
Adoption of Sustainable Production on the Performance of Horticulture Exporting Firms in Kenya.

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Abstract

Despite horticulture exports being the second-biggest foreign exchange earner after tea in Kenya, the sector's performance has dwindled, with farmers' produce often rejected in the global market. Sustainable production has been identified and adopted as a potential strategy to enable the performance of horticulture exporting firms in Kenya. Since extant studies have yet to examine the effect of adopting sustainable production on the performance of horticulture exporting firms in Kenya, this study filled this research gap. Specifically, this study examines the effect of sustainable production practices, including cleaner production, sustainable product design, and sustainable packages, on the performance of horticulture exporting firms in Kenya. The study is guided by the resource orchestration theory (ROT); it adopted a positivist research paradigm and a cross-sectional research design. A sample of 242 was obtained from the study population of the 645 members of Registered Horticulture Exporters. The target respondents were the Supply Chain Officer, the Operation Officer, or the Logistics Officer. Data was collected using observation checklists, interviews, and semi-structured questionnaires. Inferential statistics using linear regression and correlation analysis were used to analyse data. The results found that the adoption of sustainable production practices has a significant impact on the performance of horticulture exporting firms in Kenya. The study recommends that managers of horticulture firms and other stakeholders leverage cleaner production, sustainable product design, and sustainable packaging to enhance the performance of horticulture exporting firms in Kenya. These findings affect policy formation and decision-making for effective performance management for farmers, exporting firms, and economic development.

Keywords: Sustainable Production, Performance, Horticulture, Exporting Firms, Procurement

Introduction

The relationship between sustainable production on the performance of horticulture exporting firms in Kenya has been a complex and multifaceted area that continues to present research opportunities (Chin et al., 2023). Producers, Managers, exporting firms, and academicians progressively recognize the prominence of producing unmatched items, while keeping the costs and profits at bay (Eltayeb and Zailani, 2024). Firms that adopt sustainable production benefit from uniqueness of products, safety, reputational boosts, productivity lower risks, and more

resource utilization (Ahmadi et al., 2020; Mutegi et al., 2023). However, sustainable practices such as cleaner production, sustainable product design sustainable packaging, and ethical sourcing might raise costs and require investments in new technology and processes, potentially hindering performance (Eltayeb and Zailani, 2024; Feng et al., 2024). There is still no consensus on how businesses should strike a balance between fulfilling sustainable production goals, operating efficiently, and still managing to perform effectively.

Different theoretical arguments advance the nexus between sustainable production and performance. The institutional theory championed by Selznick (1957), asserts that organizations may adopt sustainable production in response to institutional pressures from external stakeholders, who are increasingly concerned about the environmental and social impacts of the supply chain. These practices may lead to improvements in organizational performance. Resource orchestration theory posits that sustainable production such as green design, green products, and eco-friendly packages can be valuable resources that can enable firms to leverage their sustainable production for a competitive edge (Peuscher, 2016). Significant contributions on sustainable production practices on a firm's performance have been recognized by Kariuki (2023); Kimutui and Awuor (2022) and Maaloul et al., (2023) who observed a favourable correlation between sustainable production and performance. Otieno and Muathe (2023), Otieno (2024), Omusebe (2018) found a negative relationship between the two. Previous research has produced conflicting results, and the idea continues to be unattainable because no scholars have reached an equitable agreement on a solution.

Firms globally are taking a proactive approach in avoiding issues of non-compliance, as consumers, especially in Europe, demand attributes such as quality, safety, sustainability, and traceability (Waye, 2018). Supermarkets impose stringent food safety standards requiring third-party certification from Euro-GAP and BRC, among other protocols. An example is French/snap bean imported from Kenya, requiring a phytosanitary certificate issued by a competent authority like Kenya Plant Health Service (KEPHIS). Tesco in the UK is the single largest supermarket with a share of 30% of the market. It aims to be a zero-carbon business by 2050, through sourcing ethically while observing sustainable standards across the products (Tesco, 2019). Walmart, the largest retailer in the US in adopting Sustainable Supply Chain Management (SSCM), committed to three goals: to be supplied with 100% renewable energy, create zero waste, and sell products that sustain resources and the environment. These goals have enabled them to reduce GHG emissions and costs by installing auxiliary power units in their trucks. Their business sustainability strategy became the most competitive and innovative company in the world (Plambeck, 2017). Dole's operating subsidiary Standard Fruit de Costa Rica developed a carbon-neutral SC for bananas and pineapples exported to North America and Europe. Costa Rica's goal is to become the first carbon-neutral country by 2030.

Another example is Unilever, whose sourcing strategies aim to improve farmer productivity, reduce pesticides, and increase renewable energy use. Its "Sustainable Living Plan" aimed at improving the health and well-being of 1B people, halving its environmental footprint, and sourcing 100% of all agricultural raw materials sustainably. It introduced new detergents that

allow for less water consumption at lower temperatures through innovation. It also introduced the use of natural and bio-gradable ingredients across its products. Other frontrunners in the food business are Nestlé and Mars, who have embarked on similar programs (Weele & Tubergen, 2024). Kettle Foods is a multinational producer and distributor of organic all-natural snacks. Its all-natural approach resulted in annual growth of 15 %, with sales doubling each year. The firm influences its products' designs and tracks ingredients in its SC addressing sustainability from an innovation perspective, therefore attracting a premium price because of a differentiated product. Through its certification program, it ensures compliance downstream and upstream. Its oils are recycled and converted to biodiesel used in its delivery fleet. By partnering with an Electric firm, they have installed one of the most extensive solar systems generating an estimate of 120,000 (kWh) of electricity yearly. Thus, won the Green Power Partnership award in 2012. It reduced energy use by 20% through its first green warehouse, saving \$110,000 on natural gas and \$51,000 on electricity. Reclaiming and reusing water saves 3.4 million gallons annually and converts 3200 gals of waste oil to biodiesel each month.

Levi Strauss & Co. (2014) faced pressure from external stakeholders about the cotton used in their products, over claims that they used forced child labour while harvesting cotton in Uzbekistan. These prompted the company to trace its origin and eliminate the practice from the source. Sustainable practice in SC needs urgent attention, especially in emerging and developing countries. These because they are plagued by various negative impacts from unsustainable production practices (Chowdhury, & Klassen, 2016). A high percentage of the population is also at the bottom of the pyramid, especially in Africa. SSCM though a relatively new practice is gaining momentum in developing countries more so in Africa (Ojo et al., 2024). A study done by Engel (2024) confirms that South Africa (SA) is making good progress, having adopted laws and strategies focused on sustainability in the last decade. Through the SSCM function, SA believes it has substantial potential to contribute to Vision 2025. Among measures, it aims to have 30% clean energy by 2025 (Annual Performance Plan, 2012 -2013).

Firms competing in the global market use local legislation as minimum standards in complying with international standards to protect their brand reputation and improve sales. An example is Woolworths, whose organic foods sell at a premium, proving that sustainability can offer a company a distinct competitive advantage. With top sustainable firms being honoured at the 4th annual SSC Awards. The only award in Africa dedicated to SSC. Rwanda is another example of a country focused on achieving sustainable goals by banning non-biodegradable plastic bags and packaging materials. Rwanda is reputed as one of the cleanest countries in Africa. It has initiated green development, which focuses on empowering people to adopt practices that enhance social cohesion, economic prosperity, and environmental integrity. It bypasses old technologies and environmentally destructive development. Building an economy that can withstand a changing climate and provide prosperity for the generation to come. An example is the Rwanda Cleaner Production Centre tasked with advocating greener practices (Nimpano 2021). Other developing economies like Kenya have also made great strides in SSCM.

Flamingo Homegrown in Naivasha is an example of a Kenyan horticultural exporting firm that

has adopted sustainability after non-compliance issues regarding their workers' health led to reputation risk for their brand. The risk compelled the firm to reinvent its production by harnessing the land's complex ecosystems. Through building greenhouses dedicated to breeding and harvesting ladybirds to control pests biologically rather than chemically (Maaloul et al., 2023). Another example of a leading sustainable company is Olivado through their Biogas factory in Muranga. Its organic waste from the avocado oil process creates efficient gas for powering its generators. The same is used on vehicles as well as in the manufacturing of biofertilizers. As the world moves toward EVs with the anticipation of diesel and petrol vehicles ceasing in 2030, the Government has provided a fiscal incentive for EVs by lowering import duty. Companies such as Kenya Power are looking at investing in EV charging infrastructure. The study aims to do a comprehensive study on how the sector could avoid non-compliance issues by embracing SSCM, therefore, minimizing costs and resulting in improved firm performance.

Traditional spectrum on firm performance meant higher profit by a firm and ensuring value to firm shareholders as a way of measuring firm performance. Export performance refers to a firm's global market performance in terms of sales, market share, export volume (quantity exported), and profits earned (Osoro et al., 2024, Kimutui & Awuor 2016). A nation's export is an indication of its foreign exchange earnings contributing significantly to economic growth, in terms of job creation, and foreign earnings. According to scholars like Awino (2015) and others, performance should not be viewed only on financial indicators, but also non-financial measures should be considered. Today performance in sustainability is measured holistically and includes environmental degradation, employee safety, and ethical and social responsibility. Kenya's Horticulture export is the second biggest foreign exchange earner after tea accounting for 21.4% of the total value in export. The total horticulture export is estimated at Ksh 157.7 billion as of 2021 (Nzomoi et al., 2022). Kenya is the largest exporter of various vegetables to the European Union including beans, peas, and avocados. The second-largest developing-country exporter of flowers in the world after Colombia. (Tyce, 2020). Major importers include the UK, Germany, Netherlands, France, and Belgium with the highest quantity of export being through supermarket chains that include Tesco and Salisbury in the UK, and Lidl in Germany.

The Horticulture sector continues to perform positively, increasing from an estimate of Ksh 115 billion in the year 2017 to an estimate of 158 in the year 2021 (Nzomoi et al., 2022). Therefore, making it the single largest contributor to Kenyan economic growth. Despite its improved performance the sector continues to encounter challenges that hinder its full potential and contribution to the economy. Essential among them is the strict market requirement. The global competition is moving away from price and basic quality parameters to a market requirement beyond the inspection and acceptance of the end products to adoption of sustainability along the supply chain. Horticulture export in Kenya involves the export of fruits, vegetables, herbs, and cut flowers. The Major market for the product is the European Union. Kenya's Horticultural sector is often regarded as a success story in sub-Saharan Africa. The Country is the region's largest exporter of roses, peas, green beans, and avocados. Flowers are the biggest contributor at about 33.3% of the value of horticulture. Most of the flowers are sold in the Netherlands and

other European markets including Germany, Italy, and France followed by the UK. Flowers are mostly registered under their umbrella body the (Kenya Flower Council). They are followed by vegetables and fruits with the European Union being the main importer (World Bank Report 2023). The industry directly or indirectly provides employment and supports the livelihoods of over six million people (Nzomoi et al., 2022).

The industry contributes to 36% of the agricultural share of GDP (KIPPRA (2023)). Currently, the horticulture industry is the fastest-growing agricultural sub-sector. The ideal tropical and temperate climatic conditions make it favorable for production. Most producers are concentrated in Naivasha, Nanyuki, Timau in Meru and Thika, with smallholder farmers mainly concentrated in Kirinyaga. Studies show that 80% of farms involved in horticulture are SMEs with the large farms predominately focusing on export markets (Muriithi & Matz 2015). Research in the Sector according to Tyce (2020) has been dominated by the Global Value Chain and Global Products Network (VGC/GPN) therefore the importance of conducting studies in the sector.

Statement of the Problem

The agriculture sector is the mainstay of the Kenyan Economy with the subsector of horticulture contributing to 33% of the Agriculture GDP and 38% of export earnings. According to the Government of Kenya report (2021), the growth of the national economy is highly correlated to the growth and development of agriculture. Vision 2030 identifies agriculture to deliver 10% of annual economic growth. Several challenges have been identified in the sector. These include inefficiency in the Supply chain resulting from poor access to inputs, lack of storage capacity, lack of post-harvest services, expansion in the market, and lack of institutional support. These attributed to among other challenges the cost of transport. An example is airfreight rates of fresh produce at \$1.40-1.60 per kg, compared to that of Egypt at \$0.75 and Ghana at \$0.60 (RSA, 2015). The recent requirement by major European retailers demanding that fresh produce be transported by sea instead of air is a major challenge in Kenya where cold railway cargo is not established. The ability to match European consumer requirements has seen a surge in rejection of produce that exceeded MRLs. An example is the interception of 41 consignments in the first quarter of 2015, a 10% increase compared to the same period. These caused farmers to incur losses of an estimated KSH 60 billion. With more than 5000 farmers being banned from exporting products as reported by the European Food and Safety Commission. In 2014 Kenyan flower farmers were locked out of the EU market. In 2007 farmers suffered a sales loss of KES 2.8 billion after a ban of eleven years from exporting avocados by South Africa (FPEAK, 2020). These trends have put Kenya's market share in the EU at risk (KIPPRA (2023)).

Lack of proper infrastructure and cold storage for highly perishable produce contributes to an average of 44.5% of produce discarded during processing and distribution according to Foodtank.com (2022). Technology limitation affects grading and packaging, making the product less competitive (UNIDO 2022). Energy costs affect production, irrigation, plant, and machinery operation. Power outage is a major cause of production deterioration according to Kabano (2019). Social sustainability issues in one of the horticultural firms resulted in a ban on exporting avocado to Tesco, the largest supermarket in the UK, with annual sales of EUR 56,883m from

3,787 stores and over 1.2 million customers. The action harmed its reputation as one of the largest exporters of avocados in sub-Saharan Africa (Tesco, 2019). Lee et al., (2017) warn of the increased zero tolerance on SC sustainability violations. Tyce (2020) noted that failure to comply attracts penalties, fines, or contract termination leading to subsequent financial losses. Studies that link SSCM and firm performance in the sector are limited, with few specific studies that correlate SSCM and moderating institutional pressure on firm performance. Most studies are done in developed countries. Studies done in Kenya concentrate on Green Supply Chain Management in the manufacturing sector mostly dealing with non-perishable goods. The horticulture sector is unique presenting different challenges that affect the firm’s performance. This study aims to close the knowledge gap by evaluating if the adoption of SSCM in the sector contributes to a firm’s performance. The horticulture sector is currently challenged in terms of market growth, sales loss, reputation, and cost of production.

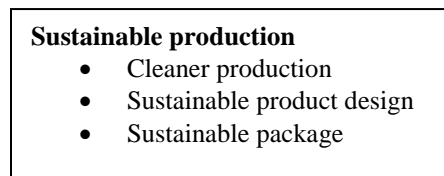
Objective

To establish the relationship between the adoption of sustainable production and the performance of horticulture exporting firms in Kenya.

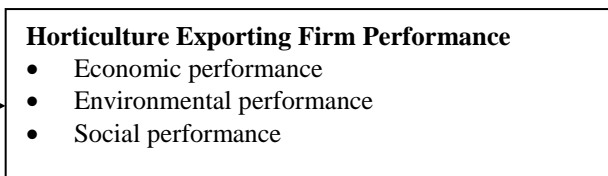
Research Hypothesis

There is no significant relationship between the adoption of sustainable production and the performance of horticulture exporting firms in Kenya.

Independent Variables



Dependent Variable



Adapted from Saeed and Kersten (2023) and Yaw Agyabeng-Mensah et al., (2020)

Figure 1: Conceptual Framework

Literature Review

Theoretical Perspectives of Resource Orchestration Theory

The theory can be argued as an extension of RBV. The theory argues that having sufficient resources on its own is not enough for firms to achieve competitive advantage but both managerial orchestration and managerial acumen are essential Peuscher (2016;2018). Internal management through line managers and senior management has been argued to determine how successful the adoption of sustainability is in SC. These can be achieved through influencing the process of bundling and eventually leveraging the capabilities across internal functions. Horticulture firms through developing policies, and strategies in Supply Chain operations can ensure the success of the implementation process (Zhu et al.,2021a; Sirmon et al., 2023; Peuscher 2018). According to Sirmon et al. (2023), “Managers should be simultaneously involved in all stages of the resource management process while consistently scanning the

external environment for salient cues". Koufteros (2024) argues that bundling of resources builds competencies and leverages them into the market, emphasizing the need for managers to synchronize this with an appropriate strategy. Vachon & Klassen (2018) argue that SSCM integration goes beyond collaboration with suppliers to include the two-way exchange of environmental management knowledge (resources) in an integrative manner. Darnall et al. (2019) propose that the conceptualization can be widened by integrating environmental management systems with customers using integrative information systems and processes. The theory is relevant to this study as the focus is on the process of managing firm resources internally in such a way that value is created. Horticulture firms through resource orchestration, integration, and collaboration with their network partners can successfully ensure production compliance with global standards, resulting in growth in market share and increased sales.

Empirical Review

Production in horticulture involves planting flowers, fruits, herbs, and vegetables, processing, drying, freezing, juicing, and making flower bouquets. It is the process of adopting sustainable crop production practices through an ecosystem approach. These are where inputs, such as land, water, seed, and fertilizer, complement the natural processes that support plant growth, including pollination, and natural predation for pest control. Cleaner production is critical in achieving sustainability. These involve fast, reliable, and energy-efficient production processes aimed at eliminating waste while improving productivity (Nimawat & Namdev, 2017). It encompasses horticulture firms using inputs with minimal environmental impact which are highly efficient. It requires efficiency associated with a clean production method, low energy consumption, efficient technology, and reduced raw materials. The objective is to reach low input, high output, and low pollution (Al-Odeh and Smallwood, 2022).

Globally consumers can identify products that are more energy-efficient using eco-labels. To qualify for the labels, horticulture producers must work closely with their suppliers to redesign their products in such a way that will increase energy efficiency. An example is the Home Depot in the US which offers Energy Star products resulting in sales of 125M certified products and over \$770 million in energy-saving to customers (Star Award 2024). The cleaner Production process requires environmental certification. Ensuring the health of product users and the production process are harmless to workers. Horticulture supply has long production throughput times (harvesting only one or a few times a year). There is seasonality in the production, and quality and quantity have high variability. Processing times are product-dependent, and traceability is critical. According to Figueirêdo et al. (2021), the modification of fertilization and pest management is the best way to improve the environmental performance of agricultural production. In achieving sustainable production, product design is therefore key.

Product design is the process by which the product is designed. The production design in the horticulture sector involves the seeds that will be planted, and the chemicals or products that will be applied, this includes fertilizers, pesticides, fungicides, etc. The process requires careful production planning and scheduling (Jimenez-Guerrero et al., 2018). According to Perez-Mesa (2015), seed and biotechnology companies increasingly design the final product with the end

consumer in mind. Quality and food safety standards are top priority in the entire SC process from seed to fork. The process requires a review of critical decisions involving top management to ensure sustainability compared to focusing on the pipe solution's end (Grant et al., 2024). Soysal et al. (2022) underscore the importance of consumer requirements consideration when re-designing SC. Horticulture design requires consideration in terms of seasonality. This is because horticulture products are affected by biological variations, seasonality, and other variable factors, e.g., weather. Lutke Entrup (2022) posits the importance of considering shelf-life constraints for quality changes, e.g., decay or ripening. For the retail outlets product shrinkage, stockout, and best-before date are critical if a firm is to maintain its reputation.

Sustainable packaging involves downsized and eco-friendly packaging materials during the packing of horticulture produce for export referred to as "smart packaging" or "intelligent packaging". Packaging according to Brahma et al., (2021) performs several functions which include containment protection, preservation by keeping the produce fresh, enhancing product safety, and improving traceability of the product while moving across SP. It also improves the presentation and quality of information to consumers. It involves collaborating with vendors to adopt innovations in packaging such as the use of aseptic giving the product a longer shelf life. It engrosses packaging that is standardized, eco-friendly, reusable or returnable, and recyclable. Materials that use microfilm and which do not have poisonous ingredients such as lead, mercury, and tin. It encompasses the use of degradable packaging materials replacing cardboard boxes with returnable totes to reduce the warehouse's waste. The structural design should also follow the principle of "zero package," thus achieving minimal resource consumption and maximal environment friendliness (Grant et al., 2024). Abbey and Guide (2017) add a new dimension by focusing on recovering products delivered to customers. They extract new sources of value through biodegradable materials making packaging waste a non-issue going a long way to improve sales in terms of reduced cost. Packaging is critical all the way to the final stages of sales, as it is key in ensuring brand visibility and marketing and it is currently a brand changer. It is also crucial in maintaining product safety during processing packaging, storage, and distribution summed as logistics.

Sustainable farming production practices have been found to simultaneously raise yields through increased efficiency in the use of inputs, resulting in reduced cost and, therefore increased sales. Reduction of the adverse environmental effects of production results in a positive brand reputation (FAO, 2024; Babu and Blom, 2024). According to research done by UNEP (2018), sustainable farming practices globally have been found to offer small farmers and their family's multiple benefits. The benefits have been enhanced through productivity, reducing production costs, and strengthening their capacity to manage risk. Cleaner production encompasses the use of inputs with or reduced environmental impacts which are highly efficient, Amemba et al., (2023), in their study, advocated using environmentally friendly energy sources like solar energy, recycling raw materials, and using biodegradable energy sources and materials in production operations. This is a way of achieving sustainability and reducing costs. These an important element in sustainability as these involves fast, reliable, and energy-efficient production processes. Ultimately the aim is to eliminate waste and improve productivity

therefore positive firm performance (Nimawat & Namdev, 2017).

A sustainable package in horticulture is a key element in production according to studies done by Ogecha (2016) the study found that recycled packaging had a significant influence on value addition and customer service. Therefore, achieving the objective of meeting the customer needs and expectations. Another study by Kariuki et al., (2023) shows that green packaging positively influences competitive advantage in the horticultural industry. Therefore, identifying it as a significant source of competitive advantage as packaging differentiates a firm from the competitors. Studies done by Gachukia (2015) note that trade in high-care products in selected pre-packaged forms has become a primary source of profit for leading exporting firms mainly destined for the UK market. These findings concur with those of Liao, Hu, and Ding (2017) who in their studies concluded that competitive advantage is mostly determined by an organization's innovativeness.

Research Methodology

Research Philosophy, Research Design, Population and Sampling Technique and Sample Size

The study adopted a positivist research paradigm which is an epistemological position, characterized by a belief in theory. This is before conducting research with the statistical justification of conclusions from empirically testable hypotheses, which is the core of tenets of social science (Cooper & Schindler, 2011). The research employed a cross-sectional survey research design. The target population was 645 registered firms with Horticultural crops directorate (2020). The respondents included either the Supply Chain Officer, the Operation Officer/Manager, the Logistic Officer, or a Senior member of staff involved in the day-to-day supply chain operation of the Horticulture firm. The sampling frame consisted of the 240 firms registered with the Horticultural Crops directorate as guided by Gall et al., (2014) formula.

Data Collection Measurement and Analysis

In this study, primary data mainly utilized questionnaires with the constructs measured by a five-point Likert scale. The hypotheses testing the correlation between adopting a sustainable supply chain was measured through a linear regression model. The general linear regression model was $Y = \beta_0 + \beta_1 X_1 + \varepsilon$. Where Y is the dependent variable (performance of horticulture firm performance in Kenya), β_0 is the Constant (Coefficient of intercept), β_1 is the beta coefficient, X_1 is Sustainable Production, ε = error term.

Research Findings and Discussions

The total number of questionnaires administered was three hundred. The total number of respondents was 245. The six Sustainable Supply Chain constructs had a Cronbach Alpha of 0.86, indicating an elevated level of internal consistency. Each construct using Rykov's rho is indicated as omega. Rykov's rho was above 0.4 thereby indicating high validity of each latent variable. Linearity of the study was done using an ANOVA test to visually show if there was a linear or curvilinear relationship between two continuous variables before carrying out regression analysis. Shapiro-Wilk statistics showed that the data conformed to a normal distribution.

Descriptive Statistic on Sustainable Production

The objective was to establish the relationship between sustainable production and the performance of horticulture exporting firms in Kenya. Table 1 is a presentation of the findings. The study measured Sustainable production by three sub-variables: cleaner production, sustainable product design, and sustainable package.

The study confirmed that the Firm's customers' needs were carefully analyzed and considered during production to ensure the integration of sustainability in the production process according to the majority ($M = 4.23$ $SD = 0.71$). This concurs with Perez-Mesa's (2015) finding that seed and biotechnology companies are increasingly designing (producing) the final product with the end consumer in mind. Therefore, alluding to Figueiredo et al., (2021) assertion that certification of fertilization and pest management is the best way to improve the environmental performance of agricultural production. Most horticultural firms ensured that all inputs procured had minimal negative environmental impact at the design or production stage, ($Mean = 4.20$, $SD = 0.70$). This concurs with McDonough & Braungart's (2021) statement that states "the design of sustainable products follows the cradle-to-cradle design philosophy to create a closed-loop system". Here is where the materials or products produced can be recycled by the firms without degradation. Close collaboration with suppliers is maintained by the horticulture farmers to ensure cleaner production processes ($Mean = 4.15$, $SD = 0.72$). According to Shrivastava and Costa (2017), different stakeholders can ascribe different legitimacy to achieving sustainability. Further emphasizing that there should be frequent information sharing among the stakeholders in the Supply chain. Scholars argue collaboration has evolved and most firms have adopted these as a strategy for firms to achieve sustainable performance in supply chains (Liao et al., 2017; Kumar et al., 2019; Fischer and Pascucci 2017; Agyabeng-Mensah et al., 2020).

Horticulture firms strictly required adherence to the specifications set out in packaging materials to ensure sustainability ($M = 4.26$, $SD = 0.66$). Horticulture firms strongly encouraged innovations in the reduction of packaging materials and sizes through standardization ($M = 4.20$, $SD = 0.68$). Firms ensure the size, shapes, and materials used in packaging ensure sustainability while promoting quality during transportation and storage. Key in avoiding spoilage of produce ($Mean = 4.30$, $SD = 0.65$). Brocken et al., (2016) introduced different resource flows which included prolonged use and reuse of products, reusing materials by recycling therefore reducing the use of resources. Studies done by Kariuki et al., (2023) identified green packaging as positively influencing competitive advantage in the horticultural industry as it differentiates a firm from the competitors. Confirming Gachukia (2015) earlier observation that packaging has become a primary source of profit for leading exporting firms destined for the UK market. These findings concur with Liao, Hu, and Ding (2017), who revealed that competitive advantage was determined by an organization's innovativeness. Therefore, indirectly contributing to firm performance. Jesus Garcia et al., (2017) acknowledge that packaging is one of the elements that can support and promote improvement and innovation in SSCM. Based on the aggregate mean of 4.22 and standard deviation of 0.69 it is evident from the respondents that Sustainable production contributes to a firm's performance. Therefore, Cleaner production, Sustainable product design,

and Sustainable packaging are crucial contributing factors impacting firm performance of horticulture firms in Kenya.

Table 1: Descriptive statistics on Sustainable Production

| Statement | Mean | Std. Dev |
|---|------|----------|
| The Firm’s customers' needs are carefully analyzed and considered during production to ensure the integration of sustainability in the produce. | 4.23 | 0.71 |
| The firm ensures all inputs procured have a minimal environmental impact during the design/production stage. | 4.20 | 0.70 |
| The production process involves close collaboration with suppliers to ensure the integration of sustainable processes. | 4.15 | 0.72 |
| Suppliers are strictly required to adhere to the specifications set out on the supply of packaging materials to ensure sustainability. | 4.26 | 0.66 |
| Suppliers of packing materials are encouraged to be innovative and work towards standardization, reducing or downsizing packaging. | 4.20 | 0.68 |
| The firm ensures the size, shape, and materials for packaging promote efficiency and maintain the quality during storage and transportation to avoid spoilage of produce. | 4.30 | 0.65 |
| Aggregate Mean | 4.22 | 0.69 |

The respondents, through open-ended questions, were asked what other measures are in place to ensure sustainability in design production and packaging. They were further requested to suggest how best issues of sustainability can be addressed towards improved firm performance. Most of the Horticulture firms attested to the use of eco-friendly, non-toxic, recycled, bio-degradable materials when it comes to packaging. Empathizing on the need to adhere to the global standard in packaging as captured by one of the respondents. *“We use biodegradable, eco-friendly packaging materials that are multipurpose and long-lasting with a capability of recycling thereby minimizing emissions of carbon and other greenhouse gases into the atmosphere. Another suggestion on how to improve the packaging was: ‘In production, the firm should consider addressing matters like emerging trends, so that consumer's needs are not compromised, in packaging the firm should consider the size and type of flower, for example in rose flowers we have one with a big and small head, so it should consider the size of flower in packaging”* The use of green technology in production was another measure suggested for example use of organic fertilizer. This is in concurrence with Patel (2023) and Nyambura, & Mwenda (2022) who qualifies these statements noting that integrating sustainable materials into the various production, distribution, and consumption processes has become a vital pathway for firms to achieve sustainability for competitive advantage.

Correlation Analysis for Sustainable Production

The correlation analysis results in **Table 2** indicate that the Pearson correlation coefficient of $r=0.542$ is strong and statistically significant ($p < 0.05$). Implying a strong relationship between Sustainable production and the performance of horticulture exporting firms. The finding concurs with Patel's (2023) decree that integrating sustainable materials into the various production

processes has become a vital pathway for firms to achieve sustainability for competitive advantage and in turn increased firm performance.

Table 2: Correlation Analysis for Sustainable Production

| Correlations | | Production | Firm Performance |
|---------------------|---------------------|------------|------------------|
| Production | Pearson Correlation | 1 | .542** |
| | Sig. (2-tailed) | | .000 |
| | N | 244 | 244 |
| FP | Pearson Correlation | | 1 |
| | | .542** | |
| | Sig. (2-tailed) | .000 | |
| | N | 244 | 244 |

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

Regression Analysis for Adoption of Sustainable Production

H₀₁: There is no significant relationship between the adoption of sustainable production and the performance of horticulture exporting firms in Kenya.

According to the table below, sustainable production practices accounted for 30% of the variation observed in the performance of horticulture exporting firms in Kenya ($R^2 = 0.295$). Therefore, since the relationship between sustainable production and firm performance was statistically significant, the null hypothesis that stated that there was no significant relationship between the adoption of sustainable production or that sustainable production has no significant effect or impact on firm performance is thus rejected and the null hypothesis adopted.

The researcher uses the linear regression model to evaluate the statistical relationship between the adoption of sustainable production and the performance of horticultural exporting firms. The model used is the least square regression. The model summary results of the study are illustrated in Table 3. The R-squared of the result of the model is 0.295. The result implies that the adoption of sustainable production accounted for 29% of the total variations in the performance of horticultural exporting firms in Kenya. The Analysis of Variance (ANOVA) model analysis of the variance is illustrated in Table 4. The result indicating the overall model was statistically significant as supported by a p-value of 0.000. Supported by an F-value of 101.053. A significant level of < 0.05 . This shows that the model can statistically predict the relationship between sustainable production and the performance of the horticultural exporting firms in Kenya. The regression coefficient for the model is shown in Table 5. The Beta Coefficient for the adoption of sustainable production is 0.524. This denotes that the adoption of sustainable production influences 52.4% of performance in the horticultural exporting firms in Kenya. Therefore, for every one-unit increase in sustainable production practices, the performance of horticulture exporting firms increases significantly by 0.524 units. The P-value of the variable is $0 < 0.001$. The result presumed that the adoption of sustainable production exerts a significant influence on the performance of horticultural exporting firms in Kenya.

Table 3: Model Fitness

Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|------|----------|-------------------|----------------------------|
| 1 | .543 | .295 | .292 | .500 |

a. Predictors: (Constant), production
b. Dependent Variable: Performance

Table 4: Analysis of Variance Table

ANOVA

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|---------|------|
| 1 | Regression | 25.279 | 1 | 25.279 | 101.053 | .000 |
| | Residual | 60.537 | 242 | .250 | | |
| | Total | 85.816 | 243 | | | |

a. Dependent Variable: Performance
b. Predictors: (Constant), production

Table 5: Regression of Coefficients

Coefficients

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|-------|------------|-----------------------------|------------|---------------------------|--------|------|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1.858 | .222 | | 8.353 | .000 |
| | Production | .524 | .052 | .543 | 10.052 | .000 |

a. Dependent Variable: Performance

Conclusions and Recommendations

Conclusion of the Study

The hypothesis was “There is no significant relationship between the adoption of sustainable production and the performance of horticulture exporting firms in Kenya.” The study reveals that the adoption of sustainable production has a statistical significance in explaining the performance of horticulture exporting firms in Kenya. Meaning a unit improvement in adoption of sustainable production leads to a positive impact on the performance of the horticulture exporting firm. The study therefore concludes that the adoption of sustainable production positively and significantly relates to the performance of horticulture exporting firms.

Recommendation of the Study

In horticulture production, it's essential for customer needs to be carefully analyzed and captured during the design stage. These may involve basic surveys, customer satisfaction surveys, and feedback from customers and retailers. It involves; analyzing customer behavior in supermarket aisles where fresh produce is displayed and scrutinizing produce that has been rejected while understanding the reason for this. The study recommends that customer feedback be carefully examined as this helps in understanding their needs. These are necessary before production to incorporate market needs into the design processes. The process also involves daily monitoring

and evaluating customer requirements that are constantly evolving. These will guarantee that all inputs including fertilizers, seeds, pesticides, fungicides, and other production machinery and equipment procured have a minimum negative impact on the environment.

On packaging, the study recommends that the material used ensures produce maintains quality during transportation up to the destination. Sustainability involves ensuring packaging materials are degradable and eco-friendly. The essence is to maintain quality standards and elimination of wastage during transportation. Exporting horticulture are required to adhere to global standards on packages to remain competitive and avoid spoilage of produce that leads to waste. These ultimately affect volume and sales and in turn the firm performance. The study further recommends firms should leverage on this as having adopted sustainability to end users through labeling the package. A clear demonstration of traceability along the supply chain of the produce exported. Proper capture of the produce is essential as eco-friendly while using ethical practices during production. These should be captured in the branding of the produce. These will go a long way towards improved firm performance.

Research limitations

The study conducted had limitations. The horticulture sector is vibrant. It involves dealing with the perishable produce for export. The production process is also seasonal meaning it has different timelines. This posed a challenge when engaging with the respondents. The researcher had to follow up and remind the respondent to respond to the questionnaire. When the respondents were challenged in filling in the questionnaire the Researcher would request an appropriate time and help the respondent fill in the questionnaire and clarify any of the questions that were not clear. Initially, some respondents were hesitant to fill in the questionnaire fearing the repercussions however, the researcher reassured the respondents that this was purely for academic purposes. Due to the challenges, it took a longer time than initially anticipated to collect the data.

Areas of Further Study

The study limited itself to four variables (procurement, production, logistics, and internal supply chain management) meaning the empirical review was limited to these variables. Therefore, other studies can be conducted on different variables including the adoption of technology towards sustainability. This study limited itself to institutional pressure as the moderator. Further studies for example the moderating effect of firm size on the adoption of sustainability in the supply chain. Studies show that firm characteristics such as firm size affect its performance. Smaller horticulture exporting firms may lack the resources required to adopt SSCM. Studies on SSCM in other sectors of the economy are recommended, including the manufacturing sector, hospitality, public sector, university, and other important sectors of the economy. The study was conducted in Kenya, comparative studies from other regions can be conducted, especially among the major horticulture exports which include Egypt, Morocco, and South Africa. Most scholars in SSCM in Africa are based in Ghana therefore more scholars from other African countries should explore the topic enabling the continental to build a more sustainable future.

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