



Achieving Zero Hunger in Kenya: Logistics Management Practices for Enhancing Operational Efficiency of the Agriculture and Food Authority

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Abstract

This study seeks to determine logistics management practices that may be leveraged upon, to enhance the operational efficiency of the Agriculture and Food Authority in Kenya (AFA). The study is motivated by the Sustainable Development Goal 2 which, advocates for zero hunger in the United Nations member states. The study employs a randomly selected sample of 380 individuals drawn from fifteen Silos under the management of the AFA. Structured questionnaires are developed, and used to collect data. The standard multiple regression approach is used to analyze the collected data. The analysis results confirm that the three components of logistics management namely; inventory management, $b = 0.274$, $t(304) = 6.141$, $p < 0.001$; transport management, $b = 0.135$, $t(304) = 3.499$, $p < 0.05$; and warehouse management, $b = 0.101$, $t(304) = 2.776$, $p < 0.05$ positively, and significantly impact operational efficiency of the AFA. The study concludes that, through the various practices under logistics management, the AFA is in a good position to ensure food security in Kenya, and with it, the realization of zero hunger. However, future studies should focus on identifying other logistics management practices, which can boost operational efficiency further, and increase chances of the country meeting SDG 2.

Keywords: Operational efficiency, inventory management, transport management, warehouse management, zero hunger

INTRODUCTION

Sustainable development provides is a paradigm shift in development that focuses on a future where there is a balance in societal, economic, and environmental considerations to improved quality of life (Basera, 2016). Sustainable development as a concept has its roots in the Bruntland's Commission report which advocated for development that satisfies the expectations of the present generation, without jeopardizing chances of future generations to meet their own needs (Jarvie, 2016). The Bruntland report identified economic growth, environmental protection, and social equity as pillars for sustainable development.

The focus on the achievement of a sustainable future has occasioned a shift from Millennium Development Goals (MDGs) to Sustainable Development Goals (SDGs). It is argued that SDGs which were ratified by all member states of the United Nations (UN), provides the framework on which to leverage the 2030 Agenda for Sustainable Development (UN, 2015b). The agriculture supply chain is therefore a critical value chain in the realization of sustainable development. Through SDG goal 2, the UN member states acknowledge that achieving zero hunger is the bedrock for food security, and the promotion of sustainable agriculture (UN, 2015b).

Moreover, it is documented that agricultural investment is critical to increasing employment, incomes, and growth and is an avenue for the attainment of zero hunger (FAO, IFAD & WFP, 2015). To this end, Kenya established the Agriculture and Food Authority (AFA) to regulate, promote, and develop scheduled crop value chains to enhance economic growth (AFA, 2021). The expectation then was that the AFA could guarantee a sustainable supply of agricultural produce that would enhance food security and by an extension lead to zero hunger in the Kenyan context.

The operational efficiency of the AFA has however been brought into focus particularly, by the Council of Governors who argue that Kenya needs better laws to increase food production (CoG, 2019). The bone of contention has been that many counties have seen a 10-25 percent reduction in agricultural productivity due to the non-realignment of the Crops Act No. 16 of 2013, and the AFA Act No. 13 of 2013 with the new constitution to give Governor's autonomy to discharge their responsibilities (CoG, 2019).

One key supply chain practice that the Council of Governors has associated with the laxity in operational efficiency of the AFA is logistics management. Indeed, logistics management practices have been found to have a positive impact on the operational efficiency of fast-moving consumer goods manufacturing companies in Kenya (Gitonga, 2017); organizational performance in the context of Dangote flour mills PLC in Nigeria (Ajoke et al; 2019); operational efficiency of companies drawn from various sectors in Macedonia (Ristovska, Kozukarov & Petroski, 2017); and in organizational performance of shipping firms in the Kenyan context (Kirui & Nondi, 2017).

There is no doubt that investment in agriculture provides a platform for Kenya to realize zero hunger as postulated in SDG goal 2. The operational efficiency of the AFA is perhaps one way in which investment in agriculture can be achieved. This study paper, therefore, examines logistic management practices that can be exploited to enhance the operational efficiency of the AFA as a way of attaining zero hunger. In particular, the study analyzes the effect that material flow management, waste production management, and technology management have on the operational efficiency of the AFA singly, and collectively.

LITERATURE REVIEW

This study was grounded in the lean theory proposed by the Toyota production system, and which has since been found critical to the efficiency and effectiveness of process performance in the realm of organizational performance (Womack & Jones, 2003). The choice of the lean theory in this study was based on an understanding that utilization of the assumptions of the theory to logistic management in the AFA, was likely to reduce logistics challenges and result in enhanced agricultural returns.

Operational Efficiency

Operational efficiency is perceived in the discourse on organizational performance as the sensible and profitable utilization of scarce resources in institutional, commercial, and industrial undertakings (Dhillon & Vachhrajain, 2012). Operational efficiency is therefore a concept that seeks to maximize product quality while maintaining waste at a lower minimum (Ohene-Asare, Turkson & Afful-Dadzie, 2017). Prasad approaches the concept of operational efficiency from business management and profit generation perspective and posits that operational efficiency tests the organizational capacity to

use available income prudently to generate profit (Prasad as cited in Dhillon & Vachhrajain, 2012).

Andrew and Chia-Yen (2012) on the contrary view operational efficiency as a measure of the survival of organizations on the strength of activities undertaken. They contend that operational efficiency is achieved if organizations take cognizance of the need to balance between profit and return on investments; balance operations achievement, remain accountable both to the society and environment and adapt to the needs of the customer and the public at large. The definition of operations efficiency in the context of the Agriculture and Foods Authority (AFA) is therefore premised on the definition by Andrew and Chia-Yen (2012) and leans more towards the effectiveness of activities undertaken.

The AFA brings together the coffee, tea, sugar, horticultural crops, fiber crops, nuts and oil crops, food crops, and pyrethrum and other industrial crops directorates (AFA, 2016). The authority is among other functions, tasked with the administration of the Crops Act 2013, promotion of best practices in the agricultural supply chain, maintaining a database of data on agricultural products excluding livestock products, controlling agriculture research, and advising the national and county governments on matters related to Agriculture (GoK, 2013). The operational efficiency of the AFA in this study was therefore operationalized as activities undertaken to among others; reduce regulatory bureaucracy, reduce cost, minimize overlap of functions, and improve decision making. Achievement of these activities must however take into account how the authority manages logistics.

Logistics Management

Supply chain practices have been found to have significant impacts on organizational performance as well as, in the realization of competitive advantage (Karimi & Rafiee, 2014). One such practice is logistics management, which relates to the planning and organization of activities for effective implementation of processes (Mellat-parast & Spillan, 2014). Two categories of logistics, inbound logistics, and outbound logistics have been delineated (Lambert & Burduoglo, 2000). According to Lambert and Burduoglo, Inbound logistics is associated with material procurement, handling, storage, and transportation; while on the contrary outbound logistics is associated with the collection, maintenance, and delivery of the product to the consumer.

Logistics management as a supply chain practice has become significant in doing business, and integrates the movement of goods, information, services, and capital, right from material sourcing, to consumers (Springinkle & Wallenburg, 2012). According to Mentzer et al. (2004), logistics management provides the right product having the required quality, in the right place, at the right time and at the right price. Logistics management is therefore committed to facilitating inventory control, transport management, and warehousing (Ristovska, Kozuharov & Petkorski, 2017). Logistics management in this study was therefore measured using the three variables; inventory management, transport management, and warehouse management.

Empirical Review and Hypotheses formation

Several studies in existing literature document the influence of logistics management, through its components such as inventory management, transport management, and warehouse management on organizational performance.

Inventory Management and Operational Efficiency

Siddiqui and Khan (2019) for instance, used the Karachi context to investigate the impact of inventory management on a firm's efficiency. They established that some indicators of inventory control such as inventory accuracy, lean inventory, and availability of stock were significant predictors of firm efficiency. However, capacity utilization appeared not to have a significant effect on efficiency. The findings by Siddiqui and Khan (2019) were therefore inconclusive with regards to the effect of inventory control on operational efficiency in the context of agricultural organizations.

In another study, Opoku et al. (2020) used Ghana's manufacturing firm context to determine the effect of inventory management on operational performance. Using the Ordinary Least Squares (OLS) regression analysis, they determined that inventory management practices had positive and significant effects on the operational performance of manufacturing firms. Once again, the findings by Opoku et al. (2020) were inconclusive with regards to the potential effect of operational efficiency in the context of agricultural firms.

From Ethiopia, Atnafu and Balda (2018) used the micro and small enterprises context to analyze the effect of inventory management on firm competitiveness and organizational performance. Using the Structural Equation Model, Atnafu and Balda concluded that higher levels of inventory management enhanced competitive advantage, and tended to improve organizational performance. Suffice it to say, however, Atnafu and Balda (2018) were keen on firm competitiveness and performance as opposed to operational efficiency.

Meanwhile, from the Kenyan perspective, Ouma and Mwangangi (2018) examined the influence of inventory management on organizational performance in the context of soft drinks manufacturing firms. They used regression analysis to show that inventory management significantly impacted the performance of the firms. From the empirical review, it was apparent that there is a dearth of studies focusing on inventory management and operational efficiency in the context of agricultural firms in the Kenyan context. The researcher, therefore, postulated that

H₀₁: Inventory management has no significant effect on the operational efficiency of the AFA

Transport Management and Operational Efficiency

Transport logistics remains a critical supply chain practice. However, not many studies have been conducted to examine its effect on operational efficiency in agricultural organizations. The few studies focus mainly on the performance of firms. Musau, Namusonge, and Ng'eno (2017) for instance analyzed the effect of transport management on firm performance in Kenya, in the context of textile firms. They concluded that transport management was key to the performance of textile firms. Meanwhile, Timna (2017) used the Kenya Cooperative Creameries (KCC) context to show that despite challenges experienced in transport infrastructure, transportation had a significant effect on performance at KCC. Samita, Kadima, and Juma (2020) on the other hand, used the sugar industry context to show that transport management had a positive impact on procurement performance.

Although studies by Timna (2017) and Samita et al. (2020) used agricultural-oriented organizations, their focuses were not on operational efficiency but firm performance on one hand and procurement performance on the other. Because of such a dearth of studies on operational efficiency, this study postulated that

H₀₂: Transport management has no significant effect on the operational efficiency of the AFA.

Warehouse Management and Operational Efficiency

The utility of warehouse management in organizations has also featured prominently in the empirical literature. Odhiambo (2017) used the store context to examine the effect of warehouse management on organizational efficiency. Odhiambo however leaned more towards inventory management, as opposed to interrogating warehousing indicators. Guliti et al. (2019) came close to operational efficiency in examining the effect of the integrated warehouse but used the university context as opposed to agricultural firms. Mutai and Morong (2017) examined warehouse management on organizational productivity; they however used the energy sector context. Considering such a lack of focus on the operational efficiency in the context of agricultural oriented firms, we question whether warehouse management has a direct effect on operational efficiency in the AFA and postulate that

H₀₃: Warehouse management has no significant effect on the operational efficiency of the AFA.

Following the postulations made, the following conceptual framework was developed.

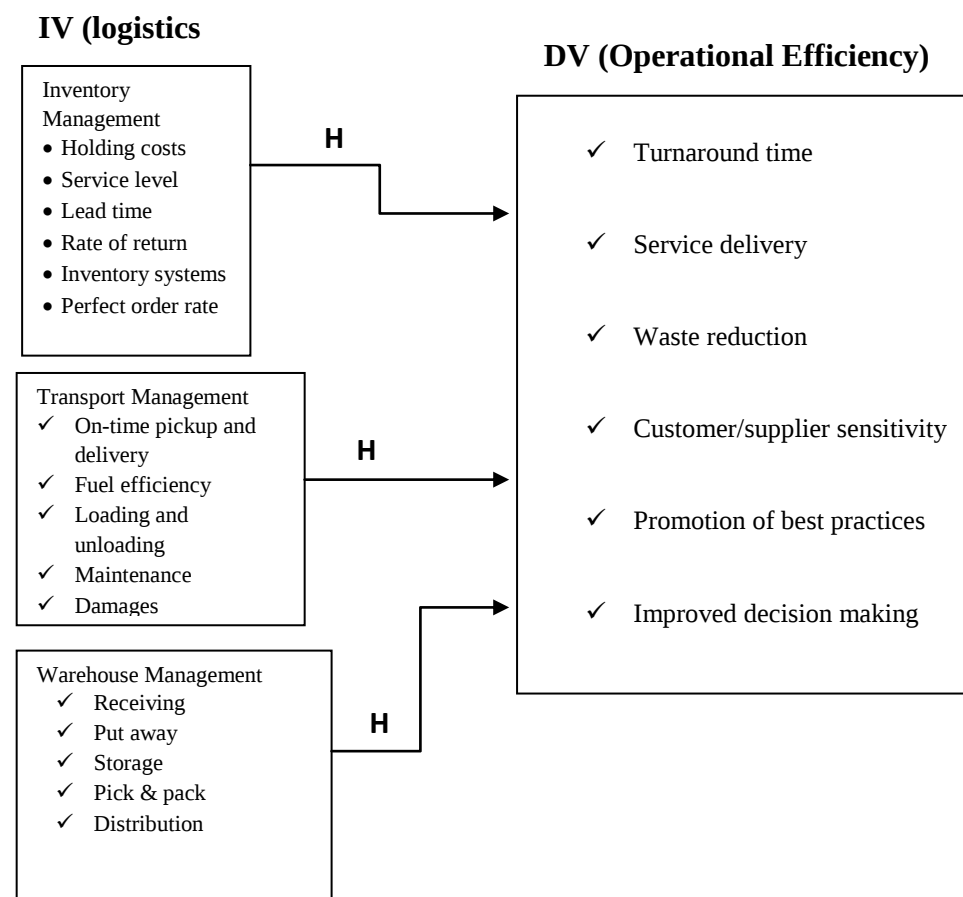


Figure 1: Conceptual framework

METHODOLOGY

Study Design

This study employed the explanatory research design anchored in the post-positivist research paradigm, and which has previously been used in cause-effect studies (Saunders, Lewis, & Thornhill, 2009). In exploring logistic management practices that enhance operational efficiency, this study fitted in the cause-effect category and justified the use of the explanatory design.

Study Sample

The study employed a population of 456 individuals comprising of 15 managers, 124 heads of department, and 384 general employees, drawn from fifteen silos under the management of the AFA. Using the sample formula suggested by Zikmund et al. (2010), the population was narrowed down to a sample of 380 individuals consisting of 9 managers, 56 heads of department, and 315 general staff. Data were collected using a structured questionnaire that had five sections in line with the four study variables and respondents' background characteristics.

Data Analysis

Data were analyzed using the standard multiple regression approach. In this approach, operational efficiency was regressed on the three logistic management variables yielding a model of the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where Y = Operational efficiency

X_1 = Inventory management

X_2 = Transport Management

X_3 = Warehouse Management

$\beta_{i/s}$ = regression coefficients

ϵ = residuals

RESULTS

Multicollinearity assumption was satisfied as demonstrated by variance inflation factors (VIFs) below 10 (1.04 – 1.149). Similarly, the assumptions of normality were also satisfied as shown by Skewness values in the range -0.709 to -0.081 and Kurtosis statistics ranging from -0.383 to 0.149. Meanwhile, the assumption of independence of observations was confirmed by a Durbin-Watson value of 1.903.

Respondents' background characteristics (Table 1) confirmed that a majority of the respondents were male (61.4%); most of them (55.5%) had attained a higher diploma in education and were mostly (54.5%) aged above 50 years. The experience distribution revealed that 35.1% of the respondents had been with the authority for between 16 to 20 years.

Table 1: Respondents Background Characteristics

Characteristic	Category	n	%
Gender	male	189	61.4%
	female	119	38.6%
	Total	308	100.0%
Education	diploma	97	31.5%
	higher diploma	171	55.5%
	Bachelor's degree	35	11.4%
	Master's	5	1.6%
	Total	308	100.0%
Age	less than 20	1	0.3%
	21-29	11	3.6%
	30-39	34	11.0%
	40-49	94	30.5%
	50 and above	168	54.5%
	Total	308	100.0%
Experience	1-5	26	8.4%
	6-10	66	21.4%
	11-15	91	29.5%
	16-20	108	35.1%
	over 20	17	5.5%
	Total	308	100.0%

The descriptive statistics (Table 2) confirmed that the mean response stores across the four variables averaged 4.0 while the standard deviations were below 1. This was a clear indication that respondents were consistent in agreement that the AFA was showing high levels of operations efficiency and logistics management practices. Meanwhile, the skewness and kurtosis statistics indicated normal distributions across the data sets.

Table 2: Descriptive Statistics

Variables	Mean	Std. Deviation	Skewness		Kurtosis	
			Statistics	Std. Error	Statistics	Std. Error
Operations efficiency	4.20	.448	-.081	.139	-.372	.277
Inventory management	4.11	.544	-.473	.139	.011	.277
Transport management	3.98	.616	-.591	.139	-.383	.277
Warehouse management	3.91	.634	-.709	.139	.149	.277

The multiple regression output for regressing operational efficiency on the logistics management variables shown in Table 3 revealed the following: the overall model was significant, $F(3,304) = 29.718$, $p < 0.001$, $R^2 = 0.227$. The predictors were significant; with inventory management, $b = 0.274$, $t(304) = 6.141$, $p < 0.001$ implying that for every 1 unit increase in inventory management, there was a 0.274 increase in operational efficiency of the AFA; for transport management, $b = 0.135$, $t(304) = 3.499$, $p < 0.05$ implying that for every 1 unit increase in transport management, there was a 0.135 units increase in operational efficiency, and for warehouse management, $b = 0.101$, $t(304) = 2.776$, $p < 0.05$ implying that for every 1 unit increase in warehouse management, there was a 0.101 units increase in operational efficiency. The variance explained by logistics management in the variation of operational efficiency was however a mere 22.7% ($R\text{-sq} = 0.227$).

Table 3: Regression Output

R	R-sq	SE	df	F	Sig.	Durbin-Watson
.476	.227	.396	3,304	29.718	.000	1.903
Model	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance VIF
1(Constant)	2.144	.225		9.537	.000	
Inventory management	.274	.045	.332	6.141	.000	.870 1.149
Transport management	.135	.039	.186	3.499	.001	.902 1.108
Warehouse management	.101	.036	.143	2.776	.006	.959 1.042

a. Dependent Variable: Operations efficiency

The researcher concluded that operational efficiency in the AFA could therefore be modeled by the equation.

$$Y = 2.144 + 0.274X_1 + 0.135X_2 + 0.101X_3$$

Where X_1 – Inventory management

X_2 = Transport management

X_3 = Warehouse management

DISCUSSIONS

The study confirmed that logistics management is a critical facet of the operational efficiency of the AFA, and can be leveraged upon to achieve food security and realization of zero hunger in Kenya. Logistic management components of inventory management, transport management, and warehouse management were found to have positive and significant effects on the operational efficiency of the AFA.

The findings of this study possess huge implications for the theory and practice of operational efficiency from a logistics management perspective. From a theoretical perspective, the findings underscore the importance of lean theory in optimizing available resources using the right set of activities (Radnor, 2010). The activities undertaken under logistics management have the potential to enable the AFA to simplify and organize its working environment in a manner that reduces waste, operational costs, and optimizes equipment and working space. In doing so, the authority would be in a position to deliver agricultural products and services better, faster, and cheaply, consistent with the ideals of lean theory (Abu Salim et al; 2018).

By introducing lean processes such as designated reorder points, service level, lead time, and inventory accuracy in inventory management, the AFA has an opportunity to be in a position of reducing holding costs, computing required stock to avoid stock-out, and conducting an inventory headcount to verify accuracy of internal data. Similarly, lean processes such as on-time pickup and delivery, fuel efficiency, and maintenance among others, when employed in transport management have the potential to enable stakeholders to make plans for goods reception, create a sustainable supply chain, and know when to replace part or all the fleet.

From a managerial perspective, the findings are important in the sense that they highlight critical logistics management components that can be harnessed to improve the operational efficiency of the AFA. This knowledge is particularly useful to the Government of Kenya through the relevant ministry, in its desire of realizing SDG goal 2 of zero hunger.

The study for instance established that inventory management measured through holding costs, service level, lead time, rate of return, and perfect order rate; transport management measured via on-time pick up and delivery, fuel efficiency, loading and unloading times, maintenance, and damages; and warehouse management measured through receiving, put away, storage, pick & pack, and distribution were positive and significant predictors of operational efficiency of the AFA. This knowledge is particularly useful to Silo managers and other agricultural stakeholders in the desire to improve service delivery while minimizing cost. The study highlights activities that can be undertaken in every component of logistics management to enhance operational efficiency. Although several studies have previously highlighted the positive impacts of logistics management on firm performance (Mukolwe & Wanyoike, 2015; Ristovska, Kozuharov, & Petkovski, 2017; Timna, 2017), none of them has identified activities to be undertaken, in each logistics component. This study was therefore a novel one in making such a contribution to the existing discourse.

CONCLUSION AND RECOMMENDATIONS

Logistics management through inventory management, transport management, and warehouse management is a vital element in the achievement of operational efficiency in the AFA. Through logistics management, the AFA can among other positives, lower holding costs, increase service level, lower rate of return, increase on-time pick up and delivery, improve fuel efficiency, reduce loading and unloading times, and improve its distribution network. Enhanced operational efficiency in the AFA gives hope to increased food security and the realization of zero hunger in Kenya. However, the small proportion of variance explained in operational efficiency occasioned by the variation in logistics management variables is an indicator that other supply chain practices need to be examined. Future studies should therefore focus on identifying other logistic management practices that can impact positively on the operational efficiency of the AFA to boost chances of Kenya attaining SDG goal 2.

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