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Utility Maximizing Investment in Well Capacity for Conjunctive Use of Ground and Surface Water at the Farm Level in Southern Iran

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ABSTRACT

Conjunctive use of ground and surface water can increase reliability of the water supply by providing independent sources. In this study, corrected utility-efficient programming that allows for more than one seasonal irrigation depth for each crop was used to determine the amount of utility maximizing investment in the well capacity for conjunctive use. Results showed that optimum investment at the 15% discount rate for the small, medium and large representative farms with a low degree of risk aversion is 150341, 531592.7 and 1084648 thousand Rials, respectively, which decreases as aversion to risk increases.

Keywords: Conjunctive use, Ground and surface water, Risk-efficient investment.

INTRODUCTION

The innately random nature of surface water gives groundwater an important role as a contingent supply for times when the flows of surface water are below average (Burt, 1976). The value of the role of groundwater in stabilizing supplies through improving reliability and reducing the impact of drought can be even greater than its role in adding to total quantity (Tusr, 1990; Tusr and Graham-Tomasi, 1991). Therefore, conjunctive use of ground and surface water can increase the reliability of the water supply by providing independent sources (Lettenmaire and Burges, 1979; Fisher *et al*., 1995).

Farmers' available irrigation supply in most districts of Fars Province, southern Iran, includes their share of irrigation water from rivers as well as installed capacity for pumping groundwater. At the beginning of the growing season, an estimate of the stream flow is made for the entire growing period. On the basis of that estimate and the installed capacity to pump groundwater, farmers make their cropping pattern decisions in an effort to maximize their utility for the year. If their only supply is surface water and the surface water is less than what was planned for, they must decide which crop to irrigate with how much water in order to continue to maximize their utility for that season. As the capacity of pumping ground water increases, a shortage of surface water can be compensated for by its equivalent groundwater withdrawal. The problem becomes one of how large should the pumping capacity in the system be? In other words, to put it in economic terms, what is the utility maximizing investment in well capacity? Due to the recent prolonged drought in southern Iran, this has become an important question.

The international literature is filled with the studies on conjunctive water management (Gangwar and Toorn, 1987; Bredehoeft and Young, 1983; Gorelick, 1988; lingen, 1988; O'Mara, 1988; Brewer and

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