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Determinants of Cotton Farmers' Water Use Efficiency in Arid Northwestern China

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Abstract

Cotton production constitutes a major source of income for the rural population in the arid northwestern Chinese Aksu-Tarim Region (ATR), with around 60 % of total sown crop land being cultivated with cotton. In this ethnically diverse region of China a continuously positive economic development is indispensable to ensure social stability. However, the increasing overuse of scarce fresh water resources for irrigation agriculture not only leads to a severe ecological degradation, but also endangers stable yields and farm profitability. Therefore it is of vital importance to understand what determines the water use efficiency (WUE) of cotton producers in the region. Applying a stratified random sampling approach 228 cotton producing farm households were interviewed with standardised quantitative questionnaires. In the regression analysis the application of drip irrigation technology (over the traditional flood irrigation method) and owning a groundwater well were identified as the major determinants of farmers' WUE, with drip irrigation having a greater impact between the two. While drip irrigation can be considered positive throughout, the practice of owning a well is more debatable. While it ensures stable irrigation water supply during times of seasonal surface water shortage and thus ensures against water stress induced yield reductions, the continuous exploitation of groundwater resources may have detrimental effects on the regional hydrological system in the long run. In the next step the determining factors for the decisions to adopt drip irrigation and to install wells were determined using a probit model with the same set of independent variables. Results showed that among others the individual farmer's cotton harvest area had a significant positive effect on both decisions. Finally, the factors influencing farmers' intention of installing new wells in the near future were analysed. With the perceived soil salinity, the perceived water quantity development in the region, and the reliance on surface water being among the significant determinants, it is demonstrated that installing wells clearly aims at overcoming on-farm water scarcity and related problems. Results from this study can help policymakers in devising strategies for improving WUE, while reducing groundwater depletion in the study region.

Keywords: China, cotton, groundwater, irrigation, regression analysis, water saving

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