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# Distribution Tracking Traceability and Performance of Horticultural Firms in Kenya

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## Abstract

**Purpose:** This study sought to examine the relationship between distribution tracking traceability and performance of Horticultural Firms in Kenya.

**Methodology:** This study adopted a cross-sectional survey research design. The unit of analysis for this study was 658 registered Horticultural firms in Kenya. Target population was 2,632 respondents. Who comprised of the heads of procurement, head of production, head of administration and head of Finance in horticultural firms in Kenya formed the unit of observation. That was four respondents from each of 658 registered Horticultural firms in Kenya. The sample size was determined using Slovin's Formula and stratified random sampling in the selection of 256 respondents from the target population. The study used both primary as well as secondary data. Secondary data was collection from the annual reports of different horticultural firms in Kenya. Primary data was obtained using both structured and semi-structured questionnaires. A pilot test of 10% was conducted to assess the validity and reliability of the research instruments. The semi-structured questionnaires generated qualitative and quantitative data. Thematic analysis was used to analyse qualitative data and the results were presented in a prose form. Descriptive as well as inferential statistics were used in analysing quantitative data with the help of Statistical Package for Social Science version 28. Descriptive statistics comprised of frequency distribution, percentages, standard deviation and mean. Inferential statistics included correlation analysis, multiple regression analysis and stepwise regression analysis.

**Findings:** The study found that distribution tracking traceability positively and significantly affects the performance of horticultural firms in Kenya ($\beta = 0.302$, p-value = 0.004). The results indicated that location tracking, transport monitoring, and inventory management influence the overall performance of horticultural firms. This means that improving distribution tracking traceability (location tracking, transport monitoring, and inventory management) enhances the efficiency and effectiveness of horticultural supply chains.

**Unique Contribution to Theory, Policy and Practice:** This study applies the Resource-Based View (RBV) theory to distribution optimization in the horticultural sector, offering valuable insights on how firms can leverage their internal resources and capabilities to enhance operational efficiency, quality control, and customer satisfaction. It also provides actionable recommendations for horticultural firms and policymakers to adopt resource-based strategies, improving competitiveness, efficiency, and sustainable growth.

**Keywords**: *Distribution Tracking Traceability, Performance, Horticultural Firms, Customer Satisfaction*

## Introduction

Horticultural firms play a crucial role in society and the economy by engaging in the cultivation, production, and distribution of plants and plant-based goods (Maharjan & Kato, 2023). These businesses are integral to both local and global markets, contributing significantly to food security, employment, and economic growth. The horticultural sector faces challenges in profitability, market share, and customer satisfaction due to supply chain inefficiencies, logistical disruptions, and intense competition, requiring businesses to adapt to evolving consumer preferences. Horticultural firms are responding to evolving consumer preferences for organic and locally sourced products by adopting supply chain traceability. This strategy enhances transparency, ensures product quality, and reduces risks, helping businesses meet sustainability demands and stay competitive (Schuitemaker & Xu, 2020; Gupta & Boyd, 2018). Traceability enables firms to adapt effectively, boosting performance while addressing global challenges in quality assurance and shifting market dynamics. The components of supply chain traceability include raw materials tracking traceability, product tracking traceability, distribution tracking traceability and consumer tracking traceability.

Distribution tracking traceability is a vital aspect of an effective supply chain management, especially in manufacturing and distribution process (Dong, Jiang & Xu, 2023). It involves tracking product flows between warehouses and the final consumers, tracking the transportation procedures, and controlling the level of inventory to maintain the efficiency of operations, quality, and customer satisfaction. Distribution tracking traceability is associated with efficiency in distribution tracking, minimization of losses, greater coordination, and alignment between supply chain objectives and business objectives and customer demands. Distribution tracking traceability uses the primary elements of location tracking, transport monitoring, and inventory (Westerlund et al, 2021). All these aspects guarantee that products not only can be traced across the supply chain but also handled in a way that would add value and enhance operational performance.

Globally, distribution tracking traceability has become essential for supply chain management in horticulture and food industries. In the European Union, regulations such as the General Food Law require firms to implement traceability systems, enabling product tracking from origin to consumers, improving safety, reducing recalls, and enhancing efficiency (European Commission, 2016; Golan et al., 2018). Similarly, in Japan, horticultural firms utilize traceability to monitor production and distribution, ensuring quality compliance and meeting export requirements (Iwamoto et al., 2021). In Africa, Ghana and Tanzania have implemented traceability systems in cocoa and horticultural supply chains, enhancing product tracking, real-time monitoring, and responsible sourcing practices (Osei-Amponsah et al., 2019; TAHA, 2021). In Kenya, initiatives like the Horticulture Traceability Initiative (HOTI), FPEAK, and KFC allow firms to track products from farms to international markets, improving quality assurance, operational efficiency, and customer trust, thereby strengthening competitiveness in global horticultural trade (FPEAK, 2021; Onyango, 2022).

**Statement of the Problem**

The horticultural sector in Kenya is a major contributor to economic growth, accounting for approximately 26% of agricultural GDP, which remains a cornerstone of the national economy (Horticultural Crops Directorate, 2022). Despite notable expansion over the past decade, horticultural firms face several challenges, including intensified competition in export markets, fluctuating foreign exchange rates, climate change, and shifting consumer demands (Fresh Produce Exporters Association of Kenya, 2022). To maintain competitiveness, firms have increasingly adopted distribution tracking traceability (DTT) systems, which enable real-time monitoring of product movements from farms to end consumers, improve inventory management, and enhance coordination across supply chains (Masudin et al., 2021). DTT has been linked to improved operational efficiency, reduced losses, better alignment of supply chain and business objectives, and higher customer satisfaction.

However, the performance of horticultural firms in Kenya has remained inconsistent over the last five years (Wawire et al., 2018). The Central Bank of Kenya (2023) reports that sector earnings declined from Ksh. 144 billion in 2020 to Ksh. 107.8 billion in 2023, while customer satisfaction dropped from 89.1% in 2020 to 78.9% in 2023. Financial performance indicators such as return on assets and return on investment also declined significantly during this period, and market share experienced fluctuations, suggesting inefficiencies in supply chain management. These trends highlight the need to examine how the adoption of DTT systems can improve operational and financial outcomes for horticultural firms.

Although several studies have explored supply chain traceability, few have focused on distribution tracking in the horticultural sector in Kenya. For instance, Issack and Noor (2020) examined the effect of supply chain traceability on performance of food and beverage manufacturing firms in Nairobi City County, Gichure and Wahome (2019) investigated the extent of traceability along organic fresh produce value chains in Nairobi City County, and Taracha and Noor (2023) assessed the effect of supply chain traceability on the performance of retail firms in Kenya. These studies, while insightful, either focused on different sectors or did not specifically examine the impact of distribution tracking traceability on horticultural firms, creating a knowledge gap that this study sought to address.

The null hypothesis in this study was;

**$H_{01}$:** Distribution tracking traceability has no significant effect on performance of horticultural firms in Kenya

**Literature Review**

**Theoretical Review**

The Resource-Based View (RBV) theory was developed by Wernerfelt in 1984 to explain how firms achieve sustained competitive advantage through their internal resources (Wernerfelt, 1984). RBV emphasizes that a firm's resources and capabilities are critical in determining its

ability to compete effectively (Hinkes & Peter, 2020). Resources are considered valuable, rare, imperfectly imitable, and non-substitutable (Barney, 1991; Vasudevan, 2021). Capabilities, on the other hand, are firm-specific skills that enable the effective deployment of these resources (Putra & Wiagustini, 2021). In essence, the theory shifts attention from external market conditions to internal resource configurations, explaining how firms can organize assets, knowledge, and competencies to achieve superior performance and market positioning (Hong, Cho & Kim, 2015).

RBV assumes that firm resources are heterogeneous, immobile, and capable of generating sustained competitive advantage (Vasudevan, 2021). Critics, however, argue that resource differences are not always enduring, as competitors can imitate or acquire similar resources over time, weakening uniqueness (Rungtusanatham, 2019). Additionally, RBV presumes that resources alone drive performance, often underestimating the role of capabilities and external environmental factors such as market dynamics and competition (Phiri & Banda, 2024); Barney & Hesterly, 2020). The theory has also been criticized for overlooking the dynamic nature of industries, emphasizing static resource ownership rather than how firms reconfigure and leverage resources through innovation, flexibility, and operational responsiveness (Karani, 2022).

RBV provides a useful framework for analyzing the impact of distribution tracking traceability on the performance of horticultural firms in Kenya. Traceability systems represent valuable, rare, inimitable, and non-substitutable resources that enhance operational efficiency and market differentiation (Hinkes & Peter, 2020; Putra & Wiagustini, 2021). By tracking the origin, cultivation practices, and distribution channels of produce, firms gain unique information that supports quality assurance, compliance with standards, and customer trust (Karani, 2022). Such capabilities allow firms to exploit these resources effectively, improving product differentiation, competitive positioning, and overall performance. RBV underscores that the competitive advantage derived from traceability is contingent not only on the resource itself but also on the firm's ability to deploy and integrate it strategically within operations and supply chain management.

**Conceptual Framework**

Conceptual framework is a diagrammatic representation of the relationship between the independent variables and the dependent variable (Devi, 2019). The independent variable in this study was distribution tracking traceability. The dependent variable was performance of Horticultural Firms in Kenya. Figure 1 shows the relationship between the independent variable and the dependent variable.

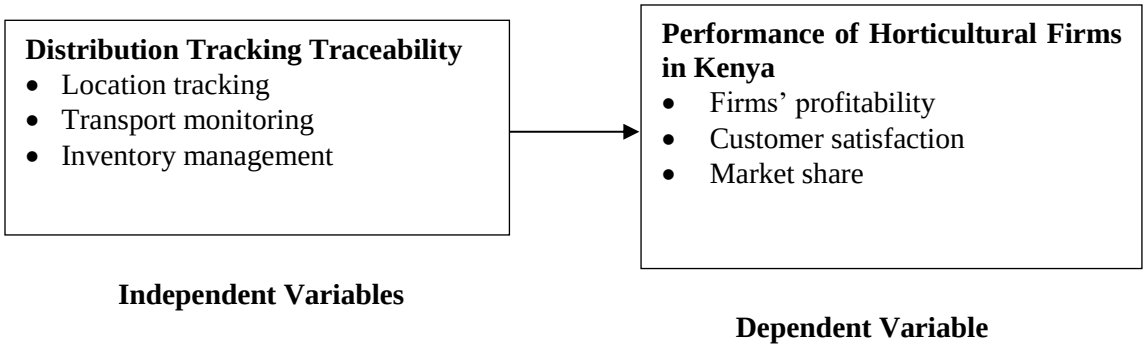


**Figure 1: Conceptual Framework**

**Empirical Review**

In India, Panigrahi, Shrivastava and Nudurupati (2024) examined the effects of inventory management on the performances of SMEs. The research design was the systematic literature review where databases like Scopus, Web of Science and Google Scholar were analyzed. Data collection was done by first of all retrieving 175 papers by use of search string of nine key words that are relevant and further screening on the basis of titles and abstracts to retain 95 papers to be subjected to in depth analysis. The results showed that good inventory management behaviour has a great effect on the performance of the SME. Specifically, the combination of technical, technological, and behavioral know-how into inventory management was identified to enhance operational efficiency, minimal stock-outs, and the optimal usage of resources. The research also established that effective sound inventory practices contribute to improved decision-making, standardization of processes, and sensitivity to the market needs.

Mahajan et al. (2024) determined the effect of inventory management and Total Quality Management (TQM) practices on the performance of firms in China. The research design utilized in the study was the bibliometric research design to review the published articles, review papers and conference proceedings. The sample was a total of 497 publications between 1993 and 2021, which were obtained in Scopus and Web of Science databases such as Elsevier, Emerald, Taylor and Francis, Wiley, IEEE, Informs and SAGE. The result showed that there was no direct correlation between inventory management and the performance of the firm. Nevertheless, the effect of the TQM practices on the performance of the firms was identified as substantial and positive, which emphasizes the significance of the strategies based on quality. The research also reported that the firms that combined TQM and inventory management said that they had increased operational efficiency and customer satisfaction.

Similarly, Anisere-Hameed and Bodunde (2021) investigated how inventory management influences the profitability of the manufacturing companies in Nigeria. The research used an ex-post facto design of study and targeted food and beverage manufacturing firms in Nigeria within the period of the 2015-2019. Secondary data was collected by referring to financial statements and other records of the sampled firms. The research indicated that there was a strong positive

correlation between inventory management and profitability ratios such as, return on assets, investment, net operating margin, and net income. The research also determined that other inventory management procedures like appropriate monitoring and control of stock helped to manage cash flow and operational efficiency. Also, the implementation of Just-in-Time (JIT) system, decreased credit sales, deeper oversight of inventory turnover time, as well as hiring of inventory management specialists were observed to increase profitability and financial performance in general.

Mwamba and Yangailo (2024) investigated the effects of the inventory management on the performance of Tanzania Zambia Railway Authority. The research design adopted was descriptive. The results showed that there is a strong impact of inventory management practices on organisational performance. In particular, the study uses the ABC analysis in making decisions but it does not use the Economic order quantity (EDOQ) model in its purchases. Moreover, the implementation of the ICT and electronic management systems was found to be one of the key factors to increase the level of operational efficiency. The research also highlighted the importance of training employees on procurement and regulatory compliance especially among the younger employees who have little work experience in order to enhance organisational overall effectiveness. The study also revealed that incorporation of contemporary inventory management methods would enhance decision making and sustainability of organisations in the long run.

Among state corporations in Kenya, Njoki, Ismail and Osoro (2021) examined how inventory management affects the performance. The research design was descriptive and included state corporations in the entire nation. Structured questionnaires were used to collect primary data. The research established that there is the existence of a strong positive relationship between inventory management practices and the performance of state corporations. It also indicated that good inventory management practices, keeping of proper records about inventory and proper disposition of assets increased operational efficiency and minimized costs. The research further found out that state corporations that practiced strong inventory management recorded better results in resource movement, transparency and responsible exploitation of the state funds. The study also revealed that accountability and decision making in the corporations was enhanced by the good management of inventory.

**Research Methodology**

The study adopted a positivism research philosophy and a cross-sectional survey research design. The unit of analysis for this study was 658 registered Horticultural firms in Kenya as per the Horticultural Crops Directorate (2022). Horticultural Firms were used in this study because the horticultural sector in Kenya contributes 26% of the agricultural GDP in Kenya, which in turn contributes about 34% of the national economy. The heads of procurement, production, finance, and administration in horticultural firms is justified due to their integral roles in the supply chain in horticultural firms in Kenya formed the unit of observation. The target population was 2632

heads procurement, production, finance, and administration departments from 658 registered Horticultural firms in Kenya.

This study made use of Slovin's Formula to determine the study's sample size. Slovin's formula is a mathematical equation used to determine the sample size needed for a simple random sample when the population size is known.

$$n = \frac{N}{1 + NE^2}$$

Where by: n = no. of samples; N = total population; E = error margin / margin of error (0.05).

$$n = \frac{2{,}632}{1 + 2{,}632\ (0.05^2)}$$

$$n = 256\ Respondents$$

This study adopted stratified random sampling in the selection of 256 respondents from the target population. The strata in this study were procurement, production, finance, and administration departments in horticultural firms in Kenya. This sampling technique will be used because horticultural firms have distinct departments such as procurement, production, finance, and administration, each with its unique responsibilities and challenges. Stratifying the sample based on these departments ensures that the study captures the diversity and specific dynamics within each functional area. Different departments may have varying levels of expertise and involvement in supply chain activities. Stratified sampling allows for the inclusion of respondents with specific knowledge and experience related to their department's role in the supply chain, providing a more nuanced understanding of the research questions.

**Table 1: Sample Size Distribution**

| Departments | Target Population | Sample Size |
|---|---|---|
| Procurement | 658 | 64 |
| Finance | 658 | 64 |
| Production | 658 | 64 |
| Administration | 658 | 64 |
| **Total** | **2632** | **256** |

The study used both primary as well as secondary data. Secondary data, including profitability, market share and customer satisfaction index, was collected from the annual reports of different horticultural firms in Kenya. Primary data was obtained using semi-structured questionnaires. To ensure the validity and reliability of the research instrument, a pilot test was conducted with 26 respondents (10% of the sample) from 10 horticultural firms in Kenya. Validity was examined through content, face, and construct validity. Content validity was enhanced by expert feedback, ensuring the questionnaire addressed all relevant aspects of the study. Face validity was improved by refining ambiguous questions identified during the pilot test. Construct validity was evaluated using Confirmatory Factor Analysis (CFA) to confirm the relationships between

variables and constructs. Reliability was assessed using Cronbach's alpha, ensuring internal consistency.

Semi-structured questionnaires were used to gather both qualitative and quantitative data. Thematic analysis was used to analyse qualitative data and the results were presented in a narrative form. On the other hand, quantitative data analysis involved the use of SPSS version 28.0 statistical software to apply both descriptive and inferential statistics. Descriptive statistics were employed to summarize and describe the key characteristics of the dataset, including measures of central tendency such as means and medians, and measures of variability such as standard deviations and ranges. In addition to descriptive statistics, inferential statistics were utilized to make broader inferences about the population from the sample data. Techniques such as correlation and regression analysis were employed to explore and quantify the relationships between variables and test research hypothesis. The regression model that was used to test is shown below:

$$y = \alpha + \beta_1 x_1 + \varepsilon$$

Where; Y = Performance of Horticultural Firms in Keny; α = Constant; $\beta_1$= the slope representing degree of change in independent variable by one unit variable; $X_1$ = Distribution Tracking Traceability; and ε = error term

**Research Findings and Discussions**

The sample size for this study included 256 heads of procurement, head of production, head of finance and head of administration from registered horticultural firms in Kenya. Out of these, 221 questionnaires were returned, reflecting a high response rate of 86.5%. However, 2 of the returned questionnaires were deemed unusable due to incomplete responses or other issues, reducing the total number of usable questionnaires to 221. This results in a usability rate of 85.92%. The high response and usability rates suggest strong participation and engagement from the targeted department heads within the horticultural firms, ensuring that the data collected is both reliable and representative of the intended population.

Latwal (2020) indicates that a response rate of 50% is considered sufficient for effective analysis, a rate of 60% is viewed as good, and anything 70% or higher is deemed excellent. The study achieved a notable response rate of 86.48%, which significantly exceeds these benchmarks. This high response rate not only indicates that the level of participation was more than adequate but also reflects a strong engagement from the respondents. Furthermore, with 85.92% of the returned questionnaires deemed usable, the reliability of the collected data is enhanced, reinforcing the strength and credibility of the study's findings. This robust engagement and high usability underscore the effectiveness of the data collection process.

**Table 2: Response Rate**

| Responses | No. | Percentages |
|---|---|---|
| Administered questionnaires | 256 | 100% |
| Returned | 221 | 86.48% |
| Unusable questionnaires | 35 | 0.56% |
| Usable questionnaires | 221 | 85.92% |

**Distribution Tracking Traceability**

The respondents were asked to indicate their level of agreement with various statements on distribution tracking traceability in horticultural firms in Kenya. The results were as shown in Table 3. The respondents agreed that the locations of products in transit are accurately tracked at all times, with a mean of 4.120 (SD=0.893), indicating that firms prioritize real-time monitoring of product movement. Moderate agreement was reported regarding the presence of systems to monitor product movement across distribution channels (mean=3.381, SD=0.947) and that location tracking ensures products reach their intended destinations effectively (mean=3.835, SD=1.081), suggesting room for improvement in distribution verification processes. The respondents agreed that transportation of products is regularly monitored to ensure safety and quality (mean=4.032, SD=0.715), and that transport monitoring minimizes losses, damages, or delays during distribution (mean=4.098, SD=1.124), highlighting the importance of logistics oversight in safeguarding product integrity.

Similarly, respondents agreed that effective transport monitoring enhances the efficiency of product delivery (mean=4.186, SD=1.000). These findings agree with the observations of Ehigie and McAndrew (2020), who noted that source identification and tracking processes are critical for ensuring product quality and efficient distribution. With regard to inventory management, the respondents strongly agreed that inventory levels are systematically tracked and updated in real-time (mean=4.253, SD=1.009) and that inventory management ensures the availability of products to meet demand (mean=4.490, SD=0.701). Proper inventory tracking and control were also perceived to contribute to improved overall firm performance, with a mean of 4.633 (SD=0.732). These findings suggest that horticultural firms in Kenya emphasize traceability across distribution and inventory processes to enhance operational efficiency, maintain product quality, and improve overall performance.

**Table 3: Statements on Distribution Tracking Traceability**

| Statements | Mean | Std.Dev |
|---|---|---|
| The locations of products in transit are accurately tracked at all times | 4.120 | 0.893 |
| Systems are in place to monitor product movement across distribution channels | 3.381 | 0.947 |
| Location tracking ensures products reach their intended destinations effectively | 3.835 | 1.081 |
| Transportation of products is regularly monitored to ensure safety and quality | 4.032 | 0.715 |
| Transport monitoring minimizes losses, damages, or delays during distribution | 4.098 | 0.1.24 |
| Effective transport monitoring enhances the efficiency of product delivery | 4.186 | 1.000 |
| Inventory levels are systematically tracked and updated in real-time. | 4.253 | 0.1.009 |
| Inventory management ensures availability of products to meet demand. | 4.490 | 0.701 |
| Proper inventory tracking and control contribute to improved overall firm performance. | 4.6 3 | 0.732 |

**Performance of Horticultural Firms in Kenya**

The respondents were asked to indicate their level of agreement with various statements on the performance of horticultural firms in Kenya. The results were as shown in Table 4. The respondents agreed most strongly with the statement that marketing and distribution strategies effectively expand the firm's market presence, with a mean of 4.443 (SD=0.914). This finding suggests that horticultural firms in Kenya prioritize marketing and distribution to strengthen their market reach. Similarly, respondents agreed with a mean of 4.463 (SD=0.915) that an increase in market share has positively influenced the overall performance of horticultural firms, which aligns with Alsharairi, Mezher and Wehbe (2020) observation that market share growth reflects shifts in consumer preferences and competitive dynamics. The respondents also agreed that the firm competes successfully against other horticultural firms in Kenya (mean=4.290, SD=1.034) and that customer service practices contribute positively to overall satisfaction (mean=4.273, SD=1.031). These findings highlight the importance of effective competitive strategies and quality customer service in driving performance. With a mean of 4.183 (SD=0.976), the respondents agreed that the firm responds promptly and effectively to customer feedback and complaints, suggesting that responsiveness enhances customer satisfaction.

In addition, the respondents agreed that profit margins of the firm have improved over the past few years (mean=4.173, SD=0.795), indicating growing financial performance. The respondents agreed with a mean of 4.087 (SD=0.821) that consumers are generally satisfied with the quality of horticultural products offered. This aligns with Kosgei (2020) observation that customer satisfaction increases when products meet expected standards. Moderate agreement was observed regarding the maintenance or increase of market share (mean=3.973, SD=0.981) and the effectiveness of competitive strategies in increasing market presence (mean=3.993, SD=0.992), showing that firms have made efforts to maintain competitiveness, though challenges may still exist. The respondents were moderately positive about the consistent achievement of profitability targets (mean=3.913, SD=0.974) and improvements in return on investment, indicating steady financial performance. The respondents agreed least with the statement that the firm effectively manages costs to enhance overall profitability, with a mean of 3.780 (SD=1.287), suggesting that cost management is an area that may require improvement to

further enhance overall performance. Overall, the findings indicate that horticultural firms in Kenya have demonstrated strong performance in marketing, customer satisfaction, and competitive positioning, while cost management and consistent profitability remain areas for potential strategic focus.

**Table 4: Statements on Performance Horticultural Firms in Kenya**

| | Mean | Std. Deviation |
|---|---|---|
| The horticultural firm consistently achieves its profitability targets. | 3.913 | 0.974 |
| Profit margins of the firm have improved over the past few years. | 4.173 | 0.795 |
| The firm effectively manages costs to enhance overall profitability. | 3.780 | 1.287 |
| Consumers are generally satisfied with the quality of horticultural products offered. | 4.087 | 0.821 |
| The firm responds promptly and effectively to customer feedback and complaints. | 4.183 | 0.976 |
| Customer service practices of the firm contribute positively to overall satisfaction. | 4.273 | 1.031 |
| The firm has maintained or increased its market share in the horticultural sector. | 3.973 | 0.981 |
| Marketing and distribution strategies effectively expand the firm's market presence. | 4.443 | 0.914 |
| The firm competes successfully against other horticultural firms in Kenya. | 4.290 | 1.034 |
| Competitive strategies adopted by horticultural firms have increased their market presence. | 3.993 | 0.992 |
| An increase in market share has positively influenced the overall performance of horticultural firms. | 4.463 | 0.915 |

Figure 2 shows the declining of profitability of the horticultural firms (return on investment) for the period between 2019 and 2023. The average profitability (Return on Investment) of horticultural firms in Kenya has shown a general decline from 2019 to 2023. In 2019, the ROI was relatively high at 21.6%, but it decreased to 19.2% in 2020. Whereas there was a slight recovery to 20.0% in 2021, the downward trend continued in the subsequent years, with profitability dropping to 18.5% in 2022 and further down to 17.9% in 2023. This consistent decline in profitability over the five-year period suggests that horticultural firms in Kenya may be facing increasing challenges, such as rising operational costs, market competition, or other economic factors impacting their financial performance.

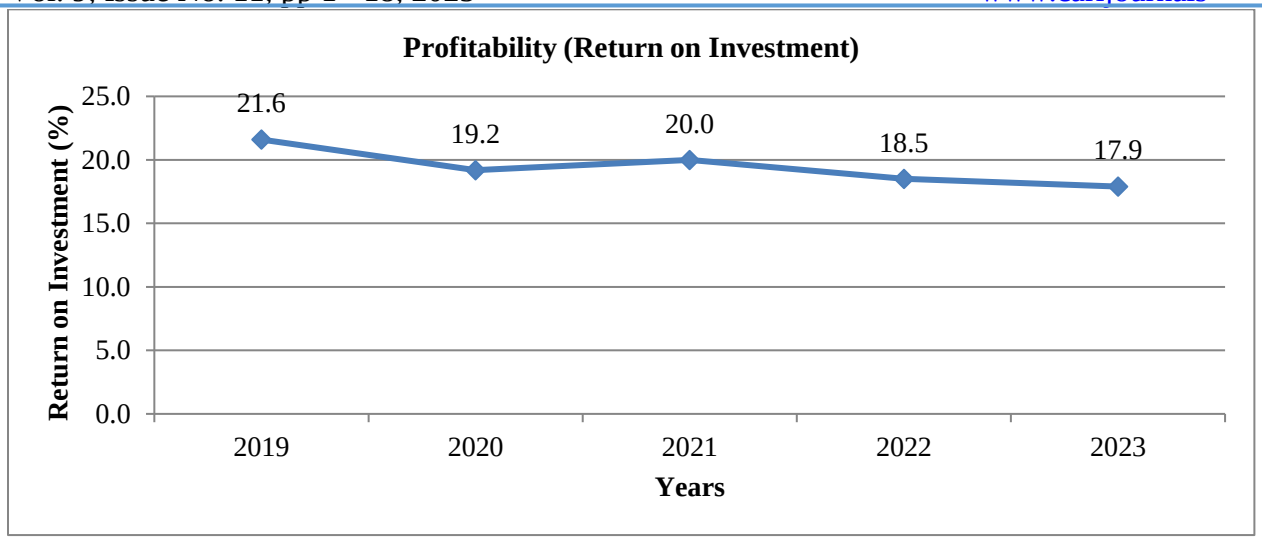


**Figure 2: Trend of Profitability (Return on Investment)**

Figure 3 shows the declining of market share of the horticultural firms for the period between 2019 and 2023. The average market share of horticultural firms in Kenya experienced significant fluctuations between 2019 and 2023. In 2019, the market share was 26.21%, but it dropped sharply to 12.69% in 2020, likely due to disruptions caused by global events such as the COVID-19 pandemic. The market share recovered somewhat in 2021, increasing to 18.72%, and saw a substantial rise in 2022, reaching a peak of 32.78%. By 2023, the market share slightly decreased to 26.76%, aligning closely with the 2019 level.

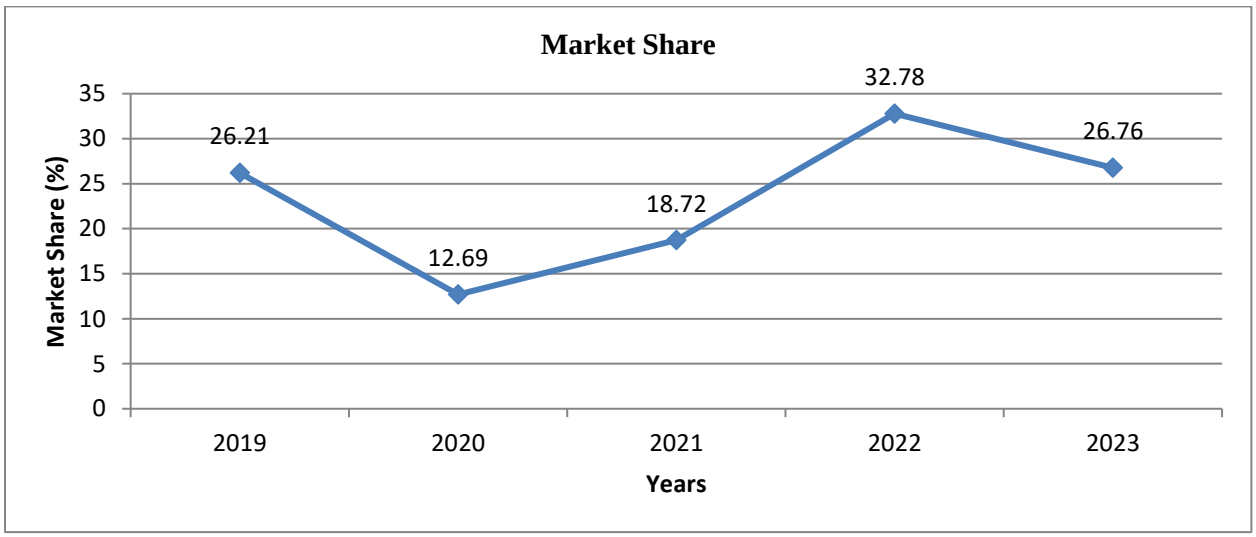


**Figure 3: Trend of Market Share**

Figure 4 shows the average customer satisfaction index among horticultural firms for the period between 2019 and 2023. The average customer satisfaction index of horticultural firms in Kenya displayed a fluctuating trend between 2019 and 2023. Starting at 85.3 in 2019, the satisfaction index peaked at 89.1 in 2020, indicating a high level of customer satisfaction during that year.

However, from 2021 onwards, there was a gradual decline, with the index dropping to 86.2 in 2021, further down to 81.3 in 2022, and reaching its lowest point at 78.9 in 2023. These findings is in line with the findings of Mbewe and Kalenga (2021).This downward trend suggests that customer satisfaction has decreased over the years, potentially reflecting challenges or changes in the industry that may have impacted service quality or customer expectations.

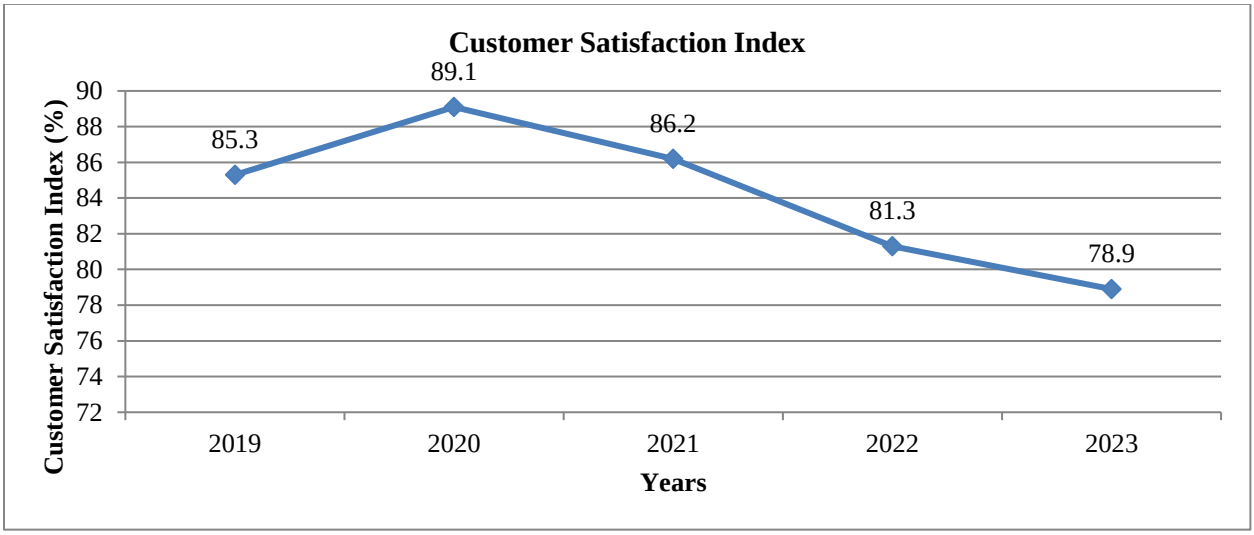


**Figure 4: Trend of Customer Satisfaction Index**

## Correlation Analysis

Pearson correlation analysis was used to assess the strength and direction of the linear relationship between distribution tracking traceability and performance of horticultural firms in Kenya.

The correlation results show that distribution tracking traceability exhibits a strong positive correlation with PHF performance ($r = 0.689$, $p < 0.001$). This finding implies that firms that track and trace their input materials, such as seeds, fertilizers, and pesticides, throughout the supply chain, are likely to experience enhanced operational efficiency and product quality. Effective Distribution tracking traceability helps in identifying and mitigating risks related to product safety, compliance with regulatory standards, and environmental sustainability, all of which are critical factors influencing firm performance in the horticultural sector. These findings is in line with the findings of Mai'auduga et al. (2024), who asserted that there is appositive relationship between Distribution tracking traceability and performance of the Chinese food industry.

**Table 5: Correlation Coefficients**

| | | PHFK | DTT |
|---|---|---|---|
| Performance of Horticultural Firms in Kenya (PHF) | Pearson Correlation | 1 | |
| | Sig. (2-tailed) | | |
| | N | 221 | |
| Distribution Tracking Traceability | Pearson Correlation | .689** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 221 | 221 |

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

**Regression Analysis**

Regression analysis was used to assess the strength of the relationship between distribution tracking traceability and performance of horticultural firms in Kenya. The R-squared value of 0.476 suggests that 47.6% of the variance in the performance of horticultural firms can be explained by distribution tracking traceability. This indicates a moderate model fit, with the remaining 52.4% of the variance in firm performance unexplained by input traceability alone.

**Table 6: Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| **1** | .690[a] | .476 | .473 | .32846 |

a. Predictors: (Constant), Distribution Tracking Traceability

The Analysis of Variance (ANOVA) demonstrates how well distribution tracking traceability predicts performance. Since the F-statistic (97.295) is significantly greater than the critical value of 3.94 from the F-distribution table, the regression model is highly significant. The p-value of 0.000, which is much lower than the significance level of 0.05, indicates that the model is valid for predicting the effect of input traceability on the performance of horticultural firms in Kenya.

**Table 7: Analysis of Variance**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **1** | Regression | 27.609 | 1 | 27.609 | 97.295 | .000[b] |
| | Residual | 33.768 | 119 | 0.284 | | |
| | **Total** | **61.377** | **220** | | | |

a. Dependent Variable: Performance of Horticultural Firms in Kenya
b. Predictors: (Constant), Distribution Tracking Traceability

From the findings, regression equation was as follows;

Y=0.396+ 0.302 (Distribution tracking traceability)

The results reveal that distribution tracking traceability has a positive and significant effect on the performance of horticultural firms in Kenya (β = 0.302, p-value = 0.004). This coefficient suggests that improvements in distribution tracking traceability lead to a significant increase in firm performance. Specifically, for each one-unit increase in distribution tracking traceability,

firm performance increases by 0.302 units. The effect is highly statistically significant ($p < 0.001$), which highlights the importance of effectively managing and distribution tracking traceability in achieving better performance outcomes for horticultural firms in Kenya. The findings are in line with Shrivastava and Nudurupati (2024) assertion that distribution tracking traceability has a positive effect on the performances of SMEs. The findings are also in concurrence with Mahajan et al. (2024) observation that distribution tracking traceability has a positive effect on the performance of firms in China. The findings also agree with Njoki, Ismail and Osoro (2021) argument that distribution tracking traceability has a positive effect on the performance of state corporations in Kenya.

**Table 8: Regression Coefficients**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | .396 | .093 | | 4.258 | .001 |
| | Distribution tracking traceability | .302 | .051 | .407 | 5.922 | .004 |

a. Dependent Variable: Performance of Horticultural Firms in Kenya

## Conclusion

The findings conclude that distribution tracking traceability positively and significantly affects the performance of horticultural firms in Kenya. The results indicated that location tracking, transport monitoring, and inventory management influence the overall performance of horticultural firms. This means that improving distribution tracking traceability (location tracking, transport monitoring, and inventory management) enhances the efficiency and effectiveness of horticultural supply chains. There are several benefits of distribution tracking for horticultural firms, such as ensuring operational reliability: Accurate tracking of products in transit ensures that they reach their intended destinations safely and efficiently, reducing the likelihood of losses or delays.

## Recommendations

The study recommends that horticultural firms in Kenya enhance their distribution tracking traceability systems to improve performance by ensuring comprehensive tracking of input sources, conducting regular supplier audits, and upholding ethical and sustainable practices. It further emphasizes the importance of transparent communication regarding suppliers, including sharing their names and locations, to strengthen consumer trust and public perception. The study also highlights the need for continuous evaluation of transportation and storage tracking systems to minimize losses, improve efficiency, and support better operational outcomes. Training staff on best practices in traceability and transport management is encouraged to enhance implementation. Additionally, the study suggests regular reviews of these processes to identify improvement areas, reduce waste, and boost firm performance. For further research, the study recommends examining distribution tracking traceability in other sectors and exploring additional factors beyond traceability that may influence horticultural firm performance.

**References**

Alsharairi, M., Mezher, T., & Wehbe, N. (2020). The impact of input traceability on the performance of the Lebanese agro-food sector. *Journal of Cleaner Production*, 267, 121-143.

Anisere-Hameed, R. A., & Bodunde, T. D. (2021). The impact of inventory management on the profitability of manufacturing companies in Nigeria. *International Journal of Innovative Research and Advanced Studies*, *8*(1), 9-15.

Barney, J. B., & Hesterly, W. S. (2020). *Legal Management and Competitive Advantage: Concepts and Cases* (6th ed.). Pearson Education.

Barney, J. B., & Hesterly, W. S. (2020). *Legal Management and Competitive Advantage: Concepts and Cases* (6th ed.). Pearson Education.

Central Bank of Kenya (2023). *Agricultural sector survey*. Retrieved from https://www.centralbank.go.ke/

Devi, P. S. (2019). *Research methodology: A handbook for beginners*. New Delhi: Notion Press.

Dong, L., Jiang, P., & Xu, F. (2023). Impact of traceability technology adoption in food supply chain networks. *Management Science*, *69*(3), 1518-1535

Ehigie, B. & McAndrew, E.B. (2020). Innovation, diffusion and adoption of total quality management. *Management Decision, 43*(6), 925-940.

European Commission. (2016). *Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002.* Retrieved from https://eur-lex.europa.eu/

FPEAK. (2021). *Traceability. Fresh produce exporters association of Kenya*. Retrieved from https://fpeak.org/traceability/

Fresh Produce Exporters Association of Kenya (2022). *Update on the State of the Horticulture Industry in Kenya 2020.* Retrieved from https://fpeak.org/

Gichure, J. & Wahome, W. (2019). (2019). Extent of traceability along organic fresh produce value chains: case of kale in Nairobi, Kenya. *Organic Agriculture, 7*, 15-29.

Golan, M.S., Jernegan, L.H. & Linkov, I. (2020). Trends and applications of resilience analytics in supply chain modeling: systematic literature review in the context of the COVID-19 pandemic. *Environ Syst Decision, 40*, 222–243

Gupta, M.C. & Boyd, L.H. (2018). Theory of constraints: a theory for operations management. *International Journal of Operations & Production Management, 28*(10), 991-1012.

Hinkes, C. & Peter, G. (2020). Traceability matters: A conceptual framework for deforestation-free supply chains applied to soy certification. *Sustainability Accounting, Management and Policy Journal, 11*(7), 1159-1187.

Hong, S., Cho, S. H., & Kim, S. W. (2015). Effects of process traceability on firm performance: Evidence from manufacturing firms in South Korea. *International Journal of Quality Innovation*, 1(1), 1-11.

Issack Y. M. & Noor, I. S. (2020). Effect of supply chain traceability on performance of food and beverage manufacturing firms in Nairobi City County, Kenya. *International Journal of Management Sciences and Business Research, 09*(10), 48–58.

Iwamoto, M., Plangger, K., & Etter, M. (2021). It's real, trust me! Establishing supply chain provenance using blockchain. *Business Horizons, 62*, 283–293.

Karani, A.M. (2022). Effect of supply chain strategies on the performance of manufacturing firms in Kenya. *Risk Governance & Control: Financial Markets & Institutions, 6*(4), 90-112

Kosgei, A. K. (2020). Block chain readiness Assessment for Domestic Horticultural Traceability in Urban Kenya. *Logistics and Transportation Review, 137*, 101923.

Maharjan, R. & Kato, H. (2023). Logistics and supply chain resilience of Japanese companies: Perspectives from impacts of the COVID-19 pandemic. *Logistics, 7*(2), 27-56.

Masudin, I., Ramadhani, A. & Restuputri, D.P. (2021). The effect of traceability system and managerial initiative on Indonesian food cold chain performance: A Covid-19 Pandemic perspective. *Global Journal of Flexible Systems Management, 22*, 331–356.

Mbewe, S., & Kalenga, M. (2021). Enhancing traceability in Malawi's tobacco industry: A case study. *Tobacco Industry Review*, 12(2), 85-90.

Mwamba, E., & Yangailo, T. (2024). The impact of inventory management on the performance of an organization. *Scientific Journal: Depth Building the Future*, *20*(20), 77-85.

Njoki, G. C., Ismail, N., & Osoro, A. (2021). Inventory Management and Performance of State Corporations in Kenya. *New Realities in Africa*, 2(1), 205-219.

Onyango, J.O. (2022). Impact of Inventory Management Techniques on the Performance of Public Health Facilities in Kisumu County. *Journal of Pharmacy and Pharmacology, 8*(17), 438- 442.

Osei-Amponsah, R., Amoah, M., Appiah-Kubi, P., & Apusiga, K. (2019). Enhancing food safety in Africa: challenges and opportunities for the horticulture sector. *African Journal of Agricultural and Resource Economics, 14*(2), 133-146.

Phiri, A., & Banda, J. (2024). Process traceability and organizational performance in Malawi's textile industry. *Malawian Business Review, 18*(4), 33-48.

Putra, I.G. & Wiagustini, N. (2021). Financial sustainability based on resource based view theory and knowledge based view theory. *Academy of Accounting and Financial Studies Journal,* 25*(1)*, 1-15.

Rungtusanatham, M. (2019). Advancing theory development in total quality management: A "Deming management method" perspective. *International Journal of Operations & Production Management, 23*(8), 918-936.

Schuitemaker, R. & Xu, X. (2020). Product traceability in manufacturing: A technical review. *Procedia CIRP*, 93, 700-705.

TAHA. (2021). *Traceability. Tanzania horticultural association.* Retrieved from https://taha.or.tz/traceability/

Taracha, C. M. & Noor, I. S. (2023). Supply Chain Traceability and Performance of Retail Firms in Kenya. *Int Journal of Social Sciences Management and Entrepreneurship, 7*(2), 493-503.

Tzafestas, S. (2022). General systems theory and system dynamics. *Systems and Cybernetics, 12,* 87-119.

Vasudevan, H. (2021). Resource-based view theory application on the educational service quality. *International Journal of Engineering Applied Sciences and Technology, 6,* 174-186.

Wawire, N. H., Kisaka, S. M., & Ogollah, K. (2018). Factors influencing the performance of horticultural firms in Kenya. *International Journal of Scientific and Research Publications,* 8(10), 731-737.

Wernerfelt, B. (1984). A resource-based view of the firm. Birger Wernerfelt. *Strategic Management Journal, 5*(2), 171-180.

Westerlund, M., Nene, S., Leminen, S., & Rajahonka, M. (2021). An exploration of blockchain-based traceability in food supply chains: On the benefits of distributed digital records from farm to fork. *Technology Innovation Management Review 11*(6), 6-18.