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Policy brief

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The Value of Irrigation to Productivity in Cambodian Rice Systems[1]

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KEY MESSAGES

- The Royal Government of Cambodia has prioritised irrigation as a means to increase agricultural productivity; however, it expects farmers to utilise and maintain irrigation systems.
- Farmer water-user fees have been set by the government as a means to maintain irrigation systems. The collection of these fees has been decentralised to farmer water user communities (FWUCs) at local level.
- The estimates of the value of water to rice productivity, particularly during the wet season, are quite low, suggesting that a policy which requires relatively high water-user fees would not be feasible.
- Productivity during the dry season is substantially higher than in the wet season but the extent of irrigation during this season is limited. Further research is needed to understand why.

THE PROBLEM

Cambodia's economy is based largely on the agricultural sector which contributes 33 percent of national GDP and employs more than 67 percent of the national labour force. Rice production is central to this sector: not only do the majority of Cambodia's farmers depend directly and indirectly on the success of the rice crop each year, but being the main food staple, rice production is a big factor in the national effort to promote food security.

Despite its importance, rice farming in Cambodia has traditionally been dependent on rainfall rather than irrigation. Rainfall distribution determines the success and size of the harvest and, as a result, farmers generally only grow one crop per year. In the dry season, when there is a lack of water, accessing water is time-consuming and expensive. Recognising the importance of water management to promoting the country's rice production, both the government and donors have made efforts to expand the irrigated area. The expectation is that irrigation will make farmers less reliant on rainfall, allowing them to cultivate more crops with more certainty and predictability, resulting in higher productivity and better livelihood outcomes. The Cambodian government's current planning document emphasises the importance of water management, in particular "rehabilitating and enhancing irrigation potential" to increase agricultural productivity (RGC 2009:28).

Despite the priority given to irrigation in Cambodia's development strategies, there is no quantitative analysis of how water is managed, particularly the value of water, at farm level. This information is crucial to understanding the impacts of water policy, including water reallocation and water fees. The following case study presents the key findings of a household survey across three provinces in Cambodia which aimed to assess the value of water to farmers in terms of productivity.

THE CASE STUDY

A household survey was conducted in 10 irrigation schemes across three provinces: Kampong Chhnang, Kampong Thom and Pursat. Each of these schemes is located within the Tonle Sap watershed and represents different agro-ecological conditions within the catchment.

In each irrigation scheme, 30 farming households representing a diversity of wealth and plot characteristics typical of each scheme were selected for the survey sample with the help of village heads. These

1 This policy brief is based on the CDRI working paper by C. Wokker, P. Santos, Ros B., and K. Griffiths (2010): *Irrigation Productivity in Cambodian Rice Systems.* The working paper presents the results of the economic component of the Water Resources Management Research Capacity Development Programme (WRMRCDP), a five-year project funded by AusAID, aimed at improving the use and governance of water resources to increase agricultural production and the sustainable use of natural resources in Cambodia.

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households were interviewed in mid-2008, and then at the end of each wet and dry season until mid-2010. The data collected includes household composition, characteristics of the head of the household (gender, age, education), plot characteristics and assets and, for each season, responses to questions related to income generation (including farm and non-farm income) and impacts on production (drought, flood, infestation and disease).

The survey questions relating to the value of water were:

- Do you irrigate? If yes, do you use gravity or pumping?
- If you use gravity, what depth do you irrigate to and how many times do you do this during the dry season?
- If you pump water, what is the pump's capacity and how many hours is it used for?

The answers to these questions were then multiplied by the area of irrigated land and the number of times a plot is irrigated per season to determine the value of water to productivity.

Using this dataset, it was possible to estimate the relationship between the amount of irrigation water used and the rice yield in both the wet and dry seasons. During the analysis, care was taken to properly identify the contribution of water to yield (net of other inputs and influences such as farmer skill or plot fertility) through the estimation of production function with plot fixed effects. The possibility of the better plots being selected for irrigation was addressed and found to be insignificant.

Figure 1: Marginal Productivity of Irrigation Water

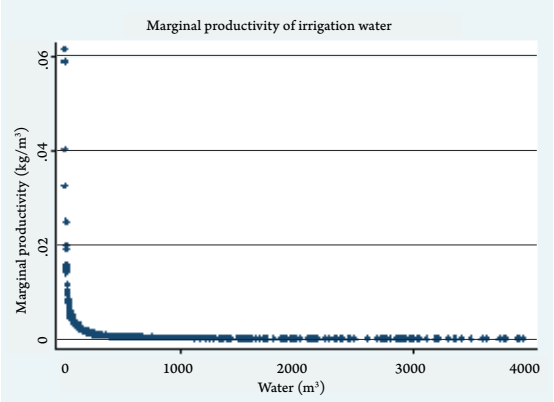
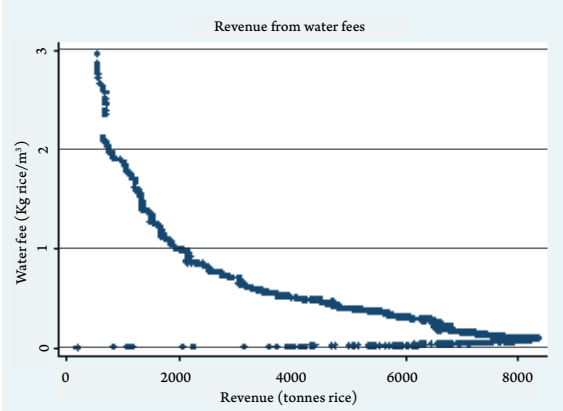


Figure 2: Revenue from Water Fees



KEY FINDINGS

The estimates of the extra yield produced as a result of irrigation, when measured in terms of rice production, are very low: a 1 percent increase in the amount of water used raises rice yield by only 0.06 percent in the wet season (see Figure 1) and 0.12 percent in the dry season. For amounts of water larger than 1000 cubic metres per plot (controlling for other inputs), very little is added to yield size.

Figure 2 shows that increasing water fees too much is not the best way to raise revenue because farmers may choose not to use water rather than paying a higher fee. Hence, if the water fee per m^3 is greater than the monetary value of 0.025kg of rice, the total revenue raised by the FWUC will decrease.

The overall key findings are that:

- Raising water fees "too much" will not lead to increased revenue for FWUCs.
- Farmers are acutely sensitive to changes in water fees above a relatively small value, thus raising water fees may be used to reallocate water to other (potentially more valuable) uses.
- Increasing water productivity in rice production when water is most used (i.e. the wet season) seems central to balancing competing water uses and policy objectives.

POLICY IMPLICATIONS

The key policy implications arising out of this research are that:

- The marginal return to farmers from irrigation costs in the wet season is low; therefore farmers will not be willing to pay much for water during the wet season.
- Increasing productivity in the wet season through interventions at the level of research and development and extension and marketing is central to any effort to better manage irrigation water. Neighbouring countries' experiences in this area may be especially useful in selecting an appropriate policy-mix for the Cambodian context.

REFERENCE

Royal Government of Cambodia (2009), *National Strategic Development Plan: Update 2009-2013* (Phnom Penh: RGC)