International Journal of
Supply Chain and Logistics
(IJSCL)

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CARI Journals

International Journal of Supply Chain and Logistics
ISSN 2520-3983 (Online)
Vol. 10, Issue No. 6, pp 22 - 37, 2026
www.carijournals.org

Influence of Logistics Management on Export Performance of Avocado Fruit in Meru County, Kenya

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Accepted: 4th July, 2026, Received in Revised Form: 24th July, 2026, Published: 9th Aug, 2026

Abstract

Purpose: This research explored the influence of logistics management on the export performance of avocado fruit in Meru County, Kenya.

Methodology: The research adopted a descriptive survey design for this work. Data were collected from 18 cooperative leaders and 640 farmers belonging to two major avocado cooperatives. From this pool, 326 farmers were selected through stratified random sampling, while cooperative leaders were selected purposively. The data collection relied on questionnaires and interview guides, and their reliability was verified through pilot testing. For quantitative analysis, SPSS version 26 helped run descriptive statistics, correlation tests, and multiple regression. Qualitative data were handled through thematic analysis.

Findings: The evidence shows that logistics management exerts a significant positive influence on export performance. Nonetheless, ongoing logistical shortcomings, especially poor infrastructure and insufficient cold storage, continue to restrict export volumes, compromise fruit quality, and limit market penetration.

Unique Contribution to Theory, Policy and Practice: This study provides the first empirical evidence from Meru County quantifying the relationship between logistics management and export performance ($\beta = 0.322$, $p < 0.001$), demonstrating that while cooperatives recognize logistics as critical, current practices, particularly in cold chain management and digital integration, remain severely underdeveloped. Unlike previous studies focused on large-scale exporters, this research reveals that smallholder cooperatives face distinctive constraints requiring collective solutions rather than individual investments.

Keywords: *Logistics Management, Export Performance, Avocado Value Chain, Agricultural Cooperatives, Supply Chain Optimization, Meru County*

JEL Codes: *Q13, Q17, F14*

1.0 INTRODUCTION

1.1 Background of the Study

The global avocado market has grown over the past decade, driven by rising consumer awareness of the fruit's nutritional benefits and increasing demand in major import markets including the European Union, the United States, and the Middle East. According to the Food and Agriculture Organization (2024), worldwide avocado production stood at 8 million metric tonnes in 2022. Kenya features among the top ten avocado-exporting nations globally. In 2024, the country exported around 129,706 metric tonnes of fresh and dried avocados, earning US$160.8 million (WITS, 2024).

Kenya's avocado industry benefits from favorable climatic conditions. The crop grows well at altitudes between 1,500 and 2,200 meters. Meru County, located on Mount Kenya's eastern slopes, has developed into a significant production area, contributing notably to national export figures. Small-scale farmers in the region have increasingly pursued export opportunities, attracted by higher prices and reliable demand from overseas buyers (Muita et al., 2025).

Nevertheless, the avocado sector in Meru County confronts considerable difficulties. Inefficiencies running through the supply chain, particularly within logistics, hold back the industry's advancement. Poor transport infrastructure, limited cold storage capacity, inadequate post-harvest handling methods, and scant use of digital technologies have all damaged Kenyan avocados' quality and international competitiveness. These logistical weaknesses lead to post-harvest losses around 30–40%, reduced exportable quantities, and trouble accessing premium markets due to quality concerns (Kilelu et al., 2024).

1.2 Statement of the Problem

The avocado subsector signifies a substantial opportunity for economic development in Meru County, contributing to household incomes, employment, and foreign exchange earnings. However, the sector's potential remains unrealized due to persistent challenges in supply chain management, particularly logistics operations. Despite increasing international demand for Kenyan avocados, exporters from Meru County face substantial difficulties in meeting quality standards, delivery timelines, and volume requirements of international buyers.

The logistical challenges confronting avocado cooperatives in Meru County are multifaceted. Transportation costs remain prohibitively high, eroding farmer margins and reducing competitiveness (Karing'u et al., 2021). Road infrastructure, particularly feeder roads connecting farms to collection centers and major roads, is often inadequate, leading to delays, increased vehicle maintenance costs, and damage to produce during transit (Muita et al., 2025). Cold chain facilities are absent, limiting the ability to maintain the quality of products from harvest to export destination.

These logistics challenges translate directly into reduced export performance. Post-harvest losses, estimated at 30-40% of production, diminish export volumes and waste valuable resources (Kilelu et al., 2024). Quality failures due to poor handling and temperature control lead to product rejections or price discounts in export markets (Shivachi et al., 2023). Inconsistent supply resulting from transport delays erodes buyer confidence and undermines long-term relationships with international partners (Gwaltu, 2025).

Despite documented challenges, empirical research examining how specific logistics dimensions-transportation costs, road infrastructure, transport efficiency, and ICT adoption directly shape export performance in Meru County's smallholder avocado cooperatives remains limited. Previous studies have addressed transaction costs (Karing'u et al., 2021) or general logistics practices (Githinji & Wachiuri, 2023), yet none have quantified the relationship between these distinct logistics components and export volumes, quality outcomes, and market reliability within this specific context. This gap in evidence leaves policymakers and cooperative leaders without the empirical grounding needed to target logistics interventions effectively. The present study addresses this deficiency by examining the influence of logistics management on avocado export performance in Meru County.

1.3 Objective of the Study

To examine the influence of logistics management on the export performance of avocado fruit in Meru County, Kenya

1.4 Research Hypothesis

H_{01}: Logistics management has no significant influence on the export performance of avocado fruit in Meru County, Kenya

2.0 LITERATURE REVIEW

2.1 Theoretical Review

This study is anchored in the Resource-Based View (RBV) theory, which offers an essential framework for comprehending how logistics management capabilities contribute to export performance. The RBV, which was first articulated by Wernerfelt (1984) and later developed by Barney (1991), states that companies with valuable, rare, unique, and non-substitutable resources and capabilities (VRIN) have a sustainable competitive advantage. Logistics management capabilities such as transportation infrastructure, cold chain facilities, warehousing systems, and information technology are resources that can create a competitive advantage in an export market within the context of agricultural cooperatives (Haque et al., 2025).

The RBV theory is relevant to this study in the following ways: Agricultural value chain logistics can be difficult to replicate because of the high costs involved in investments in physical infrastructure, technology, and organizational capacity. As found by Lubis (2022), developing

superior logistics capabilities can make cooperatives stand out from other cooperatives, get premium markets, and get better prices. Additionally, logistics capacities constitute valuable resources that support the cooperative's ability to deliver quality, timely deliveries, and reliable supply to buyers, an important point for success in international trade (Reklitis et al., 2021). The logistics capability in the smallholder setting is limited, as most cooperatives have little logistics infrastructure and capacity, as noted by Githinji and Wachiuri (2023).

2.2 Empirical Literature Review

A growing body of empirical evidence has explored the association between logistics management and agricultural export performance in some developing countries. Karing'u et al. (2021) investigated costs incurred in transactions and participation in avocado export marketing in Murang'a County, Kenya. Their research revealed that inadequate infrastructure and high transport expenses represented major barriers to farmers' export competitiveness, adversely affecting profit margins. Road conditions, market distance, and transport availability all posed significant constraints. These observations resonate with what we found in Meru County.

Shikur (2022) used panel data to show that transport infrastructure plays a critical role in agricultural export performance. Inefficient transport systems impeded market access and increased transaction costs. The study advised investing in transport networks to strengthen agricultural export competitiveness. Debebe et al. (2023) investigated efficiency in logistics and export competitiveness of Ethiopian horticultural products. Their findings indicated that improvements in logistics efficiency correlated with larger export volumes. Cold chain management and transport efficiency emerged as the logistics dimensions with the strongest influence on export performance.

Githinji and Wachiuri (2023) explored logistics practices among avocado exporters operating in Central Kenya. Their results demonstrated significant links between transportation management, warehousing, inventory management, and export performance. Reducing transport costs and guaranteeing on-time delivery were identified as the most critical logistics factors.

2.3 Conceptual Framework

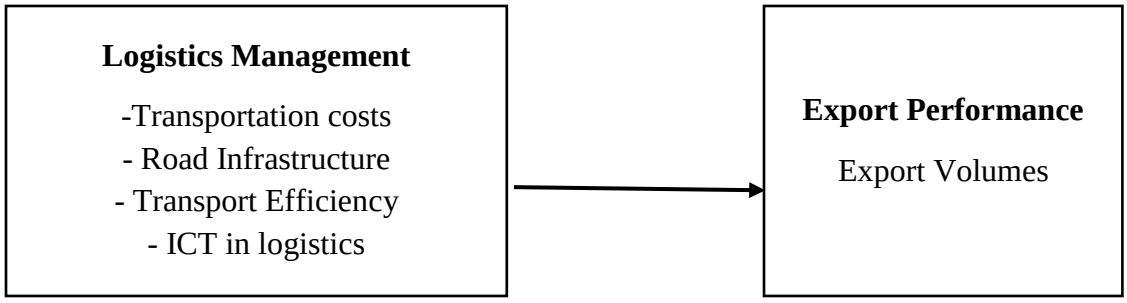

Figure 2: Conceptual Framework

3.0 METHODOLOGY

3.1 Research Design

The study used a descriptive survey research design. This design suited the objective of examining the connection between export performance and logistics management. The descriptive survey approach enables the quantitative data collection from a large sample, facilitating analysis of statistical data and generalization of findings (Creswell, 2018). This design allowed for the examination of multiple logistics dimensions and their relationships with export performance through the use of questionnaires, which were administered to a representative sample of avocado farmers and cooperative leaders.

3.2 Target Population

The study's targeted population comprised 18 cooperative leaders and 640 farmers affiliated with two avocado cooperatives in Meru County: Mt. Kenya Avocado Cooperative and Abothuguchi Avocado Cooperative. These cooperatives were purposively selected because they represent active avocado cooperatives in the county, with established export market linkages.

Table 1: Target Population

Avocado Cooperative	Farmers	Cooperative Leaders
Mt Kenya	140	9
Abothuguchi	500	9
Total	**640**	**18**

The farmers' sample size was determined using the Taro Yamane formula. Stratified random sampling was applied to farmers within each cooperative, ensuring representation across different farm sizes and experience levels. This approach enhanced the sample representativeness and reduced sampling bias. The sample size is presented in Table 2.

Table 2: Sample size

Avocado Cooperative	Sample Size (farmers)	Sample Size (Cooperative Leaders)
Mt Kenya	104	9
Abothuguchi	222	9
Total	**326**	**18**

Questionnaires were used to gather the data from farmers, and interview guides were used for the cooperative leaders. The questionnaire included four parts: demographic information, logistics management practices, and export performance, with closed-ended items (on a five-point Likert

scale) and open-ended items (for qualitative information). The interview guide was used to delve further into the logistics issues, cooperative approach, and export experiences.

After obtaining ethical clearance and permission from the institution, the collection of data was carried out for three weeks. The researcher visited the two cooperatives to explain the purpose of this study and obtain their consent to serve as respondents. Questionnaires were given to farmers during their cooperative meetings, with the researcher explaining and clarifying as necessary. The cooperative leaders were interviewed one by one at convenient places. The quantitative data were analyzed using SPSS version 26. The data were analyzed using descriptive statistics such as percentages, frequencies, standard deviations, and means, which were used to summarize the data and describe logistics management practices and export performance.

4.0 FINDINGS AND DISCUSSIONS

4.1 Pilot Test Results

4.1.1 Reliability of Research Instruments

The reliability was assessed using Cronbach's Alpha (α), a widely accepted method for assessing internal consistency in social science research.

Table 3: Reliability Analysis

Construct	No. of Items	Cronbach's Alpha	Interpretation
Logistics Management	6	0.816	Good

The reliability analysis yielded Cronbach's Alpha coefficients of 0.856 for logistics management (6 items). The coefficients exceeded the acceptable threshold of 0.70, confirming the reliability of the research instruments (Taber, 2018).

4.1.2 Validity of Research Instruments

Validity in this study was ensured through multiple approaches: face validity and construct validity. Face validity was established through expert evaluation by three specialists in agricultural supply chains, rural cooperatives, and research methodology who reviewed the questionnaire for clarity, contextual appropriateness, and relevance. Their feedback confirmed that the instrument effectively measured constructs related to supply chain optimization and export performance. The factor loading results are shown in Table 4.

Table 4: Factor Loading

Item Code	Factor Loading	Decision
Logistics Management	0.812	Retained

Factor loadings from exploratory factor analysis (EFA) were used to evaluate construct validity and determine the underlying structure of the variables. The item exhibited factor loadings exceeding the recommended minimum threshold of 0.50, confirming strong convergent validity.

4.1 Response Rate

The study distributed a total of 326 questionnaires to farmers affiliated with Mt. Kenya Avocado Cooperative and Abothuguchi Avocado Cooperative. Of these, 290 were duly completed and returned, yielding an overall response rate of 88.96%. This response rate exceeded the widely accepted threshold of 70% for survey research, indicating a high level of participation and engagement from cooperative members. The response rate is presented in Table 5.

Table 5: Response Rate

Category	Sample size (farmers)	Respondents	Response rate %
Mt Kenya	104	94	90.38%
Abothuguchi	222	196	88.29%
Total	**326**	**290**	**88.96%**

Additionally, 13 out of the 18 targeted cooperative leaders were successfully interviewed, resulting in a response rate of 72.2%. This participation level reflected the effectiveness of prior coordination and the willingness of cooperative leaders to support the research. The strong response was facilitated by flexible scheduling, clear communication, and collaboration with local cooperative management structures.

4.2 Descriptive Analysis of Logistics Management

This section aimed to assess the influence of Logistics Management and its contribution to export performance. The respondents' opinions are illustrated in Table 6.

Table 6: Descriptive Statistics for Logistics Management

Statements	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean	STD
Affordable transportation costs	157 (54.1%)	128 (44.1%)	2 (0.8%)	3 (1%)	0	1.49	0.572
Efficient transport to export points	130 (44.8%)	146 (50.3%)	14 (4.9%)	0	0	1.60	0.581
Adequate infrastructure	153 (52.8%)	133 (45.9%)	4 (1.3%)	0	0	1.49	0.528
Digital tools improve transport	132 (45.5%)	148 (51.0%)	10 (3.4%)	0	0	1.58	0.560
Minimum spoilage/damage	152 (52.4%)	137 (47.2%)	1 (0.3%)	0	0	1.48	0.507

The descriptive analysis of logistics management revealed uniformly low mean scores across all five indicators, ranging from 1.48 to 1.60 on a five-point Likert scale. The statement regarding affordable transportation costs recorded a mean of 1.49, with 54.1% of respondents strongly disagreeing and 44.1% disagreeing that transportation costs were affordable. This finding reflects the substantial financial burden that transportation imposes on avocado cooperatives, attributable to the perishable nature of avocados necessitating timely transport, reliance on hired vehicles due to limited cooperative-owned transport, and distance from production areas to export points. These findings concur with Karing'u et al. (2021), who observed that high costs of transportation affect farmers' participation in agricultural markets due to growing expenses and reduced profit margins.

Efficient transport to export points yielded a mean of 1.60, with 44.8% strongly disagreeing and 50.3% disagreeing that transport systems are currently effective. This suggests that many cooperatives face substantial challenges in accessing export points, likely due to poor road networks, lack of reliable transport services, or delays in post-harvest movement. According to Shikur (2022), efficient transport systems and infrastructure are essential to agricultural export performance, with inefficiency in the transport system negatively affecting agricultural export performance by limiting market access.

Adequate infrastructure recorded a mean of 1.49, with 52.8% strongly disagreeing and 45.9% disagreeing. Respondents identified infrastructure constraints, including inadequate vehicles, poor roads, insufficient crates for packaging, lack of cold chain facilities, and inaccessible roads during rainy seasons. The sentiment on digital tools improving transport recorded a mean of 1.58, with 45.5% strongly disagreeing and 51.0% disagreeing. This reveals limited progress in leveraging digital technologies such as route optimization software, GPS tracking, and mobile platforms to enhance transport efficiency.

The statement concerning minimum spoilage and damage recorded the lowest mean of 1.48, with 52.4% strongly disagreeing and 47.2% disagreeing that spoilage and damage were minimized. This indicates that post-harvest losses remain a significant challenge, potentially due to inadequate cold chain management, poor harvesting practices, rough handling during transport, or delays in delivery to collection points. Das et al. (2025), emphasized the importance of cold chain logistics and last-mile delivery systems in minimizing post-harvest losses of perishable commodities like avocados.

Interviews with cooperative leaders corroborated the quantitative findings. Most leaders acknowledged that while transportation systems are in place, they are functional but not fully efficient. Leaders highlighted the reliance on hired transport providers, which afforded limited control over timing and conditions, particularly problematic during peak harvest periods. These insights align with findings from Muita et al. (2025), who documented that many cooperatives lacked their own transport systems and depended heavily on third-party transporters.

The absence of refrigerated vehicles was repeatedly mentioned, with leaders noting that fruits often arrived at exporters already bruised or spoiled due to insufficient crates for packaging during transport. This is supported by the Agriculture and Food Authority (2023), which has warned that the use of unrefrigerated transport compromises avocado quality and jeopardizes Kenya's compliance with international export standards. Another key issue was the lack of storage facilities within cooperatives. Ten of thirteen leaders confirmed their cooperatives lack proper warehousing. Most said they harvest and dispatch fruit on the same day to exporters, with no capacity for temporary storage. This finding aligns with sector-wide calls for cooperative-level cold storage, which could substantially reduce post-harvest losses estimated at 30–40% caused by poor storage (Agrifarms, 2025; Kilelu et al., 2024).

Regarding market access, most cooperative leaders reported limited direct involvement in export logistics, relying instead on contracted exporters. This indirect distribution model means limited value chain control: cooperatives supply produce but have little say over branding, pricing, or export transactions. Research by Amare et al. (2019) shows that over 70% of Kenyan avocados are marketed through intermediaries before reaching international buyers, a pattern consistent with the Meru County context.

4.3 Diagnostic Tests

The study employed the following diagnostic tests: Linearity, Normality

4.3.1 Normality Test

To determine whether the residuals from the regression model followed a normal distribution, the study applied both the Kolmogorov–Smirnov and Shapiro–Wilk tests. The normality criterion was set at a significance level greater than 0.05. The results from these tests are summarized in Table 7.

Table 7: Normality Test Results

Variable	Kolmogorov-Smirnov		Shapiro-Wilk	
	Statistic	Sig.	Statistic	Sig.
Logistics Management	0.055	0.172	0.979	0.105
Export Performance	0.049	0.185	0.983	0.098

The normality test results, presented in Table 7, confirm that both logistics management and export performance follow normal distributions. For logistics management, the Kolmogorov-Smirnov statistic was 0.055 ($p = 0.172$), and the Shapiro-Wilk statistic was 0.979 ($p = 0.105$). For export

performance, the corresponding values were 0.049 (p = 0.185) and 0.983 (p = 0.098). Since all significance values exceeded the 0.05 threshold, the normality assumption is satisfied for both variables, justifying the use of parametric statistical techniques in subsequent analyses.

4.3.2 Multi-Collinearity

Multi-collinearity was assessed using Tolerance values and the Variance Inflation Factor (VIF) as indicated in Table 8.

Table 8: Multi-Collinearity Test Results

Variables	Tolerance	VIF	Interpretation
Logistics Management	0.464	2.154	No Multicollinearity

Logistics management had a Tolerance value of 0.464, well above the 0.10 threshold. This means approximately 46.4% of its variance is unique and not shared with other predictors, suggesting independent explanatory power. The VIF value of 2.154 falls well below both the conservative threshold of 5 and the more liberal threshold of 10, confirming that multi-collinearity does not threaten the stability of regression estimates.

4.3.3 Autocorrelation Tests

The autocorrelation assessment, presented in Table 9, evaluated whether the residuals from the regression model examining the relationship between logistics management and export performance were independent. The analysis employed the Durbin-Watson statistic to detect the presence of autocorrelation in the error terms.

Table 9: Autocorrelation Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.432	0.187	0.184	0.412	1.890

The results show a moderately positive correlation (R = 0.432) between logistics management and export performance. The model explains approximately 19% of the variance in export performance (R^2 = 0.187), meaning that other factors account for the remaining 81%. Importantly, the Durbin-Watson value of 1.890 confirms that the statistical assumptions for regression analysis are met, as there is no autocorrelation in the residuals. This ensures that the findings are reliable and that the relationship observed between logistics management and export performance is not biased by correlated errors.

4.4 Inferential Statistics

The inferential statistical analysis used to test the theories developed in Chapter One on the influence of logistics management practices on avocado fruit export performance in Meru County, Kenya, is presented in this section. This study employed the following methodologies for inferential analysis: correlational analysis, multiple regression, and hypothesis testing.

4.4.1 Correlational Analysis

Pearson Product-Moment Correlation was conducted to examine the bivariate relationship between logistics management and export performance, as indicated in Table

Table 10: Pearson Correlation Matrix

		Logistics Management	Export Performance
LM	Pearson Correlation	1	0.432
	Sig. (2-tailed)		.000
	N	290	290
EP	Pearson Correlation	0.432	1
	Sig. (2-tailed)	.000	
	N	290	290

Pearson Correlation (0.432): This correlation coefficient evaluates the direction and strength of the linear relationship between export success and logistics management. The value of 0.432 is positive, indicating that as logistics management practices improve, export performance also tends to improve. The magnitude of 0.432 represents a moderate positive correlation, meaning the relationship is clearly present but not extremely strong. This suggests that logistics management is a vital determinant of export performance, though other factors also contribute to export performance.

Sig. (2-tailed) = 0.000: This p-value represents the correlation's statistical significance. The value of 0.000 means the probability of obtaining this correlation by chance is less than 0.1% (or 1 in 1,000). Since this value is well below the conventional significance threshold of 0.05, the correlation is statistically significant. This demonstrates that the observed correlation between export performance and logistics management is genuine and not the result of random sample variance.

4.4.2 Regression Analysis

The study performed multiple regression analysis using logistics management as an independent variable to evaluate its effect on export performance. Table 11 presents the model summary.

Table 11: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of Estimate
1	0.718	0.515	0.508	0.347

The model summary shows that the multiple correlation coefficient (R) between export performance and the independent variables is 0.718, suggesting a strong positive relationship. The coefficient of determination (R^2) is 0.515, indicating that all four supply chain practices collectively explain 51.5% of the variance in export performance. The adjusted R^2 value of 0.508 confirms that approximately 50.8% of the variance is explained after accounting for degrees of freedom.

Table 12: Analysis of Variance

Source	Sum of Squares	df	Mean Square	F	p
Regression	13.896	1	13.896	81.876	<0.001
Residual	60.465	288	0.210		
Total	74.361	289			

The ANOVA results in Table 12 confirm that logistics management has a statistically significant influence on export performance ($F(1, 288) = 81.876$, $p < 0.001$). This means that the variation in export performance explained by logistics management is substantially greater than the variation left unexplained. The highly significant p-value provides very strong evidence that logistics management is an important determinant of avocado export performance in Meru County. The regression sum of squares (13.896) represents the portion of total variation in export performance that is attributable to logistics management, while the residual sum of squares (60.465) represents variation due to other factors. The F-statistic of 81.876, being substantially larger than the critical F-value, confirms that logistics management explains a significant proportion of the variance in export performance.

4.4.3 Hypothesis Testing

The null hypothesis formulated in Chapter One, that logistics management has no significant influence on export performance, was tested at the 0.05 significance level. Based on the regression results, the null hypothesis is rejected ($\beta = 0.322$, $p < 0.001$). The hypothesis decisions summary is presented in Table 13.

Table 13: Hypothesis Testing

Hypothesis	Statement	p	Decision
H_{01}	Logistics management has no significant influence on export performance	<0.001	Rejected

The null hypothesis of H_{01}, which represents logistics management, was rejected because the p-value of logistics management was less than 0.001, which is less than 0.005. This indicates that logistics has a statistically significant impact on export performance. The results suggest that logistics management greatly impacts export performance.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The findings revealed a positive association between logistics management practices and export performance among avocado cooperatives in Meru County. Effective logistics practices encompassing adequate infrastructure, reliable transport systems, affordable transportation, and cold chain capabilities play an essential role in reducing post-harvest losses, minimizing spoilage, and ensuring timely delivery of avocados to international markets (Githinji & Wachiuri, 2023).

These findings align with earlier research conducted in similar agricultural export contexts. Karing'u et al. (2021), in their examination of avocado export marketing in Murang'a County, documented that elevated transportation costs and inadequate infrastructure diminished farmers' market participation by compressing profit margins and constraining competitiveness. Research by Shikur (2022) found that adequate infrastructure and efficient transport systems are vital in shaping agricultural export performance. Despite the positive association between logistics management and export performance, the current logistics in Meru County faces some challenges. The effective flow of avocados from the farm to the exporters is still hampered by transit delays, transportation costs, poor road networks, lack of cold chain transport.

5.2 Recommendations

The results of this study demonstrate substantial inefficiencies in logistics management, which lead to post-harvest losses, decreased market competitiveness, and financial limitations for farmers. The following recommendations offer practical ways to address current issues and set up Meru County's avocado sector for greater export performance. The County Government of Meru should invest in infrastructure development. One of the major challenges of transportation is poor road conditions, particularly during rainy seasons. In avocado-growing regions, the county government should give priority to grading and maintaining feeder roads, especially those that link fields to main roads. The cooperative leaders should look at group solutions to logistical problems,

such as jointly owning refrigerated vehicles and organizing transportation schedules in order to lower expenses and increase dependability.

The cooperative leaders and exporters should conduct training and capacity building. Holding regular training programs covering export quality standards, appropriate harvesting and handling procedures, and the use of digital technologies equips farmers with the knowledge and skills required to produce fruits that meet export quality standards. The cooperatives can collaborate with universities, development organizations, or agricultural extension services to support this training.

Another recommendation is conducting training and workshops on cold-chain logistics and proper post-harvest processes since insufficient knowledge on these issues limits export potential. The training programs may involve export quality requirements, picking techniques that do not cause bruises, packing procedures, and the use of digital technologies in logistics management. In addition, cooperative leaders should jointly invest in the purchase of refrigerated trucks and cold storage. This measure is expected to decrease post-harvest losses, improve the fruit's quality during the transport process, and increase access to the high-quality export market since only the products stored in cold conditions are demanded there.

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