Wageningen University

Department of Environmental Sciences

Chair Group Water Resource Management

MSc International Land and Water Management

MSc Thesis:
The Groundwater Irrigation Landscape of Nepal's Western Terai

A comparative case study of groundwater development and farmer's decision-making in Rupandehi, Banke and Kailali

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920928-849-100

May 2, 2017

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Abstract

Population growth and changing dietary habits are posing new challenges for food security worldwide, while contemporary climate variability and anticipated climate change influence the reliability of rainfall, hence the stability and productivity of cropping systems where water is limiting. Shallow tube wells (STWs) are relatively inexpensive to install and have become a major source of irrigation in South Asia, particularly in the Eastern Indo-Gangetic Plain, where state investments in large canal systems are relatively low. Although widely acknowledged in India, Pakistan and Bangladesh the prevalence of STWs in Southwestern Nepal (locally henceforth referred to as the 'Terai') is largely neglected by decision-makers. Furthermore, the groundwater irrigation literature pays scant attention to fundamental decision-making processes regarding investment in and utilization of STWs. This impedes efficient mobilization of existing resources for achieving agricultural targets such as ensuring food security. To fill this gap this thesis set out to achieve three goals: (a) Describe the groundwater irrigation landscape in the Terai region, (b) characterize the expansion of STWs in the Terai and (c) provide insights on farmers' decision-making processes regarding investment in and utilization of STW technology (pumps combined with energy source [diesel, electric]) in the rice season across environmental and wealth gradients. The results showed that water stress is a limiting factor for rice production in Terai and STWs have become the predominant source for irrigation water. Analyses of investment decision regarding STW technology show that decision are generally delegated to local technicians (mistris). However, profit motives create adverse incentives for the mistris that are counterproductive for improving on-farm water management. Furthermore, utilization of STWs is best conceived of as 'perceived ideal time of irrigation' and 'delay factors', the former being homogenous within villages, while the latter depend on environmental and socio-economic gradients. Thus, in order to increase the resilience, profitability, and food production outcomes associated with rice cultivation in the Terai, the use of STWs need to be embraced by policy makers and development practitioners as the most pragmatic solution to addressing water stress. Knowledge dissemination on the purpose of puddling and ideal times of irrigation for rice

may reduce irrigation costs and increase yields – further studies are warranted. In addition, cooperation with the mistris may provide efficient pathways for reaching a multitude of farmers as they affect the STW irrigation sector in multiple ways, especially if low-cost and highly efficient pump sets can be promoted, though efforts are needed to reconcile the mistris' incentives for profits with more efficient irrigation management. To reduce delay factors, providing reliable and large-scale electricity supply would reduce costs for irrigation (both investment and operation) manifold. Besides, formalizing local water markets and providing credit facilities may lead to large improvements of irrigation timing through reduction in irrigation delay times.