

IMPLEMENTING OPERATIONAL RISK MANAGEMENT IN SMALL-SCALE AGRIBUSINESS: EVIDENCE FROM ALFAGRO, A YOUTH-BASED FARMING ENTERPRISE



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ABSTRACT

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Background: Agribusiness, particularly in small-scale farming enterprises, is highly exposed to operational risks due to uncertainty in production, limited managerial capacity, and external environmental factors. Despite this, structured risk management practices such as ISO 31000 are rarely implemented in small agribusiness entities.

Purpose: This study aims to identify operational risks, assess their levels based on probability and impact, and formulate appropriate risk mitigation strategies in an agribusiness context, specifically at Alfagro.

Design/methodology/approach: This research employs a qualitative descriptive approach supported by risk assessment tools. Data were collected through in-depth interviews, focus group discussions, and questionnaires involving key operational stakeholders. Risk analysis was conducted using the Godfrey risk matrix, while risk treatment strategies were developed based on Flanagan and Norman, aligned with ISO 31000:2018 framework.

Findings/Result: The study identifies 13 operational risks categorized into human resources, internal processes, and external factors. The results show that most critical risks are dominated by external (pests and diseases) and process-related issues (storage conditions and harvest delays). One risk is classified as extreme, three as high, five as medium, and four as low. Risk mitigation strategies focus on preventive and reduction measures, particularly in improving post-harvest handling, scheduling, and pest control systems.

Conclusion: The implementation of ISO 31000 based risk management is applicable and beneficial for small-scale agribusinesses. Structured risk identification and prioritization enable more effective operational decision-making and improve production sustainability.

Originality/value (State of the art): This study contributes to the limited literature on risk management implementation in small-scale agribusiness, demonstrating practical adaptation of ISO 31000 in a youth-based farming enterprise context.

Keywords:

agribusiness,
Alfagro, ISO
31000:2018,
operational risk, risk
management

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INTRODUCTION

The agricultural sector plays a strategic role in supporting economic development, ensuring food security, and generating employment, particularly in developing countries such as Indonesia. Increasing population growth and changing consumption patterns have intensified the demand for agricultural products, especially fresh fruits and vegetables. This trend has become more prominent following the COVID-19 pandemic, where public awareness of

health and nutrition significantly increased, leading to higher consumption of vitamin-rich commodities such as citrus fruits. Globally, the agricultural sector is also recognized as a key contributor to sustainable development, particularly in supporting rural livelihoods and economic resilience (FAO, 2021).

Among horticultural commodities, lemons have experienced substantial demand growth due to their nutritional benefits, including high vitamin C and antioxidant content (Trisnawati et al., 2019). This

growing demand presents significant opportunities for agribusiness development. However, agribusiness activities are inherently exposed to high levels of uncertainty and operational risk due to their dependence on biological processes, environmental conditions, and supply chain complexities (Hardaker et al., 2015; Chavas, 2018). Previous studies have highlighted that operational risks in agribusiness are commonly driven by production variability, post-harvest losses, and limited managerial capabilities, particularly in small-scale enterprises (Nartea et al., 2012; Komarek et al., 2020; Duong et al., 2019).

Despite the increasing importance of risk management in business sustainability, many small and emerging agribusinesses still lack structured risk management systems. Operational inefficiencies such as the absence of standard operating procedures (SOP), weak production planning, and limited managerial capacity often exacerbate risk exposure. This condition indicates a gap between the need for systematic risk management and its actual implementation in small-scale agribusiness contexts. Studies suggest that small enterprises tend to adopt informal and reactive approaches to risk management, which limits their ability to anticipate and mitigate potential disruptions (Verbano & Venturini, 2013; Nguyen et al., 2016).

ISO 31000:2018 provides a comprehensive framework for risk management that integrates risk identification, assessment, and mitigation processes (ISO, 2018). While this framework has been widely adopted in large organizations, its application in small-scale agribusiness, particularly youth-based farming enterprises, remains limited. This gap suggests the need for empirical research that examines how structured risk management approaches can be adapted to small and developing agribusiness entities.

Alfagro, a youth-based agribusiness focusing on lemon production, represents a relevant case to explore this issue. Although Alfagro operates in a high-demand market, it faces significant operational challenges, including fluctuating production levels, quality degradation, and inefficiencies in operational processes. These challenges are mainly caused by pest and disease attacks, inadequate post-harvest handling, suboptimal storage conditions, and limited managerial capacity. Furthermore, the lack of structured risk management practices increases the vulnerability of the business to operational disruptions.

Given these conditions, a systematic analysis of operational risk is necessary to support more effective decision-making and enhance business sustainability. Therefore, this study aims to (1) identify the operational risks faced by Alfagro, (2) assess the level of risk based on probability and impact, and (3) formulate appropriate risk mitigation strategies using the ISO 31000:2018 framework. This study also responds to the growing need for structured risk management adoption in small-scale agribusiness under increasing uncertainty (Chavas, 2018; Meuwissen et al., 2019).

This study contributes to the literature by providing empirical evidence on the implementation of risk management in small-scale agribusiness, particularly in the context of youth-led farming enterprises. In addition, it offers practical insights for improving operational resilience and risk governance in similar agribusiness settings.

METHODS

This study employs a qualitative descriptive approach to analyze operational risk in agribusiness. Qualitative approaches are commonly used to explore complex phenomena and provide a systematic understanding of real-world conditions (Creswell, 2014). The research was conducted at Alfagro Farm, located in Badung, Bali, Indonesia. The site was selected purposively considering its relevance as a developing agribusiness entity facing operational challenges. Data collection and processing were conducted from May to July 2023.

This study utilizes both primary and secondary data. Primary data were obtained through in-depth interviews, focus group discussions (FGD), and questionnaires involving key stakeholders who are directly engaged in Alfagro's operational activities (Table 1). Secondary data were collected from company documents, scientific literature, and previous studies to support the analysis (Sekaran & Bougie, 2016).

The sampling method used in this study is purposive sampling, a non-probability sampling technique where respondents are selected based on specific criteria relevant to the research objectives (Etikan et al., 2016). Stakeholders were identified using the RACI matrix (Responsible, Accountable, Consulted, Informed), which clarifies roles and responsibilities in the operational process. The respondents include the CEO, vice CEO,

division coordinators, head of production, and selected operational staff.

The analysis follows the ISO 31000:2018 risk management framework, which includes risk identification, assessment, evaluation, and treatment (ISO, 2018).

1. Risk Identification.

Risk identification was conducted through interviews, literature review, and questionnaires to identify all potential operational risks.

2. Risk Assessment

Risk assessment was conducted using probability and impact measurements based on a Likert scale (1–5), which is widely used to measure perceptions and judgments (Likert, 1932). The aggregation of respondent assessments was calculated using the geometric mean to reduce bias (Saaty & Vargas, 2006).

3. Risk Mapping

Risk mapping was performed using the Godfrey risk matrix, which classifies risks based on probability and impact levels (Godfrey, 1996) (Figure 1).

4. Risk Evaluation (Risk Acceptability)

Risk evaluation determines the level of risk acceptance based on the multiplication of probability and impact values (Godfrey, 1996). Risk acceptability level in Table 2.

5. Risk Treatment

Risk treatment strategies were developed using the approach of Flanagan and Norman (1993), which includes avoidance, transfer, reduction, and retention strategies. Risk response strategy in Table 3.

Table 1. Types and sources of data

Description	Data Type	Data Collection	Source
Company overview, business process mapping, risk identification and assessment	Primary	In-depth interviews, questionnaires	Internal stakeholders (CEO, Vice CEO, division coordinators, production staff)
Scope determination and risk treatment formulation	Primary & Secondary	Literature study	Journals, books, company documents

Table 2. Risk Acceptability Level

Risk Acceptance	Level	Description
Unacceptable	Extreme	Risk must be eliminated
Undesirable	High	Risk must be avoided
Acceptable	Medium	Risk can be tolerated
Negligible	Low	Risk can be accepted

Source: Godfrey (1996)

Table 3. Risk Response Strategy

Acceptance Level	Risk Level	Response
Unacceptable	Extreme	Risk avoidance
Undesirable	High	Risk transfer
Acceptable	Medium	Risk reduction
Negligible	Low	Risk retention

Source: Flanagan and Norman (1993)

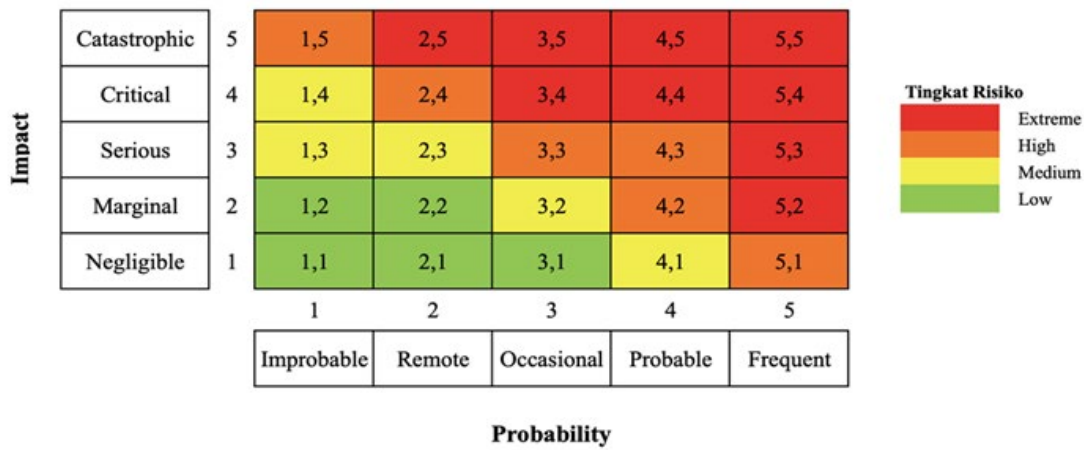


Figure 1. Godfrey risk matrix

RESULTS

Overview of Alfagro and Operational Context

Alfagro is a youth-based agribusiness engaged in lemon cultivation and horticultural products located in Badung, Bali. The farm operates at an altitude of 900–1100 meters above sea level, which provides favorable agroclimatic conditions for lemon production. In addition to production activities, Alfagro also promotes youth empowerment in agriculture, emphasizing sustainability, product quality, and environmentally friendly practices. Despite its potential, Alfagro faces operational inefficiencies due to limited managerial systems, lack of standardized procedures, and dependence on inexperienced human resources. These conditions create significant exposure to operational risks that affect production consistency and product quality.

Business Process Analysis

To identify potential operational risks, a comprehensive understanding of the business process is essential. This study focuses on the operational activities of lemon production and marketing at Alfagro. The business process was analyzed based on company data, supported by literature review and previous studies.

The operational process begins with lemon tree maintenance, followed by harvesting, washing, quality control, storage, packaging, marketing, and distribution. Maintenance activities include pruning to stimulate fruit development, fruit wrapping to prevent pest attacks, fertilization, weed control, and pesticide application in accordance with SNI standards. After the

maintenance stage, lemons are ready to be harvested within approximately seven days. Harvesting is conducted carefully by cutting the lower branches to avoid damaging the tree.

Post-harvest, lemons undergo a washing process using water and soap to remove pesticide residues. The fruits are then subjected to quality control through sorting based on physical condition. Lemons that meet market standards are classified as Grade A or B and proceed to storage, while lower-quality lemons (Grade C), typically affected by pests or physical damage, are processed into eco enzyme products.

High-quality lemons are stored and undergo a curing process aimed at achieving uniform yellow coloration. This process utilizes plant growth regulators in accordance with SNI guidelines. After 5–7 days of curing, the lemons exhibit improved aroma and taste. Subsequently, the fruits are packaged to extend shelf life by reducing moisture loss and metabolic deterioration. The packaged lemons are then marketed either directly to customers through online channels or distributed to local retailers and business partners based on demand.

Risk Identification

A total of 22 potential risks were initially identified and validated through interviews and questionnaires. After validation, 13 operational risks were selected based on relevance and frequency (Table 4). The identified risks are categorized into three main groups: Human resource risks, Internal process risks, and External risks. The results indicate that operational risks are not only driven by external uncertainty but are also strongly influenced by internal management weaknesses.

Risk Assessment: Probability and Impact

The analysis of probability shows that most risks fall into the “low to moderate” likelihood category, with an average score of 2.17. However, the risk of pests and diseases (R12) has the highest probability, indicating frequent occurrence (Figure 2). In terms of impact, the results indicate that pest and disease risk (R12) has the highest impact score (4.37), followed by several operational risks such as harvest delays and storage issues (Figure 3).

These findings suggest that external risks, particularly biological risks, have both high probability and high impact, making them the most critical risks in agribusiness operations. This is consistent with

agricultural risk literature, which emphasizes the vulnerability of farming systems to biological and environmental uncertainties (Hardaker et al., 2015).

Risk Mapping and Prioritization

The combination of probability and impact results in the classification of risks into four categories: low, medium, high, and extreme. Operational Risk Levels at Alfagro in Table 5. The results show (Figure 4): 1 extreme risk (R12: pests and diseases), 3 high risks (harvest delay, storage issues, high rainfall). 5 medium risks, and 4 low risks. This distribution indicates that although most risks are manageable, a small number of critical risks require immediate attention.

Table 4. Operational risk identification at Alfagro

Operational Risk Area	Risk Code	Operational Risk Identification	Potential Impact
Human Resources	R01	Harvest time delay	Increases the risk of pest infestation and reduces shelf life
	R02	Miscommunication among workers	Inefficiency in time and labor
	R03	Dependency on specific employees	Inefficiency in time and labor
	R04	Errors in demand calculation	Decreased trust from partners or customers
Internal Process	R05	Improper post-harvest handling	Decline in lemon quality
	R06	Quality deterioration during transportation	Fruit spoilage
	R07	Payment delays from partners	Production delays
	R08	Lemon production does not meet targets	Inability to fulfill demand
	R09	Inadequate storage conditions	Fruit spoilage
	R10	Inappropriate use of technology	Inefficiency in time and labor
External Factors	R11	High rainfall intensity	Affects plant growth in both quality and quantity
	R12	Pests and plant diseases	Decreased fruit quality leading to potential crop failure
	R13	Unpredictable dry and rainy seasons	Affects productivity and quality of lemons

Table 5. Operational risk levels at Alfagro

Risk Code	Operational Risk Identification	Probability (P)	Impact (I)	Risk Score (P×I)	Risk Level
R01	Harvest time delay	3.18	2.86	3.3	High
R02	Miscommunication among workers	2.49	3.25	2.3	Medium
R03	Dependency on specific employees	1.89	2.55	2.3	Medium
R04	Errors in demand calculation	2.17	2.49	2.2	Low
R05	Improper post-harvest handling	1.74	2.27	2.2	Low
R06	Quality deterioration during transportation	2.35	3.02	2.3	Medium
R07	Payment delays from partners	2.14	2.14	2.2	Low
R08	Lemon production does not meet targets	2.49	3.10	2.3	Medium
R09	Inadequate storage conditions	2.83	2.95	3.3	High
R10	Inappropriate use of technology	1.64	1.43	2.1	Low
R11	High rainfall intensity	2.93	3.25	3.3	High
R12	Pests and plant diseases	3.73	4.37	4.4	Extreme
R13	Unpredictable dry and rainy seasons	2.17	2.86	2.3	Medium

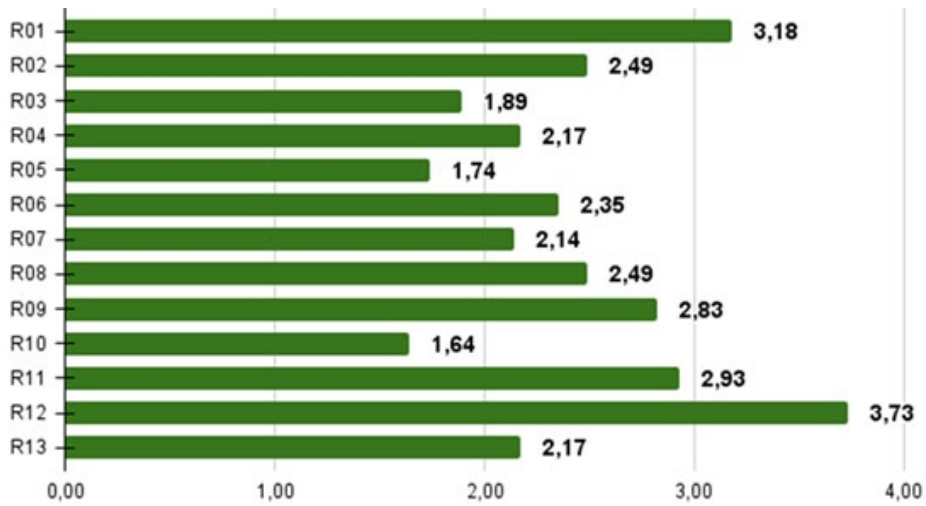


Figure 2. Risk probability level

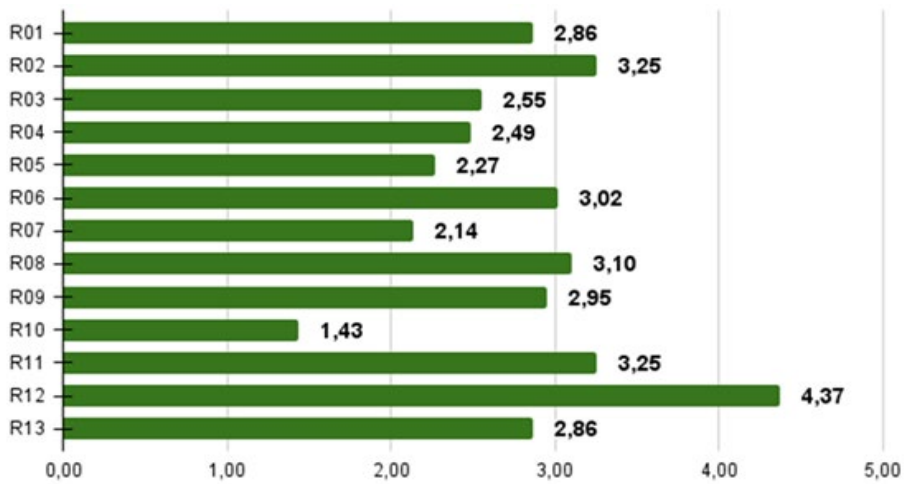


Figure 3. Risk impact level

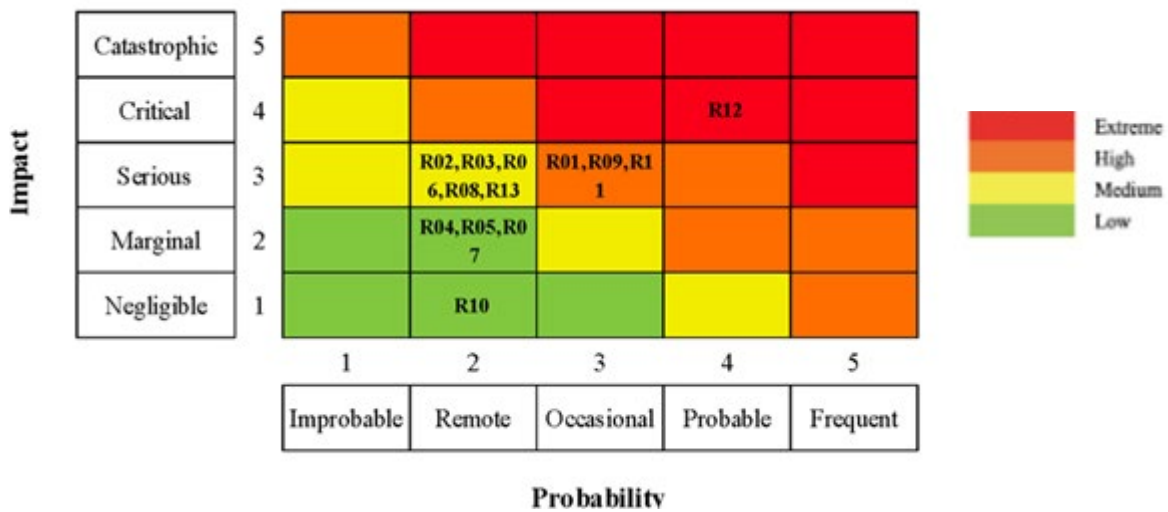


Figure 4. Risk Map (Godfrey Matrix)

Risk Evaluation

Risk evaluation was conducted to determine the level of risk acceptability based on Godfrey (1996). Risk acceptability levels at Alfagro in Table 6. The results indicate that: Extreme risk → unacceptable, High risk → undesirable, Medium risk → acceptable, Low risk → negligible. This classification helps prioritize risk treatment strategies, particularly for risks that threaten operational sustainability.

Risk Treatment

Risk treatment strategies were developed based on Flanagan and Norman (1993), focusing on four approaches: avoidance, transfer, reduction, and retention. For extreme and high risks, priority is given to preventive and mitigation strategies. The most critical risk, pests and diseases, requires integrated pest management, training programs, and the development of operational guidelines. Meanwhile, high-level risks such as harvest delays and storage limitations require improvements in production planning, infrastructure, and operational control. For medium risks, strategies focus on process improvements, such as better communication systems, standard operating procedures (SOP), and simple technological adoption. Low-level risks are generally acceptable and require minimal intervention. Risk treatment strategies at Alfagro in Table 7.

The findings highlight that operational risks in Alfagro are dominated by external factors (e.g., pests, climate variability) and internal managerial weaknesses (e.g., lack of SOP, poor coordination). This supports previous studies indicating that small agribusinesses are highly vulnerable due to limited managerial capacity and reliance on informal systems (Verbano & Venturini, 2013).

Furthermore, the presence of a single extreme risk (pests and diseases) demonstrates the critical importance of risk prioritization in agribusiness. Without structured risk management, such risks can lead to significant production losses and threaten business sustainability. The application of ISO 31000 in this study shows that even small-scale agribusinesses can adopt structured risk management practices. The framework helps transform informal decision-making into a systematic approach, enabling better risk awareness and strategic response.

Managerial Implications

This study provides practical insights into operational risks that hinder productivity and performance in Alfagro. The findings reveal 13 identified risks, consisting of four low-level risks, five medium-level risks, three high-level risks, and one extreme risk. These results highlight that while most risks are manageable, several critical risks require immediate managerial attention.

Table 6. Risk acceptability levels at Alfagro

Risk Code	Operational Risk Identification	Risk Level	Risk Acceptability
R12	Pests and plant diseases	Extreme	Unacceptable
R01	Harvest time delay	High	Undesirable
R09	Inadequate storage conditions	High	Undesirable
R11	High rainfall intensity	High	Undesirable
R02	Miscommunication among workers	Medium	Acceptable
R03	Dependency on specific employees	Medium	Acceptable
R06	Quality deterioration during transportation	Medium	Acceptable
R08	Lemon production does not meet targets	Medium	Acceptable
R13	Unpredictable dry and rainy seasons	Medium	Acceptable
R04	Errors in demand calculation	Low	Negligible
R05	Improper post-harvest handling	Low	Negligible
R07	Payment delays from partners	Low	Negligible
R10	Inappropriate use of technology	Low	Negligible

Table 7. Risk treatment strategies at Alfagro

Risk Code	Operational Risk Identification	Risk Acceptability	Risk Treatment	Treatment Activities
R02	Miscommunication among workers	Acceptable	Reduction	Conduct regular communication and integrate verbal and non-verbal communication methods
R03	Dependency on specific employees	Acceptable	Reduction	Establish clear and well-defined information flow and workflow systems
R06	Quality deterioration during transportation	Acceptable	Reduction	Develop simple and appropriate fruit transportation tools
R08	Lemon production does not meet targets	Acceptable	Reduction	Develop standard operating procedures (SOP) for production and post-production processes
R13	Unpredictable dry and rainy seasons	Acceptable	Reduction	Conduct seasonal forecasting using information from meteorological agencies
R04	Errors in demand calculation	Negligible	Retention	Establish formal sales agreements or contracts
R05	Improper post-harvest handling	Negligible	Retention	Develop clear SOPs for post-harvest handling
R07	Payment delays from partners	Negligible	Retention	Establish formal written agreements in invoices
R10	Inappropriate use of technology	Negligible	Retention	Develop a budget plan for technology utilization

High-level risks, including harvest delays, inadequate storage conditions, and high rainfall intensity, require additional treatment strategies, particularly through risk transfer and mitigation approaches. To address harvest delays, it is recommended to develop structured production planning systems, establish standard operating procedures (SOP), and implement training programs supported by reward and punishment mechanisms. For storage-related risks, management should prioritize securing appropriate storage facilities, collaborating with partners or government institutions, and optimizing logistics routes. Meanwhile, risks associated with high rainfall can be mitigated through improved pest and disease control, better planting schedules, soil covering techniques, simple irrigation systems, and the application of integrated crop management practices.

The most critical risk identified is pests and plant diseases, which fall under the extreme risk category and require intensive and proactive treatment. Recommended strategies include farmer training programs, the development of practical guidelines for pest and disease control, and the adoption of low-cost and efficient technologies to minimize potential losses. Overall, this study proposes a set of risk management strategies based on the ISO 31000 framework, emphasizing preventive and mitigation approaches.

These strategies include the development of alternative and innovative programs to reduce the likelihood and impact of risks. In addition, the study provides a clear representation of the business process, which can enhance employees' understanding of operational workflows. This is expected to improve efficiency and effectiveness in daily operations, ultimately contributing to better organizational performance and increasing the likelihood of achieving business objectives.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study identifies 13 operational risks faced by Alfagro, which are categorized into three main areas: human resources, internal processes, and external factors. Human resource risks include harvest delays, miscommunication, dependency on specific employees, and errors in demand calculation. Internal process risks involve improper post-harvest handling, quality deterioration during transportation, payment delays from partners, production shortfalls, inadequate storage conditions, and inappropriate use of technology. External risks consist of unpredictable seasonal patterns, high rainfall intensity, and pest and disease attacks.

The risk assessment results indicate that four risks are classified as low, five as medium, three as high, and one as extreme. The most critical risk identified is pests and plant diseases, which have both high probability and impact.

Risk treatment efforts in this study focus on extreme and high-level risks by applying preventive and mitigation strategies. These include developing alternative and innovative programs, transferring risks beyond the company's control through third-party involvement, and strengthening communication and coordination with relevant stakeholders. The findings demonstrate that a structured risk management approach based on ISO 31000 can support better decision-making and improve operational resilience in small-scale agribusiness.

Recommendations

Based on the findings of this study, several recommendations can be proposed for future research and practical development. Future studies are encouraged to incorporate risk appetite and risk tolerance approaches that are tailored to the specific characteristics and conditions of the business, rather than relying solely on general frameworks such as Godfrey. In addition, this study primarily reflects the perspective of internal management; therefore, future research should expand its scope by involving external stakeholders, including partners, customers, and industry experts, to provide a more comprehensive assessment of risk. Furthermore, as this study focuses only on operational risks, subsequent research is recommended to explore other types of risks, such as financial, strategic, and market risks, to achieve a more holistic understanding of risk management in agribusiness.

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REFERENCES

Chavas, J. P. (2018). Role of risk and uncertainty in agriculture. In *The Routledge handbook*

of agricultural economics (pp. 603-615). Routledge.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage Publications.

Duong, T. T., Brewer, T., Luck, J., & Zander, K. (2019). A global review of farmers' perceptions of agricultural risks and risk management strategies. *Agriculture*, 9(1), 10.

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, 5(1), 1-4.

FAO. (2021). *The state of food and agriculture 2021*. Food and Agriculture Organization of the United Nations.

Flanagan, R., & Norman, G. (1993). *Risk management and construction*. Blackwell.

Godfrey, P. (1996). *Control of risk: A guide to the systematic management of risk from construction*. CIRIA.

Hardaker, J. B., Huirne, R. B. M., Anderson, J. R., & Lien, G. (2015). *Coping with risk in agriculture* (3rd ed.). CABI Publishing.

ISO. (2018). *ISO 31000: Risk management-Guidelines*. International Organization for Standardization.

Komarek, A. M., De Pinto, A., & Smith, V. H. (2020). A review of types of risks in agriculture: What we know and what we need to know. *Agricultural systems*, 178, 102738.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1-55.

Meuwissen, M. P., Feindt, P. H., Spiegel, A., Termeer, C. J., Mathijs, E., De Mey, Y., ... & Reidsma, P. (2019). A framework to assess the resilience of farming systems. *Agricultural Systems*, 176, 102656.

Nartea, G., Aditto, S., & Gan, C. (2012). Sources of Risk and Risk Management Strategies: The Case of Smallholder Farmers in a Developing Economy. *Chapters*.

Nguyen, T. P. L., Mula, L., Cortignani, R., Seddaiu, G., Dono, G., Viridis, S. G., ... & Roggero, P. P. (2016). Perceptions of present and future climate change impacts on water availability for agricultural systems in the western Mediterranean region. *Water*, 8(11), 523.

Saaty, T. L., & Vargas, L. G. (2006). *Decision making with the analytic network process*. Springer.

Sekaran, U., & Bougie, R. (2016). *Research methods for business* (7th ed.). Wiley.

- Trisnawati, I., Hersoelistyorini, W., & Nurhidajah. (2019). Tingkat kekeruhan kadar vitamin C dan aktivitas antioksidan infused water lemon dengan variasi suhu dan lama perendaman. *Jurnal Pangan dan Gizi*, 9(1), 27–38.
- Verbano, C., & Venturini, K. (2013). Managing risks in SMEs: A literature review and research agenda. *Journal of technology management & innovation*, 8(3), 186-197.