Gains from trans-boundary water quality management in linked catchment and coastal socio-ecological systems: a case study for the Minho region

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Sustainable economic development requires balancing of marginal costs from catchment water pollution abatement and associated marginal benefits from freshwater/coastal ecosystem appreciation. Hence we need to differentiate between intra- and trans-boundary catchments because benefactors and beneficiaries from water quality improvement are not one and the same. In trans-boundary catchments, private (national) welfare maximizing rates of water quality improvement differ across nations as benefits from water quality improvement generally accrue to one nation while the costs are paid by multiple nations. In this paper we develop a deterministic optimal control approach to explore private and social welfare maximizing rates of water pollution abatement in linked catchment and freshwater/coastal socio-ecological systems. For a case study of the Minho region (Iberian Peninsula), we estimate nation-specific water pollution abatement cost functions (based on management practice adoption) to determine and compare private (national) and social (trans-national) welfare maximizing rates of water pollution abatement. Results show that some private (national) welfare gains can be obtained through adoption of win-win practices, leading to a 12% reduction in the annual rate of water pollution and a 7% increase in annual regional income. Maximum social (international) welfare gains can, however, be obtained through adoption of win-win and lose-win practices across Spain and Portugal, leading to a 36% reduction in water pollution and a 14% increase in regional income. Non-cooperation in water pollution abatement would only lead to a 16%-32% reduction in water pollution and a 8%-13% increase in regional income. Hence, social (trans-national) welfare losses from non-cooperation between Spain and Portugal would equate to between 16 and 81 m€/yr.

Explaining investments in irrigation wells under increasing groundwater scarcity: panel data analysis for 6 Indian villages

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While groundwater irrigation in India has made a substantial contribution in terms of raising agricultural productivity and farm incomes for poor and marginal farmers, excessive extraction has led to depletion of scarce groundwater resources in many parts of the country. The basic incentive structures that induce overexploitation of groundwater in this context are related to a lack of clearly defined and secure property rights that encourage cooperation. Lack of assurance about the actions of others, and lack of adequate legal and institutional arrangements to regulate users has lead to an open access solution, characterized by over-pumping and depletion of the resource.

In this study we use time series data (2001-2005) collected in the framework of the ICRISAT Village Level Studies to capture farmers’ decisions to invest in wells. The dataset, which contains information on 367 rural households of 6 villages in the states Andhra Pradesh and Maharashtra, allowed us to use a double hurdle model to determine not only the factors that affect the decision to make investments in wells but also the intensity of the investment. Results show that factors playing a role in these decisions are the land size, whether the irrigated land is owned by the irrigator, the perception on the existing water access, the households financial asset status (indebtedness, savings) and the past investments in wells. Understanding of these decisions can help policy makers to design the policies which are necessary to ensure the sustainability of the groundwater irrigation sector in India.