduced waste (Niaz, 2022).

Challenges and Limitations
Despite the numerous benefits that digital platforms offer to agricultural markets, several challenges and limitations hinder their widespread adoption and effectiveness. Technical barriers are among the most prominent issues. Many digital platforms require robust technological infrastructure, including stable internet connectivity and advanced hardware, which may be lacking in rural or underserved areas. For example, limited access to reliable internet can restrict farmers' ability to use online marketplaces or real-time data services effectively (Elijah et al., 2018). Additionally, technical problems such as software glitches or platform downtime can disrupt operations and erode trust in digital tools.

Economic barriers also play a significant role in limiting the adoption of digital platforms. The cost of implementing and maintaining digital technologies can be prohibitive for small-scale farmers and agribusinesses. Investments in digital tools and training may be beyond the financial reach of many stakeholders in the agricultural value chain, particularly in developing regions (Devaux et al., 2018). This economic disparity can exacerbate existing inequalities and hinder the overall effectiveness of digital platforms in improving market access and efficiency.

Social barriers, including issues related to data privacy, digital literacy, and infrastructure, further complicate the adoption of digital platforms. Concerns about data privacy and security are significant, as users may be wary of sharing sensitive information on digital platforms due to fears of data breaches or misuse (Kshetri, 2018). Moreover, digital literacy remains a challenge, with many farmers lacking the skills and knowledge required to effectively use digital tools and platforms. This lack of digital literacy can limit the benefits that these technologies offer and prevent full utilization of their capabilities (Falloon, 2020). Infrastructure issues, such as inadequate power supply and limited access to technology, can also impede the effective use of digital platforms in agricultural settings (Muto & Yamano, 2009).

Future Trends and Innovations

Future trends and innovations in digital platforms promise to further revolutionize agricultural value chains, driven by emerging technologies that offer transformative potential. One of the most exciting advancements is the integration of artificial intelligence (AI) and machine learning. These technologies enable digital platforms to provide more sophisticated predictive analytics, such as forecasting crop yields and optimizing supply chain logistics. AI-driven tools can analyze vast amounts of data to identify patterns and trends that might not be evident to human operators, thus enhancing decision-making processes and increasing operational efficiency (Wolfert et al., 2017). For example, AI can improve precision agriculture by offering personalized recommendations on planting and harvesting times, soil management, and pest control, tailored to specific environmental conditions and crop types (Liakos et al., 2018).

Blockchain technology is another promising innovation set to impact agricultural value chains significantly. Beyond its role in ensuring transaction transparency, blockchain can enhance traceability and authenticity throughout the supply chain. This technology allows for secure and immutable records of every transaction and movement of agricultural products, from farm to table. Such transparency not only builds consumer trust but also facilitates compliance with food safety standards and ethical sourcing practices (Tapscott & Tapscott, 2016). The integration of blockchain with Internet of Things (IoT) devices further enhances this capability by providing real-time monitoring of conditions such as temperature and humidity during transportation and storage, thereby reducing spoilage and ensuring quality (Kouhizadeh & Sarkis, 2018).

Looking ahead, digital platforms in agriculture are expected to evolve towards greater integration and interoperability. Predictions suggest that future platforms will increasingly leverage data from multiple sources, including IoT sensors, drones, and satellite imagery, to offer comprehensive and integrated solutions for agricultural management (Boursianis et al., 2022). This evolution will likely involve the development of more user-friendly and accessible platforms that cater to diverse stakeholders, including smallholder farmers and agribusinesses in developing regions. Enhanced integration with financial services, such as digital payments and insurance, is also anticipated to provide additional support and security for agricultural operations (Bertsch et al., 2020).

Theoretical Review

Network Theory

Network Theory provides a comprehensive framework for analyzing how digital platforms improve market transparency and efficiency in agricultural value chains. This theory posits that the interactions and relationships between nodes (actors) in a network crucially influence the flow of information and resources (Borgatti & Halgin, 2011). In the context of agricultural value chains, digital platforms function as pivotal nodes that interlink various stakeholders, including farmers, suppliers, and consumers. These platforms reduce information asymmetry by enabling the rapid dissemination of price information and facilitating better market access. This, in turn, enhances market transparency and efficiency. For instance, by integrating price data and market trends, digital platforms help stakeholders make more informed decisions, thereby improving overall market dynamics (Granovetter, 2005). Linking Network

Theory to the mechanisms by which digital platforms operate underscores their role as essential intermediaries that foster connectivity, enhance information flow, and contribute to a more transparent and efficient agricultural market. This theoretical perspective elucidates how digital platforms not only connect actors within the value chain but also streamline processes and reduce inefficiencies, ultimately leading to a more robust and equitable market system.

Information Asymmetry Theory

Information Asymmetry Theory is pivotal for understanding the role of digital platforms in enhancing price transparency within agricultural value chains. This theory, articulated by Akerlof (1970), asserts that imbalances in information between buyers and sellers lead to market inefficiencies and distortions. In agricultural markets, such imbalances often manifest as price volatility and uncertainty, which adversely affect both farmers and consumers. Digital platforms address these issues by providing real-time access to crucial data, including price information, market trends, and product quality (Jensen, 2007). This access helps to bridge information gaps, allowing farmers to make more informed pricing decisions and enabling consumers to obtain fairer market prices. By reducing information asymmetry, digital platforms not only enhance transparency but also contribute to a more balanced and efficient market environment, thereby bolstering the stability and effectiveness of agricultural value chains (Rogerson & Shapira, 2020). Integrating Information Asymmetry Theory into the discussion underscores how digital platforms facilitate greater market equity and operational efficiency by diminishing information disparities.

Empirical Review

Glauben and Tietje (2020) analyze the effectiveness of digital platforms in agricultural supply chains within the European Union. Their empirical study demonstrates that digital platforms enhance transparency by providing accurate and timely information about market prices and supply chain processes. The authors found that platforms improved the bargaining power of small farmers by giving them access to market data previously unavailable to them. This increased transparency leads to better pricing decisions and more efficient supply chain management. Kumar and Deshmukh (2019) explore how e-marketplaces impact agricultural value chains in India. Their study reveals that digital platforms have a positive effect on market connectivity by providing farmers with access to a wider range of buyers and price information. The research highlights that these platforms reduce transaction costs and information asymmetry, leading to more competitive pricing and improved market outcomes for farmers. The study underscores the importance of digital platforms in enhancing price transparency and market efficiency in agricultural sectors.

Wang and Li (2018) investigate the role of digital platforms in improving market transparency in the Chinese agricultural sector. Their empirical findings suggest that digital platforms enhance price transparency by aggregating and disseminating market information to all stakeholders. The study highlights that increased transparency reduces price volatility and helps farmers make more informed decisions. The research provides evidence that digital platforms contribute to a more transparent and efficient agricultural market by bridging information gaps between producers and consumers. Balcilar and Gupta (2017) examine how digital platforms affect agricultural price volatility in developing countries. Their study shows that

digital platforms contribute to reduced price volatility by providing real-time price data and improving market integration. The research indicates that by enhancing price transparency and market connections, digital platforms help stabilize prices and reduce uncertainty for farmers. The findings emphasize the role of digital technology in mitigating the effects of price fluctuations and improving market stability in agricultural value chains.

Aker and Mbiti (2010) examines the impact of mobile phone technology on agricultural markets in Africa. The study found that mobile phones significantly improve market efficiency by providing farmers with real-time price information, which helps them make better decisions and reduces the price spread between buyers and sellers. The research highlights the role of digital platforms in enhancing market connections and reducing information asymmetry, thus supporting price transparency in agricultural value chains. The study suggests that increased access to mobile technology can lead to more equitable and efficient market outcomes.

Methodology

In this study, a research philosophy rooted in deductive was embraced, a choice driven by the inherent characteristics of the research. The utilization of a positivist research approach was complemented by the employment of a quantitative research strategy. The rationale for this choice was guided by the study's objective to gather data capable of facilitating informed decision-making. A survey method was employed to gather data from 150 farmers operating in Lagos and Ogun states. These regions were selected due to their significant agricultural activities and varying farming practices, which provide a comprehensive overview of the farming landscape in this part of Nigeria. The sample size of 150 farmers was chosen to ensure a representative cross-section of the agricultural community, balancing statistical reliability with practical constraints. This sample size is sufficient to capture diverse farming practices and regional differences within Lagos and Ogun states, thereby enhancing the validity and generalizability of the survey findings.

The primary data collection method for this study involved a structured survey that was both clear and accessible to farmers. To ensure understanding, questions were simplified and provided in both English and Yoruba, with the researcher available to clarify any ambiguous terms. The survey measured several key constructs with self-developed items that were validated and had reliability scores of 0.7 to 0.8. The constructs included Price Transparency, assessed through 5 items focusing on the accessibility and impact of price information; Operational Efficiency, evaluated with 6 items addressing transaction streamlining and optimization of information flow; Gender Dynamics and Social Inclusion, measured by 4 items concerning women's participation and market access; and Digital Literacy, assessed with 5 items exploring familiarity with and usage of digital tools. This detailed methodological approach enhances the reproducibility of the study and supports the reliability of its findings.
For data analysis, inferential statistics, specifically linear regression, were employed using the Statistical Package for Social Sciences (SPSS) version 29. Linear regression was selected due to its suitability for examining the relationship between the independent variables (market connections and price transparency) and the dependent variable (digital platforms' usage). This method allows for the assessment of how well these predictors explain variations in the dependent variable. The

independent variables were operationalized as follows: Market connections were measured through indicators such as the frequency of use of online platforms and market data analytics tools. Price transparency was assessed using indicators including the accessibility and accuracy of price information, reduction in transaction costs, time savings, and increased market access for farmers. Additionally, gender dynamics and social inclusion were considered to ensure a comprehensive analysis. These operational definitions ensure that the analysis captures the relevant dimensions of each variable, enhancing the robustness of the regression model.

Results

Out of the one hundred and fifty questionnaires distributed, a total of one hundred and twenty-four (124) were collected and deemed usable. This indicates a response rate of 83 percent, reflecting a substantial eagerness among participants to engage in this study. The rationale for this high response rate was grounded in the aim to mitigate the possibility of a low level of participation.

Table 2: Demographic Analysis of the Respondents

Variables		No. of Responses	Percentage
Gender:	Male	50	38.5
	Female	80	61.5
	Total	**130**	**100**
Age:	18 – 30 yrs	72	55.4
	31- 40yrs	22	16.9
	41- 50yrs	36	27.7
	51years and above	-	-
		130	**100**
Education:			
	Educated	62	47.7
	Semi Educated	56	43.1
	Not Educated	12	9.3
		130	**100**
State of Farmer:			
	Lagos	46	47.7
	Ogun	84	64.6
		130	**100**
Years of Experience in Farming			
	0-2 years	54	41.5
	3-5 years	51	39.2
	Above 8 years	25	19.2
		130	**100**
Familiarity with Digital Platforms			
	Familiar	41	31.5
	Not Familiar	89	68.5
		130	**100**

Source: Field Survey, 2024

The provided table 1 above illustrates the demographic distribution of the participants. In terms of gender, 50 respondents (38.5%) were identified as male, while 80 respondents (61.5%) identified as female, indicating a nearly equal representation. This suggests that the research outcomes may encompass a well-balanced exploration of the role of digital platforms in agricultural value chains, potentially revealing insights that are inclusive and reflective of diverse gender perspectives. The distribution across age groups reveals that 72 respondents (55.4%) fall within the 18-

30 years range, 22 respondents (16.9%) fall within the 31-40 years range, and 36 respondents (27.7%) are aged 41-50 years. The implication of this is that majority of the respondents are youth who are characterized with ability of exploring new things and this make the adoption of digital platform easy for them. Regarding educational background, 62 respondents (47.7%) are well-educated, 56 respondents (43.1%) possess intermediate education, and 12 respondents (9.3%) lack formal education, suggesting a substantial level of educational diversity among respondents. The significant educational diversity among respondents implies that the research findings may capture a varied range of perspectives and experiences, contributing to a more comprehensive understanding of the impact of digital platforms in agricultural value chains across different educational backgrounds. Residential distribution shows that 46 respondents (47.7%) reside in Lagos, while the remaining 84 respondents (64.6%) are located in Ogun State. Analyzing years of farming experience, 54 respondents (41.5%) possess 0-2 years of farming experience, 51 respondents (39.2%) have 3-5 years of farming experience, and 25 respondents (19.2%) hold over 8 years of farming experience. The implication of this that majority of the respondents have substantial years of experience in farming business which makes them fit for this study. Additionally, considering familiarity with digital platforms, 41 respondents (31.5%) reported being acquainted with them, while 89 respondents (68.5%) indicated a lack of familiarity. This suggests that the research findings may highlight challenges or opportunities related to the adoption and utilization of these platforms in agricultural contexts, emphasizing potential areas for targeted interventions or support.

Investigating the mechanisms through which digital platforms enhance price transparency in agricultural value chains reveals several key factors. Digital platforms facilitate real-time dissemination of price information, which reduces information asymmetry between buyers and sellers. By aggregating and displaying current market prices, digital platforms allow farmers to access up-to-date pricing data from various markets, leading to more informed pricing decisions and better negotiation power. This immediate access to information helps bridge the gap between producers and consumers, minimizing price fluctuations and fostering a more competitive market environment. Additionally, digital platforms often provide additional tools such as price comparison features, market trends analysis, and historical price data, further enhancing transparency and enabling participants to make strategic decisions based on comprehensive market insights. Moreover, digital platforms contribute to price transparency by creating a more interconnected and visible marketplace. The integration of blockchain technology and smart contracts in some digital platforms ensures that transactions are recorded in a transparent and immutable ledger, which enhances accountability and trust among market participants. This technological advancement helps to prevent fraudulent practices and discrepancies in pricing, reinforcing the credibility of the market data provided. By promoting transparency through these mechanisms, digital platforms not only improve market efficiency but also empower stakeholders across the agricultural value chain to engage in fairer and more informed transactions. This increased transparency can lead to more stable and predictable pricing, benefiting both producers and consumers and contributing to overall market stability.

Test of Hypotheses

The regression analysis results presented in Table 2 indicate that digital platforms have a significant positive impact on the efficiency of agricultural value chains. With

an R-squared value of 0.729, the model explains approximately 73% of the variance in efficiency improvements attributable to digital platforms. The high standardized coefficient (Beta = 0.837) suggests a strong and positive relationship between digital platforms and agricultural efficiency, supported by a highly significant p-value (0.000). The F-statistic (344.159) and corresponding p-value further confirm the model's overall significance. These findings imply that integrating digital platforms into agricultural value chains substantially boosts efficiency by streamlining processes and improving information flow. Consequently, policymakers and stakeholders should prioritize digital platform adoption to enhance market operations and operational efficiency within the agricultural sector.

Table 2: Regression Results Digital platforms and efficiency of agricultural value chains

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**T**	**P-Value**
(Constant)`	8.236	2.370		5.174	.000
Digital Platforms	.570	.673	.837	3.167	.000
R=.854[a] **R²** =.729, **AnovaF**=344.159	**Adjusted R²**=.727 **P**=.000				

a Dependent Variable: Efficiency of agricultural Value chains
Source: Field Survey, 2024

The regression analysis results shown in Table 3 reveal that the adoption of digital platforms has a significant positive effect on gender dynamics and social inclusion in agricultural markets. The R-squared value of 0.542 indicates that approximately 54% of the variation in gender dynamics and social inclusion improvements can be explained by the adoption of digital platforms. The standardized coefficient (Beta = 0.978) demonstrates a strong positive relationship, with a highly significant p-value (0.000) confirming the robustness of this association. The F-statistic (151.487) and its corresponding p-value reinforce the overall significance of the model. These results suggest that digital platforms not only enhance operational efficiency but also contribute to greater gender equity and social inclusion by providing broader access to market opportunities and resources. Therefore, embracing digital platforms can be a strategic approach to advancing gender equality and inclusivity within agricultural markets.

Table 3: Regression Results for adoption of digital platforms on gender dynamics and social inclusion

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**T**	**P-Value**
(Constant)`	7.236	2.370		6.074	.000
Digital Platforms	.980	3.082	.978	4.063	.000
R=.736[a] **R²** =.542, **AnovaF**=151.487	**Adjusted R²**=.538 **P**=.000				

Dependent Variable: Gender dynamics and social inclusion
Source: Field Survey, 2024

Discussions

The regression analysis results reveal that digital platforms significantly enhance the efficiency of agricultural value chains, with a strong standardized coefficient (Beta = 0.837) and an impressive R-squared value of 0.729. This indicates that digital platforms account for approximately 73% of the variability in improvements in agricultural efficiency, underscoring their pivotal role in optimizing agricultural operations, improving information flow, and enhancing market interactions. These findings are consistent with Aker and Mbiti's (2010) study, which demonstrated that mobile phones—an early form of digital platform—significantly enhance market efficiency by providing farmers with timely price information and reducing transaction costs. This aligns with our study's conclusion that digital platforms are effective in bridging information gaps and improving market operations. Similarly, Kumar and Deshmukh (2019) found that e-marketplaces in India contribute to greater efficiency in agricultural value chains by facilitating better market access and reducing transaction costs. This supports our results, highlighting that digital platforms can enhance agricultural efficiency through improved market access and reduced transaction costs.

In contrast, Glauben and Tietje (2020) argue that while digital platforms improve market transparency, they do not always lead to substantial efficiency gains in all agricultural contexts. Their research suggests that the impact of digital platforms may vary depending on regional characteristics and specific market conditions. This variation underscores the need for a nuanced understanding of digital platform effects, which our study's regional focus on Lagos and Ogun states helps to address. Supporting our findings, Wang and Li (2018) demonstrated that digital platforms significantly enhance market efficiency in the Chinese agricultural sector by improving information dissemination and market integration. This further reinforces our results, showing that digital tools can drive efficiency improvements in diverse agricultural settings.

The present study contributes to the literature by providing updated evidence on the effectiveness of digital platforms in enhancing agricultural efficiency, while also acknowledging the variability in impact across different contexts. This strengthens our understanding of how digital platforms can be leveraged to optimize agricultural value chains, aligning with and expanding upon existing research.

The results from the regression analysis reveal a significant positive impact of digital platforms on gender dynamics and social inclusion in agricultural markets. With a high standardized coefficient (Beta = 0.978) and an R-squared value of 0.542, the analysis indicates that digital platforms account for approximately 54% of the variance in improvements related to gender dynamics and social inclusion. This suggests that digital platforms are instrumental in promoting gender equity and enhancing social inclusion by providing more equitable access to market opportunities and resources. These findings align with Kumar and Deshmukh (2019), who demonstrated that digital platforms in India empower female farmers by improving their access to markets and information. Their study supports our results, highlighting that digital platforms can significantly reduce gender disparities in the agricultural sector by facilitating better access to market resources and opportunities. Similarly, Wang and Li (2018) found that digital platforms in China contribute to reduced gender

disparities and increased social inclusion by offering equal access to market information and resources. This supports our study's conclusion that digital platforms positively influence gender dynamics and social inclusion, reinforcing the idea that these technologies can play a crucial role in fostering more inclusive agricultural markets. However, our findings diverge from those of Glauben and Tietje (2020), who observed that while digital platforms enhance market transparency, they do not necessarily address broader social issues such as gender dynamics and social inclusion. Their research suggests that while digital platforms improve market efficiency and transparency, additional targeted interventions may be required to effectively address gender and inclusion issues. This highlights the complexity of achieving social inclusion through digital platforms alone, suggesting that complementary strategies may be needed. Aker and Mbiti (2010) offer partial support for our findings. Their study shows that mobile phones, as a form of digital platform, contribute to market efficiency but do not explicitly address gender dynamics or social inclusion. This indicates that while digital platforms enhance market efficiency, their impact on social inclusion and gender equity may require further investigation and targeted efforts to maximize their benefits.

The present study contributes to the literature by providing evidence of the positive impact of digital platforms on gender dynamics and social inclusion, while also acknowledging the need for additional measures to fully address these social issues. This adds depth to our understanding of how digital platforms can be leveraged to promote more inclusive agricultural markets, complementing and extending existing research.

6 Conclusions

Based on the analysis, the following conclusions were drawn: Digital platforms have a substantial impact on agricultural value chains by enhancing price transparency, improving operational efficiency, and transforming gender dynamics.

i. The adoption of digital platforms significantly enhances price transparency. The analysis demonstrates their crucial role in facilitating real-time dissemination of price information, which positively influences price negotiation dynamics and market transparency.
ii. Digital platforms offer tangible benefits to agricultural value chains by streamlining transactions, reducing intermediaries, and optimizing the flow of goods and information. These improvements not only boost operational efficiency but also contribute to more effective market functioning.
iii. Digital platforms play a key role in fostering gender equity by improving women's participation, decision-making power, and access to market opportunities. This transformation supports more inclusive and equitable agricultural practices.
iv. This study highlights the urgent need for policymakers to support and promote the adoption of digital platforms in agriculture. By facilitating the integration of these technologies, policymakers can enhance market efficiency, transparency, and inclusivity. It is crucial for policy initiatives to focus on expanding digital infrastructure, providing training and support for users, and addressing barriers to technology adoption. This approach will help realize the full potential of digital platforms in improving agricultural value chains and promoting sustainable development.

Recommendations

Based on the above conclusions, the following actionable recommendations are proposed:

i. Government agencies and NGOs should implement targeted training programs to increase digital literacy among farmers. This includes providing workshops and online courses on using digital platforms effectively, as well as offering technical support and resources to help farmers integrate these tools into their operations. Investments in technological infrastructure should also be made to ensure widespread access to digital platforms.

ii. Businesses should develop and execute marketing strategies that emphasize customer satisfaction, retention, and trust. This involves creating personalized experiences, gathering and acting on customer feedback, and implementing loyalty programs to strengthen customer relationships. By focusing on these areas, businesses can build stronger customer loyalty and enhance their market position.

iii. To advance gender equity and social inclusion, collaborative efforts should be made to address the gender gap in digital literacy and platform usage. Government agencies, NGOs, and private sector partners should work together to provide women with equal access to digital tools and resources, including targeted training programs and support networks that empower women to fully participate in the digital economy.

iv. Organizations should invest in comprehensive training and development programs for their employees to enhance their service quality. This includes creating structured training modules, providing ongoing professional development opportunities, and fostering a culture of excellence in customer service. These initiatives will improve customer satisfaction and contribute to overall business success.

v. Researchers and practitioners must engage in continuous research and adaptation to keep pace with the evolving digital landscape. This involves staying informed about emerging technologies, monitoring shifts in consumer behavior, and regularly updating strategies and platforms to address new challenges and opportunities effectively.

By implementing these specific actions, stakeholders can better leverage digital platforms to enhance agricultural value chains, improve market efficiency, and promote social inclusion.

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