

## GREEN WAREHOUSING AND MARKETING SUSTAINABILITY OF FERTILIZER PRODUCTION FIRMS IN NIGERIA

DOTUN Babatunde Onifade    WALI Andy Fred    NWULU Chinyere Stella  
 ALEX-AKEKUE Nennaaton

Department of Marketing, Faculty of Administration and Management,  
 Rivers State University Nkpolu-Oroworukwo, Port Harcourt

Corresponding email: dotun.onifade@rsu.edu.ng

### **Abstract**

This study investigated the correlation between green warehousing and marketing sustainability of fertilizer production firms in Nigeria. The study was conceptualized with green warehousing as predictor to marketing sustainability measures of product stewardship, resource usage and competitive advantage. The study adopted a cross-sectional research design. The study population comprised 21 fertilizer production firms in Nigeria. The entire universe was surveyed. 6 copies of structured questionnaire designed in the 5-point Likert scale, were administered to production, procurement, inventory, quality assurance, marketing managers and community relations managers of each of the 21 firms. Thus 126 respondents provided data for the study. The reliability of the instrument was determined using Cronbach's Alpha test. All the variables scored above 0.70. Pearson Product Moment Correlation was used to test the nexus between green warehousing and measures of marketing sustainability. The Statistical Packages for Social Sciences Version 25.0 facilitated the test. The results of the tests revealed that green warehousing has a significant correlation with marketing sustainability. Thus, the study concluded that green warehousing predicts marketing sustainability of fertilizer production firms in Nigeria; and recommends that managers of fertilizer production firms in Nigeria should adopt green warehousing, if they seek to enhance their marketing sustainability.

**Keywords:** Competitive advantage, fertilizer production firms green warehousing, marketing sustainability, product stewardship, resource usage

### **Introduction**

The world is experiencing rapid depletion of resources resulting from man's excessive use of the natural environment. As noted by Walker and Brammer (2023), mankind's recalcitrant attitude towards the environment is beginning to hurt humanity and the physical environment in very many unpleasant ways. The quest to ameliorate the unfavorable effects of these changes has necessitated new legal regulations and practices globally (Beamon, 2022). There are serious calls by governments and non-governmental actors all over the world for immediate remedial action to stem the extravagant use of natural resources to aid resource conservation and mitigate the negative impacts of environmental changes (Govindan et al., 2016).

Businesses and governments have become more focused on environmental sustainability than ever before (Azizz, 2023). Additionally, scholars have joined governments and the private sector in the quest to introduce environmentally friendly practices aimed at conserving natural resources and promoting environment sustainability, hence the green concept and initiatives.

Within the business environment, the role of green supply chain management (GSCM) practices emerged as a means of managing environmental concerns arising from industrial activities. Organizations are influenced by the mandate of going green as stakeholders demand transparency on the conditions under which products are produced, stored and distributed (Alabi & Ogunleye, 2024).

There is a general belief that achieving eco-friendly supply chain is a function of several factors ranging from production, warehousing to final consumption (Arasa & Odoyo, 2020). There is also a demand by consumers that businesses take responsibility for what they are contributing

to the declining state of the environment (Aslam et al., 2019). GSCM practice such as green warehousing implies adoption of eco-friendly practices that focus on protection efforts, finding alternative fuel sources, using natural resources wisely and making cost-effective (Azizz, 2023; Beamon, 2022).

The impact of GSCM practices within the Nigerian oil and gas value chains, and agricultural space cannot be over emphasized (Ogunleye & Osundina, 2023). This is because Nigeria relies heavily on agriculture for its economic stability and food security (Peattie & Crane, 2020). Fertilizer production is a critical sector in agricultural development, thus the need for sustainable practices in the fertilizer industry.

Fertilizer production is resource-intensive, often involving the use of non-renewable resources like natural gas, the generation of greenhouse gases like carbon dioxide, nitrous oxide and other pollutants like ammonia gas which cause climate change, ecosystem damage and health risks. By adopting sustainability practices such as green warehousing, companies can reduce negative environmental impacts associated with their operations and improve their marketing sustainability (Peattie & Crane, 2020).

The goal of achieving marketing sustainability may be possible if organizations adopt green warehousing in their operations (Ogunleye & Osundina, 2023). However, there is no sufficient empirical studies that have systematized how green warehousing improve marketing sustainability. This study there joined the discourse by assessing the nexus between green warehousing practices and marketing sustainability of fertilizer production firms in Nigeria.

### **Foundational Theory**

The sociological baseline theory of this study is triple bottom-line (TBL) theory (Elkington, 1998, as cited in Jørgensen & Knudsen, 2018) which states that firms while considering financial profitability, should also recognize the social and environmental consequences of their actions. TBL theory recognizes the need to strike a balance between profit (economic), people (social) and planet (environment). By incorporating these three dimensions, organizations can make informed decisions that promote sustainability and create long-term value (Kirchherr et al., 2018).

TBL theory encourage businesses to adopt a holistic approach to value creation by considering the interests of all stakeholders, including shareholders, employees, customers, communities, and the environment (Jørgensen & Knudsen, 2018). The application of TBL theory in this study was informed by the view that by integrating economic, social and environmental considerations, fertilizer production firms in Nigeria can enhance their marketing sustainability. This is because green warehousing practices reduce environmental impact, and deliver cost savings, improved employee well-being, and stronger market position. These benefits align with principles of TBL theory and support the development of sustainable marketing strategies that contribute to long-term business success and stakeholder value.

### **Concept of Green Warehousing**

Green warehousing refers to environmentally friendly practices within warehousing operations that reduce carbon footprint and overall environmental impact (Zhen & Li, 2022). It encompasses adoption of energy-efficient technologies, waste management practices, and sustainable building designs (Beamon, 2022). Green warehousing emphasizes energy efficiency and uses energy-efficient lighting, optimized heating and cooling systems, and incorporates renewable energy sources (Chen et al., 2023).

A green warehouse should be designed based on environmental technology (Kumar et al., 2021). For instance, roofs with solar panels, doors with sensors which can automatically close, building materials with better insulation and many other sides (Bartolini et al., 2019). Equipment for green warehousing should consume less energy, and cause less pollution and require reasonable space layout (FFüchtenhans et al., 2021). Thus, green warehousing improves environmental condition and is vital to reversing negative impact of human action on the ecosystem.

### **Marketing Sustainability**

Marketing sustainability refers to the broader integration of sustainable practices into all aspects of marketing processes, including the strategies, operations, and impacts of marketing activities themselves. It focuses on ensuring that the marketing function contributes positively to overall sustainability goals (Peattie & Crane, 2020).

Marketing sustainability addresses the sustainability of marketing processes and operations, including reducing waste, minimizing resource use, and employing ethical practices throughout the marketing function. It involves embedding sustainability principles into the core of marketing strategies, ensuring that all marketing decisions align with broader sustainability objectives (Smith & Shaw, 2021). Key indicators of marketing sustainability includes product stewardship, resource usage and competitive advantage.

Product stewardship refers to the responsibility of all stakeholders involved in the life cycle of a product (manufacturers, distributors, consumers, and waste managers) to minimize its environmental impact. This comprehensive approach aims to ensure that products are designed, produced, used, and disposed of in ways that are environmentally friendly and sustainable.

Resource usage refers to the consumption of various resources such as paper, plastics, energy, and water during the execution of marketing campaigns and activities. This includes everything from the production of marketing materials (e.g., brochures, banners) to the energy used in digital marketing operations (e.g., data centers, advertising platforms) (Lynch, 2023). Resource usage in marketing sustainability encompasses the consumption and management of materials, energy, and other resources involved in marketing activities.

Competitive advantage is defined as the edge a company has over its competitors due to its ability to deliver superior value to customers, either through lower costs, differentiated products or services, or both. It allows a company to achieve higher sales, profit margins, and market share compared to its rivals (Porter, 2024).

### **Green Warehousing and Marketing Sustainability**

Studies on the impact of green practices on business outcomes are not in short supply. Indeed, several scholarly investigations have been conducted on the relevance of green practice to business, marketing and supply chain performance. For instance, Khan et al. (2024) assessed the association between GSCM practices and sustainable organizational performance of construction firms in Pakistan. The results revealed that eco-design is positively associated with economic, social, and environmental performance.

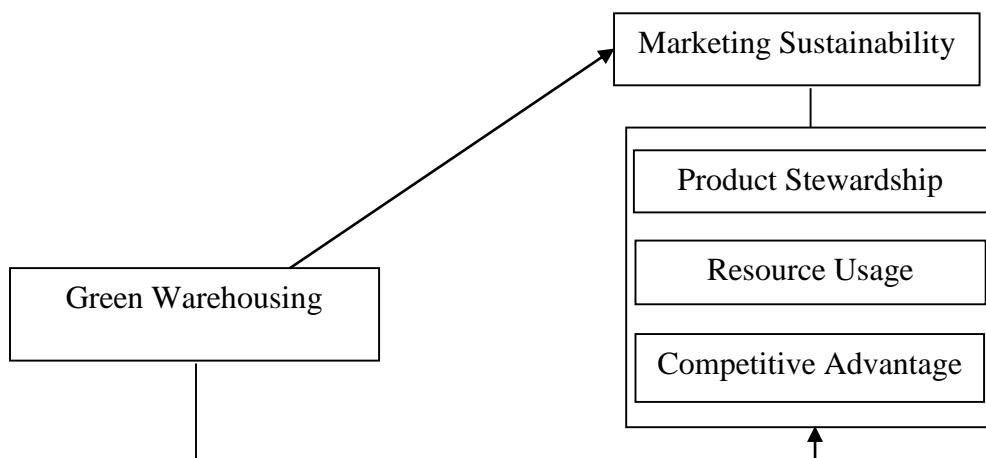
Similarly, Hongquan and Abdullah (2024) examined the effect of GSCM on sustainable performance of dairy companies in China. The study revealed the complex relationship that exists between GSCM practices such as green transportation, green inventory management, green warehousing and sustainability performance of dairy companies in China. Relatedly, Mamdouh and Farouk (2024) undertook a comparative study of the impact of GSCM practices on return on

equity of firms in the United States and firms in China. The findings suggested that there is a significant positive relationship between Eco Design and ROE in both countries.

Also, Tsikad et al. (2024) examined the effect of GSCM practices on operational performance and sustainable competitive advantage of FMCG firms in Oman. The study found that GSCM practices have considerable indirect impact on sustainable competitive advantage. Likewise, Azizz (2023) investigated the impact GSCM practices on organizational performance. The results showed that green design, green production, green procurement, and green logistics, significantly affect an organizational performance. In addition, Gunasekar et al. (2023) studied the impact of GSCM practices on triple bottom line performance. Findings indicate a significant positive relationship between GSCM practices and triple bottom line (economic, social and environmental) performance.

Considering the review of literature so far, we hypothesize as follows:

- H<sub>01</sub>:** There is no significant relationship between green warehousing and product stewardship of fertilizer production firms in Nigeria
- H<sub>02</sub>:** There is no significant relationship between green warehousing and resource usage of fertilizer production firms in Nigeria
- H<sub>03</sub>:** There is no significant relationship between green warehousing and competitive advantage of fertilizer production firms in Nigeria



**Fig. 1:** Conceptual framework of relationship between green warehouse and marketing sustainability of fertilizer production firms in Nigeria

### Methodology

This study adopted a cross-sectional research design with a correlational type of investigation. The study population comprised 21 fertilizer production firms operating within the geographical boundaries of Nigeria as enlisted by Fertilizer Suppliers Association of Nigeria. The researchers took a census. 6 copies of structured questionnaires were administered to the production, procurement, inventory, quality assurance, marketing and community relations managers of each of the 21 fertilizer production firms. This means that 126 management staff of fertilizer production firms provided data for the study. The reliability of the instrument was ascertained via Cronbach's Alpha test with all the items scoring above 0.70. Pearson Product Moment Correlation was used to test the hypotheses at 95% confidence level, with the aid of the Statistical Packages for Social Science, version 25.0.

**Table 1: Reliability Coefficients of Variable Measures**

S/N	Dimension/Measure	No. of Item	Cronbach Alpha
1	Green Warehousing Practices	5	0.720
2	Product Stewardship	5	0.793
3	Resource Usage	5	0.701
4	Competitive Advantage	5	0.726

Source: Survey Data (2025).

Table 1 reveals the results of Cronbach's alpha analysis. The result is that all the variables in the study produced high Cronbach's Alpha coefficients. This indicates that there is inter-item consistency among the variables in the study. This means that, if this study is conducted again under similar conditions, the results will be similar to the results of this study.

### Data Analysis and Findings

**Table 2: Descriptive Statistics of Green Warehousing**

	N	Sum	Mean	Std. Dev.	Variance
We apply environmentally sustainable practices in the storage and management of raw materials, intermediate products and bagged fertilizers within warehouse facilities.	121	474	3.92	1.207	1.456
We installed solar panels, wind energy, or other renewable energy sources to power our operations, including lighting fixtures, climate control and machinery.	121	498	4.12	.541	.293
We fitted energy-efficient building materials, light transparent roofing materials, LED lighting fixtures, and smart systems, to reduce energy consumption across the production facility.	121	502	4.15	.638	.407
Our warehouses are constructed to meet sustainability standards such as Leadership in Energy and Environmental Design (LEED) and other green certifications that focus on energy conservation, material use and water efficiency.	121	504	4.17	.514	.264
Valid N (listwise)	121				

Source: SPSS output of data analyses (2025)

Table 2 depicts high mean scores of 3.00 and above, for items in the study questionnaire. This means that greater number of the respondents agreed and strongly agreed to items on green warehousing. However, it can be seen that item 4 which sought to determine the extent to which fertilizer production firms in Nigeria build warehouses to meet sustainability standards such as Leadership in Energy and Environmental Design (LEED) and other green certifications that focus on energy conservation, material use and water efficiency, has the highest mean score of 4.17. This shows that item 4 is the strongest manifestation of green warehousing among the firms surveyed.

**Table 3: Descriptive Statistics of Product Stewardship**

	N	Sum	Mean	Std. Dev.	Variance
We produce fertilizers with lower environmental impact, such as slow-release or controlled-release, that reduce nutrient runoff and minimize water and air pollution.	121	405	3.35	.832	.692
We consider reduction of energy consumption, water usage and raw material waste during the production of fertilizers to reduce the overall environmental footprint.	121	478	3.95	.968	.936
We provide farmers and end users with clear guidelines on how to apply fertilizers in an environmentally responsible manner (such as using the correct amounts, timing, and methods) to prevent overuse, nutrient runoff and soil contamination.	121	494	4.08	1.168	1.363
We provide systems and guidelines for proper disposal, recycling and reuse of fertilizer packaging, empty containers, or unused products, to prevent contamination of soil and water sources.	121	501	4.14	.926	.858
Valid N (listwise)	121				

Source: SPSS output of data analyses (2025)

Table 3 depicts high mean scores of over 3.00. This means that more of the respondents agreed and strongly agreed to on product stewardship. However, it can be seen that item 4 which sought to determine the extent to which fertilizer production firms in Nigeria provide systems or guidelines for proper disposal, recycling, or reuse of fertilizer packaging, empty containers, or unused products, to prevent contamination of soil or water sources, has the highest mean score of 4.14. This shows that item 4 is the commonest manifestation of product stewardship among the firms surveyed.

**Table 4: Descriptive Statistics of Resource Usage**

	N	Sum	Mean	Std. Dev.	Variance
We make use of environmentally friendly resources, such as land use for mining raw materials, as well as the release of emissions (e.g., carbon dioxide, nitrous oxide) during the production process.	121	473	3.91	.799	.638
We make use of significant amounts of natural energy in the form of electricity, natural gas, and other fuels, to process the raw materials and carry out chemical reactions.	121	391	3.26	1.293	1.671
We engage required manpower to operate the facilities, maintain equipment, and manage logistics operations.	121	491	4.06	1.149	1.319
We make use of adequate equipment, machines and required infrastructure to produce fertilizers, such as reactors, conveyors, and storage facilities, aimed at contributing to long-term resource use.	121	508	4.20	.964	.930
Valid N (listwise)	121				

Source: SPSS output of data analyses (2025)

Table 4 depicts high mean scores of 3.00 and above. This means most respondents agreed and strongly agreed to items on resource usage. However, it can be seen that item 4 which sought to determine the extent to which fertilizer production firms in Nigeria use adequate equipment, machines and required infrastructure to produce fertilizers, such as reactors, conveyors, and storage facilities, aimed at contributing to long-term resource, has the highest mean score of 4.20. This means that item 4 most nearly describe resource usage behaviour of the firms surveyed.

**Table 5: Descriptive Statistics of Competitive Advantage**

	N	Sum	Mean	Std. Dev.	Variance
Our company can produce fertilizer brands at a cost lower than those of our competitors through economies of scale, access to cheaper raw materials and more efficient production processes.	121	482	3.98	1.209	1.461
Our company offers fertilizer brands with unique features, such as specialized nutrient blends, granulated products and environmentally friendly options that meet the specific needs of different farming regions and agricultural markets.	121	482	3.98	.850	.723
Our company makes use of advanced production technologies, such as more efficient manufacturing processes, automated systems, and innovations in nutrient delivery, to improve product quality and reduce operating costs.	121	509	4.21	.1218	.447
Our company offers a very efficient and reliable supply chain system, including access to key raw materials like nitrogen, phosphorus, potassium and effective distribution network to ensure timely delivery of products to customers.	121	506	4.18	.943	.890
Valid N (listwise)	121				

Source: SPSS output of data analyses (2025)

Table 5 depicts high mean scores of the questionnaire items ranging over 3.00; this means that a greater number of the respondents agreed and strongly agreed to the research question with respect to competitive advantage. However, it can be seen that question 3 which sought to determine the extent to which fertilizer production firms in Nigeria utilize advanced production technologies, such as more efficient manufacturing processes, automated systems, or innovations in nutrient delivery, to improve product quality or reduce costs, has the highest mean score of 4.21. This shows that question 3 has the strongest influence on the variables.

**Table 6: Correlation between Green Warehousing and Product Stewardship**

		Green Warehousing	Product Stewardship
Green Warehousing	Pearson Correlation	1	.611**
	Sig. (2-tailed)		.000
	N	121	121
Product Stewardship	Pearson Correlation	.611**	1
	Sig. (2-tailed)	.000	
	N	121	121

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

Source: SPSS output of data analyses (2025)

Table 6 reveals a correlation coefficient of 0.611\*\* between green warehousing and product stewardship. This suggests a strong positive relationship between green warehousing and product stewardship. More so, the probability value (0.000) is less than the critical value (0.05), which shows that the relationship between green warehousing and product stewardship is statistically significant. Thus, the null hypothesis that there is no significant relationship between green warehousing and product stewardship of fertilizer production firms in Nigeria was rejected.

**Table 7: Correlation between Green Warehousing and Resource Usage**

		Green Warehousing	Resource Usage
Green Warehousing	Pearson Correlation	1	.459**
	Sig. (2-tailed)		.000
	N	121	121
Resource Usage	Pearson Correlation	.459**	1
	Sig. (2-tailed)	.000	
	N	121	121

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

Source: SPSS output of data analyses (2025)

Table 7 reveals a correlation coefficient of 0.459\*\* between green warehousing and resource usage. This indicates a moderate positive relationship between green warehousing and resource usage. More so, the probability value (0.000) is less than the critical value (0.05), meaning that a statistically significant relationship exists between the variables. Therefore, the null hypothesis that there is no significant relationship between green warehousing and resource usage of fertilizer production firms in Nigeria was rejected.

**Table 8: Correlation between Green Warehousing and Competitive Advantage**

		Green Warehousing	Competitive Advantage
Green Warehousing	Pearson Correlation	1	.311*
	Sig. (2-tailed)		.011
	N	121	121
Competitive Advantage	Pearson Correlation	.311*	1
	Sig. (2-tailed)	.011	
	N	121	121

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

Source: SPSS output of data analyses (2025)

The SPSS output on Table 8 reveals a correlation coefficient of 0.311\*\* between green warehousing and competitive advantage, indicating a weak positive relationship between green warehousing and competitive advantage. Also, the probability value (0.000) is less than the critical value (0.05). This means that the relationship between green warehousing and competitive advantage of fertilizer production firms in Nigeria is statistically significant. Thus, the null hypothesis that there is no significant relationship between green warehousing and competitive advantage of fertilizer production firms in Nigeria was rejected.

### Discussion of Findings

This study focused on the nexus between green warehousing and marketing sustainability of fertilizer production firms in Nigeria. The results of statistical tests showed that green warehousing has positive and statistically significant relationship with measures of marketing sustainability. Particularly, the results indicates that green warehousing has a strong positive relationship with product stewardship; a moderate positive relationship with resource usage; and a weak positive relationship with competitive advantage. These findings reinforce the report of Mamdouh and Farouk (2024) that there is a significant positive relationship between eco-design and ROE of firms in the U.S and those in China. Similarly, our findings agree with those of Khan et al. (2024) that GSCM practices positively associate with economic, social, and environmental performance.

More so, our findings align with the revelation of Hongquan and Abdullah (2024) that a complex relationship exist between GSCM practices (green transportation, green inventory management, green warehousing) and effective performance of dairy companies. In line with the findings of the present study, Tsikad et al. (2024) indicated that GSCM practices have positive relationship with operational performance and long-lasting competitive advantage.

In addition, our findings validate the position of TBL theory that firms while considering financial profitability, should also recognize the social and environmental consequences of their actions. The findings reemphasize the need for firms to strike a balance between profit, people, and planet.

### Conclusion and Recommendations

This study examined the relationship between green warehousing and marketing sustainability of fertilizer production firms in Nigeria. The findings indicate that green warehousing play a significant role in increasing marketing sustainability. From the empirical results it was revealed that, green warehousing significantly relate to marketing sustainability. Thus, we conclude that green warehousing is a key antecedent to marketing sustainability (product stewardship, resource usage and competitive advantage) of fertilizer production firms in Nigeria. The study therefore recommends that fertilizer production firms in Nigeria that seek enhanced marketing sustainability should adopt green warehousing to boost product stewardship, resource utilization and competitive advantage.

### References

Alabi, A., & Ogunleye, T. (2024). *Supply chain challenges in green procurement*. *International Journal of Supply Chain Management*, 33(1), 78-91.

Arasa, R., & Odoyo, A.J. (2020). Strategic inventory management practices and the performance of supermarkets in Nairobi County, Kenya. *European Journal of Business and Management Research*, 5(2).

Azizz, M. A. (2023). The impact of green supply chain management practices on organizational Performance. *Adrri Journals*, 1(1).

Bartolini, M., Bottani, E., & Grosse, E. H. (2019). Green warehousing: Systematic literature review and bibliometric analysis. *Journal of Cleaner Production*, 226, 242–258.

Beamon, B. M. (2022). Sustainable logistics and green supply chain management. *Journal of Cleaner Production*, 335, 130514.

Chen, Y., Li, X., & Zhang, Z. (2023). Energy-efficient practices in warehouse management: A review. *Energy Reports*, 9, 145-160.

FFüchtenhans, M., Glock, C. H., Grosse, E. H., & Zanoni, S. (2021). Using smart lighting systems to reduce energy costs in warehouses: A simulation study. *International Journal of Logistics Research and Applications*, 5, 1-19.

Hongquan, Z., & Abdullah, A.R. (2024). Effect of green supply chain management on the sustainable performance of dairy companies in China. *International Journal of Academic research in Business & Social Sciences*, 14(8).

Kirchherr, J., Reike, D., & Hekkert, M. (2018). *Conceptualizing the circular economy: An analysis of 114 definitions*. *Resources, Conservation & Recycling*, 127, 221-232.

Lynch, A. (2023). *Resource usage and marketing: An overview*. *Business & Environment*, 20(2), 87-99.

Mamdouh, O., & Farouk, N. (2024). The impact of green supply chain management practices on return on equity: a comparative study between the United States and China. *International Journal of Accounting and Management Sciences*, 3(3).

Narasimhan, R., & Carter, J. R. (1998). Environmental supply chain management: Strategies, practices, and performance. *Journal of Operations Management*, 16(5), 563–580.

Ogunleye, T., & Osundina, O. (2023). Environmental impact of fertilizer production. *Environmental Science & Technology*, 57(2), 145-159.

Peattie, K. & Crane, A. (2020). *Green marketing: Theory and practice*. Routledge.

Porter, M. (2024). *Competitive advantage: Creating and sustaining superior performance*. Free Press.

Smith, N. C. & Shaw, S. (2021). *Ethical marketing and social responsibility*. Springer.

Tsikada, C., Imran, S., Masengu, R., & Mugoni, E. (2024). Effect of green supply chain management practices and operational performance on sustainable competitive advantage. *Brazilian Journal of Development*, 10(6), e70276. <https://doi.org/10.34117/bjdv10n6-019>

Zhen, L., & Li, H. (2022). A literature review of smart warehouse operations management. *Frontiers of Engineering Management*, 9(1), 31–55. <https://doi.org/10.1007/s42524- 021- 0178-9>.