Journal of Economics, Management Sciences and Procurement *Volume 4, Issue I, 2025*
pp. 526-541

Green Leadership and Environmental Performance in the Agriculture Sector: Addressing Climate Change and Ensuring Food Security

Article history: *Revised format:19th August 2025, Available online:4th December 2025*

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Abstract:

Purpose: *The study aimed to determine the effect of green leadership on environmental performance within the agricultural input manufacturing sector in Nairobi County, Kenya. It sought to establish whether environmentally oriented leadership practices enhance sustainability outcomes among firms producing pesticides, fertilizers, and related agrochemicals.*

Methodology: *The study was grounded in the Natural Resource-Based View. A census survey of 87 agricultural input manufacturing firms was conducted. Data were collected through a structured, close-ended questionnaire. Linear regression analysis was employed to test the relationship between green leadership and environmental performance.*

Findings: *Results showed that green leadership significantly and positively influenced environmental performance ($\beta = 0.705$, $t = 5.373$, $p < 0.001$). Firms whose leaders embedded sustainability principles in strategic decisions, promoted eco-friendly practices, and inspired employee commitment reported higher environmental outcomes.*

Conclusion: *Green leadership plays a central role in improving environmental performance within Kenya's agricultural input manufacturing industry. Strengthening leadership capabilities that support environmental stewardship and sustainability-oriented decision-making is essential for achieving long-term ecological results.*

Value: *The study provides empirical evidence for practitioners and policymakers on the importance of green leadership in driving sustainable industrial performance. It highlights the need for national and county governments to support leadership development programs that integrate sustainability competencies, ensuring future industry leaders are equipped to advance green transformation and environmental resilience.*

Keywords: *Climate Change, Food Security, Green Leadership, Environmental Performance*

Paper Type: *Research Article*

Recommended Citation: Karama, F. B. (2025). *Green leadership and environmental performance in the agriculture sector: Addressing climate change and ensuring food security*. *Journal of Economics, Management Sciences and Procurement, 4*(1), 526–541.

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1. Introduction

Climate change has emerged as one of the most serious challenges of the twenty-first century, with wide-ranging consequences across many sectors, particularly agriculture (Adamo et al., 2021). It is characterized by rising temperatures, erratic rainfall, and frequent extreme weather events that threaten livelihoods, ecosystems, and food systems worldwide (El-Sayed & Kamel, 2020). As the global population continues to grow, ensuring adequate and safe food becomes even more urgent (Vagsholm et al., 2022). The intersection between climate change, agriculture, and food safety presents complex issues that demand urgent attention and coordinated leadership.

In this context, green leadership plays a central role in tackling environmental and food-related challenges. It refers to leadership practices that integrate environmental awareness, sustainability, and resource conservation into decision-making and organizational behavior (Hofstad & Vedeld, 2021). Green leaders influence others to adopt eco-friendly policies and behaviors, guiding institutions toward sustainable outcomes (McPherson & Clarke, 2024; Dewi, 2023). Effective green leadership fosters collaboration among government agencies, civil society, and the private sector to ensure the availability and accessibility of nutritious food while promoting resilient agricultural systems.

Globally, the link between green leadership and environmental performance has been widely examined. Studies indicate that organizations led by environmentally conscious leaders tend to implement sustainable practices such as waste reduction, renewable energy use, and eco-innovation, which improve overall environmental outcomes (Nisar et al., 2024). Green transformational leadership enhances employee engagement in environmental initiatives, leading to higher environmental performance across sectors (Nisar et al., 2024; Review of Applied Management and Social Sciences [RAMSS], 2024). Moreover, according to FAO (2024), agrifood systems contribute nearly one-third of total anthropogenic greenhouse gas emissions, underscoring the need for strong leadership to shift production systems toward sustainability.

Regionally, Africa continues to bear a disproportionate share of climate-related impacts despite contributing the least to global greenhouse gas emissions (World Meteorological Organization [WMO], 2024). The continent faces recurring droughts, floods, and heatwaves that damage agricultural output and threaten food security. In Kenya, agriculture remains the backbone of the economy and employs a majority of the population. However, environmental degradation, unsustainable farming practices, and poor industrial waste management have undermined the sector's performance (UNIDO, 2024). The Climate Action Tracker (2024) reports that agriculture and food processing account for more than 40 percent of Kenya's greenhouse gas emissions. This trend has been exacerbated by emissions from fertilizer and pesticide manufacturing industries, which contribute significantly to environmental pollution (Nature, 2024).

The adverse impacts of climate change in Kenya are already visible through declining agricultural productivity and food insecurity. The Kenya Institute for Public Policy Research and Analysis (KIPPRA, 2024) estimated that climate variability could cause crop revenue losses of up to 73 percent under extreme scenarios. Frequent droughts and erratic rainfall patterns have reduced cereal production and livestock productivity, while soil degradation and pollution from agrochemicals continue to threaten the country's ability to meet its food security

goals (WMO, 2024). These challenges are closely linked to weak environmental governance and limited green leadership within agricultural institutions and industries. Strong, visionary green leadership can promote responsible production, enforce compliance with environmental standards, and drive the adoption of clean technologies to mitigate emissions and improve agricultural performance. However, there remains a scarcity of empirical studies on green leadership and its influence on environmental performance in the agricultural sector of developing nations like Kenya, creating a significant research gap that this study aims to address.

2. Theoretical Framework

The Natural Resource-Based View (NRBV) is a theory developed by Stuart L. Hart in 1995. It builds on the original resource-based view by looking at how natural environmental resources can become sources of competitive advantage for organizations (Hart, 1995). Hart suggested that businesses can do well by doing good for the environment. He outlined three main ideas in this theory: pollution prevention, product stewardship, and sustainable development. Pollution prevention means reducing waste and using resources more efficiently to save costs and improve performance. Product stewardship involves considering the environment in every stage of a product's life cycle, including sourcing, production, and disposal. Sustainable development goes further by encouraging companies to invest in long-term strategies that support the environment and communities. These strategies can help businesses improve their environmental performance and become more competitive over time (Hart, 1995). This theory has been widely used in many studies. For example, Russo and Fouts (1997) found that companies with strong environmental performance also tend to do better financially. Other researchers have used the NRBV to show how green leadership leaders who support eco-friendly practices can improve a company's reputation and environmental results (Li et al., 2022).

This theory is very relevant to the agriculture sector in Kenya, especially because farming depends so much on natural resources and is highly affected by climate change. Green leadership in Kenya's agriculture can be seen when leaders encourage practices like conserving water, reducing chemical use, and using clean energy. These actions help the environment and also improve farm productivity and food security. The NRBV shows that these green practices are not just good for the environment they are also smart business decisions. When agriculture leaders adopt sustainable methods, they create new capabilities that can help them survive climate challenges and meet market demands. For instance, climate-smart agriculture, organic certification, and efficient irrigation systems are all examples of strategies that align with the NRBV principles. Kenya has already acknowledged the need to turn climate risks into opportunities for growth and resilience (Government of Kenya, 2022). As the agriculture sector faces more pressure from changing weather, leaders who take green actions based on NRBV principles are more likely to succeed and contribute to food security (IEA, 2023; Takaindisa, 2025). In short, the NRBV helps explain why green leadership in agriculture is important for both the environment and long-term success.

3. Empirical Review (Hypothesis Development).

In small and medium enterprises (SMEs), leaders who prioritize sustainability help their companies perform better environmentally (Sun et al., 2022). In the food industry in Saudi Arabia, research found that green transformational leadership had a strong and direct effect on environmental performance, with a beta value of 0.80, showing that green leaders can significantly reduce waste, improve energy use, and manage emissions more effectively (Aboramadan et al., 2022).

In many cases, leaders influence performance by motivating employees to act in environmentally friendly ways. One study found that when green leadership was present in the Saudi food industry, employees were more likely to adopt green behaviors both in their main job tasks and in extra initiatives (Sobaih et al., 2022). These behaviors had a major effect on the company's environmental outcomes. Interestingly, the study showed that leadership's direct impact became less significant when employee behavior was considered, meaning that leadership often works through inspiring people to be more environmentally responsible (Sobaih et al., 2022).

Other research has found that green leadership improves performance through creative and cultural changes inside organizations. In China, leaders who focused on environmental values encouraged their employees to come up with eco-friendly ideas, which led to better environmental results (Li et al., 2024). In the pharmaceutical industry, leaders did not directly change environmental performance but did so by improving how confident and empowered employees felt in tackling green challenges. These changes, supported by green training programs, helped companies reduce their environmental impact (Saleem et al., 2024).

This trend holds across different sectors and countries. In Saudi Arabia's healthcare system, green leadership helped improve environmental performance by increasing healthcare workers' belief in their own ability to act sustainably (Saleem et al., 2025). In the hotel industry, green-minded managers encouraged behaviors like saving water and reducing energy use, which directly improved the hotel's environmental metrics (Sobaih et al., 2022). In rural Chinese farming communities, local leaders who promoted green ideas also inspired farmers to adopt sustainable practices, mainly by building a culture that valued environmental care and knowledge sharing (Wang et al., 2023).

Leaders help directly by setting goals and improving processes, and indirectly by encouraging employees to act in green ways, be creative, and embrace sustainability. These findings apply in many settings from farms to factories and across cultures, making green leadership a powerful tool for improving environmental results (Aboramadan et al., 2022; Sobaih et al., 2022; Sun et al., 2022)

Drawing together these empirical insights, a clear pattern emerges: green leadership enhances environmental performance across manufacturing, service and agricultural sectors. Leaders who prioritize environmental values encourage employee engagement, foster innovation and embed sustainability into organizational culture and operations. Hypothesis: Based on the reviewed evidence, we propose that

H_1: Green leadership has a significant and positive effect on environmental performance.

4. Methodology

Positivism is the essential ideology that informed the choice of a study design for the proposed review. The stipulated relationships in the review will as such be taken through a scientific investigation with a purpose of accepting or rejecting them. Other than objectivity being a requirement, the expert believes that positivism was aimed at stressing on methodology that

would make it possible for quantification and replication of results as proposed by (Gratton & Jones, 2014). This review applied explanatory study design to assess the cause-effect association between commercial state corporations' performance and strategic Leadership (Orodho, 2003).

Target Population and Sampling

This study targeted a population of 87 firms involved in the manufacturing of agricultural inputs such as pesticides, fertilizers, and related agrochemicals within Nairobi County, Kenya. These firms play a vital role in supporting the agricultural value chain by supplying essential inputs that enhance productivity (Food and Agriculture Organization [FAO], 2024). Given that the total population was relatively small, the study adopted a census survey design, which involves including all members of the population rather than selecting a sample. This approach is recommended when the study population is small and manageable, as it eliminates sampling error and provides more comprehensive and accurate data (Mugenda & Mugenda, 2003; Kothari, 2014).

Data Collections

Close-ended survey forms that were given to junior staff were used to collect data. The survey firms' items were formulated conditional on an attitude scale response system providing five different responses from the firms involved in the manufacturing of agricultural inputs. The five-point attitude scale will represent the following criteria of scores; Strongly Agree (5), Agree (4), Undecided (3), Disagree (2) Strongly Disagree (1). Reliability was tested by use of the Cronbach's alpha coefficients. Cronbach's alpha coefficients surpassed 0.7 therefore viable enough to deem a study instrument reliable and fitting (Cooper & Schindler, 2006; Hair *et al.,* 2010).

Data Analysis and Model Specification

For data analysis, presentation and reporting of the results, data was put through screening before being used for analysis, interpretation and conclusion. The data screening process comprises data preparation, editing, coding and screening to look out for outliers. Data was summarized using descriptive statistics and general observations concerning the association between green Leadership and environmental performance. The descriptive techniques employed entailed mode, frequencies, mean, median as well as standard deviations. The review also used inferential statistics to make judgements on the suggested hypotheses generate in the review. To measure the strength of the causal associations existing between variables in the study. The study was to employ Pearson's product moment's correlation. Linear regressions were used to assess direct influence on green leadership and environmental performance. Multiple regression models are presented as

$$Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

Where: -
Y is environmental performance of firms involved in the manufacturing of agricultural inputs, X_1 is Green Leadership, β_0 is a constant, ε is Error term (random variation due to other unmeasured factors).

5. Findings and Discussion

This section presents the data analysis and findings based on the study objectives. Out of the 87 distributed questionnaires, 74 were correctly filled and returned, resulting in a response rate of 85.06%. This high response rate was achieved through the researchers' continuous engagement with respondents at various research sites, supported by follow-up phone calls and flexible completion options that encouraged participation. According to Babbie (2016) and Kothari (2014), response rates above 70% are generally considered excellent in survey research, as they enhance the representativeness of the sample. Therefore, the achieved rate demonstrates the effectiveness of the data collection approach and provides a solid foundation for reliable analysis, reinforcing the credibility of the study's results.

Firm Characteristics

Table 1 shows the characteristics of the firms that participated in the study. The findings indicate that most firms (43.2%) had been in operation for over 15 years, suggesting that the agricultural input manufacturing sector in Nairobi County is largely composed of mature and experienced firms. Those in operation for 6–10 years and 11–15 years each accounted for 20.3%, while only 16.2% had existed for less than five years, implying a relatively stable industry with continuous entry of new firms (Kothari, 2014). Regarding firm size, nearly half (47.3%) of the firms had between 301 and 400 employees, followed by 25.7% employing 201–300, and 12.2% having fewer than 100 employees. Only 14.9% of firms had more than 400 employees, reflecting a dominance of medium-sized enterprises. This composition suggests that the sector is moderately industrialized, with firms large enough to sustain production yet flexible enough to adapt to environmental and market changes

Table 1 Firm Characteristics

		Frequency	Percent
firm age	0-5 years	12	16.2
	6-10 years	15	20.3
	11-15 years	15	20.3
	Above 15 years	32	43.2
	Total	**74**	**100**
No of employees	1-100 employees	9	12.2
	201-300 Employees	19	25.7
	301-400 Employees	35	47.3
	401 - 500 Employees	6	8.1
	Above 500 Employees	5	6.8
	Total	**74**	**100**

Factor Analysis

Factor analysis was conducted to identify the underlying structure of variables relating to green leadership and environmental performance among agricultural input manufacturing firms in Nairobi County. The Kaiser–Meyer–Olkin (KMO) value of 0.839 and Bartlett's Test of Sphericity ($\chi^2 = 424.238$, $p < 0.05$) confirmed sampling adequacy and significant intercorrelations among variables, validating the suitability of the data for factor analysis (Field, 2013; Leech et al., 2013). Principal Component Analysis (PCA) with varimax rotation extracted two major components green leadership and environmental performance both

exhibiting strong factor loadings above 0.50, as recommended by Hair et al. (2015). The green leadership factor explained 74.41% of the total variance, with high loadings on items such as clear communication of environmental goals (0.933), vision for sustainable agriculture (0.932), and motivation toward climate-smart initiatives (0.894). These results indicate that leadership practices emphasizing vision, collaboration, and innovation significantly shape organizational environmental behavior (Ahmad et al., 2020). The environmental performance factor explained 84.68% of the variance, with strong loadings on variables such as waste reduction (0.774), recycling and reuse (0.936), and efficient resource utilization (0.854). The high cumulative variance demonstrates that these two constructs reliably represent the firms' sustainability orientation and operational practices toward environmental conservation (Hair et al., 2015). Overall, the results confirm that green leadership and environmental performance are distinct yet closely related dimensions that capture firms' efforts toward environmental sustainability, validating the measurement model and providing a sound empirical foundation for subsequent regression and hypothesis testing (Morgan et al., 2012; Yong & Pearce, 2013).

Table 2: Factor Analysis

	loadings	KMO	Bartlett's Test of Sphericity	Cumulative %
Green leadership		0.839	424.238*	74.41
Our leaders clearly communicate the firm's environmental goals.	0.933			
The firm's leaders provide a clear and inspiring vision for sustainable agricultural practices.	0.932			
Our leaders encourage collaboration among employees to achieve shared environmental objectives.	0.855			
The firm's leaders actively motivate us to meet environmental performance targets related to climate change and food security.	0.894			
Our leaders respect and consider employees' environmental values and beliefs in decision-making.	0.853			
The firm's leaders promote innovative thinking around eco-friendly and climate-smart agricultural solutions.	0.684			
Environmental performance		0.737	620.899*	84.675
Our firm selects materials that minimize pollution, energy use, and resource consumption during product design and development.	0.69			
Our firm uses the minimum necessary amount of materials in product development to reduce environmental impact.	0.715			

Our firm carefully considers whether products are easy to recycle, reuse, or decompose during the design process.	0.969
Our firm actively reduces hazardous emissions and waste in its operations.	0.774
Our firm recycles and treats waste and emissions for reuse.	0.936
Our firm implements practices that reduce the consumption of water, electricity, and fossil fuels.	0.854
Our firm works to reduce its dependence on raw materials	0.939

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.
*p<0.05

Descriptive Statistics

Table 3 presents the descriptive statistics for the study variables related to green leadership and environmental performance among agricultural input manufacturing firms in Nairobi County. The overall mean score for green leadership was 2.89 (SD = 0.78), suggesting a moderate perception of environmentally oriented leadership practices within the firms. The highest-rated leadership behavior was "our leaders actively motivate us to meet environmental performance targets related to climate change and food security" (M = 3.11, SD = 0.95), followed closely by "leaders clearly communicate environmental goals" (M = 3.09, SD = 1.25). These results imply that firm leaders show reasonable engagement in motivating and communicating sustainability goals to employees. However, relatively lower means were observed in promoting innovation toward eco-friendly solutions (M = 2.78, SD = 0.97) and inspiring a clear vision for sustainable agriculture (M = 2.81, SD = 1.12), indicating that innovation and visionary leadership in sustainability remain underdeveloped areas. The skewness and kurtosis values for all items ranged between -1.30 and 0.82, falling within acceptable normality thresholds (Field, 2013), implying that the data were approximately normally distributed.

For environmental performance, the overall mean was 3.11 (SD = 0.97), denoting that firms moderately integrate environmentally friendly practices in their operations. The highest mean value (M = 3.61, SD = 1.15) was recorded for "our firm recycles and treats waste and emissions for reuse," reflecting strong engagement in waste management practices. Similarly, "our firm works to reduce its dependence on raw materials" (M = 3.28, SD = 1.08) and "actively reduces hazardous emissions and waste" (M = 3.14, SD = 1.40) indicate reasonable efforts toward sustainable production. However, the relatively lower mean for "our firm considers product recyclability during design" (M = 2.49, SD = 0.86) suggests that eco-design principles are not yet widely embedded in production planning. Overall, the results show that while firms exhibit moderate commitment to environmental performance, there is room for improvement in innovation, design for recyclability, and energy efficiency. The low skewness (range -0.27 to 0.83) and negative kurtosis values (range -1.57 to -0.55) further confirm a normal distribution of responses, supporting the suitability of the data for inferential analyses such as regression (Hair et al., 2015).

Table 3 Descriptive statistics

n=74	Mean	Std. Dev	Skewness	Kurtosis
Our leaders clearly communicate the firm's environmental goals.	3.09	1.25	-0.01	-1.30
The firm's leaders provide a clear and inspiring vision for sustainable agricultural practices.	2.81	1.12	0.21	-1.25
Our leaders encourage collaboration among employees to achieve shared environmental objectives.	3.00	1.05	-0.22	-0.50
The firm's leaders actively motivate us to meet environmental performance targets related to climate change and food security.	3.11	0.95	-0.12	-0.35
Our leaders respect and consider employees' environmental values and beliefs in decision-making.	2.89	1.27	0.08	-1.29
The firm's leaders promote innovative thinking around eco-friendly and climate-smart agricultural solutions.	2.78	0.97	0.82	-0.65
Green Leadership	**2.89**	**0.78**	**0.00**	**-1.00**
Our firm selects materials that minimize pollution, energy use, and resource consumption during product design and development.	2.78	1.22	-0.27	-1.57
Our firm uses the minimum necessary amount of materials in product development to reduce environmental impact.	2.99	1.08	0.43	-0.59
Our firm carefully considers whether products are easy to recycle, reuse, or decompose during the design process.	2.49	0.86	0.83	-0.55
Our firm actively reduces hazardous emissions and waste in its operations.	3.14	1.40	-0.25	-1.41
Our firm recycles and treats waste and emissions for reuse.	3.61	1.15	-0.08	-1.43
Our firm implements practices that reduce the consumption of water, electricity, and fossil fuels.	3.14	1.47	-0.03	-1.46
Our firm works to reduce its dependence on raw materials	3.28	1.08	0.15	-1.30
Environmental performance	**3.11**	**0.97**	**0.19**	**-1.48**

Correlation Analysis

Table 4 presents the correlation results among environmental performance, green leadership, firm age, and firm size. The results indicate a positive and statistically significant relationship between green leadership and environmental performance ($r = 0.560$, $p < 0.01$), meaning that improvements in green leadership practices correspond with higher environmental performance levels. A negative and significant correlation was observed between firm age and

green leadership ($r = -0.294$, $p < 0.05$), suggesting that as firms become older, their emphasis on green leadership may slightly decline. Conversely, firm age had a weak and insignificant relationship with environmental performance ($r = -0.149$), implying limited influence of longevity on environmental outcomes. Similarly, firm size showed weak and insignificant correlations with both green leadership ($r = 0.148$) and environmental performance ($r = 0.083$), indicating that sustainability efforts are fairly consistent across firms regardless of size. The absence of multicollinearity and the presence of a linear relationship between green leadership and environmental performance demonstrate that the data met the assumptions for further analysis, providing a solid foundation for conducting linear regression analysis to determine the predictive effect of green leadership on environmental performance.

Table 4 Correlation analysis

	Environmental Performance	Green Leadership	Firm Age	Firm Size
Environmental Performance	1			
Green Leadership	.560**	1		
Firm Age	-0.149	-.294*	1	
Firm Size	0.083	0.148	0.088	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Regression Analysis (Hypothesis Testing)

The regression results presented in Table 4 reveal that green leadership has a significant and positive effect on environmental performance among agricultural input manufacturing firms in Nairobi County. The regression coefficient for green leadership was $\beta = 0.705$ ($t = 5.373$, $p < 0.001$), indicating that a unit increase in green leadership practices leads to a corresponding improvement in environmental performance by 0.705 units. This confirms the study hypothesis (H_1) that green leadership significantly enhances environmental performance. The overall model was statistically significant ($F = 10.691$, $p = 0.000$), with an R^2 value of 0.314, implying that green leadership explains 31.4% of the variation in environmental performance. The control variables firm age and tenure were insignificant ($p > 0.05$), suggesting that organizational characteristics did not substantially affect environmental outcomes. These empirical findings align with evidence from prior studies showing that leadership behaviors emphasizing sustainability strongly influence firms' ecological performance. For example, Sun et al. (2022) reported that leaders who prioritize sustainability initiatives within small and medium enterprises (SMEs) substantially improve their firms' environmental outcomes. Similarly, Aboramadan et al. (2022) found in Saudi Arabia's food industry that green transformational leadership had a strong direct impact on environmental performance ($\beta = 0.80$), enabling firms to reduce waste, manage emissions, and enhance energy efficiency. This is consistent with the current study's results, where green leadership emerged as a strong predictor of environmental performance. The results further resonate with Sobaih et al. (2022), who observed that green leadership motivates employees to adopt environmentally friendly behaviors, leading to improved environmental outcomes. The relationship between leadership and performance, therefore, operates both directly through managerial actions and indirectly—through employee engagement and motivation. Likewise, Li et al. (2024) and Saleem et al. (2024) found that green leadership stimulates creative problem-solving and fosters an organizational culture supportive of sustainability, which in turn enhances environmental outcomes. These studies collectively suggest that leadership's influence extends beyond policy

formulation to shaping the environmental values, attitudes, and behaviors of employees. In alignment with these global trends, the present study confirms that green leadership in Kenya's agricultural input manufacturing sector plays a critical role in improving environmental performance. Leaders who communicate environmental goals clearly, promote collaboration, and motivate staff toward sustainable practices contribute significantly to the adoption of green operations such as recycling, emission reduction, and energy conservation. The high explanatory power of the regression model ($R^2 = 0.314$) demonstrates that leadership orientation toward sustainability is a key determinant of environmental success. Therefore, the significant linear relationship between green leadership and environmental performance provides a solid empirical basis for advancing regression and further hypothesis testing in this context.

Table 5 Regression analysis

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	1.028	0.549		1.873	0.065
Control Variables					
Firm age	0.015	0.089	0.018	0.173	0.863
Firm tenure	-0.002	0.078	-0.002	-0.02	0.984
Predictor					
Green leadership	0.705	0.131	0.566	5.373	0.000
Model Summary statistics					
R	0.561				
R Square	0.314				
Adjusted R Square	0.285				
Std. Error of the Estimate	0.818				
ANOVA (goodness of fit statistics)					
F Stat	10.691				
F prob	0.000				

a Dependent Variable: Environment Performance

6. Conclusion

This study confirms that green leadership significantly enhances environmental performance within Kenya's agricultural input manufacturing sector. Leaders who embed sustainability principles into their strategic vision, encourage eco-friendly practices, and foster employee commitment to environmental goals contribute meaningfully to improved environmental outcomes. These include reduced emissions, efficient resource use, and adoption of green technologies all essential for mitigating the effects of climate change and promoting long-term ecological resilience. The findings reinforce the idea that environmental performance is not only shaped by policies or technologies, but by the leadership's ability to inspire and implement green change throughout the organization. Importantly, these results support global evidence showing that green leadership drives positive environmental change across sectors and contexts. In the agricultural sector where environmental degradation directly threatens food systems green leadership becomes even more vital. In promoting a sustainability-oriented culture, such leadership helps firms reduce their ecological footprint while improving productivity and resilience. Therefore, strengthening green leadership is a strategic pathway toward achieving climate action and ensuring food security in Kenya and beyond. The strong

relationship observed in this study provides a robust foundation for further research and policy recommendations focused on environmental governance in agriculture.

7. Recommendation

Practical Implications

The study provides strong evidence that green leadership is a key driver of environmental performance in agricultural input manufacturing firms. Practically, this means firms should prioritize the development of leadership competencies that emphasize environmental values, strategic sustainability thinking, and the ability to mobilize teams toward eco-friendly operations. Leaders who champion recycling, emission reduction, and sustainable resource use can significantly enhance operational sustainability. Organizations may also benefit from integrating environmental objectives into performance appraisals, leadership training, and strategic planning processes to align daily operations with long-term ecological goals.

Theoretical Implications

The study contributes to the body of knowledge by reinforcing and contextualizing the Natural Resource-Based View theory within the agricultural sector in a developing country setting. It supports the theoretical proposition that internal capabilities such as sustainability-driven leadership can serve as strategic assets that improve environmental outcomes. Furthermore, it provides empirical support for linking leadership behaviors to firm-level ecological performance, expanding the applicability of green leadership constructs beyond developed contexts and traditional sectors like manufacturing and energy, into agriculture and food systems. This widens the theoretical lens on sustainability leadership and environmental governance.

Policy Implications

At the policy level, the study underscores the need for national and county governments, particularly in Kenya, to support leadership development programs that integrate sustainability competencies. This includes revising agricultural, environmental, and industrial policies to incorporate leadership capacity-building as a lever for climate resilience and food security. Policymakers should also consider offering incentives to firms that demonstrate strong environmental leadership, such as tax benefits or certification programs, while establishing environmental performance benchmarks that reflect leadership engagement. In doing so, government and regulatory bodies can accelerate the sector's transition toward climate-smart agriculture and sustainable production systems.

8. Future Studies

This study was limited in scope and methodology, which presents opportunities for future research. The investigation focused solely on green leadership as a single overarching construct, without breaking it down into specific leadership dimensions. While this provided a general understanding of how leadership influences environmental performance, it overlooked the possibility that different leadership styles—such as transformational green leadership, servant green leadership, or ethical green leadership—may have varying degrees of influence on organizational sustainability outcomes. Future studies should therefore decompose green leadership into these distinct dimensions to identify which aspects have the strongest impact on environmental performance. Additionally, the research was limited to agricultural input

manufacturing firms in Nairobi County, which restricts the generalizability of the results to other regions or sectors. Expanding the study to include multiple industries and counties would allow for comparative analysis and enhance the robustness of findings across Kenya's diverse economic landscape.

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