AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

NOVEMBER 2010

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

MADHYA PRADESH SITUATION ANALYSIS

Introduction

This situation analysis included a collation of secondary data relating to agricultural water management (AWM) practices and policies, and a field study of 18 AWM practices in Bundelkhand, Malwa and Mahakaushal regions in the Indian State of Madhya Pradesh. This brief gives an overview of the AWM situation in the State and showcases the different practices taking place, based on the case studies.

The results of the situation analysis are summarized here concentrating on existing environmental, social and political conditions across Madhya Pradesh as well as on the AWM strategies currently in use and those that have potential to improve agricultural production and farmers' livelihoods. The AWM strategies described here were shared at the State Consultation Workshop and priority solutions were selected by participants. For more on this please see the state Consultation Workshop Brief which is also available on the website.

Context

Socioeconomic Conditions

With 9.4% of the country's geographical area, Madhya Pradesh is the second largest State in India. It has a population of 60.3 million, which is close to 6% of the country's population. The State was one of the first to decentralize under the three-tier Panchayat Raj Institution System into 48 Zila (District) Panchayats, 313 Janpad (Block) Panchayats and 23,051 Gram (Village) Panchayats.

Madhya Pradesh has one of the lowest per capita expenditures of all the Indian states, which was INR 439 in rural areas of Madhya Pradesh in 2004-05 compared to the all-India average of INR 559. The incidence of poverty in the State declined to 37% in 2000 but remains high compared to the national level of 26%.

Madhya Pradesh has particular problems with roads and power. The lack of power impacts on agricultural production, and the road network limits access to markets.

Natural Resources

The State has a geographical area of around 30.8 million hectares (Mha), of which 15 Mha were the net area sown in 2005-06, 1.3 Mha were under permanent pastures and tree crops, 1.2 Mha were fallow and 1.2 Mha were cultivable wasteland.

The ten major rivers of the State provide 70 km^3 of water, of which 70% could be harnessed for irrigation. The net irrigated area in 2005-06 was 5.7 Mha, approximately 38% of the net area sown. Infrastructural developments initiated by the Water Resources Department (WRD) and the Narmada Valley Development Authority (NVDA) have created approximately 2.6 Mha of irrigation potential. However, only around 50% of this is utilized. In addition to this, the Rural Development and Agriculture Departments are contributing to water harvesting and the creation of irrigation potential.

Madhya Pradesh has 11 agroclimatic zones across five regions:

- **Baghelkhand Region** is notable for its relatively large landholdings (50-300 ha), sizeable agricultural labor force, and availability of good groundwater.
- In **Bundelkhand Region** there is a high percentage of landlessness, particularly among the Scheduled Caste (SC) population. Availability of groundwater is relatively good but trends suggest that reserves are declining. The region has large tanks used for fishing and agriculture. The tanks are owned by Malgujar/Zamindar (cultivating owners with revenue rights) or the government.
- **Chambal Region** has a mixed groundwater status and high levels of poverty and landlessness. Two of the districts rank highly in the percentage of irrigation to gross sown area. Sheopur District has the distinction of no irrigation from government sources but the highest percentage of irrigation by private sources.
- **Malwa Region** has two distinct subregions, one with hilly areas and the other with plain-plateau land. It covers three of the poorest districts of the State, inhabited by the Bhil tribes. There are three sets of rivers in Malwa two of which, the Narmada and the Mahi rivers, have been dammed to provide irrigation and hydraulic power. Groundwater is overexploited and the situation is considered critical.
- **Mahakaushal Region** has a high tribal population (43%). There are three major rivers, Narmada, Tapti and Wainganga, and five medium and major dams. Availability of groundwater is considered safe in the sense that annual utilization of groundwater is less than annual

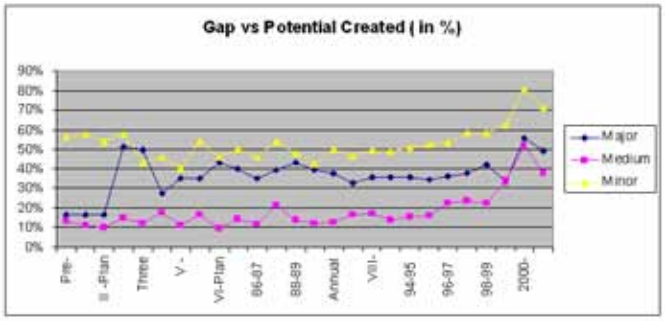
recharge, although one or two districts appear to have overexploited their resources. Irrigation varies across the Region with less than 10% of the gross sown area being irrigated in some districts.

Agriculture in Madhya Pradesh

According to the 2000-01 Agriculture Census there are 7.3 million landholders in the State, and 73% of the rural population depends on agriculture. The average per capita landholding is 2.2 ha. Of the total gross cropped area 42% is sown with cereals, 21% with pulses, 21% with oil seed, 3% with commercial crops (e.g., cotton and sugarcane), and 13% with vegetables, fruits, fodder and medicinal crops. The gross cropped area varies by season with 59% sown in kharif, 41% in rabi, and 24% in both seasons.

Irrigation in Madhya Pradesh

The area under irrigation in 1999-2000 was 5.66 Mha, of which Government canals irrigated 1 Mha, nongovernmental canals 1,600 ha, tanks 132,000 ha, wells 3.71 Mha and other sources 810,000 ha. All the five-year plans resulted in some increase in irrigation but there continues to be a gap between the potential created and actual irrigation. This gap was as much as 60% for minor irrigation schemes.



Policies and Programs

The major policies guiding irrigation development are the Madhya Pradesh Irrigation Act, 1931, and The Madhya Pradesh Irrigation (Amendment) Act, 1976 and 1990. The Act is supplemented by the Madhya Pradesh Irrigation Rules 1974 and Directives for Irrigation Panchayats Formation/ Election. The Science and Technology Policy 2007 supports irrigation and agriculture through four of its ten goals.

Other relevant policies include the State Water Policy 2003 of the Government of Madhya Pradesh Water Resource Department, which covers drinking water, irrigation and electricity. The policy provides for the timely upkeep and modernization of dams and canals, but it is generic with no time-bound goals.

The National Water Policy (NWP, 1987) calls for participatory irrigation management (PIM), stating that: "Efforts should be made to involve farmers … in various aspects of management of irrigation systems, particularly in water distribution and collection of water rates." The NWP (2002) modified this to state that: "Management of the water resources for diverse uses should incorporate a participatory approach by involving not only the various governmental agencies but also the users and other stakeholders..." The Madhya Pradesh Sinchai Prabhandan Me Krishkon Ki Bhagidari Adhiniyam (1999) has been enacted in accordance with the model PIM Act of the Central Government, which provides for the creation of Water User Associations (WUAs), Distributary Committees (DCs) and Project Committees (PCs). By March 2004, 1,687 WUAs, 90 DCs and 76 PCs were formed.

Agricultural Water Management Strategies

AWM strategies comprise irrigation technologies and supporting management systems. This section reviews some of the strategies currently being implemented in Madhya Pradesh.

Community Initiatives in Finding Local Solutions

Gravity Irrigation from Storage Tanks

Known as an "up level tank," this is a very low-cost method of irrigation in areas where the electricity supply is erratic. Water is pumped into the storage tank from tube wells for 5-6 hours when electricity is available which then flows downhill to irrigation outlets for use when needed. The tank studied in Mirjapur Village, Indore District, cost approximately INR 130,000 in 2001 and took 15 days to construct by 12 laborers. Where such tanks have been constructed, farmers have experienced increased yields as water is applied when most needed by the crops.

Wastewater Use

Wastewater is used in Khandwa District where farmers use electric pumps to lift water from the river which carries the wastewater from the city. The river receives household bathing and washing water, as well as cattle urine, but the farmers are satisfied with the quality of the water and the nutrients that it provides. In their opinion they have not faced any health or crop-quality problems and the water flows all year round. In addition, the wastewater recharges groundwater supplies.

Diesel Pumps

Diesel pumps are used in Mahipura Village, Dhar District by poor farmers, each owning less than 1 ha. The farmers have access to water through the many tanks, dams and wells

developed by government agencies and NGOs but require pumps to make use of it. They chose diesel pumps because there is limited access to electricity. Pumps are available in the local market for INR 20,000-30,000. Credit is available from government and private lenders. Diesel consumption for these 5 horse power pumps is around 1 liter per hour for 5-6 hours/day depending on soil and crop requirements. Farmers rent out pumps for INR 3,000 per month and payment is made in cash or agricultural produce. On average, pump owners can increase their income by INR 5,000/ha through additional production and INR 10,000 from pump rental fees.

A farmer using a small diesel engine to draw water from his pond

NGO Initiatives

Participatory Irrigation Management

In Khandwa District, the Aga Khan Rural Support Programme (AKRSP) has entered into a Memorandum of Understanding with the WRD to ensure community participation in the management of eight irrigation tanks. In the village of Dabhia, where one of the tanks is located, the total catchment area is 4 km^2 within which there are 3 km of canals. Landholdings are approximately 3 acres. The WUA formed by AKRSP includes two women and nine men. To date no water-quality or availability issues have been reported. The result of PIM has been an increase in the area irrigated, a 35% rise in yields, and 100% of families now crop in both seasons compared to just 8% previously. Incomes for 92% of families have doubled and out-migration has ceased. Despite these benefits there has been no spontaneous adoption of PIM outside the intervention area.

Pedal Pumps

This is a new AWM technique introduced to Latto village, Mandla District by the Madhya Pradesh Rural Livelihoods Project (MPRLP), under the Department of Panchayat and Rural Development, in 2006. The intention was to provide low-cost pumping to farmers who could not afford diesel or electricity. A group called Shiv Shakti Swayam Sahayata Samuh, formed by MPRLP, manage and maintain the pedal pump. The pump is portable and is taken from farm to farm, it requires 200 ft of pipe to irrigate 1 acre and can lift water up to 35 ft. On average, farms are 2 acres. Spare parts are available in the local market. The pump and parts cost INR 2,000 and are rented out at INR 150 per hour. The low investment costs mean that most farmers could become pump owners and leasers fairly easily. Farmers who use the pump now cultivate vegetables thus improving incomes and household nutrition. A farmer cultivating vegetables in both seasons can earn INR 20,000. The benefits have led to spontaneous uptake in other villages.

Stop Dam Irrigation

In Mandla District the dam is owned by a village WUA formed by the MPRLP. The dam has a catchment of 182 ha, irrigates 75 ha and cost INR 3.2 million to construct. This was paid by the MPRLP but the farmers provided labor. Due to good rainfall and adequate forest cover the dam functions well and water is now available all year. It is used for fishing, household needs and irrigation. The village is mostly tribal, and farmers own approximately 1.75 ha of land each. They access the water by cutting the bund at the edge of the field and are charged INR 70/ha for its use. The system allows agricultural production in both rabi and kharif seasons. Although all households (320) were targeted by the scheme, the actual number of beneficiaries is restricted to those located near the water sources (some 65-130 households).

Diesel Pump and Sprinkler

A local NGO, the Centre for Advanced Research & Development (CARD) and the Rajiv Gandhi Watershed Development Mission (RGWDM), started work in Manga Gram, in Mandla District in 2007. They saw that watershed development work had increased water availability but that its use for irrigation was limited by lack of equipment. As a result, they formed a WUA and provided a diesel pump and sprinkler to be used by the community. Diesel pumps were not new to the area but the concept of shared management through a WUA was. The pump is rented out at INR 125 per hour and famers purchase the diesel. The WUA shares the benefits, and it is estimated that the initial capital investment for the pump and sprinkler system (paid for with a grant from CARD and RGWDM) of INR 45,000 could be repaid within 2 years. The outcome of the program is that farmers can crop in the rabi season and families no long migrate out. It is important to note here that in this case the pump and sprinkler were provided by the program, and without such support, the initial investment of approximately INR 8,000 per farmer could prove prohibitive even with credit. Thus, some adaptation of the model has been seen with neighboring farmers investing in the pump but not the sprinkler.

Medh Badhan or Field Bunding

In Paudi Village, Dindori District, a group of 26 farmers constructed bunds on 32 ha of land in 2006. Now more water

is absorbed in the fields, which remain wet until the end of winter and maintain sufficient moisture for a rabi-season crop. The groundwater depth is also improving. The cost of the initial labor was covered by the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) but amounts to INR 8,000-12,000 per ha. Maintenance is performed by individual farmers or the user group under the direction of the Gram Panchayat.

Tank Irrigation in Matana
The 400 ha tank, built some 70 years ago, is owned by the Irrigation Department but managed by the village committee. The tank collects rainwater and is only dry for a short period each year. It is used by 200 farmers each of whom cultivates approximately 4 ha. Many of them have assets such as motorcycles and farming implements, suggesting that the tank is contributing towards the affluence of the community. Incomes are 30-40% higher than those of farmers outside the tank command area. The fact that the tank has been operating for 70 years is also an indicator of the success of the community management system.

Integrated Tank and Well Irrigation in Laxmipura
This tank is also owned by the Irrigation Department and managed by a village committee. The tank is approximately 20 ha with a catchment area of 60 ha. It supplies 20 farmers' fields, of around 4.5 ha each, with water until February. After this the 10 open wells and 12 tube wells, recharged by the tank, are used until April. These wells are managed by individual farmers. Since there is equal access to water and land the households have relative income equality. One difficulty is access to power to pump water from the wells because electricity is only supplied for 6-8 hours per day. Five farmers have diesel pumps. A pump costs around INR 15,000 after subsidies of 50% from various schemes. Calculating the cost of wells and pumps gives an investment cost of around INR 65,000 per farmer, which takes approximately 5 years to recover due to the increase in income of 30%. The cost of maintaining the tank is borne by the Irrigation Department but pump maintenance costs INR 2,500 per pump per year.

Field *Dubri*
A *dubri* is an open well-like structure with a depth less than 4 meters used for harvesting rainwater. It is shaped such that water runs down the slope into the pond. They are constructed on farmers' fields, which are, on average, 1.5 ha, and hold approximately 785 m^3 of water. One drawback is that water needs to be lifted from the *dubri*, and in the village studied the farmers did not have their own pumps but had to rent them. Each *dubri* costs approximately INR 33,000 to construct, paid for by the Rashtriya Krishi Vikas Yojana (The National Agriculture Development Programme). The *dubris* must be repaired after heavy rains which can take 7-10 days. Substantial increases in yield are reported; two crops are now grown each year and incomes are estimated to have risen by INR 10,000 per farm per year. The cost to the NGO to implement the program with 20 farmers has been approximately INR 44,500-55,000.

Government Initiatives

There are many examples of government irrigation structures managed by local communities but few managed by the government, which is in line with State and National policies. One example is a **government-owned tank system for fodder production on a diary farm** in Sagar District. The farm is approximately 696 ha of which a part is irrigated by the 6.12 ha tank, which contains rainwater until February. The Irrigation Department spends INR 7,956 per year on maintenance, which was reportedly insufficient. Those in charge of the diary farm would rather maintain the tank themselves as they believe they could improve its effectiveness.

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 established to share findings and receive comments.

This briefing note is based on a report by the Centre for Advanced Research & Development and the 18 case studies that they conducted. The report is internal but if you would like to request an electronic copy please contact awmsolutions@cgiar.org

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