INFLUENCE OF LOGISTICS OPTIMIZATION ON PERFORMANCE OF AGRICULTURAL FIRMS IN MURANG'A COUNTY, KENYA

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ABSTRACT

The goal of this study was to determine the impact of logistics optimization on agricultural firm performance in Kenya's Murang'a County. The study's particular aims were to investigate the impact of transportation, inventory, information, as well as packaging management on agricultural firm performance in Kenya's Murang'a County. The findings of the study are intended to be useful to Kenyan policymakers, agricultural enterprises, and researchers and scholars. The study was conducted in Murang'a County, with a focus on agricultural businesses. The focus was on logistics optimization facets which include transport management, inventory management, information management as well as packaging management which will all form the independent variables. The guiding theories included agency theory, resource-based view theory, game theory and transaction cost theory. Descriptive research design was employed with a target population of 142 agricultural firms in Murang'a County. Purposive sampling technique was utilized in drawing the study sample. Primary data was collected directly from the respondents using self-administered questionnaire which encompassed both closed and open-ended items. Prior to the actual study, pilot study was undertaken involving 14 logistics managers from fourteen agricultural firms in Murang'a County. Research tool reliability was established using Cronbach Alpha analysis though the use of SPSS Version 26. Descriptive statistics were used in description of the actual study findings and presentations done in form of tables. According to the findings, transportation management, inventory management, information management, and packaging management all have a substantial impact on agricultural company performance in Murang'a County. This study concludes that firms in Murang'a County should fully embrace the usage of fleet management systems, according to the report. This study recommends that agricultural firms in Muranga County should also maximize on the use of inventory management techniques such as Economic Order Quantity and ensure sustainability principles are observed by practicing green packaging of the inventory.

Keywords: *Information Management, Inventory Management, Logistics Optimization: Packaging Management, Performance of Firms Transport Management*

1.0 INTRODUCTION

Supply chain managers and other decision makers are often interested in understanding qualitatively how they ought to respond to changes in conditions. Indeed, some authorities have argued that obtaining empathetic is goal of mode the is for choice making. They reason that such models are always approximate and so the numbers one obtains from numerical calculations with them are mainly useful to obtain understanding not answers (Abdul Halim, 2016). Even those who do not accept this viewpoint and many do not agree that the development of understanding of circumstances is an important goal of modeling. Since data gathering and computation are expensive particularly for large scale optimization glitches the question arises whether it is conceivable to develop a theory of optimization that would provide a qualitative understanding of the solution of an optimization problem without data gathering or computation. The answer is it is, and we shall do so in the remainder of this section. To that end, it may be useful first to stretch a few examples of qualitative questions arising in supply-chain management. Similar examples abound in other fields as well (Adulyasak, Cordeau & Jans, 2014).

Supply chain is the integration and coordination of procurement, production, distribution and demand planning. These planning doings require taking strategical, tactical and operational decisions. And optimization models are being developed to operate these activities in the supply chain. Logistics management is a part of supply chain management which comprises the planning, control, as well as implementation of well-organized movement and storage of necessary information, goods, and services from point of origin to point of destination (Adulyasak, Cordeau & Jans, 2014). Therefore, logistics management plays a significant role in enhancing a firm's strategic edge in customer service and operational excellence (Achillas, Bochtis, Aidonis and Folinas (2018), pointed to the fact that logistics management is a growth-oriented corporate strategy and not a mere means for cost reduction. They noted that in an attempt to leverage and consolidate on the merit of logistics management, agricultural organizations are approval of the current logistics developments.

Regardless of the fact that agricultural enterprises are an essential contributor to Kenya's economic growth and improvement, their expansion is hindered or hampered by a lack of adequate financing from credit institutions. One of the main priorities in today's business world is efficiency improvements. Because of the longer and increasingly complex supply chains, the task of logistics management has become more and more relevant for companies. Agricultural firms focus on achieving the maximum level of desired competitive advantages of service and cost leadership. However, 67% of agricultural firms scuffle to recognize bottleneck practices where to deploy proficient recourses and in what order (Achillas et al., 2018). However, logistics problems such as long lead times and variability, increasing number of logistics channels and unpredictable demand prevail in agricultural firms.This has resulted in increased difficulties in agricultural firms in Murang'a County to control and coordinate logistics activities within and among collaborating firms. While it is commonly recognized that efficiency can be enhanced through the implementation of logistic management systems, only a few studies have been published that provide models for logistics optimization that address this issue (Carvalho & Nascimento, 2016).

In a competitive global market, companies inevitably have to reduce cost. Regarding cost contribution, raw material is a major part of the total cost. Therefore, the companies seek for low cost suppliers from various distant locations for common and more specialized raw materials (Ali, Melkonyan, Noche & Gruchmann, 2021). As a result, logistics cost is also a significant cost contributor, considering the number of suppliers and the distance from the suppliers. In order to lower suppliers cost, logistics is, thus, a very important aspect to consider. There are several terms referring to logistics, for example, logistics is the organized movement of materials, information, and sometimes people or Rushton et al. gave an equation to express that "Logistics = Supply + Materials management + Distribution". Obviously logistics management, especially global logistics management, needs a variety of skills such as buying skill, logistics knowledge, and so forth (Achillas et al., 2018).

Logistics management is a crucial strategic aspect for boosting competitiveness in a global market that is competitive and dynamic (Carvalho & Nascimento, 2016). Logistics management had progressed from a more passive and cost-cutting activity to a critical success factor for a company's competitiveness. As a result, there was a growing consensus that businesses must address logistics challenges alongside economic and business concerns (Tuttle & Heap, 2008). Delivery service, logistics cost, and tied-up capital were all factors in the performance of logistics systems. Customers demanded faster delivery times and more precise

services, and logistics management was arguably easiest to envision in manufacturing, where items flowed physically (Ali et al., 2021).

A global competitive logistics network would be the driving force of international trade, according to a recent World Bank assessment on logistics performance, and the significance of efficient logistics for trade and growth would be generally recognized: (Carvalho & Nascimento, 2016). Good logistics efficacy is linked to trade expansion, export diversification, the potential to attract foreign direct investment, plus economic growth, in other words, commercial logistics are important (WB, 2019). The World Bank recognized the importance of logistics performance and launched a research to assess nations' logistics competitiveness. It is important to emphasize that the focus of this paper is on route selection and delivery quantity decisions, and not on the construction of candidate routes, because a typical 3PL provider has little difficulty generating a set of viable routes, taking into account the structure of the road network, traffic patterns, etc. Our primary concern is to find an effective solution procedure for our problem given a practical set of candidate routes (Ali et al., 2021).

Optimization and the supply chain strategy tells us what we need from our supply chain present, near term and long term in order to realize the objectives of our overall corporate strategy. Having performed a supply chain critical path analysis, we can determine at each of these levels where the real and potential constraints will be. The next step is to collaborate with the suppliers in that chain to communicate the strategy and how they can be a part of it (Darvish, Larrain & Coelho, 2016). It is then necessary to evaluate each supplier's ability to meet the current and future demands by performing a supplier capability assessment of their operation. This assessment should be performed by an independent third party to avoid bias. This is an on-site assessment of the suppliers' operation to determine their ability to support the top tier's current and future demand as well as their ability to deal with variation in that demand. Firms became globalized in order to provide access to emerging markets, increase production efficiency gains, and leverage technological competencies beyond their own geographical borders, which increased the importance of logistics (Juma, Odunga, Atheru & Nzai, 2018). Every company aspired to capture a share of the global market and take advantage of higher production and sourcing efficiencies in today's highly competitive climate.

The logistics function's role in ensuring the seamless movement of resources, products, and information across a whole company's supply chains was a crucial factor of its performance at the time (Regattieri, Santarelli & Piana, 2018). Which is why, in recent years, logistics has gained prominence and recognition as a vital aspect in gaining a competitive advantage. Kenya's logistics performance had deteriorated in recent years. Whereas the time it took to import items and the quantity of paperwork required were remotely similar to the standard in Sub-Saharan Africa, the cost was far greater. For enterprises exporting or importing to Kenya, but also the logistics providers engaged, low logistical efficiency was a major worry and commercial risk. However, according to a World Bank report on the Logistic Performance Index, Kenya's logistical attractiveness in 2018 was ranked 63, down from 42 in 2016, the last time the WB conducted a poll (Darvish et al., 2016).

Kenya's transportation infrastructure was insufficient to satisfy the country's demands, despite tremendous progress in infrastructure development in recent years. The country's infrastructure indices appeared to be better than those of other low-income African countries, although they stayed below those of Africa's middle-income economies, such as Egypt and Nigeria (WB 2012). Raising Kenya's infrastructures up to the same level of the continent's middle-income countries increased yearly growth by even more than 3%. Kenya's development projects included considerable upgrades to roads, trains, seaports, airports, water, and sanitation as the country strives to improve its worldwide competitiveness (KSC, 2018). Although road and rail linkages with neighbouring nations were still restricted, Kenya had the potential to become a major regional hub for air travel, trains, and ports in the future. Logistics systems have been at the centre of attention of enterprises for over a decade with today's heightened expectation of customers and harsh competitive environment in markets. Enterprises are continuously seeking the best development and enterprise-level best solution strategies for their logistics systems to meet the present and possible future expectations and to stay beyond their counterparts.

With the advancement of information, communication systems, and optimisation techniques, it became possible to model and to obtain solutions for large scale complex problems. Hall (2003) stated that transportation science covers research from many fields such as geography, economics, and location theory. Methodologies of transportation science come from physics, operations research, probability, and control theory; it is fundamentally a quantitative discipline, relying on mathematical models and optimisation algorithms to explain the phenomena of transportation (Hall, 2003). Frazelle (2002) explained the overall goal of transportation as it should be: to connect sourcing locations with customers at the lowest possible transportation cost within the constraints of the customer service policy. Thus, the transportation optimisation

equation could be expressed as follows: minimising total transportation costs subject to customer service policy constraints (Frazelle, 2002). Frazelle (2002) also emphasised that transportation expenses are rising quickly versus other logistics costs, with smaller, more frequent orders, increasing international trade and global logistics, rising fuel charges, labour shortages, decreased carrier competition due to carrier mergers and acquisitions, and increased union penetration in the labour market. Optimisation is a well-established field due to comprehensive research conducted over past decades. In decision science, optimisation is an essential tool. As stated by Nocedal in 1999, optimisation is an important tool in decision science and in the analysis of physical systems. In order to benefit from optimisation, it is necessary to identify some objectives and then some quantitative measures of the system.

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1.1 Statement of the Problem

Because of the tight linkage between agricultural and economic performance, agriculture must grow rapidly in order to stimulate economic growth (Anand, 2018). However, agricultural performance in Kenya has fluctuated wildly in the recent year, culminating in a downward trend. Despite Kenya's agriculture sector growing by 3.6 percent in 2019, Coffee and wheat production in Kenya declined by 8.8% and 8.8%, respectively, in comparison to 2018. As a result, maize, tea, and sugarcane production decreased, owing to a variety of climate circumstances. Furthermore, horticultural exports decreased by about 6% (Kenyanya & Ombok, 2018).

Additionally, in Kenya, agricultural processing centers have been integrated as crucial points in a country's logistics and transportation system; they play a strategic role in a region's or an individual country's economic growth and social development (Mutai & Osorio, 2021). As an integrated set of facilities and services the firm in this industry sector can be considered the site in a supply chain where the given location serves all physical (transport, distribution and warehousing), informational and financial or value flows from the point of origin to the final customer/consumer (Kenyanya & Ombok, 2018). Besides, the development history of a Kenya's agricultural base has proven that they are not only places for loading and unloading goods, but may provide value added for the national economy.

Recent economic demands require that the firms serve as logistics centers not only for farm warehouse storage and transport points where goods are in transit and provisionally stored and is handled but also such inventory handling functions (Nyoro & Jayne, 2019) as, partially processing and assembly, packing and distribution for improved customer service (Kenyanya & Ombok, 2018). This notwithstanding, most of the available literature comes from the developed countries (Chege & Wang, 2020). Review of extant literature focusing on agricultural logistics has revealed several research streams, which can be broadly classified by research methods adopted, products and geographical area to which the analyses pertain. These clearly demonstrates the need to conduct the study in the Kenyan environment in order to address the logistics optimization concerns. As a result, the study aims to fill this research gap by determining the influence of logistics optimization on the performance of agricultural firms in Murang'a County, Kenya.

1.2 Objectives of the Study

1.2.1 General Objective of the Study

To establish the influence of logistics optimization on performance of agricultural firms in Murang'a County, Kenya.

1.2.2 Specific Objectives of the Study

1. To determine the influence of transport management on performance of agricultural firms in Murang'a County, Kenya.
2. To assess the influence of inventory management on performance of agricultural firms in Murang'a County, Kenya.
3. To analyze the influence of information management on performance of agricultural firms in Murang'a County, Kenya.
4. To examine the influence of packaging management on performance of agricultural firms in Murang'a County, Kenya.

1.3 Significance of the Study

1.3.1 Agricultural Firms in Kenya

The significance of the study will be to establish the effect of logistics optimization on performance agricultural firms in Kenya. This will facilitate managers to make complex judgments and accurate decisions regarding all facets of the logistics function in their company. Secondly, the study will help warehousing, procurement, transportation and finance departments on doing its activities with effectiveness and efficiency thus ensuring service reliability, operational performance and customer satisfaction in the services delivered. Third, the study will help identify the priority areas in logistics optimization for the management of the agricultural firms to deploy their expert resources to maximize on performance improvement and competitiveness.

1.3.2 County Government

It is anticipated that the findings of this study will be useful to the government through the ministry of agriculture. The information will assist the management understand the causes of poor performance of agricultural firms and the possible solutions, its influence on the efficiency of agricultural firms in the Kenyan context. The findings will also help the ministry to identify areas of improvement, challenges experienced and ways to manage future occurrences. The government, as the regulator, will benefit in creating the relevant enabling environment for these facilities to operate successfully and thus enhance revenue collection.

1.3.3 Researchers and Scholars

The results of this study will contribute to the current literature on logistics optimization, particularly in the context of agricultural firm performance. As a result, academics and other scholars who are interested in expanding on the findings or exploring other similar sectors of interest will refer to the findings of this study in the future. The research will also add to the growing body of knowledge in the field of port administration.

1.4 Conceptual Framework

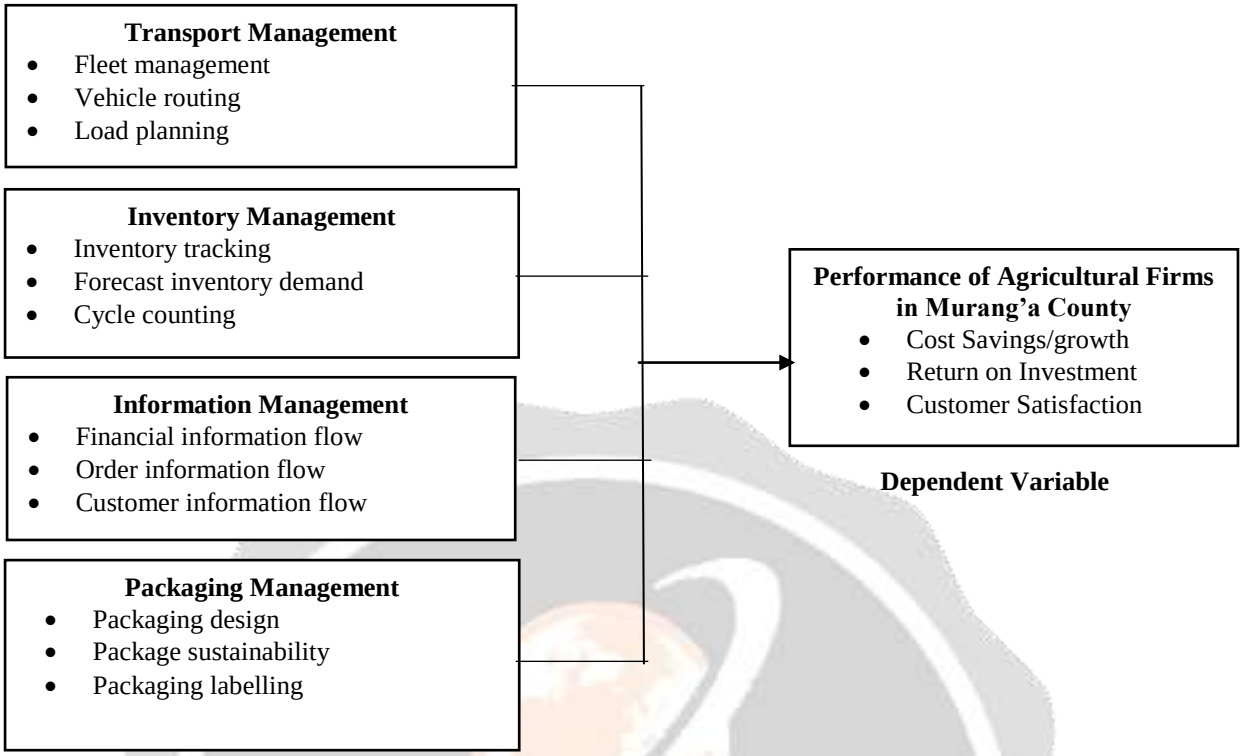

Figure 1. 1 Conceptual Framework

2.0 DATA AND METHODOLOGY

2.1 Research Design

The descriptive research design was employed in this study.

2.2 Target Population

The target population, according to Łobaziewicz (2017), refers to the larger population to which the study hopes to generalize its findings. The study's target population was 142 participants (senior logistics mangers).

2.3 Sample and Sampling Technique

According to Etikan and Bala (2017), a sample is a portion or part of the population of interest. This study adopted purposive sampling technique. The choice of purposive sampling technique is because it helps a study focus on the concerned portion of the population under study (Etikan & Bala, 2017). The sample size was picked from 221 agricultural firms in Murang'a county using the following formulae adapted from Yamane (1967) at a confidence level of 90%.

$$n = \frac{Z^2 p.q.\ N}{e^2 (N-1) + Z^2 pq}$$

$$n = \frac{1.96^2 * 0.5 * 0.5 * 221}{0.05^2 (221-1) + 1.96^2 * 0.5 * 0.5}$$

$n = 142.35104$

= 142 companies

Sample Size (n) = 142*1 = 142

Table 3. 1 Sample Size

Department	No. of Firms	No. of Respondents	Total Respondents
Logistics/transport	142	1	142
Total			**142**

2.4 Data Collection Instruments

A self-administered research questionnaire was employed as the data collection instrument in this study. Primary data was obtained directly from the participants and was utilized to analyze the relationships that were being investigated in this study. The study involved both the qualitative and quantitative aspects of performance and therefore, self-administered structured and unstructured questionnaire was appropriate for this study (Blumberg et al., 2014). A self-administered research questionnaire was used to collect quantitative data from the logistics managers working in the randomly selected agricultural firms in Murang'a County.

2.5 Pilot Test

The study used 14 logistics managers from 14 agricultural firms in Murang'a county to carry out the pilot study of which these were part of the sampled population. This will represent 10% of the accessible population. This is generally supported by social scholars such as Bell, Bryman and Harley (2018), who indicates that successful pilot study uses 10% of the actual respondents. The respondents who participated in the pilot testing of the research instruments were exempted from being respondents in the main study to eliminate biasness in the research results based on prior knowledge of the contents in the research instrument. Thus, the 14 respondents will be deducted from the actual sample size. The study used simple random sampling in the selection of the respondents, which according to Etikan and Bala (2017), ensures that each unit has an equal chance of being chosen and the random sample is the most representative of the entire population and least likely to result to bias. To check the validity of the research instruments, the study sought an expert opinion through a focus group discussion.

2.5.1 Validity of the Research Instruments

The content-related method was used to test the validity of the research instruments in this study. The fact that this test of validity technique is consistent with the study's aims and research paradigm will guide it. The validity of the study tools was guided by the recommendation of two experts.

2.5.2 Reliability of the Research Instruments

The study was informed by these qualities in the current research and that was the basis of testing the reliability of this research. In addition, Ghauri et al. (2020).) indicates that a measuring instrument is reliable if it provides consistent results. Etikan and Bala (2017) indicated that there are many methods used by researchers to obtain reliability of research instruments and as a result the current study used test-retest method. Eriksson & Kovalainen (2015) posit that this method involves administering the same test twice to the same group after a certain time interval has elapsed since the previous test which to the view of the study, was applicable to the current study. Reliability coefficient of the research instrument was assessed using Cronbach's Alpha coefficient. This tool measures internal consistency among a group of items combined to form a single scale. According to Bell et al. (2018), a Cronbach alpha coefficient of greater than 0.70, indicates a factor as being reliable. If the Cronbach alpha coefficient was to be less than 0.7, then the instrument was to be revised before the main research is carried out to the acceptable level. According to Eriksson and Kovalainen (2015), the following is the commonly accepted rule of thumb for describing internal consistency of a research instrument.

2.6 Data Processing Analysis

After gathering primary data in the field, it was edited and entered into a computer for analysis using SPSS version 26. Coding will be used to organize and reduce research data into manageable summaries. Collected data was analyzed using descriptive statistics, utilizing the frequency distribution; percentages standard deviations and means. According to Bell et al. (2018), the purpose of descriptive statistics is to allow for meaningful description of a distribution of scores or measurements using a few indices or statistics.

Statistical tally system was used to generate frequency counts from the responses so as to prepare frequency distributions. The data was described using descriptive statistics such as means, standard deviations, frequencies, and percentages. Percentages of the overall study sample response on the 5-point rating Likert scale were determined for each item. In each item, averages were determined. The average will be used to determine the concentration of responses within the 5-point Likert rating scale range as a measure of central tendency. Tables were used to present the data that had been analysed. This was done in accordance with the research objectives and questions. Multiple regression models were used to assess the impact of logistics optimization on agricultural firm performance in Murang'a County, Kenya. The following was the multiple regression model:

$$Y= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

3.0 RES ULTS AND DISCUSSION

3.1 Response Rate

A total of 128 questionnaires were distributed, with 115 of them being properly completed and returned. This resulted in an 89.84 percent response rate. The response rate to questionnaire was very high, which provided a good representation and allowed generalizations to be made. This excellent response rate was attributed to the data collection procedure, where the researcher personally administered questionnaires to the respondents who ensured they were filled and collected them for analysis. This response rate demonstrated the validity of the study.

Table 3. 1 Response Rate

Particulars	Frequency	Percentage (%)
Distributed Questionnaires	128	100
Returned Questionnaires	115	89.84
Unreturned Questionnaires	13	10.16

3.2 Pilot Study Results

The internal method to consistency was used in this study. Reliability coefficient of the research instrument was assessed using Cronbach's Alpha coefficient. According to Nyoro and Jayne (2019), a Cronbach alpha coefficient of greater than 0.7, indicates a factor as being reliable. If the Cronbach alpha coefficient was to be less than 0.7, then the instrument was to be revised before the main research is carried out to the acceptable level. All the study variables had an aggregate Cronbach Alpha coefficient which was above 0.7. Therefore, indicating that the all the variables and their items were reliable for this study.

Table 3. 2 Pilot Test Findings Summary

Variables	No of items	Cronbach's Alpha	Decision
Transport Management	6	.769	Acceptable
Inventory Management	6	.830	Acceptable
Information Management	7	.793	Acceptable
Packaging Management	6	.800	Acceptable
Performance	6	.891	Acceptable

Further the study tested for construct validity through in-depth interviews with key informants comprising of logistics managers and lecturers prior to the administration of the questionnaire so as to solicit valid concepts. The key informants provided relevant information that was used to modify the questionnaire thereby coming up with constructs that were valid.

3.3 Respondent Demographic Information

3.3.1 Position in the Firm

The respondents were asked to indicate the position they held in the firm. The findings in table 3.3 show that 46.09% (majority) of the respondents were logistics managers, 19.13% of the respondents were transport managers, 15.65% of the respondents were supply chain managers, 10.43% of the respondents were

procurement managers and 8.70% of respondents were accounts managers. Logistics managers constituted majority of the respondents from whom data was collected. This was a very important profile distribution for this study since the respondents were the right target population with adequate information relevant to this study hence best placed.

Table 3. 3 Position in the firm

Position	Frequency	Percent (%)
Logistics Manager	53	46.09
Supply Chain Manager	18	15.65
Transport Manager	22	19.13
Procurement Manager	12	10.43
Accounts Manager	10	8.70
Total	**115**	**100**

3.3.2 Highest Level of Education Attained

According to Table 3.6; the findings show that up to 4.35% of the respondents were PhD holders, 6.96% of the respondents were master's degree holders, and 30.43% of the respondents were bachelor's degree holders, whereas 58.26% of the respondents were diploma' holders. The findings therefore revealed that majority of the respondents have attended universities or colleges and had acquired PhDs, masters' degree, bachelors' degree or diplomas respectively and therefore are relatively well acquainted with the required data for the research.

Table 3. 4 Highest Level of Education Attained

Academic Level	Frequency	Percent (%)
Diploma	67	58.26
Degree	35	30.43
Masters	8	6.96
PhD	5	4.35
Total	**115**	**100**

3.4.3 Years of Experience

The respondents were asked to indicate the duration they have worked in the firm. 46.09% of the respondents have a working experience between 7 to 10 years, 26.09% of the respondents have 0-3 years' experience, 20.00% have 4 to 6 years working experience, 4.34% of the respondents have 11-15 years' experience whereas a few, 3.48% have above 15 years' experience as illustrated in Table 3.5. The distribution shows that the respondents have adequate working experience and therefore possess the necessary and adequate knowledge and information which was considered useful for this study.

Table 3. 5 Years of Experience

Experience	Frequency	Percent (%)
0-3 Years	30	26.09
4-6 Years	23	20.00
7-10 Years	53	46.09
11-15 Years	5	4.34
Above 15 Years	4	3.48
Total	**115**	**100**

3.5 Discussion of Findings

3.5.1 Transport Management

The majority of agricultural enterprises in Murang'a county have a fleet management system, as evidenced by a mean of 3.46 and a standard deviation of.457 in table 3.6. Furthermore, the results suggest that the majority of agricultural enterprises in Murang'a county use vehicle routing to help optimize vehicle use, as seen by a mean of 3.53 and a standard deviation of.446. Furthermore, according to the report, the majority of agricultural enterprises in Murang'a county use load planning to ensure proper truck space utilization, as evidenced by a mean of 3.69 and a standard deviation of.435. Furthermore, according to a mean of 3.66 and a standard deviation of.400, the majority of agricultural enterprises in Murang'a County have a vehicle tracking system to improve vehicle security. This echoes the findings of Omulo and Kumeh (2020). Finally, the findings revealed that the majority of agricultural enterprises in Murang'a county do periodic vehicle maintenance in order to preserve vehicle efficiency in operations, as evidenced by a mean of 3.76 and a standard deviation of.553. These findings imply that transport management activities contribute to logistics performance, and therefore to agricultural firm performance in Murang'a county. Good logistics transportation management may improve logistical efficiency, save operating costs, and improve service quality for businesses.

Table 3. 6 Transport Management

Statement	Mean	Std. Deviation
We have a fleet management system in our firm.	3.46	.457
We conduct Vehicle routing to help in optimizing vehicle use.	3.53	.446
We conduct load planning to ensure proper vehicle space utilization	3.69	.435
We have a vehicle tracking system to enhance vehicle security.	3.66	.400
We conduct periodic vehicle maintenance to maintain vehicle efficiency in operations.	3.76	.553

The findings in table 3.7 showed that other than fleet management, vehicle routing, and load planning, agricultural firms in Murang'a County also embrace load optimization (10.43%), route optimization (8.70%), carrier management (9.57%) and freight handling (71.30%) in their transport management operations.

Table 3. 7 Other transport management techniques used

Transport management technique	Frequency	Percentage %
Carrier management	11	9.57
Route optimization	10	8.70
Load optimization	12	10.43
Freight handling	82	71.30
Total	**115**	**100**

3.5.2 Inventory Management

The majority of agricultural enterprises in Murang'a county can estimate future inventory demand changes, according to the survey, which found a mean of 3.43 and a standard deviation of.457. Furthermore, as seen by a mean of 3.59 and a standard deviation of 4.12, the majority of agricultural enterprises in Murang'a county have an automated inventory recording system, allowing them to track inventory level changes in real time. Furthermore, the study's findings demonstrate that the majority of agricultural enterprises in Murang'a county use cycle counting as an inventory security technique, as shown by a mean of 3.48 and a standard deviation of.412. Furthermore, the study's findings reveal that the majority of agricultural enterprises in Murang'a county use inventory control systems to maintain stable inventory levels, as evidenced by a mean of 3.47 and a standard deviation of.401. Finally, the study discovered that the majority of agricultural enterprises in Murang'a County are able to provide inventory to our clients in a timely manner, as evidenced by a mean of 3.50 and a standard deviation of.423. This finding are in line with the findings of Mutai and Osoro (2021), who observed that strategically managing inventory would improve logistics operations and, as a result, the performance of agricultural enterprises in Murang'a County. For most large, medium-sized, and small businesses, inventory management is a significant management issue. In today's competitive and changing industry, inventory management is vital to an organization's success. This comprises lowering the

cost of retaining stocks by keeping just enough inventories in the right place, at the right time and at the right cost to produce the exact number of items required.

Table 3. 8 Inventory management

Statement	Mean	Std. Deviation
We are able to forecast future inventory demand fluctuations.	3.43	.457
We have an automated inventory recording system thus able to track inventory level changes as it occurs real time	3.59	.389
We conduct cycle counting as an inventory security measure	3.48	.412
We employ inventory control techniques to keep sustainable inventory levels.	3.47	.401
We are able to avail inventories to our customers just in time	3.50	.423

The findings in table 3.9 showed that other than inventory tracking, forecast inventory demand and cycle counting; agricultural firms in Murang'a county also embrace drop shipping (5.22%), crossdocking (18.26%), inventory kitting (24.35%), and backordering (52.17%) in their inventory management operations.

Table 3. 9 Other inventory management techniques used

Inventory management technique	Frequency	Percentage %
Drop shipping	6	5.22
Crossdocking	21	18.26
Backordering	60	52.17
Inventory kitting	28	24.35
Total	**115**	**100**

3.5.3 Information Management

The study's findings revealed that the majority of agricultural enterprises in Murang'a County have a seamless financial information flow with their clients, as evidenced by a mean of 3.47 and a standard deviation of.401. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County have a reliable order information flow, resulting in timely order processing, as evidenced by a mean of 3.49 and a standard deviation of.402. Furthermore, according to the report, the majority of agricultural enterprises can track client order status, as evidenced by a mean of 3.50 and a standard deviation of.423. Furthermore, the survey found that the majority of agricultural enterprises in Murang'a County use their automated financial system to ensure that there are no double payments, as evidenced by a mean of 3.46 and a standard deviation of.402. Furthermore, the majority of agricultural enterprises in Murang'a County maintain smooth information flow across all logistics activities inside their firms, as evidenced by a mean of 3.44 and a standard deviation of.402 in the survey. Finally, according to a mean of 3.64 and a standard deviation of 3.98, the majority of agricultural enterprises in Murang'a County use an automatic customer feedback system to obtain product and service ratings. These findings implied that uninterrupted and timely flow and management of relevant information enhances logistic optimization and in turn improves firm performance. Thus, all firms needed to share information on transfer, inventory levels and positions, sales data and forecasting information, order status, production schedules, and delivery capacity, and company performance measurements.

Table 3. 10: Information Management

Statement	Mean	Std. Deviation
We have a smooth financial information flow with our customers.	3.47	.401
We have a reliable order information flow thus timely processing of orders.	3.49	.402
We are able to track customer order status	3.50	.423
Through our automated financial system, we ensure there are no double payments.	3.46	.402
We ensure smooth information flow to all logistics functions within our firm	3.44	.402
We use automatic customer feedback system to get product and service reviews.	3.64	.398

The findings in table 3.11 showed that other than financial information flow, order information flow and customer information flow; agricultural firms in Murang'a County also emphasize on material information flow (55.65%), marketing information flow (26.09%) and operational information flow (18.26%) to optimize on logistics.

Table 3. 11 Other information management techniques used

Information management technique	Frequency	Percentage %
Material information flow	64	55.65
Marketing information flow	30	26.09
Operational information flow	21	18.26
Total	**115**	**100**

3.5.4 Packaging Management

The majority of agricultural enterprises in Murang'a County have a unique package design for easy identification, according to the survey, which found a mean of 3.61 and a standard deviation of.399. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County established a long-term package for maximum product protection, as evidenced by a mean of 3.56 and a standard deviation of.398. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County used appealing package labeling to attract customers, as seen by a mean of 3.46 and a standard deviation of.302. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County design packaging using ecologically friendly materials, as evidenced by a mean of 3.48 and a standard deviation of.300. Finally, the survey discovered that the majority of agricultural enterprises in Murang'a County cut corners on packing material in order to keep product costs low, as seen by a mean of 3.50 and a standard deviation of.378. The findings implied that sufficient packaging management through packaging design, package sustainability and packaging labelling. The purposes of packaging, aside from protecting, enclosing, and conserving the product, are numerous and complex, and the description here can be connected to three primary categories: logistics, marketing, and the environment.

Table 3. 12: Packaging Management

Statement	Mean	Std. Deviation
We have a unique packaging design for easier identification	3.61	.399
We develop a sustainable package for maximum product protection	3.56	.398
We conduct attractive package labeling to appeal to our customers.	3.46	.302
We use environmentally friendly materials in developing the packaging.	3.48	.300
We economize on the packaging material not to exceed the product value.	3.50	.378

The findings in table 3.13 shows that other than packaging design, package sustainability and packaging labelling; agricultural firms in Murang'a County also embrace poly building (21.74%) and kitting (78.26%) in their packaging management operations to optimize on logistics. This finding is in line with the findings of Mutai and Osoro (2021).

Table 4. 13 Other packaging management techniques used

Packaging management technique	Frequency	Percentage %
Poly building	25	21.74
Kitting	90	78.26
Total	**115**	**100**

3.5.5 Performance of Agriculture Firms

According to the findings, the majority of agricultural enterprises in Murang'a County can maintain a short lead time with automated order processing, as evidenced by a mean of 3.72 and a standard deviation of.388. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County

are dependable to their clients, as seen by a mean of 3.66 and a standard deviation of.526. Furthermore, according to the survey, the majority of agricultural enterprises in Murang'a County have kept inventory carrying costs to a bare minimum with proper projected inventory demand, as evidenced by a mean of 3.54 and a standard deviation of.463. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County reported a reasonable return on investment, as evidenced by a mean of 3.80 and a standard deviation of.544. Finally, the survey discovered that the majority of agricultural enterprises in Murang'a County have received repeat orders because clients are happy with our products, as evidenced by a mean of 3.77 and a standard deviation of.412. The findings implied that cost savings, high return on investment and high customer satisfaction in firms are reliable measures of performance of firms.

Table 3. 14: Performance of Agricultural Firms

Statement	Mean	Std. Deviation
With automatic order processing, we are able to keep a short lead time.	3.72	.388
We are reliable to our customers due to timely order processing.	3.66	.526
With proper forecast inventory demand, we have kept at bare minimum inventory carrying costs.	3.54	.463
We have been reporting satisfactory return on investment	3.80	.544
We receive repeated orders since customers are satisfied with our products	3.77	.412

The findings in table 3.15 showed that other than cost savings, return on investment and customer satisfaction; agricultural firms in Murang'a county also utilize metrics of productivity (14.78%), market share (24.35%) and profits (60.87%) in measuring their firm performance. This finding is in line with the findings of Weidner, Yang and Hamm (2019).

Table 3. 15 Other performance rating measures used

Measure of performance	Frequency	Percentage %
Profits	70	60.87
Market share	28	24.35
Productivity	17	14.78
Total	**115**	**100**

3.6 Correlation Analysis

Correlation is often used to explore the relationship among a group of variables, in turn helping in testing for multicollinearity. That the correlation values are not close to 1 or -1 is an indication that the factors are sufficiently different measures of separate variables. It is also an indication that the variables are not multi-collinear. Therefore, absence of multicollinearity allowed the study to utilize all the independent variables.

Table 3. 16: Correlation Analysis

Study Variable		Performance of Agricultural Firms	Transport management	Inventory management	Information management	Packaging management
Performance of Agricultural Firms	Person Correlation	1				
	Sig. (2-tailed)					
Transport management	Person Correlation	.762**	1			
	Sig. (2-tailed)	.000				
	N	115				
Inventory management	Person Correlation	.776**	.762**	1		
	Sig. (2-tailed)	.000	.000			
	N	115	115			
Information management	Person Correlation	.770**	.798**	.786**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	115	115	115		
Packaging management	Person Correlation	.795**	.748**	.754**	.766**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	115	115	115	115	

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

3.7 Model Summary Regression Analysis

The multiple regression analysis showed a strong relationship, R^2 = 0.632 which showed that 63.2% of change in performance of agricultural firms can be explained by a change of one unit of all the predictor variables jointly, while 36.8% is the variation from other factors not inclusive in this study findings. This finding is in line with the findings of Weidner et al. (2019). Refer Table 3.17.

Table 3. 17 Model Summary[a] of Overall Regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.798[a]	.637	.632	.16532

a. Predictors: (Constant), Transport management, Inventory management, Information management, Packaging management

a. Dependent Variable: Firm Performance

This result indicated that predictor variables influence the performance of agricultural firms positively. Further test on ANOVA showed that the significance of these F-statistic (24.007) is less than 0.05 since p value, ^{p}=0.00. This is displayed in Table 3.18.

Table 3. 18 ANOVA[a] of Overall Regression Model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.197	1	5.549	24.007	.000[a]
	Residual	15.949	114	.231		
	Total	**38.146**	**115**			

a. Dependent Variable: Performance of Agricultural Firms

a. Predictors: (Constant), Transport management, Inventory management, Information management, Packaging management

The findings implied that there was a positive significant relationship between independent variables and performance of agricultural firms. Thus, transport management, inventory management, information management and packaging management are important logistics optimization factors when improving performance of agricultural firms in Murang'a County. Finally, the estimated multiple regression model to estimate performance was indicated in Table 3.19.

Table 3. 19 Coefficients [a] of Overall Regression Ratings

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	**Std. Error**	**Beta**	**T**	**Sig.**
(Constant)	.141	.056		2.503	.005
Transport management	.275	.080	.387	3.423	.001
Inventory management	.395	.093	.537	4.235	.003
Information management	.550	.104	.665	5.268	.002
Packaging management	.360	.090	.441	3.999	.004

a. Dependent Variable: Performance of Agricultural Firms

$Y= \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \varepsilon$
$Y = 0.141 + 0.275X_1 + 0.395X_2 + 0.550X_3 + 0.360X_4$
Where;
Y= Performance of Agricultural Firms
0.141 = Constant
0.275 = Transport management
0.395 = Inventory management
0.550 = Information management
0.360 = Packaging management

The coefficients $\beta_1 = 0.275$, $\beta_2 = 0.395$, $\beta_3 = 0.550$ and $\beta_4 = 0.360$ are significantly different from 0 with p values 0.001, 0.003, 0.002 and 0.004 respectively and are less than p = 0.05 as summarized in table 3.19.

4.0 CONCLUSION

4.1 Summary of Findings

4.1.1 Influence of Transport Management on Performance of Agricultural Firms in Murang'a County, Kenya

The majority of agricultural enterprises in Murang'a County, according to the statistics, have a fleet management system. Furthermore, the majority of agricultural enterprises in Murang'a County use vehicle routing to help maximize vehicle use, according to the findings. The majority of agricultural enterprises in Murang'a County, according to the statistics, have a fleet management system. The research also found that the majority of agricultural enterprises in Murang'a County use vehicle routing to help optimize vehicle use. Finally, the findings demonstrated that the majority of agricultural enterprises in Murang'a County execute routine vehicle maintenance to maintain vehicle efficiency.

4.1.2 Influence of Inventory Management on Performance of Agricultural Firms in Murang'a County, Kenya

The majority of agricultural enterprises in Murang'a County, according to the study's findings, can foresee future inventory demand changes. Furthermore, the majority of agricultural enterprises in Murang'a County have an automated inventory recording system that allows them to track inventory level changes in real time, according to the research. Furthermore, the findings of the study show that a significant number of agricultural businesses in Murang'a County use cycle counting as an inventory security strategy. Furthermore, the findings of the study suggest that the majority of agricultural enterprises in Murang'a County adopt inventory control procedures to keep inventory levels stable. Finally, the survey discovered that the majority of agricultural enterprises in Murang'a County are able to provide goods on time to our clients.

4.1.3 Influence of Information Management on Performance of Agricultural Firms in Murang'a County, Kenya

The study's findings revealed that the majority of agricultural enterprises in Murang'a County have a smooth financial information exchange with their consumers. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County have a reliable order information flow, resulting in prompt order processing. Furthermore, the study found that the majority of agricultural businesses can track client order status. Furthermore, the survey found that the majority of agricultural enterprises in Murang'a County use an automated financial system to ensure that no payments are made twice. Furthermore, the majority of agricultural enterprises in Murang'a County maintain smooth information flow to all logistics activities within their firms, according to the survey. Finally, the survey discovered that the majority of agricultural businesses in Murang'a County rely on an automated customer feedback system to obtain product and service input.

4.1.4 Influence of Packaging Management on Performance of Agricultural Firms in Murang'a County, Kenya

The majority of agricultural enterprises in Murang'a County have a unique package design for easier identification, according to the survey. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County established a long-term package to ensure maximum product protection. Furthermore, the study's findings revealed that the majority of agricultural enterprises in Murang'a County used appealing package labeling to attract clients. Furthermore, the study's findings demonstrated that the majority of agricultural enterprises in Murang'a County design packaging using ecologically friendly materials. Finally, the survey discovered that the majority of agricultural enterprises in Murang'a County cut corners on packing materials in order to keep costs down.

4.2 Conclusions

4.2 1 Transport Management

This study concludes that, transportation management in Murang'a County has a positive significant impact on agricultural company performance. According to the findings, farms have a fleet management system. The study also found that agricultural organizations use vehicle routing and have a fleet management system to maximize vehicle use. Furthermore, the study found that using vehicle routing is critical for agricultural businesses to maximize their efficiency. Finally, the study found that agricultural businesses should do routine vehicle maintenance in order to maintain vehicle efficiency. As a result, transportation management ensured that agricultural firm commodities and products moved at a lower cost, faster, and more consistently, and that firm products arrived on schedule and in good condition.

4.2.2 Inventory Management

This study concludes that, Inventory management has a favorable significant influence on agricultural firm performance, according to the data. Agricultural enterprises always estimate future inventory demand fluctuations, according to the report, and have implemented an automated inventory recording system that allows them to follow inventory level changes in real time. Furthermore, the survey found that a significant number of agricultural businesses use cycle counting as an inventory security strategy and inventory control procedures to maintain stable inventory levels. Finally, the survey found that being able to offer inventory to our customers on time is critical for agricultural enterprises. As a result, good inventory management reduces depreciation, pilferage, and waste while ensuring that goods are available when they are needed.

4.2.3 Information Management

This study concludes that, information management has a positive significant impact on agricultural firm performance in Murang'a County. The study revealed that agricultural enterprises have a reliable order information flow and hence prompt processing of orders due to a smooth financial information flow with our clients. Furthermore, the survey found that tracking the progress of customer orders is critical for agricultural businesses. As well as ensuring that no duplicate payments are made through automated banking systems. Furthermore, the study found that agricultural enterprises who use an autonomous customer feedback system to obtain product and service reviews use a fluid information flow to all logistics activities within their firms.

Customers' needs are met, customer satisfaction is measured, and customers are committed to the services, hence logistics services are made up of three components. As a result, the quality of logistics information and communication is determined by the value supplied by the provider to customers through effective communication.

4.2.4 Packaging Management

This study concludes that; package management has a positive significant impact on agricultural firm performance in Murang'a County. The survey also found that agricultural enterprises that have built a sustainable package for optimal product preservation have developed a unique packaging design for easier identification. Furthermore, the survey found that agricultural enterprises make sure to create appealing package labeling to appeal to their customers, as well as using ecologically safe materials in the packaging development. Finally, the study found that agricultural enterprises who kept packaging costs below the value of their products had better product performance. As a result, many agricultural companies should always conduct extensive research into consumer wants and needs when developing product packaging to ensure that it is appealing and engaging.

5.0 Areas for Further Studies

The study was confined to a literature review that only proposes transport management, inventory management, information management, and packaging management besides the theories that support these four variables. As a result, empirical evidence that illustrates the overall performance of agricultural enterprises is outside the scope of the study's four variables. As a result, a similar study with additional variables should be done to determine if other logistics optimization variables influence agricultural firm performance. Similarly, data was gathered from a single Kenyan county. Kenya has agricultural enterprises in a number of counties. This study recommends similar research to be conducted from multiple informants' groups of counties to come up with a variety of outcomes.

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