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Economics of Agricultural Water Conservation: Empirical Analysis and Policy Implications

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Abstract

Climate change and recurrent drought in many of the world's dry places continue to inspire the search for economically attractive measures to conserve water. This study analyzes water conservation practices in irrigated agriculture in a sub-basin in North America's Rio Grande. A method is developed to estimate water savings in irrigated agriculture that result from public subsidies to farmers who convert from surface to drip irrigation. The method accounts for economic incentives affecting farmers' choices on irrigation technology, crop mix, water application, and water depletion. Findings show that farmers will invest in technologies that reduce water applications when faced with lower financial costs for converting to drip irrigation. Subsidies for drip irrigation increase farm income, raise the value of food production, and reduce the amount of water applied to crops. However, an unexpected result is that water conservation subsidies that promote conversion to drip irrigation can increase the demand for water

depleted by crops. Our findings show that where water rights exist, water rights administrators will need to guard against increased depletion of the water source in the face of growing subsidies for drip irrigation. Our approach for analyzing water conservation programmes can be applied where water is scarce, irrigation is significant, food security is important, and water conservation policies are under debate.

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Notes

1. Many irrigation researchers prefer the term consumption to depletion, as shown for example in Perry et al. (2009) and Hellegers et al. (2011).

2. The following amortization was used to translate capital into annual equivalent costs of investing in a drip irrigation system: AP = i(CC) / [1 – $(1+i)^{-T}$], where AP (annual equivalent amortization payment) = $364; CC (unsubsidized drip irrigation system capital cost/acre) = $2500; i (interest rate) = 7.5%; and T (system life) = 10 years.

3. Our approach to PMP is an example for approaching an “inverse problem”, in which observed data are used to recover parameters from the data-generating process based on an assumed known structure of that process (Yeh, 1986).

4. GAMS code is posted at Department of Agricultural Economics and Agricultural Business (2012) under “Water Policy Decision Models (in GAMS): Farm Scale”.