




# INFLUENCE OF LEAN SUPPLY CHAIN PRACTICES (WASTE MANAGEMENT AND QUALITY ASSURANCE) ON PERFORMANCE OF FOOD AND BEVERAGE MANUFACTURING FIRMS IN KENYA: A CASE OF FARMER'S CHOICE LIMITED

Joseph Mbiyu Wambui 

Masters student, Department of Procurement and Logistics  
Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya  
joembiyu@gmail.com

Sammy Odari

Lecturer, Department of Procurement and Logistics  
Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya  
sodari@jkuat.ac.ke

## Abstract

*The global Food and Beverage Manufacturing Sector (FBMF) Supply Chain sector is complex and influenced by numerous factors. In Kenya, FBMF plays a critical role in building a stable and growing economy and contributes approximately 2.8% of Kenya's Gross Domestic Product. Despite this significant contribution, most FBMF are still grappling with inefficiencies emanating from constraints such as high operational costs, wastage of resources and lack of proper quality assurance checks. This study aimed at assessing the influence of lean supply chain practices on the performance of food and beverage manufacturing firms in Kenya. Data was collected through a semi-structured questionnaire from a sample size of 76 employees selected from eight departments through Stratified Random Sampling. Descriptive and inferential statistics data was analyzed using SPSS. There was a strong positive correlation between performance and waste management ( $p \leq 0.001$ ) and performance and quality assurance ( $p \leq 0.05$ ). Further, there was a strong positive correlation between waste management and quality assurance*

( $p \leq 0.05$ ). Multiple linear regression model R Square value was 0.767; while regression coefficient of waste management and quality assurance practices on performance was 2.398 and 1.100 respectively. This study concluded that waste management and quality assurance practices positively influence organization performance, hence should be promoted.

*Keywords:* Lean, supply chain practices, waste management, quality assurance, organizational performance

## INTRODUCTION

In the increasing competitive manufacturing industry, the concept of lean has gained increased prominence as firms strive to maximize productivity while simultaneously minimising waste within a manufacturing operation (Narayanamurthy & Gurumurthy, 2016). With the aim of reducing waste, increasing turns and building greater flexibility into their supply chain, some supply chain professionals across the world have attempted to come up with key lean practices that can be employed to the supply chain to build collaborative, adaptive, and flexible supply chains (Nath, & Agrawal, 2020). These practices include reducing costs and wastages; reducing lead time; managing demand and enhancing quality and customer satisfaction; and enhancing organizational behavior efficiency (Udokporo et al., 2020). The implementation of “Lean Practices” has enabled firms across the globe to be more customer-focused, flexible and profitable. The following sections look at the influence of adoption of lean principles on performance of food and beverage manufacturing firms in four levels namely: Global, African, Kenyan and Locally at Farmers Choice Limited.

Womack & Jones (1996) as cited by Mohamed, (2020) came up with the lean enterprise concept as a group of individuals, functions and legally separate but highly operationally synchronized entities. Lean supply management focuses on the elimination of all types of waste, including time, to enable the establishment of a level schedule (Mohamed, 2020). The concept of lean manufacturing can be traced way back to the Toyota Production System (TPS) whose main goal was to reduce and eliminate waste within the factory environs (Iswanto, 2020). The application of lean manufacturing was not extended to other parts of supply chain where large quantities of finished products were stock piled as customer orders are anticipated.

In spite of the presence of lean manufacturing facilities in the supply chain where throughput times were being decreased dramatically, customers still experienced high levels of delays for delivery of their orders (Gorane, & Kant, 2017). The concept of furthering the concept of lean enterprise to small businesses was developed by Karlsson and Ahlstrom as cited by Gorane, and Kant, (2017) which concluded that most of the theoretical principles contained in

lean supply was suited to Small and Medium Enterprises. Hvass, (2014) proposes a lean management model of supply chain for the clothing and textiles industry. He argues that lean retailers need rapid replenishment of products, and shipments should meet strict requirements including delivery times, accuracy and completeness of orders. This includes for example the use of bar codes, Electronic Data Interchange (EDI) and shipment marking.

### **Statement of the Problem**

In the recent years, many manufacturing and service companies have been challenged to increase their focus on quality of products and customer satisfaction. Putting into perception the challenges of global competition, many Organizations have been reduced to find ways of reducing costs, improving quality and meet the ever-changing needs of a more informed class of customers.

According to Muinde et al., (2020), there are five major supply chain management challenges facing Kenyan firms, including FBMF namely: cost containment, rapid change in business environment which leads to inability to adapt, lack of clear visibility and integration of information and activities in the wake of flooded markets, and low customer intimacy and satisfaction. Another major challenge facing the Kenyan FBMF is the stiff competition from China and India markets, which have adopted efficient lean supply practices. This has led to low market for locally manufactured products, which are considered more expensive in the market. In addition, the irregular and high cost of tariffs experienced by manufacturing firms has led to extremely high operational costs.

To top it all, the adoption of inefficient production practices have led to wastage of resources, and forced the already strained manufacturing firms to incur additional costs, not to mention customer dissatisfaction and lack of competitive advantage (Arasa and Gathinji, 2014; Malaba et al., 2014). This not only has negative implications on the local-scale trade, but also at the national and global levels, which leads to high economic losses (Sindiga et al., 2019) and affects Kenya's total Gross Domestic Product (GDP). As a result of the challenges, enterprises are faced with numerous limitations such as: economic slump, low value addition to products, rising prices and cost of production, increased lead time, and disorganized and non-integrated activities. This will eventually lead to economic and time losses and poorly performing firms, dissatisfied customers and dissatisfactory quality of food and beverage products.

One solution to solving the above problems is adopting lean supply chain practices. While there are numerous lean supply chain practices that firms can adopt, two most relevant in the Kenyan FBMF industry are waste management and quality assurance. The production activities in the industry have been found to be characterized by wasteful processes,

overproduction waste, defective products and wasteful transportation system (Were, 2016). Consequently, this has affected quality and prices of commodities. Therefore, adopting waste management and quality assurance lean process may be the solution for firms in this sector. While several studies have hinted to a possible link between waste management and quality assurance lean supply chain practices and performance, very few have studied the relationship between lean supply chain practices and performance variables. For instance, Jemutai, (2014) found Waste management practices to be critical for performance of the firm. However, the study was not conducted in FBMF and hence the need to replicate the study in this industry. Kimeu, (2015) studied the Effect of waste management practices on the operational performance of hotels in Mombasa county, Kenya and concluded that 100% of the hotels are committed to improving already existing waste management practices since they have positive effect operational performance. The study however was restricted to operational performance and thus financial performance such as profitability was not assessed. The study was also conducted in a hugely service industry and not manufacturing sector. Rajab, (2015) researched on Quality Management Practices and Supply Chain Performance of Large-Scale Manufacturing Firms in Kenya and found positive relationship between these variables. However, elements such as Quick market response on customer preference, Quality production and Information integration were not addressed. This study therefore sought to address these gaps in existing literature.

### **Objectives of the study**

- i. To determine the influence of waste management practices on the performance of FBMF in Kenya
- ii. To examine the influence of quality assurance practices on the performance of FBMF in Kenya

### **THEORETICAL REVIEW**

The study was guided by Institutional theory and Kaizen Philosophy of continuous improvement. The institutional theory describes how external influence from the Government, media and public associations' impact organizational behaviour and decision-making and how such pressure gradually creates institutional rules. Organizations seek survival and legitimacy by conforming to critical institutional rules which stem from coercive, mimetic and normative isomorphic drivers (Connelly et al., 2011). Coercive isomorphism explains how Government regulators with who the organization is connected to influences the organization's response to pressure exerted (Sarkis et al., 2011). Mimetic isomorphism occurs in when organizations

imitate other successful and legitimate organizations in the industry to reduce cognitive uncertainty (Connelly et al., 2011, Aerts, Cormier & Magnan, 2006). In normative isomorphism, Organizations that comply with standards, legislation and societal norms are secured against the possible consequences of environmental and social misconduct, including penalties, protests, campaigns and sanctions (Peters et al., 2011).

Kaizen Philosophy of continuous improvement is an approach to creating continuous improvement based on the idea that small, ongoing positive changes can reap major improvements centered around teams. Kaizen's philosophy was developed in the manufacturing sector, with the aim of eliminating waste, lowering defects, boosting productivity, encouraging worker purpose and accountability, and promoting innovation (Singh & Singh, 2009). The Kaizen's cycle for continuous improvement entails the following processes: get the employees involved; gathering a list of problems; encourage solutions and then choose an idea; test the solution, regularly measure and analyze the results; if successful adopt the solution; repeat the ongoing process. One of the approaches of Kaizen's theory is through the lean six sigma, which aims at eliminating eight wastes in manufacturing firms. The first waste type is categorized: a lot of time is wasted while waiting for the next step in the process (Manos, 2007). Other wastes include: overproduction of products, defects, unnecessary movement of products and materials, inventory, whereby excess products and materials are not processed; unnecessary movements by people, extra-processing and non-utilized talent, which occurs when manufacturing firms underutilize people's skills, talents and knowledge.

Kaizen theory also employs other approaches and tools, such as value stream mapping, which documents, analyzes and improves information or material flows required to produce a product or service, and Total Quality Management (TQM). Edward Deming (1984) as cited in (Manos, 2007) defines Total Quality Management (TQM) as the achievement of customer satisfaction by managing the whole supply chain process both internally and externally. All Organizational functions, that is, customer service, marketing, engineering, design, production and finance are focused to meet customer needs and Organizational benefit. This involves both the employees and management working together to improve processes, culture, services and products. Continuous improvement of both goods and services becomes the key focus for the organization to achieve customer satisfaction for long term success, hence increasing business and reducing losses due to elimination of wasteful practices. Hence, Kaizen theory of continuous improvement aids the present study by explaining the significance of quality assurance through continuous improvement of processes. The theory helps in examining whether the resulting quality assurance improves the supply chain performance.

As per the institutional theory, there are three isomorphic pressures that will compel an organization to adopt waste management practices. These are coercive, mimetic and normative. Various coercive pressures such as environmental regulations and standard operating procedures are important in compelling Organizations to adopt waste management practices. Practices of other influential organizations, consulting firms, industry trade associations and voluntary reporting guidelines act as mimetic pressures while the changes in stakeholder expectations, hiring of individuals from the same industry, recruitment of staff from a narrow range of training institutions and common promotion practices are some normative pressures that will put pressure on the Organizations in adopting waste management practices. Linking these practices to the waste management hierarchy, it is clear that activities at the bottom of the hierarchy are more influenced by coercive pressures. Contrarily, the practices at the top of the hierarchy are more driven by normative and mimetic pressures. To be more effective in managing waste, there is a need to transform coercive pressures to more of normative and mimetic which has to be the responsibility of many social actors. By using the institutional theory, the paper contributes by suggesting how the broad isomorphic pressures should change over time to improve sustainable waste management practices.

## **EMPIRICAL REVIEW**

### **Waste Management Practices**

A number of studies have been conducted on the role of waste management practices on the performance of firms. Bartolacci et al. (2016) researched on Waste Management and financial performance with focus on Italian companies. This study adopted an empirical analysis on a population of Italian companies in relation to the four-year period 2010-2013. Economic-financial analysis was performed on these firms by calculating several balance sheet indicators (Marchi, Paolini and Quagli 2003). In particular, the ROI and a further two indicators into which said ROI can be broken down, namely the ROS and the working capital turnover ratio, were chosen. The results of the analysis performed did not show a clear and evident relationship, positive or negative, between the profitability of companies operating in the sector of collection, treatment and disposal of waste.

Thienel, (2014) conducted a study on “Understanding Key Environmental Management Practices Associated with the Environmental and Financial Performance in Selected Manufacturing Firms.” This study developed three models to predict five EFPs (Return On Assets, Sales Growth Tobin’s q, Innovation Process, and Innovation Product) from 19 EMPs (Recycling, Proactive waste reduction, Reactive waste reduction, Consume internally, Create market for waste, Water consumption, Energy consumption, Early supplier involve,

Environmental standard for suppliers, Environmental audits suppliers, Environmental awards, Life cycle analysis, Design targets/goals, Environmental risk analysis, Corporate policy/procedure, Environmental mission statement, Environmental department, Surveillance of market, Strategic alliance). The study found that proactive and reactive waste reduction improves the Environmental and Financial Performance of the firm.

Jemutai, (2014) examined the Green supply chain management practices and performance of firms in automotive industry in Nairobi, Kenya. This study used research design to collect data and descriptive statistics was used to analyze the data. The study focused on firms in automotive industry in Nairobi, Kenya. It found out that firms appreciate the role of Green Supply Chain Management Practices. Waste management practices were found to be critical for performance of the firm.

Kimeu, (2015) studied the Effect of waste management practices on the operational performance of hotels in Mombasa county, Kenya. The study examined the existing waste management practices by hotels and identified waste management practices affect hotel operational performance. The study employed census survey research design, with the unit of analysis being hotels in Mombasa County, Kenya. The target population was hotels operations managers in the 43 hotels found in the study area or their equivalent offices depending on the structure of the hotels. The data collection was done by use of questionnaires that were administered to hotels operations managers and corroborated with observation checklists. Data was then analyzed by use of descriptive statistics and inferential including mean, standard deviation and used frequencies in the analysis. The study further noted that, the model used had a moderate explanatory power of the effect of waste management on operational performance of the hotel. The study concluded that 100% of the hotels are committed to improving already existing waste management practices since they have positive effect operational performance.

### **Quality Assurance Practices**

Rajab, (2015) researched on Quality Management Practices and Supply Chain Performance of Large-Scale Manufacturing Firms in Kenya. The study had three objectives namely: to determine the extent to which quality management practices are implemented by large scale manufacturing firms in Kenya, to establish the relationship between quality management practices and supply chain performance of large scale manufacturing firms in Kenya and to determine the challenges of implementing quality management practices faced by large scale manufacturing firms in Kenya. The study applied a descriptive research design of data collection and descriptive statistics for data analysis. The study found that the quality

management practices (continuous quality improvement, lean operations/production, six sigma practice, international organization for standardization, benchmarking and supplier partnering) have been practiced to a large extent by the large manufacturing firms in Nairobi, Kenya. Also, the study found that there is a positive relationship between dependent variable (supply chain performance) and independent variables.

Ikay and Aslan (2011) in their study on 255 SMEs in Turkey measured the difference between ISO-certified and non-certified firms on performance. 892 questionnaires were emailed to SME representatives, with a response rate of 32.9 percent. The differences between certified and non-certified firms in terms of performance and quality practices were assessed by one-way analysis of variance (one-way ANOVA). The results indicated no statistically significant difference between certified and noncertified firms in terms of performance. Certification showed no direct effect on performance. This study applied both financial and non-financial criteria in measuring performance, according to Kaplan and Norton (1992). The current study used regression analysis to analyze the data and establish the relationship between ISO certification and performance in Kenya, and results implied that there was significant relationship between variables, thus addressing the methodology gap.

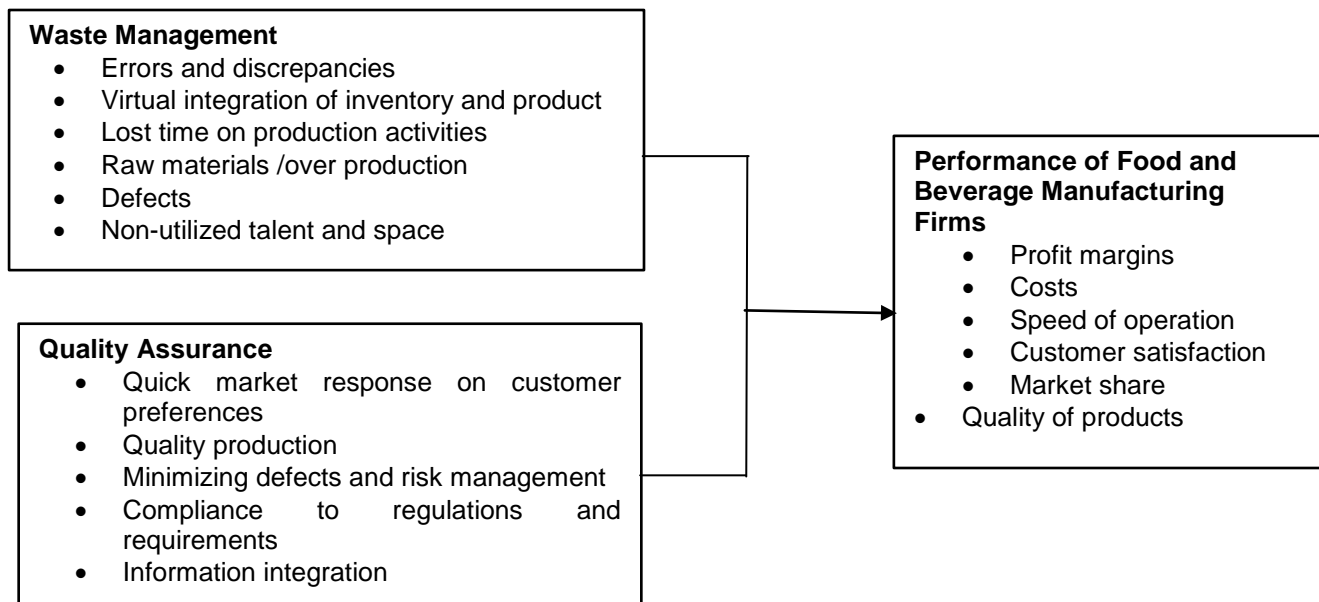
Siongok, and Noor, (2016) studied the role of quality control system on procurement performance in Kenyan State Corporation. The objectives of the study included examining how quality control planning, policies, procedures and reporting influences procurement performance in State Corporations. The researcher used questionnaires containing closed as well as open questions to facilitate gathering of information as the primary data collection method. The data gather was processed and consequently reliability of the instruments was tested alongside the pilot study. The data was analyzed using SPSS (version 22) and presented through tables and charts. The study reported that quality control system affects the procurement performance of KeNHA. Equally, quality control planning, quality control policies, quality control procedures and quality control reporting affects the procurement performance of KeNHA.

Wanyoike, (2016) examined Quality management practices and firm performance among manufacturing firms in Kenya. The study applied both descriptive and explanatory research designs. The target population comprised of 60 manufacturing firms in Kenya, with the sample size being 120 respondents. The study adopted census sampling technique. The study used primary data which was collected using self-administered questionnaires. Validity of the instruments was ensured through face, and content validity and the research instrument's reliability was tested using Cronbach's Alpha with a coefficient of 0.7, which was considered acceptable. Data was analyzed through descriptive and inferential statistics. Descriptive statistics was used to summarize data while inferential statistics, specifically Multiple Linear



Regression, was used to test hypothesis. The data analysis used SPSS version 21. The study recommended that the management should be committed to quality by providing strategic direction with respect to quality management practices, which should be aligned to the firms' objectives

Figure 1. Conceptual Framework



## RESEARCH METHODOLOGY

The study adopted a descriptive case study type of research design. A case study of Farmers Choice Limited. Data was collected through a semi-structured questionnaire surveys, with both closed and open-ended questions. Farmers Choice Limited is one of Kenya's Large-scale food manufacturing firm, which has a population size of 891 employees working in the targeted departments. The sampling frame for this study was derived from the Farmers Choice database.

The sample for this study was selected through Stratified Random Sampling technique which was applied to select key informants' representative of the relevant departments in Farmers Choice Limited. Stratification ensures a high degree of representation of the entire population and aimed to bring out the different scale and sector-specific successes and challenges and help in the design of customized recommendations. The sample was selected using the following formula by Nassiuma (2000). With the population (N) of three hundred (891), coefficient of variation (C) of 0.5 and the margin of error or the level of precision (e) of 0.05, the

sample size (n) of the study was ninety (90) respondents. The sample was selected using the following formula by Nassiuma (2000)

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

where:

n=sample size;

N=population size;

C=Coefficient of variation which is  $\leq 50\%$ ;

e=level of precision or the margin of error which is fixed between 2% -5%.

The calculated sample size is presented on the Table 1.

Table 1: Strata-wise sample distribution

Strata	Total Employees	Sample Size
Production	178	18
Sales and Marketing	178	18
Store	109	11
Logistics/Transport	119	12
Purchasing/ Procurement	79	8
Finance	89	9
ICT	69	7
Engineering	70	7
Total	891	90

Both qualitative and quantitative data was collected through the use of semi-structured questionnaire. The questionnaires were administered through drop and pick of questionnaire and also through email survey, based on the most suitable approach for every context. Data was cleaned and screened to identify missing data, omissions and remove questions which did not get responses and check for any other inconsistencies. Data was then be analyzed using SPSS (Statistical Package for Social Scientists) Version 24. The main descriptive data analysis and presentations methods was frequency distributions, means, standard deviations and percentages. The findings were then presented through tables and graphs as were found appropriate. Regression analysis were applied to determine the relationship between LSC practices and performance of FBMF in Kenya. Pearson's correlations coefficients were run to examine the relationship among the independent and the dependent study variables under study.

## RESULTS AND DISCUSSIONS

In the present study, the targeted sample was 90 employees. However, only 76 questionnaires were duly filled and returned, which translates to a sample size of 84.5 percent. According to Locke et al., (2013), a sample size with more than 80% response rate is considered acceptable.

### Descriptive Statistics

Descriptive statistics were used to show summarize and show distribution of response. The descriptive statistics adopted for each variable included frequency, standard deviation and mean which are discussed in Table 2.

Table 2: Descriptive Statistics for waste Management

Lean Supply Chain Practices	Mean	SD
We eliminate delays and waiting between activities	4.17	.82
We eliminate excess inventory or mismanagement	4.10	1.27
We avoid unnecessary movements/ transportation	4.43	.75
We have managed to eliminate lost time on unmoved goods	3.80	.924
We always reduce raw materials used	2.73	1.29
We reduce over-production of products	4.31	.769
We reduce defects	4.03	.720
We eliminate non-utilized space	3.47	.840
We eliminate non-utilized talent / human resource	2.77	1.30
We eliminate errors and discrepancies	3.93	1.06

The researcher sought to determine the extent of implementation of this practice at Farmers Choice company limited. A number of questions with 5-point likert scales were asked to establish the extent of implementation of this variable. The first statement was on eliminating delays and waiting between activities. Most respondents were of the view that FCL eliminates delays and waiting activities. A mean of 4.17 was derived which is indicative of high level of agreement with the statement. The respondents were also asked to indicate their agreement with the statement of the influence of LSC practices on reducing excessive inventory or mismanagement. A mean of 4.10 was derived with a standard deviation of 1.27 showing a high level of agreement. In terms of avoiding unnecessary movements or transportation which is another important component of waste management, a mean of 4.43 and standard deviation of 0.75 was obtained.

However, the degree of agreement with having an enhanced virtual integration of activities and processes was not as strong. The mean for this component was 3.43 and standard deviation of 1.24 showing significant agreement. There was high level of agreement

with the statement on reducing over-production of products. The mean of responses was 4.31 with standard deviation of 0.769 showing overwhelming agreement among respondents on the company's commitment to achieve this practice. With regard to non-utilized space, a mean of 3.47 and standard deviation of 0.840 was found which is closest to neutral responses. For non-utilized talents the mean was 2.77 and standard deviation of 1.30. However, agreement with elimination of errors and discrepancies had a mean of 3.93 and SD of 1.06.

The findings on waste management are in consistent with existing literature. Bartolacci et al. (2016) researched on Waste Management and financial performance with focus on Italian companies. The results of the analysis performed did not show a clear and evident relationship, positive or negative, between the profitability of companies operating in the sector of collection, treatment and disposal of waste. Thienel, (2014) found that proactive and reactive waste reduction improves the Environmental and Financial Performance of the firm.

A number of recommendations were given by respondent on waste management (Figure 2) including promotion of culture of personal responsibility, continuous training of employees and having good shifts changeovers. Other recommendations provided included recycling component such as water and paper and just in time delivery.



Figure 2: Suggested recommendations for waste management

Quality Assurance is another component of lean practices in supply chain that the present study sought to explore. Respondents were asked questions with the aim of determining the extent of adoption of quality assurance practices in FCL. One component of quality assurance for instance is doing regular research on customer preferences. Participants in the research were asked to state their level of agreement on the implementation of this practice. A mean of 3.91 was found on this variable and standard deviation of 1.009 indicating that there was significant level of agreement among respondents (Table 3). Another quality assurance component that was evaluated was the ability of the organization to quickly respond to market demand. Majority of the respondents agreed that Farmers Choice Limited was quick to respond to market demand with a mean of 4.46 and standard deviation of 0.944 showing high level of agreement.

Timely response to customer complaints was also assessed with respondents indicating this LSC practice was generally adhered to in the organization. A mean of 4.33 and standard deviation of 1.148 showed high level of agreement. Maintaining high quality of production is another component of quality assurance assessed. A mean of 4.89 was derived indicating high level of agreement of this been practices at FCL. The practice of minimizing defects was highly agreed with by the respondents with a mean of 4.17 and standard deviation of 0.839. However, a relatively low level of agreement was found with regard to FCL anticipating and managing risks effectively. A mean of 3.67 and a standard deviation of 0.755 was arrived at. High compliance to regulations and requirements was a practice highly agreed upon with a mean of 4.72 and standard deviation of 0.826. The practice of representatives of our firm communicate effectively with customers was accepted as being evident with a mean score of 3.88 and standard deviation of 1.177.

The findings are congruent with existing literature on the implementation of quality assurance practices in Lean supply chains. Rajab, (2015) researched on Quality Management Practices and Supply Chain Performance of Large-Scale Manufacturing Firms in Kenya. The study established that that the quality management practices (continuous quality improvement, six sigma practice, lean operations/production, international organization for standardization, benchmarking and supplier partnering) have been practiced to a large extent by the large manufacturing firms in Nairobi, Kenya. Also, the study found that there is a positive relationship between dependent variable (supply chain performance) and independent variables. Siongok, and Noor, (2016) studied the Role of quality control system on procurement performance in Kenyan State Corporation. The study found that quality control system affects the procurement performance of KeNHA. Equally, quality control planning, policies, procedures and reporting affects the procurement performance of KeNHA.

Table 3: Descriptive statics for Quality Assurance practices

Lean Supply Chain Practices	Mean	SD
We do regular research on customer preferences	3.91	1.009
We are quick to respond to the market demand	4.46	.944
We respond to customer complaint in time	4.33	1.148
We maintain high quality production	4.89	.419
We minimize defects	4.17	.839
We anticipate and manage risks effectively	3.67	.755
We observe high compliance to regulations and requirements	4.72	.826
Information integration	3.76	.992
Representatives of our firm communicate effectively with customers	3.88	1.177
Our firm has strong, long term relationships with customers	4.41	.941
Our brands have excellent customer recognition and strong reputation for quality	4.92	.356

Respondents also through open ended questions recommended some improvement that can be made in FCL pertaining to Quality assurance. Some of the improvement recommended included enhancing guarantee of quality through advertising, continuous improvement of quality assurance process, use of technology on quality monitoring and implementation, getting customer feedback on products and having good traceability programme as shown Figure 3.

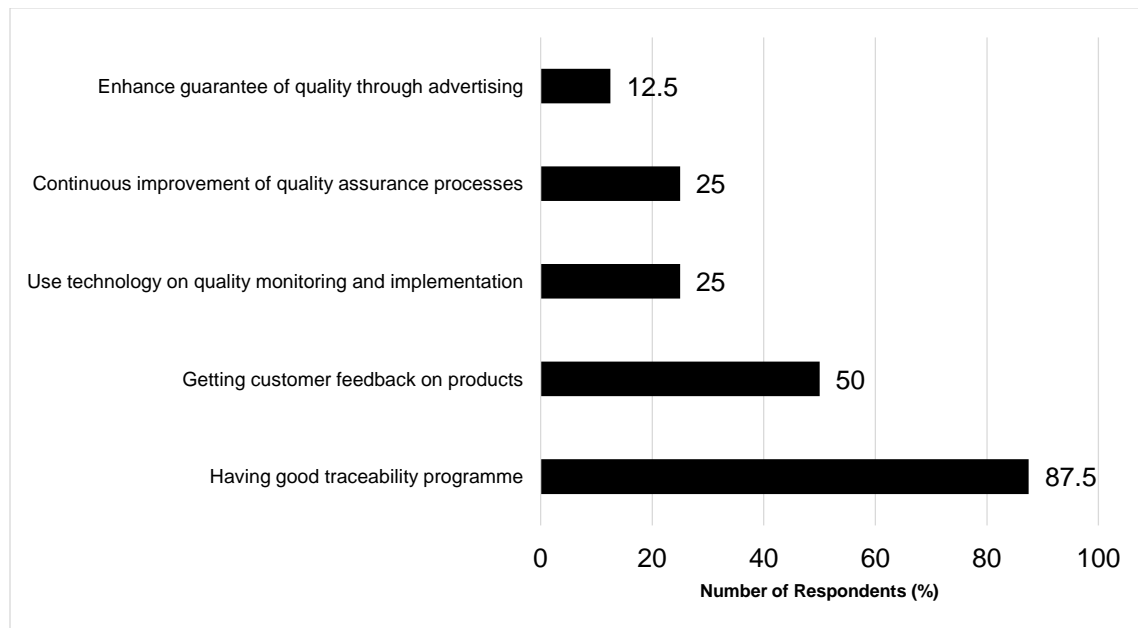


Figure 3: Suggested recommendations for quality assurance

The performance of lean supply chain practices of FCL discussed above was measured and assessed using outcome variables discussed below. Generally, there was indication that implementing lean practices positively influenced the performance of FCL. Majority of respondents indicated that implementing LSC practices significantly increased profit margins

due to the implementation of lean practices. The mean of 4.32 and standard deviation of 0.82 showed strong agreement (Table 4). A significant number of respondents agreed that the implementation of LSC practices significantly enhanced the quality of products produced by FCL. The mean was 4.51 while the standard deviation was 1.

With regard to speed of operations the mean of 4.24 and standard deviation of 0.798 showed strong agreement. The respondents indicated that implementing LSC practices significantly enhanced customer satisfaction, with the mean of 4.18 and standard deviation of 0.89 showing strong agreement. With regards to the influence of LSC practices on increasing market the mean was 3.64 and standard deviation of 0.919 was reported. The influence on reducing cost of operation and production by LSC practices received a widespread response with a mean of 2.83 with a standard deviation of 1.38.

Table 4: Descriptive statics for performance measures

Lean Supply Chain Practices	Mean	SD
Quality of products has been significantly enhanced	4.51	1.00
Profit margins have significantly increased	4.32	.820
Customer satisfaction has been significantly enhanced	4.18	.890
Speed of operations has significantly increased	4.24	.798
Market share has significantly increased	3.64	.919
Cost of operation and production has reduced	2.83	1.38

### Correlation among Variables

Table 5 shows the correlation among the variables used in the study. Correlation among variables is measured using Karl Pearson's Correlation coefficient. This coefficient measures the degree of the linear relationship between two variables.

Table 5: Correlation Analysis

		Waste Management	Quality Assurance	Performance
	Pearson Correlation			
	Sig. (2-tailed)			
	N			
Waste Management	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	76		
Quality Assurance	Pearson Correlation	.284 <sup>*</sup>	1	
	Sig. (2-tailed)	.013		
	N	76	76	
Performance	Pearson Correlation	.682 <sup>**</sup>	.751 <sup>*</sup>	1
	Sig. (2-tailed)	.000	.016	
	N	76	76	76

The table reveals a positive correlation between waste management and quality assurance with a correlation coefficient of 0.284, at a significant level of 0.013, which is less than p-value of 0.05. Overall, there was a strong positive correlation between performance of FCL and all the two hypothesized lean supply chain practices. Hence an increase in one of the two independent variables is accompanied by an increase in the performance of the organization and vice versa. There was a strong positive correlation between waste management and FCL performance with a correlation coefficient of 0.682, at a significant level of p value 0.000. Also, there was a positive correlation between performance and quality assurance ( $r=0.751$ ). In summary, between the two independent variables, waste management practices have the strongest correlation with performance of FCL.

### Regression Analysis

A multiple linear regression was conducted in order to determine the influence of waste management and quality assurance on performance of FCL. The regression was done using the ordinary least squares method. As shown in Table 6, the value of R Square was 0.767. This value implies that waste management practice and quality assurance practices about 76.7% of the variation in performance. This means that about 23.3% of the variation in performance can be attributed to other factors not considered in the study.

Table 6: Multiple Linear Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.876 <sup>a</sup>	.767	.748	.37323

a. Predictors: (Constant), Waste Management Practices and Quality Assurance Practices

Based on the analysis of variance (ANOVA) results presented on Table 7, the regression model used fits the data since F-ratio is 3.576. This ratio is statistically significant ( $p=0.005$ ). This shows that the two independent variables of lean supply chain practices are good predictors of performance.

Table 7: ANOVA Results

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.436	4	.359	3.576	.005 <sup>b</sup>
	Residual	9.890	71	.139		
	Total	11.326	75			

a. Dependent Variable: Performance

b. Predictors: (Constant), Waste Management Practices and Quality Assurance Practices.



From Table 8, the regression coefficient of waste management practices on performance was 2.398. This means that one unit increase in waste management practices will lead to an increase in performance by 2.398 units. This impact is economically significant because increasing waste management practices by one unit means that performance will increase by more than double. The relationship is statistically significant (t-value is 4.229 and p-value is 0.001). Therefore, lean supply chain practices such as reduction of defects, reduction of over-production of products and reduction of raw materials used leads to a large increase in performance of FCL. Furthermore, elimination of delays and lost time, elimination of excess inventory, elimination of non-utilized space, elimination of errors and discrepancies and avoidance of unnecessary movement leads to a very significant increase in performance of the organization.

The results reveal a positive relationship between quality assurance practices and the performance of food & beverage manufacturing firms. *Ceteris paribus*, an increase in quality assurance practices by one unit leads to an increase in performance by 1.100 units. This relationship is statistically significant (t-value is 3.126 and p-value is 0.000). This means that quality assurance practices such as regular research on customer preferences, quick response to the market demand, responding to customers' complaint in time, maintenance of high quality production, defect minimization, anticipation and effective management of risks, high compliance to regulations and requirements, effective communication with customers, having strong and long-term relationships with customers and having brands with strong reputation for quality leads to a substantial increase in performance. Offering quality products increases customer satisfaction which increases the firm's market share.

Table 8: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
(Constant)	4.037	.623	Beta	6.483	.000
Waste Management Practices	2.398	0.567	2.143	4.229	.001
Quality Assurance Practices	1.100	0.352	1.008	3.126	.000

a. Dependent Variable: Performance

b. Predictors: (Constant), Waste Management Practices and Quality Assurance Practices.

## CONCLUSION AND RECOMMENDATIONS

From the results of this study, it can be concluded that Lean Supply Chain practices namely: proper waste management and quality assurance positively influence the performance of food and beverage manufacturing firms. Both variables were found to significantly influence

performance and hence the need for their continued improvement. Improvement can be made through the following: waste management practices such as promotion of culture of personal responsibility, continuous training of employees and having good shifts changeovers, water and paper and just in time delivery. Quality management practices include: getting customer feedback on production, reduction in market returns, having good traceability program and continuous improvement of quality assurance;

Given the effective role of lean supply chain practices in FCL performance, similar organizations in food and beverage sector need to start implementing such practices. Manufacturing firms in Kenya should adopt waste management and quality assurance practices to improve their operations and overall performance. Lean manufacturing improves efficiency, increases profit margins, reduces waste, and increases productivity. As manufacturing processes are streamlined, businesses can better respond to fluctuations in demand and other market variables, resulting in fewer delays and better lead times. Consequently, all organizations in Kenya can be encouraged to implement such practices. In the implementation of lean practices, a number of issues need to be considered. For waste management, the organization should promote a culture of personal responsibility, continuous training of employees and having good shifts changeover. Further, for quality assurance the organization need to engage in customer feedback on production, reduction in market returns, having good traceability program and continuous improvement of quality assurance.

## AREAS FOR FURTHER RESEARCH

The present research was focused on two lean supply chain practices namely quality assurance and waste management. A similar study can also be replicated in different areas such as processing, warehousing and distribution. Further, the current study was undertaken in a FMCG, the same can be replicated in a services industry.

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