South Asian Regional Workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management, Dhaka, Bangladesh, 18-21 May 1992

As stated in the last issue of the Newsletter we are pleased to share with you the outcome of the workshop held in Dhaka, Bangladesh during 18-21 May 1992.

A four-day South Asian Regional workshop on Groundwater Farmer-Managed Irrigation Systems and Sustainable Groundwater Management was held in Dhaka, Bangladesh from 18 to 21 May, 1992. Fifty-seven participants from 10 countries including 5 IIMI professional staff, attended the workshop. Five Indonesian participants who attended the workshop were taken on a one-week field trip after the workshop. The first day's activities began with an inaugural session followed by presentations of syntheses of the papers that had been prepared. Discussion groups were then formed and assigned the task of identifying issues of particular concern for further exploration during the remainder of the workshop. These discussion groups were organized around the topics of:

i) Aquifer and drawdown conditions;

ii) FMIS groundwater support services;

iii) FMIS sustainability under water-surplus conditions;

iv) FMIS sustainability under water-deficit conditions; and

v) FMIS sustainability within surface irrigation systems.

The second and the third day were devoted to field visits to see the working of various types of FMIS under different management conditions in the northern part of Bangladesh. On the final day, there were again small group discussions – this time set up to address and make recommendations about some of the areas of concern identified earlier. These three groups focused on: technical considerations; institutional issues; and socioeconomic aspects.

Issues for Discussion

On the first day, the five discussion groups came up with a number of concerns for further exploration. These issues are listed below by discussion-group topic.

Aquifer and Drawdown Issues. There is an urgent need to collect and disseminate technical information on aquifer characteristics, groundwater quantity and quality and drawdown conditions; on groundwater table variation in response to rainfall, surface water recharge and pumping; and on micro-level groundwater mapping and information system on groundwater availability and abstraction mechanisms. Organizational aspects of groundwater information collection and dissemination are also important.

Overdevelopment of groundwater and its utilization result in: depressed water tables, interaction between shallow and deep aquifers, and imbalances between fresh water and salt water interfaces. This leads to problems of inequity and lack of sustainability and increases cost of groundwater abstraction. Therefore, it is necessary to initiate careful monitoring of groundwater table fluctuations and introduce proper regulatory mechanisms for sinking and spacing of shallow tubewells (STWs) and deep tubewells (DTWs).

Valuable groundwater is often used inefficiently and at times wasted. Therefore, integration of efficient utilization of groundwater through better water management practices in conjunction with rainfall and surface water is necessary.

Selection of type of tubewells, their installation, operation and management are to be matched to meet the aquifer characteristics and drawdown conditions.

There is a need to enact proper groundwater regulatory mechanisms through a proper mix of technology and management for groundwater utilization so as to maintain groundwater at desired levels and prevent environmental degradation. It would be useful to find solutions to problems associated with:

* the increasing costs of construction, replacement and O & M;
* the deterioration of water quality; and
* the differential effects of water markets on the poor.

Study is needed on the impact of withdrawing state assistance for groundwater development and on how measures can be developed to improve the performance of groundwater development.

Groundwater Support Services Issues. There is a need to provide support services for groundwater FMIS in the following areas:

* easily available credit for construction of wells, purchase of equipment and spare parts and operation and maintenance;
* price support, market information and marketing facilities and storage and transport facilities for their produce; and
* subsidies for operation, maintenance and replacement.

It is necessary to:

i) Develop an institutional framework for group formation, partnership and legal framework for the groundwater group.

ii) Provide training for management support, recordkeeping, accounting and on-farm management.

iii) Provide technical support services on information of groundwater resources available, selection criteria, on-farm water management; and well maintenance and mechanic support.

iv) Provide spare parts during the recommended life span of the tubewell.

v) Analyze and identify the impact of groundwater support services on the following:

   * technical performance of groundwater utilization in improving command area, pump operation efficiency, recovery of water charges, loan recovery and rates of return to investment;
   * macro-economic policies (protection versus free market, pricing policies including energy cost and subsidies for groundwater development);
   * management/organization style (ownership issue – individual versus group management and public versus private); and
   * role of private sector; poverty alleviation through credit and water markets; role of STWs/manually operated pumps.

Sustainability Issues of GWFMIS in Water-Surplus Areas. There is a need to improve economic efficiency and profitability of groundwater irrigation. Therefore, it is necessary to:

i) Introduce macro-economic policies for profitable and efficient groundwater irrigation;

ii) Provide groundwater development subsidies (increase output price, input subsidy, credit and insurance);

iii) Balance surface water and groundwater development for their optimal utilization;

iv) Encourage local manufacturing of groundwater development equipment.

v) Ensure economic growth through better performance of water markets and improved access to water and credit markets for the poor.

vi) Define and demarcate objectives of groundwater development in relation to growth, sustainability, equity, poverty alleviation and gender issues.

vii) Discuss and identify the conditions under which drawdown issues assume importance in the short run and in the long run; there is a need to study agrochemical pollution of groundwater and resource degradation.

Sustainability Issues of GWFMIS in Water-Deficit Areas. It is necessary to:

i) Recognize that priorities may be different between lift technologies under different groundwater environments and socio-economic conditions.

ii) Identify the level of resource management and institutional development necessary for different regions; develop institutional objectives and management organizations relevant to farmers' interests.

iii) Understand and plan for water conservation, improved recharge and conjunctive use; social and economic implications of groundwater depletion; new mechanisms to improve resources management including the study of the relative efficacy of water markets, regulation and control to be met.

iv) Develop partner—*not* client—relationships between farmers and agencies; strengthen capacity of organizations (farmers, state agencies) to adapt and innovate for different groundwater conditions; train farmers and operators; and improve extension services.

v) Integrate groundwater irrigation activities institutionally and sectorally (agriculture, energy and transport) for sustainable use of groundwater and other resources.

vi) Collect and compile data on and techniques for technology management, farmers' needs and resources management, and improve accessibility to this information.

Sustainability Issues of GWFMIS within Surface Irrigation. It is necessary to:

i) Develop methodologies and techniques for efficient resources management through conservation and utilization; select appropriate tubewell technology—deep versus shallow tubewells for conjunctive use of groundwater (GW) with surface water; integrate groundwater activities with surface water utilization; treat groundwater as a common property resource through legal provisions and sanctions.

ii) Understand the interaction between groundwater and surface water recharge in terms of groundwater abstraction and water quality, and suggest measures to control them.

iii) Identify sources of pollution of surface water and groundwater and arrest deterioration of water quality.

iv) Understand the linkages existing among GW user groups, surface water FMIS and public agencies and suggest measures to improve their linkages and performance.

v) Develop and field-test a suitable organizational structure for conjunctive use of surface water and groundwater systems.

vi) Stipulate proper regulatory and control mechanisms to control water table, and to prevent waterlogging and pollution.

vii) Provide adequate training; cost-effective technology; adequate input services; market and credit facilities.

Workshop Recommendations

Technical Considerations. The main issues under this topic were grouped as follows:

i) Groundwater resource assessment;

ii) Groundwater exploration;

iii) Water conservation and management; and

iv) Environmental considerations in groundwater abstractions.

Under the existing methods of groundwater assessment and data collection, objectives and review of assessment and data collection are not

well-defined in most of the countries. Also most of the data collection is at a macro level and the data are not readily usable at micro level by the farmers who need them most. Therefore, it is recommended that:

* the objectives of data collection and mapping groundwater resources and review mechanisms must be clearly defined;
* groundwater data and their assessment are not readily available to the farmers at the micro-aquifer level (at the village level). Attempts must be made to collect micro-aquifer data within the existing agro-ecological unit through cost-effective procedures and using the local knowledge of the farmers. Also mechanisms must be developed to make data available to the farmers when they need them.Participatory research data collection should be promoted.
* existing data should be synthesized; attempts must be made to collect additional data to fill in gaps; to update the database and to analyze the data to bring them to a usable form and make them available to farmers, agencies and planners.
* at present, many national governments rely upon foreign experts and assistance to develop requisite databases and to assess groundwater resources. It is necessary to develop local capability to undertake these assignments.

Under groundwater exploitation, it was recommended that groundwater zoning be introduced into areas where only shallow tubewells can be used, areas where only deep tubewell can be allowed and areas where both shallow and deep tubewells can be allowed for groundwater extraction. Based on relevant environmental data and agro-ecological zones, appropriate groundwater extraction guidelines should be developed and disseminated, which are suited to the location through technology policy for groundwater extraction.

There was a lively discussion on the use of shallow and deep tubewells as extraction devices. Arguments were put forward for and against the use of deep tubewells. While discussing deep tubewells, two sets of issues were identified. The first set is with regard to existing deep tubewells. In Bangladesh itself there are more than 30,000 deep tubewells. The process and results of turnover and local management of these tubewells need to be looked into. Ultimately, most of these tubewells are likely to be owned by selected individual farmers who will be invariably well-to-do. The second set of issues is with regard to the installation of new deep tubewells. There were forceful arguments to ban turbine pumps for installation of deep tubewells. It was also argued that in view of these large deep tubewells in water deficit areas such as hard rock areas, groundwater levels are receding fast, requiring innumerable shallow well owners either to deepen the wells or to abandon them. Therefore, there is an urgent need to regulate the use of deep tubewells in these area too.

At the end, it was recommended that a three-phase approach be adopted which initially emphasizes shallow tubewells and groundwater management for stabilizing the drawdown level at an appropriate depth by regulating the use of shallow tubewells; secondly, to go for deep-set shallow tubewells and, finally, attempts may be made to go for deep tubewells where other methods of extraction have failed or are inefficient.

Under watershed conservation and management, it was recommended that the micro-aquifer should be the unit for groundwater conservation. It was suggested that a water balance study of the micro-aquifer be carried out to study the impact of surface water on groundwater and to design appropriate extraction mechanisms.

In order to improve the efficiency of groundwater use and to manage the groundwater resources in a sustainable manner it was suggested to:

i) Provide adequate technical extension services;

ii) Establish a strong unit for maintenance of groundwater structures;

iii) Provide adequate energy and energy distribution;

iv) Diversify crops for efficient water use;

v) Provide adequate credit facilities;

vi) Carry out proper monitoring and evaluation;

vii) Improve distribution systems and on-farm water management; and

viii) Carry out research on equity of distribution.

Under environmental considerations, it was recommended that in all irrigation systems, groundwater extraction and use should be controlled so as to minimize environmental problems, such as waterlogging and salinization, sea water intrusion, reduction in agricultural productivity, health hazards, groundwater deterioration due to pesticides and fertilizers, land subsidence, etc. It was also suggested that ecological balances need to be maintained for sustainability of groundwater irrigation systems.

Institutional and Organizational Considerations. Six functional issues were identified under this topic:

i) Policy and legal aspects;

ii) Planning;

iii) Cost-sharing, resource mobilization and investment;

iv) Creating appropriate groundwater infrastructure;

v) Management of operation and maintenance; and

vi) Agricultural production and marketing.

The following strategies were suggested for developing appropriate institutional and organizational mechanisms:

i) Policy dialogues

ii) Holding workshops

iii) Pilot testing

iv) Researching

Under policy and legal aspects, it was recommended that necessary institutions be developed and policy formulated with respect to: integrating surface water and groundwater; ensuring regulatory mechanisms, providing legal status to farmers' organizations, providing incentives, involving landless laborers and enacting strong legal provisions for considering groundwater as a common property resource.

Planning of groundwater resources needs assessment of potential and demand; a very strong participatory approach involving beneficiary farmers is recommended; organizational strengthening of agencies, NGOs and FOs is stressed. Coordination arrangements among agencies, NGOs and FOs are suggested.

Under supply and installation of extraction equipment, it was recommended that competition in adopting technology be permitted to allow involvement of private organizations in the above activities and to provide necessary training to FOs. There should be legal provision to ensure availability of spare parts for imported equipment.

Under management of O&M, it was recommended that both groundwater resource management and management of extraction technology be given due consideration. In addition, in those areas where surface water is available, conjunctive use and management are necessary. While beneficiaries are accountable for proper operation and management, agencies need to be made responsible for proper energy supply.

Under agricultural production, proper institutions are recommended for crop diversification, credit and marketing mechanisms. There is a need for interministry collaboration for dealing with groundwater, agriculture and other allied areas.

Socioeconomic Considerations. In order to make groundwater agriculture economically viable, groundwater extraction and utilization have to be effectively integrated into the larger national macro economy. In this endeavor, the group considered the following as important:

i) Infrastructural facilities be made available. Under these facilities, some of the areas recommended to be adequately developed were rural electrification, transportation and storage facilities, supply of equipment and spares, agro-processing industries, legal and administration framework of groundwater utilization and management and stabilization of exchange rates.

ii) Pricing policy be updated. Under this policy it was recommended to provide a selective subsidy for irrigation well equipment, appropriate pricing for surface water and groundwater, power, input and output and reforms in credit policies.

iii) Groundwater and surface water interaction be considered for optimal conjunctive use of surface water and groundwater.

iv) Equity. It was recommended to monitor regional/ social/ intergenerational/ gender equities and targeting of benefits from groundwater irrigation.

v) Institutional arrangements. Under these arrangements, it was recommended that water markets be promoted. However, institutions need to be created and strengthened to help regulate both sellers and buyers. Institutions for efficient conjunctive use and management need to be established.

Other Recommendations. The following recommendations are crosscutting the themes already discussed. They emerged in the final plenary session:

i) Groundwater should be considered as a common property resource. Groundwater and surface water must be integrated into a unified legal framework. All, including landless people, should have *inalienable* rights to water for drinking and religious purposes, followed by agricultural and industrial uses, in a hierarchical order. Groundwater should be considered a legally tradable commodity subject to regulation against overexploitation. Groundwater use should be planned in conjunction with surface water.

ii) Deep tubewells are costly and nearly universally controlled by large farmers. Appropriate institutional mechanisms should be in place before this technology is developed.

iii) Banning of deep tubewells is not a possible solution. But their use should be regulated through viable local institutional arrangements.

iv) Landless laborers should be given preference to manage tubewells in a sustainable manner;

v) Some of the aquifers extend over more than one nation (for example the Gangetic aquifer). Regional efforts are necessary to assess groundwater potential and interconnectedness.

vi) State policies toward groundwater management should target not only the individual pump owner but the network of wells that will interact now or in the future.

vii) Well ownership may be individual, but communities in an area should be organized and be invested with the right of taking decisions on new individual investments in wells in their area. Conservation technologies must be adopted by all owners of wells. Group purchase and distribution of power to these owners and enforcement of collection / loan repayment for credit provided to them are needed.

viii) Aquifer characteristics, and recharge rates vary greatly within even small areas; therefore, state policies should be tailored to the nature of each ecological zone (i.e., groundwater resource endowment region). Blanket countrywide or statewide policies for areas of high ecological heterogeneity are likely to be inefficient and wasteful of state capital when direct subsidies are involved.

ix) When the cost of pumping exceeds publicized and agreed-upon locally defined limits, all further official credit for extractive investments should be cut off. These include investments in well deepening, pump energization, construction of new wells, etc.

x) Choice of technology should be such that small groundwater groups are preferred to large groups when the resource base so permits. If shallow groundwater exists, then shallow tubewells are to be promoted rather than deep tube wells.

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