Complex Terrain and Ecological Heterogeneity (TERRECO): Evaluating Ecosystem Services in Mountainous Landscapes

Ecosystem CO_2 Exchange in Croplands of South Korea

Economic Simulation Model for Agriculture in Soyang Watershed of South Korea

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Background:

Sustainable management of watersheds is a big challenge faced by present and future human generations, given the context of visibly unavoidable climate and rapid economic changes. Thus, policy decision making at both national and local levels should be well-informed with scientific evidence that is grounded in sound methods and an accepted valuation framework that takes into account all physical-environmental and socio-economic factors and their interactions that critically influence sustainable watershed management. As it is of no doubt that agricultural production takes an important role in this regard, the need for an economic analytical tool for agriculture at watershed level arises.

Fig. 2. Agricultural intensification in Haean catchment of Soyang Watershed

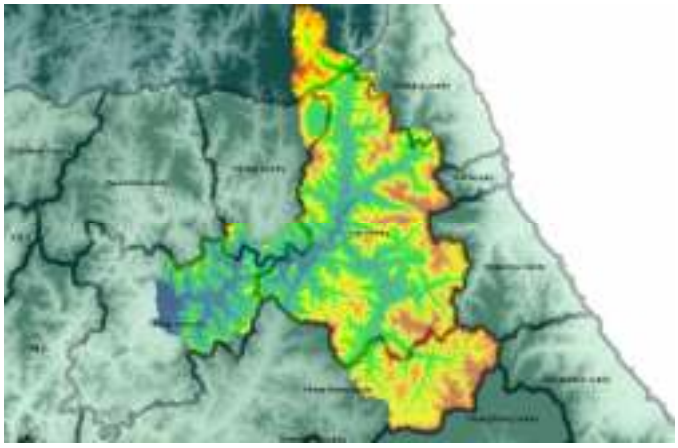

Fig. 1. The study site of Soyang Watershed

Soyang Watershed of South Korea is a typical example for the examination of human - nature interactions. The area is characterized with intensive agricultural production, soil erosion and water pollution. With the aim at providing information for better decision making in the pursuit of multiple goals in sustainable development, an Agricultural Sector Model is a good economic analytical tool.

Method:

The research is intended to build an Agricultural Sector Model (ASM) for policy analysis using mathematical programming with the objective function of maximizing the sum of producers' and consumers' surpluses.

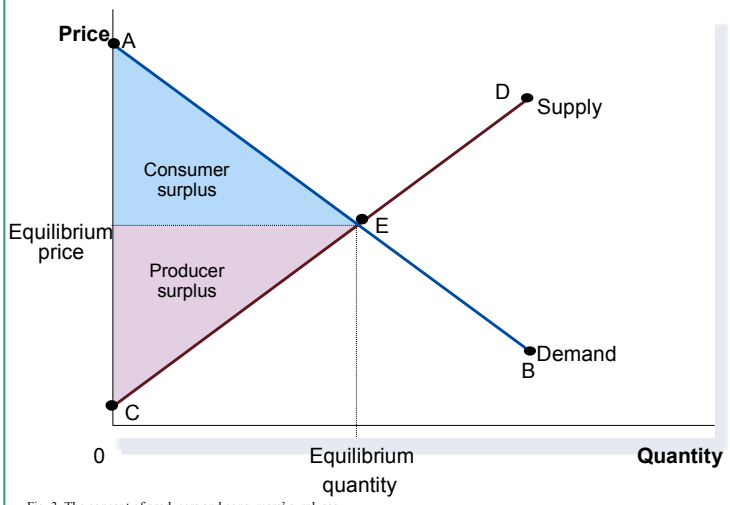

Fig. 3. The concept of producers and consumers' surpluses

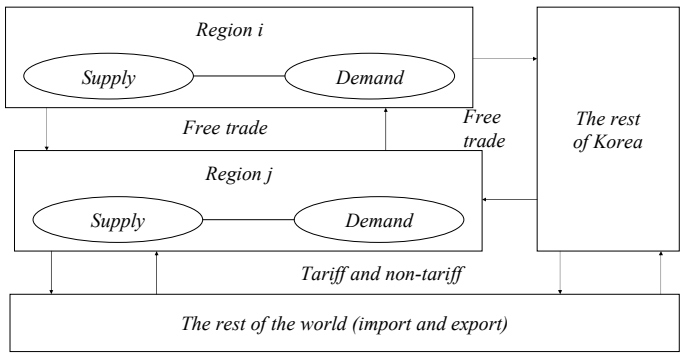

Fig. 4. Basic framework of the agricultural sector model for Soyang Watershed

The model includes three different modules: supply, demand, and trade. With regard to the supply, agricultural production depends on many factors that could be categorized into three groups, namely bio-physical (soil, nutrient availability, climate factors, and water availability, etc, socio-economic (technology, resource endowment, management capability, and markets), and policy (taxes, subsidies, quotas, etc*)* factors. In terms of the demand, it includes those for consumption, for industrial use, and for feed of animals. The difference between supply and demand is compensated by trade, either domestic or international import and export. Domestic trade is supposed to be free but international trade is subject to tariff and non-tariff constraints.

Outlook:

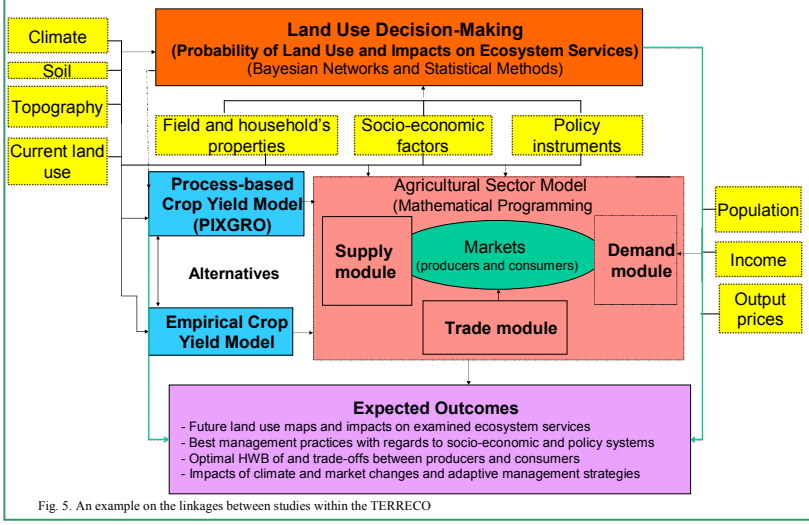

Fig. 5. An example on the linkages between studies within the TERRECO

The expected outputs of the ASM should be: (1) The estimates of agricultural supply under resource constraints (land, labor, capital), (2) the projections of agricultural production and consumption, and (3) the stimulated changes of agricultural production and consumption, of human well-being of producers and consumers under different relevant scenarios. Specific considerations include the changes of agricultural production technology (e.g. the conversion from conventional to organic farming) and labor market as well as payments for environmental services in terms of government subsidies.

As part of the TERRECO, the model plays a critical link between other studies. This is to ensure the validity and consistency of the research outcomes.

References:

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