

An Empirical Assessment of On-Farm Water Productivity using Groundwater in a Semi-Arid Indian Watershed

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Abstract Realistic estimation of irrigation volume applied to any crop at farm level generally requires information on event based discharge rates and corresponding periods of irrigation application. Use of mean seasonal discharge rates leads to erroneous estimation of volume due to unaccounted seasonal fluctuations in the water table, upon which the discharge rate of tube well is dependent. In the absence of such information, an alternative approach of estimating farm level water application based upon water table fluctuation data has been adopted in this study. The total actual water extracted during each irrigation event from the watershed was distributed among the farms irrigating crops in proportion to the product of irrigation time and the pump capacity (h_p). Volume of water withdrawal concurrent to an irrigation event was computed based on the water level fluctuations in the wells in conjunction with potential recharge contribution from the surface storage structures to the groundwater aquifer. A production function approach was used to estimate the marginal productivity of water for selected crops at various stages of plant growth. Water, as an input in the production function, encompassed either in-situ soil moisture storage from rainfall or irrigation from groundwater or both. The inter-season as well as intra-season groundwater use, and the consequent groundwater withdrawals were analyzed based on the marginal value and output elasticity of water at different crop growth stages during