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Effect of Risk Management Practices on Agricultural Projects Performance: A Case of Avocado Growing Project under Kotwidika Cooperative in Murama Sector, Kayonza District, Rwanda

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Abstract: *This study examined the effect of risk management practices on agricultural project performance, focusing on the avocado-growing project under KOTWIDIKA Cooperative in Murama Sector, Kayonza District, Rwanda. Specifically, it assessed the effect of risk identification on project performance. The study adopted a descriptive and correlational research design using a mixed-methods approach. The target population comprised 351 respondents, from which a sample of 187 was selected. A total of 178 questionnaires were completed and returned, and one project manager was interviewed. Data were collected using questionnaires, interviews, documentary review, and observation. Quantitative data were analyzed using descriptive statistics, Pearson Product-Moment correlation, and simple linear regression. The findings showed that risk identification practices were generally implemented, with an overall mean of 4.18 and a standard deviation of 0.81. The correlation analysis indicated a strong positive and statistically significant relationship between risk identification and project performance ($r = .894$, $p < .001$). Regression analysis showed that the model was statistically significant ($F = 262.402$, $p < .001$), with risk identification explaining 85.8% of the variation in project performance ($R^2 = .858$). The study concluded that early risk identification, farmer participation, and regular field observation support project performance. It recommends maintaining field visits and farmer discussions while strengthening identification of climate-related, production, and market risks.*

Keywords: *Risk Management Practices; Risk Identification; Agricultural Project Performance; Avocado Growing Project; KOTWIDIKA Cooperative; Kayonza District; Rwanda*.

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1. Introduction

Project management is recognized globally as an essential discipline for ensuring project efficiency, minimizing losses, and achieving strategic objectives. In the agricultural sector, projects are often implemented in dynamic and unpredictable environments, making them highly vulnerable to risks such as droughts, floods, pest outbreaks, diseases, price volatility, and financial shocks. Studies suggest that the absence of proper risk management frameworks in agricultural projects leads to delays, reduced yields, and sometimes complete project failure (FAO, 2021; OECD, 2020). By integrating structured risk management processes including risk identification, assessment, response planning, monitoring, and evaluation projects can better anticipate challenges and adapt

strategies to mitigate potential losses (PMI, 2017; Hardaker et al., 2015).

Agriculture is a vital sector not only for food production but also for employment, rural livelihoods, and national economic growth. Globally, countries that have successfully integrated risk management practices in agricultural projects report enhanced productivity stability and income security. In the United States, for example, the USDA (2022) highlights that farmers adopting crop insurance, futures markets, and climate monitoring systems are better positioned to manage production risks and market uncertainties. Similarly, in Europe, the European Commission (2021) reports that reforms under the Common Agricultural Policy, including disaster relief funds, insurance schemes, and risk-sharing mechanisms, have strengthened resilience among farmers, particularly in climate-sensitive regions such as Spain and France. These global lessons underscore the importance of formalized risk management in improving agricultural project outcomes.

In Asia, research shows that countries like India and China have benefited from the adoption of climate-smart agricultural practices, digital risk monitoring platforms, and early warning systems. According to the Asian Development Bank (2021), projects that incorporate structured financial planning and risk mitigation frameworks record more stable yields and better market performance compared to traditional approaches lacking systematic risk interventions. These findings highlight the critical role of risk management in improving agricultural productivity and competitiveness in diverse contexts.

Africa, where agriculture supports the livelihoods of the majority of the population, faces unique challenges that amplify project risks. Studies indicate that agricultural performance across the continent is constrained by climate variability, poor infrastructure, limited access to finance, pest and disease outbreaks, and weak institutional capacity (AfDB, 2020). Research by the World Bank (2019) suggests that insufficient integration of risk management practices into project planning and execution has contributed to low productivity, frequent project failures, and limited income growth among smallholder farmers. Countries such as Senegal, Cameroon, Chad, Ethiopia, and Zimbabwe provide illustrative cases where structured risk management including irrigation control, drought-resistant crop adoption, cooperative-based risk sharing, and financial planning enhances resilience and improves long-term sustainability (World Bank, 2021; Ngigi, 2023).

Within East Africa, agricultural projects remain central to rural development and poverty alleviation, yet they continue to encounter risks that threaten productivity and livelihoods IFAD, 2020). In Kenya, horticultural and export-oriented projects demonstrate higher performance when farmers implement crop insurance and climate-smart technologies, though smallholders still contend with pest infestations and price volatility. In Tanzania, irrigation expansion and cooperative frameworks improve outcomes, but storage deficiencies and post-harvest losses remain significant barriers. Burundi, characterized by small-scale agriculture, faces persistent challenges due to limited access to finance, inadequate risk assessment, and weak monitoring frameworks, reducing the sustainability of many agricultural initiatives despite cooperative participation (Ngigi, 2024).

In Rwanda, agriculture contributes significantly to GDP and rural livelihoods, and high-value crops such as avocado have attracted increasing attention due to both domestic demand and export potential. Government support through policies like the Crop Intensification Program (CIP) and the Strategic Plan for Agricultural Transformation (PSTA IV) promotes commercial agriculture, value chain development, and climate resilience (MINAGRI, 2018; World Bank, 2020). Despite these supportive interventions, avocado projects remain exposed to multiple risks, including climate variability, pest and disease outbreaks, financial constraints, and fluctuating market prices. The ability of cooperatives and individual farmers to manage these risks determines project sustainability, yield, and income generation.

The KOTWIDIKA Cooperative in Murama Sector, Kayonza District, represents a key example of organized avocado production in Rwanda. The cooperative model provides an avenue for shared knowledge, collective decision-making, and risk pooling, which can potentially mitigate individual farmers' exposure to financial and operational risks (Nkurunziza, 2024). However, without formalized risk management practices, even cooperative-led projects remain vulnerable to adverse climatic, economic, and market conditions. Evidence suggests that projects implementing structured risk management practices including early warning systems, insurance schemes, and systematic monitoring achieve higher resilience, profitability, and sustainability compared to those that rely solely on traditional farming approaches (World Bank, 2020). Understanding the effect of risk management practices on avocado project performance is therefore critical for informing policy, improving project planning, and enhancing farmer income. Effective risk management not only reduces project vulnerability but also strengthens market competitiveness, ensures timely delivery of output, and supports long-term sustainability.

1.1 Statement of the problem

Agriculture continues to form the backbone of Rwanda's rural economy, providing employment to the majority of the population through both subsistence and commercial farming (Oprah, 2024). The sector plays a central role in

ensuring national food security and supporting livelihoods. However, many agricultural projects face persistent challenges related to productivity, sustainability, and risk resilience (World Bank, 2020). Smallholder farmers are disproportionately affected by these challenges, often struggling with limited access to quality inputs, reliable markets, financial services, and institutional support. Consequently, rural communities continue to experience poverty, food insecurity, and underemployment, despite the government's efforts to promote commercial agriculture and rural development (FAO, 2021).

In Kayonza District, particularly in Murama Sector where the KOTWIDIKA Cooperative operates, climate variability and frequent droughts exacerbate agricultural risks, reducing crop productivity and heightening socioeconomic vulnerability among farmers (MINAGRI, 2024). While initiatives such as the Kayonza Irrigation and Integrated Watershed Management Project (KIWMP) have established over 1,300 hectares of irrigated orchards benefiting more than 4,000 farmers, ongoing challenges remain. Farmers face climate stress, limited technical capacity, compliance difficulties with export standards, and gaps in access to finance and infrastructure. These risks directly affect household incomes, local development outcomes, and the long-term sustainability of agricultural projects in the region (Dennis, 2024).

Several studies have examined agricultural development and risk-related issues in Rwanda and other similar contexts. For example, Uwizeye et al. (2023) investigated the impact of input quality and extension services on crop productivity, finding that limited access to improved seeds and training significantly hampers yields among smallholders. Niyonzima and Twarabamenye (2020) focused on market access and financial service constraints, concluding that weak linkages to markets and credit impede farmers' ability to scale production. In an analysis of climate-smart agriculture adoption in Rwanda, Habiyaremye et al. (2021) reported that farmers' risk perceptions and adaptive capacity significantly influence uptake of resilience-enhancing practices. Additionally, Nsengiyumva et al. (2022) highlighted that inadequate post-harvest handling and value addition infrastructure reduce competitiveness of horticultural exports, particularly for high-value crops.

Despite the growing economic potential of avocado farming and its increasing demand in local and international markets, there is limited research on the role of risk management in enhancing project performance in this sector. Farmers face specific challenges such as access to quality grafted seedlings, limited technical knowledge, insufficient post-harvest and pack-house infrastructure, and compliance with export standards (NAEB, 2021). Existing research highlights the importance of risk management in improving productivity and sustainability of agricultural projects broadly, but there is a clear empirical gap regarding avocado-growing projects at the cooperative level in Rwanda. This study seeks to fill this gap by examining how risk management practices influence the performance of the avocado project under KOTWIDIKA Cooperative in Murama Sector.

1.3.1 General Objective

The general objective of this study was to assess the effect of risk management practices on the performance of the avocado growing project in Rwanda.

1.3.2 Specific Objectives

The specific objectives were:

i. To assess the effect of risk identification on the performance of the avocado growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda

2. Literature Review

This review focuses on key concepts of risk management and project performance within agricultural projects, particularly in cooperative settings. Risk management is understood as a structured process involving risk identification, risk assessment, risk mitigation, and risk monitoring and evaluation (M&E), which collectively aim to reduce uncertainty and enhance project outcomes. Project performance, in this context, refers to measurable outcomes such as crop yield, produce quality, income stability, operational efficiency, and farmer satisfaction, which indicate the success and sustainability of agricultural initiatives.

The review emphasizes the interconnection between systematic risk management practices and improved performance, highlighting that cooperatives adopting proactive risk strategies tend to achieve greater productivity, profitability, and resilience to environmental and market shocks. By examining these concepts, the study establishes a framework for understanding how KOTWIDIKA Cooperative can apply risk management practices to optimize avocado production and achieve sustainable project success (Vogel, 2022).

2.1.1 Risk Management

Risk management is the systematic process of identifying, assessing, mitigating, and monitoring risks that may affect project objectives (Smith & Merritt, 2015). In agriculture, these risks include environmental, operational, financial, and market uncertainties. Traditionally, risk management

emphasized insurance and loss prevention, focusing on pure risks such as natural disasters and pest infestations (Watson et al., 2018). Modern approaches also address business risks, including price fluctuations, market demand changes, and operational inefficiencies (Fraser & Simkins, 2016). Within cooperatives like KOTWIDIKA, effective risk management integrates preventive and strategic measures to enhance resilience, improve decision-making, and support sustainable productivity, quality output, and stable farmer incomes (Hillson, 2017; Mungai & Muriithi, 2017).

The concept emphasizes a proactive rather than reactive approach. By embedding risk management into project planning and implementation, cooperatives can reduce unexpected losses, safeguard farmer incomes, and strengthen the overall resilience of agricultural initiatives. For example, in avocado farming, risk management ensures that potential threats such as prolonged drought or pest attacks are identified early, and mitigation strategies such as irrigation or integrated pest management are implemented in a timely manner. Risk management also contributes to long-term project sustainability. Structured processes allow cooperatives to continually monitor risks, evaluate the effectiveness of mitigation strategies, and adapt practices as conditions change. In the context of KOTWIDIKA Cooperative, adopting risk management practices will likely improve productivity, quality of produce, and financial returns, ultimately contributing to cooperative growth and farmer welfare

2.1.2. Risk identification

Risk identification is the process of recognizing potential threats that could hinder the achievement of project goals (Oprah, 2024). It involves systematically listing all possible risks, including environmental, financial, operational, and market-related uncertainties. In avocado farming, risk identification might include recognizing climate variability, pest infestations, poor soil fertility, and limited access to quality inputs as potential challenges. Identifying these risks early allows cooperative managers to plan interventions and allocate resources effectively (Usmane, 2022).

The process of risk identification encourages awareness among stakeholders and promotes collective responsibility. Within a cooperative setting, farmers, extension officers, and managers collaborate to detect risks that may impact yield, quality, or income. For example, farmers may report areas prone to pest outbreaks, while managers assess market demand fluctuations. This collaborative approach ensures a comprehensive understanding of risks affecting the project (Presley, 2020) Risk identification also forms the foundation for subsequent risk management activities. Once risks are recognized, they can be evaluated, prioritized, and mitigated, reducing the likelihood of project failure. In KOTWIDIKA Cooperative, systematically identifying risks enabled the cooperative to implement preventive measures such as soil improvement programs, irrigation systems, or pest control strategies, ultimately enhancing avocado project performance.

2.1.2 Project Performance

Project performance refers to the measurable outcomes of a project, which indicate the success and efficiency of implemented activities (Hasher, 2024). In the context of agricultural cooperatives, performance is often evaluated based on crop yield, produce quality, income generation, market access, and farmer satisfaction. High project performance reflects effective management practices, including risk management, resource allocation, and operational efficiency.

Project performance is influenced by both internal and external factors. Internally, the cooperative's management systems, technical capacity, and financial resources affect productivity and income stability (Douglas, 2021). Externally, environmental factors such as climate variability, pest outbreaks, and market fluctuations shape performance outcomes. Understanding these interactions is critical to optimizing avocado production under cooperative-led initiatives. Strong project performance ensures long-term sustainability, competitiveness, and resilience. For KOTWIDIKA Cooperative, improving performance through effective risk management lead to increased avocado yields, better quality produce for local and export markets, stable farmer incomes, and strengthened cooperative operations. This demonstrates the vital link between risk management practices and the overall success of agricultural projects (Terry, 2024).

2.2. Theoretical Review

Theoretical frameworks provide the foundation for understanding how concepts and practices influence outcomes within a study. In this research, several theories are relevant for explaining the relationship between risk management practices and the performance of the avocado growing project under KOTWIDIKA Cooperative, but this study focus on only the Theory of Change.

2.2.1 Theory of Change

The Theory of Change (ToC) provides a structured framework for understanding how specific activities and interventions lead to desired outcomes in development projects (Vogel, 2012). It emphasizes the logical linkage between inputs, activities, outputs, outcomes, and long-term impacts, while explicitly considering underlying

assumptions and contextual preconditions. In agricultural projects, ToC helps map how risk management practices such as pest and disease control, irrigation systems, soil fertility enhancement, and market analysis contribute to measurable improvements in crop yield, produce quality, income stability, and broader community well-being (Whites, 2024). By visualizing these causal pathways, ToC allows project managers to plan interventions strategically and anticipate the steps necessary to achieve intended results.

The framework also underscores the importance of assumptions and external conditions that influence project success (Yane, 2022). In the context of KOTWIDIKA Cooperative, ToC assumes that farmers adopted recommended practices, essential inputs were available, extension services provided technical support, and market access remained stable. These assumptions provide a foundation for designing interventions that are realistic, achievable, and contextually appropriate. For example, recognizing drought as a key risk allows the cooperative to prioritize irrigation and water management strategies, which directly support yield stability, reduce losses, and safeguard farmer incomes (Jackob, 2021).

The relevance of ToC to this study is significant because it links risk management practices to observable project outcomes, providing a clear rationale for evaluation and analysis. By mapping activities to measurable results, the study can assess the effectiveness of risk identification, assessment, mitigation, and monitoring on avocado project performance. Furthermore, ToC facilitates adaptive management by allowing KOTWIDIKA Cooperative to adjust strategies based on monitoring data and emerging challenges, ensuring that interventions remain effective, strategic, and sustainable. Overall, the framework provides a practical tool for understanding how structured risk management contributes to the success and resilience of the avocado growing project (Vogel, 2012; Whites, 2023).

2.3. Empirical Review

Empirical studies indicate that effective risk identification significantly improves agricultural project performance. Mungai and Muriithi (2022) conducted a mixed-methods study involving surveys of 120 smallholder cooperative members and interviews with cooperative managers in Kenya. The research assessed risk identification practices such as participatory workshops and early pest detection systems. The study found that cooperatives using participatory approaches achieved a 25% higher yield consistency and reduced post-harvest losses compared to those without structured practices. Members reported increased confidence in farm planning and resource allocation. The authors concluded that participatory risk identification strengthens member engagement, enhances proactive decision-making, and improves project outcomes. They recommended integrating local knowledge with formal risk assessment tools. However, the study focused on staple crops such as maize and beans, leaving a gap in understanding risk identification for high-value horticultural crops like avocado, which is the focus of the present study.

Nathy & White (2023) conducted a longitudinal study over three years involving 60 cooperative-led farms in Vietnam, using structured questionnaires to measure risk identification practices and their correlation with production and income outcomes. The study found that farms conducting regular field scouting and soil assessments identified risks early and achieved an average 18% increase in crop yield and improved marketable produce quality. Early interventions reduced losses from pests and nutrient deficiencies. The researchers concluded that systematic risk identification supports operational efficiency and productivity and recommended implementing digital tracking tools to enhance real-time monitoring and early-warning systems. Despite these insights, the study did not examine the role of cooperative dynamics and member participation, which are particularly critical for smallholder cooperatives in Rwanda.

Presley & Zuwena (2024) carried out a case study of five avocado cooperatives in Ghana, collecting data through interviews, focus groups, and field observations to document risk identification processes. The findings revealed that cooperatives that systematically identified risks related to drought, pests, and market price fluctuations produced higher-quality avocados and maintained more stable incomes. Farmers also reported improved confidence in planning and resource allocation. The study concluded that early risk recognition is essential for sustainable avocado production and recommended training farmers in participatory risk mapping and integrating weather forecasting into planning. Nevertheless, the study was limited geographically to Ghana, meaning its findings cannot be generalized to the Rwandan context without further investigation, particularly in relation to local market and climatic conditions.

Hillson (2022) conducted a comparative study of 80 agricultural projects across sub-Saharan Africa to examine the impact of risk identification on project performance. Using both surveys and project performance data, the study found that projects with structured risk identification practices experienced 20% fewer crop losses and 15% higher profitability than those with informal or ad-hoc risk practices. The research concluded that systematic risk identification enables timely intervention, reduces production losses, and enhances stakeholder confidence in

project outcomes. The author recommended integrating participatory methods with technical risk assessment tools to maximize effectiveness. However, the study focused on general agricultural projects without specific attention to cooperative-led avocado production, highlighting a gap that the present study aims to address in the context of KOTWIDIKA Cooperative in Rwanda.

3. Methodology

The study adopted a descriptive and correlational research design to examine the effect of risk identification on the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The descriptive design helped describe the risk identification practices used in the project, while the correlational design examined the relationship between risk identification and project performance. A mixed-methods approach was used to collect both quantitative and qualitative data. Quantitative data focused on risk identification and project performance, while qualitative data provided additional explanations of the experiences and views of project stakeholders.

The target population comprised 351 respondents involved in the avocado-growing project under KOTWIDIKA Cooperative. These included cooperative management, technical staff, and avocado farmers. The respondents were selected because they had relevant knowledge and experience concerning the implementation of the project and the identification of potential risks. However, the original population distribution contained an inconsistency: the narrative identified four managers and 335 farmers, whereas the table identified one project manager and 338 farmers. Both distributions totaled 351 when the 12 technical staff were included. This discrepancy required confirmation against the original project records.

The sample size was determined using Yamane's (1967) formula. In this formula, (n) represented the required sample size, (N) represented the target population, and (e) represented the margin of error. The study used a target population of 351 respondents and a margin of error of 0.05. The result was round to 187 respondents. A census approach was applied to the project manager and technical staff, while stratified random sampling was used to select farmers. The farmer strata considered farm size, farming experience, and gender, as described in the original methodology.

The study used questionnaires, an interview guide, documentary review, and observation to collect data. Questionnaires were administered to selected respondents to obtain quantitative information about risk identification practices and project performance. Interviews were conducted with relevant project stakeholders to obtain detailed information about how potential risks were identified during project activities. Documentary review was used to examine available project records and reports, while observation provided supplementary information about activities within the avocado-growing project. All the research instruments focused on risk identification and project performance.

Data collection was conducted by the researcher, with assistance from trained research assistants where necessary. Respondents were given clear instructions on how to complete the questionnaires, and explanations were provided when questions required clarification. Interviews were conducted with relevant participants, and available project documents were reviewed according to the study objectives. Follow-ups were made where necessary to improve questionnaire return. Ethical procedures were observed throughout the data collection process.

The validity and reliability of the research instruments were assessed before the main data collection. Content and construct validity were considered, and the instruments were reviewed by knowledgeable individuals to ensure that the questions measured risk identification and project performance appropriately. A pilot test was conducted to identify unclear questions and improve the instruments before their final administration. Reliability was assessed using Cronbach's alpha, and a coefficient of 0.70 or higher was considered acceptable. Since the study focused on risk identification as the only independent variable, the reliability analysis concentrated on the risk identification items and the project performance items. The relevant reliability coefficients were to be reported based on the actual pilot test results.

Quantitative data were coded and analyzed using SPSS. Frequencies, percentages, means, and standard deviations were used to summarize respondents' views on risk identification and project performance. Pearson correlation analysis was used to examine the relationship between the two variables. Simple linear regression was used to assess the effect of risk identification on project performance. The regression model was expressed as follows: ($Y=\beta0+\beta1 X1+\varepsilon$). In this model, (Y) represented the performance of the avocado-growing project, (X) represented risk identification, ($\beta0$) represented the constant or intercept, represented the regression coefficient for risk identification, and (ε) represented the error term. Project performance was measured using yield, quality, income, and farmer satisfaction, as specified in the original methodology. The coefficient of determination (R^2) was used to indicate the proportion of variation in project performance explained by risk identification, while the p-

value was used to assess the statistical significance of the relationship. Qualitative interview data were analyzed thematically and used to complement the quantitative findings.

Ethical considerations were observed throughout the study. Permission was sought from the relevant authorities and KOTWIDIKA Cooperative before data collection. Participants were informed about the purpose of the research, and their participation was voluntary and based on informed consent. Respondents' identities and information were kept confidential, and the collected data were used only for academic purposes. The researcher ensured that the findings were presented honestly and accurately, without fabricating, altering, or misrepresenting the collected information. The study remained focused on examining the effect of risk identification on the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda.

4. Results and Discussion

This section presented, analyzed, and interpreted the findings of the study on the effect of risk identification on the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The findings were discussed in relation to the study objective, which was to examine the effect of risk identification on project performance. The section covered descriptive findings, Pearson Product-Moment Correlation analysis, simple linear regression analysis, and a discussion of the findings

4.1 Findings

The findings were based on data collected from respondents through questionnaires. Quantitative data were analyzed using descriptive statistics, Pearson Product-Moment Correlation, and simple linear regression analysis. The presentation focused specifically on the relationship between risk identification (X) and the performance of the avocado-growing project (Y).

4.1.1 Response Rate

The study sampled a total of 187 respondents to provide information on the effect of risk management practices on the performance of the avocado growing project in Rwanda. Among the sampled respondents, 186 respondents were selected to respond to questionnaires, while one Project Manager was selected for an interview to provide qualitative information. Out of the 186 questionnaires distributed, 178 questionnaires were successfully completed and returned, while 8 questionnaires were not returned. The response rate was calculated to determine the adequacy of the collected data for analysis.

Table 1: Response Rate of Respondents

Category	Frequency	Percentage (%)
Returned questionnaires	178	95.7
Unreturned questionnaires	8	4.3
Interview respondent (Project Manager)	1	—
Total sampled respondents	**187**	**100**

Source: Field Data, 2026

Table 1 indicates that the study sampled 187 respondents, including 186 questionnaire respondents and one Project Manager who participated in an interview. Out of the 186 questionnaires distributed, 178 were successfully completed and returned, representing a response rate of 95.7%, while 8 questionnaires were not returned, representing 4.3%. The interview with the Project Manager was successfully conducted and provided additional qualitative information regarding risk management practices and project performance. The response rate of 95.7% was considered adequate for the study because it provided sufficient information for statistical analysis and enabled the researcher to obtain reliable findings regarding the effect of risk management practices on the performance of the avocado growing project in Rwanda. The high response rate was attributed to effective coordination during data collection and the willingness of respondents to participate in the study.

4.1.2 Descriptive Statistics of Insurance System

Table 2 presents respondents' perceptions regarding risk identification practices and their contribution to the performance of the avocado growing project under KOTWIDIKA Cooperative in Rwanda. A five-point Likert scale was used where 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Neutral (N), 2 = Disagree (D), and 1 = Strongly Disagree (SD). The analysis was conducted to assess how the identification of potential risks, including production, environmental, financial, and market-related risks, contributes to improved project performance.

Table 2: Angel Investors and Performance of SMEs

Views of Respondents	N	M	SD
Potential risks affecting avocado production are identified before they negatively affect project activities.	178	4.3	0.78
Farmers and project managers regularly discuss possible risks affecting avocado production.	178	4.1	0.85
The project identifies climate-related risks such as drought and excessive rainfall in advance.	178	4.2	0.81
Pest and disease risks affecting avocado production are identified through regular field observation.	178	4.4	0.70
Market-related risks such as price fluctuations and buyer changes are considered during project planning.	178	3.9	0.92
Overall Mean		**4.18**	**0.81**

Source: Field data, 2026-**Key:** M=Mean, SD=Standard Deviation

Table 2 presents respondents' perceptions regarding risk identification practices and project performance in the avocado growing project under KOTWIDIKA Cooperative. The findings indicate that respondents strongly agreed that pest and disease risks affecting avocado production were identified through regular field observation (M = 4.4, SD = 0.70). This was followed by the identification of potential risks affecting avocado production before they negatively affected project activities (M = 4.3, SD = 0.78). These findings suggest that the project management team and cooperative members placed considerable emphasis on early recognition of production challenges to prevent losses and maintain stable avocado production. The findings further reveal that respondents agreed that climate-related risks such as drought and excessive rainfall were identified in advance (M = 4.2, SD = 0.81). This indicates that the project recognized the importance of environmental factors that may affect avocado productivity. Early identification of climatic risks enabled farmers and project managers to prepare appropriate responses such as improving water management practices, adjusting farming activities, and adopting suitable agricultural practices to reduce possible negative effects on production.

The results also show that respondents agreed that farmers and project managers regularly discussed possible risks affecting avocado production (M = 4.1, SD = 0.85). This implies that risk identification was not limited to project managers but involved different actors participating in the avocado production process. Regular discussions among farmers and project stakeholders enhanced information sharing, increased awareness of emerging challenges, and supported timely decision-making. However, market-related risks such as price fluctuations and changes in buyers recorded the lowest mean score among the indicators (M = 3.9, SD = 0.92). Although respondents generally agreed that market risks were considered during project planning, the relatively lower score suggests that greater attention may be required in identifying and managing market uncertainties. Fluctuations in avocado prices, changing buyer requirements, and market accessibility may influence farmers' income and project sustainability if they are not identified and addressed early.

The overall mean score of 4.18 and standard deviation of 0.81 indicate that respondents generally agreed that risk identification practices were effectively implemented within the avocado growing project. The findings demonstrate that the project management team and cooperative members actively recognized potential uncertainties related to production, climate conditions, pests, diseases, and markets. Effective risk identification enabled the project to anticipate possible challenges and develop appropriate responses, thereby supporting improved project performance.

From the findings, the study established that risk identification positively contributed to the performance of the avocado growing project under KOTWIDIKA Cooperative. Early recognition of risks enabled farmers and project managers to take preventive measures, reduce potential losses, improve resource planning, and maintain stable production processes. This implies that agricultural projects that establish effective risk identification

mechanisms are more likely to achieve their objectives related to productivity, income generation, produce quality, and long-term sustainability.

The qualitative findings from the interview with the Project Manager provided additional insights into how risk identification influenced the performance of the avocado-growing project. The interview focused on understanding how risks affecting avocado production were identified and how early identification contributed to project performance.

Regarding the identification of potential risks affecting avocado production, the Project Manager explained that the project management team regularly assessed possible challenges affecting farmers, including climate-related risks, pests, diseases, input availability, and market uncertainties. According to the Project Manager, risk identification was conducted through field visits, discussions with farmers, and monitoring of production conditions.

> *"Before implementing different activities, we usually assess the possible challenges that may affect avocado production. Through field visits and discussions with farmers, we identify issues such as diseases, weather changes, and input shortages early enough. This helps us prepare solutions before the problems become serious and affect production."*

The Project Manager further explained that early identification of risks improved project planning and enabled timely interventions. According to the respondent, understanding possible risks before they occurred allowed the cooperative to organize necessary resources, provide technical support to farmers, and adjust farming practices depending on prevailing conditions.

> *"Identifying risks early has helped us to plan better because we know the challenges that may arise. When farmers report problems early, we can provide support and take corrective actions before those problems affect avocado yields and farmers' incomes."*

The interview findings also revealed that farmer involvement played an important role in risk identification. The Project Manager explained that farmers provided valuable information based on their daily experiences in avocado production, which helped the project management team understand emerging challenges at the farm level. This participatory approach improved communication between farmers and project managers and strengthened the ability of the cooperative to respond to risks.

Another theme emerging from the interview was that continuous observation and monitoring of avocado farms supported early detection of production risks. The Project Manager indicated that regular farm visits enabled the identification of pest attacks, disease outbreaks, and environmental challenges before they caused significant damage. This proactive approach contributed to maintaining avocado quality and improving production stability.

The findings are supported by the Theory of Change, which explains that project success depends on a clear relationship between planned activities, outputs, outcomes, and long-term impacts (Vogel, 2022). In this study, identifying potential risks represented an important project activity that enabled the cooperative to introduce appropriate interventions, leading to improved avocado production, reduced losses, and enhanced project outcomes. The findings suggest that when risks are recognized early, project managers can develop strategies that increase the likelihood of achieving desired results.

The findings are consistent with Hillson (2022), who established systematic risk identification enables agricultural projects to recognize uncertainties early and develop effective response strategies that improve project outcomes. Similarly, Project Management Institute (PMI) (2021) emphasized that continuous risk identification supports effective project planning, monitoring, and control throughout the project life cycle. The findings also agree with Presley and Zuwena (2024), who found that avocado cooperatives systematically identified risks related to drought, pests, and market fluctuations achieved improved production stability and more reliable incomes. These studies support the present findings that effective risk identification is a critical practice for improving the performance of avocado growing projects.

4.1.3. Correlation Analysis

Pearson Product-Moment Correlation analysis was conducted to determine the direction and strength of the relationship between risk identification and the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The correlation coefficient ((r)) was used to establish the strength and direction of the relationship between the two variables, while the significance value (p-value) was used to determine whether the observed relationship was statistically significant at the 5% level of significance ($(p<0.05)$). A positive correlation indicated that higher levels of risk identification were associated with higher project performance, while a negative correlation indicated an inverse relationship. The results were presented in Table 3.

Table 3: Pearson Matrix between independent variable and dependent variable

		Risk identification	Project Performance
Risk identification	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	178	
Project Performance	Pearson Correlation	. 894**	1
	Sig. (2-tailed)	.000	
	N	178	178

Source: Field data, 2026

The results in Table 3 indicated a strong positive relationship between risk identification and project performance, with a Pearson correlation coefficient of r=.894. This showed that higher levels of risk identification were associated with higher levels of project performance under KOTWIDIKA Cooperative. The significance value was reported as .000 in the statistical output, which was interpreted as p<.001, rather than an actual probability of zero. Since the p-value was below the 5% significance level (p<.05), the relationship was statistically significant. Therefore, the null hypothesis of no significant relationship between risk identification and project performance was rejected. However, correlation alone did not establish that risk identification caused the observed improvement in project performance.

4.1.4. Regression analysis

Simple linear regression analysis was conducted to examine the effect of risk identification on the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The analysis focused on risk identification as the independent variable (X) and project performance as the dependent variable (Y). The regression results were used to assess the direction, magnitude, and statistical significance of the effect of risk identification on project performance. The findings were presented in the regression model summary, ANOVA, and coefficients tables.

Table 4. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.927[a]	.858	.855	.16899

a. Predictor: (Constant), Risk identification

The model summary showed that the correlation coefficient (R) was .927, indicating a strong positive relationship between risk identification and the performance of the avocado-growing project under KOTWIDIKA Cooperative. The coefficient of determination (R Square) was .858, meaning that risk identification explained 85.8% of the variation in project performance, while the remaining 14.2% was associated with other factors not included in the model and random variation. The adjusted R Square was .855, indicating that the model explained 85.5% of the variation after adjustment. The standard error of the estimate was .16899, representing the dispersion of observed project performance values around the values predicted by the regression model.

Table 5. ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.975	1	7.494	262.402	.000[b]
	Residual	4.941	176	.029		
	Total	34.915	177			

a. Dependent Variable: Project Performance

b. Predictors: (Constant), Risk identification

The ANOVA results showed that the regression model had an F-statistic of 262.402 and a significance value reported as .000, interpreted as p<.001. Since the p-value was below the 5% significance level (p<.05), the regression model was statistically significant. This indicated that risk identification was significantly associated with the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District. The regression model therefore provided statistically significant evidence of a relationship between risk identification and project performance

Table 6. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.004	.152		.023	.981
	Insurance System	.383	.069	.406	5.518	.000

a. Dependent Variable: Project Performance

The regression coefficients showed that the Insurance System had a positive and statistically significant effect on the performance of Rutongo District Hospital, with an unstandardized coefficient (B) of .383, a standardized coefficient (Beta) of .406, and a t-value of 5.518. The significance value was reported as .000, interpreted as p<.001, which was below the 5% significance level. This indicated that a one-unit increase in the Insurance System score was associated with a .383-unit increase in hospital performance, holding the model specification constant. The constant was .004, with a significance value of .981, indicating that it was not statistically significant

4.2 Discussion of Findings

This study examined the effect of risk identification on the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The findings indicated that risk identification was an important practice in the implementation of the project. Respondents generally agreed that potential risks affecting avocado production were identified before they negatively affected project activities. Particular attention was given to pest and disease risks through regular field observation, as well as climate-related risks such as drought and excessive rainfall. The findings also indicated that farmers and project managers discussed possible risks affecting avocado production. However, market-related risks, including price fluctuations and changes in buyers, received comparatively less attention. These findings suggest that identifying potential production and environmental challenges can help project stakeholders anticipate problems and prepare appropriate responses. The interview with the Project Manager further indicated that field visits and discussions with farmers supported the identification of risks such as diseases, weather changes, and input shortages. This suggests that involving farmers in identifying risks can improve information sharing and support timely decision-making within agricultural projects.

The findings from the correlation and regression analyses further indicated a positive relationship between risk identification and project performance. The correlation analysis showed that higher levels of risk identification were associated with higher levels of project performance. The regression analysis also indicated a statistically significant relationship between risk identification and project performance. These findings suggest that recognizing potential risks before they affect project activities can support the achievement of project objectives. This relationship may be explained by the role of early risk identification in helping project stakeholders anticipate challenges, improve planning, and prepare suitable responses. The interview findings supported this explanation, as the Project Manager indicated that identifying risks early helped the cooperative organize support and respond to problems before they seriously affected avocado production and farmers' income. Therefore, risk identification can be understood as an important project management practice that supports the implementation and performance of agricultural projects.

The findings are also supported by the Theory of Change, which guided the study. The theory explains the relationship between planned activities, outputs, outcomes, and long-term impacts (Vogel, 2022). In the context of the avocado-growing project, identifying potential risks formed part of the activities intended to support successful project implementation. By recognizing possible challenges affecting avocado production, the cooperative could prepare appropriate responses and support activities aimed at achieving the expected project outcomes. The findings suggested that early identification of risks, together with farmer participation and field observation, helped the project stakeholders recognize problems that could interfere with production. The Theory of Change therefore provides a framework for understanding how risk identification may contribute to project performance

through its connection with project activities and intended outcomes.

The findings are consistent with previous studies cited in the research. Hillson (2022) emphasized that systematic risk identification enables projects to recognize uncertainties early and prepare appropriate response strategies. Similarly, the Project Management Institute (PMI, 2021) emphasized the importance of continuous risk identification throughout the project life cycle. Presley and Zuwena (2024) also reported that identifying risks related to drought, pests, and market fluctuations was associated with improved production stability and more reliable incomes among avocado cooperatives. These studies are consistent with the present findings, which indicated that risk identification was practiced through field observation, discussions with farmers, and recognition of potential production and environmental challenges. The findings therefore reinforce the importance of identifying risks as part of project implementation. They also suggest that greater attention to market-related uncertainties could help the cooperative identify a broader range of challenges affecting avocado production and project performance.

5. Conclusion and Recommendations

5.1. Conclusion

The study concluded that risk identification was an important project management practice associated with the performance of the avocado-growing project under KOTWIDIKA Cooperative in Kayonza District, Rwanda. The findings showed that potential risks affecting avocado production, including pests, diseases, climate conditions, and market uncertainties, were identified through field observation and discussions between farmers and project managers. The correlation and regression analyses indicated a positive and statistically significant relationship between risk identification and project performance. The study therefore concluded that identifying potential risks early could help the cooperative anticipate challenges, improve project planning, and prepare appropriate responses to protect production, produce quality, and farmers' income. However, greater attention to market-related risks could further strengthen the cooperative's risk identification practices.

5.2. Recommendations

Based on the findings of the study, the following recommendations are made:

1. KOTWIDIKA Cooperative should continue identifying potential risks before they negatively affect avocado-growing activities. Regular field visits and discussions with farmers should be maintained to recognize emerging production challenges and support timely decision-making.
2. The cooperative should give greater attention to identifying market uncertainties, particularly avocado price fluctuations, changes in buyer requirements, and market accessibility. This may help farmers anticipate challenges that could affect their income and improve the project's ability to respond to changing market conditions.
3. The cooperative should encourage farmers to report potential risks and share their experiences with project managers. This can improve communication, strengthen farmer participation, and help identify risks that may not be immediately visible to project staff.
4. Project managers and farmers should pay attention to possible climate challenges, including drought and excessive rainfall, so that appropriate responses can be planned in advance. Regular observation of weather conditions and discussions about possible climate-related challenges should be encouraged to support avocado production.
5. The cooperative should strengthen regular field observation to identify pest and disease risks affecting avocado production. Farmers and project staff should share information about unusual crop conditions so that potential problems can be recognized early and appropriate action can be considered.

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