

HUMAN CAPITAL DEVELOPMENT AND THE PERFORMANCE OF AGRO-ALLIED SMES IN NORTH CENTRAL, NIGERIA

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ABSTRACT

This paper is a part of my thesis titled “Entrepreneurial Ecosystem Components and the Performance of Agro-allied SMEs in North Central, Nigeria. It examines the influence of human capital development on the performance of agro-allied small and medium enterprises (SMEs) in North Central Nigeria. Implementing a quantitative research approach, primary data were collected via structured questionnaires given to agro-allied SME operators and employees across six States and the Federal Capital Territory. A descriptive cross-sectional design and simple random sampling were used to survey a population of 1,492 registered agro-allied SMEs, producing 713 valid responses for analysis. Human capital was measured using indicators of employee education, managerial experience, training, workforce competence, and continuous learning, while SME performance was proxied by competitive advantage. Data were analysed using descriptive statistics, regression analysis, and partial least squares structural equation modelling (PLS-SEM). The results disclose a strong human capital base among agro-allied SMEs and demonstrate a positive and statistically significant relationship between human capital and SME performance ($\beta = 0.77$, $p < .001$). The structural model shows that human capital explains 68.2% of the variance in SME performance, indicating substantial clarifying power. Despite widespread investment in training and skills development, evidence of residual skill gaps highlights the need for more targeted, sector-specific capacity-building initiatives. The study concludes that sustained investment in workforce education, entrepreneurial experience, and continuous learning is critical for enhancing productivity, competitiveness, and long-term performance of agro-allied SMEs. These findings provide important policy and practical understandings for strengthening human capital as a primary driver of agro-allied SME performance.

Keywords: Human Capital, Entrepreneurial Ecosystem, Skills Development, SME

Performance

Introduction

Agro-allied small and medium scale enterprises (SMEs) are widely recognised as key contributors to employment generation, innovation, and economic diversification in developing economies. In Nigeria, agro-allied SMEs account for a substantial proportion of employment and business activity, particularly in non-metropolitan regions such as North Central Nigeria. Despite their importance, agro-allied SME performance in the region remains uneven and constrained by structural and capability-related challenges (Brixiová et al., 2020; Belitski et al., 2022).

Human capital seen as the knowledge, skills, competencies, and experience gained by individuals has been identified as a critical determinant of firm performance (Becker, 1964). For SMEs, where owners and employees play multiple operational and strategic roles, the quality of human capital is particularly crucial. Inadequate skills, limited managerial capacity, and low levels of formal training can restrict productivity, innovation, and competitiveness.

Within the entrepreneurial ecosystem perspective, human capital constitutes a core ecosystem component that enhances firms' ability to access opportunities, utilise resources efficiently, and adapt to environmental changes (Stam, 2015). Although previous studies have examined human capital and firm performance, empirical evidence focusing on SMEs in North Central Nigeria remains limited. This study therefore seeks to examine the effect of human capital development on SME performance in the region.

Hypothesis

In line with the objective, the study proposes the following hypothesis:

H1: Human capital development has a positive and significant influence on the performance of agro-allied SMEs in North Central Nigeria.

Literature Review

The section provides a meaningful synthesis of existing academic works relevant to the subject of this study.

Concept of Human Capital

Human capital within SMEs extends beyond the accumulation of individual skills to represent a dynamic and strategic resource that fundamentally shapes firm performance and competitiveness. In developing economies such as Nigeria, this resource is particularly critical because the limited scale of SME operations amplifies the influence of owner-manager competencies and employee capabilities on organisational outcomes (Akanbi & Itiola, 2013; Okeowo et al., 2022). Technical expertise, managerial competence, and entrepreneurial orientation collectively constitute the human capital base upon which SMEs build resilience and sustain competitive advantage. Unlike larger firms that benefit from structural buffers, SMEs rely disproportionately on the quality, flexibility, and commitment of their human capital to navigate institutional constraints and market volatility.

Human capital in SMEs performs a dual function as both a driver of operational efficiency and a catalyst for innovation. Empirical evidence from Nigeria and other Sub-Saharan African contexts shows that education, training, and experiential learning enhance not only task-specific skills but also cognitive adaptability and problem-solving capacity, enabling firms to respond proactively to environmental changes (Afolayan et al., 2020; Olugbola, 2017). Continuous learning therefore represents a strategic investment rather than a peripheral organisational activity. By institutionalising learning and skill development within organisational routines, SMEs transform human capital into a renewable resource that evolves in tandem with technological advancement and competitive pressures.

Recent indigenous scholarship further demonstrates that the development of human capital significantly influences SMEs' innovative capacity and market performance. Studies focusing on Nigerian SMEs reveal that innovation outcomes are driven less by resource endowment alone and more by the effective application of knowledge, experience, and entrepreneurial skills embedded in human capital (Adelaja et al., 2021; Ogunleye et al., 2018). SMEs that prioritise systematic human capital development cultivate an adaptive workforce capable of exploiting opportunities while mitigating risks associated with environmental uncertainty. In this context, human capital functions simultaneously as a stabilising mechanism against external shocks and as a proactive source of value creation, underscoring its indispensability for long-term SME sustainability in dynamic markets.

Empirical Review

Empirical evidence consistently indicates a positive relationship between human capital and firm performance. SMEs with more educated and skilled employees tend to exhibit higher productivity, improved financial outcomes, and greater innovation capacity (Brixiová et al., 2020; Belitski et al., 2022). Training and managerial experience have also been shown to enhance decision-making quality and strategic orientation.

Human capital constraints are particularly pronounced due to limited access to formal training, weak education systems, and skill mismatches in developing economies (World Bank, 2022). Nigerian SMEs often rely on informal learning and experiential knowledge, which, while valuable, may be insufficient to support sustained growth and competitiveness in dynamic markets.

Theoretical Framework

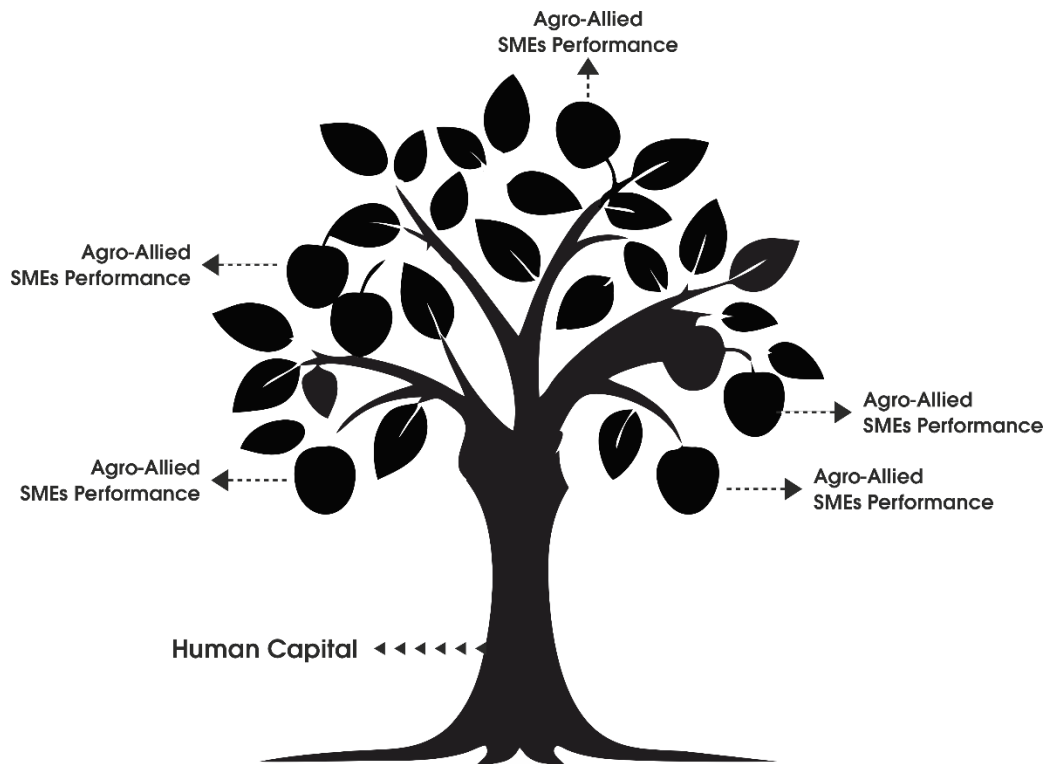
This paper is anchored in Human Capital Theory and Entrepreneurial Ecosystem Theory. Human Capital Theory, advanced by Becker (1964), underscores the centrality of education, skills, and experience as investments that yield returns in the form of enhanced productivity and firm performance. Proponents of this theory argue that SMEs, by cultivating the knowledge base and competencies of their workforce, can overcome resource constraints and achieve competitive advantages. In this view, human capital development is not merely a supportive function but a strategic imperative, enabling SMEs to translate individual capabilities into collective organisational outcomes. Becker's framework thus positions human capital as the linchpin of sustainable growth, where investment in people directly correlates with improved efficiency, innovation, and profitability.

Building on this foundation, Entrepreneurial Ecosystem Theory, articulated by scholars such as Stam (2015) and Audretsch et al. (2019), situates human capital within a broader systemic context. Here, human capital is seen as a critical pillar that interacts synergistically with other ecosystem components such as finance, infrastructure, networks, and institutions to foster entrepreneurial success. Proponents of this theory highlight that while financial and institutional support are vital, the quality and adaptability of human capital determine how effectively SMEs leverage these resources. Human capital, therefore, functions as both a driver and mediator, shaping the capacity of firms to innovate, scale, and integrate into dynamic entrepreneurial ecosystems.

These theoretical perspectives converge to project human capital development as both an internal investment and an external enabler. Becker's Human Capital Theory emphasizes the micro-level benefits of education and training for firm performance, while Stam and Audretsch extend the analysis to the macro-level, illustrating how human capital interacts with ecosystem structures to influence entrepreneurial outcomes. As for SMEs, this dual lens implies that nurturing human capital is essential not only for immediate productivity gains but also for embedding firms

within supportive ecosystems that amplify their growth potential. The proponents of these theories collectively affirm that human capital development is indispensable for SMEs seeking resilience, innovation, and long-term success.

Figure 1: Conceptual Framework



Source: Author 2026

Methodology

The study area covered North Central Nigeria, comprising Benue, Kogi, Kwara, Nasarawa, Plateau, Niger States, and the Federal Capital Territory (FCT). The region is agriculturally rich and plays a strategic role in Nigeria’s food production, with agro-allied SMEs forming a critical part of the agricultural value chain. A descriptive cross-sectional research design was employed, using survey methods to collect data at a time. The study population consisted of 1,492 registered agro-allied SMEs in North Central Nigeria, as reported by the NBS/SMEDAN National Survey (2021). Using Cochran’s (1977) sample size determination formula at a 95% confidence level and 5% margin of error, a total sample size of 956 respondents was derived and proportionately distributed across the six States and the FCT. Simple random sampling was employed to ensure equal selection probability, minimise bias, and enhance the representativeness of the sample. Primary data were sourced through online questionnaires (Google Forms) administered to agro-allied SME operators and employees across both urban and rural areas. Data collection was facilitated in collaboration with state managers of the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) across the study area, which improved accessibility and response rates. The unit of analysis comprised individual agro-allied SME operators and employees, selected because of their direct involvement and firsthand knowledge of agro-allied business operations and performance.

Data were retrieved using a self-developed structured questionnaire divided into two sections. Section A focused on respondents’ socio-demographic characteristics, while Section B

comprised (7) Likert-scale items grouped into a cluster measuring human capital and agro-allied SME performance. Competitive advantage was adopted as a key non-financial indicator of SME performance. Responses were measured on a five-point Likert scale ranging from “strongly disagree” to “strongly agree.” Ethical considerations were strictly observed. Participation was voluntary, respondents were informed of the study’s purpose, confidentiality was assured, and no inducements were offered.

Results

This section shows both descriptive and inferential data analysis, presentation and interpretation of the study.

Demographic Analysis

Demographic analysis provides critical background information on respondents, offering context for interpreting the study’s findings on agro-allied SMEs in North Central Nigeria. The analysis covers key characteristics, including state of business operation, respondent status within enterprises, years of business experience, age, and educational qualifications. These variables, while not part of the study’s control objectives, help contextualize patterns that may influence SME performance.

Table 1: Demographic Data

Variable	Category	Frequency	Percentage
State of Business Operation	Federal Capital Territory (FCT)	114	16.0
	Nasarawa State	106	14.9
	Niger State	85	11.9
	Benue State	116	16.3
	Kogi State	103	14.4
	Kwara State	94	13.2
	Plateau State	95	13.3
	Total	713	100.0
Status of Respondents	Farm Operator	544	76.3
	Farm Employee	169	23.7
	Total	713	100.0
Years of Business Operation	Less than 1 year	126	17.7
	1-5 years	141	19.8
	5-10 years	133	18.7
	10-15 years	212	29.7
	15 years and above	101	14.2
	Total	713	100.0
Age of Respondents	Less than 20 years	9	1.3
	20-30 years	162	22.7
	30-40 years	199	27.9
	40-50 years	197	27.6
	50-60 years	119	16.7
	60 years and above	27	3.8
	Total	713	100.0
Education Qualification	First School Leaving Certificate	12	1.7
	WASC/GCE/NECO Certificate	211	29.6
	OND/NCE/Diploma Certificate	313	43.9

	HND/BSc/BA Certificate	171	24.0
	PGD/MSc/MA/PhD Certificate	6	0.8
	Total	713	100.0

Source: Author's Computation (2026).

The distribution of agro-allied SMEs in North Central Nigeria and the Federal Capital Territory (FCT) shows a fairly balanced geographical spread, with Benue State (16.3%) and the FCT (16.0%) having the highest concentrations, while Niger State (11.9%) recorded the lowest. Most respondents are farm operators (76.3%), with employees making up 23.7%, indicating that the dataset primarily reflects insights from decision-makers responsible for strategic and operational management. The years of business operation vary, with 29.7% of SMEs having operated for 10–15 years, demonstrating resilience, and 37.5% in business set-up for less than five years, reflecting active entry of new ventures. This combination of experienced and emerging enterprises provides a balanced view of the challenges and opportunities across different growth stages.

The age distribution reveals that the mainstream of respondents are within the productive age brackets of 30-40 years (27.9%) and 40-50 years (27.6%), highlighting the dominance of middle-aged entrepreneurs in driving SME performance, with limited involvement from younger (<20 years) or older (60+ years) individuals. Educational qualifications indicate a relatively well-educated workforce, with 43.9% holding OND/NCE/Diploma certificates and 24% possessing university degrees, while only 1.7% have primary education. This profile suggests that agro-allied SMEs benefit from skilled and knowledgeable operators and employees, which can enhance innovation, adoption of modern farming practices, and overall enterprise performance.

Construct Analysis

The construct analysis focuses on examining the key variables of the study as measured by the survey instrument. It presents respondents' perceptions and evaluations of human capital development and its relationship to agro-allied SMEs performance in North Central Nigeria. Using descriptive statistics like frequencies and percentages, this section highlights the distribution of responses across each construct. The analysis provides insight into how the respondents view the human capital factor as it relates to agro-allied SME operations and establishes the basis for subsequent inferential testing of the hypothesised relationships between the human capital development and agro-allied SME performance.

Table 2: Construct Data

Statement	Response	Frequency	Percentage
(1) My employees possess the necessary educational qualifications for our operations.	Strongly Disagree	73	10.2
	Disagree	32	4.5
	Neutral	25	3.5
	Agree	193	27.1
	Strongly Agree	390	54.7
	Total	713	100.0
(2) The management team has significant entrepreneurial experience.	Strongly Disagree	81	11.4
	Disagree	36	5.0
	Neutral	25	3.5
	Agree	231	32.4

	Strongly Agree	340	47.7
	Total	713	100.0
(3) Our staff regularly participates in capacity-building and training programmes.	Strongly Disagree	64	9.0
	Disagree	22	3.1
	Neutral	16	2.2
	Agree	156	21.9
	Strongly Agree	455	63.8
	Total	713	100.0
(4) Workforce competence enhances the overall productivity of my business.	Strongly Disagree	64	9.0
	Disagree	22	3.1
	Neutral	16	2.2
	Agree	160	22.4
	Strongly Agree	451	63.3
	Total	713	100.0
(5) Continuous learning and development are prioritised in our business.	Strongly Disagree	64	9.0
	Disagree	19	2.7
	Neutral	12	1.7
	Agree	147	20.6
	Strongly Agree	471	66.1
	Total	713	100.0
(6) We actively seek out training opportunities to enhance employee skills.	Strongly Disagree	81	11.4
	Disagree	72	10.1
	Neutral	2	0.3
	Agree	294	41.2
	Strongly Agree	264	37.0
	Total	713	100.0
(7) Lack of qualified personnel is a challenge to our business performance.	Strongly Disagree	104	14.6
	Disagree	38	5.3
	Neutral	18	2.5
	Agree	246	34.5
	Strongly Agree	307	43.1
	Total	713	100.0

Source: Author's Computation (2026)

The results in Table 4.2 indicate a strong human capital base among agro-allied SMEs in North Central Nigeria. A large majority of respondents (81.8%) affirmed that their employees possess adequate educational qualifications, while about 80% reported that their management teams have substantial entrepreneurial experience. These findings suggest that both workforce education and managerial experience provide a solid foundation for effective business operations and strategic decision-making. Recent empirical evidence supports this view, showing that educational attainment and entrepreneurial experience significantly enhance SME productivity, innovation capability, and resilience in emerging economies (Akinwale, Adekunle, & Olomu, 2021; Nwankwo & Kanyangale, 2022). Well-qualified employees and experienced managers are better positioned to respond to market uncertainties, adopt new technologies, and implement growth-oriented strategies, particularly within agro-based enterprises.

Furthermore, the data reveal a strong commitment to continuous learning and skills development, as over 85% of respondents confirmed regular staff participation in training programmes and acknowledged the positive impact of workforce competence on productivity. In addition, 86.7% prioritised continuous learning, and 78.2% actively sought training opportunities to enhance employee skills, underscoring a proactive approach to human capital development. These findings align with recent studies that identify employee training and continuous learning as critical drivers of operational efficiency, innovation, and long-term SME performance (Adegbite, Amaeshi, & Nakajima, 2023; Urban & Hwindingwi, 2024). However, despite these investments, a small proportion of respondents (7.6%) still identified a lack of qualified personnel as a performance constraint, suggesting that existing training initiatives may not fully address sector-specific skill gaps. This highlights the need for more targeted, industry-relevant capacity-building programmes to maximise the productivity and competitiveness of agro-allied SMEs.

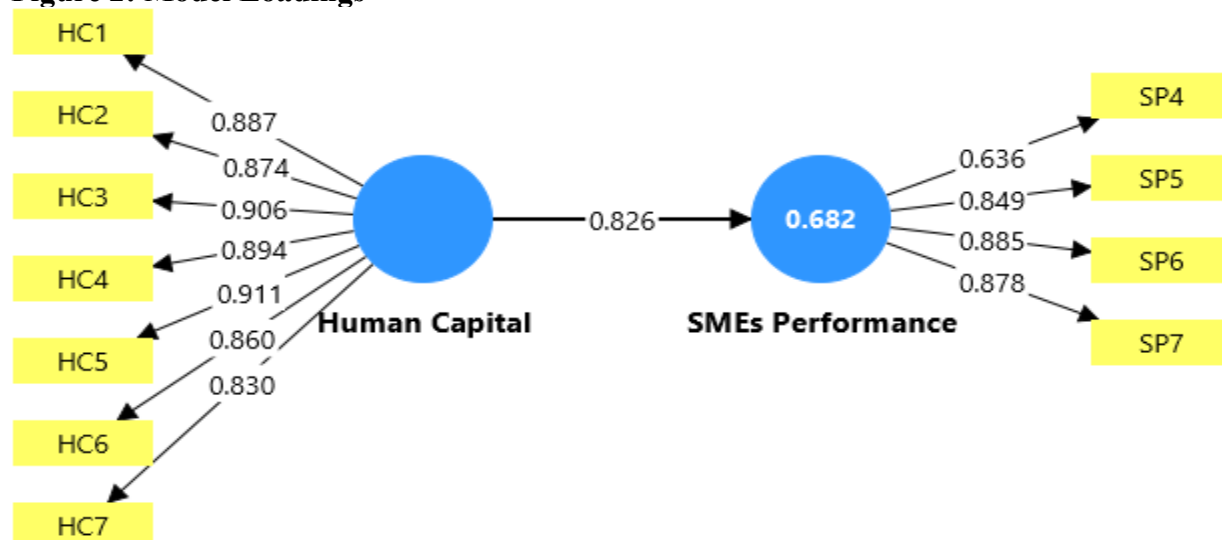
Inferential Statistics

To assess the strength, direction and significance of relationships between the study variables and to test the proposed hypothesis in this paper, inferential statistical methods are employed.

Measurement Model

This explains how latent concepts are measured using observable indicators, it specifies the relationship between latent variables and their measured variables.

Figure 2: Model Loadings



Source: Author’s Computation, 2026

The measurement and structural model demonstrates strong psychometric adequacy and substantive explanatory power. All retained Human Capital (HC) indicators (HC2–HC7) exhibit high standardized loadings going from 0.830 to 0.911, above the recommended threshold of 0.70, thereby confirming indicator reliability and strong convergent power of the construct. Similarly, the retained SMEs Performance (SP) indicators (SP4–SP7) load satisfactorily on their latent variable (0.636–0.885), indicating acceptable representation of the performance construct after refinement. The structural path from Human Capital to SMEs Performance is strong and positive ($\beta = 0.826$), suggesting that improvements in human capital significantly enhance SME performance. The R^2 value of 0.682 for SMEs Performance indicates that human capital explains 68.2% of the variance in performance, which is considered substantial in PLS-SEM, especially in social science and SME studies. Items SP1, SP2, and SP3 were deleted because their factor loadings fell below acceptable thresholds and likely weakened construct reliability and convergent validity. The removal of weakly loading indicators is consistent with PLS-SEM best practices, which recommend eliminating items with loadings below 0.70 (or below 0.40 outright) to improve Average Variance Extracted (AVE), Composite Reliability (CR), and overall model robustness (Hair et al., 2019; Hair et al., 2021). This iterative purification process enhances the explanatory power, parsimony, and predictive accuracy of the final model, making it statistically robust and theoretically sound.

Hypothesis Testing

This is a statistical procedure used to make decision about a population based on sample data.

Table 3: Regression Coefficient

Predictor	B	SE B	β	T	P	95% CI for B
Constant	1.44	0.09	-	16.43	< .001	[1.27, 1.61]
Human Capital (HC)	0.67	0.02	0.77	32.55	< .001	[0.63, 0.71]

Source: Author's Computation, 2026

The regression results indicate that human capital is a strong and statistically significant predictor of SMEs performance. Specifically, human capital had a positive effect on SMEs performance, $B = 0.67$, $SE = 0.02$, $\beta = 0.77$, $t = 32.55$, $p < .001$, suggesting that a one-unit increase in human capital is associated with a 0.67-unit increase in SMEs performance. The narrow 95% confidence interval [0.63, 0.71] further confirms the precision and robustness of this estimate. The standardized coefficient indicates a large effect size, highlighting the substantial contribution of human capital to performance outcomes. Additionally, the tolerance value of 1.00 suggests the absence of multicollinearity, confirming the stability and reliability of the regression estimates. Overall, the findings underscore the critical role of human capital in enhancing SMEs performance.

The regression results, shows that human capital development has a positive and significant influence on the performance of agro-allied SMEs in North Central Nigeria is not rejected. The positive and statistically significant coefficients ($B = 0.67$, $\beta = 0.77$, $p < .001$) provide strong empirical evidence against the null hypothesis. Therefore, the study confirms that human capital development significantly affects agro-allied SME performance.

Discussion of Findings

The findings clearly demonstrate that human capital exerts a strong and robust effect on agro-allied SME performance in North Central Nigeria ($\beta = 0.77$) is consistent with empirical evidence that positions skills, education, and managerial competence as central drivers of firm-level outcomes in developing economies. In Nigerian, studies repeatedly show that SMEs with better-trained and more experienced employees achieve higher productivity, operational efficiency, and market competitiveness, particularly in sectors such as agriculture where tacit

knowledge and adaptive capacity are crucial (Afolayan et al., 2020; Adegbite et al., 2019). The large standardized coefficient and high t-value reported in this study indicate not just statistical significance but economic relevance, implying that marginal improvements in workforce capability generate disproportionately large performance gains. This supports the human capital view that intangible assets rather than physical capital alone constitute the main source of competitive advantage for agro-allied SMEs in Nigeria.

Furthermore, the narrow confidence interval underscores the stability and reliability of the human capital-performance relationship, suggesting that returns to investment in employee training and managerial development are consistent across firms. This aligns with Nigerian evidence showing that human capital mitigates environmental uncertainty by enhancing innovation, quality control, and strategic decision-making in SMEs (Aremu & Adeyemi, 2011; Ogundele et al., 2018). However, the strength of this relationship also exposes structural weaknesses in policy implementation, as many public SME support programmes in Nigeria underinvest in skills development relative to finance-focused interventions. The findings therefore imply that without deliberate and sustained investments in vocational training, agribusiness education, and managerial capacity building, agro-allied SMEs may struggle to sustain growth even when other ecosystem factors improve. Human capital thus emerges not only as a performance determinant but as a mediating capability that enables agro-allied SMEs in North Central Nigeria to fully leverage broader entrepreneurial ecosystem resources.

Policy Implications

The findings call for a strategic reorientation of SME support policies toward human capital-led agro-industrialisation. Rather than treating training as a peripheral intervention, policymakers should embed human capital development within agricultural, industrial, and SME policies as a long-term productivity strategy. This can be operationalised through modular, sector-specific skill certification schemes for agro-allied SMEs that combine technical, managerial, and digital competencies, and are co-designed with industry actors. Such an approach would ensure policy relevance, reduce skill mismatches, and allow public agencies to track the returns on human capital investments in terms of productivity growth, value addition, and employment quality in the agro-allied sector.

In addition, policymakers can introduce incentive-based human capital policies that reward firms for demonstrable investments in workforce development. These may include training tax credits, subsidised apprenticeship programmes, and performance-linked grants tied to measurable improvements in productivity, innovation, or quality standards. By shifting from input-based to outcome-oriented policy instruments, governments and development partners can encourage SMEs to internalise skill development as part of their growth strategy. This approach moves policy beyond short-term capacity building toward the creation of a resilient agro-allied SME ecosystem capable of sustaining competitiveness and inclusive economic development.

Practical Implications

SME owners and managers, the results underscore the need to reconceptualise human capital as a strategic asset that drives firm scalability and resilience. Beyond ad hoc training, agro-allied SMEs should adopt structured learning pathways that align employee skills with evolving market demands, technological change, and quality standards in agro-processing and agribusiness. Integrating on-the-job training with mentorship, knowledge sharing, and problem-solving routines can enhance adaptive capacity, enabling firms to respond more effectively to supply chain disruptions, climate variability, and competitive pressures.

SME managers can leverage human capital development as a tool for organisational transformation by fostering a learning-oriented and innovation-driven workplace culture. Encouraging employee participation in process improvement, product development, and decision-making not only enhances operational efficiency but also strengthens employee commitment and retention. In resource-constrained environments, such internally driven capability building offers a cost-effective pathway to sustainable competitive advantage, allowing agro-allied SMEs to move up the value chain and achieve long-term performance gains without over-reliance on external support.

Conclusion

The study provides strong empirical evidence that human capital development has a positive and significant effect on the performance of agro-allied SMEs in North Central Nigeria. The rejection of the null hypothesis confirms that human capital is a critical driver of agro-allied SME success. Consequently, sustained investment in education, skills development, and managerial competence is essential for improving SME performance and long-term sustainability in the region.

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