



LEAN SUPPLY CHAIN PRACTICES AND PERFORMANCE OF AGRO PROCESSING FIRMS IN NAIROBI METROPOLIS, KENYA

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ABSTRACT

The general objective was to examine the effect of lean supply chain practices and supply chain performance of agro processing firms in Nairobi Metropolis, Kenya. The specific objectives were to; determine effect of just in time, supplier relationship, on supply chain performance of agro processing firms in Nairobi Metropolis, Kenya. The study was guided by theories namely; lean theory, social exchange theory. The researcher employed descriptive research design. The target population of this study was 102 agro processing firms in Nairobi City County. The study adopted census approach since the population under study is small and use questionnaires for data collection. The sample for piloting was 10% of the sample hence 10 supply chain managers. This study used both construct validity and content validity. The Cronbach Alpha coefficient was used to measure the consistency of variables. Primary data was analyzed using both descriptive statistics (frequency, percentage, mean) and inferential statistics that included Pearson correlation and regression. The study concludes that just in time has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. In addition, the study concludes that supplier relationship has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. Based on the findings, this study recommends that the management of agro processing firms should put into consideration availability of resources on demand, production on demand, availability of labor on demand.

1

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INTRODUCTION

Lean in a supply chain context is a term that means eliminating non-useful activities through the supply chain. Lean is a management approach that involves the identification and elimination of wastes through the continuous improvement of a product to ensure customer satisfaction is achieved. The goal of the lean approach is to create more value for the customers at a less cost (Singh & Pandey, 2015). Lean supply management practices hence involve different stakeholders in the supply chain involved in the production and sale of a product. For lean management to be achieved, it can involve different companies or departments within an organization (Hu et al., 2015). Drohomerski et al. (2014) summarized lean supply chain objectives as the elimination of sources of waste in the supply chain, improvement of customers' value delivery, supply chain partners' involvement, collaboration with suppliers and customers, and development of effective suppliers.

Adoption of lean supply chain management enables the firms to tailor their supply chain processes and organizational roles to support lean supply chain principles. Organizations within a lean supply chain are able to leverage their own lean journey more easily, delivering better customer value by responding more efficiently, quickly, and predictably to customer needs (Margaret, 2013). Lean supply chain management (LSCM) is increasingly commanding a significant contribution in daily performance of most manufacturing organizations. Adoption of LSCM by the organizations has given rise to competitive edge in the global market via constant supply of quality products at affordable costs thus commanding good market share and reaping high profits.

According to Nyambura, Mutui, and Mutwiri (2018), within an organization, lean supply management practices continuously explore different approaches through which customer value is continuously enhanced. This practices can include; wastage minimization, effective utilization of in-house talents, optimization of technology utilization and effective utilization of resources. The outcomes of the lean supply management practices in an organization are the reduction in the use of human efforts, less capital and general resources to produce products. As a result, products are produced more efficiently and at a less cost. The practice ensures that

organizations are able to effectively respond to the changing tastes of customers and offer products at a competitive price hence gaining a competitive advantage in the market.

Mutua, Ngugi and Odhiambo (2018) documented that lean practices have a direct correlation to the overall performance of the SCM process with 57.1% of the performance of the SCM process being directly determined by wastage and costs. According to Ngonjo (2014), lean supply chain management practices play a critical role in the performance of the procurement of a business organization. The lean practices ensure that the procurement of goods and services is transparently conducted in a cost efficient manner. As a result, the cost of procuring goods is lowered which directly contributes to the profitability of a business. Ndungu, Were and Mwangangi (2020) indicated that lean practices to improve company internal processes and Just-In-Time tenets contribute to quality production of goods, reduction of cost of production and improvement in the company's performance.

Sumo (2015) study on supply chain performance amongst automotive manufacturing firms in Kenya found that the tools of lean practices applied by automotive firms included value stream mapping, Five (5) Ss, Just in time production and Jidoka. Just in time production enabled firms to stay put in the competitive industry by ensuring demand is responded to when it arise. It also influences supply chain performance in automotive firms by ensuring there are supplies only when needed thus enabling a firm to cut costs on inventories and wastage. Fatuma (2015) found that large manufacturing firms in Kenya that adopted quality management practices characterized by lean production, benchmarking, six sigma practice and supplier partnering had a higher market share. Adoption of quality management practices enables a firm to relate well with all its stakeholders which contributes to a successful accomplishment of set goals and objectives. Ongaro (2019) study on effect of lean manufacturing practices on supply chain performance of manufacturing firms in Kenya indicated that the four lean production practices of just in time production, cellular manufacturing, pre-production planning and total quality control are positively and significantly associated with supply chain performance

Statement of the Problem

Agribusiness plays a crucial function in the economic transformation through the development of agro-based industries and provision of employment and income(s). The Food Processing sub-sector is a key driver of the Kenyan economic growth. To support the sector and enhance food security, the Government has provided substantial amount of resources for development of key infrastructures and improvement of general logistics systems and regional market penetration protocols. Despite the huge commitment of public resources, the Kenya National Bureau of Statistics (KNBS) reports a notable decline in performance of food processing firms. The intermediate and capital goods industries are also relatively underdeveloped, implying that Kenya's food manufacturing sector is highly import dependent. Locally manufactured food comprises 10% of Kenya's exports. Poor performance of food and beverage companies as a result of increase in costs can be indicated by the closure of a fast consumer goods manufacturer such as Cadbury Kenya, Kuguru Foods Complex Limited in July 2015, Pecha Food Limited in July 2016, Stawi Food and Fruits Limited in August 2016 and Maz International Limited in March 2017 (KAM, 2017). The agro processing sector has also experienced declining customer satisfaction due to supply chain disruptions characterized by food safety scares, shortages and ever increasing prices (Awino, 2019).

Kathikeyan (2016) noted that the key challenges facing the supply chain performance of agricultural produce are logistical activities such transportation, storage and handling as well as inefficient ways of managing information. Failure in the performance of a firm's supply chain courtesy of inefficient logistics activities results in competitive losses and can ultimately lead to collapse of an organization. Producers and Marketers of agricultural produce incur post-harvest losses ranging between 30-75% an index of low performance due to poor logistical activities (Oparanya, 2021). Mutunga, Magutu and Chirchir (2015) attributed poor performance of the agro processing sector in Kenya to inefficient supply chain management.

In recent years, there has been substantial interest in lean thinking by researchers especially in the manufacturing sector. Wambui and Odari (2021) study on the influence of lean supply chain

practices on the performance of food and beverage manufacturing firms in Kenya found a strong positive correlation between performance and waste management, and performance and quality assurance. Kimari and Muli (2022) study on influence of lean supply chain management practices on the performance of manufacturing firms found that Just in Time Procurement had an insignificant negative influence on performance, Six Sigma lean supply chain practice had a significant positive influence on performance and Total quality management had an insignificant positive influence on performance. Yala (2016) study on lean supply chain management practices and operational performance of the manufacturing firms in Kenya found that lean supply chain management practices have very strong correlation with manufacturing firms in Kenya with demand management having the highest level of effect. This is an indication that there is study limitation on lean supply chain management and performance in agro processing firms in Nairobi Kenya. This study hence sought to fill the knowledge gap by examining the effect of lean supply chain practices and supply chain performance of agro processing firms in Nairobi Metropolis, Kenya.

Research Objectives

- i To determine effect of just in time on performance of agro processing firms in Nairobi Metropolis, Kenya.
- ii To assess effect of supplier relationship on performance of agro processing firms in Nairobi Metropolis, Kenya.

LITERATURE REVIEW

Theoretical Review

Lean Theory

Lean theory was introduced by James, Womack, Jones and Roos (1991). The theory was later developed by Nash, Poling and Ward (2006) who saw it as a systematic approach that aims at enhancing a continuous flow of quality product or service to customers just at the time they need it. According to the theory, processes that aim at fully satisfying customers' needs should follow prescribed principles while minimizing all forms of loss. According to Ciarniene and Vienazindiene (2012), lean is a functional model comprising of comprehensive techniques which aim at reducing and eliminating wastage when combined together in a production process hence making a firm more

responsive and flexible to changes in demand. Lean theory capitalizes on a continuous quality delivery to customers basing on customers’ needs at specific time. By doing so, the production process eliminates waste characterized by unnecessary planning meetings, unnecessary inventories, overproduction, and unnecessary transport and over processing (Rand, 2011).

Organizations aiming at applying lean theory in their production lines should have a strong focus on customers, should be willing to remove production wastes from all production processes on daily routine and must be willing to grow and survive prevailing stiff competition. Firms applying this strategy aim at increasing efficiency while at the same time decreasing waste since they receive goods just when they are needed in production process. The strategy enables producers to accurately forecast demand. Bautista and Santos (2016) asserts that organizations are able to reduce the amount of working capital due to the reduction in inventory levels. Consequently, the strategy ensures step by step inspection of the production process hence minimizing wastage. Lean theory forms the basis of this research as it evaluates and brings out lean practices that aim at removing production overburden, inconsistency and minimizing waste.

Social Exchange Theory

Social exchange theory was propounded by Homans (1958) with the sole aim of establishing inter-organizational relationship. According to West and Turner (2007), SET assumes that relationships are interdependent. The theory was developed based on the notion that a relationship between two parties is created through a process of cost benefit analysis. The Social Exchange

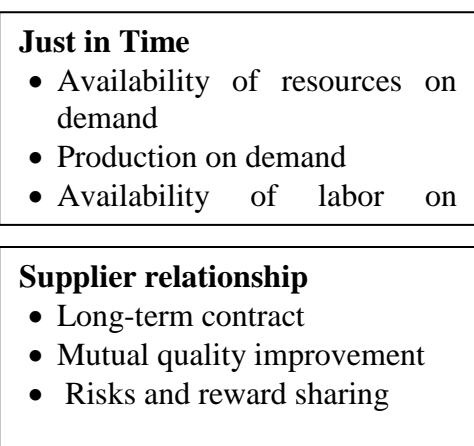
Theory assumes that relationships between entities in transaction are mutual and interdependent (West & Turner, 2007). In a completely interdependent system, all sub-criteria of the systems are mutually related, directly or indirectly for the benefit of parties involved. Therefore human beings are attuned and mutually dependent on each other in a given environment (Yang, Chiu, Tzeng, & Yeh, 2008).

Within the Social Exchange Theory, transactions are bidirectional, meaning that there is mutual exchange of material things, where something has to be given in exchange of something else in a given environment (Cropanzano & Mitchell, 2005). In addition, the Social Exchange Theory assumes that individuals take part in an exchange only when they expect their rewards from it to justify the cost of participation. It means buyer supplier relationship is mutual and there is equitable sharing of resources and benefits. However, in the Social Exchange Theory, there is no guarantee for reciprocal rewards after investing costs or money due to lack of contractual obligations.

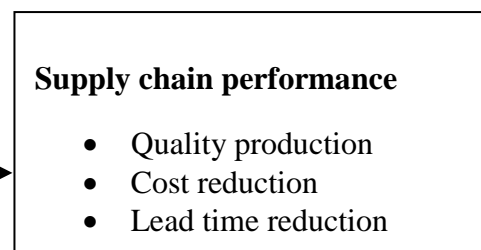
The theory is specifically applicable in the selection of supplier strategies and for making decisions about how to deal with buyers and suppliers. A buyer, when engaging in an exchange, should make his agency interesting and should focus on social norms like trust and commitment (Kraiselburd, Pibernik & Raman, 2011). Through a commitment exchange relationship, the chance for a continuation of this relationship is higher. The social exchange theory is applicable in supply chain management as a valuable instrument when analyzing buyer-supplier commitment (Nammir et al., 2012).

Conceptual Framework

Independent Variables



Dependent Variable



Just in Time

Just-in-time is an approach to achieving excellence in a manufacturing company based on the continuing elimination of waste (Singh & Singh, 2015). There is an increasing demand worldwide for strategic resources that future supply may not meet the demand. Some resources are so rare that it is impossible to increase production. Additionally, factors such as environmental considerations, political stability, and economics act as limiting factors to supply increase. The inequality between demand and supply of resources is bound to become a global problem in the future. If the demand for a specific resource is greater than its supply, many countries will have limited access to it. Mannelli(2020) states that if resources are scarce and the demand is high, some people will miss out if there is a strict prioritization criterion. Developing countries such as Kenya will be the worst hit in their desire to use resources in the development of new technologies. Most industrialized countries will drive global demand and exploit resources that they have no control over. An inadequate supply of resources will contribute to an increase in prices for the final product and the resource. Future supply-demand inequality will also contribute to global issues like humanitarian disregard, inaccessibility of the resource, and price instability.

Production on demand is the process of producing goods only when they are required and, in the quantities, needed. In contrast, traditional manufacturing would often entail the production of products in large quantities, thereafter stored in facilities until they are needed for shipping. Production on demand can be likened to lean methodology. Iranmanesh et al. (2019) indicates that lean manufacturing is a methodology that seeks to lower costs by minimizing waste. Production on demand eliminates costly inventory, creates opportunities to create specialized and unique products. It eliminates the need to store goods and materials. It minimizes the need to meet minimum order requirements or forecast new product volumes. It also allows companies to direct staffing resources elsewhere and ship warehousing costs.

Production on demand lowers landfill waste and ends overproduction, especially in foods that are influenced by trends. Most of the foods not consumed end up being thrown in garbage bins and become land waste. However, on-demand

manufacturing will ensure that companies produce what consumers order. Moreover, production on demand streamlines operations and allows companies to outsource supply chain solutions. The demand for labor is defined as an economic principle that stands for demand for a company's output. The principle indicates that if demand for a company's output goes up, the firm will need more labor and thus will be required to hire more staff. However, if the demand for labor decreases, the company will require less labor, and thus some may be laid off. Managers must make cost minimization strategies by lowering the number of employees if the company is making losses (Ndereyimana et al.2022). Labor market factors contribute to either the demand or the supply of labor. People that require employment will supply their labor to get salaries while companies that need labor will pay for their skills and time.

Supplier Relationship

Supplier relationship refers to the ability of a firm to establish, manage, and maintain long-term reliable partnership with its suppliers (Li & Lin, 2016). Long-term supplier contracts can contribute to many benefits in an organization. They will enhance innovation through initiatives such as continuous improvements. They will smooth demands, drive the value of a program and enable better forecasting. Companies can also reap rewards if they treat their suppliers well and as business partners. Long-term contracts contribute to the mastering of routines and strategies such that long-term contracts will lower the number of new employees that need to be trained. There is a better return on investment for the suppliers and the company. There are dedicated account support as the supplier gets familiar with the product thereby creating room for improvement. Long-term relationships can help the company to exchange efficiency, lower uncertainty, and manage dependence (Lee et al.,2018). Long-term contracts help to build stronger partnerships which creates a greater understanding of what is required with greater dedication from the teams involved.

One of the most essential aspects of lean supply management is the creation of a mutually beneficial relationship, especially with suppliers. It is a principle in the ISO standards that seeks to empower companies to facilitate quality in the organization to meet universal quality management standards. The benefits of creating a mutual supplier relationship and quality are the

increased capacity to create value for the company and suppliers. There are faster responses to consumer requirements and market conditions. There is also an optimization of resources and costs. Risks come in various forms such as climate change, geopolitical tensions, cyber threats, and supply-driven disruptions that need to be carefully analyzed by all parties (Baldwin & Freeman, 2021). The lack of risk sharing in the supply chain can lead to optimal decisions that lower the total supply chain profit. If there is no risk sharing, most retailers will aim for a lower level of product availability than what would be needed to maximize profits. Some of the risk-sharing mechanisms include quantity flexibility, revenue sharing, and buybacks. Sharing rewards can induce improvement of performance from a supplier such as lead time

Empirical Review

Lubis et al (2022) examined production and demand forecasting analysis of rice in North Sumatra, Indonesia. The study investigated the most suitable method for forecasting rice production and demand between the use of linear, quadratic, and exponential trend analysis from 2010-2021. The findings indicated that the quadratic trend analysis was the best method to highlight production and demand forecasts. The study established that there was a high production of rice due to the continuous increase in demand for rice.

Kwadwo (2015) conducted a study on impact of efficient inventory management on profitability of manufacturing firms in Ghana. This study used secondary data which was collected from the stock exchange of Ghana for a period of 10 years. The findings revealed that inventory management directed towards raw materials positively and significantly influences profitability of manufacturing firms. Mersha et al. (2018) assessed the impact of the Integrated Water Resources Management (IWRM) policy on demand satisfaction and water availability in Ethiopia. The study conducted scenario analysis in the Awash Basin in Ethiopia. It observed monthly stream-flow against the simulated flows at five control points over a period of 15 years. The results established that irrigation plans established to combat food insecurity led to overexploitation of the water resources. The repercussion is increased inequity between commercial farmers and smallholders.

Mutua, Misoi, and Boit (2021) investigated effect of Just-in-time procurement strategy on organization performance of food and beverage manufacturing firms in Nairobi County. The study adopted a causal research design. Data was collected using questionnaires. The sample was 83 heads of department. The study concluded that JIT Procurement strategy has a positive effect on organization performance of food and beverage manufacturing firms in Nairobi County.

Cha and Kim (2018) assessed the critical success factors for mutual collaboration with suppliers in the IT industry in Korea. The study used a qualitative research method to interview 42 respondents. The findings of the study established that the IT industry should adopt an organizational process model that focuses on supplier relationship management. Khalil, Khalil and Khan (2019) investigated the relationship between supply chain management practices and organizational performance with the mediating role of innovation. Data were collected from 207 small and medium enterprises (SMEs) in Punjab, Pakistan. Findings revealed that strategic partnership with supplier and level of information sharing had no influence on organizational performance. Furthermore, quality of information sharing, internal supply chain process, and lean practices had significant influence on organizational performance.

Alves (2018) investigated how culture affected the quality of cooperation between Portuguese exporting companies and their distributors in Angola. The study used qualitative methodology through interviews of five Portuguese exporting companies and five Angolan distributors. The results indicate that culture, trust, and commitment played a big role in cementing the supplier relationship between the two countries. Nzeyimana and Gitahi (2022) investigated the supply chain management practices and performance of public institutions in Rwanda. The study used a descriptive research design with a sample size of 82 respondents. The findings of the study established that smart supplier partnerships were important in improving the performance of public institutions.

RESEARCH METHODOLOGY

The researcher employed descriptive research design. The target population of this study was agro processing firms in Nairobi City County. According to Kenya Association of Manufactures

(KAM), there are 102 agro processing firms in Nairobi City County out of which 36 are large firms, 33 medium and 33 small firms. The study targeted 102 supply chain managers of the agro processing firms. The study adopted census approach since the population under study is small. Therefore, 102 firms were included in the study as units of analysis. The study used questionnaires for data collection. The raw data collected from the field was organized to facilitate analysis. Quantitative data obtained from questionnaires were coded and analyzed with the use of a computer in Statistical Package for Social Sciences (SPSS) Version 28 program. Primary data was analyzed using both descriptive statistics (frequency, percentage, mean) and inferential statistics that included Pearson correlation and regression.

ANALYSIS AND INTERPRETATION OF DATA

Descriptive Statistics Analysis

Just In Time and Performance of Agro Processing Firms

The first specific objective of the study was to determine effect of just in time on performance of agro processing firms in Nairobi Metropolis, Kenya. The respondents were requested to indicate their level of agreement on statements relating to just in time and performance of agro processing firms in Nairobi Metropolis, Kenya. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4 symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 1.

From the results, the respondents agreed that the firm avails resources on demand in order to manage wastage. This is supported by a mean of 3.943 (std. dv = 0.981). In addition, as shown by a mean of 3.866 (std. dv = 0.850), the respondents agreed that the firm has a daily schedule commitment to ensure faster production on time. Further, the respondents agreed that the firm orders raw materials from the suppliers only when there is demand for production from customers. This is shown by a mean of 3.831 (std. dv = 0.914).

The respondents also agreed that the firm avails labor on demand in order to manage labor costs. This is shown by a mean of 3.796 (std. dv = 0.947). With a mean of 3.789 (std. dv = 0.856), the respondents agreed that the firm adopts best practices in the industry such as JIT and efficient customer response to prevent inventory build up.

The respondents also agreed that the firm produces on demand in order to manage inventory costs. This is shown by a mean of 3.756 (std. dv = 0.783). From the results, the respondents agreed that the firm has simplified production design to ensure timely production. This is supported by a mean of 3.682 (std. dv = 0.876). In addition, as shown by a mean of 3.621 (std. dv = 0.974), the respondents agreed that the firm has multiple skill workers to ensure faster production on time.

Table 1: Just In Time and Performance of Agro Processing Firms

	Mean	Std. Dev.
The firm avails resources on demand in order to manage wastage	3.943	0.981
The firm has a daily schedule commitment to ensure faster production on time	3.866	0.850
The firm orders raw materials from the suppliers only when there is demand for production from customers	3.831	0.914
The firm avails labor on demand in order to manage labor costs.	3.796	0.947
The firm adopts best practices in the industry such as JIT and efficient customer response to prevent inventory build up.	3.789	0.856
The firm produces on demand in order to manage inventory costs	3.756	0.783
The firm has simplified production design to ensure timely production	3.682	0.876
The firm has multiple skill workers to ensure faster production on time	3.621	0.974
Aggregate	3.793	0.873

Supplier Relationship and Performance of Agro Processing Firms

The second specific objective of the study was to assess effect of supplier relationship on performance of agro processing firms in Nairobi Metropolis, Kenya. The respondents were requested to indicate their level of agreement on the statements relating to supplier relationship and performance of agro processing firms in Nairobi Metropolis, Kenya. The results were as shown in Table 2

From the results, the respondents agreed that the firm communicates with suppliers through supply chain systems. This is supported by a mean of 3.996 (std. dv = 0.865). In addition, as shown by a mean of 3.919 (std. dv = 0.945), the respondents agreed that the firm evaluates the risks connected

with existing suppliers in terms of quality requirements on a regular basis. Further, the respondents agreed that suppliers are incorporated in the manufacturing, warehousing and stores chain. This is shown by a mean of 3.898 (std. dv = 0.611).

The respondents also agreed that the firm maintains a database for all its suppliers. This is shown by a mean of 3.831 (std. dv = 0.908). With a mean of 3.743 (std. dv = 0.897), the respondents agreed that the firm has an integrated information sharing system. The respondents also agreed that they include their key suppliers in their planning and goal-setting activities. This is shown by a mean of 3.654 (std. dv = 0.976). From the results, the respondents agreed that they regularly solve problems jointly with their suppliers. This is supported by a mean of 3.612 (std. dv = 0.786). In addition, as shown by a mean of 3.561 (std. dv = 0.776), the respondents agreed that the firm on has an enhanced relations with various suppliers.

Table 4. 1: Supplier Relationship and Performance of Agro Processing Firms

	Mean	Std. Dev.
The firm communicates with suppliers through supply chain systems	3.996	0.865
The firm evaluates the risks connected with existing suppliers in terms of quality requirements on a regular basis	3.919	0.945
Suppliers are incorporated in the manufacturing, warehousing and stores chain	3.898	0.611
The firm maintains a database for all its suppliers	3.831	0.908
The firm on has an enhanced relations with various suppliers	3.561	0.776
The firm has an integrated information sharing system	3.743	0.897
We include our key suppliers in our planning and goal-setting activities	3.654	0.976
We regularly solve problems jointly with our suppliers	3.612	0.786
Aggregate	3.782	0.841

Performance of Agro Processing Firms

The respondents were requested to indicate their level of agreement on various statements relating to performance of agro processing firms in Nairobi Metropolis, Kenya. A 5 point Likert scale was used where 1 symbolized strongly disagree, 2 symbolized disagree, 3 symbolized neutral, 4

symbolized agree and 5 symbolized strongly agree. The results were as presented in Table 3.

From the results, the respondents agreed that they receive minimal complaints from our clients regarding quality. This is supported by a mean of 4.084 (std. dv = 0.997). In addition, as shown by a mean of 3.917 (std. dv = 0.831), the respondents agreed that lean production practices enhances timely delivery of products. Further, the respondents agreed that lean production practices have improved the quality of products. This is shown by a mean of 3.858 (std. dv = 0.563). The respondents also agreed that lean production practices have reduced the supply chain costs. This is shown by a mean of 3.831 (std. dv = 0.851). With a mean of 3.751 (std. dv = 0.935), the respondents agreed that lean production practices has led to improved flexibility in production.

Table 4. 2: Performance of Agro Processing Firms

	Mean	Std. Dev.
We receive minimal complaints from our clients regarding quality	4.084	0.997
Lean production practices enhances timely delivery of products	3.917	0.831
Lean production practices has improved the quality of products	3.858	0.563
Lean production practices has reduced the supply chain costs	3.831	0.851
Lean production practices has led to improved flexibility in production	3.751	0.935
Aggregate	3.836	0.818

Inferential Statistics

Correlation Analysis

Table 4: Correlation Coefficients

		Firm Performance	Just in Time	Supplier Relationship
Firm Performance	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	94		
Just in Time	Pearson Correlation	.840**	1	
	Sig. (2-tailed)	.002		
	N	94	94	
Supplier Relationship	Pearson Correlation	.841**	.289	1
	Sig. (2-tailed)	.001	.061	
	N	94	94	94

From the results, there was a very strong relationship between just in time and performance of agro processing firms in Nairobi Metropolis, Kenya ($r = 0.840$, p value =0.002). The relationship was significant since the p value 0.002 was less than 0.05 (significant level). The findings are in line with the findings of Lubis *et al* (2022) who indicated that there is a very strong relationship between just in time and firm performance.

Moreover, the results revealed that there is a very strong relationship between supplier relationship and performance of agro processing firms in Nairobi Metropolis, Kenya ($r = 0.841$, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings conform to the findings of Cha and Kim (2018) that there is a very strong relationship between supplier relationship and firm performance.

Regression Analysis

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.929	.863	.864	.10120

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.863. This implied that 86.3% of the variation in the dependent variable (performance of agro processing firms in Nairobi Metropolis, Kenya) could be explained by independent variables (just in time, supplier relationship, total quality management and supply chain information flow).

Table 6: Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	12.027	4	3.018	41.34	.000 ^b
1 Residual	6.568	90	.073		
Total	18.595	94			

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 41.34 while the F critical was 2.473. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of just in time, supplier relationship, total quality management and supply chain information flow on performance of agro processing firms in Nairobi Metropolis, Kenya.

Table 4. 3: Regression Coefficients

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	0.205	0.038		5.39	0.000
just in time	0.369	0.099	0.367	3.72	0.000
supplier relationship	0.486	0.107	0.487	4.54	0.000

The regression model was as follows:

$$Y = 0.205 + 0.369X_1 + 0.486X_2 + \epsilon$$

According to the results, just in time has a significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya ($\beta_1=0.369$, p value= 0.004). The relationship was considered significant since the p value 0.004 was less than the significant level of 0.05. The findings are in line with the findings of Lubis *et al* (2022) who indicated that there is a very strong relationship between just in time and firm performance.

The results also revealed that supplier relationship has significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya, ($\beta_1=0.486$, p value= 0.001). The relationship was considered significant since the p value 0.001 was less than the significant level of 0.05. The findings conform to the findings of Cha and Kim (2018) that there is a very strong relationship between supplier relationship and firm performance

Conclusions

The study concludes that just in time has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. Findings revealed that availability of resources on demand, production on demand, availability of labor on demand influence performance of agro processing firms in Nairobi Metropolis, Kenya

In addition, the study concludes that supplier relationship has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. Findings revealed that long-term contract, mutual quality improvement, risks and reward sharing influence performance of agro processing firms in Nairobi Metropolis, Kenya

Recommendations

The study found that just in time has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. This study therefore recommends that the management of agro processing firms should put into consideration availability of resources on demand, production on demand, availability of labor on demand

In addition, the study found that supplier relationship has a positive and significant effect on performance of agro processing firms in Nairobi Metropolis, Kenya. This study therefore recommends that the management of agro processing firms should ensure strengthen their relationship with the suppliers through timely and effective communication

Suggestions for Further Studies

This study focused on examining the effect of lean supply chain practices and performance of agro processing firms in Nairobi Metropolis, Kenya. Having been limited to performance of agro processing firms in Nairobi Metropolis, Kenya, the findings of this study cannot be generalized to other firms in Kenya. The study therefore suggests further studies on examining the effect of lean supply chain practices and performance of other firms in Kenya

Further, the study found that the independent variables (just in time, supplier relationship, total quality management and supply chain information flow) could only explain 86.3% of the performance of agro processing firms in Nairobi Metropolis, Kenya. This study therefore suggests research on other factors affecting performance of agro processing firms in Nairobi Metropolis, Kenya

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