AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

JANUARY 2010

This briefing note is a summary of the Situation Analysis conducted in West Bengal, India in 2009.

WEST BENGAL SITUATION ANALYSIS

Introduction

This situation analysis is based on secondary data, field observations, household interviews and interviews with key informants. It examines farming systems in West Bengal and the characteristics of existing agricultural water management (AWM) practices. It takes into account the natural, political and institutional environments that influence AWM and identifies the people and organizations that have a stake in smallholder AWM. The results of the situation analysis are summarized here. The AWM solutions identified in the analysis were shared at the State Consultation Workshop and priority solutions for further analyses were selected by participants. For more on this, please see the State Consultation Workshop Brief which is also available on the website.

The Context

Nearly 70% of the population of West Bengal depend on agriculture, making AWM a critical factor in improvement to livelihoods. Improving AWM is made all the more imperative because some 37% of the State's population are below the poverty line, compared to a national average of 26%, and over 80% of the absolute poor live in rural areas.

Three-quarters of the land area of the State is alluvial plain and is highly suitable for agriculture. Major tributaries of the Ganges River flow through the State with high rainfall of 1,200-3,000 mm per year. There is therefore distinct potential for improving AWM, agricultural production and livelihoods.

A particular difficulty in using AWM to address agriculture and poverty issues is that water resources are unevenly distributed across the State; so for example the three zones that can be identified based on groundwater resources would need different AWM solutions. These zones are:

- The Himalayan and Sub-Himalayan zones of Darjeeling and parts of the Jalpaiguri and Cooch Bihar districts in the north.
- Rocky uplands of Purulia and the western fringes of Bankura, Birbhum, Bardhaman and Medinipur districts.
- Low-lying alluvial plains encompassed within Jalpaiguri, Cooch Bihar, North Dinajpur, South Dinajpur, Malda, Murshidabad, Nadia, Hugli, Haora, Bardhaman, Bankura, East Medinipur, West Medinipur, North 24 Parganas and South 24 Parganas districts.

The Policy and Institutional Environment

The State government is committed to increasing the irrigation potential of surface water through the rehabilitation of existing minor irrigation schemes[1] and excavation of new water storage structures. Groundwater irrigation should only be expanded after an assessment of aquifers and should be socially balanced.

The resources for the proposed government intervention in minor irrigation would come from central financial support, such as from the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and the Command Area Development and Water Management Programme (CADWM). In the case of groundwater irrigation, there is no comprehensive scheme for sharing expenditures between the Central government and the States except for the loan-based Rural Infrastructure Development Fund (RIDF).

The Water Investigation and Development Department (WIDD), Government of West Bengal has been the principal government agency implementing minor irrigation schemes in the State. Panchayats are also expected to be involved in all implementation aspects, from site selection to construction, after which open dug-wells, tube wells and river lift irrigation schemes are handed over to Panchayat Samities (village committees) to operate and maintain. Panchayat Samities are permitted to collect adequate water rates from beneficiaries to meet operation and maintenance costs in full. This has been highly successful.

The West Bengal Ground Water Resources (Management, Control and Regulation) Act was passed in 2005, in response to the rise in groundwater extraction. This is implemented by the State Water Investigation Directorate (SWID), the District Level Authority (DLA), the Corporation Level Authority (CLA) and the State Level Authority (SLA). Under this Act, anyone intending to extract groundwater must obtain a permit.

Agriculture and AWM in West Bengal

There has been no growth in agricultural production over the past few years, and the number of landless people and

farmers with small parcels of land has greatly increased - currently, over 3.3 million hectares are divided into individual plots of 2 ha or less. This is a cause of concern as West Bengal has not yet attained actual food security; it currently produces 50% less than its requirement for wheat and 75% less for pulses.

There have also been changes in AWM with canal irrigation declining and groundwater irrigation dramatically increasing (Table 1). The Minor Irrigation Census (MIC) by the Government of India (GoI), which records irrigation schemes of less than 2,000 ha, identified over 800,000 structures in 2001 of which the majority (approximately 600,000) were shallow tube wells (STWs). The decline in dug-wells and surface irrigation is mainly due to lack of maintenance. The ownership pattern of shallow tube wells also suggests that most are privately owned by individuals or groups.

Table 1: Changes in Cannal and Groundwater Irrigated Areas

	Irrigated area ('000 ha)	
Year	Canals	Groundwater
1962-63	886	16
1982-83	756	360
2002-03	560	1,508
% change (1962-2003)	-36.79	9,325

Source: Narayanamoorty, 2007

In the late 1990s, the pumps used for the STWs were almost all diesel-operated with only 10% being electrically powered, compared to around 50% in India as a whole. As a result West Bengal had the lowest proportion of electricity-run water extracting mechanisms to total water extracting mechanisms of any State in India.

The State government has not developed adequate facilities for surface water irrigation or provided reasonably priced electricity connections, as yet, which has made farmers dependent on diesel pumps, even at a time when diesel prices are increasing.

Existing Technologies and Trends

Twenty villages were surveyed in four districts, and the State-wide trend of increasing groundwater use was seen in all but one village. In the villages of North 24 Parganas, farmers depend largely on diesel-operated STWs and electrically run STWs. In the villages of Hooghly, the farmers mainly depend on submersible pumps and deep tube wells (DTWs). Purulia District is the exception because most of the agricultural land is mono-cropped and there are very few irrigation facilities.

Groundwater irrigation in Hooghly District

Electric Pumps

The low adoption of electric pumps in West Bengal compared to the rest of India is a function of the availability of electricity connections, the cost of electricity and the metering structure imposed by the State government.

Farmers with electricity meters complained that they pay around INR 30,000 per year compared to just INR 10,000 per year for unmetered submersible pumps. This cost is also transferred to farmers who buy water from pump owners and now pay INR 500-1,000 more per acre of *boro* paddy cultivation than before the introduction of metering.

The metering charges are based on the time of day - INR 1.97 from 6 a.m. to 5 p.m.; INR 5.10 from 5 p.m. to 11 p.m.; and INR 0.97 from 11 p.m. to 6 a.m. Under this structure it is cheaper to irrigate at night but this poses logistical problems. During the day, there are fluctuations in the supply and also power cuts, which force farmers to irrigate in the evening, when the tariff is highest. As a result, many farmers are ceasing to cultivate in *rabi* (October-March) and summer (April-June) seasons. Many felt that diesel pumps were more reliable and better value.

Diesel Pumps

Diesel pumps are extremely popular but, due to the rising price of diesel, farmers are increasingly opting for Chinese-made pumps instead of conventional Kirloskar-type pumps produced in India. The Chinese pumps cost less to run as they require less fuel and can even be run on kerosene, which is cheaper than diesel, or a mixture of kerosene and diesel. They are also much lighter, which means that the pumps can be carried to the field and brought home at

Farmer using a treadle pump

night. As a result, the pumps are less vulnerable to theft, and farmers can transport them between different water sources, including tanks and canals. The primary disadvantage of the Chinese-made pumps is that they heat up quickly and wear more easily than other pumps, but this does not appear to diminish their growing popularity.

Treadle pumps

In Uttar Dinajpur, treadle pumps are used by farmers in a few villages. These manually operated pumps are made out of bamboo and cost as little as INR 200. The amount of water extracted is similar to that extracted by hand pumps, which means that they can be used on crops with low water requirements and small vegetable patches, but they cannot replace STWs, which are essential for crops like *boro* paddy that require large amounts of irrigation water and in places where the groundwater table has fallen below 30 feet. An advantage of treadle pumps is that they have no direct financial operating costs, although they require labor.

Water harvesting structure in Purulia District

Water Harvesting Structures

In Purulia District the poor capacity for retention of rainwater leads to severe runoff and soil loss. The nongovernmental organization, Professional Assistance for Development Action (PRADAN), is trying to address this by introducing water harvesting structures (WHS) and the System of Rice Intensification (SRI) with funds from the Swaran Jayanti Rojgar Yojna (SJRY) and MGNREGA. These WHS are generally constructed on private lands, particularly of marginal and small-scale farmers from the scheduled castes and scheduled tribe communities. These WHS are rectangular or square and generally require 5% of the land area of the farm. Slightly larger ones are also constructed and are locally known as Hapa. They are best located at the lower level of the land, where natural water seepage can be used to the maximum. Those located on higher land tend to dry up faster. As a result of the introduction of WHS, many of the barren lands that remained fallow are being cultivated. According to the farmers interviewed, the main benefit of this system is that they no longer have to migrate in search of work, or gather food from the forest.

Rainwater Harvesting

The Irrigation Economy

The cost of irrigation depends on a number of factors especially the water source, the water extracting equipment, the means of powering the equipment, and whether the equipment is owned or leased. Farmers find innovative ways to reduce costs, such as using Chinese-made pumps, mixing kerosene with diesel, or using submersible pumps to fill tanks at night when electricity tariffs are lower and using this water to irrigate during the day.

Comparisons of various different irrigation options and estimated costs are given in Table 2. They are based on the data collected for *boro* paddy and are only indicative, as a number of factors influence cost including season, village and year. The range in costs is significant with a minimum of around INR 800 and a maximum of nearly INR 7,000 per acre. A Chinese pump costs around INR 10,000 and a traditional Kirloskar pump INR 22,000. The cost of installing submersible

pumps has also tripled in the past 10 years, and farmers are instead taking advantage of temporary connections provided by the State Electricity Board to irrigate summer paddy for three months.

Table 2: Estimated costs of various pump types

Type of pump	Estimated cost of irrigation (INRS/acre)	
	Pump Owners	Buyers of water
Diesel STW (private-conventional)	2,700	5,400 -6,900
Diesel STW (Chinese pump)	1,800	6,000
Electric STW (private)	1,200	3,240-5,400
Electric STW (CADC)	--	2,000-2,700
Submersible (pvt-metered)	1,200	2,000-2,500
Submersible (pvt- unmetered)	535	1,500
Submersible (panchayat)	--	1,500
DTW (government)	--	816 -1,200

Note: Pvt = Private. Source: Banerjee, 2010

Irrigation Problems

The introduction of groundwater irrigation with tube wells had a positive impact on farmers and their families as water from these wells allowed them to grow surplus crops for the market. However, over the years the cost of irrigation has increased, while that of food grains has remained relatively constant. This is threatening to reverse the positive trends in agriculture and livelihoods.

For users of electrical pumps, the metering system and the introduction of a three tariff structure based on the time of day have given the farmers cause for complaint because they usually have to operate their pumps when the tariffs are highest and there are frequent power cuts. This is altering farming patterns and could potentially result in a return to a single annual crop.

The rising cost of diesel is also affecting production. Many farmers who use diesel pumps are opting not to grow the lucrative *boro* paddy but instead to grow less water-intensive crops such as mango. This may have implications for food security.

In all cases, the cost of production has gone up due to the (electricity) tariff and diesel costs, and for some, these additional costs mean they can no longer afford to use their pumps or to rent pumps.

Next Steps

Since the situation analysis was conducted a number of case studies have been undertaken on specific AWM solutions. These will be published as briefs on the project website as soon as they are completed, and stakeholder consultations will be continued to share findings and receive comments.

References

Banerjee, P. S. 2010. Agricultural Water Management Solutions Situation Analysis for West Bengal. AgWater Solutions Project. IWMI, Colombo.

Narayanamoorty, A. 2007. Trends in Irrigated Area in India: 1950-51 to 2002-03. Global Irrigated Area Mapping, IWMI, Colombo.

[1] All groundwater and surface water schemes that have a Culturable Command Area (CCA) of up to 2,000 ha are defined as minor irrigation schemes.

[2] Case studies, conducted after this Situation Analysis, suggest that Chinese pumps are no longer favored. Details of these findings will be published soon.

[3] A unified Centrally Sponsored Scheme launched to encompass several Urban Poverty Alleviation Programmes.

This briefing note is based on a report by Partha Sarathi Banerjee.
The report is internal but if you would like an electronic copy please contact the Project Secretariat, awmsolutions@cgiar.org

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