

Green work engagement and SMEs' sustainable performance in Nigeria: The mediating role of green innovation

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Abstract

Purpose: This study examines the influence of green work engagement on the sustainable performance of small and medium-sized enterprises (SMEs) in Nigeria, with green innovation serving as a mediating variable. The study focused on SMEs in the agricultural sector across Kaduna, Kano, and Kebbi states.

Design/methodology/approach: A cross-sectional research design was employed, adopting a survey method to obtain relevant data from employees of 103 agricultural SMEs. Using a judgmental sampling technique, 300 copies of structured questionnaires were administered physically and complemented with online distribution via Google Forms. Of these, 201 usable responses were retrieved, forming the final dataset for analysis.

Findings: Green work engagement did not significantly impact SME sustainable performance, implying that employee engagement alone may not boost firm sustainability. In contrast, green innovation positively affected sustainability, showing that adopting eco-friendly practices helps achieve environmental, social, and economic goals. Green work engagement also significantly predicts green innovation, emphasizing the role of an environmentally friendly workplace in fostering creativity. Moreover, green innovation mediates the link between work engagement and sustainable performance, highlighting its key role in converting employee involvement into tangible sustainability outcomes.

Limitations and Research implications: The results' generalisability is limited by the use of judgmental sampling approach and single sector. Rather of using a scale designed for green work engagement, the research adapted the conventional work engagement scale, which would have limited measurement accuracy.

Practical Implications: The study highlights the need for SMEs, particularly within Nigeria's agricultural sector, to recognise that employee enthusiasm for environmentally friendly practices is essential, although insufficient for fostering sustainability independently.

Originality/value: The study contributes to sustainability literature by emphasizing the importance of green innovation in bridging the gap between green work engagement and organizational sustainability. It recommends that SME managers prioritize innovation-driven green practices to achieve long-term sustainable performance.

Keywords: Green Innovations, Green Work Engagement, Sustainable Performance, Resource-Based View

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Introduction

Green work engagement has emerged as a major concept globally in sustainability studies. It shows how employees take environmental concerns in the workplace seriously (Alshaabani et al., 2021). Green work engagement requires employees to adopt initiatives that support the



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organization's sustainability goals (Abouelenien et al., 2024). In recent times, Small and medium-sized enterprises (SMEs) worldwide are taking environmental business sustainability seriously to address environmental problems and the depletion of the ozone layer. The contributions of SMEs to Nigeria's economy cannot be overemphasized, particularly in job creation, creativity and innovation, and increased productivity (Ojeleye & Mustapha, 2024). Sadly, these SMEs lack sustainable methods for conducting their business activities, thereby placing stress on the environment and contributing to environmental degradation. Hence, it is important for these organisations to engage their workforce to promote sustainability, as they also contribute to global environmental problems, including climate change, biodiversity loss, and resource depletion (Marini et al., 2023). In Nigeria, where small and medium-sized businesses (SMEs) make up most of the agricultural industry, this idea is crucial to ensuring businesses remain competitive while remaining environmentally responsible.

Green work engagement in SMEs is an under-researched field of investigation and, as such, is particularly significant in developing countries, where economic activity is painfully slow. Employees' engagement with green initiatives is sometimes limited by a lack of commitment to the organization, insufficient knowledge, and insufficient resources (Muafi, 2024). Because of structural constraints such as limited access to technology, capital, and green knowledge, SMEs in Nigeria cannot leverage employee engagement to achieve positive environmental outcomes. Additionally, the objective of maximizing short-term profitability typically takes precedence over the goal of long-term sustainability. This finding raises the fundamental question of whether just participating in green labour may lead to measurable improvements in sustainable performance. While employee involvement in green initiatives is beneficial, studies in industrialized nations demonstrate that its direct impact on sustainability results is inconsistent and may be affected by variables such as innovation (Haque et al., 2024). This difference underscores the importance of exploring alternative approaches to turning green participation into long-term performance outcomes in Nigeria's small- and medium-sized business sector.

The problem becomes even more crucial when you consider that Nigeria's ecological stability and economic resilience depend on all three dimensions of sustainable performance: economic, social, and environmental. SMEs often face significant challenges in ensuring proper waste management, efficient resource use, and environmental protection, particularly in the agriculture sector. If there are no innovative projects that change how the firm works and uses technology, employees may not be as environmentally conscious as they should be. Idrus (2024) stressed that organizations that rely solely on their employees' devotion and do not frequently adopt new methods are unable to make much progress on sustainability measures. Therefore, even if green work engagement is crucial, it must be complemented by more systematic procedures that drive change at both the strategic and operational levels. Because Nigerian SMEs are still grappling with environmental problems, it is important to identify mediating factors that can translate green aspirations into measurable, sustainable performance outcomes.

Green innovation has consistently shown its significance in promoting sustainable company success. "Green innovation" is the process of developing and adopting new products, processes, and business models that generate revenue while having a lower environmental impact (Saudi et al., 2019). It enables better utilisation of assets, minimises waste, and reduces energy consumption. More importantly, it helps create a culture that is good for the environment by ensuring that organizational processes comply with international environmental standards. Extant literature indicates that green innovation enhances a firm's ability to be resilient, effective, and efficient by lowering costs and meeting stakeholder expectations (Cisneros-Chavira et al., 2023; El-Kassar & Singh, 2019). As a result, the agricultural sector faces significant environmental problems; green innovation might be particularly groundbreaking for SMEs in Nigeria. SMEs may enhance their sustainability performance and meet rising customer demand for eco-friendly practices by adopting green

technologies and innovative methods. Thus, the possible mediating role of green innovation is essential for understanding how engagement leads to outcomes.

Nonetheless, despite the increasing global interest in the linkage between green work engagement and sustainable performance, a substantial knowledge gap persists regarding the interaction between green innovation and green work engagement in influencing sustainability outcomes. To the best of our knowledge, no research has examined these concepts concurrently within a mediating framework, while some prior studies have considered them individually (Kanan et al., 2023; Aligarh et al., 2025; Demir et al., 2025). For instance, green innovation emphasizes organizational systems that channel employee efforts toward substantial outcomes, whereas green work engagement focuses on employees' dedication, vigor, and absorption (Aboramadan, 2020). This kind of involvement is quite important in countries like Nigeria, where small and medium-sized businesses (SMEs) generally don't have the same resources as larger companies. Employees' dedication to the environment may not be transformative without innovation. Additionally, developing settings are underrepresented in the literature, as the bulk of existing research has been conducted in industrialized nations (Muafi, 2024). To address the research gap and enhance our understanding of sustainable performance in Nigeria's SME sector, it is essential that a study elucidate this mediating relationship. Thus, explaining the mechanism through green innovation explains the relationship between green work engagement and sustainable performance among agric-SMEs in Nigeria

At the same time, SMEs in the agricultural sector face specific opportunities and challenges in regions such as Kaduna, Kano, and Kebbi. These states are key agricultural centres in Nigeria and contribute significantly to both employment and food security (National Bureau of Statistics, 2022). But they also have environmental concerns, including poor waste management, desertification, excessive chemical use, and soil that has lost its quality. Because workers in these SMEs are typically actively involved in industrial processes, their work has a direct impact on the environment. Promoting eco-friendly work practices among this set of employees might help them become more self-aware and better prepared for performance initiatives that benefit the environment. But if new mechanisms such as eco-friendly technologies, sustainable supply chains, and ways to reduce waste are not put in place, the effects of this kind of involvement could not be very strong (Yurdakul & Kazan, 2020). This local context underscores the need to examine how green innovation might function as a conduit that converts green work engagement to sustainable performance.

In light of this, the objective of this study is to assess the mediating role of green innovation in the relationship between green work engagement and the sustainable performance of SMEs in Nigeria. The study specifically focuses on SMEs within the agriculture industry in the states of Kaduna, Kano, and Kebbi. The goal is to determine what employees think about how their engagement affects sustainability outcomes and how innovation plays a role in this relationship, using a cross-sectional survey. This initiative aligns with the overarching objective of promoting sustainability in developing nations by providing viable pathways for SMEs. The study not only adds to what we know about green work engagement but also helps us better understand how engagement may lead to measurable sustainability benefits. So, it helps Nigerian small and medium-sized businesses bridge the gap between theoretical concepts and how they really do business.

Literature Review

This section reviews the literature on sustainable performance, green work engagement, green innovation, empirical reviews, and theoretical frameworks.



Concept of Sustainable Performance

The existing research posits that sustainable performance is a complex construct that integrates social, economic, and environmental outcomes to ensure enduring organizational success while mitigating negative externalities. Aligarh et al. (2025) defined sustainable performance as a corporation's ability to reconcile social equity, environmental integrity, and economic prosperity to meet stakeholder expectations without compromising the capability of future generations to meet their own needs. According to Kanan et al. (2023), achieving corporate objectives boosts competitiveness and advances sustainable development overall. Similarly, Ojeleye and Mustapha (2025) characterised sustainable performance as a continuous process of reporting and managing social, environmental, and economic consequences in ways that generate value for stakeholders and organisations alike. The potential of SMEs to incorporate sustainability-oriented practices that promote resilience and competitiveness (Batool & Mohsin, 2024). Although these prior definitions analysed sustainable performance at the organisational or firm level, the current study conceptualises it at the individual employee level. As such, this study defines employee sustainable performance as the degree to which workers sustain their own health and well-being, uphold ethical and environmental obligations, cultivate positive relationships at work, and maintain consistent productivity, all of which contribute to long-term value creation for the company and for the employees themselves. In other words, it is the capacity of an employee to deliver work results continuously while safeguarding personal well-being, fostering healthy workplace relationships, and engaging in responsible actions that contribute to long-term organizational success.

Concept of Green Work Engagement

Work engagement was initially defined by Schaufeli et al. (2002) as a positive, satisfying state associated with one's job, marked by vigour, devotion, and absorption. Ojeleye and Ojeleye (2024) viewed it as a positive state of mind that leads to positive work outcomes. The green context has since changed this phrase. Green work engagement is not just a fashion statement; it is a strategic approach that helps both firms and society in the long run (Marini et al., 2023). Based on this, Marini et al. (2023) viewed green work engagement as the mental state in which workers direct their excitement and energy into environmentally sustainable duties and activities. According to Idrus (2024), it is the active participation of workers in environmental projects, wherein they motivate and dedicate themselves to the organization's ecological aims. Green work engagement is the degree to which workers exhibit mental, emotional, and physical dedication to ecologically friendly work practices (Haque et al., 2024). According to Aboramadan (2020), it is the amount of energy an employee puts into his green work tasks, his desire to put effort into green work, and his ability to fully absorb the green work. In sum, this study defines it as the conversion of workers' good affective, physical, and psychological moods into ecologically conscious actions that support organisational sustainability goals.

Concept of Green Innovation

Over the last several decades, there has been an increase in studies on green innovation due to its many and important uses, the rise in environmental awareness, and the availability of green goods and applications (Cisneros-Chavira et al., 2023). Green innovation is the creation and implementation of novel concepts, procedures, products, or methods that reduce environmental damage while enhancing organisational effectiveness (Saudi et al., 2019). Cisneros-Chavira et al. (2023) viewed it as environmental innovations in goods, processes, or management techniques aimed at reducing adverse environmental effects. According to El-Kassar and Singh (2019), it is the creation, adoption, or use of a new organisational process,

product, or management technique that lowers pollution, environmental risk, and other adverse ecological effects. Businesses are seeking a balance between protecting the environment and growing the economy by adopting green products and processes. Batool and Mohsin (2024) similarly characterized it as innovations that incorporate sustainability principles into organizational operations and product design to attain competitive and environmental benefits. This study defines it as an organization's strategic capability to integrate environmental issues into creative initiatives to enhance sustainability and competitiveness.

Underpinning Theories and Hypotheses Development

Underpinning Theory

Academics such as Wernerfelt (1984) and Barney (2001) were among the first to write about the Resource-Based View (RBV) of the firm. This view says that an organization's ability to effectively use and possess valuable, rare, inimitable, and non-substitutable (VRIN) resources is the main source of its long-term competitive advantage (Zvarimwa & Zimuto, 2022). RBV posits that variations in organizational performance may be attributed to differing combinations of physical and intangible resources, in contrast to external market-based perspectives (Sun et al., 2024). This theory posits that the intentional integration and protection of resources such as human capital, organizational culture, innovation capabilities, brand reputation, and technical expertise provide unique competencies that are difficult for rivals to replicate (Assensoh-Kodua, 2019). RBV primarily underscores the need to use internal skills to establish a competitive advantage and enhance long-term performance.

Hence, in this research on green work engagement and SMEs' sustainability performance in Nigeria, RBV provides a strong theoretical basis, with green innovation as a mediating element. It stresses that companies can achieve better, longer-lasting results by leveraging their unique internal resources effectively. Green work engagement is a valuable, uncommon, unique, and non-substitutable (VRIN) intangible human resource, as shown by employees' commitment to environmentally friendly behaviours. When SMEs use this resource effectively, it encourages green innovation, leading to the creation of eco-friendly products, processes, and practices that make them more competitive. In Nigeria, where ecological challenges and competition make resource-based strategies necessary, SMEs can improve sustainability by involving their staff in everyday operations and increasing their environmental awareness.

Green Work Engagement and Sustainable Performance

A growing body of empirical research consistently demonstrates a substantial correlation between performance and work engagement across many contexts. Idrus (2024) examined green work engagement as a moderating variable in the link between employee performance and green HRM practices. The results indicated that engaged workers not only enhance their individual performance but also amplify the impact of HRM practices on organizational outcomes. Likewise, comprehensive research conducted by Rasheed (2024) identified a favourable association between job engagement and sustainable performance, suggesting that psychological involvement among employees is a crucial determinant of long-term organizational success. Gede and Huluka's (2024) further substantiates the universality of the idea, revealing that the three dimensions of work engagement, comprising vigor, dedication, and absorption, substantially influence organizational performance in Ethiopian public institutions. Kodden (2020) also stressed the significance of employee engagement as a strategic necessity and a way to motivate people to achieve long-term success. Overall, these studies support the premise that job engagement is not just a personal resource but also an



important organizational tool that leads to better performance and sustainability across many sectors and locations. Based on these investigations, the research claimed that:

H_{1a}: Green work engagement positively affects SMEs' sustainable performance.

Green Innovation and Sustainable Performance

A plethora of studies have shown that green innovation is a significant predictor of sustainable performance. Barriga-Medina et al. (2022) demonstrated that green innovation integrates economic and ecological benefits, effectively forecasting the financial and environmental performance of manufacturing firms in Colombia, Ecuador, and Peru within a broader South American framework. Saudi et al. (2019) showed that innovations in goods and processes significantly enhance the sustainable performance of Malaysian manufacturing firms. This emphasises the significance of innovation in reducing environmental impact and enhancing productivity. Likewise, Yurdakul and Kazan (2020) reported similar results in industrial businesses in Turkey, underscoring the global significance of innovation in promoting sustainability. Green creativity and innovation have a significant positive impact on SMEs' competitive advantage and overall performance, according to recent research by Muafi (2024). This finding is supported by Kanan et al. (2023) in Palestinian manufacturing sectors. Green innovation has been shown to have beneficial and substantial effects on both financial and sustainable performance in several studies, such as Dwiputri et al. (2023) in Indonesia and Aligarh et al. (2025), on Indonesian micro, small, and medium firms. When considered together, these studies demonstrate that green innovation is a strategic organisational competence that enhances competitiveness, resilience, and long-term sustainability across a range of economic circumstances. Hence, this study hypothesised that:

H_{1b}: Green innovation positively affects SMEs' sustainable performance.

Green Work Engagement and Green Innovation

A plethora of studies have shown that work engagement significantly predicts innovation in the workplace. For instance, Ludmilla and Labeat (2024) demonstrated that work engagement significantly influences innovative performance of manufacturing and service enterprises in Albania and Kosovo. The finding is supported by a study conducted in Saudi Arabia on Small and Medium-Scale Enterprises (SMEs) by Alateeg and Alhammad (2024), who reported that work engagement significantly drives innovative work behaviour. Nishat and Haque (2025) reported that the three dimensions of work engagement, vigour, dedication, and absorption, significantly influence innovative work behaviour among the Bangladeshi ready-made garment (RMG) industry. Collaborating on these studies, an earlier work by Arshi and Rao (2019) also found that work engagement stimulated innovation in 590 Omani and MNC organisations operating in Oman. In the same vein, Lestari and Anjaningrum (2025) reported that green work engagement substantially fosters the development of an innovative organizational culture within Patchwork and Quilting MSMEs in East Java. Ultimately, these studies corroborate the view that green work engagement is a strategic resource that can stimulate innovation and creativity in the workplace towards sustainable performance. Thus, the study hypothesised that:

H_{1c}: Green work engagement positively affects green innovation.

Green Innovation as a Mediator

Green innovation as a mediating mechanism linking employment resources, psychological dimensions, and organisational outcomes has been the subject of only a small number of

studies. According to Kanan et al. (2023), for example, green innovation acted as a mediator between sustainable performance and green HRM practices, indicating that innovation is an essential channel through which HR activities lead to more comprehensive sustainability outcomes. Similarly, Demir et al. (2025), showed that green innovation acted as a strategic bridge that channels leadership influence into organisational competitiveness by mediating the link between green transformational leadership and sustainable competitive advantage. These results demonstrate that green innovation is increasingly seen as a crucial mediator between resource-based and behavioural components and sustainable outcomes, in addition to being a direct driver of performance.

H₂: Green innovation mediates the effect of green work engagement on SMEs' sustainable performance.

Methodology

The study employed a quantitative method to investigate the correlation among green work engagement, green innovation, and the sustainable performance of SMEs in Nigeria's agricultural industry. A cross-sectional study strategy was used, suitable for gathering point-in-time data to identify correlations among variables. The survey approach was selected as the principal data-collection strategy due to its effectiveness in obtaining standardised responses from a large sample. The respondents of the study were employees of SMEs in the agricultural industry in Kaduna, Kano, and Kebbi States. These three states were intentionally chosen because they are important for farming in Northwest Nigeria and have played a significant role in the growth of small and medium-sized businesses. A judgmental sampling was used to identify people who knew enough about both the operational and strategic aspects of their businesses to answer the questions. This method ensured that only those with relevant management duties participated in the survey. A total of 300 structured surveys were sent, and 103 agricultural SMEs received physical copies of the questionnaires. Additional copies were distributed electronically via Google Forms to increase the response rate. Of the distributed questionnaires, 201 were completed and returned, yielding a usable response rate of 67%.

Validated scales from previous studies were adapted and used in the study, with a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Green work engagement was measured using an adapted version of the Utrecht Work Engagement Scale (UWES-9) developed by Schaufeli et al. (2006) to assess overall engagement, with a reported Cronbach's alpha of 0.78, indicating reliability and suitability for the study. The scale, although originally used to measure standard work engagement, was adapted in the context of the study to suit environment-oriented green work engagement. A sample item for the instrument measuring green work engagement is: "Carrying out tasks at work that are good for the environment motivates me." Sustainable performance was assessed using the multidimensional sustainable performance scale developed by Simiyu et al. (2023). The scale consisted of three dimensions: social, economic, and environmental viewpoints originally used at the firm level. However, the scale was adapted to suit employee-level sustainable performance. Each dimension consists of three items. An example of an item reflecting a social viewpoint is: "I actively participate in community-based programs supported by my organisation," with a reported composite reliability of 0.83. An example of an item from the economic viewpoint is: "I am satisfied with the results of my work," with a reported composite reliability of 0.78. An example of an item regarding the environmental viewpoint is: "I make conscious efforts to minimise the use of hazardous materials in my work," with a reported composite reliability of 0.81. The reliability coefficients indicate that the scale is consistent and suitable for this investigation. Green innovation was measured using a five-item scale developed by Muafi (2024) and adopted from Li et al. (2022). A sample of an item is "I make efforts to reduce



pollution in the way I carry out my work,” with a reported Cronbach’s alpha of 0.92. This scale measures green innovation unidimensionally.

Data were examined using structural equation modelling (SEM), especially Smart-PLS version 4.0.9.9, to evaluate the measurement and structural models. The measurement paradigm was first used to assess the lower-order constructs prior to advancing to the higher-order constructs, since the research selected a reflective-formative higher-order construct for sustainable performance. For the lower-order constructs, outer loadings, reliability, and validity were evaluated, while for the higher-order constructs, collinearity and both relative (outer weight) and absolute (outer loadings) contributions were analysed. The structural model was used to examine both the direct and mediated interactions.

Assessment of Measurement Model

Lower-Order Measurement Model Evaluation

The research evaluated outer loading. Hair et al. (2022) advocated that loadings of 0.7 or above should be retained, while those below 0.7 should be discarded. However, Hulland (1999) recommended eliminating outer loadings below 0.5, citing the feasibility of achieving such outcomes in social science research. Hair et al. (2021) indicated that loadings of 0.4-0.7 should be retained only if they do not negatively affect the constructs’ reliability and convergent validity. In accordance with the recommendations of Hulland (1999) and Hair et al. (2022), the outer loadings GWE4, GWE6, and GWE8 were discarded owing to their loadings being below the 0.5 threshold (see Table 1).

Table 1. Outer Loadings, Reliability and Convergent Validity

Constructs	Items	Loadings	Composite Reliability	AVE	Decision
Economic	EC1	0.778	0.840	0.638	Accepted
	EC2	0.880			
	EC3	0.731			
Environmental	EN1	0.801	0.850	0.656	Accepted
	EN2	0.904			
	EN3	0.715			
Green Innovation	GI1	0.793	0.878	0.592	Accepted
	GI2	0.769			
	GI3	0.785			
	GI4	0.825			
	GI5	0.665			
Green Work Engagement	GWE1	0.564	0.855	0.501	Accepted
	GWE2	0.752			
	GWE3	0.666			
	GWE5	0.783			
	GWE7	0.842			
Social	GWE9	0.600	0.820	0.603	Accepted
	SC1	0.756			
	SC2	0.779			
	SC3	0.795			

Convergent validity was subsequently assessed by Average Variance Extracted (AVE). Hair et al. (2022) argued that an AVE score of 0.5 or above indicates the convergent validity of a study's construct. Table 1 indicates that the AVEs for all constructs exceed 0.5. Consequently, convergent validity is confirmed. The construct reliability of this study was assessed using the composite reliability coefficient. Hair et al. (2022) recommended a threshold of 0.7 or above for the construct to be deemed reliable and consistent. Table 1 unequivocally demonstrates that the composite reliability values exceed the required threshold of 0.7. Consequently, the constructions are considered reliable.

The Heterotrait-Monotrait (HTMT) correlation ratio was used to assess the discriminant validity of the components. Henseler et al. (2015) endorsed the HTMT ratio, as the Fornell-Larcker Criterion and cross-loadings fail to identify a deficiency in discriminant validity among conceptions with loadings between 0.65 and 0.85. Concurrently, researchers have proposed two standards (Kline, 2011 & Henseler et al., 2021). Kline (2011) offered a stringent criterion of <0.85 for conceptually unique constructs, whereas Henseler et al. (2015) recommended a more lenient threshold of <0.90 for conceptually equivalent constructs. Consequently, given that the research constructs, namely social, environmental, and economic perspectives, represent characteristics of sustainable performance, a threshold of less than 0.90 was used. Consequently, since the correlations across constructs are below 0.90, divergent validity is affirmed (see Table 2).

Table 2. Heterotrait-Monotrait (HTMT) Ratio of Correlations Discriminant Validity

Constructs	Economic	Environmental	Green Innovation	Green Work Engagement	Social
Economic					
Environmental	0.600				
Green Innovation	0.619	0.674			
Green Work Engagement	0.552	0.536	0.681		
Social	0.825	0.588	0.753	0.738	

Collinearity and Significance Assessment of Higher-Order Model

This study's formative model (i.e., sustainable performance) was evaluated by examining two criteria for each indicator to be included in the construct, as specified by Hair et al. (2014). Initially, it is essential to evaluate the collinearity among the indicators using the variance inflation factor (VIF) values, which should not exceed five (5). The second objective is to evaluate the statistical contribution of each indicator to the construct, including both relative and absolute contributions. However, prior to evaluating these requirements, given that the construct is a reflective-formative hierarchical component model (HCM) or higher-order construct (HOC), a disjointed two-step technique was used (See Figure 1). The first phase included evaluating the lower-order components according to the conventional model, which establishes a direct link between the constructs (Sarstedt et al., 2019). To evaluate the hierarchical component model (HCM) in the second stage using the two-stage disjoint technique, latent variable scores from the first stage (lower-order estimation) were generated, facilitating the construction and estimation of the model. Thus, the latent variable scores for economic viewpoint (Economic), environmental perspective (Environmental), and social perspective (Social) were used to assess sustainable performance. The acquired latent variable scores were used in a two-stage methodology, using each LOC's values as formative indicators for HOC (Hair et al., 2014; Sarstedt et al., 2019).



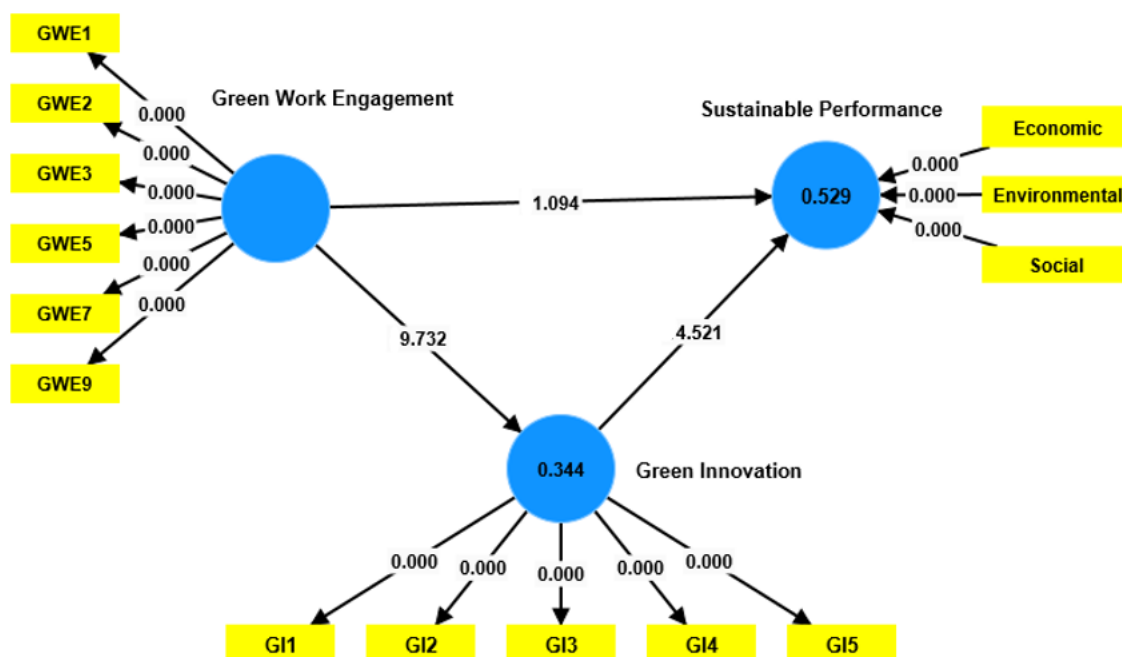


Figure 1. Higher-Order Formative-Reflective Two-Stage Disjointed Method

Table 3 demonstrates that the VIF value for each indication of the formative construct (i.e., sustainable performance) is below the essential threshold of five (5) (i.e., 1.587, 1.332, and 1.567). This unequivocally demonstrates the absence of multicollinearity among the indicators. The outer weight values for the formative indicators indicated their respective contributions to the core construct, as shown by the significant t-values (see Figure 2). The contribution was considerable, with values over 0.50 (0.738, 0.776, and 0.883). Because of this, the three dimensions of sustained performance are very important to the formative construct.

Table 3. Significance of Formative Indicators and Collinearity Assessment of Higher-Order (HOC) Construct Validity

HOC	LOCs	Outer weights	T-statistics	P-values	Outer loadings	VIF
Sustainable Performance	Economic	0.224	4.551	0.000	0.738	1.587
	Environment	0.427	8.657	0.000	0.776	1.332
	Social	0.571	10.345	0.000	0.883	1.567

Assessment of Structural Model

The structural model was employed to analyse the direct and mediating effects. The results of the tested hypotheses varied. Hypothesis 1a, which suggested that green work involvement significantly influences sustainability, was not supported because the path coefficient ($\beta = 0.189$, $p = 0.274$) was not statistically significant. This suggests that employee participation in environmentally friendly activities does not lead to rapid improvements in SMEs' sustainable performance. Conversely, Hypothesis 1b was supported, indicating that green innovation significantly enhances sustainable performance ($\beta = 0.267$, $p = 0.000$), suggesting that organisations adopting green innovation strategies often achieve better sustainability outcomes. Additionally, hypothesis 1c, which states that green work engagement significantly

influences green innovation, was supported ($\beta = 0.289$, $p = 0.000$). Furthermore, Hypothesis 2 was confirmed, demonstrating that green innovation mediates the relationship between green work engagement and sustainable performance ($\beta = 0.274$, $p = 0.000$). This suggests that while green work involvement may not have a direct impact on sustainable performance, it can facilitate it indirectly by fostering the adoption of green innovation. Furthermore, the specified confidence interval elucidates the mediation effect. Zhao et al. (2010) posited that it is important to investigate the upper and lower levels of confidence intervals when conducting a mediation analysis. They argued that, irrespective of the statistical significance of the mediation effect, both confidence intervals should be on the same side. In other words, if the lower confidence interval is positive, the upper confidence interval level should be positive, vice versa. The 5% and 95% are recommended for the lower and upper confidence interval levels, respectively.

The 5% and 95% confidence intervals for Hypothesis 2 (Green Work Engagement $\rightarrow$ Green Innovation $\rightarrow$ Sustainable Performance) ranged from 0.238 to 0.311. This range excludes zero, providing additional evidence that the mediating effect of green innovation is statistically significant and reliable. This shows that the indirect link between green work engagement and sustainable performance via green innovation is the same for everyone in the sample, which strengthens the mediation effect. This kind of mediation is complete mediation since the direct link between GWE is not important, but the mediating impact is. The model's explanatory power is indicated by a coefficient of determination (R^2) of 0.529, which indicates that the variables jointly explain about 52.9% of the variance in sustainable performance. This shows that the model is good at predicting outcomes, suggesting it may help explain the factors that affect sustainability in small and medium-sized businesses. Using a Q^2 value of 0.336, which is substantially higher than the criterion of 0, the model's predictive significance was tested. This shows that it is quite useful for predicting long-term performance. This suggests that the dimensions used in the study not only clarify but also substantially predict SME sustainability outcomes.

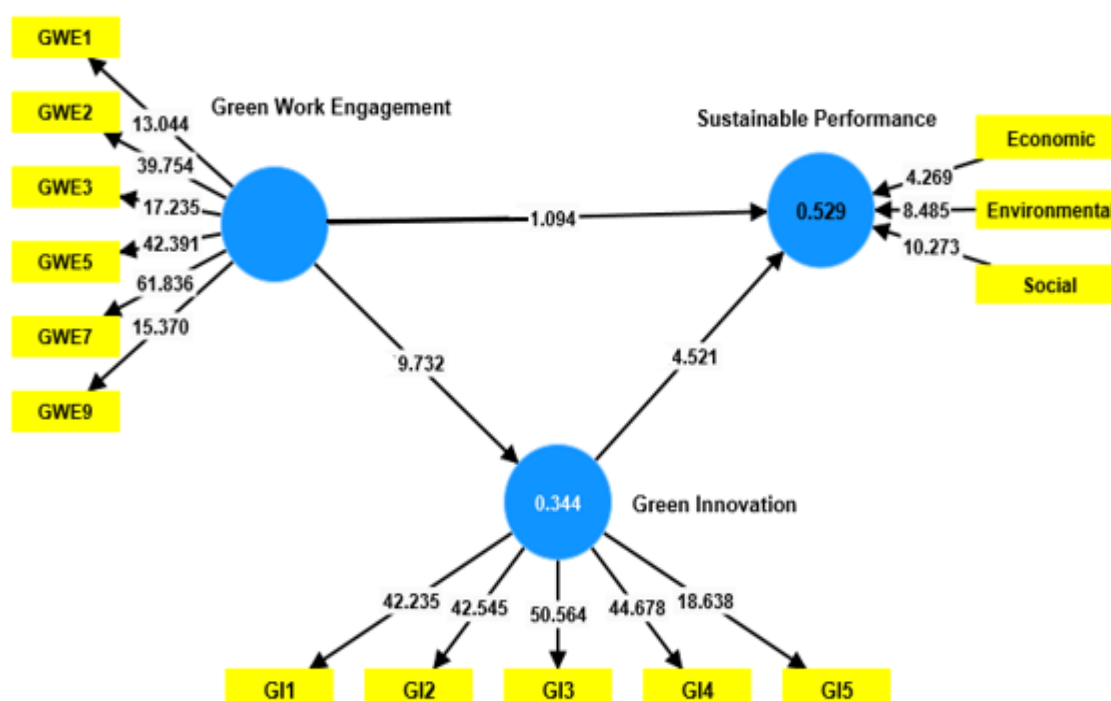


Figure 2. Structural Model



Table 4. Summary of Hypotheses Testing

Hypotheses	Path	Beta	Standard Error	T-values	p-values	Decision
H1_a	Green Work Engagement -> Sustainable Performance	0.189	0.173	1.092	0.274	Not Supported
H1_b	Green Innovation -> Sustainable Performance	0.267	0.059	4.521	0.000	Supported
H1_c	Green Work Engagement-> Green Innovation	0.289	0.030	9.732	0.000	Supported
H2	Green Work Engagement -> Green Innovation -> Sustainable Performance	0.274	0.022	7.829	0.000	Supported

Discussions

Employee engagement in environmentally friendly practices does not necessarily yield measurable sustainability outcomes without supportive organisational frameworks, as indicated by the finding that green work engagement does not significantly drive SMEs' sustainable performance. This contradicts prior studies by Gede & Huluka (2024), Idrus (2024), and Rasheed (2024). Structural limitations, insufficient green technology, fragile institutional frameworks, and inadequate investment in sustainability programs may all diminish employee commitment to environmentally friendly practices in Nigerian SMEs, particularly in resource-limited sectors such as agriculture. Employees may be intellectually and willingly engaged in green initiatives; yet, in the absence of organisational strategies and resources to bolster these efforts, their contributions will be insufficient to enhance economic, social, and environmental performance. To achieve sustainable performance, SMEs need to focus on more than simply getting employees involved; they need to develop a wider range of green skills.

The finding that green innovation significantly drives SMEs' sustainability performance clearly shows how sacrosanct innovative endeavours are for turning green ecological goals into real outcomes. This finding aligns with prior research, such as Barriga Medina et al. (2022), Saudi et al. (2019), and Yurdakul & Kazan (2020). SMEs may reduce their environmental impact by adopting eco-friendly practices, reducing waste, using energy-efficient technologies, and designing environmentally friendly products. This might also make them more competitive, cost-effective, and trustworthy to stakeholders (Dwiputri et al., 2023). This conclusion suggests that innovation provides effective tools for achieving sustainability goals, even in resource-constrained contexts such as those of Nigerian SMEs. Eco-efficient supply chains, renewable energy use, and sustainable farming methods are all strategies SMEs in the agricultural sector might adopt to promote long-term growth and resilience. So, green innovation is one of the primary factors that help SMEs succeed in the long run.

The finding that green work engagement significantly predicts green innovation clearly shows that an environmentally friendly workplace can stimulate green innovation and creativity. This aligns with previous studies (e.g., Lestari & Anjaningrum (2025), Arshi & Rao (2019), and

Alateeg & Alhammad (2024)). When employees are enthusiastic, dedicated, and absorbed about eco-friendly initiatives in the workplace, it is likely to spur creativity, fostering energy efficiency, waste reduction, and the development of sustainable products or processes. In simple terms, environmentally oriented employees are likely to develop eco-friendly solutions, products, processes, and procedures to foster sustainable performance and competitive advantage. Additionally, Lestari and Anjaningrum (2025) argued that green-engaged employees take pride in their work by creating sustainable solutions and reinforcing eco-friendly approaches to achieve innovative outcomes. Essentially, green work engagement acts as a motivator that enables employees to channel physical, cognitive, and affective resources towards creative solutions that align with organisational sustainable goals.

The finding that green innovation mediated the relationship between green work engagement and the sustainability performance of SMEs underscores the importance of organisational procedures in converting employees' environmental commitment into measurable outcomes. Even if employees are enthusiastic and devoted to activities that are good for the environment, their efforts may not have a significant impact on sustainability performance if they are not supported by innovative processes and systems. Green innovation connects engaged habits with meaningful outcomes by making sustainability a part of strategy, processes, and products. Innovation ensures that ideas or practices from engaged people are turned into technologies, processes, or solutions that make better use of resources, reduce waste, and have a positive impact on the environment.

Implications

The study's outcomes have three implications: theoretical, practical, and policy. The study's practical importance lies in the need for SMEs, especially in Nigeria's agricultural sector, to acknowledge that employee enthusiasm for environmentally sustainable practices is crucial but insufficient to promote sustainability autonomously. As such, owners/managers should establish rules and systems that enable workers to generate fresh ideas that will immediately improve sustainable performance. This means investing in eco-friendly technologies, encouraging new approaches to solving problems, and establishing company rules that support eco-friendly initiatives. SMEs may leverage the enthusiasm of motivated people into tangible advantages, including reduced waste, greater output, and greater competitiveness, by fostering an innovative culture. This implies that SMEs need access to green funding, training, and programs that help them expand their skills and abilities to continue improving at what they do through innovation.

The findings conceptually corroborate the foundational assumptions of the Resource-Based View by demonstrating that green innovation is a valued, rare, and distinctive capability that enables SMEs to transform employee engagement into enduring outcomes. Green work engagement is a significant people resource, but it requires organisational innovation skills to ensure long-term sustainability and competitive advantage. Hence, innovation is the strategic resource that connects employee behaviour with company success. This shows that, to create value, dynamic organisational resources must be added to intangible assets such as engagement. This provides tangible evidence that, under the RBV framework, effective alignment of organisational capabilities and human resources results in enduring performance, rather than just individual effort.

The results revealed that the government and regulatory bodies need to make it easier for SMEs to apply green innovation in their operations. Policies that provide SMEs with tax benefits, low-interest green loans, and subsidies for eco-friendly technology might encourage them to adopt more environmentally friendly practices. Setting up training and capacity-building programs can also help employees become better at implementing green practices



that support the company's efforts to become more innovative. Public-private partnerships may also be highly useful for helping SMEs learn new things and giving them access to modern green technologies and sustainable supply chain networks. By strengthening institutional mechanisms to assess and reward sustainability compliance, SMEs will be even more incentivised to adopt green innovation as a fundamental strategy for improving environmental and economic outcomes. Policy interventions may therefore bolster organisational actions and ensure that SMEs make a substantial contribution to broader national and international sustainability goals.

Conclusion and Recommendations

The research indicated that although green work engagement is crucial for fostering employee concern and commitment to environmental policy, it does not inherently result in significant improvements in the sustainable performance of SMEs. On the contrary, green work engagement stimulates green innovation. Additionally, green innovation is the best approach to transform work engagement into measurable sustainability outcomes. This is done by integrating eco-friendly practices into the organization's processes, products, and strategy. The findings demonstrated that green innovation not only directly influences sustainable performance but also serves as a mechanism through which green work engagement does so. This illustrates its significance in resource-constrained environments, such as those of Nigerian SMEs.

By emphasising this link, the research enhances theory and practice by demonstrating that organisational skills are essential for fostering employee engagement to achieve measurable outcomes. This shows how important it is for SMEs in the agriculture sector to invest in green innovation and build a motivated workforce. In the long run, this will help them stay strong, competitive, and aligned with sustainability objectives at home and around the world. Based on the findings, the study recommended that owners/ managers of SMEs should make green innovation their top priority. Using eco-friendly technologies, such as precision agricultural tools, renewable energy, and biodegradable materials that reduce pollution, might help with this. SMEs may also employ sustainable farming methods such as crop rotation, organic farming, and efficient solar irrigation to reduce chemical use and land degradation. Additionally, implementing effective resource management systems, such as recycling programs and energy-saving tools, will increase production while reducing operational waste. By incorporating these ideas into their daily work and providing employees with ongoing training on green practices, SMEs can help foster a culture of environmental, social, and economic responsibility.

To help SMEs generate new ideas and become more environmentally friendly, governments should provide targeted assistance programs, including tax breaks, green financing, and training. One way to do this is to get government agencies, commercial banks, and research centres to work together to provide SMEs that use green technology easy access to capital and technical help. Government-led awareness campaigns and capacity-building workshops should also teach workers and businesses about the advantages of sustainable business models. SMEs will be more likely to develop innovative ideas and align their work with national and global sustainability objectives if they are publicly recognised for environmental friendliness, and if meeting environmental rules is simpler for them.

Limitations and Suggestions for Further Study

There are certain limitations to the study that open new research directions. First, since the sample may not accurately reflect the larger population of SMEs in Nigeria, the results' generalisability is limited by the use of a judgmental sampling approach. Probability-based

sampling techniques should be used in future research to improve representativeness and lessen possible biases. Second, the study's geographic reach was limited, as it included only SMEs in three states in Northwest Nigeria. A more thorough grasp of the dynamics of green work engagement, innovation, and sustainable performance across different contexts would be possible by extending future studies to include other contexts. Third, instead of using a scale designed for green work engagement, the researchers adapted the conventional work engagement scale, which would have limited measurement accuracy. To better comprehend its unique traits, future studies should focus on developing and validating context-specific metrics for green work engagement.

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