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Incentive Contracts Linked with Market Mechanisms: Can We Address the Water Allocation Problems in a More Effective Way?

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Problem statement

- Even though price driven mechanisms like **water markets**, at least theoretically, induce efficient allocation of the water resource, they **often fail** to achieve the goal especially in low income countries where the **transaction costs** are prohibitively high (especially due to extensive f**ragmentation** of lands and peculiarities of cropping systems) and the returns from agricultural enterprises are meagre.
- The **low price elasticity** of water use coupled with **political infeasibility** of higher water prices are frequently driving these markets to **malfunction** though many international agencies advocate the formation of water users association and economic pricing of water. (see Yang Hong et al.)
- We believe that these failures stem from the frequent assumptions of zero transaction costs and no political infeasibility. We see a serious need of **designing mechanisms** that aim to fill this void.
- The current paper intends to propose an **incentive framework** that induces farmers to save water and ensures them the benefits of water trading especially in a transboundary river basin setting. We test our model in the **Cauvery Basin in South India**

Institutional solutions

Carrots or sticks?

Stick: Penalty Vs. water saving

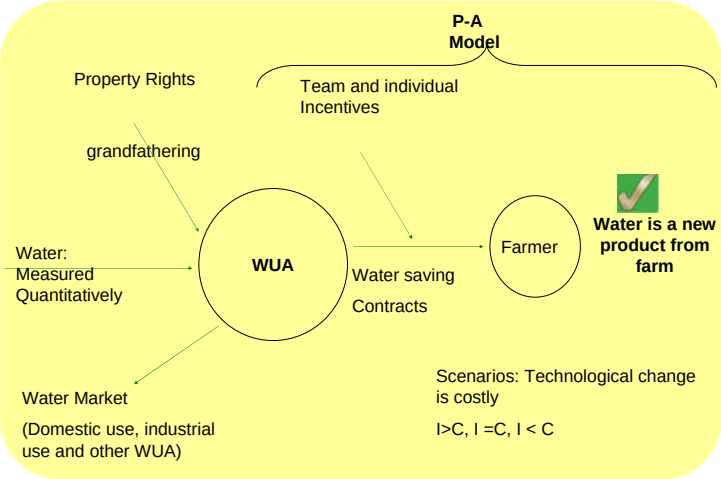
Can a penalty linked to water saving change the water use behavior of farmers? This question was answered using a double bound dichotomous choice question where farmers were presented an option of adopting water conservation strategies instead of a higher water charge (Bid).

Table 1: Double bounded Logit results

VARIABLE	COEFICIENTS	STD ERROR	T-STATISTIC
Constant*	-2.408	0.750	-3.210
Bid*	0.011	0.001	9.443
Age	0.008	0.011	0.738
Education	-0.032	0.037	-0.887
Area*	-0.062	0.022	-2.892

Mean bid value of **Rs. 245.7/Ha/year** reflects the average penalty required for driving adoption of water saving technology. The simulated Krinsky & Robb Confidence Intervals form the mean value (at 95% level) was Rs. 222.7 to 267.3 . A **positive bid coefficient** indicates that an increased penalty will hike the probability of adopting water saving technology. A **negative sign** for area of farms tells us the requirement of **higher penalty** to drive the adoption of water saving techniques by big farmers.

Carrot: Proposed Incentive Mechanism



Approach to Incentive Mechanism

- The proposed mechanism visualises a **principa**l, who is having authority to make legally valid **contracts** with farmers (agents) to share the income from the trade of saved water according to the **water saving technology** he/she adopts. This principal can be a Water Users Association (WUA) holding a water use right by a **grandfathering system** or an authority.
- The saved water can be allocated (at a price) to those economic activities where the marginal value of water is higher, like for instance, industries and domestic use. The key task of this model is crafting **a principal-agent** (P-A) model addressing **moral hazard** (as efficiency of farmers in employing the technical and management measures is hidden) to optimise the contract.
- As the technological transition is also costly, **analytical comparison** of costs (C) to income (I) from water saving at three possible scenarios are also visualized.

Special significance of the model

- Major significance the model is the allocation of water rights to farmers and making saved **water a product of agriculture**. The incentive scheme drastically **reduces the transaction costs** when compared to water pricing schemes as quantitative monitoring is not required though former can realise efficient allocation.
- In a normative sense, the other advantages are **better income** for the farmers and **higher political feasibility** for the water trading scheme. The **limitation** of the scheme is that it can work only in the presence of **effective water demand** from other sectors like industries, domestic use or high value agriculture.

Reference

Hong Yanga, Xiaohe Zhangb, Alexander J.B. Zehndera, 2003, Water scarcity, pricing mechanism and institutional reform in northern China irrigated agriculture, Agricultural Water management 61: 143–161

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