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ABSTRACT

The main objective of this study was to find out the effects of sustainable supply chain practices on the performance of sugar sub-sector in Kenya. Specifically the study identified the effect of Green manufacturing and Green Procurement to the performance sugar companies in Kenya. The study employed descriptive research design. The target population was 600 respondents comprising of the management of sugar companies in Kenya, sugarcane farmers and sugar importers and exporters. Stratified random sampling was used with sample size of 30% of the target population, which comprised of 180 respondents. The study collected data using questionnaires. The study adopted both qualitative and quantitative data analysis techniques. This study used SPSS Version 21 and Microsoft word tools to aid in data analysis. Regression analysis was used to establish the relationship between the variables. Data analysis was conducted using descriptive statistics and inferential statistics by use of hierarchical moderated multiple regression analysis. It was concluded that proper implementation of green supply chain management practices leads to better performance in sugar sub-sector in Kenya. The study recommended that manufacturing firms should implement environmentally sound practices in all phases of the supply chain, beginning with procurement of raw materials to manufacturing. The study findings were of essence to regulators to enhance the level of implementation of supply chain management practices through enforcement of stricter environmental regulations and rewarding firms that implement these practices. In conclusion the study findings provided future researchers with a useful conceptual and methodological reference to carry out studies in this area especially in emerging economies like Africa.

Key Words: Green Manufacturing, Green Procurement

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INTRODUCTION

Sustainable supply chain management (SSCM) has become a popular research topic among scholars as evidence suggests it has significantly contributed to achieve more environmentally conscious and socially responsible supply chains, (Kumar, Syed, Jose, Mrinal, & Yiğit, 2020). According to Myerson, (2015), Supply chain is a system of organizations, people, activities, information, and resources involved in the planning, moving, or storage of a product or service from supplier to customer (actually more like a “web” than a “chain”). Supply chain comprises Manufacturers, suppliers, distributors, transporters, warehouses, retailers, and customers, where value addition activities are identified, response capacity and flexibility to customers’ needs are provided. Supply chain management on the other hand is the supervision of supply chain activities while focusing on maximizing customer value and achieving a maintainable level of competitive edge, (Njuguna & Moronge, 2019).

Sustainable Supply Chain Management (SSCM) therefore can be defined as “the strategic achievement and integration of an organization’s social, environmental, and economic goals through the systemic coordination of key inter-organizational business processes to improve the long-term economic performance of the individual company and its value network” (Carter & Rogers, 2008; Subramanian, Campos & Wateau, 2017). According to (Sutduean, Joemsittiprasert & Jemsittiparsert, 2019), Organizational performance refers to the way an organization achieves its objectives regarding financial goals and market-oriented goals. Organizational performance (OP) can be achieved by incorporating SSCM practices within existing supply chain operations, (Kumar *et al*, 2020). According to (Ngamkroekjoti, & Speece, (2008), Technological turbulence is defined as the rate of change of product and process technologies used to transform inputs into outputs. Mason, (2007) says that technological turbulence “is caused by changes in, and interaction between, the

various environmental factors especially because of advances in technology and the confluence of computer, telecommunications and media industries”.

As a result of global warming, most organizations around the globe have been improving their supply chain activities and environmental performance in terms of reducing their carbon emissions, minimizing waste generated from the industry, conserving natural resources, and reducing energy consumption, (Elbarkouky & Abdelazeem, 2013; Akkucuk, 2017; Elfeki & Tkadlec, 2015). Egypt’s Carbon emissions represent almost 0.6% of the total global emissions, of which transportation has the largest share, (Ahmed, 2015; Akkucuk2017). Egypt should improve on its initiative to reduce emissions arising from its transport systems and packaging. Currently most products in the market come in eco-friendly packaging. However, like other developing countries, many of its organizations still face the problem of the disposal of the waste, (Elbarkouky & Abdelazeem, 2013; Akkucuk, 2017; Ahmed, 2015). The Egyptian Environmental Law provides for the protection of the environment from hazardous wastes generated from the industries, recycling and remanufacturing of materials, Green Distribution and green logistics activities such as receiving, storing, and movement of raw materials, management decisions related to freight consolidation, mode and carrier selection, materials handling, warehousing, and backhaul management and firms that violate the law are subjected to law enforcement, (Elbarkouky & Abdelazeem, 2013; Akkucuk, 2017; Elfeki & Tkadlec, 2015).

Despite the slow pace of implementation of the eco-friendly practices, some Egyptian companies e.g. Elsewedy Electric limited has incorporated fully SSCM practices especially in energy conservation, green procurement, supplier selection, material selection and in the choice of the equipment they use, (Elsewedy Electric, 2017; Ahmed, 2015; Elfeki & Tkadlec, 2015). Elsewedy Electric started as a family business and over the years has grown to be

an international conglomerate operating around the world, (Elsewedy Electric, 2017; Elfeki & Tkadlec, 2015). Elsewedy Electric complies with all environmental laws and regulations and mitigates the environmental impacts of all business lines, factories, and facilities by minimizing air emissions, recycling of their products, E-waste management, decrease energy use at facilities and sites, minimize waste water, and improving solid waste disposal management, and other negative external impacts. Elsewedy Electric strive to reduce their impact on the environment and conserve natural resources while reducing operating costs and improving output,(Elsewedy Electric, 2017).

Despite these challenges, multinationals such Nestle operating in Nigeria are successful in the implementation of SSCM practices in their firms,(Ogunlela & Lekhanya, 2016; Adam *et al*, 2019; Owie, 2019; Rajeev *et al.*, 2017;Ansari & Qureshi, 2015; Ikechukwu *et al.*, 2018). Nestle Nigeria operates the world's largest science and innovation network in the food and beverage industry with over 2000 brands and consumers across the 187 countries of the world. In Nigeria, Nestle launched environmentally-friendly packaging solutions, sustainable solutions for transport of cocoa plantlets, affordable nutrition and new routes-to-the market. Nestlé supports and encourages sustainable agricultural processes and green manufacturing in all its operations across the world which maximizes eco-efficiency production through conservation programmes, by improving capacity utilization of its factories and through other investments to maximize the production of goods while, at the same time, minimizing consumption of resources and reducing waste and emissions,(Nestle 2019; Owie, 2019).

According to (Mati & Thomas, 2019; SISTR, 2019; Mitullah, Kamau & Kivuva,2017), Sugarcane as a crop was introduced to Kenya in 1902 and was initially milled by jaggeries. The first sugar factory was established in 1922 in Miwani Kisumu District, followed by Ramisi in the coastal region in 1927, (Imbambi, Oloko & Rambo, 2017; Oduor &

Jonyo,2019;Njeru,2016; Nawire , Ogolla, & Kiarie,2014).Currently, Sugarcane is grown in 14 counties spread across Western, Nyanza, Rift Valley and Coastal regions mainly on small-scale farms. There are 14 sugar factories with a total installed milling capacity of 41,000 TCD. The sugar companies include Busia Sugar Industries, Butali Sugar Company, Chemelil Sugar Company, Kibos & Allied Sugar Company, Kwale Sugar Company, Miwani Sugar Company , Muhoroni Sugar Company, Mumias Sugar Company , Nzoia Sugar Company , Olepito Sugar Company, Soin Sugar Company (Kipsitet) , South Nyanza Sugar Company , Sukari Industries (Homabay County), Transmara Sugar Company ,West Kenya Sugar Company and Kwale International Sugar Company,(Mati & Thomas,2019;SISTR,2019; Mitullah *et al*, 2017; Imbambi *et al*, 2017;Oduor & Jonyo,2019;Njeru,2016).

Statement of the Problem

According to (B.A.T, 2019; Sarhaye & Marendi, 2017; EABL, 2019; Safaricom, 2019; Coca-Cola Ltd, 2019& Njuguna & Maronge, 2019), B.A.T Plc, Safaricom Ltd, Coca-cola and EABL are among the leading companies in SSCM best practices in Kenya. These companies have invested heavily in energy saving projects, reduced their water consumption, invested in effluent treatment, water and solid waste recycling, sustainable packaging/recycling ,reducing overall carbon footprint in production, reduced the amount of plastic use, ensured employee safety and planting of millions of trees across the country among others. This is not however the case with sugar subsector. (Mati &Thomas, 2019; World bank, 2015; Sarhaye &Marendi,2017 & Cowi, 2002), has indicated that pollution from toxic industrial waste water, hazardous high greenhouse gas emissions, herbicides and pesticides loading into Lake Victoria from Nzoia River basin is 3,340 tonnes total N per year and 946 tonnes total P per year causing loss of biodiversity and long term damage to ecosystems.

Studies by (Lalah *et al.*, 2008; Cowi, 2002; Moses *et al*, 2011; Omwoma, 2012; Onyari & Wandiga,

1989), indicates that River Nzoia and L.Victoria are loaded with heavy metals from the sugarcane farming activities such as the application of nitrogenous fertilizers among others. These heavy metals have numerous effects on human health including: Wilson's disease (copper), Lead arthragia (lead), birth effects, infertility, tumor (chromium) and the growth of water hyacinth, (Lalah *et al.*, 2008; Moses *et al.*, 2011; Omwoma, 2012).

Nike Inc., Dell Inc. and Apple Inc. in the USA, Toyota and Fujitsu Ltd in Japan, DHL and Volkswagen in Germany and Kenana Sugar company in Sudan due to favorable business environments in their respective countries, are leading in SSCM best practices in the world, (Mugo, 2017; Pourhejazy & Kwon, 2016; Dell 2018; Toyota, 2018; Apple, 2019; Erwa *et al.*, 2015). These Companies have set priorities for green initiatives i.e. Green design of new buildings, production of on-site renewable energy, (including solar energy, directed bio-gas fuel cells, and micro-hydro energy), introduction of hybrid (petrol/electric) and fuel cell (hydrogen) drive systems, and providing charging ports, (Toyota, 2018; Apple, 2019). Use of Green Distribution, take-back policy for its products, use of robots, minimizing carbon emissions, production of lean items, turning green their entire Supply chain, replacing lighting and energy control systems, (Pourhejazy & Kwon, 2016; Dell 2018), the installation of a photovoltaic system with solar cells and utilization of an innovative system to harvest and store rainwater, (Mugo, 2017; Dell 2018), provision clean drinking water to the communities, Hospitals & Clinics, good roads, rails and combating desertification through planting of trees, (Erwa *et al.*, 2015) among others.

According to (SISTR, 2019), Most sugar companies in Kenya are in violation of the Public Health Act, Pharmacy & Poisons Boards ACT, and NEMA ACT through adulteration of its products and by-products, improper handling of pesticides and herbicides, which has led to contamination of the Eco-system and excessive energy use in the juice heating, boiling and crystallization.

A comprehensive literature review on SSCM practices by (Kumar *et al.*, 2020; Mati & Thomas, 2019; Imbambi *et al.*, 2017; Mitullah *et al.*, 2017 & Sarhaye & Marendi, 2017), shows that most of the research has focused on green supply chain management strategies, leaving out other components of SSCM Practices. There is minimal research on the effects of SSCM Practices on firm's performance. The existing research had not provided clear evidence on the link between SSCM practices and firm performance. This study therefore investigated the effect of SSCM on performance of Sugar firms in Kenya.

Objectives of the Study

The general objective of this study was to find out the effects of sustainable supply chain practices on the performance of sugar sub-sector in Kenya. The specific objectives were;

- To determine the effects of Green manufacturing to the organizational performance of sugar sub-sector in Kenya
- To establish the influence of Green Procurement in the organizational performance of sugar sub-sector in Kenya

The study was guided by the following hypotheses;

- **H_{a1}**: Green procurement has significant effect on the performance of sugar sub-sector in Kenya
- **H_{a2}**: Green manufacturing has a significant effect on the performance of sugar sub-sector in Kenya

LITERATURE REVIEW

Resource Based View Theory

The Resource-Based View Theory (RBV) was proposed by (Barney, 1991 & Penrose, 1959). It analyzes and interprets internal resources of the organization and emphasizes resources and capabilities in formulating strategy to achieve sustainable competitive advantages, (Paul, Lawson, Petersen & Fugate, 2019, Erkul, Kaynak & Montiel, 2015, Pankaj, undated). Resources may be considered as inputs that enable firms to carry out their activities, (Mutisya & Kinoti, 2017, David &

Muthini 2019). Resource is the firm's abilities to allow some firms to add value in their customers' value chain develop new products or expand in new marketplace, (Maina & Muya 2015). (Mwaura, Letting, Ithinji & Bula, 2016), asserts that, the core focus of competitiveness of a firm is price and cost developments of production factors that can potentially affect economic growth, market shares and other performances of companies in the targeted sectors. This enables an organization to create, strengthen and sustain competitive advantage.

According to (Onwughalu, Okeke & Chibor, 2017), Lean Production is a systematic method for the elimination of waste within a production system. According to (Bailey, 2008), Lean thinking means that managers and leaders need to think that there should be a possibility of process improvement, even if it is not obvious. The foundation of lean thinking state that organization resource should be focused on activities that will lead to the creation of value for all beneficiaries, delete activities without added value, and integrate parallel activities in the organization, (Amir & Mahdloo 2016). Energy management and optimization solution can help reduce energy costs while improving mill operational performance, (Samadiafshar & Ghorbani 2018; Vijay, *et al* 2015). Green energy management involves production and use of alternative cleaner energy such as solar, wind, geothermal, biomass and hydro energy in achieving higher energy efficiency in firm's operations, (Behrang, Aira, Sanaz, Li, Syri & Deng, 2019; Samadiafshar & Ghorbani, 2018; Vijay, Manisha & Pareek, 2015).

Energy saving is at the heart of most critical economic, environmental and developmental issues facing the world today. Clean, efficient, affordable and reliable energy services are indispensable for global prosperity, (Lynne *et al* 2017; Smaliukiene & Salvatore 2019; Hosain *et al* 2011). Occupational Safety and Health Practices (OSHP) are the strategies, policies, activities and procedures that can be implementation by the organization

targeting safety of their employees, (Vinodkumar, 2010; Lim & Hussein 2017). Safety and Health Practices may reduce the chances of accidents happening in the manufacturing workplace, (Hamid, 2015; Lim & Hussein 2017). All levels inside the management should commit inside and demonstrate their support of the safety and health program to make the safety management effective, (Shekh, 2015). This theory is applicable in this study because studies shows that manufacturing firms that implement GSCM practices would benefit from cost savings (conserving materials, reduced energy and water use), better public image and decreased environmental liability. This theory supports the variables by linking green manufacturing best practices such as lean production, water saving practices, occupational safety practices and green energy management to performance of firms and enumerating the benefits that come with it.

System Theory

System theory was proposed in the 1940s' by biologist Ludwig Von Bertalanffy (General system theory, 1968) and furthered by Ross Ashby, (Introduction to Cybernetics, 1956). It is an interdisciplinary theory concerning every system in nature, in society and in many scientific domains as well as a framework with which we can investigate phenomena from holistic approach (Capra, 1997). An organization is a system of integrated parts that work together to achieve a common function. The Procurement department is part of a larger organizational system that is tasked to establish and administer purchasing practices and procedures, institute necessary reports, arrange and approve term contracts, consolidate purchases of like or common items, and generally obtain savings for goods, services and works for the institution, (Onchweri & Muturi, 2015; Panya & Were, 2018). The quantified benefits that can be derived from green procurement practices include lower supply chain costs, overall productivity, inventory reduction, forecast accuracy, delivery performance, fulfillment cycle time and fill rates, (Thoo, Huam, Sulaimana 2015).

According to (Kamoni, Rotich & Ochiri 2018), an organization is viewed as a system made of subsystems, each with inputs, transformation process, output; that deliver valuable offering information of products and service to a consumer. A system therefore is a set of things that affect one another within an environment and form a larger pattern that is different from any of the parts, (Obanda, 2010; Panya & Were, 2018). For instance, Successful e-procurement and e-sourcing implementation ensures seamless interactions of the organizations' departments with the procurement department, (Munywoki, 2016). Ethical procurement involves procurement/Supply chain officers, suppliers, distributors and all the stakeholders in the procurement cycle's compliance to ethical codes which dictates their behavior and actions while conducting business. It defines behavior as right, good and/or appropriate, (Eyaa *et al*, 2011; Munywoki, 2016; Panya & Were, 2018). The value of a product or service is recognized according to the appropriateness level of its performance and cost. Green procurement ensures suppliers are sourced appropriately and according to their level of commitment to green practices, (Lumi and Opusunju, 2016; Zamora, 2016).

In the recent years, due to global competition most companies have been challenged to increase quality of their products, reduce related costs and increase customer satisfaction to meet the ever changing needs of a more informed class of customers, (Onwughalu, Okeke & Chibor, 2017). System Theory was built upon the insight that an organization is more than a random compilation of machinery, equipment, people and money, (Sutarmin, 2016, Lumi & Opusunju, 2016 & Zamora, 2016). Only if these things are arranged into systems and systematic activates it will become be possible to produce something for which customers are willing to pay a price, (Sutarmin, 2016). System Theory is applicable in this study because the study argues the role and value of integration of organization's activities such as e-procurement-sourcing, supplier selection to achieve competitive edge for the company, which, if developed within the firm, can go a long way in improving the effectiveness of the supply chains, thereby standing to benefit other firms within the network. This theory supports the variables by linking E-sourcing-tendering, Supplier selection, ethical procurement and sustainable assets disposal to the maximization of organizational performance.

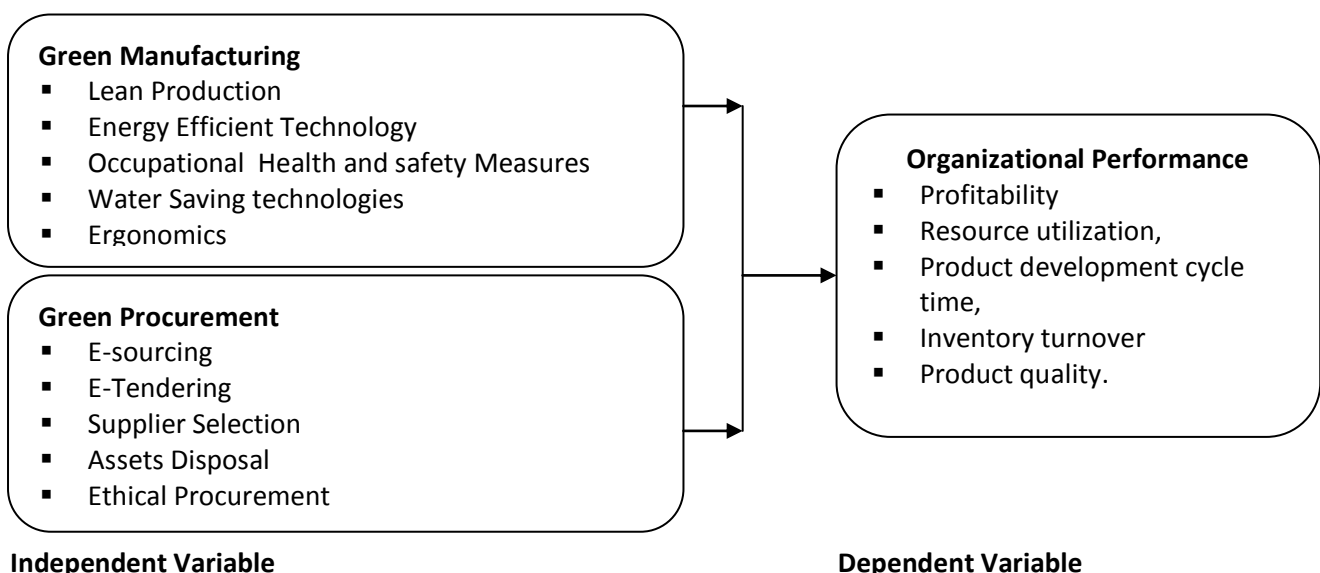


Figure 1: Conceptual Framework

Green manufacturing encompasses all activities or actions that help reduce carbon emissions into the atmosphere. It advocates for efficient, clean, low-

carbon, recycling, and the efficient use of natural resources and energy while enabling economic growth that supports creation of job opportunities

and improvement of livelihoods thus alleviating poverty, (NEMA 2012). According to (Mohammed & Awawdeh 2016), green manufacturing is an integrated system of product life cycle phases and environmental concerns to achieve couple objectives related to increase of resource utilization and decrease of negative environmental actions. Performance is said to be the ability to accomplish certain tasks. This is measured against the criteria of accuracy, speed, costs and levels of completeness, (Kamau, 2016). Organizational performance measurement can be defined as an analysis of an organizations actual performance as compared to the preset goals and objectives, (Moulin, 2012; Kamau, 2016).

Green procurement means purchasing products, services and works that cause minimal adverse environmental impacts. It incorporates human health and environmental concerns into the search for high quality products, services and works at competitive prices. According to (Sarhaye & Marendi, 2017), Green procurement/environmental purchasing is the purchase of environmentally friendly products and services, the selection of contractors and the setting of environmental requirements in a contract. It compares price, technology, quality and the environmental impact of the product, service or contract. (Kitheka *et al*, 2013), asserts that before selecting suppliers, a firm must consider compliance to green, pollution prevention principles and activities, total cost of using a supplier and the purchase price. According to (Kuloba *et al*, 2017), E-sourcing brings a set of new rules and dynamics that create ways of doing business in a totally different fashion, with a whole new and bigger set of participants, new incentives and a radically different cost structure; conditions that have the potential to create a competitive marketplace of unparalleled transparency, efficiency and access. E-Tendering systems must consider accountability and Audit-ability.

Public procurement professionals and stakeholders must adhere to a well-defined and established code

of ethics. Ethical practices should be defined and embedded in other policies, procedures and practices which overlap public procurement, (CIPS, 2017). Today's business environment is highly volatile and as such the life span of products and services offerings to the market is highly reduced as a result of increased competition from rivals. In the face of these modern realities, it behooves organizational managers to adopt SSCM practices and strategies to compete effectively so as to sustain fair performance levels that will ultimately yield to the bottom line of their establishments, (Onwughalu *et al*, 2017).

According to (Daft, 2004; Marendi *et al*, 2015), Performance is the ability to fulfill an obligation, to attain the set objectives, fulfill a requirement and accomplish something as promised or expected. Performance is the organization's ability to attain its goals by using resources in an effective and efficient manner, Organizational performance is the activities of government or its agencies in planning, implementing, reviewing, evaluating and reporting, the effectiveness of its policies, programmes and projects, (OECD, 2007; Marendi *et al*, 2015). An organization's overall performance can have several contributory dimensions, for instance, operational, financial, and environmental, (Dey and Cheffi.2013). However, Ghosh (2012) argues that inventory turnover and space requirements also improve due to performance improvement efforts. (Syed *et al*, 2019) observed that, SSCM practices play a vital role in firms' performance more than ever, because Supply chain risks caused by non-compliance tend to disrupt sustainable operations. In this study organizations performance is defined in terms of profitability, resource utilization, product development cycle time, inventory turnover and in terms of product quality.

Empirical Review

The term "green" is commonly associated with a wide range of issues, such as eco-friendly living, recycling, energy saving, waste management, pollution reduction, offsetting, (Xu, 2017; Mohammed & Awawdeh 2016, Jemutai 2014;

Baines *et al*, 2013). According to (Eshikumo & Odock, 2017), green manufacturing includes all practices connected with ecological concerns that constantly incorporate environmental manufacturing processes and products. Organizational performance can be defined as “a state of competitiveness of the organization, reached through a level of efficiency and productivity which ensures a sustainable market presence. Historically, financial measures such as return on sales (ROS), return on assets (ROA), return on equity (ROE), Debt ratio (DR), profit margin (PM), return on total assets (RTA), and market to book ratio (MBR) and return on invested capital (ROIC) have been used to measure performance of an enterprise, (Slywotzky *et al*, 2000; Hiroki & Keisuke, 2010; Klingenberg & Geurts, 2009; Ngniatedema & Li, 2014), however the generic performance objectives can be aggregated into composite measures, like customer contentment, overall service level and operational agility; or by means of measures like achieving market targets, operations, overall strategic objectives and even environmental objectives,(Eshikumo & Odock, 2017).

Firm’s environmental objectives relate to the ability of firms to reduce air emissions, effluent waste and solid wastes and the ability to decrease consumption of hazardous and toxic materials, reduced frequency for environmental accidents and improve environmental situation of the firm, (Zhu *et al*, 2008 & Odock, 2016). Studies done by (Estampe *et al*, 2010; Lee *et al*, 2012 ;Zu *et al*, 2010;Ngniatedema & Li, 2014), indicates that companies having higher scores on environmental criteria realize stronger financial returns than the overall market, whereas companies with poor scores have weaker returns. The prevailing view is that incorporating environmental variables into firms’ activities often impacts costs because additional requirements have to be met to this end. This in turn impacts firm-level financial performance, (Zu *et al*, 2008; Ngniatedema & Li, 2014). Reduced pollution and waste, helps to

achieve some of the organizational objectives like cost reduction, good corporate image, less environment health hazards which improves competitiveness and help to meet organizational performance. The logic in preventing pollution corresponds to the quality management guidelines that are critical to prevent errors at the early stage as opposed to correcting after production, (Eshikumo & Odock, 2017).

Green procurement is the purchase of environmentally friendly products and services, the selection of contractors and the setting of environmental requirements in a contract,(Sarhaye & Marendi, 2017). Green/Sustainable procurement is a holistic approach that encompasses organization, people, processes and technology. It involves looking beyond the traditional economic parameters and making decisions based on the whole life cost, associated risks, measures of success and implications on society and the environment,(Nderitu & Ngugi, 2014). Effective sustainable procurement supports reduction in total operating costs, mapping of economic, legal, environmental and social sustainability threats and opportunities, organizational culture, values, and ethics, attracting financial investors, boosting labor markets, attracting the best bidders, and further drive development goals, (World Bank, 2019).

Scholars argue that performance of manufacturing firms can be improved by selecting suppliers who are reliable and are able to meet the companies expectation in supplies requirement,(Naibor & Moronge, 2018; Lysons *et al.*, 2008). Supplier selection is critical as firms become more and more dependent on their suppliers; the capabilities of those suppliers serve as key resources in the development of the buyer's own capabilities and performance,(Manyega &Okibo, 2015).

Manufacturing firms in Kenya have over time moved from the use of traditional to the use of modern approach to organizational performance measurement. The modern approaches to performance measurement include; benchmarking,

balanced scorecard, results framework among others (Rwoti, 2005; Kamau 2014). Performance is said to be the ability to accomplish certain tasks. This is measured against the criteria of accuracy, speed, costs and levels of completeness, (Lebas, 1995; Hwang *et al*, 2014). Organizational performance measurement can be defined as an analysis of an organizations' actual performance as compared to the preset goals and objectives, (Moulin, 2012; Hwang *et al*, 2014; Kamau 2014; Azim *et al*, 2015). The preset goals and objectives are mainly in terms of profitability, liquidity, growth and stock market performance, (Kamau, 2014).SSCM has emerged as a key approach for enterprises aiming to become environmentally sustainable. Organizational Performance is the fundamental activity to evaluate the competitiveness of a company, (Hwang, Han, Jun & Park 2014). Studies by (Hwang, *et al*, 2014; Azim *et al*, 2015; Lee *et al*, 2015; Khan *et al*, 2017; Lyndon *et al*, 2016; Oluwagbemiga *et al*, 2014), indicates that different performance metrics are used to gauge and measure how a manufacturing business is performing, which is measure of how effectively the operations and business is achieving its defined goals.

METHODOLOGY

This research study adopted Positivist philosophical paradigm with an objectivist approach. The study utilized empirical review setting to investigate the theoretical relational paths drawn from literature and test them through the research hypotheses or research questions. This study was based on the premise that knowledge is founded on facts and that no abstractions or subjective status of individuals is considered. This research problem was studied through the use of a descriptive research design. The study population of this research consisted of Supply Chain and Procurement Managers of sugar companies, County Agricultural Chief Officers, Kenya sugar research Foundation officers, Sugarcane Farmers and Sugar Importers totaling to 600 professionals. The sample size for the study was therefore 180 respondents

the sugar sub-sector in Kenya. This Study used questionnaires to collect data.

FINDINGS AND DISCUSSION

Green Procurement

The first objective of the study was to find out the effect of green procurement on the performance of sugar sub-sector in Kenya. The respondents were asked to rate specific aspects of green procurement practices in their respective firms based on a five-point Likert's scale where, 5= Strongly, 4= Agree, 3=Neutral, 2= Disagree and 1=Strongly Disagree.

The findings tabulated in Table 1 revealed that on the first aspect which was on E-Sourcing result into transparency, better services, reduced costs, time savings, simplification and organizational efficiency, majority of the respondents indicated that they practiced this as evidenced by a mean of 4.36 and a standard deviation of 0.73. On the statement that the E-Sourcing provides a bigger set of participants, new incentives and a radically different cost structure, the respondents agreed as shown by a mean of 4.41 and a standard deviation of 0.71. The other aspect was that the E-Sourcing provides a competitive marketplace of unparalleled transparency, efficiency and access, the respondents indicated that they practiced this, as shown by a mean of 4.02 and a standard deviation of 1.08. With regard to the E-Sourcing encourages accountability and Auditability in the organization, most of the respondents agreed and this is evidenced by a mean of 3.59 and a standard deviation of 1.08.

The findings compare with those by Min and Kim (2012), who established that the best practice of supply chain was green procurement whereby through purchasing of products that promote green environment, the producers will as well insist on producing green supplies out of which green supply chain will be enhanced. According to Davies and Hochman (2007), green supply chain starts right at the bottom whereby the buyer insists on a certain commodity and the supplier has no option but to

comply. However, if the green supply chain is not upheld by the firm doing the purchases, it will be

difficult for other parties in the chain to comply.

Table 1: Green Procurement

Statement	N1	SD (%)	D (%)	N2 (%)	A (%)	SA (%)	Mean	Std. Dev.
E-Sourcing result into transparency, better services, reduced costs, time savings, simplification and organizational efficiency	155	2.5	1.2	11.8	38.5	46.0	4.36	0.73
E-Sourcing provides a bigger set of participants, new incentives and a radically different cost structure	155	2.5	8.1	26.1	35.4	28.0	4.41	0.71
E-Sourcing provides a competitive marketplace of unparalleled transparency, efficiency and access environmental audits for suppliers'	155	0.0	1.2	8.1	35.4	55.3	4.02	1.08
E-Sourcing encourages accountability and Auditability in the organization	155	3.1	15.0	23.8	35.6	22.5	3.59	1.08

Key: SD: Strongly Disagree; D= Disagree; N1 = Number of respondents; N2 = Neutral; A= Agree; SA= Strongly Agree

Green Manufacturing

The second objective of the study was to establish the effect of green manufacturing on the performance of sugar sub-sector in Kenya. The respondents were asked to rate various aspects of green manufacturing as applied in their respective organizations based on a five-point Likert scale. The findings as shown in table 2 revealed the following: on The company understands the concepts of quantity control in Lean production management, majority of the respondents agreed as shown by a mean of 4.24 and a standard deviation of 0.89; on the statement that the Company has replaced conventional energy sources by use renewable energies technology, most of the respondents agreed as shown by a mean of 3.78 and a standard

deviation of 1.02; on the third statement that the Company had an occupational Health and safety and Compensation policy on factory related Accidents, most of the respondents agreed as shown by a mean of 4.44 and a standard deviation of 0.69; on the statement that the operations of the organizations were designed to enhance full capacity utilization, most of the respondents agreed as shown by a mean of 4.24 and a standard deviation of 0.76; on The company had installed a photovoltaic system with solar cells which uses an innovative system to harvest and store rainwater, the respondents agreed and; on the last statement that the company has minimized its waste water by recycling its used water, majority of the respondents agreed as evidenced by a mean of 4.43 and a standard deviation of 0.71.

Table 2: Green Manufacturing

Statement	N	SD	D	N2	A	SA	Mean	Std. Dev.
		(%)	(%)	(%)	(%)	(%)		
The company understands the concepts of quantity control in Lean production management	155	2.5	1.2	11.8	38.5	46	4.24	0.89
The Company has replaced conventional energy sources by use renewable energies technology	155	2.5	8.1	26.1	35.4	28	3.78	1.02
The Company has an occupational Health and safety and Compensation policy on factory related Accidents	155	0	1.2	8.1	35.4	55.3	4.44	0.69
The Company has installed a photovoltaic system with solar cells which uses an innovative system to harvest and store rainwater	155	0	1.2	16.1	39.1	43.5	4.24	0.76
The Company has minimized its waste water by recycling its used water	155	0.0	1.2	8.735.4	54.7	4.43	0.71	

Key: SD: Strongly Disagree; D= Disagree; N1 = Number of respondents; N2 = Neutral; A= Agree; SA= Strongly Agree

Factor Analysis on Green Procurement

The study carried out factor analysis for the first variable which was green procurement. The findings as shown in Table 3 revealed that KMO sampling adequacy for the variable was 0.650. This

is within the threshold hence the factors under this variable were considered meeting the sampling adequacy hence they were all adopted for the final analysis.

Table 3: KMO and Bartlett's Test for Green Procurement

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.650
Bartlett's Test of Sphericity	Approx. Chi-Square	113.473
	Df	15
	Sig.	.000

Factor Analysis on Green Manufacturing

Factor analysis using KMO measure of sampling adequacy was carried out for the green manufacturing as one of the variables in the study. The results as shown in Table 4 revealed that the

KMO for the variable was 0.776, which is greater than the threshold of 0.6 according to Kaiser (1974). The variable was considered to have met the threshold hence all the factors under the variable were retained for the final analysis.

Table 4: KMO and Bartlett's Test for Green Manufacturing

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.776
Bartlett's Test of Sphericity	Approx. Chi-Square	279.800
	Df	15
	Sig.	.000

Hypotheses Testing

Hypothesis testing was done to establish the effect of each independent variable on the performance of sugar sub-sector in Kenya. The study formulated the following hypotheses to test the relationship between the variables of the study: green procurement has a positive significant effect on the performance of sugar sub-sector in Kenya; green manufacturing has a positive significant effect on performance of sugar sub-sector in Kenya; waste management has a positive significant effect on performance of sugar sub-sector in Kenya; Green Distribution has a positive significant effect on performance of sugar sub-sector in Kenya and; finally, Technological Turbulances have a positive significant moderating effect on performance of sugar sub-sector in Kenya.

Ha₁: *Green procurement has a significant effect on performance of sugar sub-sector in Kenya*

The first hypothesis was that green procurement had a positive and significant effect on performance of sugar sub-sector in Kenya. The findings replicated that the P-value for the variable was 0.000, $R^2=0.084$, $\beta=0.283$ and $t=3.816$. The findings imply that

indeed there was a significant relationship between green procurement and performance of sugar sub-sector in Kenya. This therefore, leads to accepting the alternative hypothesis that green procurement has a positive and significant effect on performance of sugar sub-sector in Kenya.

Ha₂: *Green manufacturing has a significant effect on performance of sugar sub-sector in Kenya*

The second alternative hypothesis of the study was that green manufacturing had a positive and significant effect on the performance of food and beverage processing companies in Kenya. The findings from the model revealed that R^2 was 0.297, $\beta = 0.563$, $P\text{-value} = 0.000 < 0.05$ and $t=8.195$. This implied that green manufacturing had a significant and positive effect on performance of sugar sub-sector in Kenya. The study therefore accepted the alternative hypotheses that there is a significant and positive relationship between green manufacturing and performance of sugar sub-sector in Kenya.

Table 5: Hypothesis Testing

Hypothesis	R^2	Beta	T Value	P-value	Conclusion
H_{a1}: Green procurement has a significant effect on the performance of performance of sugar sub-sector in Kenya	0.084	.283	3.816	0.000	Accept H _{a1}
H_{a2}: Green manufacturing has a significant effect on the performance of performance of sugar sub-sector in Kenya	0.297	0.563	8.195	0.000	Accept H _{a2}

CONCLUSIONS AND RECOMMENDATIONS

The findings of the study indicated that there was a positive significant relationship between green procurement and performance of sugar sub-sector in Kenya. The regression analysis found out a coefficient of determination (R^2) value of 0.337, meaning that 33.7% of the variation in performance could be attributed to changes in green procurement in performance of sugar sub-sector in

Kenya. These findings confirmed that there was a positive significant effect of green procurement on the performance of sugar sub-sector in Kenya. The study therefore accepted the alternative hypothesis that green procurement positively affects firm's performance and is therefore an important factor in determining the performance of sugar sub-sector in Kenya.

The study findings indicated that green manufacturing practices affected performance in sugar sub-sector in Kenya. The regression analysis findings indicated a coefficient of determination (R^2) value of 0.297, which implies that 29.7% of the variations in performance of sugar sub-sector in Kenya were as a result of green manufacturing, while all other factors contributed to 70.3 % of variations in performance. Hence green manufacturing is an important factor in determining performance of sugar sub-sector in Kenya. The findings of the regression coefficient confirm the importance of green manufacturing by indicating that there was a positive significant relationship. The alternative hypothesis was confirmed that green manufacturing has a positive significant effect on the performance of sugar sub-sector in Kenya.

Regarding green procurement practices, the study concluded that most of sugar sub-sector in Kenya had adopted this dimension. This could be attributed to the strong relationship between supply chain management practices and performance of sugar sub-sector in Kenya. Some of the aspects of green procurement that were widely practised in the processing sector, as determined by the study, include: cooperation with suppliers for eco-design of inputs, cooperation with suppliers for environmental objectives, reduced purchase of hazardous materials, reduced purchase of items that are difficult to dispose of, carrying out environmental audits for supplier's internal management and, conducting environmental awareness seminars. The study therefore concluded that to enhance firms' performance, it is imperative for manufacturing firms to invest heavily in green procurement practices with respect to supply chain management practices.

On the aspect of green manufacturing, the study established that adoption of green manufacturing practices contributes to improved performance of sugar sub-sector in Kenya. The study found a strong relationship between green manufacturing practices and the performance of sugar sub-sector

in Kenya. The study therefore concluded that improved performance was attributed to green manufacturing practices such as: production processes designed to reduce wastes and ensure water conservations; enhancing full capacity utilization; reduction of hazardous wastes during the production process; product eco-design and; cleaner production techniques. In conclusion there is need for manufacturing firms to adopt green manufacturing techniques.

The study recommended the adoption and sustenance of green procurement practice in order to enhance performance of food and beverage manufacturing firms in Kenya. The study found a positive significant relationship between green procurement and performance of sugar sub-sector in Kenya. It is recommended that manufacturing firms adopt and implement green procurement practices in compliance with all applicable Technological Turbulances. The food and beverage processing firms have the duty to engage their suppliers and set terms on the need for supply of materials that are in compliance with sustainable environment.

With regard to green manufacturing, the study recommended that manufacturing firms embrace green manufacturing practices to cut down on the cost of production and further comply with any Technological Turbulances governing manufacturing sector in the Kenyan and international context. The primary areas of focus on green manufacturing include: water conservation during manufacturing, reduced generation of hazardous wastes, reduction of wastes during manufacturing, full capacity utilization, cleaner production strategies and product eco-design. The Kenyan Government established statutory bodies such as the National Environment Management Authority (NEMA) in a move to curb environmental pollution by including, among others, the manufacturing firms. The food and beverage processing firms being advocators of healthy living, have the mandate to ensure that they set the

example by practicing green manufacturing practices.

Areas for Further Research

The focus of the study was to establish the relationship between supply chain management practices and performance of sugar sub-sector in Kenya, it should be noted that this study was limited in scope and methodology.

The study focused on four supply chain management practices, hence in future, similar studies should expand the scope of supply chain management practices. The focus of this study was on performance of sugar sub-sector in Kenya. It is recommended that future research should be carried out in other industries such as cement

manufacturing, textiles, chemical and allied, compared to the present study.

This study adopted quantitative methods for data processing and analysis. It is recommended that future studies should consider using qualitative or mixed methods to come up with findings for comparison with the findings of this study. With respect to performance, this study measured performance with a keen focus on the following dimensions: quality, cost, environmental aspect, cost management and operational performance. Future scholars should measure performance using measures such as return on investment, profitability and market share and; corroborate the findings with those of this study.

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