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# Concluding Remarks and Discussion

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Climate change poses significant challenges to global food security and safety. Strategy policies to mitigate food safety risks while minimizing environmental impacts in the era of climate change are becoming more important. Sustainable agricultural practices are potential solutions for sequestering carbon as climate change mitigation, improving environmental health and economic performance, as well as satisfying society's need for food safety. Identifying not only the farmers' decision-making but also the consumers' preferences for safe food can provide academic insights into understanding the potential strategies for a safe products market. Nevertheless, the diversity and heterogeneity of agricultural systems characterized by geographical regions or across countries might imply diversified policy implications for climate change adaptation and developing sustainable agriculture.

This booklet is a record of the AJI International Workshop which was held online under the restraints of the COVID-19 pandemic, with the aim of promoting international communication and academic collaboration among young researchers in Asian Universities and Institutions. Furthermore, it is my hope that this opportunity will drive sustained and long-term connections through collaborative research projects in the near future. Our discussion mainly concentrated on three issues.

## 1. Climate Change and Challenges to Agriculture

Climate change has become a major threat to global agricultural production and food security. Recently, extreme weather events such as drought, severe floods, and storms have increased in frequency and intensity, seriously damaging agricultural production. Increases in floods and droughts are anticipated due to variations in rainfall patterns, and dry seasons are expected to become longer in the future. Developing regions of the globe are more sensitive to climate variability and change as these regions implement old technologies, whereas developed regions can mediate climate-driven extremes through the implementation of modern technologies. Consequently, climate change would pose a direct and severe challenge to rice production, especially in Asian countries — the main rice production region of the world. Indirectly, the price of rice and the rural livelihoods of rice farmers would also be affected. Therefore, it is urgent to develop agricultural systems that are more sustainable and resilient to climate change.

Dr. Orawan Srisompun addressed the drought situation and its negative impacts on rice production in Thailand. Climate change adaptation (i.e., stopping rice growing, finding additional water sources [i.e., digging ponds, wells, or groundwater], adjusting the time of planting or slowing the rice sowing, reducing the number of rice cultivation areas, adjusting the use of rice varieties, adjusting the types of crops that are grown instead of rice, or changing to livestock instead of growing rice) were ascertained as practices to cope with insufficient rice for consumption and agricultural income for farm households. Importantly, she mentioned that a long-term strategy plan for climate change, especially drought management, is necessary to ensure rural livelihood, especially income and self-sufficiency.

Dr. Mohammad Rondhi et al. reported on Indonesian farmers' decision-making on farming insurance as an adaptation measure to climate change. Participation in farming insurance might be attractive

for risk-averse and land-owning farmers. A high level of risk aversion would be of concern for the policymakers as it potentially hinders farmers' adoption of new technologies. They discussed the specific program from the government for each specific area in Indonesia. They concluded that the government should pay more attention to farmers with rented or sharecropping land and high-risk aversion as the targets for improving farmers' participation in the government's agricultural insurance scheme.

Climate change adaptation is essential for sustaining agricultural productivity, reducing vulnerability, and enhancing the resilience of agricultural systems. Building adaptation and mitigation in agricultural systems requires simultaneous attention to increasing production by adopting varieties of technologies, adopting sustainable land management practices, building on and using local knowledge and social culture, and formulating enabling policy and institutional setups. Improving resilience and farmers' adaptive capacity to cope with climate risks has become increasingly important not only in Asian countries but also in other vulnerable regions and communities.

Recently, awareness of agriculture in harmony with the environment and its biodiversity has continually risen. Though several adaptation options are available in agriculture, not all of them can be applied to all locations, as they are mostly location-specific. Therefore, cooperation and collaboration among institutions at international and national levels are extremely important for coping with the challenges of climate change, food security, and food safety at the cross-country level.

## 2. Towards Sustainable Rice Agriculture

Today's unsustainable farming practices put global food security at risk. This would adversely impact the world's most vulnerable

populations, including rice farmers. The global population is expected to exceed nine billion by 2050, and even more people will rely on rice for nutrition. As one of the most important food staples, we must transform the rice sector to feed the world sustainably. Although rice is a staple food for many in Asia, smallholder farmers still face many challenges, including decreasing yield productivity from the effects of climate change and the pressure to meet the rising demand for food as the world's population continues to grow.

It is important to have an intimate understanding of farmers' immediate needs. With farmers' means of support as a priority, positioning climate-smart agriculture solutions as directly beneficial to farmers' livelihoods is necessary to get greater engagement. Therefore, the integration of adaptation and mitigation strategies is a primary challenge to promote sustainability and productivity.

With the global demand for rice continuing to rise and limited potential to expand yields in traditional producers such as China, the countries of mainland Southeast Asia are poised to take center stage as the world's rice bowl if they can increase their resilience to social and environmental pressures. However, climate change and labor shortages threaten rice production in a region that feeds an ever-larger share of the world's rice consumers. Major rice producers such as Thailand and Vietnam produce rice for their own populations, as well as exporting to other regions, while other traditional producers in the region, such as China, India, and Indonesia, are increasingly turning to imported rice to keep their populations fed.

Dr. Phuc Trong Ho proposed the adoption of high-yielding and high-quality rice varieties in the Mekong Delta as a solution for increasing rice production to meet the increasing consumption demand of population growth. In developing countries like Vietnam, policies should focus on increasing farm scale and farming contracts as well

as reducing land fragmentation to speed up the adoption of high-quality rice varieties. Furthermore, high-quality rice varieties should be developed with consideration for adapting to adverse production conditions and climate change impacts.

Moreover, Dr. Melanie Connor stressed that it is essential to develop rice and protect its sustainability for global food security and environmental conservation with the consideration of policymakers and scientists not only in Asia, but also in Africa. Improving sustainable rice production in Africa through capacity development and innovation is another challenge. Sub-Saharan Africa is the world's most food-insecure region. In order to secure a stable supply of food for the region and achieve the eradication of hunger, food production technology that can adapt to the increasingly unstable growing environment and effectively utilize limited resources such as water and nutrients is required. To this end, it is important to develop new technologies and knowledge that will lead to increased production of rice, a key crop in the region, and improved food self-sufficiency and nutrition for the people, with the aim of building a sustainable food production system centered on rice cultivation.

Furthermore, strengthening social norms for motivating farmers' intentions and their behaviors toward sustainable agriculture is extremely important. Especially, establishing trust among farmers is another issue which should be focused on, and this can be done by working closely with farmers' associations and investing in demonstration farms to "show by doing."

## 3. Economic Challenges and Policy Aspects

The major concern about the economic sustainability of rice farming is that subsidies are necessary if the price of rice is to be kept low. The

social, political, and economic importance of rice in all of the major rice-producing countries is such that their governments seek to ensure that sufficient rice is available at a price all can afford.

Dr. Qi Dong addressed the importance of resource input use and rice production efficiency with a comparison between China and Japan. Especially, the scarce input resources in rice production resulting from structural transformations and changes in dietary structure constitute the main differences in rice production between the two countries. The shadow costs can lead to a significant gap between the two countries and affect rice farmers' enthusiasm. In addition, the costs for sustainable rice farming seem to be remarkably high compared to conventional rice farming. High labor costs and a shrinking labor force are emerging issues, more so in a developed country like Japan than in developing countries.

This author also addresses the economic aspects of climate change adaptation in reducing productivity loss as well as improving farmers' profitability. Nevertheless, promotion policies are facing several challenges not only in developed countries like Japan but also in developing countries like Vietnam. More specifically, the Japanese direct payment policy can be a solution for ensuring farmers' income and their motivation toward sustainable agriculture. Nevertheless, the question of how the government with their direct payment policies can really achieve the sustainable production of rice in the long term should be tackled.

Meanwhile, promotional policies for sustainable rice farming or organic farming could add value to production. For specific regions like Thailand and Vietnam, developing local rice varieties (i.e., drought-tolerant, salt-tolerant, pest-tolerant) should be focused on. Large-scale farming policies are necessarily different across regions. Thailand's farmers, especially those in the Northeast regions, would not benefit

from economies of scale, while Vietnam's farmers, especially those in the Mekong River Delta regions, would benefit from increasing farm scales. Agricultural innovation and technology should be paid more attention not only at the national level but also at the local level. Simultaneously, policy recommendations for sustainable rice farming should be involved at transnational levels.

Importantly, our discussion not only shared academic knowledge linked to the various situations of Asian rice but also aimed at the establishment and activation of researcher networks, even under the constraints of the COVID-19 pandemic. An international and multidisciplinary research approach towards sustainable rice agriculture is definitely important for our future collaboration. It is necessary to mention here that the inequities within countries and across countries in Asia and how these are potentially exacerbated by existing socio-political systems should be given more attention in future research.

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Chapter 4. Rice Production for Sustainable Agriculture: Case Studies in Vietnam and Japan

Dr. Thanh Tam Ho is a Senior Researcher at the Ritsumeikan Asia-Japan Research Organization. She received her Ph.D. in Economics at Ritsumeikan University. Her research focuses on climate change adaptation and mitigation, sustainable agriculture policies, and behavior analysis. Her dissertation, "An Economic Analysis of Climate Change Response and Rice Farmers' Behavior in the Mekong Delta of Vietnam," explored farmer's decision-making on multiple climate change responses and the economic performance in rice farming. Currently, she is conducting a research project related to sustainable agriculture and promotion policy in Japan.