

# Relationship between Green Supply Chain Practices and Sustainability of Tea Factories in Nyeri County, Kenya

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**Abstract:** The adoption of green supply chain management system is becoming more acceptable in most of the organizations. Despite the large number of businesses that understand the importance of Green Supply Chain Management in the wake of increasing environmental pollution, the number of firms that actually engage in such practices is significantly lower than expected and its Sustainability is low. The study's main objective was to establish the relationship between green supply chain practices and sustainability of tea factories in Nyeri County, Kenya. The study specifically aimed to: determine the influence of reverse logistics and to establish the influence of green procurement on sustainability in tea factories in Kenya. This study was based on Supply Chain Management Theory. The study adopted a descriptive research design and the target population was a total of 64 management staff working in 5 Tea factories in Nyeri County, Kenya. The study applied purposive sampling technique to select; 1 functional manager, 6 supervisors, 5 sectional heads and 1 management trainee per each factory. The main data collection instruments were the questionnaires containing both open ended and close ended questions with the quantitative section of the instrument utilizing both a nominal and a Likert-type scale format. Descriptive statistics data analysis method, inferential statistical tools such as correlation and linear regression was used to determine and explain variable relationship using Statically Package for Social Sciences version 23. Study findings revealed that the factories are using green packaging practices, factories use eco-designs packaging materials for the products it produces and tea factory observes packaging re-cycle after procuring goods. The tea factory observes packaging re-use after procuring and they are using materials that can be recycled after use. However, company does not use materials that can be recycled and factories may be using some approved while others are using unproved materials. There is need to ensure that factories uses green procurement selection. There is need to use materials that not harmful to the environment. The factories should collaborate with suppliers to meet the environmental problems.

**Key words:** *Green Supply Chain, Practices, Sustainability, Reverse Logistics, Green Procurement*

## I. Background of the Study

Sustainability is a global issue in today's world of business; firms therefore have to be careful about environmental issues in order to maintain a good image in today's competitive environment (Tang *et al.*, 2018). Khan *et al.*,(2020) argued that businesses should give more focus to green supply chain management (GSCM) for a better and sustainable environment. Thus, it has become more challenging for firms to deal with several internal and external changes at the same time. GSCM is referred to as an incorporation of environment-friendly initiatives into every aspect of the supply chain encompassing sourcing, product design and development, manufacturing, transportation, packaging, storage, retrieval, disposal, and post-sales services including end-of-product life management (Choi *et al.*,2017).

Laari, Ojala and Töyli (2017) state that environmental performance could improve the organisation's image and performance, stakeholder relationships, cost saving, offer better quality products and service to customers. Consequently, the implementation of green supply chain management practices can reduce operational costs and prevent the organisation from being penalised for not following environmental regulations (Bu, Dang, Wang & Liu 2020; Epoh & Mafini 2018; Kazancoglu, Kazancoglu & Sagnak 2018). According to Lee (2019), supply chain performance can be enhanced through green practices, which, ultimately, increase sales and reduce operational costs. In summary, supply chain performance outcomes signify the positive effects of green supply chain management practices by organisations (Dragomir 2018).

The importance of GSCM has been growing over years, most organizations are investing in green supply chain initiatives to beat market competition and build brand image. Some of the green supply chain initiatives are green procurement, reverse logistics, customer cooperation on environmental initiatives, investment recovery and eco-design, internal environmental management, environment management system adoption such as ISO 14001, green manufacturing and packaging, environmental participation, green marketing, green suppliers, energy conservation and environmental collaboration with suppliers and customers (Jasneet *et al.*, 2018).

The goal of green supply chain management is to minimize damage to resources and the environment within which enterprises operate, with regard to the supply chain, while pursuing economic benefits, in order to meet the sustainable development of societies (Wenhao *et al.*, 2020). GSCM is referred to as an incorporation of environment- friendly initiatives into every aspect of supply chain activities encompassing sourcing, product design and development, manufacturing, transportation, packaging, storage, retrieval, disposal, and post-sales services, including end-of-product life management (Choi 2017).

Effective methods have been proposed to tackle environmental problems. These methods have transformed environmental management from merely the end-of-pipe control and waste treatment (Handfield, Sroufe, & Walton, 2005) to "close the loop" by including the reuse, remanufacturing, and recycling of products and materials (Chin-Chun, Keah, Zailani, & Vaidyanathan, 2013). Therefore, firms have to change from a conventional environmental management paradigm to the more extensive approach of reducing pollution through handling its source at individual stages of the product life cycle (for example, extraction of raw material, transportation, manufacturing, product use, recycling, and disposal) (Matos & Hall, 2007).

A study in South Africa by Epoh & Mafini (2018), analysed the relationship between green supply chain management, environmental performance and supply chain performance. The study findings indicated mixed outcomes: no relationships were found between environmental performance and two green supply chain dimensions, namely green procurement and eco-design. However, the remaining dimensions of green supply chain management, namely reverse logistics and legislation and regulation, positively and significantly predicted environmental performance. In turn, environmental performance positively and significantly predicted supply chain performance

According to Jassim *et al.* (2020), collaborating with suppliers can lower environmental impact by purchasing green and recyclable materials from them. Yu, Zhang and Huo (2017) argue that collaborating with suppliers can also help solve environmental issues and improve environmental performance. A study conducted by Al-Ghwayeen and Abdallah (2018) investigated the impact of green supply chain practices on green performance and reveal that green purchasing is positively related to environmental performance. Finally, De Sousa Jabbour, Vazquez-Brust, Jabbour and Latan (2017) assert that green purchasing and environmental performance are related.

## II. Tea Factories in Kenya

According to, Hakizimana, *et. al.*, (2017), agriculture is the main sector in the Kenyan economy. The sector accounts for about 24% of Kenya's Gross Domestic Product, with approximately 75% of the population depending on it, Export Processing Zones. In 2014, exported foodstuffs represent USD2.59 billion, 52% of all exports and 4% of total Kenyan GDP. Tea exports made up 30% of the value of food-related exports, USD 787 million (Center for International Development at Harvard University, 2016; World Bank, 2016). Tea is one of the top foreign exchange earners in Kenya alongside horticulture, coffee and tourism. The tea firms are managed by KTDA through contractual agreements intended to ensure efficient production, processing and marketing. Kenya Tea Development Agency (KTDA) was formed on the privatization of Kenya Tea Development Authority in June 2000. It took over the assets; liabilities and the mandate of the Authority. The new terms applying to the Agency are contractual agreement with the independent tea factory companies it manages. Kenya Tea Development Agency Holdings provides comprehensive services to small tea farmers such as agri-extension, transportation, processing, and marketing. It has six subsidiaries including the KTDA Management Services Limited which oversees 54 companies that collectively own 66 tea processing factories in which small farmers are shareholders (KTDA, Corporate Communication Department, 2018).

KTDA was created following the privatization of the parastatal Kenya Tea Development Authority in 2000. The Agency is contracted by the tea factory companies to; manage tea cultivation, develop and maintain tea husbandry, collect, weigh, handle and pay farmers for green leaf delivered. It is further mandated to manufacture green leaf into tea, market the manufactured tea, provide services in procurement, Information and Communication Technology (ICT) and human resource (HR) as well as develop and provide sound technical, financial and managerial infrastructure. KTDA, through its subsidiaries, also engages in buying, bulk packing, and selling tea to local and international destinations and customers; provides insurance services to the general public; and exports packed tea to destinations around the world (KTDA, Corporate Communication Department, 2018).

The performance of the tea industry is vital to the Kenyan economy. Tea is the largest foreign exchange earner in the country, contributing over Ksh114 billion (\$1.1 billion) in 2015, Ksh101 billion (\$1 billion) in 2016 and Ksh124 billion (\$1.2 billion) in 2017. More than 650,000 Kenyans earn a living directly from tea. Tea accounts for about 26 per cent of Kenya's export earnings, and 67 per cent of the volume of tea traded at the Tea Auction Centre in Mombasa. Despite the immense contribution tea production adds to the Kenyan economy, the sub-sector is grappling with increased costs of factor inputs, exemplified by the labour costs that have gone up an average of 200 per cent between 2001 and 2017. Though the government subsidised the cost of fertilisers in June 2015, it has not been sustainable and will not lower the cost of production. The cost of electricity has gone up 100 per cent and the cost of diesel has gone up 345 per cent. The increased labour costs could overburden the tea sector, making the business unsustainable (The Tea Board of Kenya, 2016).

In the year 2015 the group turnover increased from Kshs14.2 billion in the last financial year to Kshs18.3 billion this year an increase of 29% (KTDA 2015). In Year 2016, the group turnover increased from KShs 18.3 billion in the last financial year to KShs 24.8 billion this year, an increase of 35.5%. Profit before tax decreased from KShs 2.02 billion to KShs 1.44 billion. The significant increase in turnover was achieved through high tea trading activities boosted by higher tea prices (KTDA, 2016). In 2017, Group revenues were flat at Ksh 24.0 billion in the current year, while the profit before tax increased by 15% to Ksh 1.60 billion in the same period. The profit was negatively impacted by provisions for nonperforming debts in our trading companies as well as additional provisions for funds held in Imperial Bank and Chase Bank, both under receivership (KTDA, 2017).

In the year 2018, due to the improved profitability, the Board has proposed an increased dividend of Kshs 691.4 million compared to previous year's Kshs 382.5 million, an increase of 80.7%. The factories' total income increased by 9.5% to KShs 85.6 billion from KShs 78.31 billion previous year. The average cost of production went down by 0.8% from KShs 85.74 to KShs 85.09 per kg of made tea (KTDA, 2018). In the year 2020, the group revenues grew by 2.8% to Kshs 24.73 billion compared to Kshs 24.06 billion previous year, driven mainly by increased tea sales volumes. Increased tea production led to high stocks at the peak of Covid-

19 and exerted considerable pressure on working capital within the Group. The Board has proposed a dividend of Kshs 734 million compared to previous year's Kshs 683 million, a welcome performance in an otherwise very difficult year. Tea farmers were paid an average rate of Kshs 35.42 per kg of green leaf compared to Kshs 41.27 paid previous year. This was achieved from an unprecedented crop volume of 1.45 billion kilos of green leaf delivered by farmers. This translated to a total payment to farmers of Kshs 51.8 billion compared to Kshs 46 billion previous year, an increase of 12.6%. The total revenues this year were Kshs 79.0 billion compared to Kshs 69.8 billion previous year, a 13% increase (KTDA, 2020).

Green leaf produced across all factories decreased slightly from 1.18 billion kilogrammes the previous year to 1.13 billion kilogrammes in the year under review (KTDA, 2018/2019). Green leaf received by managed tea companies was processed into 268 million kilos of made tea down from 273 million kilos last year. A total of 270 million kilos of made tea was sold at an average of USD 2.59 per kilo compared to 269 million kilos at USD3.14 per kg last year. The factories' total income decreased by 18.5% to KShs 69.8 billion from KShs 85.6 billion last year attributed to the low tea prices. The average cost of production went up by 6.7% from KShs 83.4 to KShs 88.98 per kilo of made tea mainly driven by higher inflationary pressure, as well as increased provision for tax disputes currently in court. This resulted in the total payment to farmers decreasing by 25.5% from KShs 62.35 billion last year to KShs 46.45 billion in the year under review (KTDA, 2018/2019). The company recorded a turnover of Kshs 2.6 billion and an impressive profit before tax of Kshs 225.6 million this year (KTDA, 2018/2019).

The Group's profit for the year has increased from Kshs 1.84 billion to Kshs 2.07 billion. Increase in profit before tax by 13% is majorly driven by decreased cost of sales attributed to a decrease in cost of tea purchases in the year due to low demand of tea and lower cost of loose tea brought about by a decline in auction prices. In addition, the reduction in operating expenses also contributed to improved performance in the year. Revenue declined from Kshs 26 billion to Kshs 24 billion due to the following: Decrease in management fees recognized by KTDA Holdings (Company) and KTDA Management services. This is due to a 18% drop in tea prices in the year from an average of USD 3.14/kg in 2018 to USD 2.59/kg in 2019. Revenue from sale of loose tea reduced by 9% due to similar reasons. Decrease in demand from major market in Pakistan (KTDA, 2018/2019).

After registering a considerable decline in financial performance from 2014 onwards, profit margins and debt coverage indicators for bulk tea players went considerably down in 2016 and 2017 especially for players operating in relatively higher quality tea segments. In addition, increased production, which, in turn, results in better absorption of fixed costs, together with input tax credit, is also likely to support performance. However, the overall improvement would be limited by continued costs pressures, mainly on account of increasing wage rates and this has affected the general performance of the KTDA managed tea factories.

The tea industry therefore has a direct impact on rural poverty and any decline in its performance will lead to increased poverty in the tea growing regions and in the overall economy and thus proper supply chain management practices at KTDA factories affects performance and thus need for this study to establish influence of green supply chain practices on sustainability of supply chain performance in tea factories in Nyeri County, Kenya.

### **III. Statement of the Problem**

The adoption of green supply chain management system is becoming more acceptable in most of the organizations. Despite the large number of businesses that understand the importance of Green Supply Chain Management in the wake of increasing environmental pollution, the number of firms that actually engage in such practices is significantly lower. The need to improve organizational efficiency, reduce waste, overcome supply chain risk, and achieve competitive position has made companies in Kenya to start considering environmental issues from a competitive view point. Many Tea processing companies' activities in Kenya just like many other manufacturing firms in across the world have faced environmental challenges such as hazardous waste, that is, waste disposal of the products by the consumers; need to reduce carbon dioxide emissions. To enhance environmental conservation, tea processing firms have adopted green initiatives such as green supplier

selection, green manufacturing, reverse logistics and green distribution. However, in spite of the efforts, many environmentalists have complained about the sustainable utilization of natural resources and diminishing land fertility, deforestation and all pollution (Amemba et al, 2013).

Most companies are annually losing billions on cost related to supply chain management. This is due to goods returned, the environmentally harmful products, poor packaging and a lot of wastage incurred in the procurement process (give citation to this). Past research support that the statistics of organizations in Kenya has been affected by use of obsolete supply chain management practices and technologies with poor state of physical infrastructure, limited research and development, poor institutional framework, and inadequate supply chain innovation, technical, and entrepreneurial skills (ROK, 2014). Supply chain management in Kenya government ministries, is characterized by increased costs, untimely service delivery, delay in procurement of goods, works and services, poor quality goods and there is corruption and waste. During the financial year 2014/2015, a number of Ministries, Department and Commissions had funds incurred expenditure totaling Ksh 14, 435, 690, 489 of which value for money could not be established which amounts to wastages. Much of the wastages occurred in the course of procurement (Auditor General Report, Financial Year 2014/2015).

Previous studies in Kenya have not focused much on Green Supply Chain management. For instance, a research conducted by Kirop (2013) did a study on Green supply chain management in Kenya's Cement industry, it emerged that the institution lacked green supply chain practices. Mwale (2014) carried out a study on supply chain management practices and sustainability of large manufacturing firms in Nairobi which was limited to private sector. In another related study, Aura (2017) conducted a study on supply chain practices, reforms and performance in the Kenyan national government ministries. In another related study, Mwilu (2013) carried out a study on supply chain management practices and performance among public research institutions, Nabiswa (2012) studied on Green Procurement in the Public Sector and Ondieki (2012) carried out a research on Green Procurement Awareness in Kenya State Corporations. These researchers found out that green procurement practice among private and Kenyan state corporations is in the rise due to consumer demand awareness of green products; this study will be skewed to public research institution tea industries Studies have also indicated that, poor supply chain management in KTDA affects the performance of KTDA managed tea factories. This increases the cost of production and thus low return to farmers. This puts the future of tea industry at a risk. If nothing is done, the problem will grow Caroline (2013).

Despite the studies done, limited research has been done that relates green supply chain procurement to sustainability of Tea Factories in Kenya. This study seeks to fill the existing research gap by conducting a study to establish influence of green supply chain practices on sustainability in KTDA managed tea factories in Nyeri County, Kenya.

#### **IV. Supply Chain Management Theory**

Wilding and Juriado (2011) observe that cost reduction is the main motivation for logistics outsourcing. The supply chain management theory was proposed by Rao and Young in 2013. Rao & Young (2013) suggest that firms consider outsourcing of logistics to an external Logistics Services Provider (LSP) when logistics complexity is high. Welch and Nayak (2012) mentions that firms which outsource for operational and cost-based reasons will tend to restrict the Logistics Service Provider's involvement to the basic logistics functions. Therefore, an outsourcing decision might be influenced by a firm's supply chain characteristics, logistics complexity and demand uncertainty or logistics strategy. The theory supported the variable sustainability in terms of improving the supply chain efficiency since costs of reverse logistics would be reduced by adopting a strategy such as outsourcing of the logistics function and therefore this theory supports sustainability variable of outsourcing. However, the theory does not support other objectives but can only be applied in reverse logistics. Therefore, this study will apply this theory to reverse logistic and green procurement.

## V. METHODOLOGY

### Research Design

The study adopted a descriptive research design. The study considers this design appropriate since it facilitated obtaining information from few respondents in order to have a general view of the green supply in Tea Factories in Nyeri County, Kenya.

### Target Population

This study target population comprised of a total of 60 Staff comprising the CEO and the sectional heads in production, accounts, field, administration and operations and also the supervisors. The population were categorized as shown in table 1.

Table 1: Target Population

	Category	Target (Management Staff)	%(100)
1	Ragati Tea Factory Company Ltd	13	100
2	Iriaini Tea Factory	13	100
3	Gitugi Tea Factory	13	100
4	Gathuthi Tea Factory	13	100
5	Chinga Tea Factory	13	100
	<b>Total</b>	<b>64</b>	<b>100</b>

Source; Nyeri County, (2018) and KTDA (2011).

### Sample and Sampling Techniques

The sample frame of this study was the list of all 64 staff working in 5 Tea Factories in Nyeri County, Kenya. Purposive sampling was applied to select 100% of the respondents from each population subgroup/strata leading to a total of 70 management Staff; 1 functional manager, 6 supervisors, 5 sectional heads, 1 management trainees per each factory. The sample size of the study was thus 64 respondents as shown in table 2.

Table 2: Sample Size

	Category	Staffper (Factory)	Total for Five Factories	Sample Percentage (%)
1	Functional managers	1	5	100
2	Supervisors	6	30	100
3	Sectional heads	5	25	100
4	Management trainee	1	4	100
	Total	13	64	

Source; KTDA (2011).



### **Data Collection and Analysis**

The researcher used a questionnaire and data collection sheet to obtain primary data. A questionnaire is a data collection instrument that has a series of questions and other prompts whose purpose is to gather information from respondents. Cronbach's Alpha was used to test reliability of the proposed constructs in this study, management commitment had a coefficient of 0.846. Both qualitative and quantitative data analysis technique were used to analyze the data. Quantitative data collected was analyzed, presented and interpreted using both descriptive statistics while content analysis techniques was used to analyze qualitative data collected using interview schedules. Descriptive statistics such as frequencies and percentages were used to describe the data. The analyzed data was presented in form of tables, pie charts and bar graphs. Linear regression analysis was computed to establish the relationship between variables. Findings were presented using tables and figures.

## **VI. LITERATURE REVIEW**

### **Reverse Logistics and Sustainability**

Reverse logistics (RL) is a process of dealing with products and services that have been returned by customers to the company with the objective of worth creation, cost reduction and environmental protection (Govindan and Bouzon 2018). Implementation of RL practices can assist the manufacturers how to reduce their impact on world ecological system by lessening the effect of end-of-life goods on the atmosphere. Furthermore, the companies have been influenced by various constraints to implementing the RL practices.

Commonly, barriers and issues related to RL tend to be a forward step to bring sustainability within the industry (Govindan and Bouzon 2018) and all those manufacturing companies that protect and meet the environmental standard may confront various challenges in their operations. Though, in literature, very few studies identify the barriers to adoption of RL practices. Practices of RL includes many activities Such as, waste management, recycling, reusing, reprocess, material recovery and design for RL which can help any organizations to convert their opportunities into profit (Wang, Jiang et al. 2019). Therefore, adoption of RL practices have more potential for increasing the performance of RL and also add a greater impact on firms' economic performance (ECP) and environmental performance (ENP) in manufacturing industry. RL practices are the main drivers for application of sustainable development in manufacturing firms. Moreover, the research articles that provide the discussion of RL practices and barriers and drivers, focus on reverse logistics performance, product transformation and innovation.

According to (Kaviani, Tavana et al. 2020) RL barriers have significant positive impact on green product innovation and environmental performance, also influences the depletion of resources with tight environmental laws. Phochanikorn, Tan et al. (2020) empirically deducted top five barriers in his study to RL implementation in Thailand palm oil industry to reduced this industry impact on environment. (Waqas, Qianli et al. 2020) examined contextual relationship among 25 barriers of Pakistani manufacturing industry by applying MICMAC and interpretive structural modeling (ISM). On one hand, the barriers associated with RL practices can be recognized most related approach when developing sustainability within the firm (Prakash and Barua 2015). Moreover, it seems difficult to understand the barriers restraining the implementation of RL practices in manufacturing companies of developing countries like Pakistan (Govindan and Bouzon 2018). Although, the researchers have been discussing barriers, drivers, and motivational factors, opportunities are still available to develop the understanding with problems and issues to adoption of reverse logistics practices in manufacturing industry of developing countries especially in Pakistan.

Mogaka (2015) conducted a study on the Influence of Reverse Logistics Practices of returned new products on performance of Pharmaceutical Firms in Nairobi City County, Kenya. The research design was a descriptive cross-sectional research design. Data was collected using semi-structured questionnaires administered through emails and drop and pick later method. Relationship between reverse logistics and financial performance had an R2 of 0.61 implying that 61% of the variation in the financial performance was explained by reuse, recycle and landfill reverse logistics practices. The relationship between reverse logistics and market performance had an R2 of 0.781 implying that 78.1% of the variation in the market performance was explained by the reverse logistics practices. The studies conducted on the performance of pharmaceutical firms

but has not touched on the sustainability of tea factories on the issue of product returns, source reduction, recycling and material substitution hence the need for this study

### **Green Procurement and Sustainability**

Green purchasing is defined as an organisational process that involves the procurement of raw materials to be used in the production process, as well as taking into consideration the aspects concerning the environmental criteria (Abdel-Baset, Chang & Gamal 2019). According to Le (2019), organisations implementing green purchasing can carefully select products and services from the supplier that are less harmful to the environment. The authors further add that it is crucial to involve potential suppliers at the first stage of purchasing of raw materials. By involving the supplier at an early stage, the organisation can avoid purchasing harmful materials that can impact the environment (Altaf, Ali & Weber 2020; Neramballi, Sequeira, Rydell, Vestin & Ibarra 2017).

Mwaura et al, (2016), in a study titled; Green Distribution Practices and Competitiveness of Food Manufacturing Firms in Kenya, concluded that adoption of green distribution practices positively and significantly influences the competitiveness of Kenya's food manufacturing firms. Competitiveness was strongly and positively influenced by a company's redesign of its logistical systems components to increase efficiency in the delivery of goods ( $r = .514, P = .000$ ), competitiveness was positively and moderately influenced by use of IT which helped to increase market share, ( $r = 0.451, P = 0.000$ ), improve the company's financial position ( $r = 0.451, P = 0.000$ ), and also reduced the distribution costs green distribution ( $r = 0.228, P = 0.027$ ). An organization's use of local products to reduce transportation costs ( $r = 0.446, P = 0.000$ ), and the use of green label as an indicator of environmental friendliness ( $r = .393, P = 0.000$ ) also positively and significantly influenced firm competitiveness. The results indicate there was a positive but moderate relationship between green distribution and firm competitiveness. This results support the work of Ninlawan *et al.* (2010) and Amemba *et al.* (2013).

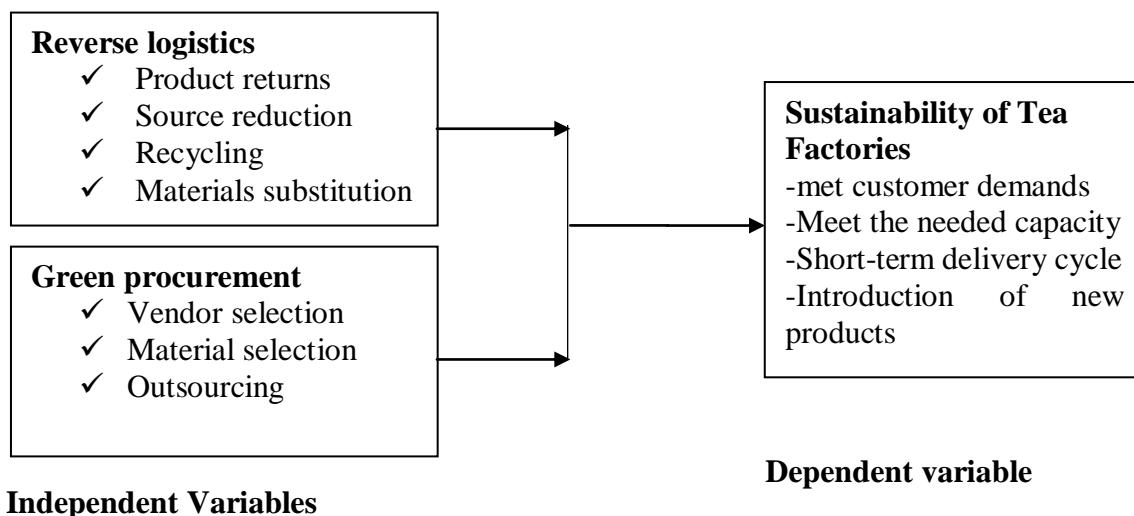
Khisa (2011) conducted a study on green procurement practices in the public sector: the case of parastatals in Kenya. This study surveyed all parastatals in Kenya with a questionnaire that targeted procurement managers. It found out that green procurement management practices were still low in the public sector in Kenya as most of the practices had a mean of 3 and 4. The mean scores indicated that there were eight factors which the respondents considered important drivers of green procurement. The results of descriptive analysis revealed that the major challenge was insufficient knowledge on concept of green procurement. The study also concludes that the most common driver of green procurement was environmental regulations while the least driver was pressure from shareholders. The study concludes that the most important challenge to the adoption of green procurement is insufficient knowledge on the concept of green procurement while the least challenge was financial resources. Consequently, the research recommended that with the global warming and environmental concerns from all sectors, there is need for the public sector organization in Kenya to adopt green procurement practices in order to help in the efforts to conserve the environment. Studies that have been done is on the public sector and very little on vendor selection, material selection and this is the reason the study is of importance since it adds value to the consumers and the tea factories.

### **Conceptual Framework**

Green Supply Chain Management (GSCM) has been proposed as a novel managerial action upon which firms are enabled to create sustainability in their manufacturing activities by minimizing environmental impact and enhancing ecological efficiency (Pietro, 2012). GSCM refers to all phases of supply chain management that needs to adhere to the environmental protection requirements (Wu, 2013) and can be broadly divided into intra- and inter-organisational environmental practices (Shi, Koh, Baldwin, & Cucchiella, 2012) that involves the cooperation among supply chain members (Flynn, Huo, & Zhao, 2010). Hence, a firm is basically a part of the supply chain and as such, they should not ignore the rest of the members' practices and as well as the expectations of the stakeholders (Alison, Mike, & Melanie, 2012). Such expectations are increasingly focused on environmentally and socially responsible principles and practice, and these dimensions



represented a key focus of the review of today’s business requisite (Alison et al., 2012). A conceptual framework describes the relationship between the research variables. Sekeran (2003) argues that a variable is a measurable characteristic that assumes different values among subjects.



**Figure 1.1 Conceptual Framework**

Source: Author 2019

Figure 1.1 shows the conceptual framework adopted by the research study. In the conceptual framework, the independent variables are; green procurement, reverse logistics, waste management system, green packaging and the dependent variable is sustainable supply chain performance.

## FINDINGS

### Response Rate

The study sought primary data from factories in Nyeri County, Kenya for the year 2022. For the study 60 out of 62 (96.7%) of the information targeted in the study was available from the respondents. This was a reliable response rate as indicated in Table 3.

**Table 3: Response Rate**

Response	Percentage
Number of Responses	60
Non-Response	2
<b>Total</b>	<b>60</b>

The total number of questionnaires that were distributed to the field was 52 and all of them were answered. In reference to Table 3, it can be inferred that there was good response rate since there was a 96.7% response

### Age Bracket

Age distribution of respondents was the main aim of the study, the findings revealed that most employees 59.6% as indicated in Table 4.6 were in the age bracket of above 45years, 15% were in the age of 39-42 years, 31.7% were in the age bracket of 35-38 years, 18.3%, 31-34 years, 31.7% and 27-30 years, 3.3% of the respondents as shown in table 4.

**Table 4: Respondents' Age Bracket**

Age Bracket	Frequency	Percent
27-30	2	3.3
31-34	19	31.7
35-38	11	18.3
39-42	19	31.7
Above 42	9	15.0
<b>Total</b>	<b>60</b>	<b>100.0</b>

#### **Distribution of Gender**

The researcher wanted to see how gender was represented in the supermarkets. From the research findings, the studies revealed that majority of the respondents as indicated in Table 4.3, 46.7% were male whereas 51.7% were female. This implies that respondents were fairly distributed in terms of their gender as shown in table 5.

**Table 5: Respondents Gender**

Sex of the Respondent	Frequency	Percent
Male	28	46.7
Female	31	51.7
No response	1	1.7
<b>Total</b>	<b>52</b>	<b>100</b>

**Source: Author Field Work 2022**

#### **Educational Background**

On respondents' highest level of education attained; the study revealed that majority of the respondents had a degree qualification (41.7%) followed by diploma with (33.3%) and masters 23.3% as can be seen in Table 6.

**Table 6: Education Background**

Education Background	Frequency	Percentage
Diploma	20	33.3
Degree	25	41.7
Masters	14	23.3
No response	1	1.7
<b>Total</b>	<b>60</b>	<b>100.0</b>

**Source: Author Field Work 2022**

#### **Effect of Reverse Logistics on Sustainability of Tea Factories**

The first objective of the study was to determine the effect of reverse logistics on sustainability of Tea Factories in Nyeri County, Kenya. The objective was tested on a scaled questionnaire. Table 7 below presents results which shows the frequencies and responses of the composite measures of reverse logistic practices. The respondents were requested to indicate whether the Tea Factory efficiently facilitates product returns to their suppliers and (78.3%) of them agreed that the factories efficiently facilitates product returns to their suppliers this was supported by mean of 4.1. Congruent to above Hong and Guo, (2019) found that but trading carefully

is still the mantra of most organizations. Cooperation with a supply chain may not bring benefits for some companies.

A significant majority (78.3%) agreed that the tea factory rationalizes its supply base (source reduction) in efforts to improve response time of the suppliers when returning goods with non-conformities, this was supported by mean of 3.91. The respondents were asked if the tea factory collaborates with its suppliers to ensure recycling of materials takes place and findings showed that majority (81.7%) and mean of 3.95 agreed that the tea factories collaborate with its suppliers to ensure recycling of materials takes place. In support, Reichert et al. (2020) agrees that while most consumers in Kenya found the re-use option of a packaging important it was interesting to see that only two processors thought that re-using of packaging is sustainable while at least four processors thought that recyclability of packaging is sustainable.

When asked if the tea factories ensure material substitution by replacing goods that may be harmful to the environment with the ones that don't impact the environment negatively majority of them (70%) and mean of 4.03 agreed that the factories ensure material substitution by replacing goods that may be harmful to the environment with the ones that don't impact the environment negatively. In general, three sustainability aspects of food packaging can be differentiated according to Pauer et al. (2019), these are: i) direct environmental effects of packaging, ii) circularity, and iii) packaging-related food losses and waste.

Study sought to establish if the tea factory undertakes waste collection for proper disposal or recovery of useful parts (80%) and mean 4.06 agreed that the factories undertake waste collection for proper disposal or recovery of useful parts. In support Giri et al., (2019) agrees that pressures from customers, regulators and competitors have caused companies to pay closer attention to how they manage their environmental impacts and eventually pursue environmental innovations.

Also when asked if the tea factory has reduced costs due to recycle/re-use according to results most of them (83.3%) and mean of 4.06 agreed that the tea factory has reduced costs due to recycle/re-use as shown in table 4.6. In general the findings had mean of 4.025 which implies that in regards to reverse logistics statements most of the respondents agreed with them. In support, Chen (2020), agreed that the most sustainable options were difficult to determine as that mainly depends on the number of times that packaging can be re-used. Packs that can be easily re-used after their primary use were popular among consumers. Interestingly, this was not mentioned as "sustainable", yet it was first of all simple, practical and cheap. Re-utilisation mainly included re-use of the pack by filling with other goods, to re-sell the used pack to people who are specialized in collecting them or to burn the pack as a fuel source for cooking. According to Ninlawan et al., (2016) concurs that green packaging involves downsized packaging and use of green packaging materials. They also point out the need to cooperate with vendors to standardize packaging, encourage and adopt returnable packaging methods, promote recycling and reuse of packaging materials. In support of this study results according to their research findings

**Table 7: Descriptive Statistics of Reverse Logistics on Sustainability of Tea Factories**

Key 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree

<b>Reverse Logistics</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Likert Mean</b>
The Tea Factory efficiently facilitates product returns to their suppliers	<b>Freq</b>			2	47	11	<b>4.1167</b>
	<b>%</b>			3.3	78.3	18.3	
The Tea Factory rationalizes its supply base (source reduction) in efforts to improve response time of the suppliers when returning goods with non-conformities	<b>Freq</b>			6	47	7	<b>3.9167</b>
	<b>%</b>			10	78.3	11.7	
The Tea Factory collaborates with its suppliers to ensure recycling of materials takes place	<b>Freq</b>		2	4	49	5	<b>3.9500</b>
	<b>%</b>		3.3	6.7	81.7	8.3	
The Tea Factory ensures material substitution by replacing goods that may be harmful to the environment with the ones that don't impact the environment negatively	<b>Freq</b>		4	2	42	12	<b>4.0333</b>
	<b>%</b>		6.7	3.3	70	20	
The tea factory undertakes waste collection for proper disposal or recovery of useful parts	<b>Freq</b>			4	48	8	<b>4.0667</b>
	<b>%</b>			6.7	80	13.3	
The tea factory has reduced costs due to recycle/re-use	<b>Freq</b>			2	50	8	<b>4.0667</b>
	<b>%</b>			3.3	83.3	13.3	
<b>Overall Mean</b>							<b>4.0250</b>

**Source: Author Field Work 2022**

### **Regression Model of Reverse Logistics**

The study obtained the model of reverse logistics and sustainability of Tea Factories and presented the results as shown in the Table 8. The regression model in the table shows R and R square values representing the correlation. The R was 0.765 and R square was 0.585. This means that about 58.5% of variation of sustainability of Tea Factories can be explained by the reverse logistics. The rest 41.5% could not be explain by this model but by other factors which could not be found in this model. The model indicates that reverse logistics explain significant of sustainability of Tea Factories. Other variables explain more on the relationship between green supply chain practices and sustainability of tea factories in Nyeri County, Kenya. In support Mohamed (2018) studied on green supply chain management and performance of manufacturing in Mombasa and noted that green supply chain management has a positive impact on manufacturing firms' performance. Ongombe (2012) looked at the relationship between reverse logistics and competitive advantage in water bottling companies in Nairobi. This study concluded that there was indeed a strong relationship between reverse logistics and competitive advantage. Companies that implemented reverse logistics practices benefitted from increased profit margins due to reduction in production costs and sales increase.

**Table 8: Model Summary of Reverse Logistics**

<b>Model Summary</b>											
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	R Square Change	F Change	df1	df2	Sig.	F Change
1	.765 <sup>a</sup>	.585	.578	.0471155	.585	81.827	1	58	.000		

a. Predictors: (Constant), Reverse logistics

**Source: Author Field Work 2022**

One-way analysis of variance (ANOVA) whose results formed the basis for test of hypothesis was used to determine if reverse logistics have any significant relationship between green supply chain practices and sustainability of tea factories in Nyeri County, Kenya. The F-statistic was 81.827, p-value of 0.000 this is indicated in Table 4.7. The p-value is 0.000 which is less than 0.05. This shows that the F-statistic is significant at 95% confidence interval. Therefore, the study rejected the null hypothesis that reverse logistics do not have a statistically significant effect on relationship between reverse logistics and sustainability of tea factories in Kenya. This was so because significance value of  $p=0.000 < 0.05$  as shown in Table 9. The alternative hypothesis that reverse logistics statistically significantly influences operational performance was accepted.

**Table 9:1ANOVA of Reverse logistics**

<b>ANOVA<sup>a</sup></b>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.182	1	.182	81.827	.000 <sup>b</sup>
	Residual	.129	58	.002		
	Total	.310	59			

a. Dependent Variable: Sustainability of Tea Factories

b. Predictors: (Constant), Reverse logistics

**Source: Author Field Work 2022**

#### **Regression Coefficients of Reverse logistics**

Analysis of regression model coefficients is as shown in Table 10. From this table, there is a negative beta co-efficient of -0.135 as can be seen from the co-efficient matrix with a p-value=  $0.000 < 0.05$ , and a constant of -0.191 with a p-value =  $0.000 < 0.05$  therefore, the constant contributes significantly to the model. Also, reverse logistics did contribute significantly to the model p-value  $.000 < 0.05$ , and a constant of 0.527. Hence, this model will provide the information needed to predict the relationship between green supply chain practices and sustainability of tea factories in Nyeri County, Kenya.



**Table 10: Regression Coefficient of Reverse logistics**

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	-.191	.038		-5.062	.000
	Reverse logistics	.527	.058	.765	9.046	.000

a. Dependent Variable: Sustainability of Tea Factories

Source: Author Field Work 2022

### Effect of Green Procurement on Sustainability of Tea Factories

The second objective of the study was to establish the effect of green procurement on sustainability of Tea Factories in Nyeri County, Kenya. The objective was tested on a scaled questionnaire. Table 11 presented the findings which shows the frequencies and responses of the composite measures of creditor's green procurement.

The respondents were requested to indicate whether the tea factory uses green procurement criteria in vendor selection appropriately (73.3%) of them supported the statement by agreeing and mean was 3.88. According to Odhiambo, (2008) many private firms in Kenya are working to improve the environmental performance of their operations and products and green procurement has been a logical extension of this work.

According to the study results most of the respondents (61.7%) of them were in agreement that tea factory does material selection to ensure materials selected are less harmful to the environment as supported further by mean of 4.216. In support Caniëls et al., (2016) found that environmental cooperation activities take place between the supply chain processes in terms of eco-design, environmental technology, green packaging, use of less energy during transportation of materials and goods, as well as effective support by management capacity enhancement such as environmental technology research and development. Green service support is an environmentally responsible practice that focuses on the use of environmentally friendly materials, conservation of materials, recycling, and energy efficiency (Wong et al. 2016).

When the respondents were asked whether tea factory outsources its procurement function most of them (81.7%) were in agreement that outsourcing is done as further supported by mean 4.183. further when asked whether the tea factory collaborates with supply base to meet environmental objectives most of them (80%) and mean of 3.9 were in agreement that indeed the tea factory collaborates with supply base to meet environmental objectives. Study also sought to establish whether factory undertakes joint decisions with supply base and from findings most of them (88.3%) agreed that indeed the tea factory undertakes joint decisions with supply base. In support, Pembere (2016) conducted a study to determine the effect of green purchasing practices on the supply chain performance of companies listed at the Nairobi Securities Exchange. The study adopted descriptive research design. The target population for the study was procurement managers of each listed company. The study used primary data. The findings of the study revealed that the adoption of green purchasing practices improves the supply chain performance

Also when asked to indicate whether factory works with supply base to address environmental problems and/or issues most of them (61.7%) and mean of 4.26 agreed that the factory works with supply base to address environmental problems and/or issues. Finally in general the study variables had average mean of 4.0833 which implies that the respondents were in agreement with majority of the questions asked as shown in table 4.10. in support Chang, Kenzhekhanuly and Park (2018) argue that poor environmental performance leads to poor company's relationship with its stakeholders. This will affect the firm's reputation and shareholders will suffer financial losses on their investments if a firm's is found liable to environmental damage. Consequently, shareholders and financial institutions perceive companies with a poor environmental record as riskier to invest

in and may demand a higher risk premium. Also companies with a poor reputation of environmental management will find it harder to attract and retain highly qualified employees who may have a strong proactive environmental management.

**Table 4.11: Descriptive Statistics of Green procurement Green Procurement on Sustainability of Tea Factories**

Key 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree

<b>Reverse Logistics</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Likert Mean</b>
The tea factory uses green procurement criteria in vendor selection appropriately	<b>Freq</b>		5	4	44	7	<b>3.8833</b>
	<b>%</b>		8.3	6.7	73.3	11.7	
The tea factory does material selection to ensure materials selected are less harmful to the environment	<b>Freq</b>			5	37	18	<b>4.2167</b>
	<b>%</b>			8.3	61.7	30	
The tea factory outsources its procurement function	<b>Freq</b>				49	11	<b>4.1833</b>
	<b>%</b>				81.7	18.3	
The tea factory collaborates with supply base to meet environmental objectives	<b>Freq</b>		6		48	6	<b>3.9000</b>
	<b>%</b>		10		80	10	
The factory undertakes joint decisions with supply base	<b>Freq</b>			2	53	5	<b>4.0500</b>
	<b>%</b>			3.3	88.3	8.3	
The factory works with supply base to address environmental problems and/or issues	<b>Freq</b>		1	2	37	20	<b>4.2667</b>
	<b>%</b>		1.7	3.3	61.7	33.3	
<b>Overall Mean</b>							<b>4.0833</b>

Source: Author Field Work 2022

### Regression Model of Green Procurement

The study obtained the model of green procurement and sustainability of tea factories and presents the results as shown in Table 12 below. The regression model in the table shows R and R square values representing the correlation. The R was 0.749 and R square 0.560. This means that about 56% of variation of sustainability of tea factories can be explained by the green procurement practices. The rest 44% other factors can explain it which are not in the model. The model indicates that green procurement explains great extent sustainability of Tea Factories. Other variables explain more on the effect of sustainability of tea factories of tea factories in Kenya.

**Table 12:2 Model Summary on Green Procurement**

<b>Model Summary</b>											
Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate	Change R Square	Change F	Change	df1	df2	Sig. F Change
1	.749 <sup>a</sup>	.560	.553		.0485088	.560	73.910		1	58	.000

a. Predictors: (Constant), Green procurement

**Source: Author Field Work 2022**

### ANOVA of Green procurement

The one-way analysis of variance (ANOVA) whose results formed the basis for the test of hypothesis was used to determine if green procurement have any significant effect on sustainability of tea factories in Kenya. The F- statistics was 73.91 with a p-value of 0.000 as shown in Table 13. The p-value is 0.000 which is less than 0.05. This shows that the F-statistic is significant at 95% confidence interval. Therefore, the null hypothesis was rejected that green procurement practices have statistically significant effect on sustainability of tea factories in Nyeri County, Kenya. Null hypothesis was rejected because significance value  $p=0.000 < 0.05$  as shown in the table 13. The alternative hypothesis that green procurement practices statistically significantly influences sustainability of tea factories was accepted.

**Table 13: ANOVA of Green procurement.**

<b>ANOVA<sup>a</sup></b>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.174	1	.174	73.910	.000 <sup>b</sup>
	Residual	.136	58	.002		
	Total	.310	59			

a. Dependent Variable: Sustainability of Tea Factories

b. Predictors: (Constant), Green procurement

**Source: Author Field Work 2022**

### Regression Coefficient of Green procurement

Analysis of regression model coefficient is shown in Table 14. From this table, there is a beta coefficient of 0.349 as indicated by the co-efficient matrix with a p-value= 0.012<0.05, and a constant of -0.065 with a p-value = 0.000<0.05 therefore, the constant contributes significantly to the model. This shows that green procurement contribute significantly to the model. Hence, this model will provide the information needed to predict the sustainability of tea factories in Nyeri County, Kenya.

**Table 14:3 Regression Coefficients of Green procurement Coefficients<sup>a</sup>**

Model		Unstandardized		Standardized	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.065	.025		-2.582	.012
	Green procurement	.349	.041	.749	8.597	.000

a. Dependent Variable: sustainability of Tea Factories

Source: Author Field Work 2022

**Table 15: Summary of Hypothesis Testing**

Hypothesis	Test	Outcome (null hypothesis)
H <sub>01</sub>	Reverse logistics practices do not have statistically significant effect sustainability on Tea Factories in Nyeri County, Kenya.	Rejected
H <sub>02</sub>	Green procurement practices do not have statistically significant effect sustainability on Tea Factories in Nyeri County, Kenya.	Rejected

Source: Author Field Work 2022

## VII. Conclusion

The study showed that reverse logistics affect the sustainability of tea factories, the factories efficiency returns products with non-conformity to their suppliers and also they ensure that materials that may cause harm to the environment are substituted by those that are safe and environment friendly. The factories undertakes waste collection and recycling them.

The green procurement propel is used by the factories in selection of procurement tenders. They are outsources if procurement factors. The factories does its materials selection to ensure that they are not harmful to environment and tea factory collaborates with supply base to meet environmental objectives.

## Recommendations

There is need for the factories to recycle some products to reduce wastage and environment is clean. The companies should always undertake the waste collection to clean environment. The products with non-conformities should be returned to the supplies. To ensure that goods that harmful are disposed.

There is need to ensure that factories uses green procurement selection. There is need to use materials that not harmful to the environment. The factories should collaborate with suppliers to meet the environmental problems.

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