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Water Markets for Efficient Water Allocation in Central Asia

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Abstract

Inefficient use of water and land resources in Central Asia under the Soviet planning system is the main cause of present ecological problems such as soil and groundwater salinisation, water logging, and desiccation of the Aral Sea. In the post-soviet era, different and conflicting interests in this region have further aggravated water distribution problems. Extreme intra-country dependence of economic, infrastructural and water distribution systems in these states also do not allow achieving efficient resource use without cooperation. However, cooperation would not occur without trust and potential mutual benefits. Water markets and the possibility of water trade by riparian countries would most likely promote the governments of Central Asian states to cooperate and consequently result in more economic gains with less water. To analyse the potentials of water markets on more efficient water use and water saving technology adoption, a two-stage hydro-economic model for the case of Amu Darya River Basin is developed. At first, a non-linear optimal crop allocation model with the objective of maximising benefit given the constraints on inputs such as fertiliser, machinery, labour, and water is developed for each water user site separately. Several model simulations results are generated to estimate the function for the relationship between the profit and water under different water availability scenarios. In the second step, these profit functions are used together with river water balance model to construct a basin level hydro-economic model. The final model was used to run baseline and water market based scenarios. Results indicate higher overall profits from water markets. Water is transferred from less efficient water use activities to more efficient water use activities while compensating the losses of less efficient water users from increased benefits of more efficient water users. Moreover, introduction of water markets under water scarce conditions results in increased adoption of water saving technologies. In sum, institutional change in the Amu Darya Basin, for instance, introduction of water markets and water trade by riparian countries may contribute to more efficient and sustainable water resources use in this region.

Keywords: Amu Darya River, hydro-economic model, water distribution, water profit function, water saving technology