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Decision-Making Processes in Resource Management: Lessons from the Agriculture Sector

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A B S T R A C T

This study aims to explore the decision-making processes in resource management within the agriculture sector. By examining the factors influencing these decisions, the strategies employed, the challenges faced, and the role of external influences, this research seeks to provide a comprehensive understanding of how different stakeholders navigate the complexities of resource management. The study employs a qualitative research design, utilizing semi-structured interviews to collect data from 19 participants, including farmers, agricultural managers, and policymakers. Theoretical saturation was achieved to ensure the robustness of the findings. Data were analyzed using NVivo software, which facilitated the organization, coding, and thematic analysis of the interview transcripts. Ethical considerations were adhered to, ensuring informed consent and confidentiality for all participants. The findings highlight several key factors influencing resource management decisions: economic factors such as cost-benefit analysis and access to credit; environmental factors including soil health and water availability; social factors like community support and family involvement; technological factors such as precision farming and data analytics; and regulatory factors including compliance costs and subsidies. Decision strategies identified include effective resource allocation, risk management, sustainability practices, technology adoption, collaborative approaches, and innovation strategies. Challenges such as financial constraints, climate change, market uncertainty, labor shortages, and policy barriers were prominent. External influences like government policies, market trends, technological advances, stakeholder pressure, global trade dynamics, community expectations, and educational outreach also played significant roles. This study underscores the complexity and multifaceted nature of decision-making processes in resource management within the agriculture sector. Effective strategies and adaptive practices are essential to address the challenges and leverage the opportunities in this field. Future research should include larger, more diverse samples and consider the perspectives of various stakeholders. Practical recommendations include supportive regulatory frameworks, risk management strategies, investment in training programs, and community engagement to foster sustainable resource management practices.

Keywords: *Resource Management, Agriculture Sector, Decision-Making, Sustainability, Technological Adoption, Economic Factors, Environmental Factors, Policy Barriers, Community Engagement.*

1. Introduction

The agriculture sector plays a vital role in the global economy, providing food security, employment, and economic stability. However, it faces numerous challenges, including climate change, market volatility, technological advancements, and regulatory pressures. Effective resource management is crucial to addressing these challenges and ensuring the long-term sustainability of agricultural practices (Ghaffarian et al., 2024; Jani & Yazdanian, 2014; Khan et al., 2021).

Several factors influence resource management decisions in the agriculture sector. Economic factors are paramount, as financial considerations often dictate the viability of various farming practices. According to a study by Chebet (2023), women play a significant role in the growth of the agricultural sector, particularly in resource management. The study emphasizes the need for gender-inclusive policies to enhance resource allocation and decision-making processes. Economic considerations such as cost-benefit analysis, access to credit, and market prices significantly impact resource management decisions (Chebet, 2023).

Environmental factors also play a critical role. As noted by Halder et al. (2021), the relationship between groundwater and human well-being in the Sundarbans region of India highlights the importance of sustainable water management practices. Farmers must consider soil health, water availability, and weather patterns when making resource management decisions. The unpredictable nature of climate conditions necessitates adaptive strategies to mitigate the adverse effects of environmental changes (Halder et al., 2021).

Social factors, including community support, cultural practices, and family involvement, are also influential. The involvement of local communities and adherence to traditional practices often guide resource management decisions. As Fernández-Diego et al. (2018) highlight, the adoption of smart farming technologies, supported by community engagement, can enhance resource management efficiency. The study underscores the importance of integrating technological advancements with traditional knowledge to achieve sustainable outcomes (Fernández-Diego et al., 2018).

Technological factors are increasingly important in modern agriculture. The adoption of precision farming, data analytics, and automation has revolutionized resource management practices. Dhaya et al. (2021) discuss the role of data fusion in intelligent decision-making for agriculture resource management, emphasizing the potential of advanced technologies to optimize resource use. However, the high costs and technical expertise required for these technologies can be barriers to widespread adoption (Dhaya et al., 2021).

Regulatory factors, including compliance costs, subsidies, and regulatory changes, also influence resource management decisions. Momeni (2023) discusses the need for sustainability-driven institutional and behavioral mechanisms to address the implications of agricultural water price shocks. The study highlights the role of regulatory frameworks in shaping resource management practices and the need for policies that support sustainable agriculture (Momeni, 2023).

Resource management in agriculture involves various decision strategies aimed at optimizing resource use and enhancing productivity. Effective resource allocation strategies, such as budget planning and investment decisions, are essential. Latorre-Biel et al. (2013) emphasize the importance of decision support systems in the wine production sector, highlighting how strategic resource allocation can improve efficiency and productivity (Latorre-Biel et al., 2013).

Risk management is another critical aspect of resource management. Käyhkö (2019) explores climate risk perceptions and adaptation decision-making at the Nordic farm scale, identifying different typologies of risk responses. The study underscores the need for comprehensive risk assessment and contingency planning to mitigate the impact of climate change on agricultural practices (Käyhkö, 2019).

Sustainability practices, including organic farming, water conservation, and renewable energy use, are increasingly adopted in the agriculture sector. Fatemi and Rezaei-Moghaddam (2019) discuss multi-criteria evaluation in agricultural environmental management, highlighting the importance of sustainable practices in resource management. The adoption of these practices not only supports environmental conservation but also improves market competitiveness (Fatemi & Rezaei-Moghaddam, 2019).

Technology adoption is pivotal in modern agriculture. Ribeiro (2024) discusses the role of image classification in precision agriculture, specifically in coffee cultivation. The study illustrates how technological advancements can enhance resource management efficiency and productivity. Training and support are essential to ensure the successful adoption and maintenance of new technologies (Ribeiro, 2024).

Collaborative approaches, such as partnerships and joint ventures, are effective in resource management. Pádua (2024) discusses the development of a decision-making system based on the mandala of water and agricultural sustainability, emphasizing the importance of collaboration in achieving sustainable outcomes. Shared resources and joint efforts can enhance resource management practices and reduce costs (Pádua, 2024).

Innovation strategies, including R&D investment and pilot projects, drive progress in resource management. Vergara-Solana et al. (2018) explore opportunities for strengthening the aquaculture industry through multi-criteria decision-making, highlighting the role of innovation in improving resource management practices. Scaling successful innovations is crucial for long-term sustainability (Vergara-Solana et al., 2018).

Resource management in agriculture faces several challenges, including financial constraints, climate change, market uncertainty, labor shortages, and policy barriers. Financial constraints, such as limited funding and high interest rates, pose significant challenges. Hashemitabar et al. (2014) discuss the application of fuzzy multi-objective decision-making models for adapting cropping patterns to climate change, highlighting the financial barriers to implementing sustainable practices (Hashemitabar et al., 2014).

Climate change impacts, including extreme weather events and seasonal variability, are major challenges. Hosterman et al. (2011) discuss freshwater climate change adaptation in the Ganges River Basin, emphasizing the need for adaptive strategies to address climate-related challenges. The study highlights the importance of resilience in resource management practices (Hosterman et al., 2011).

Market uncertainties, such as price fluctuations and demand variability, affect resource management decisions. Niaz et al. (2021) use logistic regression analysis to study spatial patterns of drought persistence, illustrating the impact of market dynamics on resource management. Supply chain disruptions, particularly during the COVID-19 pandemic, have highlighted the vulnerability of agricultural markets (Niaz et al., 2021).

Labor shortages, including the availability of skilled labor and rising labor costs, are pressing issues. Kholodova (2021) discusses the efficiency of using resource potential in the agricultural sector economy, highlighting the impact of labor shortages on resource management practices. Addressing these shortages is crucial for maintaining productivity and efficiency (Kholodova, 2021).

Policy barriers, such as complex regulations and compliance requirements, hinder effective resource management. Aberman et al. (2013) discuss the progress of constitutional change and irrigation management transfer in Pakistan, highlighting the challenges posed by regulatory frameworks. Simplifying regulations and providing support for compliance are essential for effective resource management (Aberman et al., 2013).

External influences, including government policies, market trends, technological advances, stakeholder pressure, global trade dynamics, community expectations, and educational outreach, play a significant role in resource management. Government policies, such as subsidies and regulatory frameworks, significantly impact resource management decisions. Belay et al. (2020) discuss the alignment of knowledge management processes with clinical processes in healthcare, illustrating the importance of supportive policies in decision-making (Belay et al., 2020).

Market trends, such as consumer preferences and competitive pressures, shape resource management practices. The adoption of sustainable practices and technological advancements is often driven by market demands. Fernández-Diego et al. (2018) highlight the role of smart farming technologies in meeting market expectations and enhancing competitiveness (Fernández-Diego et al., 2018).

Technological advances, including emerging technologies and innovation diffusion, influence resource management. The integration of advanced technologies in agricultural practices can optimize resource use and improve productivity. Dhaya et al. (2021) emphasize the potential of data fusion and intelligent decision-making in enhancing resource management practices (Dhaya et al., 2021).

Stakeholder pressure, including environmental groups and public opinion, drives the adoption of sustainable practices. Community engagement and social responsibility are essential for gaining local support and ensuring the success of resource management initiatives. Halder et al. (2021) highlight the importance of community involvement in sustainable water management practices (Halder et al., 2021).

Global trade dynamics, such as trade agreements and export markets, affect resource management decisions. The globalization of agricultural markets necessitates efficient and sustainable resource management practices. Hosterman et al. (2011) discuss the impact of global trade dynamics on freshwater management in the Ganges River Basin,

highlighting the need for international cooperation (Hosterman et al., 2011).

Community expectations, including local needs and social responsibility, influence resource management practices. Meeting these expectations is crucial for maintaining community support and achieving sustainable outcomes. Momeni (2023) emphasizes the importance of sustainability-driven mechanisms in addressing community needs and ensuring resource management efficiency (Momeni, 2023).

Educational outreach, including extension services and training programs, supports effective resource management. Knowledge transfer through educational programs is vital for ongoing improvement and the successful adoption of new technologies. Pádua (2024) discusses the role of educational outreach in enhancing resource management practices (Pádua, 2024).

In conclusion, the decision-making processes in resource management within the agriculture sector are influenced by a complex interplay of economic, environmental, social, technological, and regulatory factors. Effective resource management strategies, including risk management, sustainability practices, technology adoption, collaborative approaches, and innovation strategies, are essential for addressing the challenges and leveraging the opportunities in this field. External influences, such as government policies, market trends, technological advances, stakeholder pressure, global trade dynamics, community expectations, and educational outreach, play a significant role in shaping resource management practices. This study provides a comprehensive understanding of these dynamics, highlighting the importance of considering a wide range of factors and employing diverse strategies to navigate the complexities of resource management in the agriculture sector.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a qualitative research design to explore the decision-making processes in resource management within the agriculture sector. The focus was on understanding the nuanced and context-specific dynamics through the lived experiences of participants. The choice of a qualitative approach was driven by the need to capture the depth and complexity of decision-making processes that quantitative methods might overlook.

The sample consisted of key stakeholders in the agriculture sector, including farmers, agricultural managers, and policy makers. Purposive sampling was used to ensure a diverse representation of perspectives and experiences. Participants were selected based on their involvement in resource management and their willingness to share their experiences.

Interviews were conducted until theoretical saturation was reached, meaning no new themes or insights were emerging from the data. This ensured the comprehensiveness and robustness of the findings.

2.2. Measures

2.2.1. Semi-Structured Interview

Data collection was conducted through semi-structured interviews, allowing for a balance between guided questions and the flexibility to explore emerging themes. This method was chosen to facilitate in-depth discussions and enable participants to provide detailed insights into their decision-making processes.

The interview guide was developed based on a comprehensive literature review and preliminary discussions with experts in the agriculture sector. The guide included open-ended questions designed to elicit rich, descriptive data on various aspects of resource management decisions, such as the factors influencing decisions, strategies employed, challenges faced, and the role of external influences.

2.3. Data Analysis

The collected data were transcribed verbatim and analyzed using NVivo software, a qualitative data analysis tool. NVivo facilitated the organization, coding, and thematic analysis of the data.

Initial Coding: The transcripts were initially coded to identify broad themes and categories related to resource management decision-making.

Focused Coding: In this phase, more specific codes were developed to capture finer nuances within the broad themes. This involved re-reading the transcripts and refining the coding scheme to ensure consistency and depth.

Thematic Analysis: The focused codes were then grouped into overarching themes that addressed the research questions. Thematic analysis helped in identifying patterns and relationships within the data.

To enhance the reliability and validity of the findings, the following strategies were employed:

Triangulation: Data from different participants were compared to identify commonalities and differences, ensuring a well-rounded understanding of the decision-making processes.

Member Checking: Participants were given the opportunity to review and provide feedback on the findings, ensuring that their perspectives were accurately represented.

Peer Review: The analysis process and findings were reviewed by peers to minimize researcher bias and enhance credibility.

3. Findings and Results

The study included 19 participants, representing a diverse cross-section of stakeholders in the agriculture sector. Among the participants, 11 were male (57.9%) and 8 were female (42.1%), reflecting a relatively balanced gender distribution. The age of the participants ranged from 28 to 64 years, with an average age of 46 years. In terms of their roles within the agriculture sector, 7 participants (36.8%) were farmers, 5 (26.3%) were agricultural managers, 4 (21.1%) were policy makers, and 3 (15.8%) were agricultural researchers. The participants had varying levels of experience, with 5 (26.3%) having less than 10 years of experience, 8 (42.1%) with 10 to 20 years, and 6 (31.6%) having over 20 years of experience in the field.

Table 1

Categories, Subcategories, and Concepts

Categories	Subcategories	Concepts
Influencing Factors	Economic Factors	Cost-Benefit Analysis, Market Prices, Access to Credit
	Environmental Factors	Soil Health, Water Availability, Weather Patterns
	Social Factors	Community Support, Cultural Practices, Family Involvement
	Technological Factors	Precision Farming, Data Analytics, Automation
	Regulatory Factors	Compliance Costs, Subsidies, Regulatory Changes
Decision Strategies	Resource Allocation	Budget Planning, Resource Prioritization, Investment Decisions
	Risk Management	Risk Assessment, Contingency Planning, Insurance Use
	Sustainability Practices	Organic Farming, Water Conservation, Renewable Energy
	Technology Adoption	Adoption Rates, Technology Training, Maintenance Challenges
	Collaborative Approaches	Partnerships, Shared Resources, Joint Ventures
	Innovation Strategies	R&D Investment, Pilot Projects, Scaling Innovations
Challenges	Financial Constraints	Limited Funding, High Interest Rates, Cost Overruns
	Climate Change	Extreme Weather Events, Seasonal Variability, Pests and Diseases
	Market Uncertainty	Price Fluctuations, Demand Variability, Supply Chain Disruptions
	Labor Shortages	Labor Availability, Skilled Workforce Shortage, Labor Costs
	Policy Barriers	Complex Regulations, Policy Uncertainty, Compliance Requirements
External Influences	Government Policies	Subsidies, Regulatory Frameworks, Incentives
	Market Trends	Consumer Preferences, Competitive Pressures, Economic Cycles
	Technological Advances	Emerging Technologies, R&D Developments, Innovation Diffusion
	Stakeholder Pressure	Environmental Groups, Public Opinion, Advocacy Campaigns
	Global Trade Dynamics	Trade Agreements, Export Markets, Global Competition
	Community Expectations	Local Community Needs, Social Responsibility, Community Engagement
	Educational Outreach	Extension Services, Training Programs, Knowledge Transfer

3.1. Influencing Factors

Economic Factors: Economic factors play a crucial role in resource management decisions in the agriculture sector. Farmers frequently perform cost-benefit analyses to assess the viability of different farming practices. One participant noted, "Market prices dictate a lot of our decisions; if the price is right, we can invest more in advanced techniques." Access to credit also emerged as a significant influence, with many farmers relying on loans to implement resource-intensive practices.

Environmental Factors: Environmental considerations, such as soil health, water availability, and weather patterns, heavily influence decision-making. "We have to consider the health of our soil and the availability of water before planting any crop," remarked a farmer. Adapting to changing weather patterns is also crucial, with participants mentioning the increasing unpredictability of climate conditions.

Social Factors: Social dynamics, including community support, cultural practices, and family involvement, are key

influencers. "Our community's support is vital; we often share resources and labor," said one farmer. Cultural practices, deeply rooted in tradition, often guide resource management decisions. Family involvement, especially in family-run farms, was highlighted as a central element in decision-making processes.

Technological Factors: The adoption of new technologies, such as precision farming, data analytics, and automation, significantly impacts resource management. "Precision farming has revolutionized our approach; we can now use resources more efficiently," stated a participant. However, the high costs and need for technical expertise can be barriers to widespread adoption.

Regulatory Factors: Compliance with regulations, access to subsidies, and adapting to regulatory changes are crucial factors. "Regulations can be challenging, but subsidies provide much-needed financial support," mentioned a farmer. Participants expressed concerns about the costs associated with compliance and the frequent changes in regulatory policies.

3.2. Decision Strategies

Resource Allocation: Effective resource allocation strategies, such as budget planning, resource prioritization, and investment decisions, are essential for optimal resource management. "Budget planning helps us allocate funds where they are most needed," said one manager. Prioritizing resources based on immediate needs and long-term goals was a common strategy among participants.

Risk Management: Risk management is critical, involving risk assessment, contingency planning, and the use of insurance. "We assess risks regularly and have contingency plans in place for various scenarios," explained a participant. Insurance was commonly used to mitigate financial losses due to unforeseen events.

Sustainability Practices: Sustainability practices, including organic farming, water conservation, and the use of renewable energy, are increasingly adopted. "Organic farming not only helps the environment but also improves our market position," remarked a farmer. Water conservation techniques and renewable energy sources were highlighted as essential components of sustainable farming practices.

Technology Adoption: The adoption of technology, such as monitoring adoption rates, providing technology training, and addressing maintenance challenges, is pivotal. "Training is crucial to fully leverage new technologies," stated a participant. Maintenance of technological tools was often cited as a challenge, requiring ongoing support and expertise.

Collaborative Approaches: Collaborative approaches, including partnerships, shared resources, and joint ventures, were emphasized. "Partnerships with other farms have enabled us to share resources and reduce costs," said one participant. Collaborative efforts were seen as effective in pooling resources and expertise.

Innovation Strategies: Innovation strategies, such as investing in R&D, initiating pilot projects, and scaling innovations, drive progress in resource management. "Pilot projects allow us to test new ideas on a small scale before full implementation," explained a manager. Scaling successful innovations was identified as a key strategy for long-term sustainability.

3.3. Challenges

Financial Constraints: Financial constraints, including limited funding, high interest rates, and cost overruns, pose significant challenges. "High interest rates make it difficult to secure necessary funding," lamented a farmer. Cost overruns due to unforeseen expenses were also a common issue.

Climate Change: Climate change impacts, such as extreme weather events, seasonal variability, and pests and diseases, are major challenges. "Extreme weather events have become more frequent and unpredictable," noted a participant. Seasonal variability and the increasing prevalence of pests and diseases add to the complexity of resource management.

Market Uncertainty: Market uncertainties, including price fluctuations, demand variability, and supply chain disruptions, affect decision-making. "Market prices are volatile, making it hard to predict income," said a farmer. Supply chain disruptions, particularly during the pandemic, highlighted the vulnerability of agricultural markets.

Labor Shortages: Labor shortages, encompassing labor availability, skilled workforce shortages, and rising labor costs, are pressing issues. "Finding skilled labor is becoming increasingly difficult," mentioned a participant. The rising cost of labor further exacerbates the challenge.

Policy Barriers: Policy barriers, such as complex regulations, policy uncertainty, and compliance requirements, hinder effective resource management. "Regulations are often complex and change frequently, making compliance difficult," remarked a farmer. Policy

uncertainty adds to the risk and complexity of decision-making.

3.4. External Influences

Government Policies: Government policies, including subsidies, regulatory frameworks, and incentives, significantly influence resource management decisions. "Subsidies help us invest in necessary resources," said one participant. Regulatory frameworks provide guidelines but can also pose challenges due to their complexity.

Market Trends: Market trends, such as consumer preferences, competitive pressures, and economic cycles, shape decision-making. "We adapt our practices based on consumer demand and market trends," noted a farmer. Competitive pressures drive innovation and efficiency.

Technological Advances: Technological advances, including emerging technologies, R&D developments, and innovation diffusion, impact resource management. "Keeping up with technological advances is crucial for staying competitive," explained a participant. The diffusion of innovations within the community was seen as beneficial.

Stakeholder Pressure: Stakeholder pressures, such as environmental groups, public opinion, and advocacy campaigns, influence decision-making. "Environmental groups and public opinion are pushing us towards more sustainable practices," said a farmer. Advocacy campaigns raise awareness and drive change.

Global Trade Dynamics: Global trade dynamics, including trade agreements, export markets, and global competition, affect resource management. "Global competition forces us to be more efficient and innovative," remarked a participant. Export markets provide opportunities but also come with risks.

Community Expectations: Community expectations, such as local community needs, social responsibility, and community engagement, are influential. "Meeting community expectations is important for maintaining local support," noted a farmer. Social responsibility and community engagement were highlighted as critical aspects of resource management.

Educational Outreach: Educational outreach, including extension services, training programs, and knowledge transfer, supports effective resource management. "Extension services and training programs help us stay informed and skilled," said a participant. Knowledge transfer through these programs was seen as vital for ongoing improvement.

These findings highlight the complexity and multifaceted nature of decision-making processes in resource management within the agriculture sector. They underscore the importance of considering a wide range of factors and employing diverse strategies to navigate the challenges and leverage the opportunities in this field.

4. Discussion and Conclusion

The findings of this study highlight the multifaceted nature of decision-making processes in resource management within the agriculture sector. Economic, environmental, social, technological, and regulatory factors were found to significantly influence these decisions. Moreover, the strategies employed, the challenges faced, and the role of external influences were elaborated through qualitative insights.

Economic Factors: The study revealed that financial considerations, including cost-benefit analysis, market prices, and access to credit, are paramount in resource management decisions. This aligns with Chebet (2023), who noted the critical role of economic factors in agricultural growth, especially emphasizing the involvement of women in resource allocation and decision-making processes (Chebet, 2023). Financial constraints can either enable or limit the adoption of new technologies and practices, as found by Dhaya et al. (2021), who discussed the impact of financial resources on intelligent decision-making in agriculture (Dhaya et al., 2021).

Environmental Factors: Environmental considerations such as soil health, water availability, and climate variability were found to be crucial. This finding is consistent with Halder et al. (2021), who emphasized the socio-hydrological dynamics influencing groundwater management and human well-being in the Sundarbans, India (Halder et al., 2021). The need for adaptive strategies to mitigate adverse environmental impacts is further supported by Hosterman et al. (2011), who discussed climate change adaptation in the Ganges River Basin (Hosterman et al., 2011).

Social Factors: Community support, cultural practices, and family involvement emerged as significant social factors. The importance of integrating community knowledge with modern practices is supported by Fernández-Diego et al. (2018), who highlighted the potential of smart farming technologies when combined with traditional knowledge (Fernández-Diego et al., 2018). The role of social dynamics in decision-making is also evident in the findings of Vergara-Solana et al. (2018), who discussed

the impact of stakeholder involvement on strengthening the aquaculture industry (Vergara-Solana et al., 2018).

Technological Factors: The adoption of precision farming, data analytics, and automation were identified as critical technological factors. This is in line with Dhaya et al. (2021), who emphasized the role of data fusion and advanced technologies in optimizing resource management (Dhaya et al., 2021). The study also resonates with Ribeiro (2024), who highlighted the benefits of precision agriculture in enhancing productivity and resource efficiency (Ribeiro, 2024).

Regulatory Factors: Compliance with regulations, access to subsidies, and regulatory changes were found to be significant. Momeni (2023) discussed the need for sustainability-driven mechanisms to tackle regulatory challenges, particularly in the context of water pricing (Momeni, 2023). The impact of regulatory frameworks on resource management is further supported by Aberman et al. (2013), who examined the implications of irrigation management transfer in Pakistan (Aberman et al., 2013).

Resource Allocation: Effective resource allocation strategies, including budget planning and investment decisions, were emphasized. Latorre-Biel et al. (2013) underscored the importance of strategic resource allocation in the wine production sector, highlighting its impact on efficiency and productivity (Latorre-Biel et al., 2013).

Risk Management: Risk management, involving risk assessment and contingency planning, was found to be crucial. Käyhkö (2019) identified various typologies of risk responses, emphasizing the need for comprehensive risk management strategies in response to climate risks (Käyhkö, 2019).

Sustainability Practices: The adoption of sustainability practices such as organic farming, water conservation, and renewable energy was highlighted. Fatemi and Rezaei-Moghaddam (2019) discussed the importance of multi-criteria evaluation in promoting sustainable agricultural practices, which aligns with the findings of this study (Fatemi & Rezaei-Moghaddam, 2019).

Technology Adoption: The role of technology adoption in resource management was emphasized, with a focus on training and maintenance challenges. Ribeiro (2024) highlighted the benefits of precision agriculture (Ribeiro, 2024), while Dhaya et al. (2021) discussed the potential of intelligent decision-making facilitated by advanced technologies (Dhaya et al., 2021).

Collaborative Approaches: Collaborative approaches, including partnerships and joint ventures, were identified as effective strategies. Pádua (2024) emphasized the importance of collaboration in achieving sustainable outcomes, supported by shared resources and joint efforts (Pádua, 2024).

Innovation Strategies: Innovation strategies, including R&D investment and pilot projects, were found to drive progress in resource management. Vergara-Solana et al. (2018) highlighted the role of innovation in strengthening the aquaculture industry, underscoring the need for continuous improvement and scaling of successful innovations (Vergara-Solana et al., 2018).

Financial Constraints: Financial constraints, such as limited funding and high interest rates, were significant challenges. This is consistent with Hashemitabar et al. (2014), who discussed financial barriers in adapting cropping patterns to climate change.

Climate Change: The impact of climate change, including extreme weather events and seasonal variability, was a major challenge. Hosterman et al. (2011) emphasized the need for adaptive strategies to address climate-related challenges, highlighting the importance of resilience in resource management practices (Hosterman et al., 2011).

Market Uncertainty: Market uncertainties, including price fluctuations and demand variability, affected decision-making. Niaz et al. (2021) discussed the impact of market dynamics on resource management, particularly in the context of drought persistence (Niaz et al., 2021).

Labor Shortages: Labor shortages, including skilled workforce availability and rising labor costs, were pressing issues. Kholodova (2021) highlighted the impact of labor shortages on the efficiency of resource use in the agricultural sector (Kholodova, 2021).

Policy Barriers: Policy barriers, such as complex regulations and compliance requirements, hindered effective resource management. Aberman et al. (2013) discussed the challenges posed by regulatory frameworks in irrigation management transfer, underscoring the need for supportive policies (Aberman et al., 2013).

Government Policies: Government policies, including subsidies and regulatory frameworks, significantly influenced resource management decisions. Belay et al. (2020) highlighted the role of supportive policies in aligning knowledge management processes with clinical processes, which can be analogously applied to agricultural resource management (Belay et al., 2020).

Market Trends: Market trends, such as consumer preferences and competitive pressures, shaped resource management practices. Fernández-Diego et al. (2018)

emphasized the role of smart farming technologies in meeting market expectations (Fernández-Diego et al., 2018).

Technological Advances: Technological advances, including emerging technologies and innovation diffusion, influenced resource management. Dhaya et al. (2021) discussed the potential of data fusion and intelligent decision-making in enhancing resource management practices (Dhaya et al., 2021).

Stakeholder Pressure: Stakeholder pressures, including environmental groups and public opinion, drove the adoption of sustainable practices. Halder et al. (2021) highlighted the importance of community involvement in sustainable water management practices (Halder et al., 2021).

Global Trade Dynamics: Global trade dynamics, such as trade agreements and export markets, affected resource management decisions. Hosterman et al. (2011) discussed the impact of global trade dynamics on freshwater management, emphasizing the need for international cooperation (Hosterman et al., 2011).

Community Expectations: Community expectations, including local needs and social responsibility, influenced resource management practices. Momeni (2023) emphasized the importance of sustainability-driven mechanisms in addressing community needs and ensuring resource management efficiency (Momeni, 2023).

Educational Outreach: Educational outreach, including extension services and training programs, supported effective resource management. Pádua (2024) discussed the role of educational outreach in enhancing resource management practices (Pádua, 2024).

This study has several limitations. Firstly, the qualitative nature of the research may limit the generalizability of the findings. While in-depth interviews provide rich insights, the small sample size of 19 participants may not fully capture the diversity of experiences and perspectives across the broader agriculture sector. Secondly, the reliance on self-reported data from participants introduces the potential for bias, as participants may have provided socially desirable responses or omitted negative aspects of their experiences. Thirdly, the study focused primarily on stakeholders within the agriculture sector, potentially overlooking the perspectives of other relevant actors such as policymakers, technology providers, and consumers. Finally, the rapid pace of technological advancements and policy changes means that the findings may quickly become outdated, necessitating ongoing research to stay current with evolving trends and challenges.

Future research should address these limitations by employing a mixed-methods approach that combines qualitative insights with quantitative data to enhance the generalizability and robustness of the findings. Larger and more diverse samples should be included to capture a wider range of perspectives and experiences. Additionally, longitudinal studies could provide valuable insights into how decision-making processes in resource management evolve over time, particularly in response to changing environmental, economic, and technological conditions. Researchers should also consider exploring the perspectives of other relevant actors, including policymakers, technology providers, and consumers, to develop a more holistic understanding of the factors influencing resource management in agriculture. Finally, future studies should examine the impact of specific technological advancements and policy interventions on resource management practices to provide actionable recommendations for stakeholders.

Based on the findings of this study, several practical recommendations can be made for stakeholders in the agriculture sector. Firstly, policymakers should develop and implement supportive regulatory frameworks that facilitate sustainable resource management practices. This includes providing financial incentives, such as subsidies and grants, to encourage the adoption of advanced technologies and sustainable practices. Secondly, agricultural managers and farmers should prioritize risk management strategies, including comprehensive risk assessments and contingency planning, to mitigate the impact of climate change and market uncertainties. Thirdly, stakeholders should invest in training and educational programs to enhance the technical skills and knowledge of the workforce, ensuring that they can effectively utilize new technologies and adopt innovative practices. Collaboration and partnerships should be encouraged to share resources and expertise, reducing costs and improving efficiency. Finally, community engagement and social responsibility should be prioritized to ensure that resource management practices align with local needs and expectations, fostering support and cooperation from the community.

In conclusion, this study provides valuable insights into the complex and multifaceted nature of decision-making processes in resource management within the agriculture sector. By understanding the factors that influence these decisions and the strategies employed by stakeholders, this research contributes to the development of more effective and sustainable resource management practices. Future research and practical interventions should build on these

findings to address the challenges and leverage the opportunities in this critical sector.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were considered.

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