

# Green Supply Chain Management Practices and Performance of Edible Oil Manufacturing Companies in Kenya: A case Study Mvita Oil Company Limited, Mombasa County

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## Abstract

Global organizations are increasingly recognizing the importance of environmental sustainability, leading to the incorporation of green supply chain management (GSCM) into their operations. This research study sought to assess the effects of Green Supply Chain Management practices on the performance of edible oil producers in Kenya; A case study of Mvita Oil Company Limited. The specific objectives were: to examine the influence of lean supply chain practice on performance of Edible oil manufacturing companies in Kenya; to assess the effect of renewable energy adoption practice on performance of Edible oil manufacturing companies in Kenya; to assess the effect customer management practice on performance of Edible oil manufacturing companies in Kenya and finally to find out the effect of reverse logistics practice performance of Edible oil manufacturing companies in Kenya. The study employed a descriptive survey approach. This study's theoretical underpinnings included the notions of agile supply chains, lean supply chains, supply chain integration, and supply chain management. There were four hundred employees in our target group, representing middle, senior, and junior management in areas such as ICT, procurement, safety, marketing, and the environment. A sample of 126 respondents was obtained from this population using a stratified sampling technique. Data was gathered using a structured questionnaire, with responses rated on a five-point Likert scale: 1 representing a low opinion and 5 indicating a high opinion. The data were processed using the SPSS analytical tool (version 24). Descriptive statistics, Pearson's correlation, ANOVA, and multiple regressions were conducted to decipher relationships between variables. From regression analysis, The results of the linear regression showed that  $R_2=0.462$  and  $R=0.632$ , an indication that there is a strong linear relationship between Green Supply Chain Management (GSCM) practices and Performance of Edible Oil Manufacturing Companies in Kenya. The independent variables explained 46.2% of the variability of our dependent variable. The results from ANOVA test revealed that the Green Supply Chain Management (GSCM) practices statistically significantly predicts the Performance of Edible Oil Manufacturing Companies in Kenya,  $F(4, 126) = 45.895$ ,  $p < .05$ ,  $R^2 = .462$ . Correlation analysis predicted the relationship between Green Supply Chain Management (GSCM) practices and Performance of edible Oil Manufacturing Companies in Kenya. The analysis revealed that there is a significant and a moderate positive correlation between Lean Supply Chain Practice (LSC) practice  $X_1$  and Performance of edible Oil Manufacturing Companies in Kenya ( $r = 0.628$ ,  $p < 0.01$ ); Renewable Energy Adoption Practice (REA) practice  $X_2$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.502$ ,  $p < 0.01$ ); Customer Management Practice (CM) practice  $X_3$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.414$ ,  $p < 0.01$ ); and lastly the correlation between Reverse logistics practice (RL) practice  $X_4$  and the Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.485$ ,  $p < 0.01$ ).

***Key Words: Green Supply chain management Practices, Lean Supply Chain Practice, Renewable Energy Adoption Practice, Performance of Edible Oil Manufacturing Companies in Kenya***

## **1.0 Introduction**

Supply chain management (SCM) holds tremendous global importance due to its impact on organizational performance and the broader economy. Supply chain management (SCM) is the comprehensive management and coordination of all activities involved in the production, procurement, transformation, and distribution of goods and services (Bor, 2021). The main objective of SCM is to ensure the smooth flow of materials, information, and funds across the entire supply chain network, from the point of origin to the point of consumption. Organizations and companies utilize supply chain management for various functions, including planning, forecasting, procurement, production, logistics, warehousing, inventory management, distribution, information systems, and technology (Bor, 2021). Consequently, by implementing effective SCM practices, organizations optimize operations, minimize costs, improve customer satisfaction, and gain a competitive advantage in the market.

Supply chain management involves collaboration and coordination among various stakeholders, enabling organizations to respond efficiently to changing market conditions and enhance overall performance. As Bor (2021) notes, supply chain management is a critical aspect of business operations that involves coordinating and managing activities related to producing and delivering goods or services. It encompasses the entire process, from acquiring raw materials to distributing the final product. Effective supply chain management ensures smooth operations, reduces costs, and enhances customer satisfaction.

Green supply chain management (GSCM) is an approach that integrates environmental considerations and sustainability principles into supply chain operations (Chin et al., 2015). It encompasses various practices, including sustainable procurement, green design and packaging, energy efficiency and conservation, waste management, and recycling, supply chain collaboration, and regulatory compliance and social responsibility (Chin et al., 2015).

According to Bor (2021), GSCM aims to minimize environmental impact, conserve resources, reduce waste generation, and promote social responsibility throughout the supply chain network. Therefore, by adopting GSCM practices, organizations can achieve multiple benefits, such as reducing greenhouse gas emissions, conserving energy, optimizing resource usage, enhancing brand reputation, meeting regulatory requirements, and addressing the growing demand for environmentally friendly products (Bor, 2021). Moreover, GSCM plays a crucial role in driving sustainable development, fostering collaboration among supply chain partners, and meeting the expectations of environmentally conscious consumers.

The impact of supply chain practices on companies is multifaceted. Companies that effectively manage their supply chains experience several benefits. Firstly, supply chain practices improve operational efficiency, reducing costs and increasing profitability. Chin et al. (2015) contend that streamlining processes, optimizing inventory management, and enhancing logistics and transportation systems contribute to greater efficiency. Secondly, supply chain management practices improve customer satisfaction through timely delivery, higher product quality, and responsiveness to customer demands. Lastly, supply chain practices significantly impact environmental sustainability, such as reducing carbon emissions, minimizing waste generation, and promoting the use of renewable energy sources.

The global edible oil industry has a growing recognition of the importance of sustainability and environmental responsibility. Many edible oil companies are adopting green supply chain practices to reduce their environmental footprint. These practices include implementing energy-efficient technologies, using renewable energy sources, reducing emissions, and practicing responsible waste management (Diab et al., 2015). While the extent of implementation varies, the trend towards greener supply chains in the oil sector is increasing.

The edible oil industry in Kenya holds great significance for the country's economy and food security. While Kenya heavily relies on imported edible oil to meet domestic demand, efforts are being made to bolster local production and reduce import dependency (Bor, 2021). Palm oil, sunflower oil, soybean oil, and cottonseed oil are among the edible oils produced in Kenya, albeit with limited capacity. Conversely, the country relies on imports from Malaysia, Indonesia, India, and other nations to bridge the production-consumption gap.

Local processing companies play a role in refining and packaging edible oils sourced both domestically and internationally. As Machogu (2013) notes, the Kenyan government acknowledges the importance of promoting local production and has implemented supportive measures such as subsidies, training, and financing opportunities. Challenges faced by the industry include inadequate domestic production, price fluctuations of imported oils, competition from foreign brands, limited access to high-quality seeds, and inadequate infrastructure. However, the sector exhibits significant growth potential through government initiatives, increased investments in research and development, improved farming practices, and sustainable production methods (Diab et al., 2015).

The industry generates employment for farmers, processors, distributors, and retailers. Therefore, strengthening the edible oil industry in Kenya will boost the economy, promote rural development, and enhance food security. However, there are challenges that oil companies in Kenya face regarding green supply chain management. Machogu *et al.* (2013) asserts that these companies face the challenges that include limited awareness and understanding of sustainable practices, inadequate infrastructure, and high operational costs. Additionally, the companies lack information on green supply chain management due to a lack of studies on the topic, specifically focusing on the performance outcomes of green supply chain practices. Therefore, this study aims to address these gaps and explore the effects of green supply chain management practices on performance

**Specific Objectives of the Study**

- i. To explore the influence of lean supply chain practice on performance of Edible oil manufacturing companies in Kenya
- ii. To assess the effect of renewable energy adoption practice on performance of Edible oil manufacturing companies in Kenya
- iii. To assess the effect customer management practice on performance of Edible oil manufacturing companies in Kenya
- iv. To find out the effect of reverse logistics practice performance of Edible oil manufacturing companies in Kenya

**2.0 Literature Review**

The study embraced the Lean Supply Chain theory, Supply Chain Integration Theory and Supply Chain Management Theory

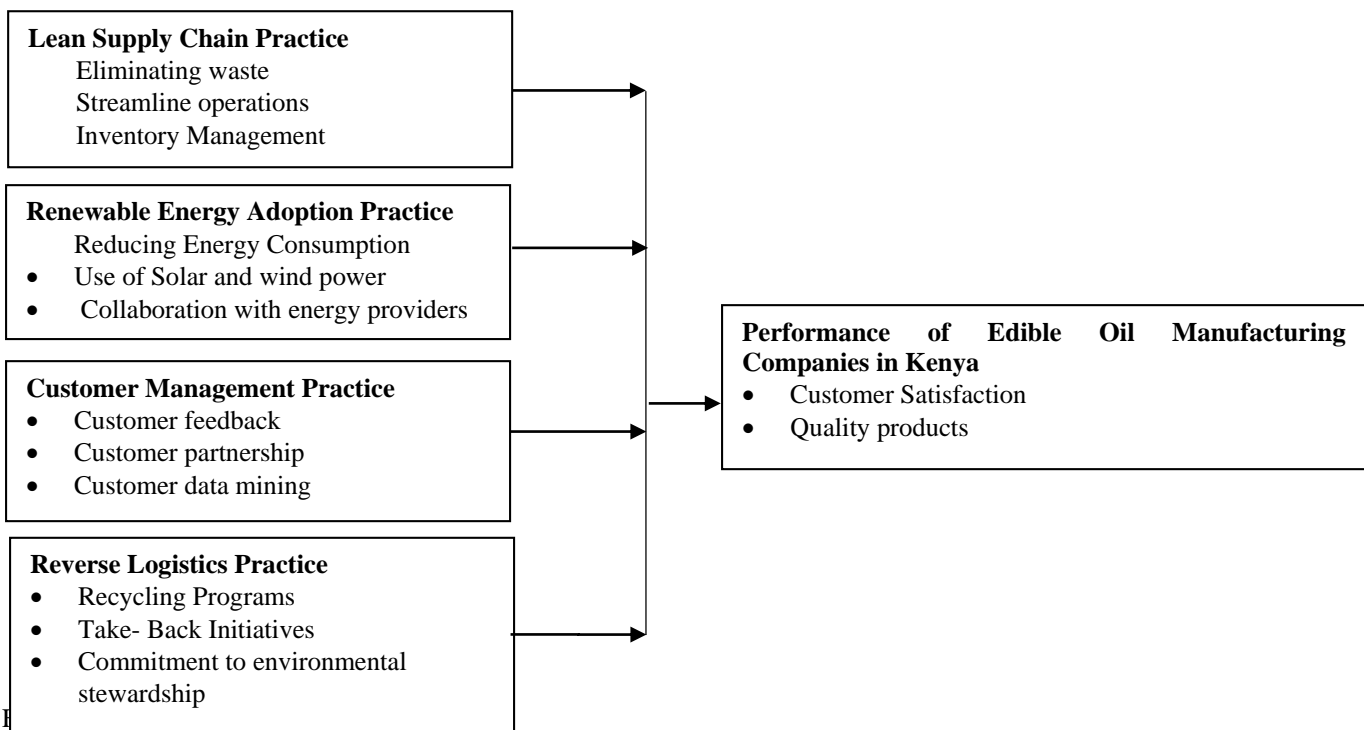
**Conceptual Frame work**

In the study exploring the impact of Green Supply Chain Management Practices on the performance of Edible Oil Manufacturing Companies in Kenya, a conceptual framework plays a crucial role. It offers a systematic arrangement for organizing and examining the variables and their connections within the research. Furthermore, it serves as a roadmap, guiding the entire research process and laying the groundwork for the study's theoretical foundation.

Specifically focusing on the aforementioned context, the conceptual framework for this study was to incorporate several key variables. These variables encompass Lean Supply Chain Practices, Renewable Energy Practices, Customer Relationship Management, and Reverse Logistics Practices.

**Independent Variables**

**Dependent Variable**



Source: Researcher (2023)

**Effect of Lean Supply Chain Practice on Performance of edible Oil Manufacturing Companies in Kenya**

Bor (2021) observes that Lean practices have gained significant popularity in supply chain management (SCM) due to their ability to drive efficiency and eliminate waste. When these practices are implemented in a green context, they improve operational performance and contribute to environmental sustainability. According to Bor (2021), lean supply chain practices eliminate waste throughout the supply chain. Bor (2021) supports this assertion by noting that waste manifests in various forms, such as excessive inventory, overproduction, transportation inefficiencies, and defects. Therefore, organizations can streamline operations, reduce costs, and improve overall efficiency by identifying and addressing these wasteful activities.

A study by Chin et al. (2015) investigated the benefits of lean practices on green supply chain practices. Chin et al. (2015) found that lean practices have additional benefits in terms of environmental sustainability in a green supply chain context. According to Chin et al. (2015), organizations can reduce energy consumption and lower their carbon footprint by eliminating waste. For example, optimizing transportation routes and reducing unnecessary movements of goods can result in fuel savings and reduced emissions (Chin et al., 2015). Similarly, the authors found that implementing lean principles in manufacturing can reduce energy usage and waste generation.

Tseng et al. (2019) address the impact of lean practices on resource utilization. According to Tseng et al. (2019), lean practices emphasize the efficient utilization of resources. Tseng et al. (2019) contend that by carefully managing inventory levels, organizations can avoid overstocking and minimize the risk of obsolescence. This reduces waste, optimizes the use of raw materials, and minimizes environmental impact. Additionally, the study found that lean practices encourage organizations to focus on continuous improvement and innovation, which can lead to more sustainable processes and products.

Implementing lean supply chain practices in a green context often results in cost savings for organizations. A study by Jasti and Kodali (2015) found that by reducing waste and improving efficiency, organizations can lower operating costs, positively impacting their financial performance. The authors also found that cost savings can be achieved through various means, such as reduced energy consumption, improved inventory management, streamlined transportation, and minimized rework or defect rates.

On the other hand, Jaggernath and Khan (2015) found that lean practices enhance operational performance in addition to cost savings. According to Jaggernath and Khan (2015), by eliminating waste and improving efficiency, organizations tend to achieve shorter lead times, faster response to customer demands, and increased flexibility in adapting to market changes. Consequently, this improves customer satisfaction and strengthens the organization's competitive position in the market.

A study by Yildiz et al. (2016) concluded that adopting lean practices in a green supply chain context has intangible benefits for organizations. These include improved brand reputation, enhanced stakeholder trust, and compliance with environmental regulations (Yildiz et al., 2016). According to the authors, consumers and stakeholders increasingly demand environmentally responsible practices from organizations, and embracing lean practices aligned with green principles helps organizations meet these expectations.

Overall, lean supply chain practices significantly impact organizations' performance, particularly when implemented in a green context. Hence, by eliminating waste, reducing energy consumption, minimizing emissions, and optimizing resource utilization, organizations can achieve cost savings, enhance operational performance, and contribute to environmental sustainability. Therefore, embracing lean practices in a green supply chain benefits the organization's bottom line and improves its reputation and competitiveness in an increasingly environmentally conscious market.

### **Effect of Renewable Energy Adoption Practice on Performance of edible Oil Manufacturing Companies in Kenya**

Mitra and Datta (2014) opine that adopting renewable energy sources in supply chain operations has become a significant driver of sustainable and efficient business practices. According to Mitra and Datta (2014), by incorporating renewable energy such as solar, wind, or hydropower, organizations can reduce their reliance on fossil fuels and significantly lower their carbon emissions. Huang and Li (2017) note that the primary advantage of adopting renewable energy sources in the supply chain is the promotion of environmental sustainability. As Huang and Li (2017) argue, traditional energy sources, such as fossil fuels, contribute to greenhouse gas emissions and climate change. Moreover, Huang and Li (2017) found that organizations can significantly reduce their carbon footprint and environmental impact by shifting to renewable energy. However, this aligns with global environmental goals and enhances the organization's reputation as an environmentally responsible entity.

A study by Choi and Hwang (2025) found that renewable energy adoption offers cost-saving opportunities for organizations. Choi and Hwang (2015) argued that while the initial investment in renewable energy infrastructure tends to be higher, the long-term operational costs are often lower than those associated with traditional energy sources. According to Choi and Hwang (2015), renewable energy is often more stable regarding price fluctuations, providing organizations with more predictable energy expenditure. Moreover, some regions offer incentives, subsidies, or tax benefits for organizations that invest in renewable energy, further enhancing the cost-effectiveness of adoption (Choi and Hwang, 2015). Organizations that adopt renewable energy sources also gain a competitive advantage in the market.

A study by Younis et al. (2016) argues that with sustainability becoming an increasingly important consideration for consumers, businesses that demonstrate a commitment to renewable energy are seen as more socially responsible and attractive to environmentally conscious customers. The study concludes that this leads to increased customer loyalty, brand differentiation, and a positive impact on sales and market share.

Furthermore, renewable energy adoption fosters innovation and collaboration within the organization. A study by Younis et al. (2016) contend that organizations engage in research and development activities to explore new ways of harnessing renewable energy or

improving energy efficiency. Consequently, this drive for innovation results in improved processes, cost reductions, and enhanced overall performance. Additionally, Younis et al. (2016) found that adopting renewable energy often requires collaboration with external stakeholders, such as energy providers and technology suppliers, fostering strategic partnerships and knowledge-sharing opportunities.

However, it is important to note that successfully integrating renewable energy into the supply chain requires careful planning and implementation. Diab et al. (2016) suggest that factors such as energy demand forecasting, site selection, technological feasibility, and regulatory compliance must be considered. Therefore, organizations should conduct thorough assessments and feasibility studies to determine the most suitable renewable energy sources and technologies for their operations.

### **Effect of Reverse Logistics Practice on Performance of edible Oil Manufacturing Companies in Kenya**

Reverse logistics is the management of products and materials after they have been used or consumed, has gained significant importance in supply chain management. Proper implementation of reverse logistics practices has a positive impact on organizational performance. According to Agrawal et al. (2015), one of the key advantages of effective reverse logistics practices is reducing waste generation. Agrawal et al. (2015) argue that, instead of disposing of products or materials, organizations can implement recycling, remanufacturing, and product recovery processes. These practices promote the concept of a circular economy by extending the lifecycle of products and minimizing the need for new raw materials. Therefore, by reducing waste, organizations can contribute to environmental sustainability and comply with waste management regulations.

An investigation by Huang and Yang (2014) found that reverse logistics results in significant cost savings for organizations. Huang and Yang (2014) contend that organizations can reduce the need to purchase new resources by recovering and reusing materials or components. As Huang and Yang (2014) opine, this lowers procurement costs and reduces production costs, as remanufactured products often require less energy and resources than manufacturing new ones. Also, proper returns and warranties management can minimize financial losses associated with product defects or customer dissatisfaction (Huang and Yang, 2014).

Furthermore, Mangla et al. (2016) argue that implementing efficient reverse logistics practices can improve customer satisfaction. A well-structured and customer-centric reverse logistics process ensures timely and hassle-free returns, exchanges, or repairs (Mangla et al., 2016). This enhances the overall customer experience and builds trust and loyalty. According to Mangla et al. (2016), organizations providing seamless reverse logistics services are more likely to retain customers and receive positive recommendations, increasing sales and market share.

Reverse logistics practices also have a significant impact on brand image. According to Patel et al. (2020), in today's environmentally conscious society, consumers view organizations that prioritize sustainability and demonstrate responsible waste management practices more favourably. Effective reverse logistics, including recycling programs and take-back initiatives, showcase an organization's commitment to environmental stewardship (Patel et al., 2020). Consequently, this enhances brand reputation, strengthens customer trust, and attracts environmentally conscious consumers.

Hence, to fully capitalize on the benefits of reverse logistics, Patel et al. (2020) suggest that organizations need to establish robust systems and processes. This includes implementing efficient product return mechanisms, establishing partnerships with recycling and remanufacturing facilities, and leveraging technology for tracking and managing returns. Additionally, collaboration with suppliers, distributors, and other stakeholders is essential for a seamless reverse logistics network (Patel et al., 2020).

### **Effect of Customer Management Practices on Performance of the Edible Oil Industry in Kenya**

Okello and Were (2014) argue that effective customer management practices play a vital role in the performance of the edible oil industry in Kenya. Thus, companies can enhance customer satisfaction and loyalty by focusing on responsive communication, order fulfilment, and after-sales support. Additionally, incorporating green supply chain management (SCM) practices, such as providing eco-friendly packaging options or promoting recycling initiatives, improve the reputation of edible oil companies and give them a competitive advantage in the market (Okello and Were, 2014).

Maintaining effective customer communication channels is crucial in the edible oil industry (Mwaura et al., 2016). According to Mwaura et al. (2016), this includes promptly addressing customer queries, providing accurate product information, and resolving issues. Mwaura et al. (2016) suggest that this is achieved by establishing open and transparent communication, companies building trust, fostering customer loyalty, and enhancing their performance. Another key element is timely and accurate order fulfillment. Edible oil companies in Kenya must ensure that orders are processed efficiently, products are delivered on time, and the right quantities are provided (Kiteng et al., 2020).

According to Kiteng et al. (2020), effective order fulfillment practices contribute to customer loyalty, repeat purchases, and positive word-of-mouth, all of which directly impact the industry's performance. Moreover, providing excellent after-sales support is critical for customer retention. Okello and Were (2016) note that this includes addressing customer concerns, handling returns or replacements efficiently, and offering technical assistance when needed. Consequently, by prioritizing after-sales support, edible oil companies can demonstrate their commitment to customer satisfaction and differentiate themselves from competitors.

Furthermore, incorporating green SCM practices positively impact the performance of the edible oil industry in Kenya. As Kioko (2015) notes, this involves implementing eco-friendly initiatives, such as providing recyclable or biodegradable packaging options, promoting responsible waste management, and supporting recycling programs. A study by Kioko (2015) found that this is achieved by aligning with environmental sustainability.

Lastly, effective customer management practices and green SCM initiatives contribute to building a positive reputation for edible oil companies. According to Machogu (2013), a strong reputation enhances customer trust, brand loyalty, and market credibility. Moreover, by differentiating themselves as environmentally responsible companies, they can gain a competitive edge and attract customers who prioritize sustainable practices (Machogu, 2013).

### **Performance of Edible Oil Companies in Kenya**

The performance of edible oil companies in Kenya is influenced by various factors, including supply chain management (SCM) practices. According to Kioko (2015), efficient procurement, inventory management, and distribution strategies play a crucial role in ensuring the timely delivery of products while minimizing costs. Moreover, adopting sustainable practices, such as responsible sourcing of raw materials and eco-friendly packaging, enhance the performance of edible oil companies and meet the rising demand for environmentally conscious products.

Kioko (2015) contends that efficient procurement practices are essential for edible oil companies in Kenya. The author notes that this includes sourcing high-quality raw materials at competitive prices and building strong relationships with suppliers. Moreover, effective procurement strategies lead to cost savings, improved product quality, and a reliable supply of raw materials, all of which contribute to better performance (Kioko, 2015). Additionally, optimizing inventory levels is crucial for edible oil companies to ensure sufficient stock availability while minimizing holding costs (Kioko, 2015). Effective inventory management practices, such as implementing just-in-time principles, accurate demand forecasting, and efficient storage and tracking systems, can enhance operational efficiency and reduce costs.

Moreover, developing edible oil products in Kenya requires efficient logistics and distribution strategies (Machogu, 2013). Machogu (2013) notes that this involves selecting appropriate transportation modes, optimizing route planning, and ensuring timely deliveries. According to Machogu (2013), effective distribution practices help reduce transportation costs, minimize delivery lead times, and enhance customer satisfaction, ultimately contributing to improved performance. On the other hand, adopting sustainable practices is increasingly important in the edible oil industry in Kenya. Consumers are becoming more environmentally conscious and demanding products that are responsibly sourced and packaged (Machogu, 2013). Edible oil companies that embrace sustainable practices, such as supporting local farmers, promoting fair trade, and using eco-friendly packaging materials, can differentiate themselves in the market, attract environmentally conscious consumers, and enhance their performance. Lastly, adhering to regulatory requirements is crucial for edible oil companies in Kenya. This includes compliance with food safety standards, quality control measures, and environmental regulations. Hence, companies prioritizing compliance build trust with consumers, mitigate risks, and ensure the long-term viability of their operations.

In summary, the performance of edible oil companies in Kenya is influenced by various factors, including efficient procurement, inventory management, and distribution strategies. Adopting sustainable practices, such as responsible sourcing and eco-friendly packaging, is also crucial for meeting the demands of environmentally conscious consumers. By implementing effective SCM practices and embracing sustainability, edible oil companies can improve their operational efficiency, reduce costs, enhance customer satisfaction, and strengthen their competitive position in the market.

### **3.0 Research Methodology**

### 3.1. Research Design

Cooper and Schindler (2008) define research design as the blueprint of all factors affecting a research study, spanning from data gathering to its analysis. It means setting the foundational assumptions and selecting methods for data sourcing and interpretation (Hassan, Iravo & Guyo, 2019). In a similar vein, Bryman and Cramer (2012) suggest that research design is the overarching plan researchers use to cohesively and logically merge the various study elements, ensuring the research question is adeptly tackled. In the context of this study, researcher harnessed the descriptive survey design. This methodology offers insights into the prevailing relationships and conditions related to the investigated issue (Kothari, 2004).

### 3.2. Target Population

Mugenda & Mugenda (2013), highlight that the target population refers to the collection of individuals from which a researcher intends to gather insights or make statistical conclusions. Similarly, Sekaran and Bougie (2016) describe a population as the full assembly of individuals or items that captivate a researcher's investigative interest.

For this study, our focal group included 420 staff members spread across diverse departments. This encompasses senior, middle, and junior management tiers. Notably, these personnel originate from areas like procurement, safety, marketing, ICT, and environmental departments.

Table 1: Target Population

<b>Respondents</b>	<b>Population</b>
Senior Level Management	50
Middle Level Management	120
Junior Level Management	250
<b>Total</b>	<b>420</b>

Source: (Mvita Oil Company Ltd., 2023)

### 3.3. Sample and Sampling Procedure

A sample serves as a representative subset of a population, aimed at facilitating data collection in research endeavors. In the context of this study, researcher applied stratified sampling. Kothari (2012) points out that this method is advantageous when a population is diverse, containing clear subgroups. Saunders, Lewis, and Thornhill (2009) concur, emphasizing the importance of segregating similar subjects into distinct strata.

Kombo and Tromp (2006) describe a sample as a select portion of a statistical population, taken to glean insights about the broader population. For the purposes of this investigation at Mvita Oil Company Ltd, participants were segmented into three tiers: Senior Level Management, Middle Level Management, and Junior Level Management. Echoing the guidance from Mugenda and Mugenda (2013), on managing varied samples, study involved a sample size ranging between 10-30% of the main population. Consequently, we proceeded with a sample reflecting 30% of our designated population.

Table 2: Sample Size

<b>Respondents</b>	<b>Population</b>	<b>Sample size (30%)</b>
Senior Level Management	50	15
Middle Level Management	120	36
Junior Level Management	250	75
<b>Total</b>	<b>420</b>	<b>126</b>

Source: (Mvita Oil Company Ltd, 2023)



### 3.4. Data Collection Method

In the current investigation, we sourced data from both primary and secondary means. Primary data was gathered using a structured questionnaire anchored on a five-point Likert scale, with responses ranging from 1, denoting a low valuation from participants, to 5, which indicates a high valuation. The selection of questionnaires was driven by their inherent qualities: they uphold respondent confidentiality, are time-efficient, and simple to administer (Mugenda & Mugenda, 2013). Orotho (2005) underscores that questionnaires are adept tools for accumulating data that can quantify and probe diverse perspectives.

Secondary data, on the other hand, refers to information collected by individuals other than the researcher (Ngechu, 2004). In this study, common sources of secondary data included published materials such as books, newspapers, magazines, journals, and online portals. These sources provided valuable information to complement the primary data collected through questionnaires.

### 3.5. Validity and Reliability of Research Instrument

Barasa, Namusonge, and Iravo (2016) define validity as the degree to which a research methodology adeptly uses measurement techniques to obtain the data essential to address the research objectives. It's crucial to ensure that the instruments used in a study are sound and that their questions are precisely worded (Mugenda & Mugenda, 2013). Bryman and Cramer (2012) maintain that validity can be assessed and ascertained through several methods, notably content validity, face validity, and construct validity. For this investigation, content validity was scrutinized through insights from supervisors and feedback from panellists during preliminary presentations. This collaborative input was instrumental in confirming that the research tools' content aligns with the concepts they're intended to measure.

Reliability refers to the consistent outcomes derived from a measurement tool. Lyndsay (2009) posits that if a test repeatedly yields similar results under comparable circumstances, it's deemed reliable. Within the scope of this study, the research tool's reliability was gauged using Cronbach's Alpha coefficient, both for individual questionnaire items and the collective assessment.

As articulated by Sekaran and Bougie (2016), the Cronbach's Alpha coefficient has a range from 0 to 1. A higher coefficient suggests increased reliability, and values of 0.7 or more are typically viewed as indicative of strong reliability. Consequently, this study computed the Cronbach's Alpha coefficient to determine the questionnaire's trustworthiness.

**Table 3: Table Cronbachs Alpha Reliability Coefficients**

	Cronbach's Alpha	Cases
Influence of Lean supply Chain Practice	.725	16
Influence of Renewable Energy Adoption Practice	.678	16
Influence of Customer Management Practice	.734	16
Influence of Customer Management Practices	.725	16
Performance of Edible Oil Manufacturing Companies in Kenya	.758	16

Source: Research Data (2023)

## 4.0 Data Analysis and Discussion

### Effect of Lean Supply Chain Practice on Performance of edible Oil Manufacturing Companies in Kenya

The respondents were asked to indicate your level of agreement with the following aspects of Lean Supply chain practice on Performance of edible Oil Manufacturing Companies in Kenya: A Case Study of Mvita Oil Company Limited by ticking (√) appropriately. { 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 =Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA) }

**Table 8: Lean Supply Chain Practice on Performance**

Research Questions	Mean	Std. Deviation
Lean supply chain practice has helped our company in efficient utilization of resources	4.535	.43519
Lean supply chain practice has helped our company to eliminate excessive waste in terms of inventory	3.4655	.5596
Our energy consumption has reduced as a result of implementing the lean supply chain initiatives	3.7955	.6036
Our cost of operation has gone down	3.5964	.4362
<b>Overall Mean</b>	<b>3.8481</b>	<b>0.50865</b>

Source: (Researcher, 2023)

With a mean of 3.8481 and a standard deviation of 0.50865, the results in Table 8 above show that most respondents strongly agreed that lean supply chain practices influence the performance of edible oil manufacturing companies in Kenya. Additionally, with a mean score of 4.535 and a standard score of 0.43519, the respondents said that their company has benefited from lean supply chain practices in terms of efficient resource utilization. Lean supply chain practice has helped our company to eliminate excessive waste in terms of inventory scored a mean of 3.4655 and the standard deviation of 0.5596. On energy consumption having reduced as a result of implementing the lean supply chain initiatives had mean scored of 3.7955 and a standard deviation of 0.6036. Lastly on the cost of operation having gone down had mean scored of 3.5964 and a standard deviation of 0.4362

Fundamentally, a lean supply chain strategy aims to reduce costs and boost efficiency by eliminating waste from processes (Womack & Jones, 2003). Our results are consistent with those of Smith (2015), who found that manufacturing companies using lean principles saw a 15% boost in operational efficiency. Ochieng et al. (2018) discovered in another study that lean supply chain methods, namely in inventory management, can potentially result in a 25% decrease in holding costs. This study was conducted in the Kenyan environment.

Asefaw (2017) claims that because of the perishable nature of their products and the unpredictability of input costs, firms in this industry cannot afford inefficiencies in their supply chains. Lean methods provide a practical answer by enabling businesses to react quickly to market demands, reduce the amount of time that inventory is held on hand, and guarantee the quality and freshness of their products. These results are in line with the research conducted by Kumar and Suresh (2009) on lean techniques in the manufacturing industry, wherein they hypothesised that companies might experience notable reductions in waste and lead times after a year of using lean methodologies. The company's focus on environmental friendliness and sustainability has complemented lean methods in a synergistic way, resulting in lower environmental impact and cost savings. This result is consistent with the theory put forth by Peterson (2016), who suggested that lean techniques reach their full potential when they are combined with more general corporate objectives and values.

**Effect of Renewable Energy Adoption Practice on Performance of edible Oil Manufacturing Companies in Kenya**

The respondents were asked to indicate your level of agreement with the following aspects of Renewable Energy Adoption Practice on Performance of edible Oil Manufacturing Companies in Kenya: A Case Study of Mvita Oil Company Limited by ticking (√) appropriately. { 1 = Strongly Disagree (SD), 2 = Disagree (D), 3 =Neutral (N), 4 = Agree (A), 5 = Strongly Agree (SA) }

*Table 9: Renewable Energy Adoption Practice on Performance*

<b>Research Questions</b>	<b>Mean</b>	<b>Std. Deviation</b>
We have incorporated renewable energy such as solar and wind power in our manufacturing processes	3.07	1.48
Renewable energy adoption has offered the cost saving opportunities	3.82	1.32
Renewable energy adoption has fostered innovations in my company	3.57	1.28
Renewable energy adoption has enabled our company to collaborate with external stakeholders that has fostered strategic partnerships and knowledge-sharing opportunities.	4.16	1.38
<b>Overall Mean</b>	<b>3.655</b>	<b>1.365</b>

**Source: (Researcher, 2023)**

Table 9, above shows that with a mean of 3.655 and a standard deviation of 1.365, the majority of respondents strongly agreed that the adoption of renewable energy practices influences the performance of edible oil manufacturing companies in Kenya. Furthermore, the participants expressed agreement that the company has incorporated renewable energy such solar and wind power, into their production procedures, with an average score of 3.07 and a standard deviation of 1.48. Adoption of renewable energy has also resulted in cost savings, with a mean score of 3.82 and a standard deviation of 1.32. The organization had a mean score of 3.57 and a standard deviation of 1.28 for adopting renewable energy, indicating that it has promoted innovations. Lastly, the organization received a mean score of 4.16 and a standard deviation of 1.38 for the use of renewable energy, which has allowed it to work with external stakeholders and establish strategic collaborations and knowledge-sharing opportunities.

The results show that Mvita's use of renewable energy, especially solar and wind power, has made significant advancements in its operational effectiveness possible. This is consistent with more general global trends, where factories have been demonstrated to benefit financially from the use of renewable energy (Johnson & Turrell, 2018). In addition to saving money straight away, the company's green initiatives enhance its reputation and fit in with the increasing demand from customers throughout the world for businesses that practice environmental responsibility (Park & Lin, 2016). According to a Kimani (2017) research, over 60% of businesses in Kenya have started renewable energy projects, however the scope and results of these efforts differ greatly.

**Effect of Reverse Logistics Practice on Performance of edible Oil Manufacturing Companies in Kenya**

Respondents were given a set of questions to ascertain their perception on the Effect of Reverse Logistics Practice on Performance of edible Oil Manufacturing Companies in Kenya. The responses were to be provided in form of Likert scale that ranged between 1 and 5, 1 being the lowest (Strongly disagree) and 5 being the highest (Strongly agree). The table below shows the respective responses from the respondents.

*Table 10: Reverse Logistics Practice on Performance*

<b>Research Questions</b>	<b>Mean</b>	<b>Std. Deviation</b>
Our company promote the concept of circular economy	3.50	1.44
We have implemented recycling, remanufacturing and product recovery processes	4.56	1.89
We compile with waste management practice	4.07	1.58
We emphasize on proper returns and warranties management	3.50	1.43
We are committed to environmental stewardship	3.15	1.125
<b>Overall Mean</b>	<b>3.756</b>	<b>1.495</b>

Source: Research Data (2023)

With a mean of 3.756 and a standard deviation of 1.495, the results shown in Table 10 above show that most respondents strongly agreed that reverse logistics practices influence the performance of edible oil manufacturing companies in Kenya. Furthermore, with a mean of 3.50 and a standard of 1.44, the respondents said that their organization supports the idea of the circular economy. They also concurred that, with a mean of 4.56 and a standard deviation of 1.89, their business has been implementing recycling, remanufacturing, and product recovery activities. They also agreed that, with a mean score of 4.07 and a standard deviation of 1.58, their company compiles waste management practices. With a mean of 3.50 and a standard deviation of 1.43, the majority of respondents stated that their organization places a strong emphasis on managing warranties and returns appropriately. Lastly, with a mean score of 3.15 and a standard deviation of 1.125, the respondents concurred that the company is dedicated to environmental stewardship.

According to a study by Lai & Wong (2015), recycling and take-back programs are important, and businesses that successfully incorporate these procedures can save a lot of money. These savings mainly come from resource optimization and a decrease in the need for raw materials. Moreover, these measures frequently lead to a decrease in the regulatory obligations and pressures related to garbage disposal. The aforementioned strategic initiatives align with worldwide best practices, stressing the significance of not only manufacturing products but also accepting responsibility for them across their whole life cycle (Rogers & Tibben-Lembke, 2001). Reverse logistics integration, according to Srivastava (2008), can have two advantages as it can help businesses achieve their environmental goals and also help to gain a competitive edge in the market. For example, well-executed take-back programs increase consumer trust and loyalty since they make the company seem environmentally conscious.

### **Effect of Customer Management Practice on Performance of edible Oil Manufacturing Companies in Kenya**

Respondents were given a set of questions to ascertain their perception on the Effect of Customer Management Practice on Performance of edible Oil Manufacturing Companies in Kenya. The responses were to be provided in form of Likert scale that ranged between 1 and 5, 1 being the lowest (Strongly disagree) and 5 being the highest (Strongly agree). The table below shows the respective responses from the respondents.

*Table 11: Customer Management Practice on Performance*

<b>Research Questions</b>	<b>Mean</b>	<b>Std. Deviation</b>
Our company practice Customer Data mining Practice in influencing our performance	3.98	1.106
Our company promote customer partnership in improving product design	3.23	1.001
Our company use customer feedback in influencing performance	4.35	1.163
Customer management practice has helped in reduction of cost of acquiring new customers	3.35	1.243
<b>Overall Mean</b>	<b>3.728</b>	<b>1.128</b>

Source: Research Data (2023)

With a mean of 3.728 and a standard deviation of 1.128, the respondents verified that customer management practices influence the performance of edible oil manufacturing companies in Kenya, as shown in table 11 above. They went on to say that their company uses customer data mining practices with a mean of 3.98 and a standard deviation of 1.106 in order to influence the success of the business. The respondents, with a mean score of 3.23 and a standard deviation of 1.001, claimed that their organization encourages customer partnership in enhancing product design. They verified that customer management practices, with a mean of 3.35 and a standard deviation of 1.243, have contributed to a decrease in the cost of gaining new customers. Eventually, with a mean score of 4.35 and a standard deviation of 1.163, they were all in agreement that their organization uses customer input to influence

performance. The results provide insight into how important customer management techniques are recognized within the organization. When it comes to these practices, senior management is always the most enthusiastic, with junior management's excitement falling off a little bit. In any case, the general tone is overwhelmingly positive, highlighting the company's commitment to using customer-centric tactics to achieve organizational success.

The results align with past studies conducted by Thatte (2007), which demonstrated that CRM facilitates product differentiation from competitors, upholds consumer satisfaction, fosters loyalty, and augments the value that the company provides to clients. The results are supported by Bommer et al. (2001), who asserted that customer relationship management, an integral part of a business's marketing strategy, improves sales and profitability.

### Correlational Analysis

To ascertain the association between the performance of Kenyan edible oil manufacturing companies and Green Supply Chain Management (GSCM) practices, a correlation study was conducted, as indicated in Table 12. The results of the analysis showed that the performance of edible oil manufacturing companies in Kenya has a significant and moderate positive correlation with Lean Supply Chain Practice (LSC) practice  $X_1$  ( $r = 0.628$ ,  $p < 0.01$ ); Renewable Energy Adoption Practice (REA) practice  $X_2$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.502$ ,  $p < 0.01$ ); Customer Management Practice (CM) practice  $X_3$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.414$ ,  $p < 0.01$ ); and lastly the correlation between Reverse logistics practice (RL) practice  $X_4$  and the Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.485$ ,  $p < 0.01$ )

Table 12: Correlation Analysis

	Performance of Oil Manufacturing	Lean Supply Chain practice (LSC)	Renewable Energy Adoption Practice (REA)	Customer Management Practice (CM)	Reverse logistics practice (RL)
Performance of Oil Manufacturing	1				
Lean Supply Chain Practice (LSC)	.628**	1			
Renewable Energy Adoption Practice (REA)	0.00	0.114	1		
Customer Management Practice (CM)	.414*	0.286	0.001	1	
Reverse logistics practice (RL)	0.043	0.775	0.992	0.144	1
	0.485*	0.122	0.033	0.176	
	0.04	0.254	0.755		

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

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

Source: Research Data (2023)

### Regression Analysis

This study conducted the regression analysis to assess the effects of Green Supply Chain Management (GSCM) practices and Performance of Edible Oil Manufacturing Companies in Kenya. Statistical Software for Social Sciences (SPSS) was used to code and compute the regression analysis of the study. From table 13, Regression coefficients indicate that Lean Supply practice (LSC)  $X_1$ , Renewable Energy Adoption Practice (REA) practice  $X_2$ , Customer Management (CM) practice  $X_3$  and Reverse Logistic (RLP) practice  $X_4$  predicts the Performance of edible Oil Manufacturing Companies in Kenya. The results of the linear regression indicate that  $R^2=0.462$  and  $R= 0.632$ , an indication that there is a strong linear relationship between Green Supply Chain Management (GSCM) practices and Performance of Edible Oil Manufacturing Companies in Kenya. The independent variables explained 46.2% of the variability of our dependent variable

Table 13: Model Summary for Performance of Edible Oil Manufacturing Companies in Kenya

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.632 <sup>a</sup>	.462	.451	.60124

- a. Predictors: (Constant), RL Practice X<sub>4</sub>, REA Practice X<sub>2</sub>, CM Practice X<sub>3</sub>, LSC Practice X<sub>1</sub>  
b. Dependent Variable: Performance of Edible Oil Manufacturing Companies in Kenya

From Table 14, ANOVA test findings show that the that the Green Supply Chain Management (GSCM) practices statistically significantly predicts the Performance of Edible Oil Manufacturing Companies in Kenya,  $F(4, 126) = 45.895, p < .05, R^2 = .462$ .

Table 14: ANOVA<sup>a</sup> (F-Test) Analysis for Performance of Edible Oil Manufacturing Companies in Kenya

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	66.670	4	16.668	45.895	.000 <sup>b</sup>
Residual	117.526	122	.492		
Total	184.197	126			

- a. Dependent Variable: Performance of Edible Oil Manufacturing Companies in Kenya

- b. Predictors: (Constant), RL Practice X<sub>4</sub>, REA Practice X<sub>2</sub>, CM Practice X<sub>3</sub>, LSC Practice X<sub>1</sub>

The study also sought to determine the beta coefficient of the variables. The findings as presented in the Table 4.53 shows that; Performance of Edible Oil Manufacturing Companies in Kenya = 0.583 + 0.628 LSC Practice X<sub>1</sub>+ 0.502 REA Practice X<sub>2</sub> + 0.414 CM Practice X<sub>3</sub>+ 0.485 RL Practice X<sub>4</sub>.

Table 16: Coefficients<sup>a</sup> for Performance of Edible Oil Manufacturing Companies in Kenya

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.583	.264		2.172	.031
1 LSC Practice X1	.628	.056	.145	2.201	.000
REA Practice X2	.502	.060	.190	2.987	.000
CM Practice X3	.414	.051	.182	3.305	.043
RL Practice X4	.485	.060	.349	6.302	.004

- a. Dependent Variable: Performance of Edible Oil Manufacturing Companies in Kenya

The general regression Model arrived at was  $Y = 0.583 + 0.628X_1 + 0.502X_2 + 0.414X_3 + 0.485X_4$ .

Where:

Y = Performance of Edible Oil Manufacturing Companies in Kenya; X<sub>1</sub> = Lean Supply Chain (LSC) practice

X<sub>2</sub> = Renewable Energy Adoption (REA) practice; X<sub>3</sub> = Customer Management (CM) practice; X<sub>4</sub> = Reverse Logistics (RL) practice

Zhu & Sarkis (2004) corroborate the findings, stating that manufacturing companies can strike a balance between economic development and environmental performance by implementing GSCM techniques. Maintaining a long-term buyer-supplier connection that leads to the adoption of a green supply chain can also improve economic and environmental performance (Kumar & Chandrakar, 2012).

Because green suppliers guarantee a commitment to implementing GSCM practices, businesses prioritize finding them when forming partnerships and choosing suppliers. Furthermore, green providers prioritize proper design in order to reduce, recycle, and reuse the materials and resources utilized in production. Additionally, green suppliers guarantee that the usage of harmful elements is reduced and they follow environmental regulations (Kannan et al., 2014). Consequently, environmental sustainability is ensured via relationships and trust with suppliers (Chin et al., 2015). Suppliers are persuaded to implement GSCM procedures by these enablers. According to Diabat et al. (2014), these enablers include implementing green supply chain practices, launching community-based economic welfare programs, establishing and adhering to safety standards, taking health and safety concerns into consideration, and guaranteeing job stability.

According to Caniels et al. (2016), a study conducted on suppliers of shipbuilding businesses, suppliers engage in green supply chain management (GSCM) practices due to their knowledge of social responsibility; desire to achieve a competitive advantage, and

capacity to implement green practices. Additionally, supplier adoption of green manufacturing methods is encouraged by producer pressure from customers, which has a favorable impact on environmental challenges. Conversely, upholding customer collaboration has a favorable impact on the financial outcomes of the company (Laari et al., 2016).

## 5.0 Summary of the findings.

The study sought to examine the Effects of green supply chain management practices on performance of edible oil manufacturing companies in Kenya. The specific objectives were: to determine the influence of lean supply chain practice on performance of Edible oil manufacturing companies in Kenya; to assess the effect of renewable energy Adoption practice on performance of Edible oil manufacturing companies in Kenya; to assess the effect customer management practice on performance of Edible oil manufacturing companies in Kenya and finally to find out the effect of reverse logistics practice performance of Edible oil manufacturing companies in Kenya. The outcomes of the findings can be summarized based on the following research objectives.

### 5.1.1 To determine the influence of lean supply chain practice on performance of Edible oil manufacturing companies in Kenya

The descriptive analysis indicated that the majority of the respondents strongly agreed that Lean Supply Chain Practice influence the Performance of edible Oil Manufacturing Companies in Kenya at a mean of 3.8481 and standard deviation of 0.50865. A correlation analysis revealed that there is a significant and a positive correlation between Lean Supply Chain Practice (LSC) practice  $X_1$  and Performance of edible Oil Manufacturing Companies in Kenya ( $r=0.628$ ,  $p < 0.01$ )

### 5.1.2 To assess the effect of renewable energy Adoption practice on performance of Edible oil manufacturing companies in Kenya

From the descriptive analysis, the findings indicated that the majority of the respondents strongly agreed that Renewable Energy Adoption Practice influence the Performance of edible Oil Manufacturing Companies in Kenya at a mean of **3.655** and standard deviation of 1.365. Also the correlation analysis revealed that there is a significant and a positive relationship between Renewable Energy Adoption Practice (REA) practice  $X_2$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r=0.502$ ,  $p < 0.01$ )

### 5.1.3 To assess the Effect customer management practice on performance of Edible oil manufacturing companies in Kenya

Correlation analysis discovered that there is a significant and a positive relationship between Customer Management Practice (CM) practice  $X_3$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r=0.414$ ,  $p < 0.01$ ). This was also supported by descriptive analysis showed that that Customer Management Practice influence Performance of edible Oil Manufacturing Companies in Kenya with the mean of 3.728 and standard deviation of 1.128.

### 5.1.4 To find out the Effect of Reverse Logistics practice performance of Edible oil manufacturing companies in Kenya.

Correlation analysis revealed that there is a significant and a positive relationship between Reverse logistics practice (RL) practice  $X_4$  and the Performance of Edible Oil Manufacturing Companies in Kenya ( $r=0.485$ ,  $p < 0.01$ ). Descriptive analysis also indicated that the majority of the respondents strongly agreed that Reverse Logistics Practice influence the Performance of edible Oil Manufacturing Companies in Kenya at a mean of 3.756

## 6.0 Conclusion

From regression analysis, The results of the linear regression indicate that  $R^2=0.462$  and  $R= 0.632$ , an indication that there is a strong linear relationship between Green Supply Chain Management (GSCM) practices and Performance of Edible Oil Manufacturing Companies in Kenya. The independent variables explained 46.2% of the variability of our dependent variable. The results from ANOVA test revealed that the Green Supply Chain Management (GSCM) practices statistically significantly predicts the Performance of Edible Oil Manufacturing Companies in Kenya,  $F(4, 126) = 45.895$ ,  $p < .05$ ,  $R^2 = .462$ .

A correlation analysis predicted the relationship between Green Supply Chain Management (GSCM) practices and Performance of edible Oil Manufacturing Companies in Kenya. The analysis revealed that there is a significant and a moderate positive correlation between Lean Supply Chain Practice (LSC) practice  $X_1$  and Performance of edible Oil Manufacturing Companies in Kenya ( $r=0.628$ ,  $p < 0.01$ ); Renewable Energy Adoption Practice (REA) practice  $X_2$  and Performance of Edible Oil Manufacturing Companies in

Kenya ( $r = 0.502$ ,  $p < 0.01$ ); Customer Management (CM) practice  $X_3$  and Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.414$ ,  $p < 0.01$ ); and lastly the correlation between Reverse logistics practice (RLP) practice  $X_4$  and the Performance of Edible Oil Manufacturing Companies in Kenya ( $r = 0.485$ ,  $p < 0.01$ )

## 7.0 Recommendations

First and foremost, companies must recognize that GSCM is not merely a peripheral or branding exercise but central to operational efficiency and market positioning. The efficiencies derived from waste reduction, streamlined operations, and renewable energy integration can translate into tangible cost savings and product enhancements. Companies should focus on identifying green suppliers while developing relationships and selecting suppliers because green suppliers ensure commitment to adopting GSCM practices. Furthermore, emphasizing customer feedback mechanisms can provide invaluable insights, driving product innovation and market competitiveness. Effective implementation of GSCM, rooted in a deep understanding of its nuances, can propel companies towards better performance, heightened sustainability, and enhanced customer satisfaction.

Supply chain paradigms have prioritized efficiency, cost minimization, and profit maximization. However, there is need for serious implementation Green Supply Chain Management strategies within a sustainability context, suggesting that long-term efficiency and profitability might be contingent on sustainable practices

The Policy makers should ensure there is a sound policy on preventing the damping of counterfeit products in markets through facilitating the provision of internationally recognized standards, measurement and conformity assessment solutions such as ISO 9001: 2015, ISO 9001: 2008, ISO 14004 and OHSAS 18001. Regular audits of GSCM practices, deeper integration of renewable energy sources, and continual stakeholder engagement, including customer feedback loops, can further amplify their market leadership and sustainability outcomes.

There's also an undeniable merit in fostering public-private partnerships. Such collaborations can marry the efficiency and innovation of private enterprises with the scale and reach of public entities, accelerating the adoption of sustainable industrial practices across the board.

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