Green Supply Chain Management and Performance of Dairy Manufacturing Firms in Kenya

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ABSTRACT

Purpose: Green procurement practices have attracted the growing interest of professional circles and academician due to its positive impact on brand reputation, competitive advantage and performance of the organisation. Milk needs a unique treatment due to perishability and since it is a consumable product it must be handled with care to ensure health products. The study was guided by the following specific objectives, namely: to establish the effect of green procurement, green manufacturing, and green distribution on the performance of dairy industry in Kenya.

Methodology: The study adopted descriptive research design, the population of the study constitute 34 dairy manufacturing firms in Kenya and Purposive and census sampling technique was used. Semi-structured, self- administered questionnaires were used to collect data. Data was analysed by use of both descriptive and inferential statistics and processed by SPSS version 28 and presented using tables.

Findings: The findings revealed that green procurement practices had a positive and significant influence on performance of dairy manufacturing firms in Kenya.

Unique Contribution to Theory, Policy and Practice: Future research in the manufacturing sector can be grounded in theoretical frameworks. The study advises that managers in the dairy manufacturing industry should establish procedures and policies that enhance their understanding of customer needs to fulfill expectations while promoting sustainability, despite the validation of existing theories. Additionally, it is recommended that regulatory bodies in the dairy sector formulate policies that facilitate collaboration among manufacturers and all stakeholders, which would help reduce potential losses impacting both productivity and sustainability, ultimately benefiting the broader economy. The report also emphasizes the necessity for the government to promote the systematic growth and development of green procurement practices within Kenyan dairy manufacturing firms to enhance overall performance. Moreover, empirical research is essential to assess the impact of green procurement on the productivity of other manufacturing sectors within the economy.

Keywords: *Performance, Green Procurement, Green Manufacturing, Green Distribution*

Introduction

The dairy industry has been under scrutiny from environmentalists due to its contribution to environmental degradation, both locally and globally (Deloitte, 2017). This degradation is caused by land usage, pollution from industrial waste, and the use of animal pesticides and feeds. To mitigate pollution, farmers are turning to the use of manure as a replacement for commercial fertilizers. Additionally, the disposal and use of plastics are significant concerns in the dairy industry. Companies like Fair Cape Dairies and Bio Foods Products are implementing sustainable packaging options, such as recyclable and reduced polyethylene terephthalate packaging, respectively (Fair Cape Dairies, 2019; Food Business Africa, 2019). Green procurement policies that incorporate environmental factors can lead to better market performance. Consumers are more likely to identify with sustainable products (Gorante & Kante, 2015), and greening the entire production chain can focus on eco-friendly packaging and delivery methods to the end consumer. Adherence to legislation, such as the plastic bag ban in Kenya, has prompted dairy processing firms to adopt the right packaging materials, which not only enhance customer value but also reduce fines and ultimately improve firm performance (Fair Cape Dairies, 2019).

Statement of the Problem

The dairy industry plays a crucial role in reducing poverty and malnutrition in both rural and urban areas by providing a reliable source of income and milk products (KAM, 2018; Joto & Odock, 2019). However, the declining consumption of processed milk products has negatively impacted the performance of milk processing firms in Kenya (Onam, Omondi & Battenweck, 2019). These firms face a variety of challenges, including seasonal variations in milk production, high processing costs, and competition from informal milk vendors (Maina et al., 2020). The dairy industry's performance declined by 6.7% in 2019 due to the low quality and insufficient supply of raw milk delivered to processors. This has led to underutilization of milk processing plants' capacities, with only 12% of marketed milk being processed in Kenya (Maina et al., 2020). Furthermore, milk processors have had to invest in expensive sustainable packaging, which has affected their profitability, along with the plastic bag ban that has also had a negative impact (NEMA, 2020).

Despite efforts to improve performance, the dairy sector, particularly the processing sector, has continued to underperform. In 2020, Kenya produced 458 million liters of processed milk and cream, a decrease from the previous year's nearly 492 million liters. Additionally, only 950 metric tons of butter and ghee were produced, while cheese production stood at 158 metric tons. Both products recorded a decline in production compared to 2019 (Faria, 2021). The Kenyan dairy sector is struggling to meet domestic demand, resulting in the exportation of milk (Njeru, 2022). Despite advancements in dairy farming technology, production levels are unable to meet the growing demand for milk and dairy products (Kipkorir, 2017). The sector faces several challenges, including economic factors, limited production resources, and poor production systems (Mburu,

2017), which have hindered it from reaching its full potential. According to Kipkorir (2017), the dairy sector's performance has declined, evidenced by low milk production and a reduction in the land allocated to dairy farming. Therefore, the current research sought to determine the effect of green supply chain management practices on performance of dairy industry in Kenya.

Significance of the Study

The aim of this study was to promote environmental protection through the adoption of sustainable manufacturing practices, which would also meet the dynamic needs of stakeholders in a beneficial way. The findings of this study can be used by policy makers and governments in developing countries to establish environmental standards that can attract investors, devise strategic responses to factors influencing the adoption of green manufacturing practices, and support green manufacturing practices in the industrial sector. This study holds considerable importance as it addresses a gap in the empirical literature pertaining to this research topic and acts as a resource for procurement professionals, policymakers, and other stakeholders in making informed decisions. Additionally, it may serve as a reference for future researchers gathering empirical data on the impact of green procurement practices on performance.

Scope of the Study

The study focused on dairy firms registered with KAM in Kenya. Though there are additional elements that influence green supply chain management on performance, this study sought to determine the effect of green purchasing, green distribution and green manufacturing on performance of dairy firms in Kenya. The study's participants will be 34 senior supply chain managers dairy firms. Unit of observation was dairy firms and unit of analysis was 34 senior procurement managers of dairy firms in Kenya.
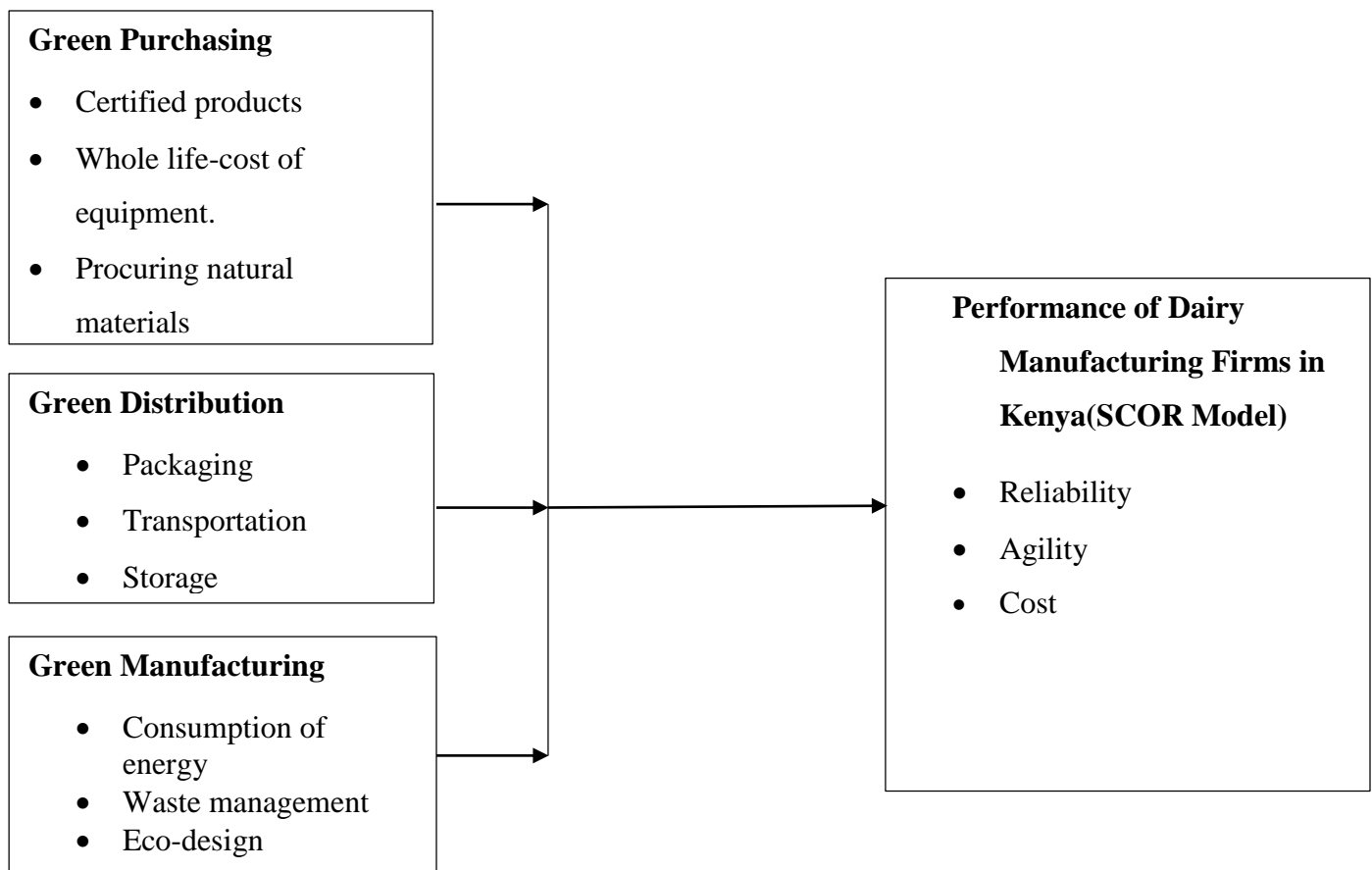
Theoretical framework

Sustainability theory is thought to be relevant for this study in order to understand the effect of GSCM on performance of food and beverage manufacturing firms in Kenya, hence it gives a theoretical background of this study. In his third edition on sustainability theory, Ekardt (2016) outlined an enduring form of economy and society that can be evaluated on a global scale. Sustainability theory explains the relationship between organizations, individuals, or institutions that are associated with a company and are influenced by its activities and goals. Hart (1995) argues that companies that strive to develop and implement an enterprising strategic environmental commitment are more conscious of their customers, suppliers, workers, and other individuals involved in the company. It is important to note that firms involve players other than those who are only concerned with meeting minimum environmental regulatory requirements; they also consider social and economic impacts. Sustainability involves an equitable approach, not just a superficial commitment to prioritize economic, social, and environmental policies without any

consideration for their relationship in space and time to achieve a balanced outcome across these aspects.

SCOR Model

SCOR framework was formed and established by the Supply Chain Council (SCC) in 1999 (Huang, Sheoran & Wang, 2004) . SCOR was competent enough in offering a foundation for measuring supply chain performance, for evaluating strategy and the expansion of a common supply chain framework (Nesti and Thaha, 2016). Hasibuan et al, (2018) conducted a study of Supply Chain Management with Supply Chain Operation reference model in a manufacturing industry. Based on performance components in the Supply Chain Operations Reference (SCOR) (Reliability, Response, Speed, Cost, and Assets) and revealed a significant influence on performance. Thus, the current study used SCOR Model based on the following performance measurement: Reliability, Agility (responsiveness and flexibility) and cost

Green Purchasing

- Certified products
- Whole life-cost of equipment.
- Procuring natural materials

Green Distribution

- Packaging
- Transportation
- Storage

Green Manufacturing

- Consumption of energy
- Waste management
- Eco-design

Performance of Dairy Manufacturing Firms in Kenya(SCOR Model)

- Reliability
- Agility
- Cost

Conceptual framework(Author 2022)

Empirical Review

Green Purchasing

Green purchasing involves incorporating environmental considerations into the procurement process. The ultimate goal is to ensure that the procured materials have a positive impact on the environment by minimizing the presence of hazardous substances (Sundarakani & Vel, 2016). In essence, green purchasing refers to a purchasing approach that prioritizes environmental sustainability, by selecting raw materials that reduce waste, promote recycling and reuse, minimize resource consumption, and utilize eco-friendly materials (Sugandini, Muafi, Susilowati, Siswanti, & Syafri, 2020). Green purchasing aims to accomplish this by setting environmental criteria for purchased items, collaborating with suppliers to meet environmental goals, evaluating suppliers based on their environmental performance, verifying ISO 14000 certification, and performing environmental audits of suppliers' internal management systems (Çankaya and Sezen, 2019). Green purchasing also encompasses the provision of design specifications to suppliers that integrate environmental criteria for the items being procured. This ensures that the products acquired are free from hazardous substances, such as lead. Additionally, it involves selecting suppliers who hold ISO 14001 certification, evaluating their internal management practices for adherence to environmental standards, and mandating the use of eco-friendly packaging (Sarwara, Zafar, Hamza, and Qadir, 2021).

In a study conducted by Mutisya and Kinoti (2017) on the impact of green purchasing on performance the results showed that the purchase of recyclable products, energy-saving equipment, and eco-design products had a positive effect. Green purchasing refers to an organizational approach that focuses on acquiring raw materials for production while taking environmental criteria into account (Abdel-Baset, Changi & Gamal, 2019). According to Lee (2019), organizations that adopt green purchasing practices can select products and services from suppliers that are less detrimental to the environment. The authors further emphasize the importance of engaging potential suppliers during the initial stages of raw material procurement to prevent the acquisition of harmful materials that could adversely affect the environment (Altaf, Ali & Weber, 2020; Neramballi, Sequeira, Rydell, Vestini & Ibarra, 2017).Furthermore, Singh and Chan (2022), technology such as e-procurement can enhance firms' performance through electronic reverse auctions, tendering, sourcing, ordering, and providing real-time, speed, and transparency.

Green Distribution

Green distribution refers to sustainable distribution practices that aim to reduce carbon emissions, are economically feasible and contribute to a better quality of life for future generations. These practices can range from using eco-friendly transportation and packaging, to promoting transparency regarding environmental impact and distribution practices (Deqqaq & Abouabdellah, 2016). Little, Hester and Carey (2016) suggest that green distribution involves eco-labeling of

products, environmentally friendly transportation, and green packaging. Enhancements in sustainable packaging involve the adoption of lightweight, recyclable, reusable, and biodegradable materials, while also eliminating non-ecological substances (Ragheb, El-Shimy & Raghe, 2016). Additional elements of sustainable distribution encompass minimizing packaging materials, employing eco-friendly options for primary packaging, utilizing reusable containers for logistics, opting for cleaner transportation methods, prioritizing significant shipment consolidation, and optimizing vehicle loading (Zhang, Zhang, Wang & Ma, 2020).

Achuora (2018) found that green distribution practices such as environmentally friendly transportation and packaging, eco-labeling of products, providing information to consumers on eco-friendly products, recycling and reusing packages, and proper disposal through package collection have a positive influence on firms' performance. Hutomo, Haizam and Sinaga (2018) suggest that essential green distribution practices include using packaging material that is lightweight, recyclable, and biodegradable, practicing eco green labeling, and using environmentally friendly transportation. Mutisya & Kinoti (2017) recommend efficient use of storage facilities and minimal material handling, storage of a variety of categories, and efficient use of warehouse space and trailers. Lu-Yi and Ling-Yun (2017) suggest walking or cycling as better transport modes, using sustainable energy sources for powering preservation equipment, and adopting energy storage techniques. Yusuf (2020) recommends proper utilization of storage space, reduction of material handling, product compatibility based on lifecycle assessment analysis, standardization, and re-use of packaging materials, eco-labeling, and consideration of fuel cost before selecting the mode of transportation. Mwaura, Letting, Ithinji and Orwa (2016) studied green distribution in the food industry and suggested biodegradable packaging materials, adoption of technology for facilitating transactions, green labeling of products in transit, efficient transportation, minimal handling for safety, and proper storage layout and arrangements. Zhang *et al.,* (2020) suggest minimizing the use of packaging materials by opting for ecological materials for primary packaging, utilizing reusable packaging and containers in logistics, choosing cleaner transportation methods, and taking into account the importance of shipment consolidation and full vehicle loading.

Green Manufacturing

Green manufacturing involves using efficient and appropriate materials in production to reduce negative environmental impacts. It is a critical initiative in supply chain management that aims to minimize or eliminate industrial pollution in the ecosystem. The adoption of green manufacturing can help improve operational efficiencies, protect the community, enhance environmental performance, and achieve economic benefits (Ghazilla *et al.,* 2015).

Manufacturing firms need to embrace sustainability in their operations by utilizing renewable resources and minimizing pollution. They face pressure to enhance productivity while ensuring environmental sustainability. By adopting green energy, processes, waste management, and

pollution reduction strategies, manufacturers can improve cost-effectiveness, corporate image, and reduce hazardous substance discharges. Green manufacturing can help optimize resources, improve reliability, and reduce pollution levels. It is essential for manufacturing firms to consider sustainability in their operations to reduce negative environmental impacts and achieve long-term success (Famiyeh *et al.,* 2018).

Efficient equipment and machine parameter controls should be designed to minimize waste through reworks and energy waste. When choosing raw materials for product manufacturing, designers should prioritize sustainability by selecting materials that are less harmful to the environment, minimize energy waste, and utilize green processes (Orji & Wei, 2016). Efficient processes use green energy, which minimizes resource waste and eliminates product rejects or rework. Such processes generate fewer undesirable wastes by reducing the production of solid wastes and greenhouse gas emissions (Rashid, Sakundarini & Thurasamy, 2017). End-of-life management is crucial in sustaining long-term ecological balance through recycling, re-use, and remanufacturing. By doing so, natural resources are protected from depletion while preventing environmental harm from materials disposal (Eltayeb, 2019).

A study conducted by Eshikumo and Odock (2017) revealed that green manufacturing significantly impacts operational performance through various factors such as process design, fuel substitution, energy-efficient management, and waste minimization. Rehman et al. (2016) also noted that green manufacturing reduces power consumption during product production, produces products free from hazardous substances such as lead, mercury, and chromium, employs eco-friendly equipment and processes, and manufactures products that reduce material and energy consumption during use.

According to Masau and Rucha's (2021) research, green manufacturing can positively impact a firm's performance by employing environmentally sustainable product design and development, utilizing green processes and products, practicing remanufacturing, conserving natural resources, using renewable and green energy, controlling emissions and discharges, and minimizing scrap and waste. Zhang *et al*. (2020) also note that green manufacturing can reduce noise pollution, substitute polluting materials and parts, optimize materials exploitation, and reduce energy and natural resource consumption in operations. Performance can be enhanced through green manufacturing by monitoring and controlling environmental pollution, reducing noise pollution, controlling hazardous substances, designing processes to minimize energy and resource consumption, recycling and reusing materials and components, and emphasizing proactive and preventative equipment maintenance (Sarwara et al., 2021).

Performance of Dairy Sector in Kenya

The dairy industry plays a crucial role in Kenya's Gross Domestic Product, contributing 4% and offering employment opportunities for approximately 1.2 million individuals, both directly and indirectly. However, the sector has faced challenges in recent years. A study conducted by

Mwangii and Gakobo (2018) indicated that while the annual turnover in milk processing firms rose by 10.83%, profitability declined by 7%. Additionally, inefficiencies have led to excessive inventories and increased logistics costs (Kenya Dairy Board, 2020). In 2019, milk processing firms experienced overstocking, resulting in some farmers pouring out their milk due to a lack of market and poor prices (Njuguna, 2019). The Kenya Dairy Board (2020) reported that although investment in milk coolers has created 3.4 million liters per day capacity, only 37% is being used. Despite an increase in milk intake by 7.25% in 2017 and 2018 and a further increase of 8.13% in 2019, milk products decreased by 7.71% in 2018 and 8.9% in 2019 (Kenya Dairy Board, 2020). Additionally, the demand for value-added products such as yogurt and fermented milk has increased, leading to a 12% decrease in fresh milk packaging over the past two years.

Ndungu and Murigi (2021) conducted a study on supply chain management practices in the dairy industry and found that financial, market, and operational factors affect performance. Chirchir and Onseria (2018) investigated logistics practices and their impact on the performance of dairy firms in Kenya, revealing that profitability, growth, market share, and customer satisfaction are key factors influencing performance. Similarly, Mwangi and Gakobo (2018) measured performance in terms of profitability, market share, branches, and annual turnover, while Joto and Odock (2019) used sales volume and profitability as metrics. Ella and Ndeto (2021) identified sales volume, profitability, and market share as key performance indicators for supply chain performance in the dairy industry. Berut, Namusonge, and Nambuswa emphasized that market share, customer satisfaction, profitability, and competitive advantage significantly influence the performance of dairy firms in Kenya. This study seeks to address a gap in the literature by analyzing the performance of dairy firms in Kenya through the application of the SCOR model.

Research Methodology

Research Design

Research design serves as the framework for the collection, measurement, and analysis of data, thereby offering insights into the methodology of conducting research (Chilisa, 2019). This study employed a descriptive research design. Descriptive research is characterized as a research design that delineates the attributes of the population or phenomenon under investigation (Siedlecki, 2020).

Target Population

A population is a clearly defined and comprehensive collection of individuals, objects, or events that exhibit certain common observable traits (Gray, 2019). The target population pertains to a particular subset of individuals or a specific segment of the overall population that possesses shared characteristics, which the researcher is interested in for the purpose of drawing generalized conclusions (Lohr, 2019).The target population comprises 34 senior supply chain managers from

dairy industry in Kenya. Unit of observation was dairy manufacturing firms while unit of analysis was senior supply chain managers from dairy firms in Kenya.

Sampling Technique

A sample is a small part or portion of the research population intended to show what the whole is like (Mason, 2017). However, in this study; the researcher will apply census method. Census is the method of statistical enumeration where the researcher collects the data for each and every unit of the universe or population. Census is critical because it provides intensive and in-depth information covering many facets of the problem under investigation (Kordos, 2017). Besides, results and conclusions generated by census are more accurate and reliable by virtue of taking every item of the universe into account (Hair,*et al,* 2019).These will contribute greatly in making the objective of the study achievable.

Research Instrument

Data collection instruments denotes questionnaires, rating scales, tests and interview schedules or guides; which are used to collect information on substantially identical items from respondents (Canals, 2017). In this study, the researcher employed semi-structured, self-administering questionnaire in collecting data. Questionnaires were utilized to gather data from respondents through a series of questions and other prompts established by the researcher (Krosnick, 2018). The questionnaires were dropped and respondent given ample time to fill then picked after elapse of agreed timeframe, those who did not meet dead line period was extended.

Pilot Testing

Pilot testing is a small-scale trial run or small preliminary study conducted on data collection instruments with the aim of establishing their validity and reliability (Jensen, 2017). A pilot study of 10% of the target population was done to test validity and reliability and these firms were excluded from final data analysis.

Validity of Research Instrument

Validity is the accuracy or degree to which data collection instruments accurately measures or represents the traits that the researcher wishes to measure as defined in the analysis of phenomenon under study (Rahi, 2017). Content validity refers to the extent to which the content of a measurement instrument, such as a questionnaire or test, encompasses the entire domain it aims to assess. To establish content validity, the items within the questionnaire must be pertinent and representative of the construct being evaluated. Additionally, the design of the questionnaire should be informed by a comprehensive review of existing literature and consultations with subject matter experts.

Construct validity, on the other hand, is the degree to which a test measures the construct it is intended to measure. It involves examining the relationship between the scores on a test and other

variables that are expected to be related to the construct. This can be done using statistical methods such as factor analysis, which helps to identify the underlying factors that contribute to the construct being measured. In this study, experts in the field of supply chain management were consulted to determine the appropriateness of the objectives to the study. This is a good way to establish the construct validity of the study, as it helps to ensure that the objectives are relevant to the construct being measured.

Reliability of Research Instrument

Reliability is the extent or degree to which data collected are reproducible (Rahi, 2017). This is experienced when questions on a survey, for instance, produces the same response repeatedly (regardless of when the survey is administered). Cronbach Alpha and alpha threshold value of 70% was adopted due to the fact that alpha threshold value of 0.7 is regarded as the most reliable (Nguyen & Nguyen, 2017)

Data Analysis and Presentation

Data analysis involves using different methods to examine and interpret data to gain insights and make decisions. Descriptive statistics and inferential statistics were are employed. And SPSS is a statistical software that was used to process data (Gray, 2019). Data processing involves a series of steps to clean, transform, and prepare the data for analysis. This includes verifying the accuracy and completeness of the data, organizing it into a structured format, and transforming it to make it suitable for analysis. Data processing is an essential step in data analysis as the accuracy and quality of the results depend on the quality of the processed data (Kumar, 2018). Data presentation is the final step in data analysis, where the results are presented in a way that is easy to understand and interpret. This may include tables, graphs, and charts, which help to visualize the patterns and relationships in the data. Effective data presentation is important in communicating the results of the analysis to others, and it can help to support decision-making processes (Merriam & Grenier, 2019). The research employed multiple regression analysis as shown below.

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(i)}$$

Where by: -

Y= Dependent variable (Performance of Dairy Firms

βo = Constant (Co-Efficient of Intercept)

X_1=Independent Variable (Green purchasing)

X_2= Independent Variable (Green distribution)

X_3= Independent Variable (Green manufacturing)

$\beta_{1-}\beta_4$ = Regression Co-Efficient for each Independent Variable

ε =Random or Stochastic Term

RESEARCH FINDINGS AND DISCUSSION

Response Rate

The study involved 34 participants who were each given a questionnaire to complete. Out of the 34 questionnaires, 33 were fully completed and returned, resulting in a response rate of 97%. This response rate is considered suitable for making inferences from the collected data. Chilisa (2019) stated that a response rate above 50% is adequate for data analysis and reporting, while a response rate above 70% is classified as excellent. Therefore, the response rate in this study falls within the acceptable range for drawing conclusions and making recommendations.

Descriptive Statistics

Green Purchasing and Firm Performance

The first specific objective of the study was to evaluate the effect of green purchasing on performance of dairy manufacturing firms in Kenya. The participants were requested to rate various statements relating to green purchasing and performance of dairy manufacturing firms in Kenya. The results were as shown on Table 4.1 presents the findings indicating that respondents concurred on the impact of green purchasing on firm performance, as evidenced by a mean score of 3.955 (standard deviation = 0.850). Furthermore, a mean score of 3.917 (standard deviation = 0.658) reflects the respondents' agreement that certified products are integral to green purchasing within their organization. Additionally, the respondents expressed satisfaction with the effectiveness of green purchasing in their firm, demonstrated by a mean score of 3.837 (standard deviation = 0.974). The respondents also acknowledged that the whole life cost of equipment affects firm performance, as indicated by a mean score of 3.824 (standard deviation = 0.928). Lastly, a mean score of 3.751 (standard deviation = 0.862) shows that respondents agreed that the procurement of natural materials influences firm performance.

Table 1: Green Purchasing and Firm Performance

	Mean	Std. Dev
Green purchasing influences firm performance	3.955	0.850
Certified products is part of green purchasing in our organization	3.917	0.658
Am satisfied with the effectiveness of green purchasing in our firm	3.837	0.974
Whole life-cost of equipment influences firm performance	3.824	0.928
Procuring of natural materials influence firm performance	3.751	0.862
Aggregate	**3.892**	**0.883**

Green Distribution and Firm Performance

The second specific objective of the study was to determine the effect of green distribution on performance of dairy manufacturing firms in Kenya. The participants were requested to rate various statements relating to green distribution and performance of dairy manufacturing firms in Kenya. The findings are presented in Table 4.2. The respondents indicated their agreement that green distribution has a significant impact on firm performance, as evidenced by a mean score of 4.118 (standard deviation = 1.064). Furthermore, a mean score of 3.979 (standard deviation = 1.158) reflects the respondents' consensus that packaging is a component of green distribution within their organization. Additionally, the respondents expressed satisfaction with the effectiveness of green distribution in their firm, demonstrated by a mean score of 3.955 (standard deviation = 0.902). The respondents also concurred that storage affects firm performance, as indicated by a mean score of 3.888 (standard deviation = 1.010). Lastly, with a mean score of 3.830 (standard deviation = 0.935), the respondents agreed that the transportation of materials influences firm performance.

Table 2: Green Distribution and Firm Performance

	Mean	Std. Dev
Green distribution influences firm performance	4.118	1.064
Packaging is part of green distribution in our organization	3.979	1.158
Am satisfied with the effectiveness of green distribution in our firm	3.955	0.902
Storage influences firm performance	3.888	1.010
Transportation of materials influence firm performance	3.830	0.935
Aggregate	**3.854**	**1.013**

Green Manufacturing and Firm Performance

The third specific objective of the study was to find out the effect of green manufacturing on performance of dairy manufacturing firms in Kenya. The participants were requested to rate various statements relating to green manufacturing and performance of dairy manufacturing firms in Kenya. The findings are presented in Table 4.3 The data indicates that the respondents concurred on the impact of green manufacturing on firm performance, as evidenced by a mean score of 4.270 (standard deviation = 0.984). Furthermore, a mean score of 4.109 (standard deviation = 0.859) reflects the respondents' agreement that energy consumption is a consideration within green manufacturing practices in their organizations. Additionally, the respondents expressed satisfaction with the effectiveness of green manufacturing in their firms, demonstrated by a mean score of 3.927 (standard deviation = 0.935). The respondents also acknowledged that waste

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management plays a role in influencing firm performance, as indicated by a mean score of 3.888 (standard deviation = 0.928). Lastly, with a mean score of 3.833 (standard deviation = 0.751), the respondents agreed that eco-design affects firm performance.

Table 3: Green Manufacturing and Firm Performance

	Mean	Std. Dev
Green manufacturing influences firm performance	4.270	0.984
In our organization, energy consumption is considered under green manufacturing	4.109	0.859
Am satisfied with the effectiveness of green manufacturing in our firm	3.927	0.935
Waste management influences firm performance	3.888	0.928
Eco-design influence firm performance	3.833	0.751
Aggregate	**3.835**	**0.251**

Performance of Manufacturing Firms in Kenya

The participants were requested to rate various statements relating to performance of dairy manufacturing firms in Kenya. The results are presented in Table 4.4. According to the findings, the respondents concurred that reliability has an impact on firm performance, as evidenced by a mean score of 3.921 (standard deviation = 0.858). Additionally, a mean score of 3.855 (standard deviation = 0.802) indicates that the respondents also agreed that agility affects firm performance. Furthermore, the respondents acknowledged that cost influences firm performance, demonstrated by a mean score of 3.788 (standard deviation = 0.710).

Table 4: Firm Performance

Statements	Mean	Std. Dev
Show your level of agree on whether reliability have an effect on performance	3.921	0.858
Show your level of agree on whether agility has an effect on performance	3.855	0.802
Show your level of agree on whether cost has an effect on performance	3.788	0.710
Aggregate	**3.838**	**0.798**

Inferential Statistics

Inferential statistics primarily concentrate on correlation and regression analysis. Correlation analysis was employed to assess the strength of the relationship, whereas regression analysis was utilized to explore the relationship between the dependent variable, which is the performance of dairy manufacturing firms in Kenya, and the independent variables, namely green purchasing, green distribution, and green manufacturing.

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (green purchasing, green distribution and green manufacturing) and (performance of dairy manufacturing firms in Kenya) dependent variable.

Table 5: Correlation Coefficients

		Firm Performance	Green Purchasing	Green Distribution	Green Manufacturing
Firm Performance	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	33			
Green Purchasing	Pearson Correlation	.888**	1		
	Sig. (2-tailed)	.000			
	N	33	33		
Green Distribution	Pearson Correlation	.764**	.294	1	
	Sig. (2-tailed)	.002	.089		
	N	33	33	33	
Green Manufacturing	Pearson Correlation	.788**	.314	.315	1
	Sig. (2-tailed)	.001	.041	.040	
	N	33	33	33	33

The results indicate a very strong correlation between green purchasing and the performance of manufacturing firms in Kenya (r = 0.888, p-value = 0.000). This relationship is deemed significant, as the p-value of 0.000 is less than the 0.05 significance level. These findings align with the research conducted by Sarwar, Zafar, Hamza, and Qadir (2021), which also identified a robust relationship between green purchasing and firm performance.

Additionally, the findings demonstrate a very strong correlation between green distribution and the performance of manufacturing firms in Kenya (r = 0.764, p-value = 0.002). This relationship is significant, given that the p-value of 0.002 is below the 0.05 threshold. These results are consistent with the work of Hutomo, Haizami, and Sinaga (2018), which similarly found a strong relationship between green distribution and firm performance.

Furthermore, the findings reveal a very strong correlation between green manufacturing and the performance of manufacturing firms in Kenya (r = 0.788, p-value = 0.001). This relationship is significant, as the p-value of 0.001 is less than 0.05. These results corroborate the findings of Rehman et al. (2016), which also identified a strong relationship between green manufacturing and firm performance.

Regression Analysis

Multivariate regression analysis was used to assess the relationship betweenindependent variables (green purchasing, green distribution and green manufacturing) and (performance of manufacturing firms in Kenya) dependent variable.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.938	0.879	0.880	0.06184

The model summary was used to explain the variation in the dependent variable that   could   be explained by the independent variables. The r-squared for the relationship   between   the independent variables and the dependent variable was 0.879. This indicates that 87.9% of the variation in the dependent variable (performance of dairy manufacturing firms in Kenya) can be accounted for by the independent variables (green purchasing, green distribution, and green manufacturing).

Table 7: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.294	3	4.823	1236.67	.000
	Residual	.943	30	.0039		
	Total	20.237	33			

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 1236.67 while the F critical was 2.410. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05,the model was considered as a good fit for the data. Henceforth, it can be used to predict the influence of green purchasing, green distribution and green manufacturing on performance of dairy manufacturing firms in Kenya.

Table 8: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	**(Constant)**	0.250	0.077		3.246	0.001
	Green Purchasing	0.258	0.076	0.260	3.395	0.002
	Green Distribution	0.379	0.09	0.381	4.211	0.001
	Green Manufacturing	0.332	0.068	0.333	4.882	0.000

The regression model was as follows:

$$Y = 0.250 + 0.258X_1 + 0.379X_2 + 0.332X_3 + \varepsilon$$

The results indicate that green purchasing has a significant impact on the performance of manufacturing firms in Kenya, with a coefficient of $\beta1=0.258$ and a p-value of 0.002. This relationship is deemed significant as the p-value is less than the threshold of 0.05. These findings align with the research conducted by Sarwar, Zafar, Hamza, and Qadiri (2021), which also identified a very strong correlation between green purchasing and firm performance.

Additionally, the results demonstrate that green distribution significantly affects the performance of manufacturing firms in Kenya, with a coefficient of $\beta1=0.379$ and a p-value of 0.001. This relationship is considered significant since the p-value is below the 0.05 level. These findings are

consistent with the work of Hutomo, Haizami, and Sinaga (2018), which also highlighted a very strong relationship between green distribution and firm performance.

The results further indicated that green manufacturing has a substantial impact on the performance of dairy manufacturing firms in Kenya ($\beta1$=0.332, p-value=0.000). This relationship is deemed significant as the p-value of 0.000 is lower than the established significance level of 0.05. These findings align with the conclusions drawn by Rehman *et al.* (2016), which suggest a robust correlation between green manufacturing practices and firm performance.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Conclusions

The study concludes that there was a very strong relationship between green purchasing and performance of dairy manufacturing firms in Kenya. Findings revealed that certified products, whole life-cost of equipment and procuring natural materials influences firm performance

In addition, the study concludes that there was a very strong relationship between green distribution and performance of dairy manufacturing firms in Kenya. Findings revealed that packaging, transportation and storage influences firm performance

The study concludes that there exists a very strong correlation between green manufacturing practices and the performance of dairy manufacturing firms in Kenya. The findings indicate that factors such as energy consumption, waste management, and eco-design significantly impact firm performance.

Recommendations

The research identified a robust relationship between green purchasing and the performance of dairy manufacturing firms in Kenya. Consequently, it is recommended that the management of these firms consider ISO-certified products, the total life-cycle costs of equipment, supplier partnerships, and the procurement of natural materials when engaging in green purchasing.

Furthermore, the study found a strong relationship between green distribution and the performance of dairy manufacturing firms in Kenya. Therefore, it is advised that the management of these firms take into account the use of biodegradable packaging materials, control of vehicle emissions, effective vehicle scheduling and routing, optimal utilization of storage space, and the incorporation of natural energy sources in storage facilities during green distribution.

Further, the study found that there was a very strong relationship between green manufacturing and performance of dairy manufacturing firms in Kenya. This study therefore recommends that the management of dairy manufacturing firms in Kenya should adopt use of natural energy like wind and biomass, waste management by adopting lean inventory like Just-in -time, lean manufacturing by ensuring end product is used, elimination of noise and pollution, proactive

servicing and maintenance of equipment's and eco-design products when dealing with green manufacturing.

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