Managing groundwater access in Tay Nguyen, Viet Nam

Increased water scarcity in Dak Lak Province in the Tay Nguyen region of Vietnam is of growing national concern. As a result, development of a sustainable water management regime has been declared a high priority (National Water Resources Strategy 2006-10). Viet Nam’s national water policies are increasingly turning towards managing the demand for water. This approach will achieve sustainable water management as well as increased water use efficiency.

To manage scarcity, and stimulate regional growth, water supply infrastructure in Viet Nam has been developed over a number of decades. New water supply infrastructure, however, is unlikely to be economically viable. For better long-term economic, social and environmental outcomes, Viet Nam’s Law on Water Resources (1998) legislates for integrated water resource planning as well as economical and rational exploitation of water resources by organizations and individuals.

The Managing Groundwater Access in Tay Nguyen, Viet Nam research project contributes to the development of integrated demand side water policy in the Dak Lak Plateau of Viet Nam. Collaborating on the project were hydrologists, agronomists and economists from the Ministry of Natural Resources and Environment, The Australian National University, Ho Chi Minh City University of Economics and Tay Nguyen University. This brief reports on part of that project.

The marginal value of water in dry season rice irrigation and opportunities to increase irrigation water use efficiency

Research objectives

1. To estimate the value of dry season water in irrigated lowland rice production.
2. To identify the irrigation schedule that maximizes profit to rice smallholders.
3. To determine whether the profit maximizing irrigation schedule uses less water than the locally recommended irrigation requirement for wetland rice.

Research method

There is no known local field experiment data that defines the relationship between physical soil properties, climatic conditions, irrigation amounts and lowland rice yields in Dak Lak. As a result, the research team developed a crop growth simulation model for rice...
Key results
Profit maximizing water requirement for dry season wet rice in Dak Lak
Local water input for dry season wetland rice production is around 12,000 cubic meters per hectare. The profit maximizing dry season irrigation schedule uses approximately 9,700 cubic meters of water per hectare during a normal climatic year. This includes 2,500 cubic meters for pre-sowing land preparation. This profit maximizing dry season irrigation uses around 25 per cent less water than what is currently recommended. It also generates a near 10 per cent increase in average profits.

The economically optimal irrigation schedule for wet rice in Dak Lak
The profit maximizing irrigation schedule was a submergence non-submergence (SNS) regime. The SNS irrigation regime maintains soil moisture between saturation and the minimum soil moisture needed for the rice crop to not suffer from water stress. In contrast to the continuous submergence irrigation (CS) currently practised in Dak Lak, the SNS regime means almost no surface water accumulates on the rice plot.

The marginal economic value of water in irrigated wet rice in Dak Lak:
The marginal value of irrigation water measures the value of additional rice output that is produced when additional water is used. When the efficient SNS irrigation schedule is used, the marginal value of water is VND38,300 per cubic meter per hectare when the seasonal water stock is 5,650 cubic meters per hectare. When the available seasonal stock is 7,000 cubic meters the marginal value falls to VND 650 per cubic meter per hectare. Water has a zero marginal value in dry season irrigated rice production above 7,200 cubic meters per hectare because it does not generate additional yields for the rice smallholder. Therefore, additional irrigation water does not increase rice farming revenue.

Profit potential
Water has a positive marginal value in dry season irrigated rice production only above the minimum seasonal allocation of 5,650 cubic metres per hectare. A profit cannot be generated on a per hectare basis with any less water, even when rice producers are efficient. This means producers would be unwilling to pay for additional dry season irrigation water during a normal or drier climatic year. The research results also suggest that if irrigation water were priced and fully enforced at above VND50 per cubic metre, dry season irrigated rice farming would be unprofitable during normal or drier climatic years.

Water savings
Reducing water diversions to dry season irrigated rice by around 2,300 cubic metres per hectare would release around 38,000 ML in the Dak Lak Plateau for other uses during the dry season. This water saving is equivalent to about three per cent of the annual average recharge to the Plateau’s unconfined aquifer.

Water policy implications
SNS irrigation is likely to increase total wellbeing in the Dak Lak Plateau
Moving from CS to SNS irrigation would substantially reduce dry season water demand in rice production. This would increase rice profits by almost 10 per cent during a normal climatic year. Such a small profit gain, however, is unlikely to motivate irrigated rice smallholders to switch from CS to SNS as water supplies are uncertain and unpriced. For SNS to be successful in Dak Lak, irrigators will need to believe they will receive a financial reward, and that the improved water reliability will lower their risks.


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The complete set of research reports, detailing all aspects of the research project can be downloaded at:

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