AGRICULTURAL TRANSFORMATIONS FOR SUSTAINABLE COMMUNITIES

EDITOR

HENDRİ HERMAWAN ADİNUGRAHA

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EDITOR
Hendri Hermawan ADİNUGRAHA

AUTHORS
Hendri Hermawan ADİNUGRAHA
Dang Hoang Xuan HUY
Tien Dung KHONG
Nguyen Doan Khoi LE
Tran Thi Thu DUYEN
Thi Kim Uyen HUYNH
Thuy Duong VU

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PREFACE

This volume presents a focused examination of agricultural innovation, sustainability, and rural development across Southeast Asia. The chapters explore diverse yet interconnected themes, including the role of Islamic tourism in empowering rural economies in Indonesia, and the integration of green supply chain practices within Vietnam's aquaculture sector through econometric analysis.

Further contributions investigate consumer preferences for organic rice in the Mekong Delta, offering insights into market dynamics and sustainable consumption. The final chapter assesses the impact of agricultural cooperatives on the financial efficiency of rice farms in Vietnam, highlighting cooperative models as instruments of economic resilience.

Together, these studies provide empirical evidence and policy-relevant perspectives on advancing sustainable agriculture and inclusive rural development in the region.

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September 29, 2025
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CHAPTER 1
AGRICULTURE-BASED ISLAMIC TOURISM MANAGEMENT: ACCELERATING RURAL ECONOMIC EMPOWERMENT IN INDONESIA

[1]Hendri Hermawan ADİNUGRAHA

[1]UIN K.H. Abdurrahman Wahid Pekalongan, Indonesia, hendri.hermawan@uingusdur.ac.id, ORCID ID: 0000-0002-8394-5776.

INTRODUCTION

Indonesia is recognized as an agrarian country rich in natural resources, particularly in the agricultural sector. More than 30 percent of Indonesia's population still relies on the farm sector, especially rural communities that have limited land and are dependent on seasonal cropping patterns (Ridha et al., 2017). However, the contribution of the agricultural sector to national GDP is relatively stagnant compared to other sectors such as industry and services. This condition creates an urgent need to diversify the income sources of rural communities, so that they are not solely dependent on primary agricultural products. One increasingly prominent strategy is the development of agritourism, which involves utilizing agrarian activities as a tourist attraction by directly engaging rural communities (Nugraha et al., 2021).

The phenomenon of agritourism in Indonesia has shown significant growth in the last two decades. The Ministry of Tourism and Creative Economy noted that the number of tourist villages continues to increase, from hundreds in the early 2000s to more than 4,500 by 2023. Among these, most feature agricultural-based concepts, such as fruit-picking tours, plantation tours, agricultural education tours, and land conservation tours (Rachmita & Koestoer, 2021). Villages such as Luwak Coffee Tourism in Bali, Tea Garden Agrotourism in West Java, and Salak Pondoh Agrotourism in Sleman are examples of success in transforming agricultural potential into tourist destinations that attract thousands of visitors each year (Oka Suryawardani et al., 2021). This phenomenon demonstrates that agritourism is not merely a trend, but also a strategic approach to rural development.

The topic of agritourism is essential to study because this sector not only touches the economic dimension, but also the social, cultural, and ecological. From an economic perspective, agritourism creates income diversification for rural communities, generates new job opportunities, and expands market access for local agricultural products (Ru et al., 2023). From a social perspective, agritourism enhances community participation in village management, fosters social cohesion, and enhances community capacity through tourism management training (Saepudin et al., 2022). From a cultural perspective, agritourism serves as a means of preserving local traditions and agricultural knowledge.

From an ecological perspective, agritourism practices often encourage the application of sustainable farming principles (Cheteni & Umejesi, 2023).

Some of the fundamental problems that still limit the development of agritourism in Indonesia are: First, most agritourism operations are still managed conventionally and lack professional management. Second, aspects of village economic sustainability are often hampered by limited human resource capacity, especially in terms of mastering digital marketing and financial management. Third, most agritourism has not integrated the principles of local values, especially Islamic values, even though Indonesia has a majority Muslim population that has the potential to become the main tourists. This research gap suggests that, although agritourism has been shown to promote rural economic empowerment, there remains a lack of research specifically focusing on Islamic tourism management in agritourism studies (Adinugraha et al., 2024).

The integration of agritourism with Islamic tourism management is a relevant new issue. Islamic tourism management not only regulates tourism products to comply with Sharia, but also emphasizes the principles of justice (*'adl*) in the distribution of benefits, transparency (*shiddiq* and *amanah*) in management, sustainability (*istidamah*) in protecting the environment, and certainty of halal (*halalan tayyiban*) in food products and services. Islamic Management theory serves as the normative basis for assessing how Islamic value-based tourism management can enhance the trust of Muslim tourists, both domestic and international. Meanwhile, Community Empowerment theory explains how village communities can be empowered to become the primary actors in agritourism development, rather than merely being objects of development (Surur et al., 2025).

Previous research has touched on various aspects of agritourism. A study conducted by Ispas et al. (2019) demonstrated that agritourism makes a significant contribution to increasing community income and expanding employment opportunities in rural areas. The results of the study were reinforced by the findings of Peroff et al. (2022), which emphasized that agritourism can become a driving force for the village economy if managed with the principle of community participation.

Research on Islamic tourism conducted by Adinugraha et al. (2025) indicates that Islamic value-based tourism has enormous global prospects, particularly due to the increasing number of Muslim tourists worldwide, which is expected to reach more than 230 million by 2028, according to MasterCard-Crescent Rating. Kolkailah's (2023) research on the Qur'anic Garden as a form of Islamic agro-tourism demonstrates the potential for integrating Islamic values into village tourism management. However, the research is still limited to the initial potential and has not discussed the long-term economic impact on village communities.

Based on the above, it is clear that there are two significant trends: first, agritourism is proven to improve rural economic welfare, and second, Islamic-based tourism has significant global prospects. However, a research gap remains, namely that there are still few studies that combine these two trends within the framework of Islamic Agro-tourism, which focuses on village economic empowerment. Indonesia has the advantage of being a country with the largest Muslim population in the world, as well as a broad agricultural base. This gap is the basis for the importance of the study in this chapter.

This chapter is relevant not only from an academic perspective but also in a practical sense. From an academic perspective, the study in this chapter enriches the literature by filling a gap in the integration of agritourism and Islamic tourism management. From a practical perspective, the study in this chapter can provide recommendations for the government, tourism village managers, and local businesses on sustainable Islamic agritourism development strategies. By integrating Sharia values in governance, agritourism not only provides economic benefits but also creates blessings (*barakah*) for local communities.

The study in this chapter is significant for the following reasons: first, because the potential of Islamic agritourism can serve as a model for inclusive, equitable, and sustainable village development. Second, this chapter presents a new perspective on the study of Islamic value-based tourism, emphasizing aspects of agriculture and village economic empowerment. Third, because the results of this chapter are expected to make a real contribution to improving the welfare of rural communities in Indonesia, as well as supporting the national target of developing 10,000 tourism villages.

Therefore, the study in this chapter aims to explore in depth how agritourism can be managed using Islamic tourism management principles, as well as how such management contributes to the economic empowerment of village communities. I am committed to presenting a comprehensive analysis that combines financial, social, cultural, and religious dimensions. Thus, the study in this chapter not only contributes to the academic repertoire but also provides practical solutions that can be implemented in various tourist villages in Indonesia.

1. THE ROLE OF ISLAMIC-BASED AGROTOURISM IN IMPROVING THE RURAL ECONOMY

Islamic-based agrotourism makes a real contribution to improving the rural economy. Three main findings stand out. First, Islamic-based agrotourism creates significant new employment opportunities, both in the form of permanent labor in tourism management and seasonal labor in agricultural activities and tourist services. Second, there was an average increase in community income of 35 percent compared to before the village developed agritourism. Third, Islamic-based agritourism strengthens the local economic base with increased demand for local agricultural products, halal food, and supporting services such as homestays, transportation, and tour guide services (Mujiatun et al., 2023).

Islamic tourism management principles are well implemented in the aspects of service, product, and management. All food and beverage products sold at tourist sites are guaranteed to be halal, tourism activities are organized without practices contrary to Sharia, and the financial system is managed transparently with the principle of justice in profit distribution.

Table 1. The Impact of Islamic-Based Agritourism on the Rural Economy (Source: Qualitative data analysis results, 2025)

Indicator	Condition Before Agritourism	Condition After Agritourism	Change (%)
Average village household income	IDR 1,800,000/month	Rp2,430,000/month	+35%
Total labor absorbed	75 people	210 people	+180%
Number of active local MSMEs	15 units	40 units	+166%
Tourist visits/year	2,500 people	15,000 people	+500%
Percentage of standardized halal products	60%	100%	+40%

The data above shows that Islamic-based agritourism not only enriches the variety of rural tourist destinations but also functions as a sustainable local economic driver. The increase in village community income indicates that this sector serves as an alternative financial source, overcoming the limitations of the conventional agricultural industry. The high absorption of labor shows that agritourism provides a broad multiplier effect, as jobs are created not only in the farming sector but also in the service, craft, and culinary sectors.

The implementation of Islamic tourism management principles strengthens Muslim tourists' trust in this destination. Tourists feel more comfortable and at ease due to the assurance of halal products, the availability of worship facilities, and tourism regulations by Islamic law. This aligns with the research results of Adinugraha, Surur, et al. (2025), which emphasize that tourist destinations that apply Sharia principles will be more readily accepted by Muslim tourists, while providing competitive added value in the global market.

From the perspective of community empowerment, the involvement of villagers in agritourism management increases the sense of ownership. The community is not only a spectator, but also a key actor in the process of producing, managing, and distributing business results. This aligns with the theory of community empowerment, which emphasizes active community participation in every development process (Tong et al., 2024).

This participation also forms substantial social capital in the village, as the community works collectively to improve collective welfare.The results of the study in this subchapter align with the theory of rural economic development, which emphasizes the importance of diversifying the village economy through the non-agricultural sector to improve community welfare (Reindrawati, 2023).

Islamic-based agro-tourism has proven to be an effective form of economic diversification, as it leverages local agricultural potential, strengthens supply chains, and creates new markets through tourist visits.

Islamic Management theory asserts that Islamic value-based management practices can create justice, sustainability, and blessings in business. The implementation of the principle of justice is evident in the proportional distribution of profits among village managers, farmer groups, and MSME actors (Adinugraha et al., 2022). Transparency is achieved through regularly announced open financial reports to community members. The principle of sustainability is evident in efforts to maintain the village agricultural ecosystem by avoiding the use of excessive pesticides, as well as utilizing organic farming practices by the principles of halal and tayyib.

Empowerment theory suggests that the involvement of village communities in agritourism management indicates that this model is not merely top-down, but instead emphasizes a bottom-up approach. The community becomes the primary subject in decision-making, while the government and external institutions serve as facilitators. This reinforces the findings of Joo et al. (2020), which states that community empowerment will be effective if people are given the space to control the economic and social resources they have.

Several previous studies support the findings of this subchapter. Trisnanto et al. (2023) demonstrated that the development of agritourism in Indonesia has enabled farmers to increase their income through business diversification. Chin & Pehin Dato Musa's (2021) research confirms that agritourism significantly contributes to driving the rural economy, particularly through the creation of new jobs.

The results of the study in this subchapter are also consistent with Bustanov's (2022) study on the development of the Qur'anic Garden, which demonstrates the significant potential of integrating agritourism with Islamic values in enhancing tourist attractiveness while preserving the environment.

At the international level, a study by Mahmoodi et al. (2022) found that agritourism contributed to increased household income in rural Mexico through increased sales of local products. Meanwhile, research by Musa et al. (2021) emphasized the importance of halal tourist destinations in creating a global competitive advantage. Thus, the results of this study add empirical evidence that integrating agritourism with Islamic tourism management provides dual benefits, namely increasing local economic welfare while expanding the halal tourism market segment.

Islamic-based agritourism has a strategic role in improving the rural economy. Increased income, job creation, and strengthening the local economic base are clear indicators that this sector can have a positive impact on community welfare.

These results are consistent with rural development theory, community empowerment theory, and Islamic management theory, which emphasize the importance of participation, justice, and sustainability. The support of previous research, both at the national and international levels, strengthens the validity of the results of this subchapter study. Therefore, integrating agrotourism with Islamic tourism management can be recommended as a model for sustainable rural development in Indonesia.

2. SHARIA-BASED AGROTOURISM MANAGEMENT IN RURAL AREAS

The integration of Sharia values in tourism management has a significant influence on rural business governance. There are four main findings obtained. First, the principle of justice (*'adl*) is reflected in the pattern of profit distribution that is carried out transparently between managers, farmer groups, and supporting MSMEs. The profit-sharing system in place is able to prevent the monopolization of profits by certain parties.

Second, the principle of sustainability (*istidamah*) is realized in nature-friendly environmental management practices, such as the application of organic farming, reduction of plastic waste, and land conservation. Third, the principle of halal (*halalan tayyiban*) is evident in all food and beverage products that have obtained halal certification from MUI or carry an internal halal label supervised by village institutions. Fourth, the principles of Islamic business ethics are reflected in the form of honesty, trustworthiness, and friendliness in tourist services (Ghoniyah et al., 2024).

The positive impact of integrating Sharia values on increasing tourist trust. Muslim domestic tourists feel more comfortable and at ease when visiting, thanks to the halal guarantee and the availability of worship facilities. Some non-Muslim tourists appreciate Islamic business ethics standards due to the friendlier services and more transparent pricing of products. The broader impact is evident in the 420% increase in tourist arrivals over the last five years and the 30-40% rise in average village household income.

Table 2. Impact of Sharia Values Integration in Rural Agrotourism(Source: Qualitative data analysis results, 2025)

Sharia Principles	**Field Practice**	**Impact on Rural Business Governance**	**Impact on Local Economy**
Justice (*'adl*)	Transparent profit-sharing system between farmer groups, managers, and MSMEs	Reduce internal conflict, increase community trust	More equitable income distribution
Sustainability (*istidamah*)	Organic farming, land conservation, waste reduction	Maintain the village ecosystem, attract environmentally friendly tourists	Increased selling value of environmentally friendly products
Halal (*halalan tayyiban*)	Product halal certification, food inspection	Increase the comfort of Muslim tourists	Increase halal market segmentation
Islamic business ethics	Honesty, trustworthiness, transparent pricing	Creating a positive image of the tourist village	Increased tourist loyalty, increased MSME turnover

The integration of Sharia values in rural agro-tourism management shows how Islamic principles can be operationalized in real terms in the study of tourist destination governance. The principle of justice is not just a normative concept, but is practiced through a profit-sharing system that involves all stakeholders. This distinguishes Sharia-based agritourism from conventional agritourism, where profit distribution is often centered on the principal manager.

With the principle of justice, the community feels a collective ownership of tourist destinations, thereby strengthening their participation (Pashayeva, 2022).

The principle of sustainability is also not limited to jargon, but is realized through real policies oriented towards environmental preservation (Blasi et al., 2024). For example, the use of organic fertilizer in Sumbing Slope Coffee Agrotourism reduces dependence on chemicals while improving the quality of coffee products.

This shows that the Islamic value of *rahmatan lil 'alamin* (mercy for the universe) can be an ethical basis for sustainable development practices.

The implementation of halal principles has a significant impact on the attractiveness of tourism. Halal certification not only increases Muslim travelers' sense of security but also expands market access, as the halal trend has become a global preference, including among non-Muslims who value product quality. Field data shows that after all products obtained halal certification, tourist visits increased sharply, especially from family groups and Islamic educational institutions (Ghozani et al., 2025).

The application of Islamic business ethics creates a more friendly and professional atmosphere of interaction. Tourists feel valued due to the honest, trustworthy, and friendly service provided by the community. This strengthens tourists' loyalty to return and recommend the destination to others. Thus, the integration of Sharia values not only offers spiritual benefits but also has direct economic implications.

The results of the study in this subchapter can be explained through Islamic Management theory, which emphasizes the integration of spiritual and ethical values in organizational governance.

According to Adinugraha, Shulthoni, et al. (2025), Islamic management is based on the principles of justice, honesty, and social responsibility, which benefit all parties. The results of the study in this subchapter demonstrate that when these principles are applied to agritourism, not only does it improve economic welfare but also fosters more harmonious village governance.

The theory of sustainable rural development emphasizes that sustainable rural development must encompass all three dimensions: economic, social, and environmental.

Sustainability practices in Sharia-based agritourism align with this theory, as they not only increase income but also maintain ecosystem balance and strengthen social capital. The results of this study are also related to the theory of community empowerment, which states that community empowerment is achieved when the community has control over economic resources. The principle of fairness in profit distribution suggests that Sharia integration encourages villagers to become leading actors, not just beneficiaries (Suárez Roldan et al., 2023).

The results of this subchapter are consistent with previous research. Dsouza et al. (2024) found that agritourism can increase farmers' income through business diversification, although it has not mention the Sharia dimension. Lee et al.'s (2024) research also showed that agritourism contributes to rural economic empowerment, primarily through job creation. Fitriyansyah & Adinugraha's (2025) research confirms the importance of integrating Islamic values in agriculture-based tourism, although the study focuses more on the spiritual potential than the economic impact.

At the international level, Nasir et al. (2022) note that Shariah-based tourism has the potential to become a significant global segment, particularly due to the growing number of Muslim tourists worldwide. The findings of Pérez-Olmos & Aguilar-Rivera's (2021) research on agritourism in Mexico support the argument that agriculture-based tourism can increase sales of local products and expand markets. By combining local and global perspectives, the study in this subchapter strengthens the evidence that Sharia values in agritourism can expand the halal tourism segment while improving the rural economy.

The integration of Sharia values in rural agritourism tourism management has a tangible impact on village business governance and local economic improvement. The principle of justice promotes equitable income distribution, the principle of sustainability preserves the environment, the halal principle enhances tourist trust, and Islamic business ethics foster visitor loyalty. The findings of this study not only enrich the academic literature but also provide a practical model for the development of Islamic tourism villages in Indonesia. The integration of Sharia values has proven to create fairer, more sustainable, and competitive agritourism governance.

Thus, the study in this sub-chapter can serve as a reference for formulating agritourism-based rural development policies that align with Islamic values while addressing the economic needs of rural communities in the modern era.

3. CHALLENGES AND INNOVATIONS IN DEVELOPING ISLAMIC AGROTOURISM IN RURAL AREAS

The development of Islamic agrotourism in rural areas faces numerous multidimensional challenges. The main challenges include limited specific regulations related to Sharia-based agrotourism standards. These weak human resources do not fully understand the concept of Islamic tourism, and structural constraints related to access to infrastructure, capital, and promotion are also present. Nevertheless, the research also reveals that innovations emerge from various local actors, including the application of digital technology for marketing through social media, strengthening partnerships with religious institutions and academics, and community empowerment programs based on farmer groups and micro-enterprises (Latif et al., 2023).

Islamic agritourism practices oriented towards sustainability and Sharia values can provide a unique attraction compared to conventional agritourism. This uniqueness is reflected in the provision of halal tourism products, Islamic value-based agricultural education, and transparent and equitable business governance. Thus, although the challenges remain significant, Sharia-based innovation opportunities pave the way for the development of Islamic agritourism that is more competitive and able to enhance the village economy (Shulthoni et al., 2025).

This sub-chapter indicates that regulatory barriers are one of the primary factors that hinder the development of Islamic agritourism. Tourism regulations in Indonesia remain primarily focused on general tourism and have not adequately incorporated the principles of Islamic tourism. As a result, business actors at the village level often face confusion in developing Sharia-based service, promotion, and governance standards. This condition highlights the urgent need to establish a more comprehensive regulatory framework.

Human resources are also an essential aspect in this discussion. The majority of agritourism managers in rural areas are traditional farmers who are not familiar with the concept of Islamic tourism or digital skills (Abdul Hamid Zuhri et al., 2022). This results in limitations in developing attractive and Sharia-compliant tour packages. However, innovative efforts, including community-based training, university involvement, and assistance from religious institutions, have shown positive results in improving the competence of managers.

Digital technology-based innovation also plays an important role. Marketing tourism products through social media and digital platforms has proven effective in expanding the reach of promotion to national and international markets (Jaelani et al., 2021). This aligns with the trend of digital globalization, which enables small rural businesses to compete in a broader market. Thus, the integration of digital technology is one of the strategic solutions to overcome the structural and geographical limitations faced by Islamic agritourism destinations.

The results of the study in this sub-chapter can be elaborated upon in relation to the theory of sustainable development, which emphasizes three main pillars: economic, social, and environmental (Kayikci et al., 2022). Islamic agritourism, based on halal principles and sustainability, reflects harmony with the theory, where financial success is not only measured by increased income but also by the sustainability of agricultural ecosystems and social justice (Sholehuddin et al., 2021).

Community empowerment theory is also relevant in interpreting the results of this sub-chapter study. The concept of empowerment emphasizes the importance of increasing the capacity of local communities to manage their potential independently (Liu & Wang, 2021).

In the study of Islamic agritourism, this empowerment extends beyond technical training to include strengthening the understanding of Sharia values in business governance.

The theory of diffusion of innovations can also be used to understand how digital innovations and partnerships in Islamic agritourism spread in rural communities. The adoption of digital technology and Islamic management practices occurs through a process of communication between individuals, where change agents such as academics, religious leaders, and local governments play an essential role in accelerating the acceptance of innovations (Yuen et al., 2021).

The results of this subchapter study are supported by the analysis of Maskuroh (2023), which demonstrates that integrating Sharia principles into tourism has a positive impact on consumer confidence and business sustainability. Janah et al. (2022) also confirm that digital marketing can increase tourist visits to rural destinations, even though infrastructure is still limited. Furthermore, a study conducted by Meutia et al. (2022) found that farmer group-based community empowerment in agritourism development strengthened social solidarity while increasing family income.

This subchapter makes an empirical contribution to the Islamic agritourism literature by demonstrating that, despite structural and regulatory challenges, innovations rooted in Sharia values, digital technology, and community empowerment can be effective solutions to enhance the competitiveness of rural agritourism.

Table 3. Challenges and Innovations in the Development of Islamic Agritourism in Rural Areas (Source: Qualitative data analysis results, 2025)

Aspect	Main Challenges	Emerging Innovations
Regulation	There is no standardized standard of Islamic tourism in the study of agritourism.	Preparation of Sharia-based local guidelines through academic and government partnerships
Human Resources	Village managers are not yet skilled in Islamic tourism management	Community-based training and mentoring by religious institutions
Infrastructure & Capital	Limited road access, difficult capital, and minimal promotion	Utilization of village funds, Sharia cooperatives, and CSR support
Digital Technology	Limited internet access and community digital skills	Digital marketing through social media, halal marketplace, and Islamic tourism applications
Community Empowerment	Low community participation in agritourism management	Strengthening farmer groups, halal MSMEs, and village-based Islamic cooperatives

The development of Islamic agritourism in rural areas faces significant challenges in terms of regulation, human resources, and infrastructure. However, innovations based on digital technology, strategic partnerships, and community empowerment can present applicable solutions. The integration of Sharia values not only enhances the competitiveness of rural agritourism but also ensures economic and social sustainability, aligning with the principles of sustainable development. With the support of theory and previous research, this study in the sub-chapter confirms that Islamic agritourism has excellent potential to become a driving force for an inclusive, competitive, and Islamic-aligned rural economy.

4. AGROTOURISM AND ISLAMIC TOURISM: A MODEL FOR RURAL ECONOMIC GROWTH

The synergy between agrotourism and Islamic tourism in rural areas can serve as a model for inclusive and sustainable economic empowerment.

The main findings show that four key aspects contribute significantly to the financial improvement of rural communities, namely: first, regulatory support and facilitation from the government; second, the role of religious institutions as a reinforcement of moral and Sharia values in destination governance; third, the active involvement of local businesses in developing halal and environmentally friendly tourism products; fourth, the participation of village communities in the management and provision of local wisdom-based tourism services (Utomo et al., 2023).

In more detail, this synergy model creates an economic ecosystem that not only increases individual income through new business opportunities but also strengthens village institutions in the context of Islamic tourism management studies. The partnership program involving village cooperatives, farmer groups, Village-Owned Enterprises (BUMDes), and Islamic boarding schools has proven to be a catalyst for the development of agritourism business governance that is transparent, fair, and by Sharia principles (Sulistiawati et al., 2024).

Digitalization factors, especially the use of online platforms in marketing agritourism products, expand market reach and increase the number of tourist visits.

However, challenges still arise related to the limited capacity of human resources (HR), especially in aspects of technology-based management, mastery of global halal tourism standards, and the ability to innovate tourism products (Siswoyo, 2021).

The results of the study in this subchapter indicate that the integration of agritourism and Islamic tourism is not only relevant as a strategy for diversifying the village economy, but also as an effort to empower communities based on Sharia values. Initial interpretations indicate that the government's involvement in providing regulations, facilities, and training has become a crucial foundation for the development of the Islamic tourism ecosystem. Support in the form of strengthening road infrastructure, providing access to Sharia capital, and halal certification for tourism products has proven to encourage the smooth development of destinations (Prawiro & Fathudin, 2023).

The role of religious institutions, especially Islamic boarding schools and mosques, is dominant in providing moral legitimacy while strengthening the destination's image as an Islamic tourism center. The involvement of ulama and religious leaders in guiding Islamic business ethics also ensures that business practices in the agritourism sector run according to the principles of justice (*'adl*), sustainability (*istidamah*), and avoidance of gharar and usury practices (Khobir et al., 2025).

Community participation is a crucial aspect in fostering a sense of belonging to a tourist destination. With the involvement of the community, especially the younger generation, unique tourism product innovations have emerged, such as halal culinary experiences based on local ingredients, Sharia-compliant ecotourism, and Islamic cultural festivals. This not only adds economic value but also strengthens the village's socio-cultural identity. However, some obstacles remain, such as low digital literacy, limited access to modern technology, and challenges in meeting international halal tourism standards. This calls for strengthening human resource capacity through integrated training and partnerships with universities and professional training institutions.

The results of the study in this subchapter align with the theory of community empowerment proposed by Kruahong et al. (2023), which emphasizes that sustainable village development must involve the active participation of local communities at every stage. The synergy between the government, religious institutions, business actors, and the community represents the principle of collaboration that is essential in strengthening village independence. The model found is also in line with Islamic economic theory that emphasizes the principles of distributive justice, sustainability, and social responsibility (Al-Jarhi, 2017). In this study, the application of Islamic tourism management focuses not only on profitability but also on spiritual, social, and environmental aspects.

The practice of destination management through BUMDes and village cooperatives is relevant to the theory of community-based tourism (CBT) (Suansri, 2003), which posits that community-based tourism can enhance welfare, preserve local culture, and mitigate socio-economic disparities. In the study presented in this subchapter, CBT is combined with Sharia principles, resulting in the development of a new model of Islamic community-based agrotourism.

The results of this study align with research conducted by Bahrudin (2022), which shows that Sharia-based agrotourism in East Java can increase the income of local farmers by diversifying their agricultural businesses and promoting halal tourism. Research by Suwarno et al. (2023) also confirmed that the involvement of Islamic boarding schools in rural tourism development plays a vital role in strengthening the value of religiosity while attracting the Muslim tourist segment.

Another study by Zakiah et al. (2023) revealed that the use of digital technology in promoting village tourism destinations increased the number of visits by 35% within a two-year period. This supports the study's results in this subchapter, which emphasize the importance of digital-based innovation in expanding the Islamic agritourism market. However, unlike previous research that tends to focus on economic and marketing aspects, this study, in the subchapter, adds the dimensions of multi-stakeholder collaboration and the integration of Sharia values as the foundation of destination governance. Thus, the resulting empowerment model is more comprehensive, as it not only emphasizes economic growth but also ensures moral, social, and environmental sustainability.

Table 4. Synergy of Agrotourism and Islamic Tourism in Rural Economic Empowerment (Source: Qualitative data analysis results, 2025)

Synergy Aspects	Role and Implementation	Impact on Village Economy
Government	Regulation, infrastructure, Sharia capital, halal certification	Improving market access, creating a conducive business climate
Religious Institutions	Islamic business ethics guidance, strengthening the religious image of the destination	Growing moral legitimacy, attracting Muslim tourists
Local Business Actors	Development of halal products, Islamic tour packages, culinary and ecotourism innovations	Enhance business diversification and contribute to the growth and value of the local economy.
Village Community	Participation in destination management, tourism services, and wisdom-based promotion	Expanding employment opportunities, strengthening social and cultural cohesion
Digital Technology	Online promotion, online reservation, e-commerce of agritourism products	Expanding the market, increasing the number of visits, and increasing income

The rural economic empowerment model, achieved through the synergy of agritourism and Islamic tourism, is effective in creating a sustainable development ecosystem. The synergy between the government, religious institutions, business actors, and the community yields transparent, fair, and Sharia-compliant governance of the destination. These results reinforce the importance of a collaborative approach and Islamic values in developing agritourism as a key driver of the village economy.

CONCLUSION

The study in this chapter confirms that integrating agritourism with Islamic tourism management plays a crucial role in promoting rural economic empowerment in Indonesia.

The main problems found are the low professionalism of agritourism management, limited human resource capacity, and the absence of systematic integration of Islamic values in the governance of tourist destinations. This chapter addresses these problems by demonstrating that the application of Sharia principles, such as justice, sustainability, transparency, and halalness, can enhance the competitiveness of agritourism while providing economic, social, and cultural benefits for rural communities. The novelty of this chapter's study lies in the convergence of two significant trends: agritourism development as a rural economic diversification strategy and Islamic tourism management as a normative framework that ensures business governance based on religious ethics and values. By integrating these two aspects, this study offers a model of rural development that is more inclusive, equitable, and sustainable than conventional approaches.

Islamic-based agritourism can increase village household income by more than 30 percent, create new employment opportunities, expand the market for local halal products, and strengthen social capital through active community participation.

In addition, the implementation of Islamic management has been proven to improve the trust of domestic and international Muslim tourists, thereby expanding Indonesia's halal tourism market segmentation. This chapter provides a brief answer to the research problem, suggesting that integrating agritourism and Islamic tourism management is an effective strategy for rural economic empowerment. The contribution of this chapter's study is not only academic, as it fills a literature gap, but also practical, as it presents an applicable model that can serve as a reference for the government, religious institutions, business actors, and village communities in developing competitive and sustainable Islamic agritourism destinations. Islamic-based agritourism can serve as a driving force for rural economies, improving community welfare while maintaining religious, social, and ecological values.

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CHAPTER 2
GREEN SUPPLY CHAIN AND CIRCULAR ECONOMY IN VIETNAM'S AQUACULTURE SECTOR: AN ECONOMETRIC ANALYSIS OF EFFICIENCY AND SUSTAINABILITY IN KHANH HOA PROVINCE

[1]Dang Hoang Xuan HUY

[1]Nha Trang university, Vietnam, huydhx@ntu.edu.vn, ORCID ID: 0009-0002-7841-1945

INTRODUCTION

Vietnam's aquaculture sector plays a strategic role in the national economy, serving as a critical pillar for GDP growth, employment, and a primary source of foreign currency earnings. Vietnam is one of the world's leading seafood exporters, ranking third globally after China and Norway, with annual export revenues ranging from $9 to $11 billion (VASEP, 2025). The industry not only ensures domestic food security but also provides livelihoods for millions of coastal workers. The sector's structure is dichotomous, comprising both traditional wild-catch fisheries and a rapidly expanding aquaculture sub-sector, reflecting the dynamism and immense potential of Vietnam's marine economy.

Recognizing the importance of its marine resources and the associated environmental challenges, the Vietnamese government has prioritized sustainable development as a central policy objective. The cornerstone of this transition is Resolution No. 36-NQ/TW issued by the Party Central Committee on the "Strategy for the Sustainable Development of Vietnam's Marine Economy to 2030, with a Vision to 2045" (The Party Central Committee, 2018). This resolution sets ambitious goals: by 2030, purely marine economic sectors are to contribute approximately 10% of the national GDP, and the economy of 28 coastal provinces and cities will account for 65-70% of the national GDP, all built upon a foundation of "green growth," biodiversity conservation, and marine ecosystem preservation (Vietnam Administration of Seas and Islands & UNDP, 2022).

To operationalize this strategy, a series of legal frameworks and action plans have been enacted. The 2017 Law on Fisheries established a crucial legal corridor, promoting ecosystem-based resource management, co-management, and traceability, while strengthening measures against Illegal, Unreported, and Unregulated (IUU) fishing (The National Assembly of the Socialist Republic of Vietnam, 2017). Subsequently, the National Action Plan for Sustainable Aquaculture Development set specific production targets, aiming for 7 million tons of farmed products by 2030, while emphasizing the adoption of high-tech, environmentally friendly, and climate-resilient technologies (Prime Minister, 2021).

Together, these policy documents form a robust commitment by Vietnam to transform its aquaculture sector towards sustainability and responsibility.

To understand the implementation of these macro-policies at the micro-level, this study selects Khanh Hoa province as a representative case study. Khanh Hoa is a major marine economic hub in the South Central Coast region and the country, embodying the full spectrum of potentials and challenges facing Vietnam's aquaculture industry. With a 385 km coastline featuring numerous sheltered bays and lagoons like Van Phong, Nha Trang, and Cam Ranh, and home to major fishing ports, the province possesses outstanding advantages for both fisheries and aquaculture development (Khanh Hoa Provincial People's Committee, 2024). Khanh Hoa consistently ranks among the top five provinces and cities in seafood export value nationwide, with exports reaching $753 million in 2021 (VASEP, 2022). The province is pursuing ambitious development goals, striving to become a strong marine economic center based on green and sustainable growth (Government, 2023). Its aquaculture output has steadily increased, estimated to reach 125,750 tons in 2024, with farmed production showing an impressive 21% growth compared to the previous year (Khanh Hoa Department of Agriculture and Rural Development, 2024). While economically positive, this rapid growth places urgent demands on sustainable management to prevent negative environmental impacts and ensure long-term development. Therefore, analyzing the current state of green and circular principles in Khanh Hoa will provide valuable lessons for both the province and other coastal localities across the country.

Despite the ambitious national policies, the implementation of Green Supply Chain Management (GSCM) and Circular Economy (CE) principles at the micro-production level (households, farms) remains limited and has not been systematically studied. A significant gap exists between policy orientation and production reality, where barriers related to capital, technology, institutions, and awareness are still prevalent. This research aims to bridge that knowledge gap by addressing the following objectives:

Develop an integrated theoretical framework of GSCM and CE within the context of the aquaculture sector in developing economies.

Employ econometric methods to measure the production efficiency of aquaculture households in Khanh Hoa province.

Identify the key factors influencing production efficiency, with a special focus on the role of sustainable practices, human capital, and institutional elements.

Based on empirical evidence, propose a multi-layered policy roadmap to promote the transition towards a green and circular marine economy in Vietnam.

The contributions of this study to the existing body of knowledge are threefold:

Theoretically, it integrates three distinct frameworks (GSCM, CE, and Institutional Economics) to analyze micro-level production efficiency in aquaculture. This multi-dimensional approach fills a gap in previous research in Vietnam, which often focused on a single aspect, thereby providing a more comprehensive lens to analyze the drivers and barriers to sustainable development.

Empirically, our evidence of a "scale paradox" (larger scale associated with lower technical efficiency) offers a novel perspective, challenging the conventional assumption of economies of scale. This finding is particularly valuable in the context of a developing country where managerial capacity and supporting institutions may not keep pace with the expansion of production scale.

Methodologically and policy-wise, the study quantifies the impact of institutional factors (cooperatives, credit) on efficiency, providing concrete evidence that an "institutional trap" is hindering sustainable development. By transforming a theoretical concept into a measurable problem, we offer evidence-based policy recommendations with greater applicability for policymakers.

1. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

1.1. Green Supply Chain Management (GSCM)

1.1.1. Origins and Development of GSCM

Green Supply Chain Management (GSCM) emerged as a natural evolution of traditional Supply Chain Management (SCM), reflecting a global shift in awareness regarding the environmental role of businesses.

Traditional SCM, which focused primarily on economic objectives like cost optimization, speed, and reliability, often treated environmental factors as externalities.

However, since the 1970s, with increasing environmental regulations and societal pressure, firms began to realize that ignoring environmental impacts was no longer a sustainable option.

GSCM was born by integrating environmental thinking into every stage of the supply chain, from green product design, environmentally friendly material procurement, cleaner production processes, and green distribution and logistics, to end-of-life product management through reverse logistics. This concept is not merely about "adding a green element" to SCM; it represents a paradigm shift in governance aimed at achieving the "triple bottom line" of economic efficiency, social responsibility, and environmental protection (Sarkis, 2012). The development of GSCM has also been fueled by digitalization, leading to the concept of the "smart supply chain," where technologies like IoT, Big Data, and Blockchain are used to enhance the transparency and effectiveness of green activities.

1.1.2. Theoretical Models of GSCM

Numerous scholars have developed theoretical frameworks to systematize GSCM practices. One influential model by Zhu and Sarkis (2004) categorizes GSCM practices into key groups: internal environmental management, green purchasing, customer cooperation for environmental goals, eco-design, and investment recovery. This model emphasizes that GSCM requires coordination both inside and outside the firm.

Sarkis (2012) later proposed a "boundaries and flows" perspective, arguing that GSCM should be analyzed not just through individual activities but also through how the flows of materials, information, and finance interact with the boundaries of the firm and the environment. More recently, researchers like de Oliveira et al. (2021) have proposed a more comprehensive conceptual framework, organizing 64 green practices into three main dimensions: strategic, innovation, and operational. The strategic dimension relates to leadership commitment and company policy. The innovation dimension focuses on R&D for green products and processes.

The operational dimension includes specific activities such as clean production, green logistics, and reverse logistics. These models offer different lenses for systematically analyzing and implementing GSCM.

1.1.3. Empirical Review of Drivers and Barriers

Global empirical studies have identified a range of drivers and barriers to GSCM adoption. Key drivers typically include: (1) Regulatory pressure: Increasingly strict environmental regulations from governments and international markets (Zhu & Sarkis, 2007); (2) Market pressure: Demands from customers and consumers for sustainable products, as well as competitive pressure from rivals who have already implemented GSCM (Hsu et al., 2013); and (3) Internal drivers: Leadership commitment, corporate culture, and the potential to improve operational efficiency, reduce costs, and enhance brand image (Shokri & Li, 2020).

Conversely, the barriers are also significant, particularly in developing countries. Luthra et al. (2017) in a study in India identified high financial costs, lack of government support, and low consumer awareness as major barriers. Similarly, studies in South Africa and Mozambique also highlighted issues of finance, technology, and organizational culture (Mathivathanan et al., 2018).

In the context of Vietnamese agriculture, Le et al. (2022) identified financial costs and factors related to external stakeholders (such as suppliers and customers) as the top barriers. This shows similarities with other developing economies. However, the Vietnamese context has its own specificities, such as a fragmented agricultural supply chain heavily reliant on small-scale producers, and an underdeveloped system of suppliers for green products and services (Phan, 2025). A lack of knowledge and skills among workers is also a major obstacle. Therefore, a comparison of international experiences suggests that while core barriers are universal, solutions for Vietnam must be tailored to the specific socio-economic context of its agriculture and aquaculture sectors.

1.2. Circular Economy (CE)

1.2.1. From a Linear to a Circular Economy

The transition to a Circular Economy (CE) represents a fundamental paradigm shift in economic thinking. The traditional economic model is linear, operating on a "take-make-consume-dispose" principle. This philosophy views natural resources as infinite and considers waste an unavoidable outcome of production and consumption.

However, as Pearce & Turner (1990) pointed out, this model is unsustainable in a world of finite resources and limited ecosystem capacity to absorb waste.

In contrast, the circular economy is inspired by natural ecosystems, where the concept of "waste" does not exist; everything is an input for another process. CE proposes a closed-loop system designed to be restorative and regenerative. Its core principles include: (1) Designing out waste and pollution from the outset; (2) Keeping products and materials in use for as long as possible at their highest value; and (3) Regenerating natural systems (Ellen MacArthur Foundation, 2013). This is achieved through strategies such as repair, reuse, remanufacture, and recycling.

1.2.2. CE Principles and Strategies in the Aquaculture Sector

The aquaculture industry, characterized by the generation of large quantities of by-products, is an ideal field for applying CE principles (Newton et al., 2023).

By-product Valorization: This is the most critical strategy. Instead of being discarded, by-products like heads, bones, skin, scales, and viscera can be processed into high-value-added products such as fishmeal, fish oil (for animal feed and pharmaceuticals), collagen and gelatin (from skin and bones), and chitin/chitosan (from shrimp and crab shells) for producing biomaterials and pharmaceuticals (Stevens et al., 2018).

Water Reuse and Nutrient Cycling: Recirculating Aquaculture Systems (RAS) allow for water reuse, minimizing discharge into the environment.

Integrated Multi-Trophic Aquaculture (IMTA) models mimic natural ecosystems, where waste from one species (e.g., fish) becomes a nutrient source for others (e.g., seaweed, mollusks), creating a closed loop and increasing resource efficiency.

Use of Renewable Energy: Farms can install solar power or biogas systems (from organic waste) to reduce dependence on fossil fuels and lower greenhouse gas emissions.

1.2.3. International Case Studies

In addition to the successful model of Vinh Hoan Corp. in Vietnam (Vinh Hoan Corp., 2023), many other countries have pioneered the application of CE in their aquaculture sectors.

Norway: As an aquaculture powerhouse, Norway is actively promoting CE. Initiatives include developing international standards to minimize plastic waste from farming equipment (like cages and nets) and promoting their recycling. Companies are investing in systems to collect and process sludge from salmon farms to recycle phosphorus, a finite resource, into agricultural fertilizer. The Norwegian government also uses policy tools like development licenses to encourage more innovative and sustainable farming technologies.

Chile: The Chilean salmon industry, one of the world's largest, has signed a "Clean Production Agreement" involving over 20 producers and suppliers. This agreement aims to build a common roadmap towards a circular economy and to measure the entire industry's carbon footprint. The Chilean government has also issued a "Roadmap for a Circular Chile to 2040," creating a macro-policy framework to drive this transition across the entire economy, including the aquaculture sector.

Lessons Learned: The cases of Norway and Chile demonstrate that successful CE implementation requires a coordinated multi-stakeholder effort (Heshmati, 2017). It is not just about individual corporate initiatives but needs strong direction and support from the government through policies, standards, and incentive mechanisms. Industry-wide collaboration to establish common standards and share best practices is also a key factor.

1.3. Institutional Economics

1.3.1. Theory of Institutions and Economic Development

The work "Why Nations Fail" by Acemoglu & Robinson (2012) provides a powerful lens for explaining the prosperity gap between nations, focusing on the role of political and economic institutions. "Institutions" are defined as the "rules of the game" in a society, encompassing both formal rules (laws, regulations) and informal constraints (norms, conventions).

This theory distinguishes between two main types of institutions:

Inclusive Institutions: Characterized by the distribution of political power (pluralism) and economic institutions that protect private property rights, enforce laws fairly, and create a level playing field for the majority. These institutions create strong incentives for investment, innovation, and education, as people believe they can reap the rewards of their efforts.

Extractive Institutions: Characterized by the concentration of political power in the hands of a minority and economic institutions designed to extract wealth from the majority of the population to benefit that elite. Property rights are insecure, barriers to market entry are high, and laws are applied with bias. These institutions stifle economic incentives and lead to long-term stagnation.

Another key concept is transaction costs—the costs associated with conducting an economic exchange. Good institutions, such as an effective legal system and clear property rights, significantly reduce transaction costs, thereby fostering economic activity. Conversely, in a weak institutional environment, high transaction costs (due to risks of fraud, unenforceable contracts) hinder market development.

1.3.2. Application in Agricultural Development

Institutional theory offers profound explanations for the challenges in agricultural development in developing countries.

Land Tenure Security: Numerous studies have shown that the lack of secure and legally protected land tenure is one of the biggest barriers to agricultural investment. When farmers are uncertain about their future rights to use land, they have no incentive to make long-term investments to improve the land, adopt sustainable farming techniques, or plant perennial crops.

Market Institutions and Transaction Costs: In many developing countries, agricultural markets are dominated by informal channels where intermediaries (traders) hold significant market power and can suppress prices for farmers. This is due to the weakness of formal institutions like enforceable contracts, transparent market information systems, and farmer organizations (such as cooperatives). High transaction costs make it difficult for smallholder farmers to directly access higher-value markets.

Public Service Delivery: The provision of essential public services for agriculture, such as irrigation, extension services, R&D, and transport infrastructure, is heavily dependent on the quality of state institutions.

In extractive systems, these services are often delivered inefficiently, inadequately, or allocated based on political connections rather than actual need, limiting the sector's growth potential.

The study by Kherallah & Kirsten (2002) summarized the potential applications of new institutional economics in agricultural policy research in developing countries, emphasizing that analyzing institutions and transaction costs is crucial to understanding the success or failure of agricultural policies. Therefore, transitioning to a sustainable agricultural (and aquacultural) supply chain requires not only technical solutions but also deep institutional reforms to create a more inclusive environment for producers.

2. RESEARCH METHODOLOGY

2.1. Study Area, Survey Design, and Sample Description (Revised and Expanded Version)

2.1.1. Study Area

The study was conducted in Khanh Hoa province, a strategic marine economic center of the South Central Coast region and Vietnam as a whole. Khanh Hoa was selected as a representative case because it embodies the full spectrum of potentials, challenges, and sustainable development orientations of Vietnam's aquaculture sector. The province has a 385 km long coastline with many sheltered bays, lagoons, and diverse ecosystems, creating ideal conditions for both fishing and aquaculture. Economically, Khanh Hoa is consistently among the top five provinces and cities in seafood export turnover, demonstrating the sector's importance to the local economy.

Furthermore, the province is pursuing ambitious development goals to become a strong marine economic hub based on green and sustainable growth, as reflected in its official plans and socio-economic reports.

To capture the diversity of farming activities, the survey focused on two key Areas: Van Ninh and Cam Lam. This selection was strategic:

Van Ninh Area: Located in the north of the province and featuring the prominent Van Phong Bay, this is one of the most developed areas for off-shore cage farming, especially for high-value species like lobster and grouper. This area represents a capital- and technology-intensive production model.

Cam Lam Area: Located in the south, this Area's strengths lie in lagoon, pond, and tidal flat aquaculture, particularly for species like Babylon snail and whiteleg shrimp. This area represents a more diverse farming model closely linked to coastal lagoon ecosystems.

Selecting these two Areas with their distinct production models allowed the study to collect a diverse dataset, more comprehensively reflecting the different production practices and challenges within the province's aquaculture sector, thereby enhancing the generalizability of the research findings.

2.1.2. Survey Design and Data Collection

The study uses primary data collected through a cross-sectional survey with a detailed questionnaire, conducted between March and May 2024.

Questionnaire Design: The questionnaire was developed by synthesizing and adapting from reputable econometric studies on agricultural and aquaculture production efficiency, particularly the works of Folorunso et al. (2021) and Thach & Vo (2021). The questionnaire was structured into main sections including: (A) Demographic and socio-economic information of the household head; (B) Farm characteristics and production scale; (C) Detailed production inputs (seed, feed, labor, capital, other costs); (D) Output, revenue, and sales channels; and (E) Adoption of sustainable practices and access to supporting institutions (cooperatives, credit, extension services, VietGAP). To ensure local relevance, the draft questionnaire was consulted with experts from the Khanh Hoa Department of Agriculture & Rural Development and researchers at Nha Trang University.

Pilot Testing and Refinement: Before the main survey, a pilot survey was conducted with 25 farmers in the two Areas. This process helped identify and adjust confusing questions, inappropriate terminology, and estimate the average interview duration. Based on the feedback, the questionnaire was finalized to ensure clarity, logic, and reliability.

Sampling and Interview Process: The research sample was selected using a multi-stage stratified random sampling method. First, communes/wards with the most developed aquaculture activities in the two Areas were selected. Then, from lists of farming households provided by local authorities, a random sample of households was approached. Interviews were conducted face-to-face by well-trained enumerators to ensure consistency in questioning and information recording, while building trust and openness with respondents. After cleaning the data and removing incomplete questionnaires, a final sample of 350 households was used for the econometric analysis.

2.1.3. Description of Survey Variables

The collected data covers a wide range of information, allowing for the construction of the necessary variables for the SFA model. The main groups of information include:

Demographic and socio-economic characteristics of the household head: Age, education level, farming experience.

Farm characteristics: Scale (area, cage/raft volume), ownership form.

Detailed production inputs: Quantity and cost of seed, feed, labor (family and hired), medicines and chemicals, energy.

Output and revenue: Total harvested output, selling price, and total revenue.

Management and sustainable practices: Participation in technical training programs, membership in cooperatives, and adoption of standards like VietGAP.

Access to support services: Access to formal credit sources, fishery extension services.

The final dataset reflects the diverse production structure of the region, including major farmed species such as grouper, Babylon snail, lobster, and whiteleg shrimp.

2.2. Methodology: Stochastic Frontier Analysis (SFA)

To assess the production efficiency of the aquaculture households, this study employs the Stochastic Frontier Analysis (SFA) method. SFA is a widely recognized parametric econometric method used to estimate a technically efficient production "frontier" and to measure the efficiency level of each production unit (in this case, farming households) relative to that frontier. The method was independently introduced by Aigner, Lovell, & Schmidt (1977) and Meeusen & Van den Broeck (1977).

The main advantage of SFA over non-parametric methods like Data Envelopment Analysis (DEA) is its ability to decompose the total error term into two components: (1) a random error (vi), which captures factors beyond the producer's control such as adverse weather or sudden market fluctuations; and (2) a technical inefficiency component (ui), which reflects managerial and operational shortcomings of the producer (Võ, 2022). This decomposition allows for more robust and reliable efficiency estimates. Furthermore, SFA allows for the statistical testing of hypotheses about the factors affecting the level of inefficiency within a single estimation model (the one-step approach), avoiding potential bias issues of the two-step method (Võ, 2022). Numerous studies on aquaculture efficiency in Vietnam and other developing countries have successfully applied this method (Folorunso et al., 2021; Thach & Vo, 2021; Kim Anh et al., 2020).

2.3. Model Specification

The SFA model is specified with two simultaneously estimated equations: the stochastic frontier production function and the technical inefficiency model.

Stochastic Frontier Production Function

This study uses the Cobb-Douglas production function, a popular form in agricultural economics research due to its flexibility and the ease of interpreting its coefficients as output elasticities (Vo, 2022). The log-linear equation is as follows:

$$\ln(\text{Output}_i) = \beta_0 + \sum_{j=1}^{k} \beta_j \ln(\text{Input}_{ji}) + (v_i - u_i)$$

Where:

- ln(Outputi): The natural logarithm of the total harvested output (kg) for household i. Data is from survey files.
- ln(Inputji): The natural logarithm of production input j for household i, including: Seed (total seed cost), Feed (total feed cost), Labor (total labor days), Capital (depreciated value of fixed assets), and Other (total cost of chemicals, energy, etc.). Data for all inputs are extracted from detailed survey files.
- βj: Parameters to be estimated, representing the output elasticity with respect to each input.
- vi: The random error component, assumed to be normally distributed N(0, σv2).
- ui: The technical inefficiency component, a non-negative variable, often assumed to follow a half-normal distribution N+(0, σu2).

Technical Inefficiency Model

The technical inefficiency component, ui, is modeled as a function of household-specific characteristics that are hypothesized to influence their managerial ability and adoption of efficient and sustainable practices:

$$ui=\delta 0+k=1\sum m\delta kZki+wi$$

Where:

- ui: The level of technical inefficiency for household i.
- Zki: A vector of variables explaining inefficiency, including: Experience (years of farming), Education (years of schooling), Scale (farm size), Training (dummy variable for participation), CreditAccess (dummy for formal credit access), VietGAP (dummy for certification), and Cooperative (dummy for membership). Data for these variables are from survey files.
- δk: Parameters to be estimated. A negative sign for
- δk indicates that the variable Zk helps reduce inefficiency, i.e., increases technical efficiency.
- wi: The error term for the inefficiency model.

3. RESULTS AND DISCUSSION

3.1. Research Results

Descriptive Profile of Aquaculture in Khanh Hoa

To provide context for the econometric analysis, it is essential to examine the basic characteristics of the surveyed farming households. Table 1 summarizes the main descriptive statistics of the research sample.

Table 1. Descriptive Statistics of Surveyed Aquaculture Households in Khanh Hoa, Vietnam (Source: Author's compilation from survey data, 2024)

Variable	Unit	Mean	Std. Dev.	Min	Max
Output and Financials					
Output	Tons/year	25.5	32.1	0.27	200.0
Revenue	Million VND/year	2,850	3,100	32	22,500
Total Cost	Million VND/year	2,150	2,450	49	18,000
Profit	Million VND/year	700	950	-17	4,500
Farm Characteristics					
Farm Scale	m^3 or m^2	1,500	1,800	60	11,000
Household Head Characteristics					
Age of Household Head	Years	45.2	10.5	28	70
Experience	Years	10.8	6.2	2	29
Education Level	Years of schooling	9.1	2.5	5	12
Sustainable Practices & Institutions					
Participation in Technical Training	% of households	35.5%	-	-	-
Cooperative Membership	% of households	18.2%	-	-	-
VietGAP Participation	% of households	8.5%	-	-	-
Access to Formal Credit	% of households	42.1%	-	-	-

Note: Values are estimates based on a preliminary analysis of the sample data.

Table 1 paints a diverse picture of household-scale aquaculture in Khanh Hoa. There are large variations in scale, output, and profit, indicating a clear differentiation in production capacity.

Notably, the participation rate in institutional and sustainable activities like cooperatives and VietGAP is very low, at only 18.2% and 8.5%, respectively. This provides initial evidence of the gap between policy encouragement and on-the-ground adoption.

Estimation of Production Technology

The estimation results of the stochastic frontier production function are presented in Table 2. These coefficients reflect the industry's average production "technology," indicating the contribution of each input factor to the total output.

Table 2. Estimation Results of the Stochastic Frontier Production Function Model (Source: Author's compilation from survey data, 2024.*)*

Variable (Natural Logarithm)	Coefficient (β)	Standard Error	Significance (p-value)
Constant (β_0)	1.254	0.432	***
Seed Cost (Seed)	0.281	0.095	***
Feed Cost (Feed)	0.452	0.112	***
Labor	0.155	0.078	**
Capital	0.089	0.051	*
Model Diagnostic Parameters			
$\sigma^2 = \sigma_v^2 + \sigma_u^2$	0.215	0.034	***
$\gamma = \sigma_u^2/\sigma^2$	0.789	0.067	***
Log-likelihood	-185.43		

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The results in Table 3 provide strong evidence. The experience and education level of the household head both positively affect efficiency, highlighting the importance of human capital. Notably, all variables related to sustainable practices and institutions have a statistically significant effect on increasing efficiency:

Technical Training: Training significantly reduces farmers' inefficiency. This is a powerful factor, showing that applied technical knowledge is a key driver.

VietGAP Participation: Adhering to good production standards not only meets market demands but also helps farmers optimize processes, reduce waste, and increase efficiency.

Cooperative Membership: Joining collective organizations helps farmers access information, technology, and markets better, thereby improving management efficiency.

Formal Credit Access: Access to capital allows households to invest in better technology and higher-quality inputs, thus enhancing production efficiency.

Conversely, the Scale variable has a positive coefficient, indicating that larger-scale farms tend to be less efficient. This may reflect managerial challenges as scale expands beyond the household's management capacity.

These results quantify the link between sustainability and efficiency. They show that adopting GSCM-aligned practices is not a cost burden but a sound economic investment that yields direct benefits through improved production efficiency.

Robustness Checks

To enhance the reliability of the results, we performed additional tests to demonstrate that the main conclusions are robust and not driven by specific model assumptions.

Alternative Production Function: The main model uses the Cobb-Douglas production function due to its popularity and ease of interpretation. However, this functional form has some limitations (e.g., assuming the elasticity of substitution between inputs is equal to 1).

To check this, we re-estimated the model using the Translog function, a more flexible form that does not impose these restrictions. The results are presented in Table 4 below.

Alternative Error Distribution: The main model assumes the technical inefficiency component (ui) follows a half-normal distribution. We tested the sensitivity of the results by re-estimating the model with an alternative assumption, the truncated-normal distribution. The results showed that the efficiency estimates and the parameters in the inefficiency model remained very similar, confirming that our findings are robust to different distributional assumptions.

Table 4. Comparison of Inefficiency Model Estimation Results between Cobb-Douglas and Translog Functional Forms (Source: Author's compilation from survey data, 2024)

Variable	**Cobb-Douglas Model (Main)**	**Translog Model (Check)**
	Coefficient (δ)	Coefficient (δ)
Constant	1.567***	1.602***
Experience	-0.045**	-0.049**
Education	-0.091***	-0.088***
Scale	0.123**	0.119**
Training	-0.258***	-0.265***
Credit Access	-0.184**	-0.191**
VietGAP	-0.315**	-0.320**
Cooperative	-0.297***	-0.301***
Average TE	68.5%	69.1%

Note: *, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

The results in Table 4 show that the estimated coefficients from the Translog model are highly consistent with the Cobb-Douglas model in terms of sign, magnitude, and statistical significance. The average technical efficiency also remained almost unchanged. This strongly supports the robustness of the conclusions drawn in this study.

3.2. Discussion

3.2.1. The Technical Efficiency Gap: Comparison and Implications

The core finding of the SFA shows that the average technical efficiency (TE) of aquaculture households in Khanh Hoa is 68.5%. This figure not only confirms the existence of a significant efficiency gap but also reveals vast untapped potential: theoretically, farmers could increase their output by an average of 31.5% without increasing inputs, simply by optimizing existing management and operational processes.

When placed in the context of research in Vietnam, this efficiency level is comparable to the findings of Thach & Vo (2021), who found an average TE of around 65% for shrimp farmers in the Mekong Delta. This similarity suggests that operating below potential may be a common feature of small-scale aquaculture in Vietnam, regardless of geographical region or farmed species. However, our result is considerably lower than those from countries with more developed and institutionalized aquaculture sectors. For instance, studies on the salmon farming industry in Norway often report TE levels above 85-90%. This difference can be attributed to factors like advanced technology, effective extension systems, a well-organized supply chain, and especially a more supportive institutional environment for producers in Norway. Thus, the 31.5% efficiency gap in Khanh Hoa is not just a technical figure; it is a quantitative indicator of the systemic challenges facing small-scale producers.

3.2.2. Decoding Efficiency Determinants: The Role of Capital and Institutions

The inefficiency model (Table 3) provides strong empirical evidence on factors that close the efficiency gap. These can be grouped and discussed in greater depth from the perspectives of human capital, social capital, and formal institutions.

Human Capital as a Foundation

The results show that both the education level and experience of the household head have a positive and statistically significant impact on improving efficiency. This confirms the indispensable role of human capital.

Higher education enhances a farmer's ability to adopt new technologies, analyze market information, and implement more complex management methods. Practical experience, on the other hand, provides them with valuable tacit knowledge for managing disease risks and adapting to local environmental conditions. Participation in training acts as a bridge between these two, providing applied technical knowledge that helps translate human capital into more effective production actions.

The Power of Social Capital and Supporting Institutions

Cooperative Membership: This result affirms the key role of social capital in improving efficiency, consistent with the theory of collective action. Cooperatives not only help farmers reduce transaction and input costs through economies of scale in bulk purchasing, but they also act as a channel for disseminating new knowledge and technology, breaking the information isolation that smallholders often face. More importantly, they strengthen farmers' bargaining power with suppliers and traders, helping them retain a larger share of the value, which in turn creates an incentive to reinvest.

Formal Credit Access: The ability to access capital is an enabling factor that allows farmers to overcome financial barriers—identified as one of the biggest obstacles to adopting sustainable practices (Le et al., 2022; Luthra et al., 2017). Formal credit helps them invest in high-quality seed, better feed, and modern technologies (like HDPE cages, aeration systems), thereby directly improving productivity and efficiency.

VietGAP Participation: Adherence to standards like VietGAP is not just a requirement for accessing high-end markets but also an effective management tool. The certification process compels farmers to standardize production processes, keep detailed records, and optimize the use of inputs (especially feed and chemicals). This directly leads to reduced waste and improved technical efficiency, turning market pressure into an internal driver for improvement, which is consistent with the arguments of Zhu & Sarkis (2007) on the role of institutional pressures.

3.2.3. The Scale Paradox: When Bigger Isn't Better

One of the most counter-intuitive and notable findings of this study is the positive and statistically significant correlation between farm scale and technical inefficiency. This means that, in the surveyed context, larger farms tend to operate less efficiently.

This finding engages in an interesting dialogue with previous research. It is consistent with the results of Nguyen et al. (2020) in the Mekong Delta, who also pointed out challenges in disease and logistics management as shrimp farms expand. However, our result contrasts sharply with studies on the salmon farming industry in Norway (Jensen & Asche, 2019) or Chile, where larger scale is often associated with higher efficiency due to economies of scale in technology adoption and contract negotiation.

This difference can be explained by the decisive role of the institutional environment. In developed countries, efficient capital markets, strong contract enforcement, and an available pool of high-quality managerial talent allow large firms to fully exploit their advantages. Conversely, in the Vietnamese context, most farms are still family-managed. As production scale expands, managerial complexity increases exponentially, potentially exceeding the household head's capacity. At the same time, limited access to formal credit creates working capital challenges, leading to cuts in input quality. Therefore, this finding suggests that the theory of economies of scale must be reconsidered carefully in emerging economies with incomplete market institutions. The process of scaling up must be accompanied by enhanced managerial capacity and a commensurate supportive institutional framework.

3.2.4. Evidence of the 'Institutional Trap

The contradiction between the clear benefits of good practices and their low adoption rates on the ground is a manifestation of the "institutional trap" described by Acemoglu & Robinson (2012). Our data shows that while joining cooperatives and adopting VietGAP significantly boosts efficiency, participation rates are a mere 18.2% and 8.5%, respectively.

Why does this irrationality exist? The answer lies in the "extractive" institutional environment facing smallholders.

They lack secure and long-term water use rights, depend heavily on informal market channels dominated by traders, and face high upfront costs to comply with standards. In such an environment, a farmer's rational strategy is to maximize short-term survival benefits rather than make long-term investments in sustainability whose returns are not guaranteed to accrue to them. This is a market and institutional failure, where macro-policies for green growth have not been translated into effective micro-level support mechanisms.

3.2.5. Beyond the Farm: Connecting Production Efficiency to the Circular Economy

The on-farm efficiency analysis is only one part of the picture. The SFA results indicate that feed is the most significant input, with an output elasticity of 0.452, and is also the largest cost item. This heavy reliance on industrial feed from other provinces or imports not only increases costs but also creates a vulnerability in the supply chain's sustainability and resilience.

This is where the opportunity for a circular economy arises directly. Khanh Hoa is a major seafood processing hub, generating enormous amounts of by-products.

Developing local by-product processing facilities to produce high-quality fishmeal and fish oil would create a closed-loop system: "waste" from the processing industry becomes a strategic input for the aquaculture industry. This model, similar to initiatives implemented in Norway and Chile, would not only reduce production costs and enhance efficiency for farmers but also address pollution, create jobs, and build a more self-reliant and sustainable local seafood value chain.

3.3. Policy Implications

Based on the empirical evidence and multi-dimensional analysis, this study proposes a set of synchronized policy solutions structured at three levels to promote the transition towards a green and circular aquaculture supply chain.

National Level Policy Architecture

Strengthen Inclusive Institutional Frameworks: The Law on Fisheries 2017 (The National Assembly of the Socialist Republic of Vietnam, 2017) and related decrees should be amended and supplemented to create stronger financial and technical support mechanisms for collective economic models like cooperatives and co-management groups. Genuinely empowering local communities in resource management will help build "inclusive institutions" from the ground up, creating incentives for sustainable protection and investment.

Promote Green Finance: The government and the State Bank of Vietnam should develop specialized green credit packages for small and medium-sized enterprises (SMEs) in the aquaculture sector. These loan packages need to have preferential interest rates and flexible procedures to help farmers overcome the initial investment cost barriers for sustainable technologies (e.g., HDPE cages, recirculating aquaculture systems, solar power). This directly addresses the financial barriers identified in previous research (Phan, 2025; Vo, 2022).

Foster Circular Economy Hubs: A national program, with support from the state budget and incentives to attract FDI, should be established to create regional seafood by-product processing centers. These centers would be located in major seafood industry clusters such as Khanh Hoa, Ca Mau, and Kien Giang, acting as nuclei of the circular economy that connect the fishing, processing, and aquaculture sectors.

Provincial Level Implementation (Khanh Hoa)

Bridge the Knowledge Gap: The Khanh Hoa provincial Department of Agriculture and Rural Development should revamp and expand its fishery extension services. Training programs should be designed based on evidence, focusing on the skills and practices that have been proven to positively impact technical efficiency (as shown in the results from Table 3). This will help narrow the gap between policy and practice.

Facilitate Market Linkages: The Department of Industry and Trade should collaborate with the Vietnam Association of Seafood Exporters and Producers (VASEP) to create platforms (both online and offline) to connect farmer cooperatives with large processors and exporters.

This would help reduce intermediaries, increase price transparency, and ensure stable outputs, gradually breaking the "institutional trap" caused by dependence on traders.

Integrate Sustainability into Provincial Planning: It is crucial to ensure that Khanh Hoa's master plans (Government, 2023) include specific orientations for spatial and infrastructure planning to support circular economy initiatives, such as land allocation for by-product processing plants and the development of logistics systems for raw material collection.

Industry and Community Level Action

Enhance the Role of Cooperatives: Policies should be implemented to provide legal and financial support to encourage the establishment and strengthening of farmer cooperatives. These organizations can help members achieve economies of scale when purchasing inputs, gain stronger bargaining power in price negotiations, and serve as an effective channel for deploying training programs and sustainable standard certifications.

Public-Private Partnerships for Traceability: Encourage partnership models between technology companies, exporters, and cooperatives to implement digital traceability systems (e.g., blockchain) at a reasonable cost. This not only helps meet the increasingly stringent requirements of international markets but also enhances consumer trust and increases the brand value of Vietnamese seafood products (World Bank, 2024; Euromonitor International, 2025).

4. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

CONCLUSION

This study provides robust econometric evidence on the nexus between sustainable practices, the institutional context, and production efficiency in the aquaculture sector of Khanh Hoa province, Vietnam. The SFA results reveal a significant technical efficiency gap, implying great potential to increase output and income without additional resource inputs.

Key factors for improving efficiency include human capital (education, experience, training) and social capital (cooperative membership, credit access). The adoption of standards like VietGAP also shows a clear positive impact.

These findings confirm that investing in green and sustainable practices is not just an environmental requirement but also a sound economic strategy that directly benefits producers.

However, the low adoption rate of these practices points to the existence of an "institutional trap," where financial, knowledge, and market barriers prevent smallholders from making long-term investments. To break this vicious cycle and realize the goals of the green marine economy strategy, a synchronized policy roadmap is needed—from strengthening inclusive institutions at the national level, to implementing specific support programs at the provincial level, and empowering community organizations at the grassroots level. The transition to a green and circular aquaculture sector in Vietnam is not only an environmental imperative but also a strategic mandate for ensuring long-term competitiveness and economic prosperity.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While the study has achieved its objectives, some limitations should be considered.

First, the study uses cross-sectional data, which provides a snapshot at a single point in time. Panel data would allow for a more dynamic analysis of efficiency changes and the impact of policies over time.

Second, the research scope is limited to Khanh Hoa province. Although it serves as a representative case, expanding the research to other coastal provinces with different socio-economic and ecological conditions would provide a more comprehensive picture and allow for comparative analysis.

Third, a key econometric limitation is the potential for endogeneity, particularly self-selection bias. For instance, the model shows that cooperative membership increases efficiency. However, the possibility cannot be ruled out that farmers who are inherently more skilled or forward-thinking are more likely to proactively seek out and join cooperatives. If this occurs, the estimated impact of the "Cooperative" variable may be biased upwards.

Due to the limitations of cross-sectional data, the interpretation of results in terms of causality should therefore be done with caution.

Future research could focus on: (1) Detailed cost-benefit analyses of specific circular economy technologies, such as by-product processing plants, at the local level. (2) In-depth studies on the role of informal value chains and the market power of traders in hindering the green transition. (3) Developing and testing new cooperative business models capable of effectively integrating smallholders into modern and sustainable supply chains. (4) Applying panel data or quasi-experimental methods like Propensity Score Matching (PSM) to address endogeneity, thereby providing more reliable causal estimates of the impact of institutional factors.

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CHAPTER 3
UNDERSTANDING CONSUMERS PREFERENCES FOR AGRILCUTURE PRODUCTS: EVIDENCE FROM ORGANIC RICE IN MEKONG DELTA VIETNAM

[1]Tien Dung KHONG
[2]Nguyen Doan Khoi LE
[3]Tran Thi Thu DUYEN

[1]School of Economics, Can Tho University, Vietnam, ktdung@ctu.edu.vn, ORCID ID: 0000-0002-2274-2123
[2]Department of Science, Technology and Innovation, Can Tho University, Vietnam
[3]School of Economics, Can Tho University, Vietnam

INTRODUCTION

Vietnam is a country with a long history of agricultural development; however, it is not among the most advanced agricultural producers, and the quality of its products often fails to satisfy the requirements of demanding export markets such as the United States and the European Union, which impose strict quality standards (Son, 2016). Rice represents one of the most important industries in the Mekong Delta, the leading region for rice exports nationwide. With an area of approximately four million hectares, the Mekong Delta contributes more than 50% of national rice output and accounts for over 90% of the country's rice exports, equivalent to more than 20% of global market share. This export volume generates approximately USD 2 billion in annual revenue for Vietnam (Khong Tien Dung, 2024). Notably, during the 2024 winter-spring crop, the Mekong Delta achieved a yield of 72 quintals per hectare, 3.7 quintals higher than the national average for the same season. Over the two decades from 2000 to 2020, the region's average rice yield increased by 17.8 quintals per hectare, contributing more than 7 million tons of additional rice—nearly 70% of the total national increase (General Statistics Office, 2021).

Globally, the trend toward organic agricultural production has accelerated, driven by increasing consumer demand for healthier and environmentally friendly food. In parallel, the living standards of Vietnamese consumers are rising, accompanied by growing concerns about food safety in daily consumption. The Mekong Delta has gradually adopted organic farming practices, consistent with the global development trend, due to their benefits such as environmental protection, production of clean food, and health security for both producers and consumers. Responding to this demand, numerous clean, safe, and organic food brands have emerged in recent years to meet consumer expectations. Importantly, consumer awareness of organic food is considered the first step in fostering market demand (Briz & Ward, 2009). A higher level of knowledge about organic food positively influences consumer attitudes and purchasing behavior, which is essential for guiding consumer orientation toward sustainable food choices.

Despite this trend, organic farming remains relatively new in Vietnam.

According to the Research Institute of Organic Agriculture (FiBL) and the International Federation of Organic Agriculture Movements (IFOAM), the area of organic farming in Vietnam in 2024 reached just over 71 thousand hectares, representing about 1.5% of the country's total cultivated area. The organic food market in Vietnam remains underdeveloped, and while precise statistical data are scarce, the limited supply—caused by low productivity, insufficient consumer information, and the absence of an effective quality assurance system—appears to be a key constraint. Previous studies also highlight that consumer awareness of organic food in Vietnam is relatively low, with many individuals unfamiliar with the concept (Truong Minh Hoang, 2012).

Currently, a portion of Vietnamese consumers are increasingly health-conscious and prefer safe, high-quality food produced with organic methods. Nevertheless, the price of organic products remains a major obstacle. Organic food is substantially more expensive than conventional alternatives, and many consumers neither fully understand nor clearly perceive the differences between the two categories. This price gap significantly restricts consumer choices, representing a major challenge for the organic agriculture sector in the Mekong Delta. To address these issues, initiatives promoting organic, safe, and high-value agricultural production are being reinforced across the region. Therefore, assessing consumer awareness and demand for organic products is both a necessary and practical task to support the sustainable development of organic agriculture in the Mekong Delta.

1. LITERATURE REVIEW AND RESEARCH METHODOLOGY

1.1 Literature Review

Several studies in Vietnam have examined consumers' and farmers' willingness to pay (WTP) for agricultural products and risk-related services using the Contingent Valuation Method (CVM) and related stochastic pricing approaches. For instance, Huynh Viet Khai and Yabe (2011) analyzed Vietnamese rice farmers' WTP for commodity price insurance. The study applied CVM, interviewing farmers at different insurance prices (2,500 VND/kg, 3,500 VND/kg, and 4,500 VND/kg).

Findings revealed that fewer than 50% of respondents recognized the value of such services, likely due to the novelty of agricultural insurance. The authors suggested that government financial support and small-scale pilot programs would be necessary to enhance farmer adoption. Similarly, Phan Dinh Khoi et al. (2014) estimated households' WTP for a biodiversity conservation program at the Bac Lieu Bird Garden using CVM. With data from 550 households in Can Tho, Hau Giang, and Bac Lieu (response rate: 86.7%), the average household WTP ranged from 9,971 VND to 20,218 VND per month. This implies that urban residents in the Mekong Delta could contribute approximately 9.5 billion VND annually to conservation efforts.

Research on consumer preferences for organic products has also been conducted. Huynh Viet Khai (2015) employed a binary stochastic pricing model to examine WTP for organic vegetables in the Mekong Delta. The results showed strong consumer interest, with an average price premium of 59% compared to conventional vegetables. Health and food safety concerns were the primary drivers of demand, while higher income and education levels were positively associated with WTP.

Insurance for aquaculture was investigated by Huynh Viet Khai et al. (2017), who used stochastic pricing to estimate shrimp farmers' WTP for insurance in Bac Lieu. Based on interviews with 130 shrimp ponds, 53.8% of respondents were willing to purchase insurance, with an average WTP of 6.86–7.23 million VND per 1,000 m^2 per crop. This exceeded the premium levels of the pilot program, suggesting improved acceptance of insurance as a risk management tool. In another study, Huynh Viet Khai et al. (2018) assessed WTP for safe pork in Soc Trang city. Interviews with 125 residents showed that 56% were willing to pay, at an average of 160,000 VND/kg. Logit regression indicated that higher income, prevailing market prices, and household dependency ratios positively influenced WTP, while the price of safe pork and weekly consumption levels negatively affected demand.

Beyond food and insurance, Nguyen Viet Thanh et al. (2018) estimated the economic value of biodiversity in Xuan Thuy National Park using CVM. Results indicated a non-use value of 8 billion VND.

Income, awareness, and occupation were found to significantly influence WTP for mangrove and biodiversity conservation, with wealthier, more knowledgeable, and environmentally engaged individuals exhibiting higher WTP. These findings underscore the importance of tailored policies for biodiversity conservation.

In general, prior studies confirm that market risks—particularly price fluctuations—play the most critical role in shaping consumer demand for agricultural and organic products. While CVM has been widely used to estimate WTP across various sectors, earlier studies often did not fully capture the role of product knowledge, consumer attitudes, and trust in shaping demand for organic foods. Stata, introduced iterative bidding processes to refine WTP estimates. Importantly, the findings highlight that trust functions as a mediating variable, linking food knowledge to attitudes and purchase intentions. This suggests that consumer trust, combined with knowledge and socio-demographic.

1.2 Data Collection and Analysis

1.2.1 Descriptive Statistics Method

Descriptive statistics encompass a set of methods for measuring, summarizing, and presenting data (Mai Van Nam, 2008). These methods are widely applied in economics to generate conclusions derived from empirical evidence. In this study, descriptive statistics are employed to illustrate consumer characteristics, awareness, and the current status of organic rice consumption. Data are synthesized and organized through statistical tables, providing a foundational basis for subsequent analysis.

1.2.2 Logit Model

The Logistic model is used to analyze the factors affecting the decision to use in the organic rice with the following general form:

$$Ln\left[\frac{P(Y=1)}{P(Y=0)}\right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_i X_i$$

In which: P(Y=1) = P0 is the probability of event occurrence. In this paper, it is the probability that consumers are willing to pay for safe - organic rice. P(Y=0) = 1- P0 is probability of no event. In this paper, it is the probability that consumers are not willing to pay for organic rice. Xi is independent variables (i=0,1,2…n), Ln is log of base e (e=2,714)

The Logistic function can be rewritten as follows:

$$Ln(Odds) = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7$$

The regression coefficients will be estimated using the Maximum Likelihood Estimation method. Based on the inheritance of related studies, the research topic proposes independent variables that can influence the demand and willingness to pay for clean - organic rice.

1.2.3 Likert Scale

Assessing consumers' perceptions of factors influencing their willingness to pay for organic rice using the Likert scale. The Likert scale is a five-point scale used in research to allow consumers to indicate the extent to which they agree or disagree with a particular statement. The Likert scale assumes that the intensity of an attitude is linear, that is, on a continuum from strongly disagree to strongly agree, and makes the assumption that attitudes can be measured.

For variables constructed from a 5-point Likert scale, the interval value is determined based on the following formula: Interval value = (maximum value – minimum value)/n

Accordingly, the meaning of each interval value is understood as follows:

1.00 – 1.80: Completely disagree/ Completely unaware/ Completely infrequent/ Very ineffective.

1.81 – 2.60: Disagree/ don't know/ not often/ not effective 2.61 – 3.40: Neutral.

3.41 – 4.2: Agree/ know/ often/ effective.

4.21 – 5.00: Completely agree/ Completely know/ Completely often/ very effective.

2. RESULTS AND DISCUSSION

2.1 Consumers Preferences for Organic Agriculture Product

Perceptions of current agriculture food issues

Table 1. Respondents' perceptions of current agriculture food issues (*Source: Survey data)*

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
NT1	133	5	1	3.90	0.7	Yes
NT2	133	5	1	4.12	0.7	Yes
NT3	133	5	1	4.07	0.6	Yes
NT4	133	5	1	4.10	0.6	Yes
NT5	133	5	1	4.06	0.6	Yes

Note: NT1: Food safety and hygiene issues are currently not guaranteed. NT2: Many foods of unknown origin, NT3: Many foods contain preservatives, NT4: Some vegetables, tubers, and rice fruits contain pesticide residues exceeding the permitted level, NT5: There are many food poisoning incidents occurring every year, affecting people and property.

Respondents' perceptions of food-related issues are summarized in Table 1. Each participant was asked to evaluate 10 statements concerning food safety and quality, using a five-point Likert scale: 1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = completely agree.

The results indicate that food safety and hygiene are major concerns among respondents. Specifically, 69% agreed and 15% strongly agreed with the statement "Food safety and hygiene are currently not guaranteed because many food items contain harmful substances", reflecting widespread concern about the risks associated with unsafe food. Similarly, 91% of respondents agreed or strongly agreed that "Many foods on the market today have unclear origins", suggesting that traceability and transparency are crucial factors influencing consumer choices. In addition, 69% of participants agreed that "Some vegetables, tubers, and fruits contain pesticide residues exceeding permissible levels", underscoring consumer awareness of chemical contamination risks.

Furthermore, 68% agreed and 20% strongly agreed with the statement "There are many food poisoning incidents occurring every year, affecting people's health and property", highlighting that respondents recognize the significant health and economic consequences of unsafe food consumption.

Overall, these findings demonstrate that consumer concerns about food quality, safety, and origin are substantial, and such perceptions play a pivotal role in shaping their attitudes and behaviors toward food selection.

Level of Understanding of Food Issues

Awareness of consumer health issues in general, and food safety in particular, has become an increasing concern. The availability of green, clean, and pesticide-free organic foods not only benefits consumers' health but also contributes positively to environmental sustainability

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Table 2. Consumer understanding of organic products (*Source: Survey data)*

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
HB1	133	5	1	4.18	0.8	Totally agree
HB2	133	5	1	3.90	0.7	Agree
HB3	133	5	1	4.12	0.8	Agree
HB4	133	5	1	3.65	0.8	Agree
HB5	133	5	1	3.89	0.7	Agree

Note: HB1: Safe foods always bring good benefits. HB2: There are many safe foods on the market, HB3: The price of safe foods is higher than the price of regular foods, HB4: Many places distribute and sell safe foods, HB5: The places selling safe foods are still limited.

The statement Organic foods always bring good benefits to consumers received agreement from 50% of respondents, indicating that many consumers recognize the advantages of choosing safe food. However, 8% expressed no opinion, and a small proportion (1.5%) disagreed, suggesting that some individuals believe organic food may be beneficial but not universally accessible or advantageous to all consumers. Regarding the statement.

There are many types of safe food on the market today, 63.2% agreed, while 1.5% completely disagreed and 2% disagreed, reflecting skepticism about the abundance of safe food options due to concerns over unclear origins that create confusion in food choices.

When asked about price perceptions, 58% agreed with the statement "Currently, the price of organic food is quite high compared to conventional food", while 7.5% expressed no opinion, 8.27% disagreed, and 2% completely disagreed.

In reality, the higher price of safe food is attributable to production, processing, and preservation processes. Although many consumers remain concerned about cost, a segment of health-conscious individuals is willing to pay more for high-quality products, making price less of a barrier for them.

With respect to distribution, 70% agreed or strongly agreed that "Many places distribute safe food", yet 8.27% disagreed and 20.3% remained neutral, partly due to limited awareness or access to distribution points. Conversely, 66.2% agreed with the statement "There are still many limitations in the places selling safe food", while only 5.2% disagreed. This highlights that although safe food outlets exist, their availability remains limited, restricting consumer access.

Evaluation of Clean and Safe Food Purchasing Locations

Statistical results indicate that across various shopping locations—including supermarkets, convenience stores, traditional markets, grocery shops, roadside vendors, and rice retail outlets—most consumers perceive these places as safe or very safe in terms of food safety.

Table 3. Consumers' trusted locations for organic agricultural products of respondents (Source: Survey data)

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
DD1	133	5	1	4.17	0.6	Agree
DD2	133	5	2	3.79	0.5	Agree
DD3	133	5	2	3.08	0.7	Neutral
DD4	133	5	2	3.18	0.6	Neutral
DD5	133	5	1	2.50	0.8	Disagree
DD6	133	5	1	3.45	0.6	Neutral

Note: DD1: Supermarket. DD2: Convenience store, DD3: Market, DD4: Grocery store, DD5: Roadside cart, DD6: Rice retail agent.

Evaluation of Packaging of Organic and Safe Products

Table 4. Evaluation of packaging of organic and safe rice products (Source: Survey data)

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
BB1	133	5	1	3.6	1.21	Neutral

Note: BB1: interested in product packaging information such as expiry date, origin, place of manufacture

Many consumers express concern about packaging, while others pay little attention to this issue. However, packaging plays a critical role in maintaining product quality. Even products that are well cultivated, nutrient-rich, and carefully harvested and processed may experience significant deterioration in quality if preservation is inadequate or packaging is inappropriate

Assessment of Attitudes Towards Consumption of Organic Agricultural Food

The assessment of respondents' attitudes toward the consumption of organic agricultural products is presented in this paper. Each participant was asked to evaluate four statements related to food issues, using a five-point Likert scale: 1 = completely disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = completely agree.

Table 5. Assessment of attitudes towards consumption of organic agricultural food of respondents (Source: Survey data)

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
DG1	133	5	3	4.27	0.5	Totally agree
DG2	133	5	1	4.22	0.6	Totally agree
DG3	133	5	1	4.13	0.7	Neutral
DG4	133	5	1	3.78	0.7	Neutral

Note: DG1: Environmental protection products; DG2: Product origin is clear; DG3: Organic products are more expensive than conventional products; DG4: Convenient shopping locations.

The results summarized in the table indicate strong agreement among respondents regarding key aspects of organic agricultural products. For the statement *Environmental protection products are really necessary*, all respondents expressed agreement, with 31.58% completely agreeing and 64.66% agreeing, while only 3.75% remained neutral and none disagreed. This demonstrates a widespread recognition of the importance of environmental protection as essential to safeguarding human well-being.

Similarly, the statement *The origin of the product is clear* received strong support, with 56.39% agreeing and 33.83% completely agreeing, reflecting consumers' emphasis on traceability in food purchasing decisions. Regarding the statement *The cost of organic agricultural products is higher than that of conventional agricultural products*, the majority of respondents agreed (64.66%) or strongly agreed (26.32%).

Nevertheless, 6.77% expressed no opinion, while a very small proportion disagreed (0.75%) or strongly disagreed (1.5%). This confirms that higher prices remain a notable barrier for some consumers.

Finally, for the statement *Convenient shopping location*, most respondents acknowledged the importance of accessibility, with 55.64% agreeing and 13.53% completely agreeing. This suggests that in addition to quality and price, ease of access is also a significant factor shaping consumer attitudes toward organic food consumption.

Knowledge of Organic Rice Food

To assess respondents' knowledge of organic rice, as well as their understanding of issues related to its production process and uses in Vietnam, a series of structured statements regarding organic rice were presented for evaluation.

Table 6. Respondents' knowledge about organic rice (Source: Survey data)

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
KT1	133	5	1	3.77	0.8	Agree
KT2	133	5	1	3.55	0.8	Agree
KT3	133	5	1	3.83	0.7	Agree
KT4	133	5	1	3.58	0.9	Agree

Note: KT1: Organic rice is rice that does not use chemical fertilizers or pesticides; KT2: Closed organic rice production process; KT3: Organic rice is always rich in nutrients and safe for health; KT4: Rice also has good effects on people with cardiovascular disease and diabetes.

Among the respondents, 82 individuals (61.65%) reported being aware of the statement Safe rice is cultivated and produced without the use of chemical fertilizers or pesticides throughout the stages of cultivation, processing, and preservation, thereby ensuring food safety for consumers in their daily meals. Similarly, 74 respondents (55.64%) indicated knowledge of the statement.

The organic rice production process is closed, including seed selection, soil preparation, irrigation, and fertilization, all of which are carried out under the close supervision of experts, although 10.53% stated that they were unaware of this issue. These findings suggest that consumers show genuine interest in the organic rice production process.

Regarding the statement Organic rice is always rich in nutrients and safe for human health. Because its production excludes harmful substances, the body can more easily absorb the nutrients contained in organic rice, 67.67% of respondents reported awareness, reflecting strong consumer interest in the nutritional value of organic rice. Additionally, 64 respondents (48.12%) knew that organic rice is beneficial for individuals with cardiovascular disease and diabetes, as it contains more fiber and has a lower glycemic index compared to conventional white rice. Respondents also recognized that organic rice supports digestive health and weight management.

In summary, while consumers demonstrate some awareness of the benefits and production process of organic rice, overall knowledge remains limited, highlighting the need for greater dissemination of information to support the development of the organic agriculture sector.

Knowledge of Negative Issues of Rice In The Market

Table 7. Respondents' knowledge of current negative issues of rice (Source: Survey data)

Variable	Observations	Max.	Min.	Mean	Std. Dev.	Sig.
VĐ1	133	5	1	3.81	0.7	Agree
VĐ2	133	5	1	3.93	0.7	Agree
VĐ3	133	5	1	3.76	0.8	Agree
VĐ4	133	5	1	3.81	0.7	Agree

Note: VD1: Recently, there is information on the market about rice, dirty, of unknown origin, VD2: Rice using pesticides affects the ecosystem and consumer health, VD3: Rice preservation uses bleach, VD4: There are many foods made from rice such as vermicelli, rice noodles of poor quality.

To further assess respondents' knowledge of organic rice, interviewers presented four additional statements highlighting negative issues related to rice in the current market. Respondents evaluated their awareness on a five-point scale: 1 = completely unaware, 2 = unaware, 3 = neutral, 4 = aware, and 5 = completely aware.

The results show that the majority of respondents were aware of the issue "Recently, reports of fake rice and rice of unknown origin have appeared on the market, causing significant consumer confusion." Only 9% reported being unaware of this problem. Given that rice is the staple food in Vietnam, negative information about its safety is widely disseminated and well recognized by consumers. Similarly, 64.66% of respondents indicated awareness of the statement "The use of pesticides in rice cultivation negatively affects both ecosystems and human health," reflecting growing public concern about environmental protection, although 4.5% reported being unaware of this issue. Awareness was also notable regarding the statement In the preservation stage during distribution, rice is often treated with detergents and preservatives to enhance appearance, but this compromises food hygiene. Here, 51.13% of respondents expressed knowledge of such practices, showing their attentiveness to quality concerns in packaging and storage. Finally, with the statement There are many products made from rice such as vermicelli, rice noodles, and rice straws; however, if these are made from poor-quality rice, they may adversely affect consumer health, 60.15% reported being aware and 15.04% completely aware. This suggests that consumers not only recognize risks related to raw rice but also extend these concerns to rice-based products, particularly with respect to fake rice and excessive use of preservatives.

In summary, while overall awareness of negative issues surrounding rice is relatively high, the findings indicate that consumer trust in rice quality remains vulnerable, thereby underscoring the importance of credible information and assurance mechanisms in promoting organic rice consumption.

Estimating Consumers' Willingness to Pay for Safe – Organic Rice

The table below presents the logistic regression results derived from the binary choice responses to the contingent valuation questions.

Model 1 was estimated using only the bid price as the independent variable, whereas Model 2 incorporated additional explanatory variables expected to influence consumers' willingness to pay for the product.

Table 8. Logistic regression model results of the willingness to pay for safe rice (Source: Survey data)

Variable	Coef.	Std. Err.	P-value	VIF
Bid1	-0.0004***	0.0001	0.002	1.10
Age	0.1777ns	0.3644	0.626	3.25
Edu	-0.2251ns	0.1680	0.180	2.09
Mem No.	-0.1907 ns	0.2054	0.353	1.07
Income	0.1371 ns	0.1257	0.276	1.54
Occupation	-0.9043**	0.3792	0.020	3.35
Knowledge2	-0.3644 ns	0.3792	0.337	1.44
Knowledge3	0.7756*	0.4337	0.074	1.36
Constant	12.6539***	4.5978	0.044	
No. of Observation = 133				
Log likelihood = -51.3813				
LR $chi^2(8)$ = 28.66				
Prob>chi^2 = 0.0004				

Note: (***), (**) and (*) are statistically significant at the 1%, 5% and 10% levels; (ns) not statistically significant

Diagnostic tests confirm that the estimated model does not suffer from econometric problems such as heteroscedasticity, autocorrelation, or multicollinearity. The variance inflation factors (VIFs) of all independent variables are below 4, well under the commonly accepted threshold of 10, indicating the absence of multicollinearity.

The estimation results show that several independent variables—including household size, age, education, and income —are not statistically significant, implying that these factors do not significantly influence consumers' willingness to pay (WTP) for organic rice. In contrast, three variables are statistically significant: bid price (bid1), occupation, and knowledge3, which together explain variation in WTP among respondents.

The coefficient of the bid price variable (bid1) is negative and statistically significant at the 1% level, indicating an inverse relationship between price and WTP. Specifically, a 1 VND increase in price reduces the probability of WTP for organic rice by 0.004%. This finding highlights the sensitivity of consumer demand to price and suggests that lowering prices could enhance WTP and stimulate greater consumption of safe food products.

The coefficient for occupation is also negative and statistically significant at the 5% level, implying that occupation influences WTP. However, the results do not clearly identify which occupational groups are most affected, even when dummy variables are introduced. This limitation suggests the need for further research to more precisely determine occupational differences in WTP.

Finally, the knowledge variable (kienthuc3) has a positive coefficient and is statistically significant at the 10% level, showing that respondents with greater knowledge of organic rice have a higher probability of WTP compared to those with little or no understanding. This result aligns with descriptive findings regarding consumer awareness and underscores the practical importance of disseminating information about organic rice. Enhancing consumer knowledge appears to play a pivotal role in increasing both acceptance and demand for organic agricultural products.

Estimating Consumers' Willingness to Pay for Organic Rice

The following table reports the Logit regression results based on the binary choice responses to the contingent valuation questions. Model 1 includes only the bid price as the independent variable, whereas Model 2 incorporates additional explanatory variables that are expected to influence consumers' willingness to pay for the product.

Table 9. Logit regression results of the Willingness to Pay for Organic Rice (Source: Survey data)

Variable	Coef.	Std. Err.	P-value	VIF
Bid1	-0.00008**	0.00004	0.046	1.10
Age	-0.0878**	0.0411	0.033	3.25
Edu	0.0145ns	0.1387	0.235	2.09
Mem No.	0.4072ns	0.2729	0.136	1.07
Income	0.2031**	0.0913	0.026	1.54
Knowledge2	-0.2901 ns	1146.178	0.442	1.44
Knowledge3	0.5228 ns	1168.771	0.271	1.36
Constant	0.4507 ns	0.3266	0.168	3.35
Knowledge2	1.1260	3.8152	0.768	
No. of Observation = 133				
Log likelihood = -41.6848				
LK chi2(8) = 14.38				
Prob>chi2 = 0.0725				

Note: (***), (**) and (*) are statistically significant at the 1%, 5% and 10% levels; (ns) not statistically significant

Diagnostic checks confirm that the model does not suffer from multicollinearity among the independent variables. The estimation results indicate that several variables—including household size, education, knowledge 2, knowledge 3, and occupation—are not statistically significant, implying that these factors do not explain variation in respondents' willingness to pay (WTP) for organic rice.

By contrast, the remaining independent variables are statistically significant, including bid price (bid1), age, and income. The coefficient of bid1 is negative and significant at the 5% level, suggesting an inverse relationship between price and WTP. This result confirms that organic rice, typically priced higher than conventional rice, faces demand constraints due to price sensitivity. A reduction in price would increase consumers' WTP and potentially expand market demand.

The coefficient of age is also negative and statistically significant at the 5% level.

This indicates that younger respondents are more likely to pay for organic rice compared to older respondents, possibly due to their greater access to media and information about organic products.

This finding is consistent with the expectations of the study and aligns with the results reported by Dan and Duyen (2010).

In contrast, the coefficient of income is positive and statistically significant at the 5% level, implying that higher household income increases the likelihood of WTP for organic rice. Respondents with greater disposable income are more capable of affording the price premium associated with organic products. This result is also in line with previous findings by Dan and Duyen (2010).

Overall, these findings highlight three key determinants of consumer WTP for organic rice—price, age, and income—providing important insights for policymakers. Efforts to reduce price barriers, disseminate information to older demographics, and target higher-income segments may enhance demand and support the development of the organic rice market.

CONCLUSIONS AND RECOMMENDATIONS

This study was conducted using data collected from direct interviews with 133 rice consumers in Vinh Long province, covering districts such as Vung Liem, Mang Thit, Tam Binh, Tra On, Binh Tan, and Binh Minh. The results provide an overview of rice consumption demand and the determinants of willingness to pay (WTP) for organic rice in the region.

The analysis reveals that consumers' awareness of organic food remains limited. Logit regression results indicate that WTP is significantly influenced by bid price, age, occupation, income, and knowledge, whereas other variables are not statistically significant. These findings confirm that consumer demand for organic rice is shaped by both economic and cognitive factors. However, the study also has limitations. It only examined a subset of potential determinants of purchasing intentions, while other relevant factors—such as cultural habits, trust in certification systems, or marketing channels—were not explored.

Although awareness of the benefits of organic food for health and the environment is increasing, organic food consumption remains relatively low.

This is largely due to the high price premium of organic products, which makes many consumers hesitant, coupled with limited knowledge and insufficient communication. Consequently, while some consumers are willing to pay more, overall demand is still modest.

Policy Recommendations

Enhancing consumer awareness: The government should strengthen communication campaigns through mass media to raise public knowledge about the benefits, characteristics, and safety of organic rice. Greater awareness will cultivate "smart consumers" who make more informed food choices, thereby expanding the organic food market.

Supporting the organic market: Policies should provide incentives for producers and businesses, including initial subsidies for both producers and consumers, to encourage organic rice production and consumption.

Strengthening inspection and enforcement: A robust monitoring system is needed to detect and prevent violations, complemented by sanctions strong enough to deter fraudulent practices that exploit consumers' limited knowledge of food safety.

Certification and labeling standards: The government should establish transparent and reliable certification systems, including standardized packaging and labeling for organic products, to build consumer trust.

Business Recommendations

Expanding distribution: Enterprises should increase the number of reliable retail outlets and ensure that products are clearly labeled with verified origins and certifications.

Promoting organic rice: Businesses should invest in advertising through newspapers, television, and digital media, emphasizing the nutritional benefits of organic rice.

Improving labeling transparency: Providing complete, reliable, and easy-to-understand labeling information (e.g., production process, percentage of organic ingredients, certification, and expiry date) can enhance consumer trust.

Educational outreach: Businesses should implement promotional programs to educate consumers on how to identify organic products, packaging,

and certification logos. Such initiatives are particularly important given the limited knowledge of many consumers.

Product quality and pricing strategies: Since consumer attitudes strongly influence purchasing intentions, businesses must provide high-quality products consistent with label claims while adopting reasonable pricing strategies to attract buyers.

Building consumer trust: Trust is a decisive factor linking knowledge and attitudes with purchase intention (Teng & Wang, 2015). Enterprises should promote transparency in their production processes and leverage third-party certifications to strengthen consumer confidence.

Ensuring product availability: The study shows that the availability of organic food in supermarkets and stores strongly shapes purchasing intentions. Thus, businesses should develop effective distribution networks to ensure convenient consumer access to organic rice.

Overall, the findings demonstrate that consumer demand for organic rice is constrained by price sensitivity, limited awareness, and weak distribution systems. Addressing these barriers through coordinated government policies and proactive business strategies is essential to foster a sustainable organic rice market in Vinh Long province and beyond.

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CHAPTER 4
THE ROLE OF AGRICULTURAL COOPERATIVES IN ENHANCING FINANCIAL EFFICIENCY OF RICE FARMS: EVIDENCE FROM VIETNAM

[1]Tien Dung KHONG
[2]Thi Kim Uyen HUYNH
[3]Thuy Duong VU

[1]School of Economics, Can Tho University, Vietnam, ktdung@ctu.edu.vn, ORCID ID: 0000-0002-2274-2123
[2]School of Economics, Can Tho University, Vietnam
[3]School of Economics, Can Tho University, Vietnam

INTRODUCTION

Vietnam remains a developing economy in which the agricultural sector continues to play a pivotal role in economic growth and structural transformation. In 2024, agriculture, forestry, and fisheries accounted for 14.85% of the country's GDP composition (General Statistics Office, 2025). Beyond fulfilling the increasing domestic demand, Vietnam has also established itself as a major exporter, making significant contributions to the country's overall trade balance. Experts generally acknowledge the substantial development potential of Vietnamese agricultural commodities, particularly as the sector's consumption markets expand. However, integration into international trade frameworks has also imposed stricter requirements concerning product quality, food safety, hygiene standards, and environmental sustainability.

Despite these prospects, structural weaknesses persist. Approximately 90% of Vietnam's agricultural exports remain in raw or minimally processed form, with limited technological content and relatively low value-added compared to competitors in global markets. This structural characteristic significantly undermines the competitiveness of Vietnamese agricultural goods and constrains their participation in higher segments of global value chains. Consequently, the imperative to establish and strengthen agricultural value chains that meet international market standards has become increasingly urgent under conditions of deep economic integration.

The Mekong Delta (MD), often referred to as the country's agricultural heartland, possesses abundant comparative advantages for agricultural development. Nevertheless, agricultural production in the region faces multifaceted challenges ranging from climate change to volatile market dynamics, which exert downward pressure on productivity and resilience. The implementation of Resolution No. 120/NQ-CP on sustainable development through climate change adaptation has been recognized as a strategic policy instrument, enabling local governments to adopt adaptive, market-oriented solutions that enhance sustainability.

The MD, exemplifies both opportunities and constraints. With favorable agroecological conditions—including fertile soil, abundant water resources, and a conducive tropical climate—the province has developed several specialized and concentrated production areas for high-quality crops. However, production remains fragmented, small-scale, and often spontaneous, thereby constraining mechanization, lowering productivity, and reducing product standardization. Weak linkages in the agricultural value chain, limited integration with processing industries, and the absence of sustainable market connections exacerbate the recurring "high yield–low price" paradox, where farmers consistently incur losses despite bumper harvests. In this context, rent-seeking behavior by intermediaries such as traders and agents often results in disproportionate distribution of value, with farmers capturing only marginal benefits while other actors reap higher profits.

Nonetheless, challenges persist. Many farmers remain reluctant to adopt cooperative and value-chain-based production models, due in part to entrenched preferences for traditional smallholder practices. This reluctance perpetuates high production costs, limited mechanization, inconsistent product quality, and price volatility, ultimately leading to unstable farmer incomes. The absence of strong vertical and horizontal integration across the value chain—from cultivation to processing and distribution—remains a critical bottleneck in the province's agricultural transformation. Advancing value-chain-oriented agricultural production thus represents not only a developmental priority but also a structural necessity to ensure sustainable, competitive, and climate-resilient growth.

1. LITERATURE REVIEW AND RESEARCH METHODOLOGY

1.1 Literature Review

The Mekong Delta (MD) is currently confronted with substantial challenges arising from environmental and climatic variability. As an ecologically sensitive region, it is highly vulnerable to irregular fluctuations in climate patterns and hydrological regimes, which in turn trigger extreme weather phenomena that adversely affect farmers' livelihoods and household incomes.

Within this context, agricultural production—particularly crop cultivation—requires the adoption of innovative strategies and forward-looking solutions aimed at mitigating production and market-related risks.

In recent years, the improvement of production efficiency and the consumption of agricultural products in Vietnam, and in the Mekong Delta in particular, has become an important focus of academic inquiry. Numerous empirical studies have investigated different aspects of production efficiency and the effectiveness of linkage models between farmers, cooperatives, and enterprises. For instance, La Nguyen Thuy Dung and Mai Van Nam (2015) analyzed the financial efficiency of rice-producing households engaged in cooperative arrangements with enterprises in An Giang province, while Nguyen Tuan Kiet (2017) evaluated the efficiency of rice production under farmer–enterprise contractual arrangements in Vinh Hung district, Long An province. Similarly, Le Nguyen Doan Khoi and Nguyen Ngoc Vang (2012) examined organizational solutions to enhance rice production efficiency in An Giang province, whereas Nguyen Tuan Kiet and Trinh Cong Duc (2017) provided experimental evidence on the efficiency of large-scale field models in Can Tho and Soc Trang. Additional contributions include Ha Vu Son and Duong Ngoc Thanh (2014), who compared financial efficiency across production models with and without the application of technological innovations, and Nguyen Thi Thu An and Vo Thi Thanh Loc (2017), who assessed the financial efficiency of chili-producing households in the Mekong Delta. Furthermore, Nguyen Do Nhu Loan (2018) analyzed the production efficiency of seedless lemon growers in Hau Giang province.

Methodologically, these studies predominantly employed descriptive statistics and comparative analysis to examine the socio-economic characteristics of farming households as well as production-related variables. Indicators such as revenue, cost, and profit per unit of cultivated area were commonly utilized to assess production outcomes. Financial performance was further measured using ratios such as revenue-to-cost, profit-to-cost, profit-to-revenue, and profit-to-family-labor. These metrics provided a basis for evaluating financial efficiency across farming systems (e.g., La Nguyen Thuy Dung & Mai Van Nam, 2015; Ha Vu Son & Duong Ngoc Thanh, 2014; Nguyen Tuan Kiet, 2017; Nguyen Tuan Kiet & Trinh Cong Duc, 2017; Nguyen Thi Kim

Thoa, 2019; Nguyen Thi Bich Ngoc, 2019; Huynh Cam Hang, 2020; Ho Le Canh Ha, 2018).

To determine whether significant differences existed between households participating in enterprise-linked production models and those outside such linkages, researchers frequently employed inferential statistical techniques. In particular, the independent samples t-test was applied to compare means across two groups with respect to household characteristics, production costs, revenues, profits, incomes, and financial ratios. While each analytical method offers distinct advantages depending on the research context, financial ratio analysis remains a crucial tool for assessing profitability, cost-effectiveness, and overall economic sustainability of agricultural production models.

Through empirical analyses of production linkage models, prior studies have consistently demonstrated that farmer households participating in cooperative or enterprise-based linkages exhibit higher financial efficiency compared to those operating independently. For example, La Nguyen Thuy Dung and Mai Van Nam (2015) found that rice-producing households in An Giang province engaged in enterprise linkage models achieved superior financial outcomes. These households reported reduced production costs, increased profitability, and the adoption of improved farming techniques, particularly through the integration of scientific and technological innovations. Nevertheless, this study did not explicitly examine the determinants of household profits within the linkage model.

Similarly, Le Nguyen Doan Khoi and Nguyen Ngoc Vang (2012) concluded that households participating in large-scale field models in An Giang not only improved production efficiency but also attained higher and more stable incomes, with reduced production risks. In a related study, Nguyen Tuan Kiet (2017) evaluated the "Working with Farmers in the Field" program in Vinh Hung district, Long An province. The findings indicated that participating households achieved significantly higher revenues, profits, and cost-efficiency relative to comparable non-participant households.

Employing multivariate regression analysis, the study further identified key determinants of profitability, including expenditures on fertilizer and pesticides, access to technical training, household education level, cultivated land area, and participation in the program itself.

Additional evidence was provided by Ho Le Canh Ha (2018), who examined rice production in An Giang, Dong Thap, and Vinh Long. The study revealed that households engaged in enterprise-linked models, particularly in An Giang and Vinh Long, earned higher profits due to stable contractual arrangements for product consumption. Determinants of profitability included crop variety, household experience, family labor inputs, and input costs. Nguyen Thi Kim Thoa (2019) similarly assessed economic and financial efficiency among rice producers within and outside cooperatives. Although no significant difference in economic efficiency was found between groups across cropping seasons, financial efficiency indicators revealed that cooperative members earned 2.47 million VND/ha and 1.53 million VND/ha more in the Summer–Autumn and Winter–Spring seasons, respectively. Likewise, Huynh Cam Hang (2020) demonstrated that households cultivating Chinese cabbage within cooperative structures in Vinh Long province achieved higher profits than independent producers.

Taken together, these studies confirm that participation in cooperatives or enterprise-linked models generally leads to reduced production costs, higher profits, improved farming practices, and greater access to technical innovations. Beyond profitability, such linkages also facilitate compliance with quality standards increasingly demanded in domestic and international markets. In particular, several studies highlight the role of science and technology adoption in enhancing financial efficiency. For instance, Ha Vu Son and Duong Ngoc Thanh (2014) found that households applying technological innovations in rice production significantly outperformed those that did not. Similarly, Duong Ngoc Thanh and Nguyen Vu Phong (2014) reported that mango-producing households utilizing scientific advancements achieved greater financial efficiency than those relying on traditional practices. These findings align with Balcom et al. (2008), who argued that the adoption of modern production techniques is crucial for achieving both productivity gains and quality improvements.

Based on these outcomes, the literature has proposed several policy implications. Specifically, households are encouraged to engage in cooperative and enterprise-linked production models, actively participate in technical training programs, and exchange experiential knowledge to enhance financial performance. Such measures contribute to cost reduction, profit maximization, risk mitigation, and improved competitiveness in agricultural markets.

Despite this growing body of research, there remains a notable gap concerning the financial efficiency of cooperative participation. While studies in neighboring provinces provide valuable insights, empirical evidence specific to MD is limited. Accordingly, this study seeks to build upon prior work by analyzing primary production data from rice and seedless lemon farming households, comparing cooperative members with non-members. The objective is to evaluate financial efficiency and identify the key factors influencing household profitability. This research is expected to provide practical evidence to guide non-member households in considering cooperative participation as a strategy for improving financial outcomes and ensuring sustainable agricultural development.

1.2 Data Collection and Analysis

1.2.1 Descriptive Statistics and Comparative Method

Descriptive statistics represent a set of quantitative techniques used to measure, summarize, and present data in economics. Indicators such as mean, minimum, maximum, and frequency distributions provide an overview of the characteristics of the study sample. The descriptive statistical approach facilitates the identification of production structures, household resources, and socio-economic characteristics. The process begins with the examination of raw data distributions and the construction of frequency distribution tables. Frequency denotes the number of occurrences of an observation or the proportion of observations falling within specific intervals. Statistical tables thus serve as the primary medium for presenting data and research findings, allowing for systematic description and enabling policymakers and administrators to make generalized observations regarding the research problem. In this study, descriptive statistics are applied to illustrate the current state of agricultural production among households.

Key variables include landholding size, farming experience, application of production techniques, labor availability, and other relevant production resources.

The comparative method allows for the assessment of similarities and differences between two groups of indicators in order to evaluate changes over time or differences across production models. As Vo Thi Thanh Loc and Huynh Huu Tho (2015, p. 39) note, comparative analysis is applied to evaluate either the increase/decrease of indicators across time periods or to assess differences in outcomes across groups or markets.

Two types of statistical measures are employed within this framework:

Absolute numbers, which reflect the scale and volume of socio-economic phenomena under specific temporal and spatial conditions. These include both absolute period numbers (capturing phenomena over a specific time span) and absolute point-in-time numbers (capturing conditions at a given moment) (Tran Thi Ky & Nguyen Van Phuc, 2011, p. 47).

Relative numbers, which express the proportional relationship between two indicators. These may involve (i) comparisons across time and space for the same type of indicator, (ii) comparisons between related but different types of indicators, or (iii) comparisons between parts and the whole. Within this, relative dynamic numbers are particularly important, as they express changes in a given phenomenon between two time periods, usually in percentage or ratio form (Tran Thi Ky & Nguyen Van Phuc, 2011, p. 49).

By applying comparative analysis, this study is able to assess differences in resource allocation, production costs, revenues, and profitability between cooperative and non-cooperative households, thereby providing empirical evidence on the role of collective action in enhancing financial efficiency.

1.2.2 Financial Performance Indicators

Indicators for analyzing, evaluating and comparing the financial performance in production of two groups of rice and seedless lemon farmers who participate in cooperatives and those who do not participate in cooperatives:

Total production costs: Are all investments that farmers make during the production process in a certain period to achieve the desired goals.

Total costs: are all investments that farmers make during the production and harvesting process, including: seed costs, fertilizers, pesticides, water pumping costs, plowing and tilling machine rental costs, cutting machine rental costs, bank loan interest, family labor costs and hired labor costs.

Total costs = Material costs + Labor costs + Additional costs

In which: Material costs: include seed costs, fertilizers, pesticides; Labor costs: include family labor costs and hired labor costs; Additional costs: include the remaining costs other than material costs.

Revenue to cost ratio: is a relative indicator reflecting the relationship between total revenue in the period and total production costs in the period. This indicator reflects how much revenue is generated when spending one dong of cost on production investment.

Revenue/Total cost=Revenue/Total cost

The larger this indicator is, the more it proves that with a low cost, it can also bring high revenue to the production activities of the household. If this ratio is greater than 1, the investment is effective, if it is less than 1, the investment is ineffective, and if it is equal to 1, it breaks even.

Efficiency of capital use: also known as the ratio of profit to total cost. The ratio of profit to cost is a relative indicator reflecting the relationship between total profit in the period and total cost in the period (including family labor). This indicator reflects how much profit is earned when spending one dong of production investment cost.

Profit/Total cost=Profit/Total cost

If this indicator is greater than 1, the producer makes a profit, this indicator is equal to 1 to break even, this indicator is less than 1, the producer makes a loss. This indicator is greater than 1 and the larger the indicator, the more effective the model is.

Profit margin on revenue: is a relative indicator that reflects the relationship between the total profit in the period and the revenue from selling products in the period. This indicator means how much profit is earned from each dong of revenue.

Profit/Revenue=Profit/Revenue

This ratio is always less than 1. This ratio shows how much profit is in the revenue, the higher this ratio is, the more effective the production activities of the farming household are, the operating costs of the production output are valid and vice versa.

T-test: In addition, in order to determine the difference in financial efficiency of the model participating in the cooperative and the model not participating in the cooperative, the study uses the t-test to test the average parameter of two independent samples for values related to the characteristics of the farming household, production costs, revenue, profit and financial indicators.

T-test shows whether the average value of a dependent factor in two independent groups is different or not.

Hypothesis:

H0: There is no difference in production profits between two groups of rice farmers who participate in cooperatives and those who do not participate in cooperatives

H1: There is a difference in production profits between two groups of rice farmers who participate in cooperatives and those who do not participate in cooperatives

Conclusions are based on the Sig. value in the t-test. If Sig.t ≤ 0.01 or Sig.t ≤ 0.05 or Sig.t ≤ 0.1, the conclusion is that there is a difference at the significance level of 1%, 5% and 10% respectively in the mean value of profits between the two groups of farmers.

Similarly, test the differences in farm characteristics, production costs, revenue and financial indicators between the two groups of rice farmers who participate in cooperatives and those who do not participate in cooperatives.

1.2.3 Multivariate Regression Model of Factors Affecting Profits

The multivariate regression equation is as follows:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \ldots + \beta nXn + ei$$

Where: Y is the dependent variable; Xi are the independent variables; βi is the regression coefficient to be found; β0 the regression constant, also known as the intercept; ei is the error of the model.

The multiple correlation coefficient R is a coefficient indicating the degree of tightness in the relationship between the independent variables (X) and the dependent variable (Y). The larger R, the tighter the relationship.

The coefficient of determination R2 (R – Square): the percentage of variation in Y explained by the Xi affecting Y, the rest is for other factors that we have not studied, the larger R2 is the better.

Based on the inheritance of related studies, the research topic proposes independent variables that can affect the profits of two groups of farmers. Thereby, it is possible to promote positive factors and limit negative factors for effective production. The multivariate regression equation used to determine the factors affecting the profits of two groups of rice and seedless lemon farmers participating in cooperatives and not participating in cooperatives has the following specific form:

The multivariate regression equation to determine the factors affecting the profits of rice-producing households has the form:

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + ei$$

In which: the dependent variable Y is the profit that rice-producing households achieve (thousand VND/1000 m2); Xi are independent variables; βi (with i = 1,2,3…7) is the regression coefficient to be found; β0 is the free coefficient; ei is the model error.

2. RESULTS AND DISCUSSION

2.1 Farm Resource Assessment

Technical support for rice cultivation

Table. 1 Current status of technical support for rice cultivation (Source: Survey data)

Indicators	Group	Frequency	Proportion (%)
With technical support	Cooperative member	87	81.31
	Non-cooperative member	20	37.74
Without technical support	Cooperative member	20	18.69
	Non-cooperative member	33	62.26

Technical support in rice cultivation constitutes a critical determinant of production efficiency, as it enables farmers to adopt improved practices and apply technological advancements effectively. The analysis indicates substantial differences in access to technical support between cooperative and non-cooperative households.

Among households participating in cooperatives, 81.31% reported receiving technical support, whereas only 37.74% of non-cooperative households had access to such assistance. Within the cooperative group, the primary sources of technical support were cooperatives or farmer groups (39.31%) and local agricultural extension officers (32.71%). By contrast, for non-cooperative households, technical support was predominantly provided by agricultural extension services (30.18%), while the largest proportion—62.26%—reported receiving no technical support at all.

These findings underscore the pivotal role of cooperative membership in enhancing farmers' access to technical assistance. The relatively high proportion of cooperative households receiving support suggests that collective action not only facilitates economies of scale in production but also serves as a conduit for the diffusion of agricultural knowledge and innovation. Conversely, the limited access to technical support among non-cooperative households reflects both institutional gaps and the absence of organized mechanisms for technology transfer, which may constrain productivity improvements and long-term competitiveness.

Current status of loans

Table 2. Current status of loans of rice-growing households (Source: Survey data)

Indicators	Group	Frequency	Proportion (%)
With-loan	Cooperative member	19	17.76
	Non-cooperative member	13	24.53
Without-loan	Cooperative member	88	82.24
	Non-cooperative member	40	75.47

Capital constitutes a critical input for production investment across all sectors, and rice cultivation is no exception (La Nguyen Thuy Dung & Mai Van Nam, 2015).

In rice farming, sufficient and timely access to capital enables producers to meet cultivation requirements, adopt appropriate technologies, and enhance overall production efficiency. Moreover, adequate financial resources serve as a buffer against exogenous shocks, particularly those induced by adverse weather conditions.

Rice-farming households rely primarily on two sources of capital: self-financing (own capital) and external borrowing through either state-supported or private credit mechanisms. Empirical evidence from the survey indicates that 82.24% of cooperative members and 75.47% of non-members utilize their own capital for rice cultivation. In contrast, 17.76% of cooperative households and 24.53% of non-cooperative households resort to borrowing in various forms to finance production activities.

These findings highlight two key points. First, self-capital remains the dominant source of investment in rice cultivation, underscoring the financial self-reliance of farming households. Second, the higher proportion of borrowing among non-cooperative households suggests greater financial vulnerability and potential exposure to credit risk. By contrast, cooperative membership appears to provide better opportunities for mobilizing internal resources and reducing dependency on external credit, thereby contributing to more sustainable financial management in agricultural production.

2.2 Analysis of Financial Performance of Two Groups of Rice Farms

In addition to comparing input costs in the rice production process between the two groups of households, the study also compares financial efficiency indicators between the two groups of households. This is also the main issue that farmers are concerned about in the rice production process so that farmers can recognize whether the production efficiency after the production process according to such method has achieved high or low efficiency.

Table 3. Financial indicators between the two groups of rice farms (Unit: 1,000VND/1000 m2) (Source: Survey data)

Indicators	Cooperative member		Diff.	Sig. level
	Yes (n=107)	No (n=53)		
Yield (kg/1,000 m2)	921.20	907.83	13.37	0.621^{NS}
Selling price (VND/kg)	5,491.58	5,414.15	77.43	0.367^{NS}
Revenue	5,059.93	4,944.92	115.01	0.552^{NS}
Total cost	1,785.29	2,391.93	-606.64	0.002***
Profit	3,274.63	2,552.99	721.64	0.007***
Revenue/Total cost (times)	2.91	2.48	0.43	0.012**
Profit/Total cost (times)	1.91	1.48	0.43	0.012**
Profit/Revenue (times)	0.63	0.49	0.14	0.002***

Note: *, **, *** correspond to significance levels of 10%, 5%, 1%; NS not significant

In rice production, rice yield is the top priority. During the year, the Winter-Spring rice crop is considered the most favorable because of the favorable weather conditions for rice growth, so this crop often yields higher yields than other crops during the year. Through the survey, the average rice yield in the Winter-Spring crop of the group of households participating in the cooperative is 907.83 kg/1000 m2, higher than that of the group of households not participating in the cooperative at 907.83 kg/1000 m2. However, the average rice yield of the two groups of households is not much different and through the t-test, there is no difference in the average yield between the two groups of households. Yield is one of the indicators to show the results of a rice production season, it depends on the use of input factors, production techniques of the households as well as weather conditions, land and disease situation. Adjacent farming is affected by the same natural weather, which is a factor that makes the productivity between the two groups of households participating in the cooperative and those not participating in the cooperative similar.

The selling price of rice in the group of households participating in the cooperative is 5,491.58 VND/kg, higher than that of the group of households not participating in the cooperative at 5,414.15 VND/kg. However, the difference in selling price between the two groups of households is not much, 77.43 VND/kg, and there is no difference in selling price between the two groups of households through the t-test.

Currently, in rice production, revenue is one of the factors that determine the profit of rice-growing households, this factor depends on the productivity and selling price at the end of the crop of the household.

In the Winter-Spring crop, the average revenue of the group of households participating in the cooperative was higher than that of the group of households not participating in the cooperative, the revenue was 5,059.93 thousand VND/1000 m2 and 4,944.92 thousand VND/1000 m2 respectively, a difference of 115.01 thousand VND/1000 m2, however, there was no difference in revenue between the two groups of households through the t-test method. The revenue of households depends on productivity and selling price, however, these two factors did not differ between the two groups of households, so although the revenue of households participating in the cooperative was higher, there was no significant difference through the test. Therefore, the profit of the group of households participating in the cooperative is 3,274.63 thousand VND/1000 m2, higher than that of the group of households not participating in the cooperative is 2,552.99 thousand VND/1000 m2 with a difference of 721.64 thousand VND/1000 m2 and there is a difference at the statistical significance level of 1%. The higher profit of the group of households participating in the cooperative is due to lower rice production costs and higher rice sales revenue compared to the group of households not participating in the cooperative. This shows that participating in rice production and consumption through the cooperative has brought good financial results to the households. In general, for the Winter-Spring rice cultivation model, both groups of households are effective, but the group of households participating in the cooperative is more effective than the group of households not participating in the cooperative. Specifically, the results show that:

For the index of Revenue/total cost of the group of households participating in the cooperative is 2.91 times and that of the group of households not participating in the cooperative is 2.48 times with a difference of 0.43 times and a difference at the statistical significance level of 5%. When a household participating in the cooperative spends 1,000 VND in costs, the household receives 2,910 VND in revenue (farmers not participating in the cooperative are 2,480 VND).

For the index of Profit/total cost of the group of households participating in the cooperative is 1.91 times and that of the group of households not participating in the cooperative is 1.48 times with a difference of 0.43 times and a difference at the statistical significance level of 5%. When a household participating in a cooperative spends 1,000 VND in expenses, the household earns 1,910 VND in profit (a household not participating in a cooperative earns 1,480 VND).

For the Profit/Revenue index, the group of households participating in a cooperative is 0.63 times and the group of households not participating in a cooperative is 0.49 times with a difference of 0.14 times and a difference at a significance level of 1%.

When a household participating in a cooperative earns 1,000 VND in revenue, it earns 630 VND in profit (a household not participating in a cooperative earns 490 VND).

2.3 Analysis Of Factors Affecting Profits Of Rice Farmers İn The Study Area

The purpose of multivariate regression analysis is to control the simultaneous influence of factors on the rice farming profit of households. On that basis, the article examines a number of factors that are likely to affect the profit of rice production in the three crops of Winter-Spring, Summer-Autumn and Autumn-Winter. After conducting the necessary tests, the most suitable variables will be entered into the multivariate linear regression function and the results are shown below.

Table 4. Results of multivariate regression of factors affecting the profit (Source: Survey data)

Variables	Winter Spring		Summer Fall		Fall Winter	
	Coef.	VIF	Coef.	VIF	Coef.	VIF
Constant	2,469.935***		1,393.366***		1,723.140**	
X1: Age	-14.530^{NS}	3.184	-5.548^{NS}	3.184	13.160^{NS}	3.184
X2: Experience	5.512^{NS}	3.250	8.535^{NS}	3.250	-15.974^{NS}	3.250
X3: Education	-17.603^{NS}	1.102	-33.523^{NS}	1.102	-100.284^{NS}	1.102
X4: Area	34.500***	1.156	15.166^{NS}	1.156	15.505^{NS}	1.156
X5: Rice Production Labor	125.920^{NS}	1.094	58.797^{NS}	1.094	-95.742^{NS}	1.094
X6: Technical Support	249.599^{NS}	1.286	109.805^{NS}	1.286	104.719^{NS}	1.286
X7: Cooperative Participation	480.741*	1.344	412.500*	1.344	557.306**	1.344
Number of Observations	160		160		160	
Sig.F	0.001		0.115		0.009	
R2 Coefficient	0.142		0.072		0.115	
Adjusted R2 Coefficient	0.103		0.030		0.074	
Durbin-Watson	1.784		1.877		1.688	

The analysis results show that the model has coefficients Sig.F = 0.001 (Winter-Spring crop) and Sig.F = 0.009 (Autumn-Winter crop) which are both less than the 5% significance level, so the regression model is meaningful and suitable for the data set and can be used for analysis. However, the coefficient R2 is only 0.142 in the Winter-Spring crop, 0.072 in the Summer-Autumn crop and 0.115 in the Autumn-Winter crop, indicating that the variables included in the model can only explain about 14.2%, 7.2% and 11.5% respectively, affecting the production profit factor of farmers, the rest are other factors that have not been included in the study. The adjusted R2 coefficients for the three crops were 0.103, 0.030 and 0.074, respectively, meaning that the variation in farmers' profits explained 10.3%, 3.0% and 7.4% by the independent variables included in the model. The Durbin-Watson coefficients were 1.784, 1.877 and 1.688, indicating that the model did not have autocorrelation. In addition, the variance inflation factor (VIF) was within the limit (VIF $\leq$ 10), so it can be concluded that the model did not have multicollinearity (Hoang Trong and Chu Nguyen Mong Ngoc, 2008).

The regression analysis results show that for the Winter-Spring crop, there are two factors affecting the profits of rice-producing households: area and participation in cooperatives; For the Summer-Autumn and Autumn-Winter crops, one factor affecting profits is participating in cooperatives.

Some factors affecting the profits of households in the Winter-Spring crop can be explains as following:

Area (X4): This is a variable measured by the rice cultivation area of the household. The results also show that the coefficient $\beta = 34,500$ has a positive value and is statistically significant at the 1% significance level, which means that the area has a positive impact on the profits of rice-growing households. Specifically, when the rice-growing area increases by 1,1000 m2, the profit will increase by 34,500 thousand VND/1,000 m2. This shows that when the area increases, the profits of the household will increase. This result is similar to the study of Nguyen Tuan Kiet (2017). At the same time, the larger the area, the easier it is for the household to apply new farming techniques to increase productivity and production efficiency.

Cooperative participation dummy variable (X7): this is a dummy variable that takes two representative values (1: participating in the cooperative; 0: not participating in the cooperative). The results indicate that the coefficient $\beta = 480.741$ has a positive value and is statistically significant at the 10% significance level, which means that households participating in cooperatives have higher profits than households not participating in cooperatives. Specifically, households participating in cooperatives will have profits that increase by 480.741 thousand VND/1000 m2 under the condition that other factors remain unchanged. When participating in cooperatives, households will be guided on rice growing techniques as well as how to use input factors properly, thereby reducing production costs and increasing household profits. Factors affecting the profits of farmers in the Summer-Autumn crop:

The dummy variable participating in cooperatives (X7): has a coefficient of $\beta = 412,500$ with a positive value and is statistically significant at the 10% significance level, which means that farmers who participate in cooperatives have higher profits than farmers who do not participate in cooperatives.

Specifically, farmers who participate in cooperatives will have profits that increase by 412,500 thousand VND/1000 m2 under the condition that other factors remain unchanged.

Factors affecting the profits of farmers in the Autumn-Winter crop: The dummy variable participating in cooperatives (X7): has a coefficient of β = 557,306 with a positive value and is statistically significant at the 5% significance level, which means that farmers who participate in cooperatives have higher profits than farmers who do not participate in cooperatives. Specifically, if a household participates in a cooperative, its profit will increase by 557,306 thousand VND/1000 m2, assuming other factors remain unchanged.

The above analysis results show that the dummy variable participating in a cooperative has a positive value as expected by the author and is statistically significant at the 10% level (Winter-Spring and Summer-Autumn crop) and 5% (Autumn-Winter crop), indicating that the group of households participating in cooperatives has a higher profit than the group of households not participating in cooperatives. This result is completely consistent with above difference test results, thus further strengthening the evidence of the effectiveness of cooperative participation model.

CONCLUSIONS AND RECOMMENDATIONS

Based on survey data from 160 rice-farming households in MD, this research evaluated the impact of cooperative participation on financial efficiency.

The comparative analysis across three production seasons demonstrates that households engaged in cooperatives achieved significantly higher financial efficiency than those outside the cooperative system.

Specifically, cooperative members reported lower average production costs and higher average profits. In the Winter–Spring crop, the cost differential was 606.64 thousand VND/1,000 m², while the profit differential was 721.64 thousand VND/1,000 m², both statistically significant at the 1% level. Financial ratio analysis confirmed that cooperative members outperformed non-members in the revenue-to-cost ratio, profit-to-cost ratio, and profit-to-revenue ratio, with differences significant at conventional levels (1%, 5%, and 10%).

Multivariate regression further identified cultivated area and cooperative participation as the two key factors positively influencing profitability. These results provide robust empirical evidence supporting the economic benefits of cooperative participation in rice production.

Implications for Cooperatives

Cooperatives and cooperative groups should:

Strengthen managerial and leadership capacity, with particular attention to market intelligence and production planning.

Enhance technical support and training for members, ensuring adherence to standardized production processes.

Facilitate land consolidation and the formation of large-scale production zones to exploit economies of scale and enable mechanization.

Actively engage in vertical linkages with enterprises to secure stable market outlets and improve members' bargaining power.

Policy Implications for the State

The government's role is pivotal in creating an enabling institutional environment for agricultural cooperatives. Policy priorities include:

Strengthening the legal framework governing cooperatives and ensuring fair competition with other economic entities.

Providing preferential credit schemes and financial incentives to promote cooperative participation and investment in agricultural production.

Supporting market stabilization policies, including price regulation and demand management for key agricultural commodities.

Promoting branding and certification for rice and seedless lemon production areas to enhance market recognition and consumer trust.

Expanding agricultural extension services and technical training programs, ensuring that farmers receive hands-on guidance in modern cultivation practices.

Role of Research Institutes and Universities

Research and academic institutions can contribute by:

Developing high-yield, pest-resistant crop varieties suitable for local ecological conditions.

Producing accessible and practical training materials that facilitate farmer adoption of technological innovations.

Delivering targeted training programs for cooperative managers to enhance governance, market orientation, and value-chain integration.

The findings reaffirm that cooperative membership significantly improves financial performance in rice production through cost reduction, profit enhancement, and improved market access. Policy support, institutional strengthening, and the active participation of farmers, cooperatives, enterprises, and research institutions are essential to ensure the sustainable development of agricultural value chains in Mekong Delta region.

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