VOL. 12 NO. 7,
MAY, 2026
E-ISSN 3026-9679
P-ISSN 3026-9423

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of Business Dev. and Management Res. (JBDMR)

Exploring the Role of Technological Innovation on Sustainable Performance of Agribusinesses in South-West, Nigeria

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DOI: https://doi.org/10.70382/ajbdmr.v12i7.078

Abstract

This study examines how the role of technological innovation shapes the sustainable performance of agribusinesses in South-West, Nigeria, focusing on product and process innovations. An explanatory research approach was used, combining survey data from agribusiness operators and stakeholders, to provide both breadth and depth of understanding. According to Krejcie and Morgan (1970), a sample size of 384 farmers was chosen for the study out of the 81,728 farmers in the chosen states. Out of 384 copies of questionnaires administered, 332 were validly returned, indicating that 86.46% of respondents were reached through the use of stratified random sampling techniques. The findings highlight that adopting technological innovations not only boosts efficiency and profitability but also promotes environmentally responsible practices and inclusive growth. The study concludes that product and process innovation have a significant and positive effect on the sustainable performance of Agribusinesses in South-West, Nigeria. The study recommends that Agribusinesses in South-West, Nigeria, should adopt

technological innovations both in process and product innovations in order to play a central role in building resilience against economic and environmental shocks, positioning agribusinesses as active contributors to sustainable performance. Through examining the relationship between innovation and sustainability, this study offers valuable insights for policymakers, investors, and practitioners seeking to transform Nigeria's agricultural sector into one that is more competitive, resilient, and sustainable.

Keywords: Technological innovation, Process innovation, Product innovation, Sustainability, Agribusiness.

Introduction

The historical evolution of agriculture in the South-West, Nigeria has witnessed a remarkable transition from subsistence farming to more commercialised, **market-oriented practices** (Akinwumi, 2016). However, this shift presents its own complexities, requiring the implementation of **sustainable practices** to maintain long-term productivity without jeopardising environmental health (Babatunde et al., 2023). The agricultural roots of South-West Nigeria extend back to ancient times, when communities practised subsistence farming to meet their basic needs (Agbaje, 2010). The region's favourable climate and fertile lands provided fertile ground for cultivating a diverse range of crops, fostering a rich and multifaceted agricultural landscape (Adebayo, 2012).

As time progressed, the adoption of **more advanced farming techniques** became increasingly evident, driven by the need to **sustain growing populations** and **meet increased market demands** (Akintola, 2015). The **pre-colonial, colonial, and post-colonial eras** each marked distinct phases in the evolution of agricultural practices, significantly influenced by the **changing socio-economic and political landscapes** of the time (Osuntokun, 2017). The contemporary agricultural landscape in South-West Nigeria is characterised by diversification, encompassing a diverse range of crops, including cocoa, oil palm, cassava, and a vibrant mix of fruits and vegetables (IITA, 2023). Livestock farming also shoulders a significant responsibility, contributing substantially to the region's overall agricultural output (FMARD, 2023). However, the sector faces numerous challenges, including land degradation, water scarcity, and the relentless pressure to increase productivity to meet the demands of a growing population (World Bank, 2023). But amidst these challenges, a beacon of hope shines brightly: the **emergence of technology in agriculture**.

This transformative wave introduces a **paradigm shift**, offering promising solutions to address existing obstacles and ultimately enhancing overall productivity (AATF, 2023). **Precision farming**, the utilisation of **drones for crop monitoring**, **data-driven decision-making**, and the incorporation of **biotechnology** are just a few of the technological interventions that possess the

potential to reshape the agricultural landscape of South-West Nigeria (Akinwumi, 2016).

In recent years, the global agricultural landscape has witnessed a **rapid influx of technological innovations** aimed at addressing the diverse challenges faced by farmers (FAO, 2023). In South-West Nigeria, the adoption of these technologies is gradually gaining traction, though the uptake varies across different agricultural **sub-sectors** (World Bank, 2023). For instance, **precision agriculture** leverages modern technologies, such as sensors, GPS-guided machinery, and data analytics, to optimise field-level management in crop farming (AATF, 2023). The integration of such technologies offers the potential to increase crop yields, reduce resource wastage, and enhance overall efficiency, thereby contributing to a more sustainable future for the sector (OECD, 2022). However, a significant threat looms over agriculture in South-West Nigeria **climate change**. Changes in temperature, rainfall patterns, and the increased frequency of extreme weather events negatively impact crop production and livestock management, demanding adaptations for **climate resilience** (Adefemi et al., 2022). This study aims to delve into how technology can contribute to **climate-smart agriculture**, empowering farmers to adapt to changing climatic conditions and mitigate associated risks, thereby paving the way for a more robust and sustainable agricultural sector in the region.

The sustainability of agribusiness is intricately woven with the **dynamics of the market** (World Bank, 2023). This study recognises the critical role of **market access, pricing mechanisms, and value chain integration** in ensuring the economic viability of agricultural enterprises (FAO, 2023). Technology can be a pivotal force in **connecting farmers to markets**, facilitating **efficient supply chains**, and improving their access to **market information** (AATF, 2023). Understanding these intricate dynamics is crucial for formulating **recommendations** that enhance the overall sustainability of agribusinesses in the region, contributing to a more prosperous and resilient agricultural sector.

Statement of Research Problem

The sustainability of agribusinesses in South-West, Nigeria has become a major concern due to increasing environmental pressures, fluctuating market conditions, low productivity, post-harvest losses, and inadequate technological adoption. Although agribusiness remains a critical contributor to food security, employment generation, and economic development, many enterprises continue to rely on traditional production and operational methods that limit efficiency and long-term sustainability. Recent studies have emphasized that technological innovation has the potential to improve agricultural productivity, resource utilization, competitiveness, and environmental performance. However, evidence suggests that the level of technology adoption among many agribusinesses in Nigeria remains relatively low, thereby constraining sustainable growth and resilience (Ayo-Lawal, 2024).

Furthermore, process innovation and product innovation have been identified as important dimensions of technological innovation capable of enhancing operational efficiency, reducing waste, improving product quality, and increasing market competitiveness. Despite growing scholarly attention to technological innovation in agriculture, most existing studies have

focused on agricultural productivity, digital technologies, food security, and general sustainability practices without adequately examining the specific effects of process and product innovation on sustainability outcomes among agribusinesses in South-West Nigeria. Consequently, there remains insufficient empirical evidence on how these innovation dimensions contribute to the economic, environmental, and social sustainability of agribusiness enterprises within the region. (Ogboru, 2025; Kehinde, et al., 2024).

In addition, challenges such as inadequate infrastructure, limited access to finance, technological constraints, weak innovation culture, and poor diffusion of modern agricultural technologies continue to hinder innovation-driven sustainability in the sector. While previous studies have acknowledged the importance of technological innovation, there is a noticeable contextual and empirical gap regarding the relationship between process innovation, product innovation, and sustainability in agribusinesses operating in South-West Nigeria. Therefore, this study seeks to address this gap by investigating the impact of technological innovation, specifically process and product innovation, on sustainability in agribusinesses in South-West Nigeria (Adeyemo, et al., 2024, Ikuemonisan, 2024). Given the importance of the agricultural sector in Nigeria, it is imperative to examine the role of technological innovation in fostering the sustainability of agricultural firms. Considering this, the primary objective of this study is to evaluate the effect of technological innovation on the sustainability of agricultural firms in Nigeria. The specific objectives are to;

i) ascertain the effect of process innovation on sustainable performance (social, environmental, economic, and innovative performance)
ii) investigate the effect of product innovation on sustainable performance (social, environmental, economic, and innovative performance)

Technological Innovation in Agribusiness

Technological innovation in agribusinesses across South-West, Nigeria has become a critical determinant of sustainable performance, particularly through the interplay of process and product innovation. Empirical evidence indicates that process innovation is referring to improvements in production systems, workflow optimisation, and adoption of advanced technologies—enhances operational efficiency, resource utilisation, and cost reduction, thereby strengthening long-term sustainability outcomes in agricultural enterprises. Similarly, product innovation, which involves the development of new or improved agricultural outputs, contributes significantly to market competitiveness, value addition, and customer satisfaction, thereby reinforcing revenue stability and enterprise resilience. Recent studies confirm that both innovation types independently and jointly exert positive and significant effects on agribusiness survival and performance in Nigeria (Eze, 2022; Ojukwu et al., 2026).

Furthermore, within the South-West region, technological innovation is increasingly aligned with sustainability objectives such as food security, environmental efficiency, and inclusive growth. Process innovation supports sustainable agribusiness performance by reducing waste and improving production efficiency, while product innovation enhances adaptability to

changing consumer preferences and market dynamics. The synergy between these innovation dimensions aligns with dynamic capabilities and resource-based perspectives, which emphasise the role of continuous improvement and knowledge integration in achieving competitive advantage. Consequently, agribusinesses that strategically invest in both process and product innovation are more likely to attain sustained productivity and long-term viability in Nigeria's evolving agricultural sector (Adeyemo et al., 2024; Bankole, 2024).

Sustainability in Agri-Business

i. **Environmental Sustainability: Preserving Our Ecosystem**: Within the conceptualisation of sustainability, environmental aspects include practices that promote ecological health, minimise environmental impact, and contribute to climate resilience (FAO, 2023; WRI, 2023). These practices encompass organic farming, biodiversity preservation, water conservation, and the responsible use of natural resources, fostering a harmonious relationship between agriculture and the environment.

ii. **Economic Sustainability: Building Resilience and Prosperity**: Economic sustainability focuses on the ability of agribusinesses to maintain profitability, withstand economic fluctuations, and contribute to the long-term economic well-being of stakeholders (OECD, 2023). Key indicators include profitability, market dynamics, and resilience to economic shocks, ensuring the financial viability and long-term success of agribusiness operations within the local economy.

iii. **Social Sustainability: Equity and Community Well-being**: The social dimension of sustainability addresses the inclusive and equitable impact of agribusiness operations on local communities (IISD, 2023). Concepts such as community development, gender dynamics, and social inclusivity are integral to assessing the broader societal implications of agribusiness practices, ensuring that benefits are shared equitably and marginalized groups are not left behind.

iv. **Resource Efficiency: Optimising for a Sustainable Future**: Resource efficiency is a key component of sustainability, emphasising the optimisation and responsible use of resources within agribusiness operations (World Bank, 2023). This includes efficient land use, water management, and minimising waste to enhance overall operational efficiency, contributing to a more sustainable environment.

Innovation Diffusion Theory

Innovation Diffusion Theory (IDT) was developed by Everett M. Rogers in 1962 to explain how innovations are communicated, adopted, and spread within a social system over time. The theory posits that the diffusion of innovation is influenced by the characteristics of the innovation, communication channels, time, and the social system in which adoption occurs. Rogers identified five adopter categories, such as: innovators, early adopters, early majority, late majority, and laggards, which explain the varying rates at which individuals embrace new

technologies (Rogers, 1962). The theory further assumes that innovations perceived as having relative advantage, compatibility, trialability, observability, and low complexity are more likely to be adopted successfully.

The major strength of Innovation Diffusion Theory lies in its ability to explain the processes through which technological innovations are accepted and disseminated across communities and organizations. The theory provides a robust framework for understanding farmers' adoption of modern agricultural technologies, digital platforms, precision farming techniques, and climate-smart agricultural practices. However, critics argue that the theory pays limited attention to institutional constraints, cultural heterogeneity, and economic inequalities that may hinder the adoption of innovation in developing economies.

In the context of sustainability in agribusinesses in South-West Nigeria, IDT is highly relevant because it explains how technological innovations such as digital extension services, smart irrigation systems, improved seed varieties, and agricultural information technologies can enhance productivity, environmental sustainability, and long-term business performance. Recent studies have applied the theory to examine agricultural technology adoption, sustainable farming innovations, and climate-smart agricultural practices among farmers and agribusiness operators (Rosário et al., 2022; Rizzo et al., 2024; Ahn et al., 2025). The theory, therefore, provides a suitable foundation for analysing the impact of technological innovation on sustainability outcomes in agribusinesses within the Nigerian agricultural sector.

Empirical Review on Technological Innovation and Sustainability of Agribusinesses

Adesanya et al. (2024) investigated the relationship between green machines and sustainability in agribusinesses in South-West Nigeria. The study used a quantitative approach, surveying registered members of the All-Farmers Association of Nigeria (AFAN) across Ekiti, Lagos, Ogun, Osun, Oyo, and Ondo using cluster and purposive sampling techniques. With 353 completed questionnaires and an 87% response rate, analysis using measurement and structural models revealed that green machines significantly enhance the sustainability of agribusinesses in South-West Nigeria. The findings underscore that integrating green machines into production is a pivotal driver of sustainable practices within the region's agro-industry. Agribusinesses are increasingly adopting green production practices to optimize resource use, reduce emissions, and promote responsible land use, aligning with global sustainability trends. Consequently, adopting green machines in the production phase is vital for ensuring the sustainability and ecological responsibility of agribusinesses in South-West Nigeria, benefiting both the industry and the environment. The implications of this study suggest that further promotion and support for green technology adoption could significantly advance the sustainable development of agribusinesses in Nigeria.

Mariyono (2020) evaluated the implications of and assess the economic and sustainable impact of environmentally friendly technological packages introduced into agribusiness players in the centre of chilli-producing regions of Indonesia. This study used a theory of optimisation in production as a fundamental analysis. Producers are assumed to maximise profit by allocating

rational amounts of inputs as the components of technological packages. A combination of qualitative and quantitative methods was used. The rate of technology adoption was evaluated, and agribusiness performance was measured using an economic advantage and technical efficiency. Data were compiled using group discussions and individual surveys. Findings indicated that the packages of technologies improved economic and sustainability performance of agribusiness resulting from efficient use of agrochemicals and water resource, and increase the production. Socio-economic and technical factors influenced performance farmers, as agribusiness players responded positively towards the ecological technology packages

Yao et al. (2016) studied the relationship between technological innovations, the firm's business, and social performances on the basis of the R&D and marketing capabilities of agribusinesses. Subjective self-assessment survey on 279 China agribusinesses was solidly conducted. The collected data were then subjected to confirmatory factor analysis and structural equation modelling. The relationships among R&D, marketing capability, business performance, and social performance are drawn from the analysis. The study shows that the stronger R&D and marketing capabilities boost the firm's business performance, which positively brings into higher firm social performance. This study contributed to the empirical literature that is especially scant, and provides significant empirical evidence. Besides, this paper provides the practical implications for firms, which include giving corresponding priority to the R&D capability, highlighting marketing capability, and strengthening the communication and cooperation between marketing and R&D departments.

METHODOLOGY

This study adopts an explanatory research design; a mixed-methods approach that involves the sequential collection and analysis of quantitative and qualitative data. The population consists of agribusiness stakeholders in South-West, Nigeria, including farmers, agribusiness entrepreneurs, government officials, and technology providers involved in the agribusiness value chain. The South-West region is selected due to its high degree of technological innovation and concentration of Agribusiness owners in the South. The target population is (81,728), of which Oyo was reported to have the largest number of Agribusiness owners with (17,522) followed by Ogun (15,600), Ekiti (13,408), Osun (12,988), Ondo (11,677), and Lagos (10,533) (AFAN, 2023).

Table 1: Population of the Study

S/N	STATE	POPULATION
1	OYO	17,522
2	OGUN	15,600
3	EKITI	13,408
4	OSUN	12,988
5	ONDO	11,677
6	LAGOS	10,533
	TOTAL	**81,728**

Source: All-Farmers Association of Nigeria (AFAN) (2023)

Inclusion and Exclusion Criteria

Farmers: Individuals actively engaged in agricultural activities, cultivating crops or raising livestock, irrespective of scale (smallholder to large-scale). Agribusiness Entrepreneurs: Owners or managers of agribusiness enterprises, which may include processing, distribution, and other value-added activities within the agribusiness value chain. Technology Providers: Entities or individuals involved in the development, distribution, or implementation of agricultural technologies, including but not limited to innovations in farm machinery, information systems, and sustainable practices

The exclusion criteria are Individuals or entities not directly involved in agribusiness activities within South-West, Nigeria. In addition to those who are not willing or unable to participate in the study. To ensure representative sampling within each stakeholder category, a stratified random sampling technique is employed. Stratification allows for proportional inclusion of smallholder farmers, large-scale agribusiness entrepreneurs, government officials, and technology providers based on the overall distribution within the South-West Nigeria agribusiness sector.

Table 2: Sampling Size of the Respondents

S/N	STATE	FORMULAR	CALCULATION	TOTAL
1.	OYO	$nh = \frac{n \times Nh}{N}$	$\frac{17{,}522 \times 383}{81{,}728}$	82
2.	OGUN	$nh = \frac{n \times Nh}{N}$	$\frac{15{,}600 \times 383}{81{,}728}$	73
3.	EKITI	$nh = \frac{n \times Nh}{N}$	$\frac{13{,}408 \times 383}{81{,}728}$	63
4.	OSUN	$nh = \frac{n \times Nh}{N}$	$\frac{12{,}988 \times 383}{81{,}728}$	61
5.	ONDO	$nh = \frac{n \times Nh}{N}$	$\frac{11{,}677 \times 383}{81{,}728}$	55
6.	LAGOS	$nh = \frac{n \times Nh}{N}$	$\frac{10{,}533 \times 383}{81{,}728}$	49
	TOTAL			**384**

Source: Researcher's Computation (2026)

Table 2 shows the number of respondents for each selected state included in the study. The questionnaire was administered individually to participants engaged in agricultural activities. It was filled out by respondents from all six states comprising the South-Western region of the country: Ekiti, Lagos, Ogun, Ondo, Osun, and Oyo. The analysis of the collected data commenced with inquiries focused on the personal details of the participants. Subsequently,

the questionnaire featured a section dedicated to gathering insights from respondents regarding various aspects of their businesses, including Product Innovation, Innovative Culture, Environmental Sustainability, Social Sustainability, and Economic Sustainability. The frequency of responses obtained from the survey participants is detailed in the table below.

Table 3: Response Frequency

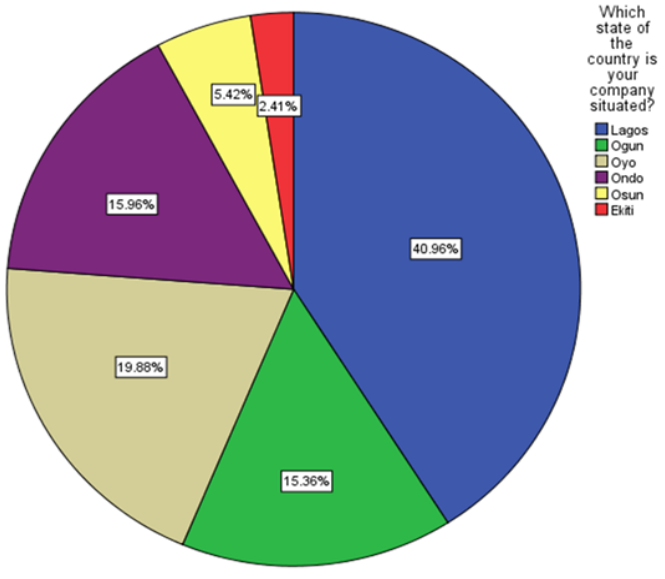
Questionnaire	Frequency	Valid Percentage
Valid	332	86.46%
Invalid	52	13.54%
Total	384	100%

Source: Researcher's Computation (2026)

In Table 3, out of 384 questionnaires, 332 were valid, indicating that 86.46% of respondents completed the survey accurately and comprehensively. These responses are crucial for understanding the research on product innovation, process efficiency, and sustainability practices in agribusiness. However, 13.54% of the responses were invalid, indicating areas for improvement in survey administration or respondent understanding. The high percentage of valid responses indicates the survey's success in gathering quality data from agricultural professionals in the South-Western region.

This robust dataset will enable a deeper exploration of agricultural practices, innovation trends, and sustainability initiatives, benefiting future research and policymaking efforts in the agricultural sector.

Figure 1. Breakdown of Response Rate Per State
Source: SPSS, 23 (2026)



The study analysed the response rates across different states, providing valuable insights into regional participation and engagement. Below is the detailed interpretation of the data on response rates from various states. Lagos State had the highest response rate with 136 responses, constituting 41.0% of the total. This indicates a significant level of engagement and participation from Lagos, highlighting its central role in the study. Ogun State contributed 51 responses,

making up 15.4% of the total responses. When combined with Lagos, these two states accounted for more than half of the responses (56.3%), underscoring their importance in the dataset.

Oyo State's contribution was 66 responses, representing 19.9% of the total. This state had the third-highest response rate, bringing the cumulative percent to 76.2%. This highlights Oyo's significant involvement in the study. Ondo State provided 53 responses, which accounts for 16.0% of the total responses. With the addition of Ondo, the cumulative response rate reached 92.2%, showing a substantial regional representation. Osun State had a lower response rate with 18 responses, contributing 5.4% to the total. The cumulative percent of 97.6% indicates that Osun's participation, while smaller, still added to the overall regional data pool. Ekiti State had the smallest response rate with only 8 responses, making up 2.4% of the total. Despite the low numbers, Ekiti's inclusion brings the cumulative percent to 100%, completing the regional data collection.

Demographic Characteristics

In this section, the respondents' demographics were presented, including their age, gender, marital status, required level of education, and duration of farming.

Table 4: Demographic Distribution of the Respondents [n=332]

Items		Frequency	Percentage
Gender	Male	262	78%
	Female	70	21.1%
Total		**332**	**100%**
Marital status	Single	87	26.2
	Married	123	37.0
	Divorced	122	36.7
Total		**332**	**100%**
Education	SSCE/OND	124	37.3
	B.Sc./HND	52	15.7
	M.Sc./MBA	139	41.9
	Others	17	5.1
Total		**332**	**100%**
Age	Below 30	17	5.1
	31-40	227	68.4
	41-50	53	16.0
	51 above	35	10.5
Total		**332**	**100%**
Duration of Farming	1 year below	17	5.1
	2-5 years	70	21.1
	5 years above	245	73.8
Total		**332**	**100%**

Source: Researcher's Computation (2026)

The demographic distribution of the respondents, as illustrated in Table 4.2, reveals a predominantly male cohort, with men constituting 78% of the sample population. This notable gender disparity suggests that men are more inclined to engage in agribusiness in the region. In terms of marital status, the table reveals that the respondents are almost evenly split between married individuals (37%) and those who are divorced (36.7%), with singles accounting for 26.2% of the sample. This distribution indicates a fairly balanced representation between married and divorced individuals, although singles are somewhat less represented.
Regarding educational attainment, the table results show that the majority of respondents hold either SSCE/OND (37.3%) or M.Sc./MBA (41.9%) qualifications. Participants with a B.Sc./HND degree represent 15.7% of the sample, while those categorised under 'Others' make up 5.1%. This distribution highlights a high level of educational achievement among the respondents, with a substantial proportion holding advanced degrees. The age distribution is predominantly skewed towards the 31-40 age group, which encompasses 68.4% of the respondents. The 41-50 age group constitutes 16%, while those aged 51 and above account for 10.5%. Respondents below the age of 30 represent the smallest group at 5.1%. This demographic spread indicates that most participants are in their most productive and economically active years.

Analysis of Research Hypothesis One

Ho_1: Process innovation does not have any significant effect on sustainability (social, environmental, economic and resource efficiency)

The study employed a closed-ended questionnaire format to assess social, environmental, economic, and resource efficiency, as well as technological innovation. The questionnaire was structured to allow for precise measurement and straightforward data analysis. A five-point Likert scale was used to capture nuanced responses, allowing respondents to express varying degrees of agreement or disagreement with statements related to the variables. This method aimed to gather quantitative data for statistical analysis, including the Chi-square test, to explore potential associations between technological innovation and social, environmental, economic, and resource efficiency dimensions. The use of a closed-ended questionnaire with a Likert scale ensured consistency in data collection across respondents, minimizing interpretative biases and enhancing comparability of responses. This approach underscores the researchers' commitment to rigorous methodology and empirical inquiry, providing a solid foundation for investigating the relationships between technological innovation and efficiency and impact dimensions.

Table 5: Chi-square Test Result

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	247.167[a]	16	0.000
N of Valid Cases	332		

Source: Researchers' Computation (2026)

A p-value of 0.000 indicates a statistically significant association between process innovation and social sustainability. The results in Table 5 imply that variations in social sustainability perceptions are not due to random chance but are significantly related to the levels of process innovation. The chi-square result indicates that we reject the null hypothesis because the p-value is less than 0.05, which is the established level of significance. Rejecting the null hypotheses signifies that process innovation has a significant effect on social sustainability

Analysis of Research Hypothesis Two

Ho_2: Product innovation has no significant influence on sustainability (social, environmental, economic and resource efficiency)

The study examines the relationship between product innovation and social sustainability in the agribusiness sector, as shown in Table 5. Most respondents strongly agree with prioritising product innovation, indicating a strong positive association between commitment to innovation and support for social sustainability initiatives. Most respondents agree with social sustainability, with 70 respondents agreeing but showing varied opinions. However, there is a minimal presence of undecided respondents for both product innovation and social sustainability. Additionally, 17 respondents disagreed with the concept of product innovation and social sustainability, suggesting a possible lack of alignment in their perceptions. The overall assessment reveals a mixed but generally positive perception of the relationship between product innovation and social sustainability in agribusiness, suggesting potential for product innovation to positively impact social sustainability outcomes.

Table 6: Chi-square Test Result

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	257.811	12	0.000
No of Valid Cases	332		

Source: Researchers' Computation (2026)

The study found a significant relationship between product innovation and social sustainability, with a Pearson Chi-square statistic of 257.811 and a p-value less than 0.05. The results in Table 6 suggest that product innovation initiatives have a significant impact on social sustainability practices in agribusinesses. Prioritising and investing in product innovation can contribute positively to social sustainability goals. This suggests that agribusiness leaders and policymakers can use these findings to develop strategies that integrate product innovation with social responsibility initiatives, enhancing their reputation, stakeholder relationships, and overall sustainability performance.

Summary of Findings

The summary of the findings was also presented in the table below

Table 7: Summary of the Hypotheses Results

S/N	Hypotheses	Analytical Tools	Decision	Findings
1	Process Innovation	Chi-square χ^2	H_{o1} Rejected	Process innovation significantly enhances social sustainability by improving working conditions, increasing job satisfaction, and fostering better community relations. It also positively impacts environmental sustainability through improved waste management and reduced emissions and contributes to economic sustainability by lowering costs and enhancing productivity. Process innovation enhances resource efficiency by optimising resource use and minimising waste.
2	Product Innovation	Chi-square χ^2	H_{o2} Rejected	Product innovation positively impacts social sustainability by meeting consumer demands and enhancing community well-being. It improves environmental sustainability by promoting eco-friendly practices and reducing the environmental footprint. Economically, product innovation drives growth and stability by creating new market opportunities. It also enhances resource efficiency by optimising resource utilisation and minimising waste.

Source: Researchers' Computation (2026)

Theoretical Findings

This research examines the profound impact of technological innovations on sustainability within the agribusiness sector of South-West Nigeria, utilising insights from the Diffusion of Innovations Theory (DOI) and Innovation Systems Theory (IST). These frameworks provide comprehensive insights into the adoption processes and systemic factors that shape the sustainability outcomes of technological innovations. Diffusion of Innovations Theory (DOI) DOI categorises stakeholders in agribusiness into innovators, early adopters, early majority, late majority, and laggards, identifying crucial factors that affect the adoption rate and scope of innovations (Rogers, 2003). In South-West, Nigeria, DOI reveals that innovations perceived as advantageous, compatible with existing practices, and easy to trial are more likely to be embraced by farmers and agribusiness owners.

Hypothesis One

The study examined the relationship between process innovation and sustainability in the agribusiness sector. Results indicate a strong correlation, showing that organisations prioritising innovation also support sustainability efforts. Many respondents who endorsed process innovation aligned with sustainability goals.

Chi-square tests confirmed significant relationships:

- Social Sustainability ($\chi^2 = 247.167$, $p < 0.05$)
- Environmental Sustainability ($\chi^2 = 383.143$, $p < 0.05$)
- Economic Sustainability ($\chi^2 = 363.122$, $p < 0.05$)
- Resource Efficiency ($\chi^2 = 247.167$, $p < 0.05$)

These findings reject the null hypothesis, affirming that innovation-driven organisations are more likely to adopt sustainable practices (Ogunnaike et al., 2024). In Nigeria, research conducted by Akinola and Owoeye highlights process innovation as crucial for development. Sustainable innovations enhance productivity, environmental protection, and citizens' well-being, fostering long-term resilience (Achi et al., 2022). Agribusinesses can leverage innovation for social sustainability, while sustainable practices in agriculture, energy, and manufacturing can drive efficiency and environmental conservation. Integrating these elements is key to Nigeria's sustainable future.

Hypothesis Two

This study investigated the relationship between product innovation and sustainability in the agribusiness sector. Findings indicate a strong positive link, showing that organisations fostering innovation are more likely to adopt sustainable practices. Respondents supporting innovation also aligned with ecological stewardship.

Chi-square tests confirmed significant relationships:

- Social Sustainability ($\chi^2 = 257.811$, $p < 0.05$)
- Environmental Sustainability ($\chi^2 = 87.303$, $p < 0.05$)
- Economic Sustainability ($\chi^2 = 179.752$, $p < 0.05$)
- Resource Efficiency ($\chi^2 = 113.032$, $p < 0.05$)

The rejection of the null hypothesis suggests that innovation-driven organisations are more likely to implement sustainability measures (Nimfa et al., 2021). In Nigeria, research by Oloyede et al. (2023) highlights that an innovative culture promotes the adoption of green technologies, sustainable farming practices, and environmental compliance, thereby reducing carbon footprints and mitigating associated risks. These findings emphasise integrating innovation into sustainability strategies. Agribusinesses that invest in green technology and eco-efficient practices can enhance their environmental performance, reduce risks, and boost long-term resilience in a competitive global market.

Conclusion

This study concluded that technological innovation significantly enhances the sustainable performance of agribusinesses in South-West, Nigeria. Specifically, process innovation improves operational efficiency, resource utilisation, and cost reduction, thereby strengthening environmental and economic sustainability.

Similarly, product innovation enhances product quality, market competitiveness, and customer satisfaction, which contribute to long-term business growth and sustainability. The study therefore established that both process and product innovations are critical drivers of sustainable performance among agribusiness firms in the region.

Recommendations

Agribusiness managers in South-West, Nigeria should intensify investment in process innovation through the adoption of modern production technologies, digital monitoring systems, and efficient supply chain practices to enhance operational efficiency and long-term sustainable performance. Furthermore, agribusiness firms should strengthen product innovation by developing value-added, environmentally friendly, and customer-oriented products capable of improving market competitiveness, profitability, and environmental sustainability. Government agencies and financial institutions should also provide supportive policies, technical training, and accessible funding to encourage continuous technological innovation within the agribusiness sector.

Suggestions for Further Studies

To further explore the relationship between innovative culture and sustainability in agribusiness, future research should consider:

i. Longitudinal Studies- Examining how these relationships evolve for deeper causal insights.
ii. Comparative Regional Studies- Expanding research beyond Nigeria to assess global applicability.
iii. Sector-Specific Analysis - Investigating innovation and sustainability in distinct agribusiness sectors.
iv. Leadership and Management Impact- Studying how leadership styles and organisational structures influence innovation and sustainability.
v. Policy Influence - Assessing the role of government policies and regulations in fostering innovative and sustainable practices.

Implications For Theory, Policy and Practice

The study contributes to theory by extending innovation and sustainability perspectives within agribusiness literature, particularly in the context of South-West, Nigeria. The findings on process innovation and product innovation provide empirical support for the proposition that technological innovation enhances sustainable performance through improved operational efficiency, product quality, environmental responsibility, and market competitiveness. From a policy perspective, the study underscores the need for government and development agencies to formulate supportive policies that encourage innovation adoption, technology transfer, research funding, and capacity development among agribusiness firms. In practice, agribusiness managers are encouraged to invest in modern production technologies and

innovative product development strategies to strengthen long-term sustainability, profitability, customer satisfaction, and resilience in a dynamic business environment.

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