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Designing a Cooperation Model for Groundwater Governance in Coastal Odisha, India

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Abstract

Failure of a theoretically efficient and empirically proven market mechanism in groundwater management has led to a search for alternative arrangements. Cooperation showed mixed results, while government intervention in terms of subsidy scheme inflated the successes. In the coastal aquifers of Odisha state in India, a government subsidy scheme in medium deep tube well installation addressed the economic scarcity of groundwater procurement while its management through cooperation among the member farmers by forming a water user association (WUA) seemed to solve the long-standing distribution issue. Sooner or later, improper management of the resource system and the physical structure collapsed the cooperation in water sharing and thereby a defunct WUA.

In this study, we attempted to introduce an incentive scheme to coordinate the individual farmers' action to save water and its distribution through community action in a principal-agent model. Empirical evidence indicates that the community has the higher bargaining power to determine the benefit share in terms of the redistribution of profit after distributing the fixed initial incentive and the variable part of the incentive, that is individually earned by member farmers by adopting a water-saving cropping pattern. Further simulations through water price increase by two to three-fold from the initial level do not increase the gross water-saving, implying a dominant type of cropping pattern in the farming system.

We further investigated the model behaviour by farm types of highly diversified irrigated agriculture for direct market supply (HDIAM) and least diversified irrigated agriculture for contract sale (LDICS). HDIAM farms are mostly sensitive to water price hike and are flexible to adopt a maximum water saving cropping pattern when we assume a reasonable reservation price in favour of their crop enterprise decision. On contrary, LDICS farms showed indifferent water use behaviour with increasing water price, because of their higher acreage under perennial water-intensive crop enterprise, such as sugarcane. Hitherto, model results infer that in the second round of incentives, there should be a lower redistribution of water due to its higher marginal value that also accounts scarcity value of water.

Keywords: Cropping pattern, groundwater, Incentives, Principal-agent