

## **6A: Adoption and Impact of Improved Irrigation Technologies**

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- In total four papers were presented in this session.
- The main thrust of the three papers (one each from USA, Canada, and India) is saving water through adoption of improved irrigation technologies.
- Given the fact that agriculture (or irrigation sector) is the major consumer of the world's fresh water resources, improving the efficiency of utilization and productivity of water in this sector would potentially release water for other uses.
- The study from Alberta, Canada, employed econometric modelling approach to analyze the determinants of adoption of "water saving" new irrigation technologies. Three scenarios of adoption process were analyzed. These are: (1) initial adoption decision (i.e., whether the farmer is willing to adopt any new irrigation technology or not), (2) adoption intensity (i.e., the extent of adoption measured in terms of area allocated to the new technology relative to total irrigable area owned, once the initial adoption decision is made), and (3) irrigation technology choice (i.e., the selection among possible available new irrigation technologies).
- The assessed adoption variables include: availability and sources of information, support services such as capital subsidies, social capital, farm characteristics, and household characteristics. The study underlined the significance of farmer to farmer information exchange, membership in agriculture related farmer organizations, and provision of sustained support services beyond the initial adoption promotion in enhancing the rate and intensity of adoption of new irrigation technologies.
- The study from Madhya Pradesh in India evaluated the effectiveness of capital subsidy for drip irrigation system adoption. Due to the growing water scarcity and the conviction that the mass adoption of new irrigation technologies such as the drip systems would ease the water scarcity problem, the central and state governments of India have provided capital cost subsidies to reduce costs of drip systems adoption. The study found that rather than improving access to drip irrigation, the subsidy system actually held back the pace of drip technology adoption and increased drip kit prices by as much as 50% due to inefficient implementation arrangements. The study underlines the significance of ex-ante evaluation of alternative implementation strategies before rolling out the capital subsidy policy. The authors recommended alternative approaches of delivering the subsidy to irrigators.
- The paper from Western Kansas, U.S.A evaluated the impact of irrigation technology capital subsidies on groundwater use and welfare using hydro-economic optimization model and accounting for the labor savings from improved irrigation technologies. The results indicated that the irrigation technology subsidy policy improves net private and social benefits and decreases actual use of water. The result regarding water use is in contrast to recent literature,

which indicated that adoption of new irrigation technologies may result in actual increases in water use.

- The last paper discussed the economics of water project capacities (i.e., determination of optimal capacities of water projects) and conservation technologies. The paper developed a new analytical framework for the design of water projects, which incorporates parameters such as water management efficiency, overflow loss, climate change (through its effect on inflow), and conservation technologies. Some of the model results are counter intuitive. For instance, the study posits that improvements in water management efficiency could lead to the design of larger dams.

### **Implications for the Bank operations**

- Water scarcity (sometimes abundance) is now considered as one of the major development challenges. Given that agriculture is the major consumer of fresh water resources, technologies that improve the efficiency and productivity of agricultural water use may contribute to the amelioration of the water scarcity problem. However, empirical evidences regarding the effect of these technologies on consumptive water use are not unanimous. There is a need for further analysis of the issue focusing on dispelling the physical, technical, institutional, and policy contexts under which the adoption of new irrigation technologies lead to real water savings.
- The empirical evidences from the Indian study underlines the significance a thorough ex-ante impact evaluation of prospective irrigation development policy together with alternative implementation or delivery approaches.