International Journal of Social and Development Concerns

ISSN 2524-1478 (Online)

Vol. 26 | Post COVID-19 Recovery and Sustainable development
Vol. 26 Article 8 | August 27, 2025

The role of risk assessment in the performance of selected horticultural projects in Kajiado South Sub-County, Kenya

Authors: [1]Faith Akoth Onyango, [2]Jennifer Wangari and [3]James Sankale
[1,2&3]The Catholic University of Eastern Africa - Kenya. **Website:** www.cuea.edu
Correspondence: Faith Akoth Onyango **Email:** faith34onyango@gmail.com

Cite as: *Onyango, F. A., Wangari, J., & Sankale, J. (2025). The role of risk assessment in the performance of selected horticultural projects in Kajiado South Sub-County, Kenya. International Journal of Social and Development Concerns, 26(8), 92–102. https://doi.org/10.5281/zenodo.16968265*

Abstract: *The purpose of this study was to investigate the role of risk assessment in the performance of selected horticultural projects in Kajiado South Sub-County, Kenya. Risk management theory guided the study. The research was founded on convergent parallel research design. The target population was made up of 1,072 people which included county agricultural officials, registered horticultural growers, and project managers from non-governmental organizations. Simple random selection was used to pick a sample of 291 respondents, and five key informants were selected using qualitative sampling techniques. To guarantee representation, proportional stratified sampling was used. Semi-structured surveys, formal interviews, farm observations, and report reviews were all used in the data gathering process. Descriptive statistics, correlation, and multiple regression were used to evaluate quantitative data using SPSS Version 28, while theme analysis was used to examine qualitative data. The study findings indicate that horticultural farmers in Kajiado South Sub-County generally acknowledge the importance of risk analysis in project performance (Mean = 3.83; SD = 0.514). A majority of the respondents (53.5% agreed and 18.5% strongly agreed) stated that risk assessment helps in setting priorities for resource allocation (Mean = 3.86; SD = 0.776). Farmers also reported active participation in risk assessment activities (Mean = 3.88; SD = 0.785), with 53.5% agreeing and 17.3% strongly agreeing that their projects regularly assess the likelihood and impact of risks (Mean = 3.83; SD = 0.780). It was recommended that, farmer training on risk identification using digital tools and indigenous knowledge, capacity building on risk analysis through structured programs, promotion of affordable mitigation strategies supported by subsidies and partnerships.*

Key Words: *Risk Assessment, Performance, Horticultural Projects*

1.1 Study Background

Agriculture is an essential economic field worldwide since it safeguards billions of people with food security and creates work opportunities and sustainable income (Spiegel et al., 2020). Horticulture has emerged as a fast-growing subsector of agriculture, particularly in developing countries. Compared with food crops, horticultural crops have proven to have unique traits in addition to species diversity (Zhang et al., 2024). With global food demand expected to rise to a projected global population of 9.7 billion

people by 2050, integrating advanced risk management strategies, such as climate-smart agriculture, to mitigate the impacts of environmental changes on agricultural productivity, might be a viable remedy in keeping up with the changing tides, (World Bank Group, 2024).
Adapting risk management tactics to counter environmental risks is becoming more critical due to heightened extreme weather events (Soriano et al., 2019). Farmers utilize various risk management strategies rather than using one predominant strategy. These include price contracting, crop insurance, and diversification (Spiegel et al., 2020; Asseldonk et al., 2016). Larger farms generally utilize risk management strategies more frequently, and the strategies are seen to be correlated to farm size (Asseldonk et al., 2016). Institutional problems are demonstrated in the development of tools that require cooperation between committed stakeholders as a resolution (Soriano et al., 2019). The state of risk management in horticulture projects across Europe represents a developing awareness to address various uncertainties, particularly in the context of climate change and market uncertainties. European farmers are increasingly using a greater diversity of risk management strategies.

In Africa, agriculture currently employs 65 – 70 percent directly and indirectly and provides the means of subsistence for 90% of Africa's population, or around 25% of the continent's GDP (OECD and FAO 2016; World Bank Group 2016). One cannot overstate the importance of agriculture to Africa's economy. Horticulture, in particular, plays an important role in the region's agricultural landscape. However, African farmers face various risks, including extreme weather events, poor infrastructure, limited access to financial resources, and market instability (World Bank Group 2015). The unpredictable rainfall patterns, droughts, and floods brought on by climate change have worsened these risks, jeopardizing agricultural initiatives. In light of the increasing stringency of sanitary and phytosanitary (SPS) regulations, as well as rigorous private standards, it is paramount that horticulture farmers, particularly from developing countries, establish solid compliance mechanisms (Phologane et al., 2024)
East Africa is a key player in the horticulture sector, particularly in exporting and producing flowers, fruits, and vegetables. The sector has enormous potential that remains untapped due to various constraints and challenges at all stages of the supply chain, from input supply to market access and consumer preferences (International Centre for Evaluation and Development, 2022).
Just like many developing countries in Africa, the agriculture sector has dominated Kenya's economy, with the horticulture subsector (fruits, cut flowers, and vegetables) being the third leading contributor to agricultural GDP after tea and dairy (KNBS, 2022). The worldwide horticulture market is expected to grow at a compound annual growth rate (CAGR) of 10.2% from its estimated USD 20.77 billion in 2021 to USD 40.24 billion by 2026 (World Bank, 2021).

Significant advancement in the agricultural sector, and the growing penetration of sustainable horticulture practices, is among the crucial considerations influencing the market dynamics (Nzomo et al, 2022). Kenya's horticulture sector employs more than six million Kenyans directly and indirectly and significantly contributes to the Gross Domestic Product (GDP) (KNBS, 2022).
Additionally, the industry supplies raw materials to the industrial sector and has increased farm profitability due to increased output and foreign exchange revenues from exports.

Statistics show that the horticulture export earnings in Kenya rose from Ksh 115.3 billion in 2017 to a high of Ksh 157.7 billion in 2021, an increase of Ksh 42.4 billion, making it one of the largest single contributors to the growth of the economy (Osoro et al,2024; FPEAK, 2023). Kajiado South Sub- County is an arid and semi-arid area (ASALs) in Kenya. Horticulture and cattle farming are the major economic

activities undertaken in this area. The farming in this region is done under irrigation schemes and in greenhouses due to the extreme weather conditions experienced in this area. Risk management is not new to Kenya, and the Government has a long track record of investment in risk mitigation, transfer, and coping mechanisms (FAO,2016). The government of Kenya has started several new projects to address the most serious hazards facing the nation, and Kenya's Vision 2030 acknowledges the need to improve the country's current risk management systems (Osoro et al., 2024)

To plan for future improvements, organizations can use performance measurement to assess project performance and gain insight into past project successes and failures. (Hwang, Tan & Sathish, 2015). Project performance simply refers to how well a project is attaining its outlined goals and objectives. It is a measure of the effectiveness, efficiency, and overall success of the project over time. Research indicates that successful project performance occurs when the project is delivered on budget, on schedule, and according to the various stated specifications and quality expectations, and achieves the planned outcomes from the outset. Key Performance Indicators (KPIs) are utilized by project managers to monitor and assess performance in many areas, including deadlines, time, and scope; stakeholder engagement; and customer satisfaction. Risk management benefits organizations, projects, and stakeholders by addressing risk at all levels and ensuring operational effectiveness in executing risk management effectively (Hilson, 2005). Sustainable agricultural approaches and practices offer alternatives for growing food and other agricultural products at a low cost to the environment while not compromising accessibility and availability to food security or the overall well-being of future generations (Robertson, 2015). Risk management practices massively improve the performance of horticultural projects, but are not broadly adopted to date, leaving farmers at risk of losing their livelihoods. The study sought to determine various risk management practices adopted by horticulture farmers in Kajiado South Subcounty and their influence on performance of the projects.

1.2 Statement of the problem

Diversified small-scale agriculture shows promising profit potential which makes horticulture stand out as a distinct agricultural subsector crucial for our agricultural advancement (World Bank, 2020). Climate changes pose a great risk to the sustainable growth and productivity of Kenya’s agricultural sector because of the extreme occurrences like drastic temperature changes, droughts, and floods (Ngugi et al, 2020). According to Partrick et al. (2020), since horticultural crops require a lot of water and have stringent temperature requirements, they are especially vulnerable to climate change. Temperature increases and variations in rainfall cause drought or floods, a shortage of water for irrigation, and pest and disease outbreaks that might impact an area's viability for horticulture crop cultivation. A report by the County Government of Kajiado, Ministry of Agriculture, indicates that agriculture is one of the main key drivers of the economy of the county and is critical in attaining the 10% economic growth rate, as envisioned by the Kenya Vision 2030. A study conducted by Patrick et al., (2020), in Kiambu and Kajiado Counties, “Climate resilient horticulture for sustainable County Development in Kenya’ indicate that farmers are aware of climate change and its effects on horticulture. The Kenyan government and various stakeholders have initiated several programs to promote risk management practices, as evident in dairy and horticulture production systems (World Bank, 2015). Despite these initiatives, risk assessment remains a challenge for many small and medium-sized horticultural projects, impacting both their performance and long-term viability.

1.3 Objective of the study

To determine the role of risk assessment in the performance of selected horticultural projects in Kajiado South Sub-County.

1.4 Significance of the Study

This research findings could benefit horticulture farmers in Kajiado South Sub-County and the wider region in Kenya by establishing how specific risk assessment practices influencing the performance of horticulture projects. The results could inform farmers on which risk management strategies are most effective, thereby enhancing decision-making and improving outcomes. It further added value to other horticultural enterprises by helping them understand how to identify and manage a range of potential challenges, enabling them to apply the study's insights to enhance performance in their own operations. The results could also guide policymakers in developing effective horticultural policies, as evidence from the study showed that effective risk management allows project managers to anticipate and mitigate unexpected challenges, thereby improving project outcomes through timely completion, cost control, and quality assurance.

1.5 The Conceptual Framework

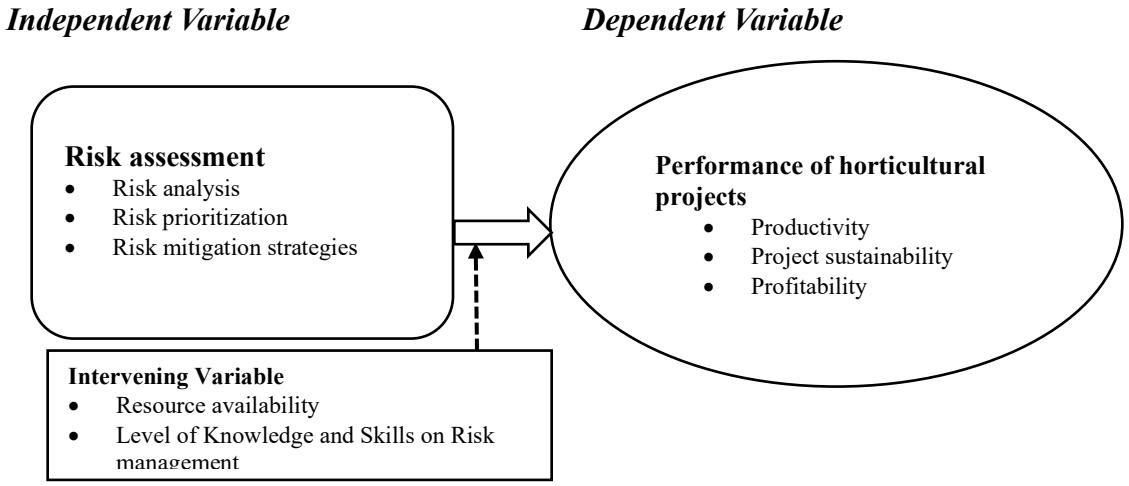

Figure 1: *The Conceptual Framework*
Source: *Own Conceptualization, 2024*

1.6 The Literature review

In this section, theoretical and empirical review on the role of risk assessment on the performance of selected horticultural projects are presented.

1.6.1 Theoretical Review

Risk Management Theory

The theory of risk management has been shaped both by classical economists and modern organizations. Frank H. Knight (1921) is among the first to differentiate between measurable risk and immeasurable uncertainty, laying the foundation for later risk theories. The Project Management Institute (PMI) also includes risk theory in its PMBOK Guide, outlining a structured process for the risk management of projects that includes identification, analysis, response planning, and monitoring (Project Management

Institute, 2021). Douglas Hubbard (2020) promotes quantitative risk analysis, opposing approaches based on intuition and advocating for evidence-based decision-making. Additionally, the International Organization for Standardization (ISO) established the ISO 31000:2018 guidelines that demand the incorporation of risk management into every organizational governance and strategy level (International Organization for Standardization, 2018). Kaplan and Mikes (2012) took a practical stance by categorizing risks into preventable, strategic, and external, hence enabling organizations to tailor their approach to risk in accordance. These theorists and institutions have formulated a sound basis for understanding and managing risk in various settings, including projects.

This study adopted the Project Management Institute risk management approach, which includes risk identification, risk assessment, mitigation, and monitoring. This theory aligned with study since horticultural projects face various risks affecting their productivity and profit generation that include pest damage and market prices alongside climate conditions and financial stability. Using the risk management theory, horticulture farmers can create strategies that use resources such as insurance, irrigation, crop diversification, integrated pest management (IPM), and financial planning to lessen the risk to their initial investments and support sustainable project outcomes. Through the application of concepts in Risk Management Theory, the research can examine analytically how risks are valued and measured in chosen horticultural projects, the nature of risk avoidance mechanisms whether formal or adopted informally and how such strategies align with important performance indicators like productivity, profitability, and sustainability (Hillson & Webster, 2007). The theory enables an evaluation of how risk management enhances project outcomes in the risky horticultural sector (Kerzner, 2017). Identifying risks effectively allows project managers to identify risks early on. Tools for identifying risks related to horticulture include SWOT analyses, brainstorming, and other techniques to understand associated risks (e.g., pests and disease outbreaks), climate change, and changes in policies, to name a few. Risk analysis typically involves assessing the probabilities and/or likely effects of identified/driving risk components. Karfis (2024) stated that risk analysis had a high correlation to project success across various business promotion rates in Brazil.

Risk levels may be analyzed using quantitative approaches such as statistical modeling to rank them, considering the effects on global horticulture. Studies indicate that employing risk response strategies such as risk transfer and risk prevention positively affect project performance (Maitete, 2004). If risks are properly monitored, these risks can be handled when they arise, and this leads to improved project performance and stability. The developments in technology, such as artificial intelligence, machine learning, and big data analytics, have changed the landscape of risk management by allowing real-time tracking and more accurate predictions of risks (McAfee & Brynjolfsson, 2012). The systematic method of Risk Management Theory enables projects to discover risks and then study them for better control, which minimizes losses and generates positive performance results (PMI, 2021).

Despite its organized nature, Risk Management Theory has substantial limitations. To begin with, it tends to over-assume predictability based on the assumption that every risk is measurable and identifiable, a very unrealistic expectation under dynamic agricultural conditions with climatic and market uncertainties (Hubbard, 2010). Moreover, the theory's genesis in corporate and industrial environments restricts its suitability for smallholder or community-oriented horticultural initiatives, where socio-economic and cultural factors have a bearing (Tadele & Manyena, 2009). In addition, risk management adoption could be time- and technically requiring, as well as financially intensive inputs that might not

be easily accessible in rural areas (IFAD, 2021). Finally, the theory tends to disregard behavioral and cultural factors that affect risk perception and reaction, thus undermining the local decision-making mechanisms necessary for the success of a project (Slovic, 2000).

1.6.2 Empirical Review

Risk analysis and the performance of horticultural projects

According to the Project Management Knowledge Book, 6th edition, risk analysis involves evaluating project risks that have been identified by comparing their likelihood and effect, and other characteristics to develop a priority for action. Every project has risks, even though many project managers assume that their projects will be successful without analyzing risk (Raz et al.,2002). Market globalization and rising competition in the agricultural field worldwide produce unstable income which demands risk analysis for good decision-making (Vaphiades, 1998). Risk analysis profoundly affects the effectiveness of horticultural crops throughout Europe and Asia since it shapes production practices and policy creation and environmental sustainability standards. Risk analysis enables understanding of three main uncertainty factors including climate variability along with market shifts and pest control operations which impacts farmers plus decision-makers toward better crop production while sustaining sustainability.

Adequate risk assessment systems need to be developed because the effects of climate change represent major threats to agricultural production (Jia-Hua, 2012). Probabilistic climate forecasts develop through collaborative modelling technology to support horticultural adaptive management programs (Jia-Hua, 2012). Risk analysis of pesticides becomes essential for safe horticultural activities because careless pesticide use in developing nations produces health problems for residents. The combination of Good Agricultural practices (GAP) with appropriate monitoring systems serves to reduce pesticide-related risks while ensuring better quality and safety of the harvested crops (Mahapatro & Rajna, 2020). The development of horticulture projects in Africa strongly depends on risk assessment to recognize potential challenges that could affect project achievement through security strategies. An organized risk analysis strategy finds essential risk locations which produce effective methods to boost sustainability and resilience on African horticulture operations. Access to finance along with market price instabilities represent the most substantial obstacles to horticultural project success.

The implementation of projects faces challenges because of complicated legal frameworks which exist in regulations (Adelhardt & Berneiser, 2024). Ugandan smallholder farmers endure major financial challenges which stem from variable market prices and alarming risks related to fake agricultural products affecting their existing lifestyle (Mugagga, 2024). Climate change poses severe risks to horticulture throughout Africa as increased incidences of drought, flooding, and erratic rainfall patterns disrupt crop productivity. In Zimbabwe, for example, climate risks are assessed at every stage of the horticultural value chain, from input provision to post-production activities, necessitating integrated adaptive strategies (Dube, 2021). While risk assessment provides a theoretical basis for managing risk within horticultural projects, the broader contextual risks of socio-economic and environmental risks must also be considered. For example, climate risk assessments in Africa highlight that the continent is highly vulnerable to extreme weather events and requires integrated approaches that bring together risk assessment and sustainable development (Guo & Yang, 2024).

Horticulture is an important livelihood sector in Kenya and it is important in the economy and employment creation. This sector is not without a multiplicity of risks that affect sustainability, profit,

and productivity. Risk analysis enables stakeholders to identify risks while assessing them so they can manage risks for better resilience and growth in this industry sector. Efforts to comprehend the vulnerabilities within the horticultural value chain start with first performing value chain risk analysis. The identification of market pricing risks and pest outbreaks, and transport issues through methodical risk assessment enables stakeholders to create specific plans that minimize potential risks. Smallholder farmer resistance to value chain failures improves when farmer organizations obtain better market information capabilities (Musuva et al., 2015). The horticultural value chain innovations within Kenya face significant vulnerabilities from changes in the climate. It is crucial to comprehend the climate change effects on particular agricultural commodities to implement practical adaptation solutions. Farmers who need to address climate changes select resistant crops and construct irrigation systems to minimize their climate risks (Patrick et al., 2020).

Water scarcity and pollution pose important challenges in horticultural production. Making sustainable investments in water regulation practices through pricing mechanisms allows horticulture operations to cut environmental degradation significantly. Business entities throughout the supply chain can participate in sustainable water usage policies through water sustainability agreements, according to Kuhn et al. (2016) and Mekonnen & Hoekstra (2010). A chief chance exists for Kenyan horticultural producers to trade globally, while specific potential hazards emerge simultaneously. Agricultural produce gets rejected by markets, and farmers experience monetary loss when producers fail to follow current regulations. Farmers, together with exporters, need to utilize different pest management methods to reduce risk while increasing technological research along with regulatory compliance partnerships (Lengai et al., 2022). Smallholder farmers face noticeable risks from EurepGAP sustainability standards, which serve to open international market opportunities. The market survival of smallholder farmers demands specific training support along with certification support to successfully meet industry requirements (Calisti & Holtmaat, 2021; Mausch et al., 2006). The proper management of horticultural risks depends heavily on effective cooperation and institutional planning between all stakeholders in the agricultural industry. The sector's ability to tolerate risks will increase substantially when institutions receive more capacity-building and actor coordination strengthens and participatory decision processes develop (Kanyua, 2020; Matui et al., 2016).

Private sector organizations are essential to decreasing horticultural project-related risks. Through technical guidance combined with market intelligence and agricultural training delivery from private firms, farmers strengthen their business effectiveness in domestic and international trading territories (Katothya et al., 2020; Zhou, 2015). Horticulture risk management incorporates technological innovations and practices as essential procedures. The generation of agricultural climate atlases supplies farmers with climate variability data to utilize during planting and irrigation decision-making. The implementation of sustainable consumption and production techniques helps both minimize horticulture's environmental impact and create higher profitability (Horst et al., 2022; Aseto et al., 2022).

The process of opening export opportunities for smallholder farmers becomes restricted because of information asymmetry, costs, and negotiation expenses. Through market information and transaction process investments, smallholder farmers would be able to diminish costs that prevent them from participating in export markets (Karing'u et al., 2021). The operations and performance of IT projects are influenced by risk analysis activities according to the findings of Ouma et al. (2020). Research aims to investigate the safety management techniques alongside social approaches and other forms of

management utilized by horticulture farmers in Kajiado South sub-county together with their impact on the project outcomes of horticulture.

1.7 Research Methodology

Research Design: This research utilized a convergent parallel research design, combining both qualitative and quantitative methodologies to develop a comprehensive understanding the role of risk assessment on the performance of selected horticultural projects in Kajiado South Sub-County. This design was suitable for the study as it allowed for the simultaneous collection of data, analyzing the two data strands independently, and triangulating the results to identify the agreement and differences. The quantitative component involved the use of structured questionnaires to gather numerical data on risk management practices and project performance. Concurrently, the qualitative component involved key informant interviews (KIIs) with project managers, extension officers, and other relevant stakeholders to explore perceptions, motivations, and contextual factors influencing the outcomes.

Study Area: Kajiado South Sub-County, one of the main administrative divisions of Kajiado County in Kenya, served as the study area. The sub-county stretches from the Tanzanian border in the south to Kajiado Central in the north and Taita Taveta County in the east (Government of Kenya, 2019). The region is characterized by semi-arid terrain and is home to Amboseli National Park, a key attraction and site for conservation projects (Kenya National Bureau of Statistics [KNBS], 2020). The local population mainly comprised the Maasai community, who traditionally practiced pastoralism.

Target Population: The target population for this study consisted of stakeholders involved in the implementation of horticultural projects in Kajiado South Sub-County. These included horticultural farm owners, county agricultural officers, and project managers from non-governmental organizations (NGOs) operating within the horticulture sector. Farmers were the primary respondents, as they were directly engaged in horticultural activities and possessed firsthand knowledge of risk identification, assessment, management, and monitoring. According to a report by the Netherlands Development Organization, four Small Business Organizations (SBOs) operated within the sub-county: Eporo Women Group (SHG), Namelok Vegetable Growers (CBO), Friends of Kilimanjaro Initiative (CBO), and Rombo Cooperative Society. Officials from the Ministry of Agriculture in the county government contributed perspectives on agricultural policy and climate adaptation measures.

Table 1: Target Population

Small business organizations (SBOs)	Target population
Friends of Kilimanjaro Initiative (CBO)	600
Namelok Vegetable Growers (CBO)	47
Eropo Women Group (SHG)	70
Rombo Farmers Cooperative Society	350
County Government Department of Agriculture	3 officers
Agricultural Sector Development Support Programme (ASDSP	1project manager
County Government Department of Agriculture,	1 project manager
Total	**1,072**

Source: *Netherlands Development Organization Report*

Sample size and sampling procedure: From the target population, the researcher used simple random sampling techniques to determine the sample size from the population of the four organizations, and the proportional stratified sampling method to draw a proportionate sample from each group. Purposive

sampling was used to select key informants, including project managers of the horticulture projects in Kajiado South Subcounty and county agricultural officers.
Using the simple random sampling technique:
$n=N/1+N(e^2)$ =
where; n = Sample size,
N =The population size
Margin of error (e) =5%
N= 1072
$n=1072/1+1072(0.05^2)$
n=1072/1+1072(0.00245)
n=1072/1+2.68
n=1072/3.68
n=291
Total sample =291

Table 2: Sample and Sampling Techniques

Target population	Total Population	Sampling Technique	Sample Size
Friends of Kilimanjaro Initiative (CBO)	600	Stratified sampling	161
Namelok Vegetable Growers (CBO)	47	Stratified random sampling	13
Eropo Women Group (SHG)	70	Stratified random sampling	19
Rombo Farmers' Cooperative Society	350	Stratified random sampling	93
Kenya Climate Smart Agricultural Project (KCSAP) – World Bank	1	Purposive sampling	1 (Project Manager)
Agricultural Sector Development Support Programme (ASDSP)	3	Purposive sampling	1 (Project Manager)
County Government – Department of Agriculture	1	Purposive sampling	3 (Extension Officers)

Target population=1072 **Sample size=291**
Source: *Netherlands Development Organization Report*

Data Collection Procedures: Data was gathered from primary and secondary sources to offer a wide-ranging and well-supported set of findings. Primary data was obtained through the dissemination of structured, designed questionnaires to horticulture farmers, to also collect quantitative data about the role of risk assessment on the performance of selected horticultural projects in Kajiado South Sub-County. Additionally, key informant interviews (KIIs) also were conducted with agriculture officials and NGOs to gain qualitative insights. To uphold data integrity, validation, and quality assurance protocols was enacted, encompassing the cross-referencing of information across diverse sources, pre-testing of questionnaires, and proper preparation of the researcher. This methodical approach yielded a comprehensive understanding on the role of risk assessment on the performance of selected horticultural projects in Kajiado South Sub-County. Descriptive statistical methods were used to analyze the data,

allowing the researcher to comprehend the underlying properties of the study variables. Thematic analysis was used to analyze qualitative data.

Ethical Consideration: The researcher sought ethical approval from the institution and relevant authorities before the study. Participants were made aware of the study's objectives, and before data collection, the researcher got their consent. The confidentiality and anonymity of the respondent's answers was maintained throughout the study. Participants in the research had the choice to participate, with consent provided free of charge. The study method ensures protection from emotional, social, physical, or unnecessary risks. Fair treatment and honest behavior were provided. Access to certain questions remains voluntary, limiting privacy. The researcher requested university approval for data collection and authorization from the National Commission for Science, Technology, and Innovation (NACOSTI).

1.8 Study Findings

Response rate: The researcher used 291 structured questionnaires that were administered to the respondents. Of these, there were 271 returned questionnaires with a successful response rate of 93.1 percent. The questionnaires that were not returned or submitted inadequately were only 20 in number (6.8%) and hence are treated as a lack of responses to the questionnaires. The high response rate of 93.1 percent would be attributed to the researcher's established good rapport and trust with the respondents. The structured format of the questionnaire and pretesting may have enhanced clarity and ease of completion, making it more accessible to the targeted farmers (Sataloff & Vontela, 2021). A response rate of 70% and above is regarded as acceptable in survey-based research (Sami, Saeed, Shafiq, Abbas, Anum, Haider & Shahid, 2023).

Education attainment

The study sought the education level attained by the participants.

Table 3: Educational Attainment of the respondents

Education Level	Frequency (n)	Percentage (%)
No formal education	32	11.8%
Primary school	93	34.3%
Secondary school	130	48.0%
Tertiary education	16	5.9%

Source: *Field data, 2025*

Most respondents (48.0%) had secondary school education, while 34.3% had only completed primary school. A smaller segment had no formal education (11.8%), and just 5.9% attained tertiary-level education. These results suggest that the majority of horticultural farmers possess at least basic literacy, which is essential for tasks such as recordkeeping, understanding agricultural inputs, and interacting with extension officers. The low level of tertiary education may be due to educated individuals seeking employment outside agriculture or running agribusinesses at more commercial levels (Mwangi & Kariuki, 2020). Enhancing agricultural literacy and technical training can improve adoption of innovations and farm efficiency.

Crop farmed

The study established the main crop categories farmed in Kajiado south subcounty.

Table 4: Main Crop Farmed by Respondents

Crop Type	Frequency (n)	Percentage (%)
Vegetables	166	61.3%
Fruits	72	26.2%
Flowers	22	8.1%
Herbs	11	4.1%

Source: *Field data, 2025*

Vegetables were the most commonly farmed crops, reported by 61.3% of respondents. Fruits were grown by 26.2%, followed by flowers (8.1%) and herbs (4.1%). Vegetables like tomatoes, onions, cabbages, and kales are preferred due to shorter maturity periods, ease of cultivation under irrigation, and steady market demand (Gitau, 2023). Fruit farming, although popular, requires more land and longer periods before harvest. Flowers and herbs, often cultivated for niche or export markets, are grown by a few commercial-oriented farmers due to their need for specialized knowledge and higher input costs (HCDA, 2020; Emmanuel & Kaburu, 2024).

Years of Experience in Horticultural Farming

The farmers were asked to indicate the main crop they grow.

Table 5: Years of Experience in Horticultural Farming

Years of Experience	Frequency (n)	Percentage (%)
Less than 2 years	26	9.6%
2–5 years	59	21.8%
6–10 years	140	51.7%
More than 10 years	46	17.0%

Source: *Field data, 2025*

The study revealed that 51.7% of the respondents had 6–10 years of experience in horticultural farming. An additional 21.8% had 2–5 years of experience, while 17.0% had more than 10 years. Only 9.6% were relatively new farmers with less than 2 years of experience. The data indicate that most farmers have significant experience, which may enhance productivity through better knowledge of local weather patterns, soil conditions, pest management, and market behavior. New entrants may still be acquiring skills, suggesting the need for continued capacity-building initiatives (Kagwiria et al., 2021).

Risk analysis and Performance of horticultural projects in Kajiado south subcounty

The study analyzed the descriptive statistics of the respondents' opinions on the risk analysis Additionally; the study assessed the association between the risk analysis and performance of horticultural projects in Kajiado south subcounty using bivariate Pearson correlation. The simple linear regression examined the predictive ability of risk analysis on the performance of horticultural projects in Kajiado south subcounty. Risk analysis was operationalized with Risk assessment, risk prioritization and risk mitigation strategies

Table 6: Respondents' Opinion on risk analysis

Statement	SD	D	M	A	SA	M	SD
This project regularly assesses the likelihood and impact of risks.	2 (0.7%)	10 (3.7%)	67 (24.7%)	145 (53.5%)	47 (17.3%)	3.83	.780
Proper risk assessment has helped improve my farm's profitability.	3 (1.1%)	9 (3.3%)	100 (36.9%)	117 (43.2%)	42 (15.5%)	3.69	.813
The farmer actively participates in risk assessment activities in the horticultural project.	1 (0.4%)	8 (3.0%)	71 (26.2%)	133 (49.1%)	58 (21.4%)	3.88	.785
Risk assessment helps in setting priorities for resource allocation.	3 (1.1%)	6 (2.2%)	67 (24.7%)	145 (53.5%)	50 (18.5%)	3.86	.776
There is a well-defined risk evaluation framework that enhances project planning.	10 (3.7%)	17 (6.3%)	68 (25.1%)	127 (46.9%)	49 (18.1%)	3.69	.961
Risk assessment is time-consuming and does not benefit the farm.	5 (1.8%)	11 (4.1%)	69 (25.5%)	138 (50.9%)	48 (17.7%)	3.79	.847
This project does not conduct a risk assessment before implementing new strategies.	4 (1.5%)	4 (1.5%)	74 (27.3%)	127 (46.9%)	62 (22.9%)	3.88	.826
Risk assessment does not influence the performance of this project.	2 (0.7%)	13 (4.8%)	66 (24.4%)	138 (50.9%)	52 (19.2%)	3.83	.817
This farm lacks a systematic process for assessing risks.	5 (1.8%)	4 (1.5%)	57 (21.0%)	145 (53.5%)	60 (22.1%)	3.93	.809
As a horticulture farmer, I do not evaluate risks because they are unpredictable.	2 (0.7%)	4 (1.5%)	61 (22.5%)	153 (56.5%)	51 (18.8%)	3.91	.730
Aggregate composite score						**3.83**	**.514**

Source: *Field data, 2025*

The findings indicate that horticultural farmers in Kajiado South Sub-County generally acknowledge the importance of risk analysis in project performance (Mean = 3.83; SD = 0.514). A majority of the respondents (53.5% agreed and 18.5% strongly agreed) stated that risk assessment helps in setting priorities for resource allocation (Mean = 3.86; SD = 0.776). Farmers also reported active participation in risk assessment activities (Mean = 3.88; SD = 0.785), with 53.5% agreeing and 17.3% strongly agreeing that their projects regularly assess the likelihood and impact of risks (Mean = 3.83; SD = 0.780). These results suggest that risk analysis is partially embedded in decision-making processes. This supports the findings of Umwari, Kamuhanda & Nyamweya (2021), who found that smallholder farmers recognize the value of risk assessments in improving operational efficiency. Likewise, Ngunju (2022) emphasized that prioritizing risks enables better resource allocation and strategic planning in horticulture.

Qualitative data reinforced these observations. A project manager noted: *"…Risk assessment is key. Before we allocate money to anything—inputs, irrigation, marketing—we analyze what could go wrong…"* (KII_002, Male, 11th June 2025). Another informant emphasized farmer participation: *"…We try to involve farmers in every risk analysis meeting, especially when introducing a new crop or technology…"* (KII_003, Male, 11th June 2025). These insights highlight the perceived strategic importance of risk analysis.

However, significant gaps emerged between conceptual appreciation and structured application. A majority of respondents (53.5% agreed and 22.1% strongly agreed) indicated that farms lack a systematic process for assessing risks (Mean = 3.93; SD = 0.809). Additionally, 75.3% believed that risks are not

evaluated because they are seen as unpredictable (Mean = 3.91; SD = 0.730). This view was echoed in the qualitative data: *"…We know risks are there, but most are beyond our control like drought or sudden disease outbreaks, so we just wait and respond…"* (KII_004, Female, 11th June 2025). Similarly, 69.8% of respondents indicated that risk assessments are not conducted before implementing new strategies (Mean = 3.88; SD = 0.826). This reactive approach weakens long-term planning. One extension officer stated: *"…New activities are often launched without formal risk evaluation because of pressure to deliver fast results…"* (KII_006, Female, 11th June 2025).

Respondents also expressed skepticism about the tangible benefits of risk analysis. Over 70% agreed or strongly agreed with the statement that risk assessment does not influence project performance (Mean = 3.83; SD = 0.817), and more than two-thirds felt it was time-consuming and not beneficial (Mean = 3.79; SD = 0.847). A project manager commented: *"…We rarely see changes in yield or income because of risk assessment, it's more theoretical than practical here…"* (KII_001, Male, 11th June, 2025).

Furthermore, only 43.2% agreed and 15.5% strongly agreed that proper risk assessment has improved farm profitability (Mean = 3.69; SD = 0.813), and responses to the existence of a well-defined risk evaluation framework were similarly moderate (Mean = 3.69; SD = 0.961). Another key informant remarked: *"…We don't have a specific framework for evaluating risks. Each officer or farmer decides on their own how to handle it…"* (KII_005, Male, 11th June 2025). These results point to a disconnect between theoretical understanding and practical implementation. Farmers conceptually value risk analysis but lack the tools, training, and institutional frameworks needed for routine application. This reflects findings by Ngunju (2022), who noted that technical and structural barriers continue to undermine effective risk analysis in smallholder farming in Kenya.

Simple Linear Regression: Risk Analysis and Project Performance

A simple linear regression was performed to determine whether risk analysis significantly influences the performance of horticultural projects in Kajiado South Sub-County.

Model Summary. The model summary was analyzed to assess how much the risk analysis explains the total variance in the performance of horticultural projects.

Table 7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.793	0.629	0.627	2.992

Source: *Field data, 2025*

The model yielded an R Square of 0.629. This indicated that risk analysis alone accounts for 62.9% of the variance in project performance of horticultural projects, suggesting risk analysis is a dominant factor in explaining performance differences across horticultural projects. The adjusted R^2 value of 0.627 further confirms the robustness of the model after correcting for model complexity. The results agreed to those of Eshun and Chan (2021) that structured risk analysis practices reduce uncertainty, enhance planning accuracy, and improve resource allocation in development projects.

The ANOVA was analyzed as part of the regression analysis to test the significance of the model as whole.

Table 8: ANOVA Table

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	4079.632	1	4079.632	455.713	.000
Residual	2408.140	269	8.952		
Total	6487.771	270			

The ANOVA results showed that the model was statistically significant, F (1, 269) = 455.713, p <=.000. This means that the inclusion of risk analysis as a predictor significantly improves the ability to explain project performance. the findings married those of Anyango ET AL. (2022) that in a resource-sensitive sectors like horticulture, managing and analyzing risks related to climate variability, pests, and market volatility is vital for project stability and growth.

Table 9: Coefficients Table

Predictor	B	Std. Error	Beta	t	Sig.
(Constant)	13.417	1.197		11.210	.000
Risk Analysis	0.653	0.031	0.793	21.347	.000

Based on the B coefficients the regression equation was created in form of linear regression model
Project Performance=13.417+0.653Risk Analysis.
Its intercept value at constant was 13.417 and this signified the projected performance of the project when Risk Analysis is 0. The outputs show the coefficient of the B coefficient in risk analysis (B = 0.653) which means that by increasing risk analysis practices by unit, the anticipated effect is 0.653 units increase in performance of the project when all other factors are held constant. The standardized coefficient of Beta value of 0.793 indicated extremely high (positive) and statistically significant (p =.000) in the research of risk analysis on the dependent variable. This strong and significant coefficient confirms that effective risk analysis is a powerful enabler of success in horticultural projects in Kajiado south sub-county. Further, Otundo (2024) noted that the ability of NGOs and farmer groups to anticipate, assess, and proactively manage risks fosters resilience, thereby improving not just efficiency but also long-term sustainability.

1.9 Conclusion

After carrying out this study, risk analysis it was concluded that, risk analysis was a stronger predictor of project performance. The findings demonstrated that structured evaluation of risk impacts, prioritization of response actions, and informed planning significantly improved horticultural productivity, profitability, and sustainability. The study therefore concluded that enhancing risk analysis practices was critical to strengthening performance of the horticultural projects.

1.10 Recommendations

Recommendation for Practice: Stakeholders in horticulture, including cooperatives and agribusinesses, should invest in capacity building on risk analysis techniques such as risk ranking, probability impact matrices, and scenario planning to enhance decision-making.
Policy: Policymakers should incorporate risk analysis modules in agricultural training institutions and curriculum, and mandate periodic risk assessments for funded horticultural projects to ensure proactive planning.

Theory: Scholars should advance theoretical models that contextualize risk analysis in smallholder settings, accounting for cognitive, resource, and institutional limitations that influence risk interpretation and action in rural agriculture.

References

Adelhardt, N., & Berneiser, J. (2024). Risk Analysis for Agrivoltaic Projects in Rural Farming Communities in SSA.

African Development Bank (AfDB). (2007). *Kenya - Small-scale Horticulture Development Project - Appraisal Report*.

African Development Bank (AfDB). (2022). *Enhancing financial resilience in African horticulture: A policy perspective.* AfDB Research Journal, 25(2), 112-128.

African Development Bank (AfDB). (2022). *Financing sustainable agriculture in Africa: The role of risk mitigation tools*. Retrieved from https://www.afdb.org

Astana, I. N. Y., Aribudiman, I. N., & Widajaya, A. A. N. A. A. (2024). Risk mitigation as a mediating factor in the relationship between top management support and construction project performance. *Journal of Applied Engineering Science*, *22*(2), 458-469

Aven, T. (2016). Risk Assessment and Risk Management: Review of Recent Advances on Their Foundation. European Journal of Operational Research.

Basel Committee on Banking Supervision. (2011). Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems.

Bernstein, P. L. (1996). Against the Gods: The Remarkable Story of Risk. Wiley.

Betts, S. C. (2003). Contingency theory: science or technology?. Journal of Business & Economics Research (JBER), 1(8).

Brynjolfsson, E., & McAfee, A. (2012). Thriving in the automated economy. *The Futurist*, *46*(2), 27-31.

European Commission. (2022). *Agricultural risk management in the European Union: Policy and funding mechanisms*. Retrieved from https://ec.europa.eu

European Horticulture Research. (2020). *Financial resilience in horticulture:Market diversification and cooperative networks*. Horticulture Review, 32(1), 22-45.

FAO (2024) Aquastat database, food and agriculture organization of the United Nations, Rome

FAO. (2021). The State of Food Security and Nutrition in the World 2021. Food and Agriculture Organization of the United Nations.

Feldmann, F., & Vogler, U. (2021). Towards sustainable performance of urban horticulture: ten challenging fields of action for modern integrated pest management in cities. *Journal of Plant Diseases and Protection*, *128*(1), 55–66.

Food and Agriculture Organization (FAO). (2021). *Climate change and horticultural production in Europe: Adaptation strategies*. FAO Report No. 234.

Food and Agriculture Organization (FAO). (2021). *Climate change adaptation and horticulture in Africa: Strategies for resilience*. FAO Policy Report No. 318.

Food and Agriculture Organization (FAO). (2022). *Climate-smart horticulture strategies in Africa.*

Food and Agriculture Organization (FAO). (2022). *Smallholder access to financial services in African agriculture*. Retrieved from https://www.fao.org

Government of Kenya. (2019). *Kenya County Development Profile: Kajiado County*. Ministry of Devolution and Planning.

Guo, Z., & Yang, R. (2024). *Climate Risk Profiles and Agricultural Vulnerability in Africa: A Multi-dimensional Analysis*. 1–5.

Hillson, D. (2005). Risk management: important or effective (or both). *Retrieved July*, *5*, 2009.

Hillson, D. (2017). *Managing risk in projects*. Routledge.

Indeed Editorial Team. (2025). What is risk identification? Definition and tools.

International Institute for Sustainable Development (IISD). (2021). *Agroecology and risk reduction in African horticulture.* IISD Policy Brief No. 22.

International Institute of Tropical Agriculture (IITA). (2021). *Impact of integrated pest management on smallholder horticulture in Africa*. IITA Research Paper Series, 27(4), 89-104.

James, F (2019, September). Analyst Prep. https://analystprep.com/study-notes/frm/enterprise-risk-management-theory-and-practice

Juma, L. (2016). *Factors Influencing The Performance Of Horticulture Projects In Kenya: A Case Of Bahati Constituency, Nakuru County*. University of Nairobi.

Kahan, D. (2008). *Managing risk in farming*. Rome: Food and agriculture organization of the United Nations.

Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision Under Risk. Econometrica.

Kasap, D., & Kaymak, M. (2007, August). Risk identification step of the project risk management. In *PICMET'07-2007 Portland international conference on management of engineering & technology* (pp. 2116-2120). IEEE.

Kenya National Bureau of Statistics (KNBS). (2020). *Kenya Population and Housing Census: Volume IV – Distribution by Socio-Economic Characteristics*. Government Printer.

Kisumbi, C. K., Mulwa, A., Mbugua, J. M., & Kikwatha, R. (2024). Enhancing performance of mango farming projects through participatory project managment. International Journal of Professional Business Review: Int. J. Prof. Bus. Rev., 9(9), 8.

Knight, F. H. (1921). Risk, uncertainty and profit. Boston: Houghton Mifflin

Korir, L. (2011). Risk management among agricultural households and the role of off-farm investments in Uasin Gishu County, Kenya. *Research Papers in Economics*.

Kujawski, E., & Angelis, D. (2010). Monitoring risk response actions for effective project risk management. *Systems Engineering*, *13*(4), 353–368.

Ladányi, M., Gaál, M., Hegedus, A., & Szenteleki, K. (2009). Climatic Risk Analysis in Horticulture-a Methodological Approach in Hungary. *CIGR Proceedings*.

Latif, M. H. (2024). Risk Assessment to improve the performance of Projects. *Deleted Journal*, *4*(1), 1–13. https://doi.org/10.62019/abbdm.v4i01.96

Mahapatro, G. K., & Rajna, S. (2020). *Insecticide Toxicity and Pesticide Residues in Horticultural Crops* (pp. 377–390). Springer, Singapore. 981-15-0794-6_18

McAfee, A., & Brynjolfsson, E. (2012). Big Data: The Management Revolution. Harvard Business Review.

Narita, D., Sato, I., Ogawada, D., & Matsumura, A. (2022). Evaluating the robustness of project performance under deep uncertainty of climate change: A case study of irrigation development in Kenya. Climate Risk Management, 36, 100426.

Nyindha, I., & Kamaara, M. (2024). DATA ANALYTICS AND PROJECT MANAGEMENT PERFORMANCE IN NON-GOVERNMENT ORGANIZATIONS IN NAIROBI COUNTY, KENYA. International Journal of Social Sciences Management and Entrepreneurship (IJSSME), 8(1).

Nzioka, G. E. S. (2021). Effect of operational management practices on the organization productivity of flower farms in Kenya (Doctoral dissertation, Strathmore University).

Obondi, K. C. (2020). *The Relationship Between Project Risk Monitoring, Control Practices, and Project Success in Construction Projects*. Northcentral University.

Ochieng, C., Mutua, J., & Njoroge, R. (2021). *Global certification and market access for African horticultural exports*. African Journal of Agribusiness, 29(2), 112-129.

Odhiambo, R., Masinde, P., Arimi, J., Owiti, B., Maitethia, D., Nawiri, P., ... & Koomen, I. (2022). 69. Enhancing partnerships for industry-led vocational training and education (e-pivot) in the horticulture value chains of Kenya. *African Journal of Science, Technology and Social Sciences*, *1*(1).

OECD. (2022). *Trade policies and horticultural risk management: An African perspective.* OECD Agriculture Outlook, 2022, 78-96.

Osoro, J., Noor, I., & Nyanga'u, S. (2024). SUPPLY CHAIN AGILITY AND PERFORMANCE OF HORTICULTURE EXPORTING FIRMS IN KENYA. International Journal of Social Sciences Management and Entrepreneurship (IJSSME), 8(3).

Project Management Institute. (2004). A Guide to the Project Management Body of Knowledge. 3rd Ed. Newtown Square, USA: Project Management Inc.

Project Management Institute. (2021). *A guide to the project management body of knowledge (PMBOK® Guide)* (7th ed.). Project Management Institute.

Smith, P. G., & Merritt, G. M. (2002). Proactive Risk Management: Controlling Uncertainty in Product Development. Productivity Press.

Tabor, K. M. (2023). Achieving multiple conservation goals with satellite-based monitoring and alert systems. University of Maryland, Baltimore County.

Vaphiades, G. (1998). *Crop Production Under Risk-Uncertainty Conditions* (pp. 47–59). Springer Netherlands.

Viola, F., Valerio Noto, L., Cannarozzo, M., Loggia, G. L., & Porporato, A. (2012). Olive yield as a function of soil moisture dynamics. *Ecohydrology*, *5*(1), 99-107.

Viswanathan, S. K., Tripathi, K. K., & Jha, K. N. (2020). Influence of risk mitigation measures on international construction project success criteria–a survey of Indian experiences. *Construction Management and Economics*, *38*(3), 207-222.

Waye, V. (2018). Commentary: Carbon footprints, food miles, and the Australian wine industry. Melbourne Journal of International Law. 9

World Bank. (2020). *Smallholder Horticulture Development Project in Kenya*.

World Bank. (2020). Transforming Agriculture in Africa: The Role of Horticulture. World Bank Group.

World Bank. (2021). *Project monitoring and evaluation in agriculture*.

World Bank. (2022). *Public-private partnerships in African agriculture: Opportunities and challenges*. Retrieved from https://www.worldbank.org