Thanh Tam Ho, Takuma Iwase, Miku Suzuki, Seiya Yamashita, Yuna Yamanaka, Koji Shimada. 2026. Chapter 7: Benefits of Sustainable Rice Farming and Influential Factors on Rice Farmers' Choice: A Case Study in Long An Province, Vietnam. In Thanh Tam Ho (ed.), *Sustainable Agriculture and Rural Development in the Era of Climate Change: Asian Perspectives*. Osaka: Asia-Japan Research Institute, Ritsumeikan University. ISBN 978-4-910550-14-5

Chapter 7
Benefits of Sustainable Rice Farming and Influential Factors on Rice Farmers' Choice: A Case Study in Long An Province, Vietnam

Thanh Tam HO, Takuma IWASE, Miku SUZUKI, Seiya YAMASHITA, Yuna YAMANAKA, Koji SHIMADA

Summary: Environmentally friendly agriculture is being explored as a potential method for carbon sequestration to combat climate change. It can also increase crop productivity and farmer income while meeting societal needs for healthy and safe food. This study attempts to investigate the benefits of environmentally friendly agriculture and its determinants among rice farmers in Long An Province, Vietnam. Data was collected from face-to-face interviews with 152 rice farmers in two districts of Long An Province. The results show that environmentally friendly agricultural practices slightly enhance rice productivity and transaction prices. Additionally, membership in farming associations can boost the adoption of environmentally friendly practices. Based on these findings, we propose policy recommendations to promote the activities of agricultural cooperatives effectively. Furthermore, we suggest implementing a 3G3R or 1M5R certification system and displaying the certification mark by agricultural cooperatives. This would help achieve the adherence to 3G3R or 1M5R, which are the main environmentally friendly farming methods in Vietnam.

1. Introduction

Vietnam has demonstrated remarkable economic growth, securing the second-highest growth rate among ASEAN nations. The agricultural sector plays a particularly significant role in Vietnam's economy, contributing 11.9% to the country's GDP — a notably higher share compared to developed nations like Japan, where agriculture accounts for only 1.1% of GDP. Agriculture remains a vital part of Vietnam's economic development and social stability. Vietnam is one of the world's leading farming countries, with rich soil that helps grow many different types of crops including rice, sugarcane, cassava, and many others. According to the U.S. Department of Agriculture (USDA) (2025) and Statista (2025), Vietnam ranks as the world's fifth-largest rice producer and third-largest rice exporter. The country's agricultural sector demonstrates remarkable efficiency, achieving exceptional yields relative to its available farmland — highlighting agriculture's vital role in the nation's economy and food security. Figure 7.1 shows the trends of Vietnamese rice production, consumption, and exports in the period 1960–2023.

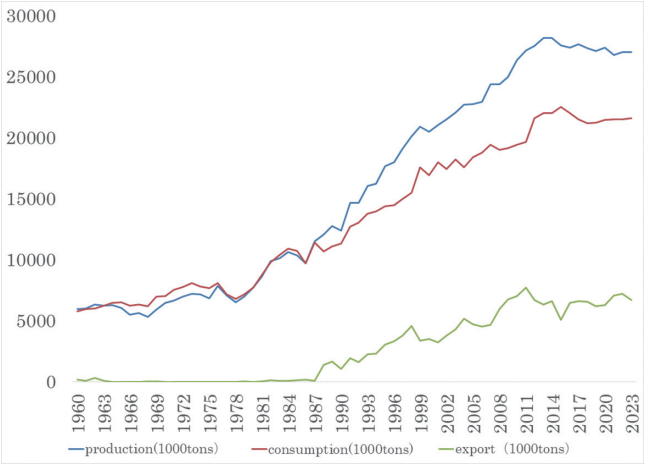


Figure 7.1. Vietnamese Rice Production, Consumption, and Exports
Source: FAOSTAT, 2024

Despite this agricultural success, Vietnam faces a significant challenge: while excelling in rice exports, the country has limited adoption of environmentally friendly farming practices. The Vietnamese government has responded by introducing two key initiatives: the "One Must Do Five Reductions" (1M5R) and "Three Gains Three Reductions" (3G3R) programs. The 3G3R program specifically targets three areas: optimizing seed density, decreasing chemical fertilizer usage, and minimizing pesticide application (Huelgas et al. 2008). The 1M5R initiative is an extension of 3G3R, providing a framework focusing on controlled seed density, reduced chemical fertilizer usage, minimal pesticide application, reducing post-harvest losses, and saving water resources.

These government initiatives, however, have faced obstacles in gaining widespread adoption. The concept of sustainable agriculture is relatively easy to understand but difficult to define and apply in practice. Current statistics paint a concerning picture: only 63,536 hectares — just 0.5% of total agricultural land — have implemented environmentally friendly farming practices, with only 17,174 farmers adopting these sustainable methods. Farmers hesitate to embrace these practices without government certification systems and subsidies to demonstrate concrete benefits. While agricultural cooperatives could spread knowledge and best practices, farmer participation in these groups remains low. This study therefore aims to understand the benefits of sustainable rice farming for productivity and the factors influencing farmers' choices regarding sustainable rice farming in the Mekong Delta, particularly in Long An province.

2. Data Collection and Methodology

(1) Study Site and Data Collection

The research was conducted in Long An Province, in the Mekong Delta region of southern Vietnam. This area holds particular significance as Vietnam's third-largest rice-producing region, according to recent government statistics (GSO 2022). To gather data, we employed a field survey methodology, conducting detailed face-to-face interviews with local farmers during November 2022.

The study focused on two strategically selected districts — Duc Hue and Tan Hung — to ensure representation of different agricultural conditions within the province. Initially, the research team interviewed 163 farmers across these districts. Following a thorough data validation process to ensure response quality and completeness, the final analysis incorporated data from 152 farmers, representing a robust 93% retention rate of the original sample.

Figure 7.2. Face-to-face Interviews with Local Farmers in Long An Province in November 2022
Source: Author's survey

(2) Methodology

First, the Cobb-Douglas production function is used to determine important inputs and the role of SAPs on rice productivity. The formula is:

$$Y = \beta_0 Seed^{\beta_1} Chem^{\beta_2} Pest\_cost^{\beta_3} Irri^{\beta_4} Labor\_cost^{\beta_5} SAPs^{\beta_6} \varepsilon$$

Or,

$$lnY = \beta_0 + \beta_1 lnSeed + \beta_2 lnChem + \beta_3 lnPest_{cost} + \beta_4 lnIrri + \beta_5 lnLabor\_cost + \beta_6 lnSAPs + \varepsilon$$

Where, Y: Rice productivity (kg/ha), Seed: Amount of seed used (kg/ha), Chemical: Amount of chemical fertilizer (kg/ha), Pesticides cost: Total chemical pesticides and insecticides cost (VND/ha), Irrigation cost: Total irrigation cost (VND/ha), Labor cost: Total hired labor cost (VND/ha), SAPs: Adoption of sustainable rice farming (Dummy variable, 1 = adoption of sustainable rice farming, 0 = otherwise).

Then, a logit regression model is used to determine the influencing factors on the farmers' choice of SAPs

$$Y = \frac{1}{1+e^{-(\alpha_0+\alpha_i X_i)}}$$

Where, Y: Adoption of sustainable rice farming, X_1: Education (years), X_2: Knowledge 1 (1-Strongly disagree to 5-Strongly agree to the statement "Environmental pollution can be caused by agrochemicals"), X_3: Knowledge 2 (1-Strongly disagree to 5-Strongly agree to the statement "Sustainable agriculture prevents air and water pollution and the destruction of nature"), X_4: Knowledge 3 (1-Strongly disagree to 5-Strongly agree to the statement "Sustainable agriculture reduces carbon emission from crop production"), X_5: Knowledge 4 (1-Strongly disagree to 5-Strongly agree to the statement "The healthier the soil, the more rice productivity"), X_6: Knowledge 5 (1-Strongly disagree to 5-Strongly agree to the statement "Chemical residues on rice pose a significant health threat to the consumer."), X_7: Farming experience (years), X_8: Participation in social group (Dummy variable, 1 = farmer participates in social group, 0 = otherwise), X_9: Geographical location (Dummy variable, 1 = locate near Ho Chi Minh City, 0 = otherwise),

X_{10}: Distance from farm to the nearest water sources (meter), X_{11}: Number of household member (people), X_{12}: Income from off-farm activity (Dummy variable, 1 = Yes, 0 = No), X_{13}: Small-scale farming (Dummy variable, 1 = Small scale, 0 = Otherwise), X_{14}: Medium-scale farming (Dummy variable, 1 = Medium scale, 0 = Otherwise).

3. Results and Discussion

In rice farming in Long An Province of Vietnam, chemical fertilizer costs comprise a substantial 40% of total rice production expenses, while hired labor represents another significant 30% of the total costs, making these two factors the predominant economic considerations in rice cultivation. By implementing sustainable rice farming practices such as 3G3R or 1M5R, farmers can achieve notable reductions in various input costs (Table 7.1). These practices specifically target and minimize expenditures related to seeds and seedlings, chemical fertilizers, and agricultural chemicals when compared to conventional farming methods. The adoption of sustainable rice farming practices presents promising potential for enhanced economic returns, as the reduction in input costs combined with maintained yield levels can result in improved overall profitability compared to traditional conventional farming approaches.

Table 7.1. Cost and Benefit of Rice Farmers in Long An Province

Item	SAPs (n=104)	Conventional rice (n=48)	Difference test (t_test)
Average yield (kg/ha)	7,058.31	6,870.78	-0.951
Selling price (VND/kg)***	5,938	5,566	-4.047***
Total income (VND/ha)	**41,915,529**	**38,240,157**	
Seeds and seedlings cost (VND/ha)*	1,796,169	1,975,770	1.735*

Fertilizer cost (VND/ha)*	6,000,361	6,543,130	1.950*
Agricultural chemical cost (VND/ha)*	1,133,453	1,353,985	1.799*
Irrigation cost (VND/ha)	843,952	1,030,693	1.455
Hired labor cost (VND/ha)	4,990,232	5,624,678	1.333
Total cost (VND/ha)	**14,764,167**	**16,528,256**	
Profitability (VND/ha)	**27,151,363**	**21,711,901**	

Note: *** p<0.01, ** p<0.05, * p <0.1. Source: Author's calculations

Analysis using the Cobb-Douglas production function reveals significant relationships between agricultural inputs and rice productivity (Table 7.2). Specifically, the research demonstrates that increasing the seed rate leads to enhanced rice productivity through improved plant density and resource utilization. Conversely, higher irrigation costs were found to negatively impact rice productivity, likely due to increased operational expenses and potential water management inefficiencies. Furthermore, the study highlights the advantages of sustainable farming practices, showing that farms implementing sustainable rice cultivation methods achieved approximately 5% higher productivity levels when compared to those using conventional farming techniques. This improvement in productivity under sustainable practices suggests the potential long-term benefits of environmentally conscious farming methods.

Table 7.2. Important Inputs in Rice Productivity in Vietnam

Variables	**Coefficient**	**S.E.**	**P_value**
lnSeed	0.129**	0.064	0.046
lnChemical	-0.038	0.029	0.206
lnPesticide cost	-0.0217	0.022	0.329
lnIrrigation cost	-0.044**	0.017	0.015
lnLabor cost	-0.004	0.029	0.902

SAPs	0.056*	0.032	0.087
Constant	9.356***	0.617	0.000
R-squared	0.100		
Prob > F	0.030		
Number of observations	137		

Note: *** p<0.01, ** p<0.05, * p <0.1. Source: Author's calculations

The findings from Table 7.3 indicate that consumer awareness regarding the health implications of chemical residues from conventional rice production methods can serve as a powerful motivator in their decision to support and choose sustainably farmed rice. This awareness creates a ripple effect that encourages farmers to adopt more sustainable farming practices. The study also reveals that active participation in community organizations, particularly farmer associations, plays a crucial role in influencing agricultural decisions and promoting sustainable farming methods. Furthermore, the research demonstrates that farmers in rural areas show a higher propensity for implementing sustainable rice farming practices, possibly due to stronger community ties and greater awareness of traditional farming methods. These rural farmers often have deeper connections to their land and more direct exposure to the environmental impacts of different farming approaches.

Table 7.3. Influencing Factors on Farmers' Choice of Sustainable Rice Farming

Variables	**Coefficient**	**S.E.**	**P_value**
Education	0.036	0.079	0.651
Knowledge1	0.010	0.296	0.974
Knowledge2	-0.043	0.332	0.896
Knowledge3	-0.206	0.291	0.479
Knowledge4	0.017	0.483	0.972

Knowledge5	0.716**	0.294	0.015
Social group	1.869***	0.628	0.003
Location	-2.509***	0.619	0.000
Irrigation distance	-0.001	0.001	0.406
Farming experience	-0.003	0.019	0.870
Household size	-0.065	0.136	0.632
Off_farm income	-0.130	0.544	0.811
Small-scale farming	0.341	0.646	0.598
Medium-scale farming	-0.144	0.635	0.821
Constant	-0.396	2.598	0.879

Note: *** p<0.01, ** p<0.05, * p <0.1. Source: Author's calculations

4. Conclusions and Policy Implication

Seed rate and irrigation costs are critical factors that significantly influence rice productivity in agricultural systems. The implementation of sustainable rice farming practices has been shown to substantially reduce various input costs, including not only seeds and irrigation requirements, but also the expensive chemical fertilizers that traditional farming methods heavily rely upon. This innovative approach has demonstrated remarkable results, generating higher profits for farmers while simultaneously improving overall productivity by approximately 5% when compared to conventional farming methods.

Multiple factors shape farmers' decisions to adopt sustainable rice farming practices, including their existing agricultural knowledge base, their level of engagement in social groups and community networks, and their specific geographical location, which affects the local growing conditions. To facilitate and support this important transition towards more sustainable practices, it is essential to strengthen rural organizations such as agricultural cooperatives, farmer groups, and women's unions that serve as vital knowledge-sharing networks. This

strategic enhancement of social capital within farming communities will ultimately empower farmers to make more informed and effective decisions about their agricultural practices, leading to improved outcomes for both individual farmers and the broader agricultural system.

References

Connor, M., L. A. Tuan, A. H. DeGuia, and H. Wehmeyer. 2020. Sustainable Rice Production in the Mekong River Delta: Factors Influencing Farmers' Adoption of the Integrated Technology Package "One Must Do, Five Reductions" (1M5R). *Outlook on Agriculture*, 50(1), 90–104.

FAOSTAT. 2024. *FAOSTAT Online Database*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/faostat/>

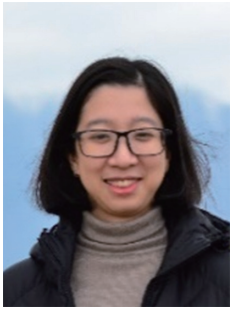
GSO, General Statistics Office of Vietnam. 2022. *Data on Agriculture, Forestry, and Fishery*. <https://www.gso.gov.vn/>

Huelgas, Z. M., D. Templeton and P. Castanar. 2008. Three Reductions, Three Gains (3R3G) Technology in South Vietnam: Searching for Evidence of Economic Impact. Contributed paper at *the 52nd Annual Conference of the Australian Agricultural Resource Economics Society*, Rydges Lakeside, Canberra ACT, Australia.

Statista. 2025. *Principal Rice Exporting Countries Worldwide in 2024/2025*. <https://www.statista.com/statistics/255947/top-rice-exporting-countries-worldwide-2011/?srsltid=AfmBOoo72xg2DHPRWenlupkniqmlWYp0l1H0AomE-940r1Z6qKzk7DHi> (accessed October 5, 2025)

U.S. Department of Agriculture (USDA). 2025. *Top Producing Countries - 2024/2025 Rice Production*. <https://www.fas.usda.gov/data/production/commodity/0422110> (accessed October 5, 2025)

7. Dr. Thanh Tam HO



Chapter 7. Benefits of Sustainable Rice Farming and Influential Factors on Rice Farmers' Choice: A Case Study in Long An Province, Vietnam

Dr. Thanh Tam Ho is an Assistant Professor at the College of International Relationship, Ritsumeikan University. She received her Ph.D. in Economics at Ritsumeikan University in 2020. Her research focuses on climate change adaptation and mitigation, sustainable agriculture policies, and behavior analysis. Currently, she is conducting several research projects related to sustainable agriculture and promotion policies in Japan and Vietnam.