Development and Practice of Environmentally Advanced Basin Model in Asia: Toward Adaptation to Climate Changes

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1. Introduction

Tropical regions support a large number of plant and animal species, and conservation of these regions is a major issue that must be tackled globally not only by the nations in tropical regions. Agriculture is a critical factor that has a major impact on the environment in tropical regions, including Asia. Agriculture in tropical Asian nations faces four issues in relation to the environment. The first issue is the expansion of cultivated land and the accompanying increase in water demand. The second issue is environmental problems resulting from the spread of modern agricultural methods. The third issue is the increase in demand for biomass energy. The fourth issue is the concern that global warming will lead to a decrease in agricultural productivity.

In order to mitigate these issues, it is desirable to develop and disseminate an environmentally advanced model in Asia that takes into consideration the balance of water, food and energy in response to climate change. At the same time, native varieties that are effective, together with native cultivation methods and traditional methods of using local resources that are effective in developing Asian nations, should be actively used.

Climate models are beginning to shed light on some of the impacts that climate change has had on water resources and global food production potential. However, there is almost no research that takes a balanced view while simultaneously considering water use and water pollution issues in basin areas in developing nations, together with actual food production encompassing changes in the form of agriculture, as well as population and energy issues. In particular, there is a lack of reliable research that considers human actions with the goal of economic betterment through agriculture, and considers the planning and propagation of technology development incorporating the three factors of water, food production and energy at the basin level.

We elected to study Indonesia and Laos, taking into consideration their recent expansion of cultivated land, which stands out among the tropical nations of Asia. We also gave consideration to the continued provision of findings to all related agricultural parties after the project has ended, and opened the possibilities for technology transfer in tandem with our study. The study also examined both the unique and universal characteristics of the regions, so that the research findings can be used in other regions.

2. Method and Expected Results

To achieve our goals, we plan to study the following: (1) Assess flood risks, drought risks and nitrogen loads; (2) identify the lands that are suitable for the development of a wide-area assessment model to predict rice growth and yields that takes into consideration weather conditions and variety characteristics; (3) assess the food production potential in basins and identify the lands that are suitable for specific varieties; (4) predict the supply and demand for biomass energy in basins and CO_2 emission reductions; and (5) propose an environmentally advanced basin model in Asia with a focus on water, food and energy. **Fig.1** shows relationship of these five study areas. These will be carried out in taking into consideration the balance of water, food and energy in response to climate change.

Based on the results of studies of these five study areas, we hope to accomplish the following:

1. Quantify the uneven distribution of water resources and change in nitrogen load at the basin level, and assess the varietal diversityagainst the drought risk.
2. Indicate the optimal management method for each variety at the basin level and the impact of climate change taking into consideration the varietal diversity, and then outline a strategy for future varietal procurement.
3. Assess paddy rice yields during rising temperatures and drought, and outline the varieties that should continue to be used and varieties of seed rice that need to be secured.
4. Propose adaptation strategies involving the adoption of sustainable food production systems at the regional and basin level.
5. Compare the food production potential in 2025, of using existing cultivation methods and by implementing the proposed adaptation strategies.
6. Outline a strategy for the sustainable use of biomass energy at the regional and basin level.
7. Utilizing the preceding six items, we will propose an environmentally advanced basin model in Asia, and build a community for environmental conservation as a research and education platform, and facilitate technology transfer.

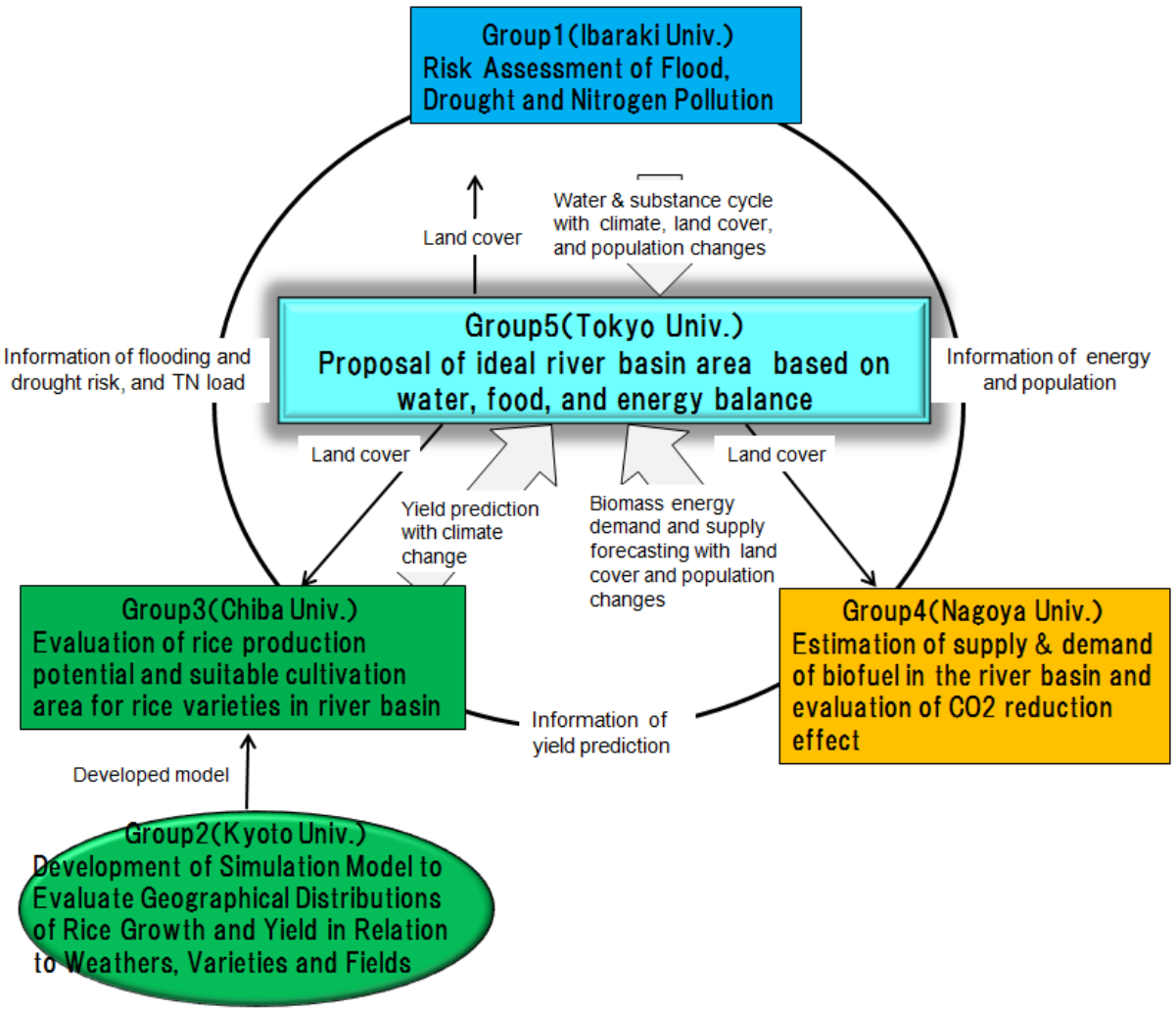

Fig.1 Relationship of five study areas.