

Preface

The Asian monsoon climate zone is humid with rainy and dry seasons. Erosion brought about by monsoon rains is pronounced in the mountainous area formed by orogenic movement of the Himalayan/Alps ranges. Alluvial basins and plains of various sizes are in the middle and downstream regions of rivers originating from these mountains. These basins and plains are wet and fertile because water flowing from wide catchments of these mountains deposits fertile soil; thus, agriculture in this region has centered on rice farming since early times. Paddy fields are filled with water, so their soil is resistant to erosion, is rarely depleted of nutrients and maintains its fertility. The fields are therefore capable of producing rice under a continuous cropping system, yielding sustainable agriculture in these areas. Rice is an edible grain cooked by boiling, is flavorful due to the high amino acid content, and has high storage stability; thus, it can provide for a large population compared with produce such as wheat, maize, and potatoes. The reason so many people are able to live in the Asian monsoon zone is that its natural environment is appropriate for growing rice.

Global warming caused by the artificial release of greenhouse gases such as carbon dioxide and methane, and by the alteration of land use has become a worldwide issue. The 3rd IPCC report (2002) on global warming revealed that the global average surface temperature increased over the 20th century by about 0.6°C, and that most of the warming observed over the last 50 years is attributable to human activities. Furthermore, global mean radiative forcing due to greenhouse gases is predicted to continue increasing through the 21st century, so the global average surface temperature is projected to increase by 1.4 to 5.8°C over the period 1990–2100. It is also likely that global warming will cause increased variability in Asian summer monsoon precipitation, and that extreme phenomena such as flood and drought, which may have important impacts on the environment and agriculture, will be more dominant than current conditions. As the projection is for climatic conditions not previously experienced, estimating its impact on agricultural production, especially rice production, will be one of the most important problems to resolve.

The National Institute for Agro-Environmental Sciences launched a research project on this problem in FY 2001 and completed it in FY 2005. The project examined the effects of global warming on agricultural production in Northeast and East Asia from the viewpoint of natural environment, crop physiology, and socioeconomics. Topics of this project included not only methodological development of the prediction of precipitation at the local scale and the detection of cropland and crop phenology using satellite data, but also the elucidation of changes in water and soil resources, effects on the physiology of crop growth, and the occurrence of insect pests as temperatures rise. The project also modified an existing world food supply-and-demand model so as to predict changes in food production accompanying environmental changes. In this project, we concluded that the increase in the dry matter and water use efficiency of rice is in response to elevated carbon dioxide in the atmosphere, but that the danger of spikelets fertility caused by high temperature becomes high under global warming. Moreover, although the expansion of possible cultivated land is expected, there are rising concerns about unstable rice production due to time and spatial maldistribution of precipitation and increase in insect damage.

This workshop is based on that project. The researchers who contributed to this project, and their counterparts who play an active role in Japan, East Asia, and Southeast Asia, gather and discuss these issues. It is a unique chance as an approach to solve such a problem. The workshop comprises three parts:

Part 1: Monitoring and clarification of the change in agro-environment.

Part 2: Response to the change in agro-environment.

Part 3: Modeling and prediction of the change in agro-environment.

Furthermore, to develop an approach to these issues, a current research project started in FY 2006 entitled, “Modeling rice-based agro-ecosystem responses to climate change and risk assessment of rice production”. In this project, target areas are set down not only in Japan, but also in East and Southeast Asia, so the framework of “international cooperation” becomes even more important. We discuss the system of international cooperation and its significance in carrying out the new project effectively, and as a result, we can also provide material for discussion to form a consortium for agricultural environmental research in monsoon Asia currently promoted by the National Institute of Agro-Environmental Sciences.

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