AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

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This briefing note summarizes the preliminary case study findings for discussion and comment

GROUNDWATER IRRIGATION IN WEST BENGAL

Based on a report by Aditi Mukherji

Groundwater has emerged as the main source of irrigation for smallholder farmers in India and much of it has been through private investments. West Bengal is no exception. Here, revising groundwater policies as well as provision and pricing of electricity could propel smallholder farmers on a path to higher agricultural growth and poverty alleviation.

The Opportunity

West Bengal is well endowed with groundwater. Net annual groundwater availability is high (30.36 billion cubic meters) as is rainfall (1500-200 mm per year), yet its potential for development in many regions has not been reached. Only around 42% of the state's groundwater resources are being used because of policy restrictions and concerns over groundwater scarcity and quality. Historically, groundwater has played an important role in West Bengal's agriculture. In the late 1980s and early 1990s, agricultural growth rates were 6% per annum, which was attributed to expansion in the area under *boro* rice cultivation and an increase in yield of all paddy crops due to assured irrigation from tubewells. Carefully crafted groundwater policies could help the state return to these high agricultural growth rates and this in turn can support poverty alleviation.

The Research

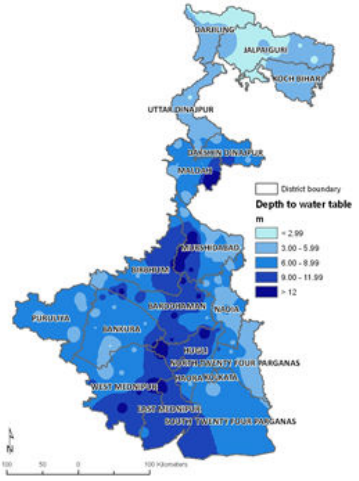
Findings are based on questionnaire surveys with 896 respondents in 59 villages in 10 districts; interviews with state and district level officials of the State Water Investigation Directorate (SWID) and West Bengal State Electricity Distribution Company Ltd. (WBSEDCL). Block level groundwater and rainfall data from 1990 to 2009 was also used for this analysis.

Main Findings

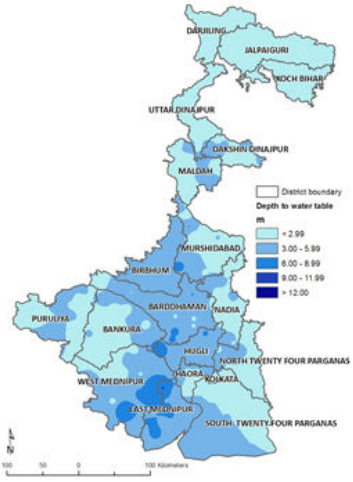
Groundwater policies do not reflect resource realities

Groundwater development in the state is 42%, and none of the districts use more groundwater than annual renewable recharge capacity. Yet, policies are quite restrictive vis-à-vis permission for new wells. For example, the 2005 Groundwater Act was designed to control the number of new wells and create an inventory of groundwater structures. Permits and registration applications were routinely rejected even in districts where groundwater development was only 20-25% or where groundwater depth was less than 30 feet. At the receiving end were small and marginal farmers who were denied access to groundwater.

One of the main reasons for restrictive policies is the concern over declining water levels. However, data from the SWID, the organization responsible for monitoring water level and implementing the Act, challenges this concern. Analysis of long term (20 years) trend of 508 wells shows that majority of wells (70.5% in pre-monsoon (Map 1) and 81.1% in post-monsoon (Map 2)) have constant trends. Econometric modeling of groundwater level and rainfall shows that for every meter of pre-monsoon drawdown, recovery goes up by 0.83 meter on average after the monsoon. This suggests that the drawdown of groundwater in the dry season creates storage space so that the subsequent monsoon rains can be captured for use in the next dry season rather than flowing out of the system unused. To compensate for any net depletion, this natural recovery process can be further enhanced through in-situ rainwater harvesting.



Map 1 Average depth to water table in pre-monsoon



Map 2 Average depth to water table in post-monsoon

High energy costs and low rates of electrification are major impediments

Findings suggest that the difficulty in obtaining electricity connections for tubewells and the high cost of diesel to operate pumps are the factors constraining groundwater use. Since 2003, the WBSEDCL has virtually stopped sanctioning new electricity connections for agricultural tubewells as illustrated in Figure 1. Farmers had to pay full cost of wires, poles and transformers based on their distance from the network – something that even better off urban consumers do not have to do. These costs can range between US$1,000-4,000 and are beyond the means of smallholder farmers.

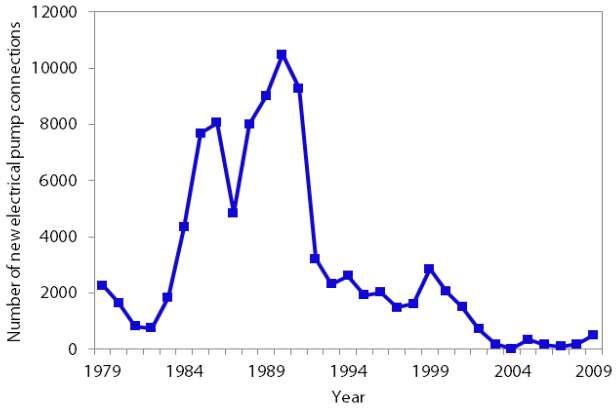


Figure 1. The decline of electric pump connections

These costs can be avoided by renting pumps — around 500,000 farmers own pumps (around 100,000 electric pumps and the rest diesel pumps) but others can purchase water from pump owners. About 3.1 million households or 50% of all rural households reported hiring of irrigation services. However, these water markets too have been contracting in recent years due to high electricity tariffs and diesel prices – putting livelihoods of small holders in jeopardy.

In response to inadequate water supplies resulting from difficulties in obtaining electricity connections and high diesel prices, West Bengal farmers have reduced cultivation of the lucrative dry-season *boro* paddy from 1.5-1.6 million ha in early 2000s to 1.1 million ha in 2011-12. Coupled with increased input costs and stagnant output prices, farmers' overall profit margins have decreased and agricultural productivity and living standards have fallen.

How to tackle water quality threat?

The threat of arsenic contamination of groundwater is often cited as a reason for restrictive groundwater policies in West Bengal. Evidence shows that groundwater containing arsenic is unlikely to affect the quality of irrigated grain, but does pose a threat to human health through drinking water supplies. Research also shows that improved nutrition reduces the risk of arsenic absorption by humans. Therefore, concerted efforts to provide arsenic free drinking water, nutritional supplements like folate to the poor and widespread information campaign is needed in the short run. Better access to livelihood opportunities, including agricultural water is needed in the long run.

Solutions

- **The Project's research eases entry barriers to pump electrification**

Based on the project's recommendations, the SWID has changed a provision of the Groundwater Act of 2005. Now farmers located in 301 or so 'safe' groundwater blocks and owning pumps of less than 5 HP and tubewells with discharge less than 30m^3/hour will no longer need a permit from SWID before applying for electricity connection from the WBSEDCL. The WBSEDCL on its part has also passed a policy resolution by which it will give new electricity connections to farmers against a payment of a fixed connection fee ranging from US$ 20 to US$ 600 per connection depending on the connected load.

- **Policies that promote water use efficiency and markets for irrigation services**

Metering of agricultural pump sets is already promoting water use efficiency, but a collateral damage has been a contraction in water markets and hardest hit have been small holder farmers since they often rely on these markets for access to irrigation. Change in electricity tariff regime from a Time of the Day (TOD) metered tariff to a judicious mix of flat and metered tariff will help in both promoting efficient water use and encouraging pro-active markets for irrigation services. Excavating tanks and ponds to promote additional recharge in post-monsoon season is also needed and existing schemes like MGNREGA should be used for this purpose.

- **Mitigate problems of arsenic contamination of drinking water**

Efforts are needed to supply arsenic free drinking water along with targeted schemes to provide nutritional supplements like folate to populations most at risk from drinking arsenic contaminated water. Careful monitoring of both quality and quantity of groundwater is also needed.

Potential impact

Providing affordable electricity connections to half a million more electric pumps would allow for irrigation of an additional 3.7 million ha of farm land. If only 50% of this potential is reached the irrigated area would increase from 2.98 million ha to 4.83 million ha or 88% of the cultivated area. Assuming average *boro* paddy productivity of 2.5 tons/ha sold at US$200 per ton, farmers would earn additional income of US$ 900 million per year.

West Bengal has a high natural endowment of groundwater and rainfall but AWM strategies must be matched with the hydrogeological setting to safeguard the underlying resource base and at the same time create wealth and alleviate poverty for its vast numbers of small holder farmers.