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LOGISTICS MANAGEMENT PRACTICES ON THE PERFORMANCE OF SCHOOL FEEDING PROGRAMS IN PUBLIC PRIMARY SCHOOLS IN ISIOLO COUNTY, KENYA

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ABSTRACT

School feeding programs are essential in enhancing food security, improving school attendance, and supporting the overall well-being of children, particularly in marginalized regions. However, the effectiveness of these programs is often hindered by logistical challenges that affect food procurement, transportation, inventory management, and last-mile delivery. This study examined the Influence of logistics management practices on the performance of school feeding programs in Isiolo County, Kenya, an arid and semi-arid region where food distribution is complex due to poor infrastructure, unpredictable weather conditions, and resource constraints. The study explored key logistics management practices, including Trans-Logix, and sustainability practices. This study was guided by Resource-Based View (RBV) Theory and Goal-Setting Theory. This study utilized a descriptive research design to assess the existing procurement and logistics processes and their Influence on the efficiency of last-mile delivery. The study was conducted in Isiolo County, Kenya, focusing on schools that are part of the government-supported school feeding programs. A combination of purposive and random sampling techniques was used to select participants for the study. The sample size included 143 respondents. This research used a questionnaire to collect primary data. The pilot study was carried out on 10 respondents who are sufficient based on Glesne (2019) who stated that 10% of the population is adequate to constitute the pilot test size. Qualitative data from interviews and focus group discussions were analyzed using thematic analysis. Content analysis was applied to documents, reports, and procurement records to extract relevant information on procurement and logistics practices. Descriptive statistics was used to analyze the data in frequency distributions and percentages which were presented in tables and figures. The study also adopted multiple regression analysis to test the relationships between the variables. The study concludes that trans-logix has a positive and significant effect on performance of school feeding programs in Isiolo County. The study also concludes that sustainability has a positive and significant effect on the performance of school feeding programs in Isiolo County. This study recommends that the management of school feeding programs in Kenya should embed sustainability practices into all aspects of program implementation. By focusing on sustainability, the program not only becomes more resilient and cost-effective but also strengthens food security and supports local economic development, ultimately improving the well-being and educational outcomes of the learners.

Key Words: Logistics Management Practices, Trans-Logix, Sustainability, Performance of School Feeding Programs in Public Primary Schools

Background of the Study

Isiolo County faces unique logistical and environmental challenges that complicate the implementation of school meals programs. The region's poor road infrastructure, long transportation routes, and unpredictable weather conditions (such as droughts and floods) create significant bottlenecks in food supply chains. These challenges lead to delays, increased costs, and disruptions in food distribution, resulting in inconsistent access to meals for schoolchildren. Additionally, limited financial resources and administrative constraints further hinder the program's sustainability and effectiveness.

Efficient procurement and logistics are crucial for the success of school meals programs. Key supply chain functions, including procurement efficiency, inventory control, Trans-logix, and material handling, and sustainability practices play a vital role in ensuring timely and cost-effective delivery of food supplies. In Isiolo County, optimizing these processes can mitigate risks associated with food shortages, spoilage, and supply chain disruptions. Effective logistics management can also reduce operational costs, improve food quality and safety, and strengthen collaboration among stakeholders, including government agencies, donors, suppliers, and local communities.

This study focuses on public primary schools in Isiolo County, as they are the primary beneficiaries of school feeding programs in Kenya. Isiolo County was chosen for this study due to its unique and challenging logistical environment, which directly affects the implementation of school feeding programs. Additionally, Isiolo's strategic position along the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor highlights its potential for future infrastructure development, while current logistical constraints offer valuable insights into supply chain inefficiencies in similarly remote regions. Despite its importance, there is limited research focusing on the logistical aspects of school feeding programs in Isiolo, presenting an opportunity to fill this gap and provide actionable recommendations. Insights from this study can not only improve program efficiency in Isiolo but also serve as a model for other ASAL counties facing similar challenges.

To enhance the efficiency of school meals programs in Isiolo County, such interventions are critical. First, strengthening supply chain resilience is critical, which involves developing robust logistics systems to address challenges posed by poor infrastructure and unpredictable weather. This can be achieved by optimizing transportation routes, improving storage facilities, and implementing effective inventory management practices. Second, enhancing stakeholder collaboration is essential; fostering stronger partnerships between government agencies, international organizations, local communities, and private sector actors will ensure coordinated and sustainable program implementation. Third, leveraging technology through the use of digital tools for real-time tracking of food supplies, monitoring inventory levels, and improving communication among stakeholders can significantly improve efficiency. Fourth, investing in infrastructure, particularly road networks and storage facilities, will facilitate smoother last-mile delivery of food supplies. Finally, capacity building through training for program implementers on efficient procurement and logistics management will enhance operational effectiveness and ensure the long-term success of school meals programs.

School meals programs are a cornerstone of social protection and educational development in Isiolo County and similar regions. Reports from the Ministry of Education indicate that school feeding programs can reduce dropout rates by up to 40% in ASAL counties. However, their success depends on overcoming logistical and procurement challenges. By addressing these issues through improved supply chain management, stakeholder collaboration, and infrastructure development, school meals programs can achieve their goals of enhancing educational outcomes and child welfare. Insights from this study can serve as a model for other

ASAL counties facing similar challenges, contributing to broader efforts to combat food insecurity and promote equitable education opportunities.

The performance of a school feeding programme is evaluated based on its ability to positively Influence pupil enrolment, retention, academic achievement, and overall well-being. A well-managed feeding programme ensures consistent and timely delivery of nutritious meals, which encourages parents to enroll and retain their children in school, especially in food-insecure areas like Isiolo County. Regular meals help reduce absenteeism and drop-out rates, creating a stable learning environment that supports long-term educational goals.

In addition to improving enrolment and retention, effective school feeding programmes contribute significantly to pupils' academic performance. Access to balanced nutrition enhances concentration, cognitive development, and class participation, leading to improved test scores and overall academic outcomes. Moreover, efficient logistics and inventory management within the programme help minimize operational costs and ensure sustainability. When food is delivered on time, handled properly, and stored in appropriate conditions, the programme becomes more reliable and Influenceful, fostering both educational success and community trust.

Statement of the Problem

Isiolo County, situated in Kenya’s arid and semi-arid lands (ASALs), faces significant challenges in implementing school meals programs. Poor infrastructure, long distances between supply points and schools, and unpredictable weather patterns disrupt transportation, exacerbating procurement inefficiencies. These logistical constraints lead to delays, food wastage, and increased costs, ultimately affecting the effectiveness of school feeding programs and Influenceing children's nutrition and education. This study aims to assess how optimizing procurement and logistics can enhance last-mile delivery and improve school meals program efficiency in Isiolo County.

School feeding programs are crucial interventions for addressing food insecurity and improving educational outcomes, particularly in marginalized and low-income regions. The National School Meals and Nutrition Strategy in Kenya recognizes these programs as essential for promoting school attendance, retention, and academic performance. However, logistical challenges, especially in ASAL regions like Isiolo County, hinder their effectiveness. Unreliable food supply chains, transport disruptions, and storage constraints compromise the sustainability and efficiency of these programs.

Isiolo County's logistical challenges stem from harsh climatic conditions, poor infrastructure, and a widely dispersed population. With a poverty rate of 64%—significantly higher than the national average of 36.1%—food insecurity remains a pressing issue. The region's frequent droughts and floods further disrupt transportation routes, making last-mile delivery of food supplies unreliable. Consequently, many schools experience periodic food shortages, which negatively Influence children's attendance and reliance on school meals as a primary source of nutrition.

Despite government and donor support, inefficiencies in procurement, transportation, inventory management, and storage persist. Reports indicate that over 40% of schools in ASAL regions like Isiolo experience periodic food shortages due to supply chain disruptions. These shortages reduce school attendance and retention, as children often depend on school meals for their daily nutrition. By improving procurement and logistics, schools can ensure reliable food supply, which encourages parents to enroll and keep their children in school.

The nutritional support provided by school meals programs plays a crucial role in cognitive development and academic performance. However, delays and disruptions in meal delivery—

caused by poor infrastructure, long distances, and unpredictable weather—compromise these benefits. Malnutrition among children in Isiolo County is a concern, and inconsistent meal provision may hinder their concentration, learning capacity, and overall school performance. Addressing logistical challenges can ensure a steady food supply, enhancing educational outcomes in the region.

High transportation costs further strain the school feeding program's budget. Vast distances between supply points and schools, poor road conditions, and inefficient procurement processes contribute to high logistical expenses. Poor planning, lack of coordination among stakeholders, and inadequate funding for fuel and vehicle maintenance exacerbate the problem. Streamlining procurement and logistics can help optimize transportation routes, reduce costs, and improve delivery efficiency, ensuring food reaches schools in a timely manner.

Limited storage facilities and inadequate food handling practices also contribute to spoilage and wastage, stretching already scarce resources. Studies indicate that up to 20% of food supplies in some Kenyan counties are lost due to poor logistics management. Addressing storage and inventory inefficiencies can help reduce food losses and improve program sustainability. Additionally, leveraging stakeholder collaboration and technological tools for logistics tracking can enhance supply chain efficiency and accountability.

Given these challenges, it is crucial to assess how logistics management practices—including procurement efficiency, inventory control, transportation coordination, and stakeholder collaboration—Influence school feeding programs in Isiolo County. The last-mile delivery phase is particularly critical, as poor road infrastructure, vast distances, and extreme weather conditions lead to frequent delays and food spoilage. This study sought to analyze these logistical dynamics and propose strategies for improving procurement and last-mile delivery to enhance the success and sustainability of school feeding programs.

Objective of the Study

General Objective

The primary objective of this study is to assess the influence of logistics management practices on the performance of last-mile school feeding programs in public primary schools in Isiolo County.

Specific Objectives

i. To evaluate the role of trans-logix on the performance of school feeding programs in Isiolo County
ii. To examine the influence of sustainability on the performance of school feeding programs in Isiolo County.

Theoretical Review

Resource-Based View (RBV) Theory

The Resource-Based View (RBV) theory highlights the importance of an organization's internal resources in achieving a competitive advantage and long-term sustainability. In the context of school feeding programs, logistical resources such as transportation networks, storage facilities, procurement systems, and skilled personnel play a crucial role in ensuring food is efficiently procured, transported, stored, and delivered. In Isiolo County, where poor infrastructure presents significant challenges, having durable vehicles, effective inventory management systems, and innovative last-mile delivery solutions—such as motorcycles or donkeys—enhances food distribution. Financial constraints also Influence procurement efficiency, making consistent food supply difficult due to reliance on government budgets and donor funding.

While logistical resources are critical, challenges such as inadequate road networks, limited storage capacity, and inefficient procurement processes hinder smooth food distribution. The sustainability of school feeding programs is also threatened by inconsistent donor funding and a lack of technological integration in inventory tracking and route optimization. To address these issues, investment in infrastructure, capacity building for supply chain professionals, and the adoption of technology—such as digital inventory tracking and GPS-based delivery monitoring—can enhance efficiency. Strengthening partnerships with private-sector players, NGOs, and local communities provides additional resources to support government efforts. By applying RBV theory, stakeholders can identify valuable, rare, inimitable, and non-substitutable logistical resources, ultimately improving food distribution efficiency and ensuring school children receive reliable, nutritious meals.

Supply Chain Management (SCM) Theory

Supply Chain Management (SCM) Theory provides a structured framework for managing the flow of goods, services, and information, ensuring efficiency, cost-effectiveness, and reliability. In school feeding programs, SCM Theory is essential for coordinating procurement, storage, transportation, and distribution, particularly in regions with logistical challenges like Isiolo County. Integrating supply chain processes enhances operational efficiency by improving procurement strategies, inventory management, and last-mile delivery systems. Given the poor road infrastructure and harsh climatic conditions in Isiolo, adopting an integrated approach ensures that food supplies reach schools on time, minimizing disruptions to meal programs. Additionally, stakeholder collaboration—including partnerships with government agencies, donors, NGOs, suppliers, and local farmers—plays a crucial role in enhancing supply chain effectiveness and promoting sustainability in school feeding initiatives. SCM Theory also emphasizes demand forecasting, inventory control, and risk management to ensure a steady food supply while mitigating external challenges such as extreme weather conditions and funding shortages. Accurate demand forecasting, supported by digital inventory management systems, helps prevent food shortages and wastage. Additionally, developing risk mitigation strategies—such as maintaining buffer stock, diversifying food suppliers, and using community-based distribution networks—enhances supply chain resilience. Cost efficiency remains a key concern, and optimizing procurement, transportation, and storage can help minimize costs while maintaining service quality. Performance measurement tools, such as Key Performance Indicators (KPIs), enable continuous improvement, ensuring that school feeding programs remain effective and sustainable in the long term.

Conceptual Framework

A conceptual framework is a structured, visual, or written representation that outlines the key concepts, variables, and their relationships within a study or project. The figure below shows the independent variables and the dependent variable

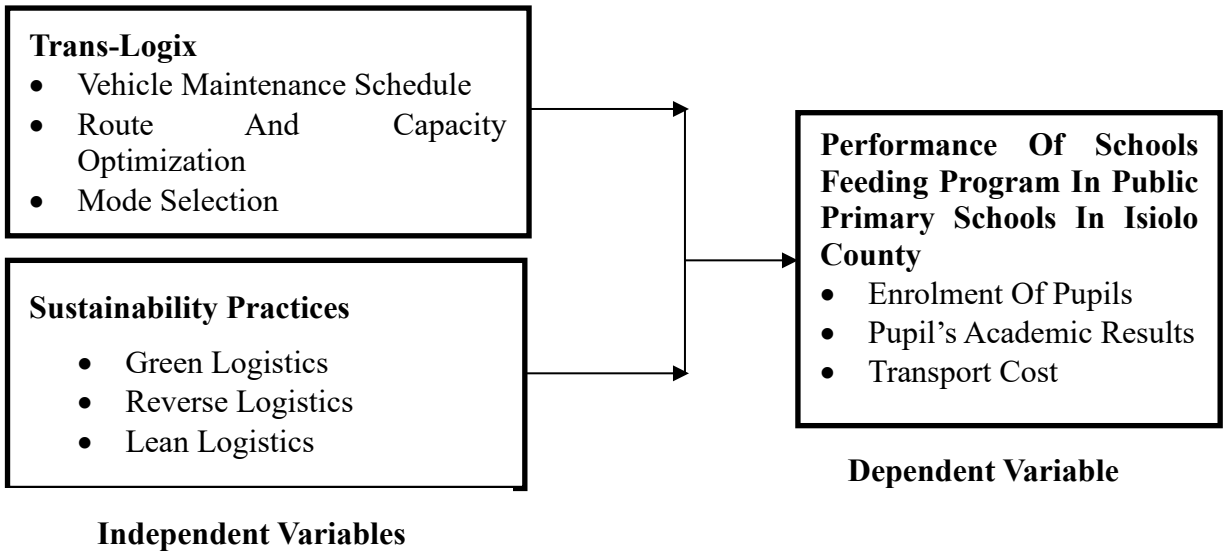

Figure 2. 1: Conceptual Framework

Trans-Logix

Trans-Logix, through its emphasis on vehicle maintenance practices, route and capacity optimization, and mode selection, plays a pivotal role in enhancing the performance of school feeding programs in public primary schools in Isiolo County. Kepaptsoglou, K. (2019) observes that Reliable vehicle maintenance practices ensure that transportation used for delivering food supplies is consistently operational, minimizing breakdowns and delays. This reliability directly Influences enrollment and retention of pupils, as parents are more likely to enroll and keep their children in schools where they are assured of consistent and timely meal provision. Route and capacity optimization further strengthen the feeding program by ensuring that food supplies are delivered efficiently and cost-effectively. By optimizing delivery routes, Trans-Logix reduces transportation time and ensures that meals arrive fresh and on schedule. This consistency in meal provision not only supports pupil retention but also contributes to improved academic results. When students receive regular, nutritious meals, their health, concentration, and cognitive abilities improve, enabling them to perform better in class and exams. Additionally, capacity optimization ensures that vehicles are used to their full potential, reducing waste and maximizing the quantity of food delivered, which further supports the program's reliability.

Mode selection, another critical component of Trans-Logix, ensures that the most appropriate and cost-effective transportation methods are used for delivering food supplies. By selecting the right mode of transport—whether by road, rail, or other mean Trans-Logix minimizes transport costs while maintaining the quality and timeliness of deliveries. Reduced transport costs free up resources that can be reinvested into the feeding program or other educational initiatives, further enhancing its Influence. Lower costs also make the program more sustainable, ensuring its long-term viability and continued positive effects on enrollment, retention, and academic performance. In summary, Trans-Logix's focus on vehicle maintenance, route optimization, and mode selection enhances the efficiency, reliability, and affordability of school feeding programs, thereby positively influencing enrollment, retention, academic outcomes, and transport cost management in public primary schools in Isiolo County.

Sustainability Practices

Sustainability practices, including green logistics, reverse logistics, and lean logistics, play a crucial role in enhancing the performance of school feeding programs in public primary schools

in Isiolo County. Green logistics focuses on reducing the environmental Influence of transportation and storage by using eco-friendly vehicles, optimizing routes to minimize fuel consumption, and adopting energy-efficient storage solutions. These practices not only lower carbon emissions but also reduce transport costs, making the feeding program more cost-effective and sustainable. Lower transport costs free up resources that can be reinvested into the program, ensuring its long-term viability. Muchenje, K. C. (2024) in his book on Green Logistics and Supply Chain Management. In Contemporary Solutions for Sustainable Transportation Practices, highlights that Green logistics, which emphasizes eco-friendly transportation and packaging, can reduce costs and ensure a steady supply of food while minimizing environmental degradation. Lean logistics, by eliminating inefficiencies in procurement and delivery, ensures that food supplies are delivered timely and in optimal condition, preventing disruptions that could affect pupil attendance and nutrition.

Reverse logistics, which involves the efficient management of returns, recycling, and waste reduction, ensures that unused or excess food is redistributed or repurposed rather than wasted. This practice minimizes food waste and maximizes resource utilization, ensuring that more students benefit from the program. Spirito, C. (2024). Lean logistics, which focuses on eliminating waste and streamlining processes, ensures that the feeding program operates efficiently and cost-effectively. By optimizing inventory management, reducing unnecessary transportation, and improving coordination, lean logistics minimizes delays and ensures timely delivery of meals. This reliability directly Influences enrollment and retention, as parents and students are more likely to trust and rely on a program that consistently delivers high-quality meals. Furthermore, the cost savings achieved through lean logistics can be used to enhance the program's quality or expand its reach, indirectly supporting better academic outcomes for pupils.

Logistics Management in School Feeding Programs

Logistics management involves the planning, implementation, and control of the efficient flow and storage of goods, services, and related information from the point of origin to the point of consumption. In the context of school feeding programs, logistics management encompasses procurement, transportation, storage, distribution, and monitoring of food supplies. Effective procurement practices ensure that quality food is sourced at reasonable prices, while poor procurement practices, such as delays and corruption, can undermine the effectiveness of SFPs. According to Gelli, A., et al. (2016), he notes that timely delivery of food to schools is critical, and inadequate transportation infrastructure, as seen in rural areas of sub-Saharan Africa, often leads to delays and food spoilage. Proper storage facilities are necessary to prevent food losses due to pests, contamination, or poor handling. Efficient distribution systems ensure that food reaches the intended beneficiaries, and inefficiencies in distribution can lead to food shortages or unequal access. Regular monitoring and evaluation are essential to identify and address logistical challenges, with the WFP emphasizing the importance of real-time data collection and analysis to improve program performance.

The performance of school feeding programs is often measured by their ability to improve enrollment, attendance, retention, and academic performance, as well as their Influence on child nutrition. Studies have shown that well-managed SFPs can significantly increase school enrollment and attendance. For example, a study in India found that the Mid-Day Meal Program led to a 15% increase in enrollment. Effective logistics management ensures that children receive regular meals, which can improve concentration and academic performance. A study in Kenya found that schools with well-managed SFPs had higher retention rates and better academic outcomes. Proper logistics management also ensures that children receive nutritious meals, which can reduce malnutrition. A WFP study in Malawi found that school feeding programs significantly improved the nutritional status of children.

RESEARCH METHODOLOGY

Research Design

This study utilized a descriptive research design to assess the existing procurement and logistics processes and their Influence on the efficiency of last-mile delivery. It also explored the role of stakeholder collaboration in improving these processes. The descriptive design allows for a detailed examination of the current state of school feeding programs in Isiolo County, including the challenges faced and the potential solutions that can be implemented.

Target Population

The study was conducted in Isiolo County, Kenya, focusing on schools that are part of the government-supported school feeding programs. The target population included 111 public primary schools (according to ministry of education report 2024). Head teachers of public primary schools and Head of school meals program in the schools

Table 1: Target Population

Category	No. of schools	No of head teachers
Head teachers	111	1
Head of school meals program	111	1
Total	**222**	

Sample Size and Sampling Technique (Ministry of Education Report 2024)

A combination of purposive and random sampling techniques was used to select participants for the study: The sample size included: 111 head teachers of primary schools in Isiolo county and 111 Head of school meals program in the schools

Yamane's Sample Size Formula

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

Where n= the required sample size

N = is the Target Population (222)

e = accuracy level required. Standard error = 5%

Sample calculation

$$n=\frac{222}{1+(222-1)0.05^2}$$

$$n=\frac{222}{1+(221)0.0025}$$

$$n=\frac{222}{1+0.5525}$$

n=143 respondents

The study sample size was 143 respondents which represents 75% of the entire population. Stratified random sampling was applied to get the respondents. The study then used simple random sampling to select respondents from each stratum. In simple random sampling, every respondent has an equal chance of participating in the study.

Data Collection Instruments

There are several ways of collecting data which differ considerably in terms of money costs, time and other resources at the disposal of the researcher (Orodho, 2018). The choice of data collection instrument is often very crucial to the success of a research and thus when

determining an appropriate data collection method, one has to take into account the complexity of the topic, response rate, time and the targeted population (Mwangi, 2019). Different tools are used to collect different types of data. There is primary data that is collected directly from the respondents; it is information that has never been collected while there is secondary data collection tools that are used to collect secondary data.

This research used a questionnaire to collect primary data. According to Patton *et. al* 2016, a questionnaire is appropriate in gathering data and measuring it against a particular point of view. It provides a standardized tool for data collection. The researcher obtained research permit from relevant authorities required for data collection. Structured and open questions were used to collect primary data from the field. The questionnaires were pilot tested to ascertain the extent to which the instrument is correct and to eliminate ambiguous questions, and improve on validity and reliability

Pilot Study

According to Bashir, (2018), validity refers to the extent to which a test measures what it is supposed to measure and the extent to its truthfulness, accuracy, authenticity, genuineness, or soundness, whether the means of measurement are accurate and whether they are actually measuring what they are intended to measure. The pilot study was carried out on 10 respondents who are sufficient based on Glesne (2019) who stated that 10% of the population is adequate to constitute the pilot test size.

Data Analysis and Presentation

Qualitative data from interviews and focus group discussions were analyzed using thematic analysis. Thematic analysis helped to understand the underlying factors affecting last-mile delivery in school feeding programs. Content analysis was applied to documents, reports, and procurement records to extract relevant information on procurement and logistics practices.

Survey data was analyzed using descriptive statistics such as means, frequencies, and percentages to summarize the key findings on delivery times, costs, delays, and procurement processes. This analysis provided an overview of logistical performance and procurement efficiency. Correlation analysis was conducted to explore relationships between trans-logix and sustainability, and performance of school feeding programs in Isiolo County.

Descriptive statistics was used to analyze the data in frequency distributions and percentages which were presented in tables and figures. Discussions and presentations of the analyzed data were done in tables of frequency distribution, percentages, bar graphs and pie charts. Measures of dispersion were used to provide information about the spread of the scores in the distribution. The study also adopted multiple regression analysis to test the relationships between the variables.

In the study, a statistical model was developed from the conceptual framework as follows: the dependent variable (DV) which in this study is performance of school feeding programs in Isiolo County take the variable [Y], and the coefficients of the independent variables (IV) denoted by X_1, X_2 were used to show the relationship of the independent variables. Statistically, analysis was carried out using the models.

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

Descriptive Statistics

Trans-Logix and Program Performance

The first specific objective of the study was to evaluate the role of trans-logix on the performance of school feeding programs in Isiolo County. The respondents were requested to indicate their level of agreement on trans-logix and performance of school feeding programs

in Isiolo County. The results were as shown in Table 2. From the results, the respondents agreed that the organization regularly conducts preventive maintenance on vehicles to minimize breakdowns (M=3.983, SD= 0.765). In addition, the respondents agreed that vehicle performance is monitored consistently to identify any maintenance needs before they become urgent (M=3.806, SD=0.845). Further, the respondents agreed that the organization uses technology to track and schedule maintenance activities for trans-logix vehicles (M=3.785, SD=0.688). The respondents also agreed that the organization regularly conducts preventive maintenance on vehicles to minimize breakdowns (M=3.718, SD=0.788). In addition, the respondents agreed that the organization uses advanced routing software to determine the most efficient routes for deliveries (M=3.698, SD=0.686). The respondents agreed that real-time data is utilized to adjust routes based on traffic conditions or weather changes (M=3.662, SD=0.617). Further, the respondents agreed that the capacity of vehicles is regularly evaluated to ensure optimal load distribution and reduce empty runs (M=3.652, SD=0.754). The respondents also agreed that the organization assesses the most cost-effective and time-efficient transportation mode for each delivery (M=3.585, SD=0.708). In addition, the respondents agreed that Mode selection decisions consider both environmental Influence and the urgency of the shipment (M=3.568, SD=0.752). The respondents agreed that the organization evaluates the available modes of transport regularly to determine if alternatives provide greater efficiency (M=3.533, SD=0.730).

Table 2: Trans-Logix and Program Performance

	Mean	**Std. Dev.**
The organization regularly conducts preventive maintenance on vehicles to minimize breakdowns.	3.983	0.765
Vehicle performance is monitored consistently to identify any maintenance needs before they become urgent.	3.806	0.845
The organization uses technology to track and schedule maintenance activities for trans-logix vehicles.	3.785	0.688
The organization regularly conducts preventive maintenance on vehicles to minimize breakdowns.	3.718	0.788
The organization uses advanced routing software to determine the most efficient routes for deliveries.	3.698	0.686
Real-time data is utilized to adjust routes based on traffic conditions or weather changes.	3.662	0.617
The capacity of vehicles is regularly evaluated to ensure optimal load distribution and reduce empty runs.	3.652	0.754
The organization assesses the most cost-effective and time-efficient transportation mode for each delivery.	3.585	0.708
Mode selection decisions consider both environmental Influence and the urgency of the shipment.	3.568	0.752
The organization evaluates the available modes of transport regularly to determine if alternatives provide greater efficiency.	3.533	0.730
Aggregate	**3.699**	**0.733**

Sustainability Practices and Program Performance

The second specific objective of the study was to examine the influence of sustainability on the performance of school feeding programs in Isiolo County. The respondents were requested to indicate their level of agreement on various statements relating to sustainability and performance of school feeding programs in Isiolo County. The results were as presented in Table 3.

From the results, the respondents agreed that their organization implements green logistics strategies to minimize environmental Influence (M=3.955, SD= 0.895). In addition, the respondents agreed that they actively work to reduce carbon emissions through fuel-efficient transportation and logistics practices (M=3.946, SD=0.886). Further, the respondents agreed that energy-efficient vehicles and equipment are used to promote sustainable logistics operations (M=3.907, SD= 0.725). The respondents also agreed that their organization has a well-defined reverse logistics system for handling product returns, recycling, and disposal (M=3.902, SD= 0.881). The respondents agreed that they encourage waste reduction and material recovery through effective reverse logistics processes (M=3.898, SD=0.683). In addition, the respondents agreed that customers and suppliers are engaged in sustainable packaging and waste minimization initiatives (M=3.884, SD=0.796). Further, the respondents agreed that Lean logistics principles, such as reducing excess inventory and streamlining operations, are applied in our supply chain (M=3.850, SD= 0.677). The respondents also agreed that Continuous process improvement is prioritized to minimize waste and inefficiencies in logistics operations (M=3.793, SD= 0.768). The respondents agreed that Technology and automation are leveraged to improve resource efficiency and sustainability (M=3.775, SD=0.639). In addition, the respondents agreed that their organization measures and tracks sustainability performance indicators to ensure long-term environmental responsibility (M=3.753, SD=0.712).

Table 3: Sustainability Practices and Program Performance

	Mean	**Std. Deviation**
Our organization implements green logistics strategies to minimize environmental Influence.	3.955	0.895
We actively work to reduce carbon emissions through fuel-efficient transportation and logistics practices.	3.946	0.886
Energy-efficient vehicles and equipment are used to promote sustainable logistics operations.	3.907	0.725
Our organization has a well-defined reverse logistics system for handling product returns, recycling, and disposal.	3.902	0.881
We encourage waste reduction and material recovery through effective reverse logistics processes.	3.898	0.683
Customers and suppliers are engaged in sustainable packaging and waste minimization initiatives.	3.884	0.796
Lean logistics principles, such as reducing excess inventory and streamlining operations, are applied in our supply chain.	3.850	0.677
Continuous process improvement is prioritized to minimize waste and inefficiencies in logistics operations.	3.793	0.768
Technology and automation are leveraged to improve resource efficiency and sustainability.	3.775	0.639
Our organization measures and tracks sustainability performance indicators to ensure long-term environmental responsibility.	3.753	0.712
Aggregate	**3.866**	**0.766**

Inferential Statistics

Inferential statistics in the current study focused on correlation and regression analysis. Correlation analysis was used to determine the strength of the relationship while regression analysis was used to determine the relationship between dependent variable (performance of school feeding programs in Isiolo County) and independent variables (trans-logix, and sustainability).

Correlation Analysis

The present study used Pearson correlation analysis to determine the strength of association between independent variables (trans-logix, and sustainability) and the dependent variable (performance of school feeding programs in Isiolo County).

Table 4: Correlation Coefficients

		Performance	Trans-Logix	Sustainability
Performance of School Feeding Programs	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	124		
Trans-Logix	Pearson Correlation	.846**	1	
	Sig. (2-tailed)	.001		
	N	124	124	
Sustainability	Pearson Correlation	.869**	.179	1
	Sig. (2-tailed)	.000	.071	
	N	124	124	124

From the results, there is a very strong relationship between trans-logix and performance of school feeding programs in Isiolo County (r = 0.846, p value =0.001). The relationship was significant since the p value 0.001 was less than 0.05 (significant level). The findings conform to the findings of Kepaptsoglou (2019) that there is a very strong relationship between trans-logix and project performance.

The results also revealed that there was a very strong relationship between sustainability and performance of school feeding programs in Isiolo County (r = 0.869, p value =0.000). The relationship was significant since the p value 0.000 was less than 0.05 (significant level). The findings are in line with the results of Muchenje (2024) who revealed that there is a very strong relationship between sustainability and project performance.

Regression Analysis

Multivariate regression analysis was used to assess the relationship between independent variables (trans-logix, and sustainability) and the dependent variable (performance of school feeding programs in Isiolo County).

Table 5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.872	.760	.761	.10129

a. Predictors: (Constant), trans-logix, and sustainability

The model summary was used to explain the variation in the dependent variable that could be explained by the independent variables. The r-squared for the relationship between the independent variables and the dependent variable was 0.760. This implied that 76% of the variation in the dependent variable (performance of school feeding programs in Isiolo County) could be explained by independent variables (trans-logix, and sustainability).

Table 6: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.027	2	6.014	111.37	.000[b]
	Residual	6.552	121	.054		
	Total	18.579	123			

a. Dependent Variable: performance of school feeding programs in Isiolo County
b. Predictors: (Constant), trans-logix, and sustainability

The ANOVA was used to determine whether the model was a good fit for the data. F calculated was 111.37 while the F critical was 3.071. The p value was 0.000. Since the F-calculated was greater than the F-critical and the p value 0.000 was less than 0.05, the model was considered as a good fit for the data. Therefore, the model can be used to predict the influence of trans-logix, and sustainability on performance of school feeding programs in Isiolo County.

Table 7: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	**(Constant)**	0.330	0.084		3.929	0.002
	Trans-Logix	0.376	0.095	0.375	3.958	0.002
	Sustainability	0.387	0.097	0.386	3.990	0.000

a Dependent Variable: performance of school feeding programs in Isiolo County

The regression model was as follows:

$$\mathbf{Y = 0.330 + 0.376X_1 + 0.387X_2 + \varepsilon}$$

According to the results, trans-logix has significant effect on performance of school feeding programs in Isiolo County (β1=0.376, p value= 0.002). The relationship was considered significant since the p value 0.002 was less than the significant level of 0.05. The findings conform to the findings of Kepaptsoglou (2019) that there is a very strong relationship between trans-logix and project performance.

In addition, the results revealed that sustainability has significant effect on performance of school feeding programs in Isiolo County (β1=0.387, p value= 0.000). The relationship was considered significant since the p value 0.000 was less than the significant level of 0.05. The findings are in line with the results of Muchenje (2024) who revealed that there is a very strong relationship between sustainability and project performance.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study concludes that trans-logix has a positive and significant effect on performance of school feeding programs in Isiolo County. Findings revealed that, vehicle maintenance schedule, route and capacity optimization and mode selection influences performance of school feeding programs in Isiolo County.

The study also concludes that sustainability has a positive and significant effect on the performance of school feeding programs in Isiolo County. Findings revealed that green

logistics, reverse logistics and lean logistics influences performance of school feeding programs in Isiolo County.

Recommendations

This study recommends that the management of school feeding programs in Isiolo County should fully integrate and utilize the Trans-Logix system for logistics and supply chain operations. Trans-Logix has demonstrated a positive and significant effect on program performance by enhancing the efficiency, transparency, and coordination of food deliveries. By streamlining transport routes, monitoring deliveries in real-time, and reducing delays or misallocations, the system ensures that food reaches schools consistently and in good condition.

The study also study recommends that the management of school feeding programs in Isiolo County should embed sustainability practices into all aspects of program implementation. By focusing on sustainability, the program not only becomes more resilient and cost-effective but also strengthens food security and supports local economic development, ultimately improving the well-being and educational outcomes of the learners.

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