

Session I: Pani Panchayats or Water Users' Associations

Participatory Irrigation Management and Pani Panchayats in Orissa¹⁰

The State Government of Orissa and ADB have been jointly involved in the Orissa Integrated Irrigated Agriculture and Water Management (OIIAWMP) for the development of irrigated agriculture as well as the empowerment of pani panchayats in Orissa by means of promoting IWRM in the state.

In 1994, the state government, spurred by a European Commission-aided endeavor, initiated the PIM process in the state with the formation and empowerment of WUAs. This, followed by a World Bank-funded project, provided the right impetus for the PIM process to pick up steam. What was initially externally imposed on the farmers through state-driven agenda was popularized with support from NGOs, and soon received positive response from the water users' groups at the village level.

The PIM Act of 2002 and the State Water Policy in 2007 by the state government provided a progressive legal framework for PIM by recognizing the need for a decentralized management approach to irrigation. Pani panchayats or WUAs were formally instituted as distinct corporate bodies; the pani panchayat general body was authorized to exercise the "right to recall" through its president and to raise resources within and outside the Department of Water Resources (DoWR) through various instruments, including borrowing from banks and financial institutions. The framework provided for the formation of sub-committees to broaden participation across the different socioeconomic user groups. Pani panchayats could now determine their own water rates, and not necessarily be in line with the rates prescribed by the government.

The pani panchayats formed between 1995 and 2004 were reconstituted under the new Act. Out of 15,775 pani panchayats envisaged for 1.7 million ha of land, only 2,518 (16%) were formed as of March 2007, covering 0.4 million ha. Irrigation management

responsibility was transferred to pani panchayats in only a few cases. The government provided pani panchayats an O&M grant of Rs100 per ha, subject to certain performance parameters, such as nominal contribution from them. In most cases, this grant was not properly used.

Limitations of the Legal Framework of PIM

- The legal framework is non-inclusive in nature, unable to accommodate women, share croppers, or tenants.
- The 3-year tenure of farmers' organizations is too short for effective performance.
- There is a contradiction in the sense that although pani panchayats are described as "independent bodies," the DoWR is designated as an "approver," with powers to reverse the decisions of the pani panchayats, rather than as a "facilitator."
- Limitations are imposed on farmers' organizations in undertaking construction works.
- The framework stipulates neither a time limit nor a set of criteria based on which pani panchayats can be evaluated for performance standards before they take over O&M responsibilities.
- Although services of civil society are regularly used to support and promote PIM, no role is defined for them in the Act.
- While strong synergy exists between PIM and *panchayati raj* institutions (PRIs)¹¹ at the ground level, the Act does not recognize this relationship. Ideally, the Act should have specified guidelines based on which PIM bodies and PRIs could maximize their mutual gains from synchronized functioning despite different geographical jurisdictions.

¹⁰ Ashish Mondal, Consultant, PPTA – OIIAWMP.

¹¹ See footnote 9.

Issues with PIM in Orissa

In a survey of 39 pani panchayats covering 13 projects and 4 river basins, a project preparatory technical assistance (TA)¹² raised certain operational and implementation issues.

- The initiative was marked by a lack of vision for pani panchayats beyond the following 5 years. A coherent strategic plan for their support was absent, resulting in an ad hoc approach
- Electoral rolls were erroneous. Legitimate landholders were often excluded while noncommand farmers found inclusion, in all probability, due to the lack of coordination between the DoWR and the Department of Revenue (DoR).
- Key stakeholders in PIM were not adequately enthusiastic or determined to make it a success. A host of factors contributed to this disinterest. First, the electoral process was too long in Orissa. In other states such as Madhya Pradesh, it was a 1-day election conducted by the revenue department. Second, in Orissa, the roles and functions designated in the PIM Act are not adequately understood either by DoWR officials or by the water users.
- Barring a few cases, farmers' organizations were found to be nonexistent and the DoWR carried out their functions. However, the involvement of farmers' organizations was found to have improved the quality of irrigation management in certain isolated instances.
- No serious efforts were made toward capacity building of the farmers' organizations, except for one training program by Water and Land Management Institute (WALMI), which only covered at most 15–20% of the farmers' organizations.
- Water distribution planning done at the beginning of the season was rendered irrelevant by the absence of incentive plans for pani panchayats or farmers for efficient water management for the rest of the year, in view of the fact that the canals flowed perennially.
- Revenue-related issues plagued the system. This included the fact that the average rate of water charges was much lower than the actual expenditure incurred for O&M. At the prevailing water rates, revenue collection was only 65% of the demand for water. Irrigated area estimates computed by DoR varied with figures offered by DoWR.
- Scheme-wise information on the performance of water collection was not available with DoWR since DoR collected and consolidated the water fees for the whole district.

The above issues need to be addressed before PIM can be properly implemented and its benefits reaped. The project preparatory TA suggested certain refinements in the PIM policy and implementation in this context.

At the Policy Level

- Inclusion of women as co-landowners and sharecroppers;
- Extension of tenure of pani panchayats from 3 years to 5 years;
- Continuity of objectives and processes within the management committee so that the capacity-building effort lasts longer;
- Increase in number of subcommittees from three to six;
- Explicit mention of the role of DoWR as facilitator and service provider, along with its accountability for assured supply of water; and
- Inclusion of civil society members in the policy-making body.

At the Operational Level

- Exclusive organizational structure for pani panchayat and CAD support, requiring reshuffling/restructuring of the department;
- Significant quantum of the support extended to pani panchayats should be on a continuous basis;
- Making pani panchayats both institutionally and financially viable entities;

¹² Technical Assistance grant for Preparing the Orissa Integrated Irrigated Agriculture and Water Management Project. Cofinanced by the Government of the United Kingdom and the Cooperation Fund for the Water Sector for US \$875,000 approved in 2007

- Authorizing farmers' organizations to determine prices, collect, and retain revenue for O&M;
- Involvement of NGOs at the subproject level as well as at higher levels for pani panchayat support;
- Inclusion of pani panchayat function in the DoWR staff appraisal system to generate interest within DoWR staff with regard to pani panchayats;
- Intensive training of DoWR staff for pani panchayat support;
- Strengthening/establishing institutional mechanisms for agriculture extension and market support;
- Joint assessment of net irrigated area by DoWR and DoR to remove anomalies and monitoring of scheme-wise water fee collection;
- Involving the revenue department in the elections so that the process takes place at the same time, and devoting more time to capacity building and strengthening of pani panchayats;
- Developing WALMI as a knowledge institution in the water sector while building capacities within WALMI with the help of eminent academic institutions;
- Introducing detailed learning and monitoring mechanisms, such as management information systems, institutional development, internal learning, as well as third party monitoring, so that facts and figures about each project are easily accessible anytime and the department can take corrective steps for any problem at its inception rather than in a situation when a lot of damage has already been done.

Progress and Issues in Andhra Pradesh Irrigation Reforms¹³

In April 1997, the Government of Andhra Pradesh passed the Farmers' Management of Irrigation Systems Act. Progress has been satisfactory on most fronts, except for certain issues related to irrigation intensity and lack of adequate investments in irrigation.

Status of Irrigation in Andhra Pradesh

Five major river basins cater to the irrigation needs of Andhra Pradesh: Lower and Upper Godavari, Lower and Upper Krishna, and the Pennar. The net area irrigated, however, lags far behind the full irrigation potential that these five basins represent.¹⁴ The gap is more pronounced in major and medium irrigation projects compared to minor projects. Except for the Lower Godavari basin, irrigated area in the river basins have yet to match the ayacut developed under them, resulting in low and stagnant levels of gross agricultural output in the last few years.

While rains have, in fact, been erratic in the state over the past few years—a dip to 613 mm of rain in 2002 was followed by a peak in 2003 when the state received 936 mm of rainfall—water use efficiency in 17 major irrigation projects studied has been on the decline, regardless of rainfall levels.

The table below presents the results of an irrigated potential utilization study undertaken in 2003–2004. It clearly demonstrates suboptimal use of available yield as well as ayacut developed in Andhra Pradesh. These findings indicate that huge potential for improvement exists in the irrigation performance of the state.

With economic development, returns on irrigation infrastructure investments are diminishing, while the potential for returns on management investments is increasing. Hence, it would be appropriate to shift focus toward optimal use of existing projects rather than investing in new projects.

Table 1: Yield Availability of Five Major Basins and Potential Utilized in 2003–2004

Major basin	Available yield (mcft) *	Total utilization (mcft) *	Balance Yield (mcft) *	Ayacut (ha)			
				Major (lakh ha)		Medium (lakh ha)	
				*** Area Developed	** Area during 2003–04	Area Developed	Area during 2003–04
Upper Godavari	1,115,000	390,000	725,000	4.25	1.13	0.61	0.08
Lower Godavari	365,000	400,000	(35,000)	4.06	3.73	1.65	1.13
Upper Krishna	614,000	614,000	0	8.12	0.35	0.45	0.03
Lower Krishna	197,000	197,000	0	9.39	6.03	0.40	0.07
Pennar	98,000	98,000	0	3.22	1.98	1.03	0.13

ha = hectare, mcft = million cubic feet

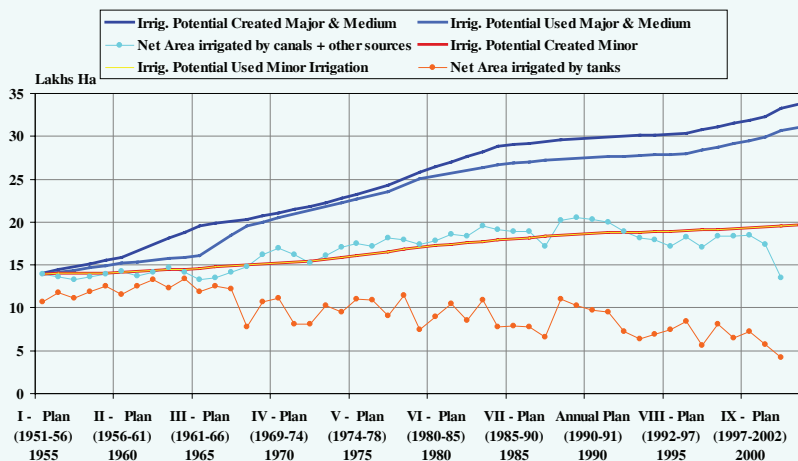
Sources: *CE [Chief Engineer] Major Irrigation; **DE&S [Directorate of Economics and Statistics] Hyderabad;

*** CADA [Command Area Development Authority] Annual Report.

¹³ Rahul Sen, Consultant with Department of Water resources, Government of Andhra Pradesh.

¹⁴ This was true even during the Ninth Plan period (1997–2002) and has been accordingly illustrated in the Plan document.

Figure 2: Irrigation Potential Created Plan-Wise and Net Area Irrigated



Source: Directorate of Economics and Statistics, Government of Andhra Pradesh

Figure 3: Irrigation Intensity

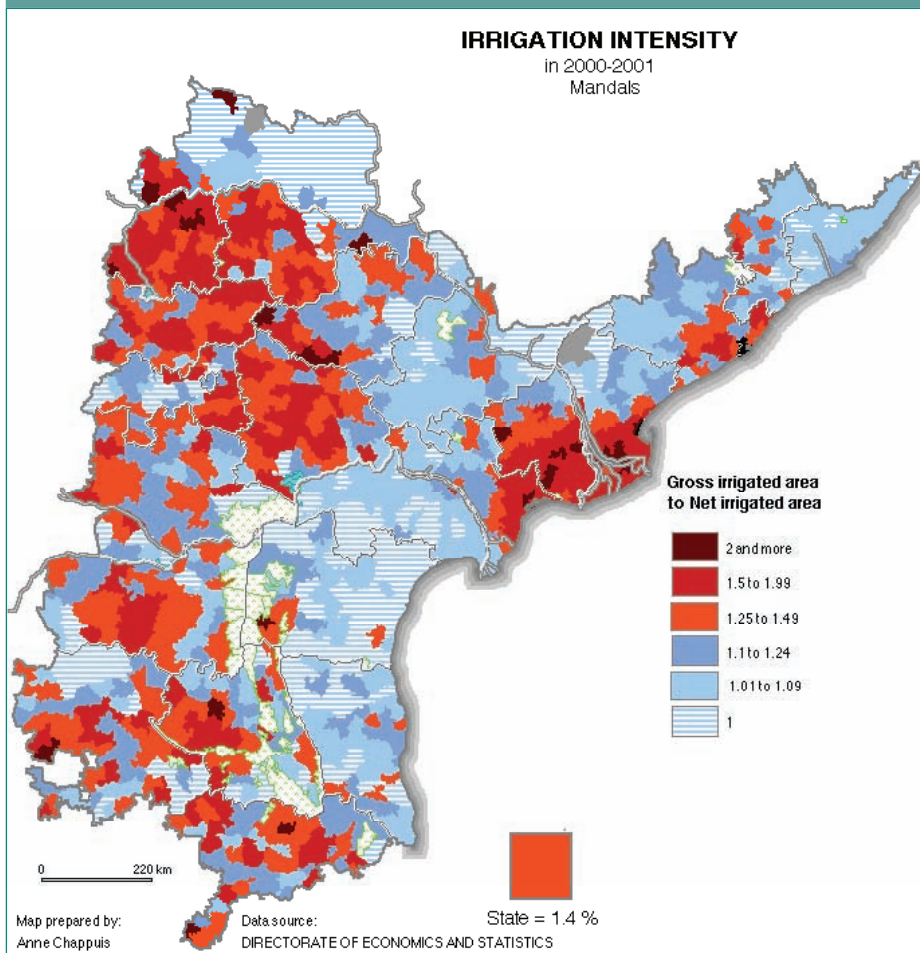


Figure 4: Irrigation Projects and Commands

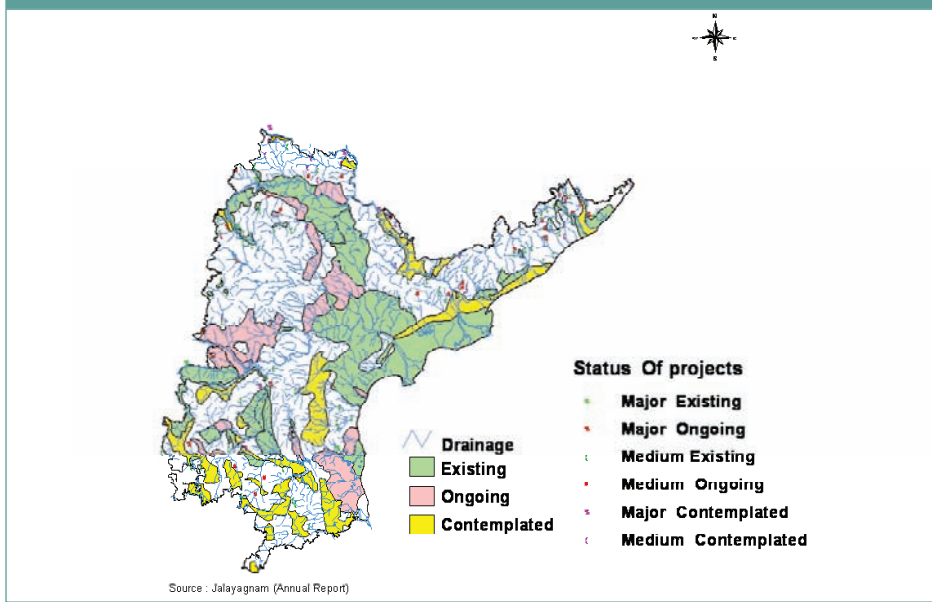


Figure 5: Major Basins and Districts of Andhra Pradesh

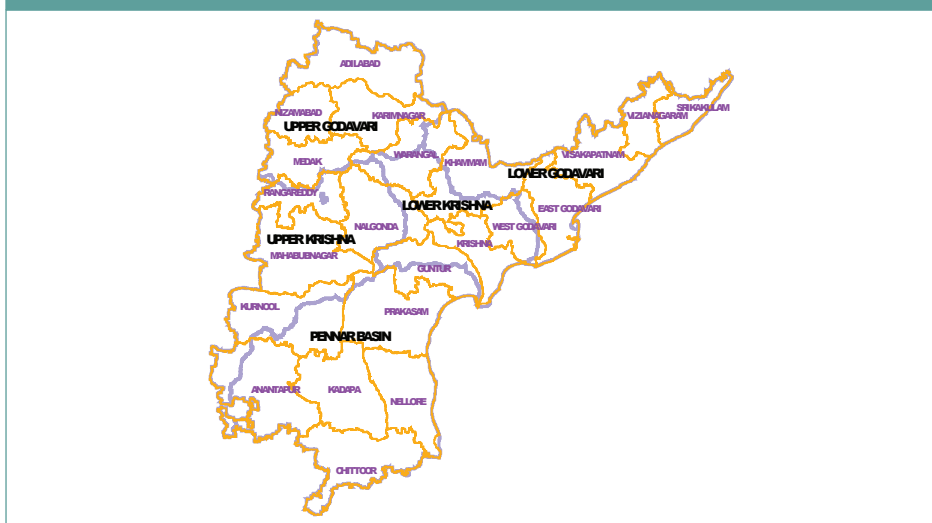


Figure 6: Yield Availability, Area Developed and Gross Values of Agriculture Output

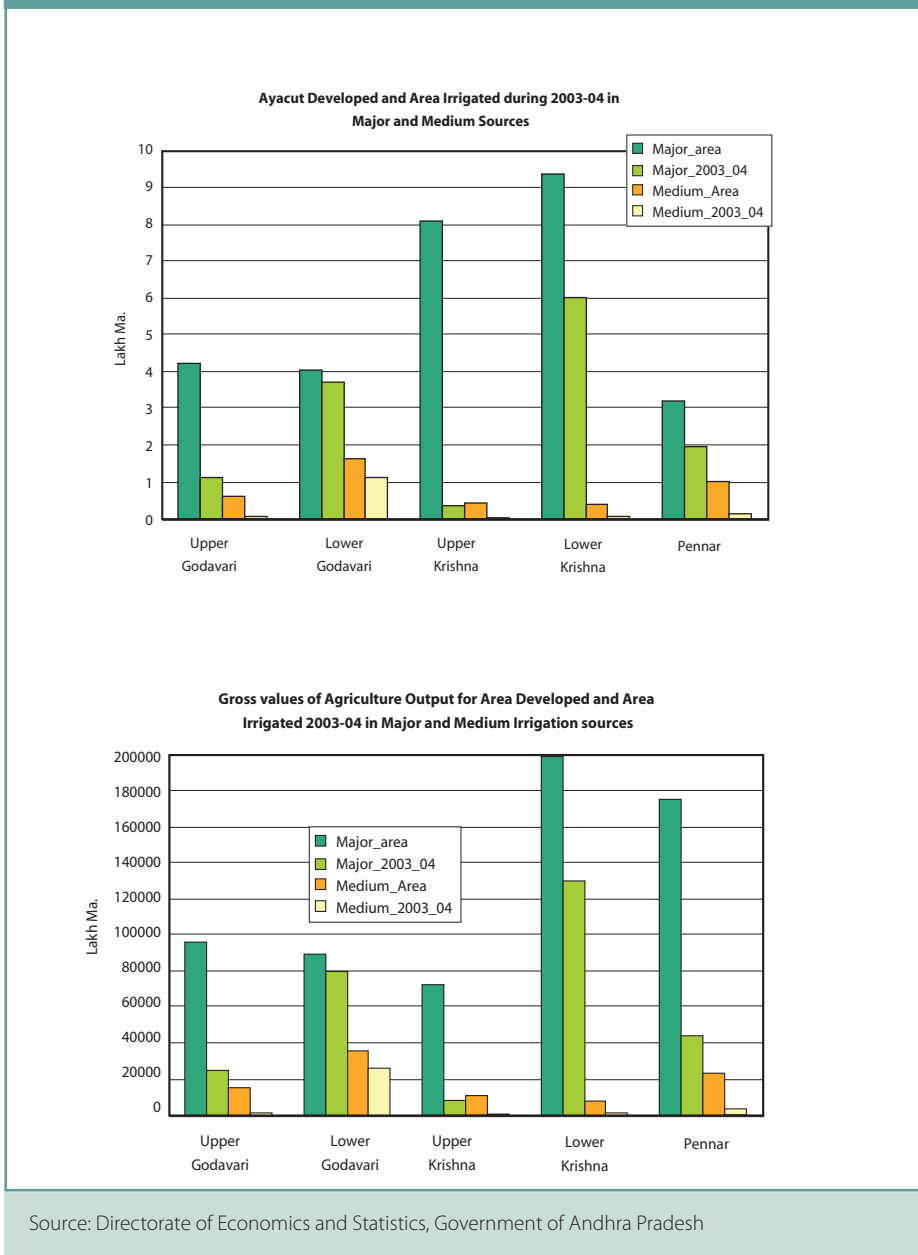


Table 2: Capacities of Existing, Ongoing, and Proposed Projects

Major Projects				
Major Basin	Existing	Ongoing	Proposed	Total
Upper Godavari	1.21	6.92	1.66	9.79
Lower Godavari	3.67	2.74	5.17	11.58
Upper Krishna	1.16	7.07	1.32	9.55
Lower Krishna	6.13	5.30	2.27	13.70
Pennar	3.85	13.56	3.82	21.20
Medium Projects				
Upper Godavari	0.57	0.19	0.47	1.23
Lower Godavari	1.51	0.55	0.44	2.50
Upper Krishna	0.45	0	0.07	3.73
Lower Krishna	0.32	0.25	0	0.57
Pennar	0.91	0.25	0.11	1.27
Total	3.76	1.24	1.09	1.84

Source: Jalayagnam (Annual Report).

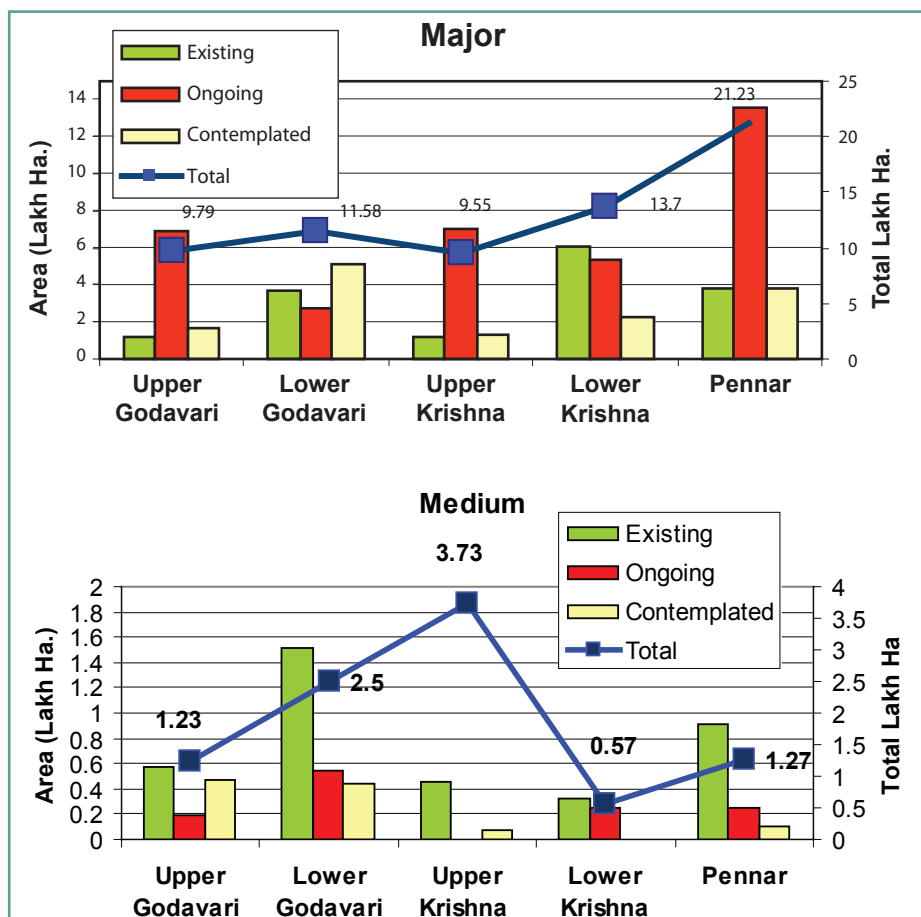


Table 3: Area Developed and Gross Value of Minor Sources

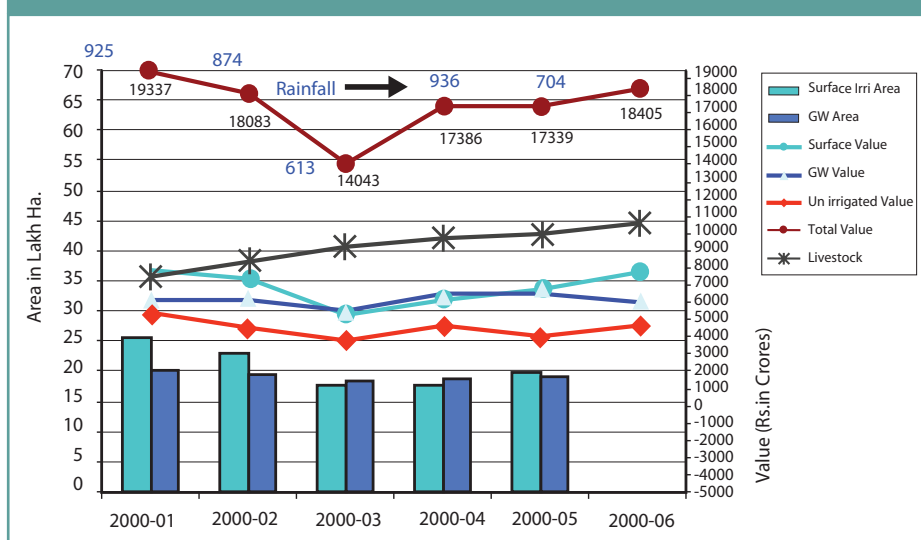
Major Basin	Area Developed (lakh ha)	Actual Area * (2003-04) (lakh ha)	Value (Rs in lakhs) (1998-99 Prices)		Groundwater (1998-99 Prices)	
			Area Developed	Actual 2003-04	Area * (2003-04) (lakh ha)	Values (2003-04) (Rs in lakh)
Upper Godavari		1.03	57,322	22,280	5.82	125,892
Lower Godavari		2.46	81,765	53,216	2.56	54,684
Upper Krishna		0.19	41,074	4,110	4.32	93,446
Lower Krishna		0.71	29,851	15,358	4.61	99,719
Pennar		0.87	75,709	18,819	6.92	149,687
Total		5.26	204,037	113,783	24.23	523,428

ha = hectare, PR = Panchayati Raj, Rs = rupees.

* DE&S Hyderabad

** CE Minor and Panchayat Raj

Figure 7: Values of Agriculture Produce – Linked to Irrigation



Year	Actual (in mm)
2001-01	925
2001-02	874
2002-03	613
2003-04	936
2004-05	704

Figure 8.1: Water Use Efficiency – 17 Major Projects

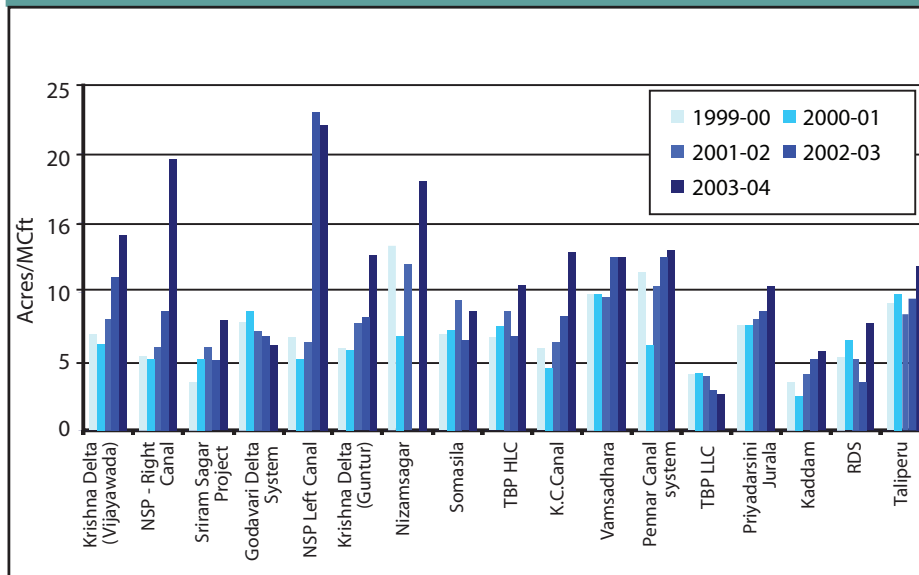
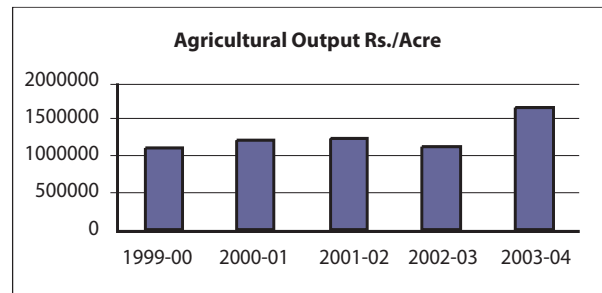
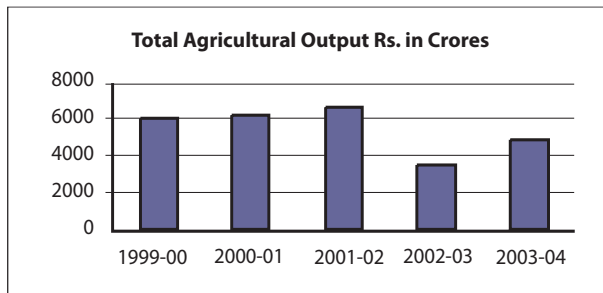
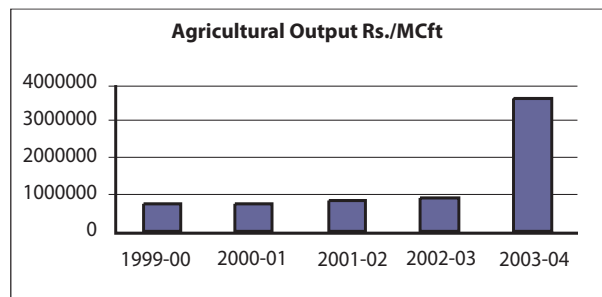
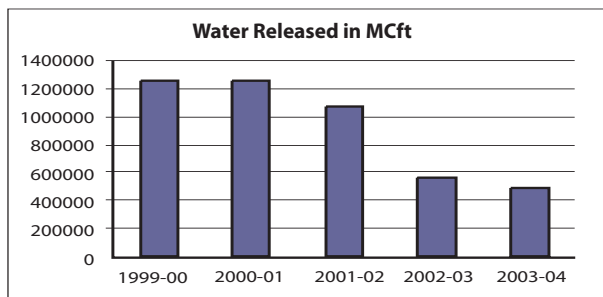


Figure 8.2: Water Use Efficiency – 17 Major Projects



How much of the potential is Utilized?

Table 4: Yield Availability of Five Major Basins and Potential Utilized in 2003–2004

Major Basin	Available Yield as per the MP Records (mcft) *	Total Utilization (mcft) *	Balance Yield (mcft) *	Ayacut (ha)			
				Major (lakh ha)		Medium (lakh ha)	
				*** Area Developed	** Area during 2003–04	Area Developed	Area during 2003–04
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* CE Major Irrigation
 ** DE&S Hyderabad
 *** CADA Annual Report

Potential Areas for Improvement

Before the state can reap the desired results of irrigation reform, it should urgently act on the following issues:

- Enabling effective O&M by WUAs,
- Participation by farmers' organizations and capacity building of such groups, and
- Governance and institutional arrangements

a. Operation and Maintenance

Proper functioning of O&M depends on

- Types of O&M works,
- Method of assessing irrigated area and of tax liability,
- Apportionment and procedure for ploughing back, and
- Sources of revenue to make O&M sustainable.

The three types of O&M works are regular maintenance, deferred maintenance, and original/cyclical capital works. Activities such as de-silting, weed

removal, embankment repairs, revetment, repairs to shutters, masonry and lining, cleaning and oiling of screw-gearing shutters, and painting of hoists and gates, come under regular maintenance work undertaken by WUAs and budgeted at about Rs5 lakh per annum per WUA. This also includes maintenance of inspection paths and emergent breach-closing works.

Fund requirements for the current year 2005–2006, as per irrigation area assessment, amount to Rs85 crore. Against this, a provision of only Rs60 crore has been made based on the water tax collection estimates.

Deferred maintenance works by WUAs, also valued at Rs5 lakh per annum per WUA, include rehabilitation activities such as reconstruction of sluices, reconstruction/repairs of drops and regulators, along with the reconstruction of measuring devices. Funds available for the current year are Rs68 crore for this purpose.

Original or cyclical works include modernization of the system and new construction works in irrigation. Provision of funds under this head for the current year is Rs486 crore, including Rs150 crore for modernizing the Nagarjuna Sagar project.

Funding O&M of Irrigation Projects

To fund the diverse activities mentioned above, tax demand is estimated through an assessment of the irrigated cropped area and crop types using radar satellite (RADARSAT) and LISS III images. Using a standardized procedure for assessment, the concerned chief engineer systematically maps the irrigated area under each project for each season. The Andhra Pradesh State Remote Sensing Application Centre (APSRAC) then takes up real-time monitoring, with a slight variation in case of the northeast monsoon areas and the south coastal areas.¹⁵

At the field level, irrigated area assessment is concurrently carried out by WUAs and competent authorities through a joint *azmoish*¹⁶ based on the information given by APSRAC and the results furnished to the revenue authorities to calculate and raise the water tax demand through proper channels. APSRAC submits the final report on coverage, production, productivity, and waterlogged areas during November–December for the kharif crop and by the end of March for the rabi crop. Based on these reports, tax demands are raised and apportionment and reinvestment plan proposed.

The reinvestment rate of water tax for the current year is scheduled to be increased from 45% to 80%.

The 20% balance is slated to be used for emergency works or drainage on a case-specific basis. Arrears too may be similarly ploughed back. WUAs and distributary committees are also scheduled to take up physical works to the tune of Rs5 lakh and Rs10 lakh, respectively. The return of funds to WUAs and distributary committees is expected to take place through direct budgetary allocation rather than through a letter of credit.

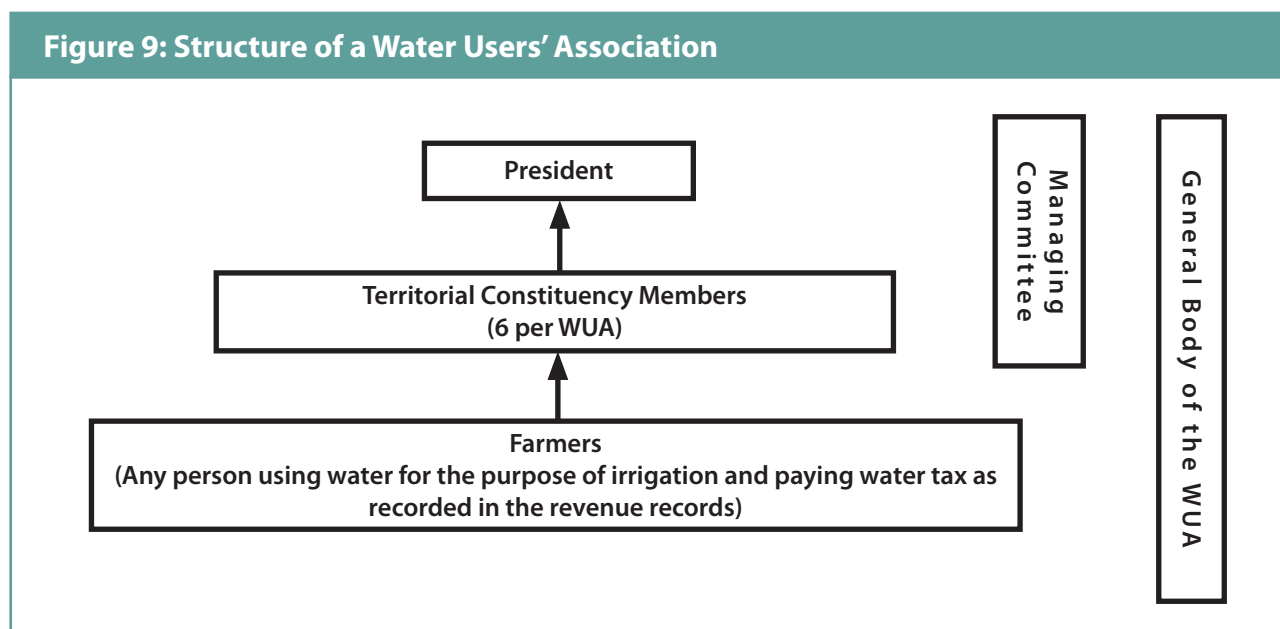
The entire budgeted funds for O&M are to be released by the second week of April to facilitate start of work before monsoon.

Although water charges can also be raised through the industry and the power sectors, the current fund requirement of Rs85 crore (2007–2008) for regular maintenance works is expected to be met largely from the taxes raised from user groups in the irrigated areas. However, with rationalization of water charges for the industry and power sectors, substantial additional revenue is expected to be generated for O&M works.

b. Capacity Building of Farmers' Organizations

The structure of a WUA is shown below:

Figure 9: Structure of a Water Users' Association



¹⁵ For the kharif season, RADARSAT images are employed from August to October, and LISS III images from October to December. For the rabi season, LISS III images are employed from January to March.

¹⁶ *Azmoish* means the inspection of lands and fields to record the details of crops raised, trees, wells, etc.

- The office bearers of WUAs have a tenure of 6 years each, with one third of the members seeking reelection every year.
- A distributary committee is comprised of the presidents of all WUAs.
- A project committee, in turn, is comprised of the presidents of the distributary committees.
- No project committee has been formed in Andhra Pradesh yet.

WUAs in the state total 10,748 as of date, out of which 2,261 are handling major projects, 8,077 handling minor projects, and 410 handling medium projects.

In July–August 2005, some NGOs began pilot training programs in 282 WUAs under the Andhra Pradesh Economic Restructuring - Minimum Rehabilitation - Programme, which covered an area of 4 lakh acres in 4 major irrigation projects. The WUAs were trained to carry out proper maintenance of the irrigation system, practice conjunctive use of water, enhance water use efficiency, and practice crop diversification and systemic rice intensification. The objective was to ensure the sustainability of WUAs as effective O&M vehicles. Techniques and processes of O&M planning and implementation, water management planning, participation in tax collection, livelihood development, establishment of offices and records maintenance, as well as the farmer field school approach were used. Regular review and monitoring as well as midterm evaluations were carried out.

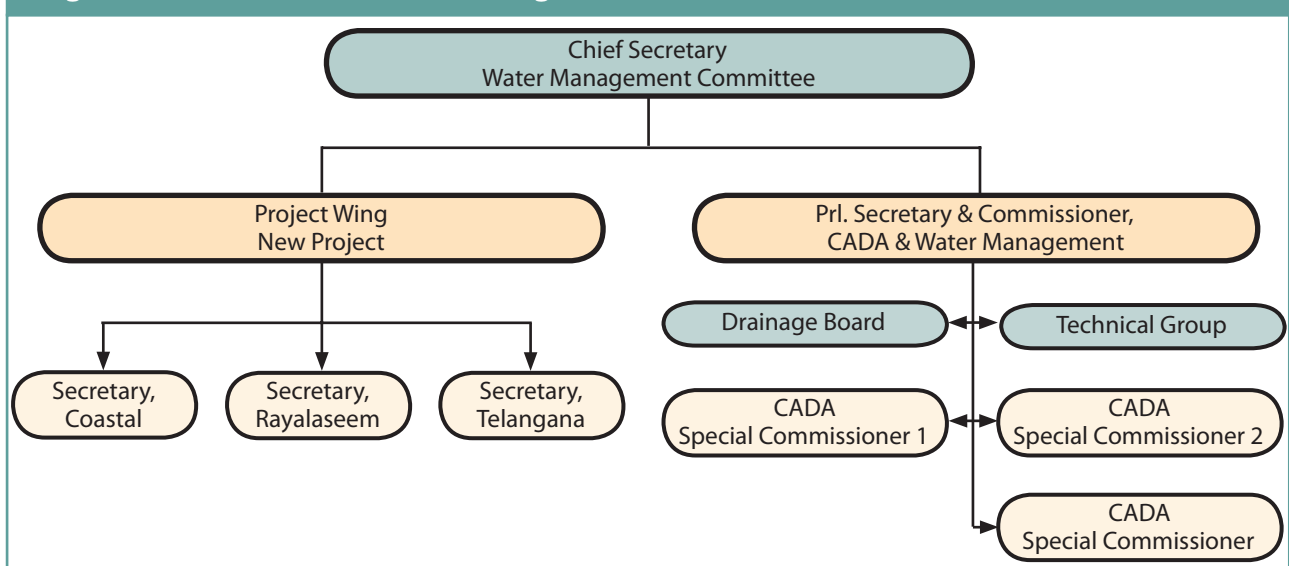
The pilot training was extended to 1,500 WUAs in the following year, covering 14 projects across an area of 40 lakh acres. For the current year (2007–2008), it is intended to cover all major and medium projects, adding up to 2,700 WUAs. The plan includes engaging a training coordinator and an irrigation engineer for every 100 WUAs at the irrigation circle level. The training coordinator will provide back-end support to WUAs and distributary committees in all their designated tasks, including monitoring of the NGOs' farmer training programs, and orientation and training of the engineering staff with support from resource agencies. The irrigation engineer is expected to handle issues such as training and coordination of water audits, benchmarking of irrigation systems, and water use efficiency studies. NGOs at the sub-division/division level will cover about 30 WUAs each.

c. Governance and Institutional Arrangements

An apex body called the Water Management Committee (WMC), constituted at the state level, will be responsible for all policy/reforms, regulation, performance, and convergence with regard to water-related issues.

The structure of the WMC is shown below. The committee would be headed by the chief secretary to the Government of Andhra Pradesh, who will be its ex-officio chairperson, with 10 secretaries of water using departments under him. The principal secretary, Water Management & CADA, will be the convener. Other members would be principal secretaries of the concerned departments.

Figure 10: Structure of Water Management Committee



Key Functions of the WMC

- 1) Policy and Reform: The WMC will review the implementation of the State Water Policy and set guidelines for and review institutional reforms for efficient water resource management across the various water user departments. It will also set guidelines for research and analysis in water resource management for future policy formulation and reform.
- 2) Regulation and Performance: The WMC will
 - a) fix rates for water usage,
 - b) set guidelines for and review the development of water management plans for the various water user departments,
 - c) fix norms for quality of water-related infrastructure and services,
 - d) set norms for water quality and water pollution (especially related to industrial wastewater),
 - f) fix norms and procedures for O&M of water resources infrastructure (both by departments and user organizations),
 - g) fix norms for apportionment of water tax and royalties collected by the Irrigation Department to various agencies for O&M of irrigation systems,
 - h) set guidelines for and review conjunctive use of groundwater and surface water in command areas,
 - i) set guidelines for and review management of waterlogging and salinity problems, including salinity ingressions, and

j) fix norms for and review the performance of the Technical Group.

- 3) Convergence: The WMC will set guidelines, review, and harmonize existing policies; execute orders and rules related to water resource management issued by different departments; and set guidelines, review, and harmonize water management plans for the various water user departments.

An independent body called the technical group will be separately constituted, whose primary function would be to make recommendations to the apex body on the following issues:

- 1) Water charges and water royalty rates for other water user sectors and apportionment of collected water charges to farmers and other agencies;
- 2) Procedures/modalities for returning to WUAs part of the water charges for O&M of the irrigation system;
- 3) Technical standards for O&M, cyclical repairs, and minimum rehabilitation of irrigation systems;
- 4) Specification of standards for water supply and wastewater for various water users and action against violators;
- 5) Specification of standards of services provided by various WRM service providers;
- 6) Rationalization of demands and conflict resolution between different sectoral users; and
- 7) Any specific issue referred to the technical group by the apex body.

Andhra Pradesh Community-Based Tank Management Project

Another upcoming project of the Andhra Pradesh state government in association with the World Bank deals with the rehabilitation of 3,000 minor irrigation tanks with a total restoration of 2.5 lakh ha of irrigated area, spread over 21 districts and covering 499 mandals. The project has three components: strengthening community-based institutions to assume responsibility for improvement and management of the tank system, improving tank systems, and providing agriculture livelihood support services.

The technical group will be comprised of a chairperson and three experts from the fields of irrigation engineering, agriculture/economics, and finance/revenue. It will make its recommendations to the WMC through the principal secretary (irrigation) and commissioner, CAD.

The technical group will be supported in research and information services by the policy and research cell functioning under the principal secretary (irriga-

tion) and the commissioner, CAD. Additionally, the technical group will have the mandate to access relevant information from different stakeholders, conduct multi-stakeholder consultations, or commission special studies to perform its functions. The I&CAD Department will make the budgetary provisions for the Technical Group.

Andhra Pradesh State Water Resources Department

The Irrigation Department of the Government of Andhra Pradesh is proposed to be revamped into the Department of Water Resources comprising three separate wings:

Projects Wing: The Projects Wing will be responsible for creating new major and medium irrigation potential within the existing setup and manpower. It will use the Water Resources Development Corporation as a special purpose vehicle for professional management of the construction program, and operationalize the resettlement and rehabilitation policy of the state in coordination with other concerned departments.

Minor Irrigation Wing: The Minor Irrigation Wing will be responsible for developing minor irrigation works, while promoting a livelihood-based approach to poverty reduction and empowerment, including the participation of women, landless, and other vulnerable and marginalized sections in irrigation management. Creation of new potential would continue within the existing state unit setup. The revival and restoration of existing water bodies would be enabled through a special purpose vehicle in accordance with the national framework.

CAD and Water Management Wing: The CAD & WM Wing will be responsible for managing the command area and farmers' organizations. It will train and engage in capacity building for PIM, research for policy and reforms, as well as Management Information System/Geographical Information System. The CAD & WM Wing will be constituted by three cells: the PIM cell, the water audit cell, and the policy and research cell, which will function in the following areas:

PIM cell

- Institutional development and capacity building of WUAs, distributory committees, and irrigation staff for water management, O&M, productivity enhancement, conjunctive use of water, and annual operational planning;
- Setting up of effective communication system, management of water service charges/ taxes, demand assessment, collection, and returning part of the water charges to the WUAs; and
- Elections of WUAs and DCs.

Water Audit Cell

- Benchmarking of projects;
- Annual water audit covering canal efficiency, distributory efficiency, reservoir efficiency, drainage, waterlogging, and conjunctive use of water.

Policy and Research Cell

- Support and services for research on technical and institutional aspects,
- Identification and analysis of current and emerging issues in water management, and
- Assessment of emerging opportunities.

Volumetric Water Supply to Water Users' Associations¹⁷

The burgeoning Indian population has tremendous water needs for direct consumption, leaving less and less water for agriculture each year. Water requirements for domestic and municipal use increase by 500–600 m³ per newborn per year. Urbanization leads to increased demand for water for sanitation, hygiene, and recreation. A village dweller requires about 100 liters less water per day than an urban citizen. Water is also extensively exploited for industrial use. As availability of land for cultivation decreases, there is growing pressure to increase productivity in terms of yield per cubic meter of water used for irrigation.

Water has to be saved and used judiciously to improve efficiency and there is no better tool that serves this purpose than volumetric supply for irrigation. The importance of volumetric water supply is recognized by most states in India, resulting in provisions for it in irrigation acts and rules of state governments.

The Government of Maharashtra took the lead in implementing volumetric water supply for irrigation through requisite systemic and policy changes. The system was introduced along with PIM, and consequently, billing matched the actual water delivered. WUAs were entitled to water as per the seasonal quota. The 1,127 WUAs handling O&M responsibilities for water distribution systems in Maharashtra universally accept volumetric water supply. In fact, WUAs as well as individual farmers preferred the new system over erstwhile practices.

Provisions in the Maharashtra Management of Irrigation Systems by Farmers Act, 2004

The canal officer for an open canal was responsible for its design, installation/construction, accurate functioning of measuring devices, and hand-over of all relevant drawings, gauge-discharge tables/graphs

to WUAs. For pressure/pipe systems, installation and construction were responsibilities of the WUAs, while the measuring devices were expected to adhere to Indian Standards Institute standards.

Maintenance and repairs for both open canals and pressure pipe systems lay in the precinct of the WUAs. In case of faulty measuring devices, the following steps were recommended:

- For open canals, discharge readings should be noted from the head regulators, cross-regulators, and “falls” or “drops.”
- The horsepower of the pump, suction delivery head, and frictional resistance of the pipe system should be computed again.
- WUAs would bear penalty charges if they do not complete repair work within a month.

Response of the Stakeholders

The Society for Promoting Participative Eco-system Management (SOPPECOM) observed that while farmers accepted the new concept implicitly, the DoWR officers—particularly at the field and middle levels—were deeply reluctant to do so. Field officers clung to prejudices that farmers would not understand water flow measurements and accounting. They believed that volumetric supply would only be possible if canals were lined and rehabilitated. They argued that billing would be expensive and difficult and, of course, that much greater effort would be needed to maintain the system. They contended that farmers would not know how to handle the measuring devices properly and would probably damage them.

Farmers, in fact, understood the process very well; they could measure flows using gauges and, with a little training, learned to handle measuring devices and understand all their benefits. Also, measuring devices were not that expensive and amounted to only 1–2% of the total rehabilitation cost.

¹⁷ S.N. Lele, Society for Promoting Participative Eco-system Management (SOPPECOM).

The intransigence of field and middle level officers in this regard, in all probability, stemmed from the prospect of expectations of higher accountability from them if the system worked, as well as loss of authority and other benefits.

Early Implementation Issues

Measurement of volumetric supply was not required to be very precise in the beginning because low water rates and even lower recovery rates could not meet O&M costs anyway. Therefore, small errors/discrepancies in values were not expected to pose a problem for DoWR or WUAs. In Dutta¹⁸ & Ozar,¹⁹ measuring devices provided earlier showed over a 20% discrepancy. Accuracy and precision would gain importance at higher water rates.

In the first phase of measurement of volumetric supply, the following few steps were recommended:

- Conversion of existing structures in measuring devices like head regulators, cross-regulators, and “falls” or “drops”;
- Construction of gauge runs by maintaining side slopes;
- Provision of 300-meter lining;
- Calibration using current meters and development of gauge/tables and graphs;
- Maintenance of downstream conditions of canals that are free from silt, weeds, and debris; and
- Obtaining user acceptance of the advantages of measuring devices while recognizing the inaccuracies of the manual formula for computing discharge.

Various measuring devices and their defining features:

- Standing wave flumes are accurate, reliable, semi-module, and independent of downstream

condition as long as the hydraulic jump is formed. However, every structure needs to be designed carefully and loss of head is about 10–15%.

- Parshall flumes are reasonably accurate, ready made (RCC, Ferro cement, fiberglass types available), and portable. These tolerate submergence of up to 90% and loss of head is about 10%.
- Roplege flumes are the simplest and cheapest to construct and need only side slopes standard 1:1, 1.5:1, 2:1, preferably lined, along with a small hump.
- Other types of measuring devices like “V” rectangular/ trapezoidal notches are portable and cheap. However, there is a need to maintain approach conditions to reduce the velocity of approach, which is difficult in field conditions.

Advantages of Volumetric Water Supply and the Way Forward

Several benefits of volumetric water supply were identified:

- DoWR committed to supply the agreed quantity of water,
- To use or reuse water from seepage as per the choice of crop,
- Make additional/more irrigation possible by mixing surface and groundwater, and
- Reuse water stored on the surface/ ground when required.

Volumetric analysis could be expected to help the department maintain and supervise various aspects more effectively. Some significant gains would include the following:

- a) Canal capacity—discharge would not need to be measured,
- b) Silting in the reservoir would not need to be measured,
- c) Inactions or deficiencies owing to evaporation would be easy to monitor, and
- d) Application of water for irrigation would not necessarily be as per the holding capacity of the soil.

¹⁸ Shri Datta Cooperative WUA in the Mula Irrigation Project, Ahmednagar district in Maharashtra is a minors level society. It was the first WUA formed by the Centre for Applied Systems Analysis and Development under an Action Research project.

¹⁹ Ozar WUA, in Waghad Irrigation Project in Nasik district, Maharashtra, was set up by the NGO Samaj Parivarthan Kendra (SPK) with technical cooperation from SOPPECOM.

Immediate steps recommended for rapid implementation of volumetric water supply:

- Infusing awareness into DoWR and Irrigation Department personnel through training and sensitization programs to compel them to realize the need for volumetric supply;
- Training for farmers/WUAs to read gauges and understand water accounting and its advantages;
- Working out the methodology to be followed;
- Giving primary importance to implementation;
- Determining and allotting a quota to each WUA in line with its entitlement;
- Organizing tours and visits to areas where volumetric supply has been successfully implemented;
- Using pilots;
- Developing methodology, strategy, and working out gross water available at farm gates; and
- Determining the annual/seasonal water quota based on the actual carrying capacity of canals.

Acceptance of volumetric supply, measurement, and accounting of water could result in the following benefits:

- Farmers/WUAs would use water judiciously through better management practices and would try to save/conserves water,
- Field preparation, night irrigation, and other improved methods of farm irrigation would be followed,
- Light water doses would be administered at high frequency,
- Groundwater would be recharged for use/reuse whenever required.

Introduction and calculation of volumetric supply rates would involve the following procedure:

- Starting pilots;
- Evolving equivalent rates close to existing area base rate; and
- Giving WUAs the option of choosing between new volumetric rates or existing area base rates, whichever is less. In case of higher volumetric rates, the rates would be adjusted and new rates proposed.

Table 5: Comparison of Volumetric and Area-Based Water Fees, 1989

Crop	Water Consumed (m ³)	Water Fees (Rs/1000 (m ³) (Vol.))	Total Fees (Rs/ha)	Area Base Fees (Rs/ha)	Difference (Rs/ha)
Sugarcane	28,463	Not available	627.0	750	(123.0)
Groundnut Kharif (monsoon crop)	5,000	10	121.0	75	46.0
Jwar Kharif	2,610	10	26.0	50	(23.9)
Bajara Kharif	3,080	10	30.8	50	(19.5)
Wheat	8,080	15	121.0	75	46.0
Gram	4,600	15	69.0	75	(6.0)
Groundnut	10,770	37.5	403.8	300	103.8)

ha = hectare, m³ = cubic meter

Table 6: Volumetric Rates in Maharashtra

(Rs/1000 m³)					
Season	1989	1990	1998	2000	2003
Kharif	10.0	20	22	24	47.6
Rabi	15.0	30	33	36	71.4
Summer	37.5	60	66	73	144.8

It can be concluded that continuous accounting and volumetric supply would improve irrigation efficiency and coverage of irrigation which in turn, could

lead to increased productivity and overall production. It would also help in computing water balance, which will be a pioneering step in irrigation schemes.

Participatory Irrigation Management in Paliganj²⁰

The Economic Development Institute of World Bank defines PIM as “the involvement of irrigation users in all aspects of irrigation management (planning and design of irrigation projects, their construction or improvement, supervision, financing, operation and maintenance, monitoring and evaluation of the system, etc.) at all levels.”

In conventional irrigation management, government agencies conduct all activities such as maintenance, operation, assessment, and irrigation rate collection. Farmers have no role to play except in using the water for irrigation after it reaches the fields. This has resulted in the current bifurcation between manager (that is, the government) and user (that is, farmers), which has, in turn, resulted in poor performance of irrigation schemes.

Under PIM, however, government personnel and farmers jointly manage irrigation schemes. Farmers’ organizations are directly involved in:

- a) Ensuring equitable, economical, and efficient distribution and optimal use of water available, thereby increasing output in terms of irrigated area as well as production per unit of water.
- b) Maintaining the distribution system within their control and preventing damage and waste by optimally utilizing funds (under provisions of the memorandum of understanding between the Irrigation Department and the WUA) and mobilizing local resources in terms of either cash or labor toward inculcating a real sense of ownership and responsibility among the farmers.
- c) Collecting water charges from farmers for maintenance of the system as well as for payment to the Water Resources Department.

In the period 1983–1992, the United States Agency for International Development (USAID)

funded the Water Resource Management and Training (WRM&T) project in Bihar. The Action Research Program (ARP) was an important component of the WRM&T, evaluating the performance and efficiency of live irrigation systems in terms of design, construction, physical status, and agronomic conditions especially in the context of the socioeconomic circumstances of the beneficiary farmers. The purpose was to rectify systemic deficiencies and design alternate solutions. The solutions were then implemented, the impact of intervention evaluated, and successful interventions transferred to other similar situations.

Under the same WRM&T project, the Water and Land Management Institute (WALMI) in Patna initiated the ARP for the Paliganj Distributory. Paliganj is about 70 km from Patna and part of the 140-year old Sone irrigation system. The Paliganj Distributory originates from the Patna main canal and has Chandous and Bharatpura as its sub-distributaries. It covers 55 villages populated by 80,000 persons (1990 census) and a gross command area of 12,197 ha.

In the initial stages, the action research team in Paliganj encountered problems in contacting and communicating with farmers. The farmers were deeply dissatisfied with the Irrigation Department and Command Area Development Authority (CADA). Thus, they had no confidence in either canal water supply or the system managers, reflected in their hostile and noncooperative attitude. They mostly viewed discussions on irrigation management as futile and meaningless. It was several months before farmers could be brought together for meetings and interactive sessions as a part of the ARP.

Discussions held during these meetings highlighted the major deficiencies in the system. The canal system was poorly maintained and operations largely unsupervised. Canals were obstructed by powerful farmers who did not allow the water to flow beyond their fields. This commonly led to conflicts and, in the absence of inter-village organizations, mediation for mutually acceptable solutions. There was no proper

²⁰ I.C. Thakur, Executive Engineer, WALMI, Patna, Bihar.

communication too among the farmers themselves or with the water manager.

The ARP highlighted these issues and strongly recommended active involvement of farmers in the maintenance, operation, and collection for irrigation through committees to resolve them.

Bihar Irrigation Policy

In 1993, the Government of Bihar announced its irrigation policy, along the lines of the National Water Policy of 1987. The policy document envisioned the establishment of farmers' organizations to take over the management of irrigation systems, enabling farmers to participate in irrigation management along with activities pertaining to O&M of the canal water supply, collection of water charges, etc. Only a certain percentage of the water charges would be paid to the Irrigation Department in order to provide a sustainable source of revenue for the farmers' organization. In 1997, the Government of Bihar passed the Bihar Irrigation Act, which provided legal status to farmers' organizations or WUAs.

Management Handover

Pursuant to the Bihar Irrigation Policy, the Paliganj Farmers' Organization was registered as the "Paliganj Vitaranee Krishak Samiti" and the management of Paliganj Distributary was handed over to it by the Water Resource Department of the Government of Bihar, on 25 February 1997. Samiti and the Government of Bihar signed a memorandum of understanding, laying down certain conditions of transfer. One of the conditions was that the Samiti would deposit 30% of the water charges to the treasury and they would retain 70% for O&M. Also, the performance of the Samiti would be reviewed after 3 years and further extension of transfer decided upon.

Forty-six irrigation systems have been transferred to the farmers' organizations in Bihar. The Paliganj Distributary is one of the 27 irrigation systems of Sone irrigation which have been handed over.

The performance of the Paliganj Vitaranee Krishak Samiti was reviewed and evaluated after 3 years, and the following conclusions were presented in the evaluation report:

Table 7: Details of Some Schemes

S. No.	Name of Distributary/ Sub-distributary	Off-takes from	GCA (ha)	GCA (ha) (70% of GCA)	Designed Discharge (cusecs)	Length (km)	Remarks
1	Paliganj Disty.	73.90 km of Patna Main Canal	12,197	8,540	180	28.8	Its commands includes the commands of two sub-directory
2	Chandous Sub-disty	9.70 km. of Paliganj Disty.	2,430	1,715	25	6.8	
3	Bharatpura Sub-disty	16.60 km. of Paliganj Disty	1,744	1,225	25	8.0	

CCA = Certified Command Area, cusec = cubic foot per second, disty = distributary, GCA = Gross Command Area, ha = hectare, sub-disty = sub-distributary

- a) Under the new PIM system, a significant increase in the irrigated area could be observed. Before, 40 villages covering an area of 4,000 ha were being irrigated out of a total of 55 villages. After the Samiti took over the management, the number of irrigated villages rose to 52 and the irrigated area to 6,000 ha.
- b) Farmers now have greater confidence in the timely availability of water in the canal.
- c) The conveyance capacity of the distributary significantly increased.
- d) The incidences of obstruction cases and the number of breaches in the canal during irrigation have reduced appreciably.
- e) Support activities under the Agriculture Development Program of the Union government such as availability of certified seeds, fertilizers at cheaper rate, training for seed production, artificial insemination of animals, loan facility to

unemployed youth, etc., were now more accessible and widespread.

As a result of these achievements in PIM, the Sone Command Area Development agency constructed pucca field channels in 17 villages and has more such projects under way in another 35 villages.

However, the functioning of Paliganj PIM remains unsatisfactory with respect to one key aspect. Collection of water charges is not up to the mark, perhaps because of habitual reluctance among farmers with regard to revenue payment. A sizeable Rs24 lakh is, thus, due to be paid to the State Treasury.

In conclusion, apart from its poor performance in water tax collection, PIM in Paliganj has definitely demonstrated success as an alternate model for irrigation management improvement and has become a role model for other farmers in the state.

Table 8. Performance of Paliganj Farmers' Organization Regarding Irrigation and Water Rate Collection

Years Items	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Kharif irrigation (acres)	8,739.8	9,612.6	9,615.4	10,074.9	10,027.1	10,129.1	10,105.2	9,406.6	-
Rabi irrigation (acres)	3,066.0	3,146.1	-	1,752.0	194.7	2,860.1	2,750.0	2,846.5	-
Govt. Rev. (Rs) (as per MoU)	283,210.0	306,033.0	243,789.0	391,248.0	422,370.0	530,408.0	530,408.0	491,505.0	430,373
Govt. Rev. deposited (Rs)	156,000.0	83,000.0	175,000.0	164,500.0	190,251.0	110,500.0	66,000.0	121,000.0	134,000.0

MoU = memorandum of understanding, Rev = revenue, Rs = rupee.

Water Tax Collection and Retention Arrangements in European Commission-Aided Minor Irrigation Projects, Orissa²¹

In 1992, the European Commission (EC) Project Appraisal Mission in Orissa conducted a study, which concluded that the grant provided by the government to WUAs to undertake O&M tasks for water distribution systems was inadequate. The mission recommended the financial strengthening of WUAs.

Consequently, in 1995, the EC assisted in renovating certain minor irrigation projects (MIPs) in Orissa. Following a financing agreement signed between the Government of Orissa and the EC, the government, through a resolution passed in December 1999, empowered the WUAs of EC-aided MIPs to collect a water service charge from the farmers to spend on the proper maintenance of distribution systems. The provision was incorporated into the Pani Panchayat Act 2002 for EC-aided MIPs only

In 2001–2002, the MoU approved by the government clearly demarcated the duties and responsibilities of both the government and the WUAs. While the government was responsible for the security and safety of the dam and head works, WUAs were responsible for the management of water and O&M of the distribution system after rehabilitation. O&M activities were to be funded through the water service charge collected by WUAs along with the grants provided by the Government of Orissa.

The project management unit deliberately used the term “water service charges” rather than “water tax” as tax collection does not carry the obligation to provide any specific service in return, whereas a “service charge” very clearly, does so. Members of the WUA undertook a participatory walk-through of the ayacut to assess the repair and maintenance costs and presented a budget accordingly. The water service charge rate was then determined by the general body of the WUAs. The funds raised through the charge were to be spent on the maintenance of the canal and sluice gate, salary of the “water man” who distributed the

water, and office expenses of the WUAs. The rate per hectare determined by WUAs ranged generally from Rs100 to Rs125 for kharif paddy.

Collection of water charges, however, was a difficult task for WUAs. Problems were encountered in maintenance standards and updating of records pertaining to farmers and land, along with a host of other factors such as local political loyalties and rivalries, lack of legal authority to punish defaulters, and interference by local revenue officers in the collection process. For instance, revenue officials insisted on collecting the water tax in spite of directives from the government to the contrary.

Despite these issues, the WUAs have persevered with their mission of collecting water charges and have expressed overall satisfaction with the degree of empowerment facilitated by the Orissa government.

Once the WUA took over the management and maintenance of the water distribution system, the user groups have reaped benefits in various ways:

- A lost ayacut was retrieved and additional ones were created. For instance, in Darpanarayanpur MIP in Nayagarh district, the original ayacut was designed to irrigate 260 ha of land. However, only 80 ha had been irrigated. Once the management went into the hands of the WUA, 24 ha over and above the 260 ha envisaged came within the purview of the ayacut.
- Rabi cultivation was facilitated for the first time with proper water management. Cultivation of crops like sugarcane, tomato, cowpea, brinjals, etc., resulted in an overall income of Rs 40 lakh for the farmers. Adoption of new seed varieties, such as Pusa-44 and Pradiksha, led to better yields. The kharif yield per ha increased from 30 quintals to 50 quintals.²²

²¹ Mr. Panigrahi, Advisor to EC-aided Minor Irrigation Projects.

²² A quintal is a unit of weight equal to 100 kilograms.

- Proper protection and maintenance of canal structures was ensured and conflict between head and tail end users virtually eliminated. These factors together led to increases in the annual income per family to the tune of Rs6,000 and consequent reductions in seasonal migration.

Issues and Observations

Session I: Pani Panchayats or Water Users' Associations

- **Unit Area Under PIM:** According to the criterion that the Bihar irrigation management adopted after the Paliganj experience, only irrigation systems with a culturable command area between 500 and 2,000 ha are to be considered appropriate for PIM. This is expected to assure supply to the distributary from the main canal.
- **Water Tax and Other Financial Issues:** Water tax is being collected by WUAs in Paliganj, Bihar. The village-level committee demarcates the irrigation area, on the basis of which the tax is collected. Demand is also created by each village level committee, out of which they pay 30% to the government. The government rate is Rs88 per acre for paddy and Rs75 per acre for wheat, which is also the rate applicable for the farmers' organization to collect water tax.
- **Reimbursement of a Part of the Water Tax:** Andhra Pradesh had regular water flow until 2002. Until that time, funds were apportioned at the Mandal Revenue Officer level and ploughed back, and the government's share was deposited in the treasury. From 2002 onwards, however, as per the Finance Ministry's directive, the apportioning of funds took place through letters of credit. The entire amount is now deposited in the treasury. The funds for plough-back are then released promptly, often causing delays. The funds that are supposed to flow in by 1 April actually do not reach their destination until 15 May. In fact, because of these delays, there was no plough back for 3 years between 2003 and 2006. Even though Rs38 crore was facilitated through the letter of credit route for irrigation works

In the absence of an association, water was being blocked by the upper reach farmers, resulting in tremendous wastage.

- **Use of Water Charges by WUAs:** With respect to appropriation of water charges, while a major portion of the water charges in Paliganj, Bihar, is expended on irrigation management activities such as O&M and office functioning, the savings may also have to be spent on unscheduled work that might be required on priority basis.

In the case of EC-aided projects, the water taxes are collected and all of it is retained by the WUAs against the 70% retained by the WUAs in Paliganj and 30% passed on to the government. Given these circumstances, the government cannot bear maintenance and repair costs of the minors and sub-minors. They have to be borne by the recipients of the water taxes. In other words, the users of the water supply must pay for O&M. In cases like the EC-aided project in Orissa, WUAs are responsible for O&M of only the minors and sub-minors, whereas as per the MoU and Finance Agreement between EC and the Government of India, the safety and security of head works lies with the state government.

Estimating Irrigated Area to Calculate the Water Tax

In Andhra Pradesh, after the water is released from the head by the irrigation department, the actual estimation of the area irrigated and the related calculation of the water tax is carried out by the revenue department. In the case of the Nagarjuna Sagar Project, the irrigated area estimated by the revenue department stood at 600,000 ha, while the irrigation department claimed it was 2 million ha. Interestingly, the agricultural department of Andhra Pradesh offered a figure of 1.9 million ha based on yet another set of independent calculations. This led to the decision to assess extent of irrigated area through joint *azmoish* (inspection). In a pilot project within the Nagarjuna Sagar Project, cadastral maps were digitized for crop-wise irrigated area assessment. It has been agreed to use that data for triangulating the information and reposing the actual responsibility of assessment with the irrigation department and the WUA. However, the revenue department will continue to collect the water taxes until the government amends the Water Tax Act.

The problem is that when they conducted the satellite remote sensing of the Nagarjuna Sagar and checked it through ground-truthing using cadastral maps, there was a discrepancy of about 16%, which then became an issue with the farmers with immense disputes over the plot size. These are currently being resolved.

in this period, by the time the funds arrived, they were rendered superfluous as the monsoon had already arrived, followed by the cropping season.

In view of this, the plough back earmarked for the current year has been raised to 80% by the finance department. Further, it is being proposed that henceforth the funds for plough back in irrigation are proposed to be henceforth released via special consideration, directly by the finance department to the irrigation department, rather than through a letter of credit. The amount would be in line with the budget of the irrigation department, which in turn, would be proportionate to the anticipated collection of water charges. This will ensure timely implementation of O&M works.

Full implementation of this proposal, however, would entail transferring the responsibility of collecting water charges from the revenue department to the WUAs, which, in turn, would require an amendment in the Water Tax Act, since water tax collection is governed by an Act of the Vidhan Sabha. In the interim, the funds released by the finance department would be transferred to the chief engineers, who would then transfer these to the WUAs.

In Andhra Pradesh, the government collects the water tax and has assured that it will transfer the tax proceeds within April to enable the WUAs to carry out necessary repairs before the monsoons set in. However, what if the government does not transfer 45% of the collected water tax to the WUAs in April each year? Also, if the irrigation department does not release water as per the agreement for water entitlement, what recourse do the WUAs have?

The Act in Maharashtra (2004) provides for an appeal to the collector in case of default, and there are cases where water has been released through appeals to the court or, alternately, through appeals to the district collector. The new Act also contains a clause of compensation, even though the extent of compensation is not specified.

One suggestion was that the consumer court would be the appropriate, and a much quicker, forum for mediation in such cases. Instances of recourse to the consumer court were not unknown in Bihar.

Though selling of water by farmers has been legalized in Maharashtra, the operational procedures and

appropriate techniques can be suitably refined only through experience over time. Only after that can rules and regulations pertaining to this be formulated and implemented through precedence.

■ **“Hand-Holding” by WALMI** of the Paliganj Distributary Committee is unique, not only because it has been operational since 1997 but because of the role of WALMI.

WALMI-Patna took a special interest in Paliganj through its Action Research Project, which has a multidisciplinary team consisting of sociologists, economists, O&M specialists, and engineers. The support from WALMI resulted in improvements in the involvement of farmers in maintenance activities, such as cleaning of weeds and management of seepage losses, which led to the expansion of irrigated area from 5,000–6,000 acres to 12,000 acres. Better seeds made available by the agriculture extension team working through WALMI enhanced productivity, and farmers expressed willingness to pay higher charges. WALMI has been hand-holding Paliganj since 1997, and because of this support, the Paliganj Association is now successfully providing services like seed and fertilizer distribution and procurement and marketing of paddy to the farmers.

■ **Well Irrigation Within the Command Area:** It is customary for CAD to be accompanied by the development of well irrigation. Among the issues relating to the command area are the percentage of well irrigation, procedure for collecting water charges, crop rotation period, pattern adopted before and after the association of water users is mobilized, and the status of unutilized water in the Paliganj case study. In Bihar, a command area consists of area irrigated by a single water source. Areas irrigated by other sources are kept out of the designated command area of the same system. There is no system of well irrigation, and the entire irrigation in the region takes place through canals only.

■ **Seepage Losses:** With respect to the issue of who would bear the cost of loss of water in case canals were not concretized, the Maharashtra experience is that WUAs have to account for seepage losses only from the point from where they sell water to the WUA. The remaining seepage losses are to be borne by the higher level organization/management.

■ **WUAs and their Interaction with PRIs and Other Government Bodies:** The creation of WUAs is sometimes perceived as a threat to panchayati raj institutions (PRIs), leading to the undermining or dilution of their powers. While the panchayat is an institution related to governance, the pani panchayats are executive in nature. Pani panchayats can become subcommittees under the overall governance of panchayats. Decentralization of panchayati raj means being able to do away with the current authoritarian Irrigation Department and the government-versus-farmers culture, and instead promoting an ambience of integrity, cooperation, and partnership.

Even from a technical perspective, the MoU gives the farmers equal status with the Irrigation Department and the government, as partners and not as antagonists. Further, the charges being collected are directly in payment for a service provided, that is, supply of water. This being the case, it is more appropriate to call them "water fees" rather than "water taxes," taxes being governmental levies, not directly related to any particular service. An understanding of this fact too would go a long way in mitigating resentment among farmers.

An official from the DoWR in Orissa attributed the lack of success of PIM in most states to a top-down approach. Apart from rehabilitation and ensuring the flow of water, capacity building of farmers and appropriate training for PIM should be important priority areas for the program. It was suggested that in ADB-proposed projects in Orissa, a joint walk-through be conducted before planning the rehabilitation work to be undertaken. Each listed task should be visited by farmers and department officials, and the extension,

Water Availability vs. Water Productivity

Water availability may not always be a critical issue in areas of abundant rainfall such as in some areas of Orissa. The greater challenge may be presented by the low productivity of water or low levels of yield per cusec of water applied in irrigation. Such situations have indeed been faced in Punjab and parts of Andhra Pradesh, such as Karim Nagar, where wheat production stagnated despite increasing use of fertilizers and water. Farmers then strategized a shift from wheat to groundnut. This demonstrates how changes in cropping pattern can lead to innovative water management and enhance productivity.

rehabilitation, and modernization work prepared by joint consent. Thereafter, only if the work is found technically viable is it budgeted for and included in the project. Thus, the stakeholder is consulted before any work is taken up in the project.

■ **Equity:** Would equity of distribution of irrigation water, in the context of "sacrifices on the part of farmers near the head works," be sustainable?

The extent of equity prevalent in any system in any area can only be gauged by comparing the current situation with that before the WUAs came into being. This can be done in two ways:

- One would need to assess how many *cusecs*²³ of water were being distributed per acre or per holding before and after WUA formation.
- Given the quantity of water available, one would have to ask whether it is being distributed equitably per acre. This method of comparison presupposes a uniform cropping pattern throughout the area, which is very often not true. For example, in several areas in Maharashtra, the cropping patterns can be divided into four types, with varied water requirements, starting from sugarcane, with the maximum requirement, followed by millets, then by wheat or paddy, and then by crops with very little water requirement.

However, most pandaras operate on crop-rotation basis. Water requirements vary from case to case, and equity hinges critically on the agreed quantity of "surplus." In fact, this experiment in Maharashtra has been very successful.

Actual inequity here can come from two main factors:

- The head-end users tend to grab whatever water they can, at whatever point of time, since the canals are not in good condition and they are not sure of continued water supply.
- In case of tank irrigation, the regulation of sluices is not properly monitored to ensure equitable supply of water to all users.

²³ Cusec is a volumetric unit for measuring the flow of liquids, equal to one cubic foot per second.

Gaining the Support of Head-Reach Farmers

Considerable challenges were encountered in Andhra Pradesh by the NGO Institute of Resource Development and Social Management in bringing farmers together for PIM. Despite the Act supporting PIM being in place, farmers in the head reach continued to take water as and when they chose, since this had been the practice for decades. This restricted the flow to the tail-end users. To circumvent this problem, the farmers were asked how many days they could do without water, and "3 days" was determined as the critical period for PIM. Thereafter, 3-day water cuts were staggered over the 22 cuts all down the length of the 6 km canal, so that no one's crops were threatened and everyone got enough water. As a result of this, the irrigated area went up from 44% to 80%. Further, the farmers were encouraged to take up other crops such as groundnuts and pulses, rather than opting exclusively for paddy cultivation. It was thus agreed that the cooperation of the head-reach farmers is vital to the implementation of equitable water distribution under PIM.

A flexible approach to handling region-specific issues should be adapted continuously to develop sustainability and to try new methods and processes as the PIM body continues to work. Administrative issues like proper distribution of money to WUAs also need to be streamlined. Last and most important, the local level political machinery needs to be taken into confidence for the smooth functioning of the system.

After enlisting the support of head-reach farmers the next most important factor that emerged was the time frame. Given the nature of our political system and cultural factors, organizations need a long time to develop sustainability, whereby new methods and processes are introduced into the body even as it continues to function. This, along with streamlining of the administrative processes and rigorous monitoring of funds, would foster financial stability in the organization. Even though it is still too early to comment, this appears to be happening in the case of WUAs in Andhra Pradesh.

The third vital factor in this regard is political influence. Since this is all-pervasive, it becomes necessary to enlist its support. This is best done by involving the political machinery at the grassroots level in the development process and giving it due importance so that it works to facilitate, rather than obstruct, the process.

■ **Rights Over Tank Resources:** There is the problem of trespassing by WUAs on farmers' rights by

usurping all water-associated dependencies, such as fisheries, and demanding payment from village people for access to these. This is especially prevalent with respect to access of marginalized sections of farmers across most states, especially those dependent on rain-fed irrigation or the tank system of irrigation.

Since the tank system is dramatically different from the canal system, being much smaller and more homogeneous, supporting multiple users, it requires a separate Act for its regulation and operation, which would also incorporate the role of the panchayati raj institution. Such an Act is under preparation, in collaboration with the National Law School.

In Madhya Pradesh, all tanks irrigating up to 40 ha have been handed over to the respective pani panchayats.

One official of the DoWR of Orissa, summarizing the performance of PIM in Orissa, agreed with the point raised in Ashish Mondol's presentation that the pani panchayats in Orissa had not performed very well so far. It was felt that pani panchayats in Orissa were still in their initial stages and would mature as an institution of water management with time. Further, as the experiences at the Hirakud Dam Project have demonstrated, pani panchayats tend to demand a participatory work scheme before they perform. The obstructions to this include the fact that no regulation of water flow has been practically possible to date, in the absence of an appropriate measuring device.

Comparing Orissa with Maharashtra, a DoWR official suggested that farmers in the latter were educated and were willing to engage in commercial farming, unlike in Orissa, where the average size of landholding is half to one acre and cultivation is frequently for subsistence rather than for commercial purposes. To overcome this, landholdings need to be consolidated.

This was contested by Mr. Lele, based on the experience in Maharashtra. Better irrigation management in the state requires understanding of the issues and a willingness/incentive to act, rather than on the level of literacy, which the farmers in Orissa do not lack. Further, the size of landholdings does not affect the issue. Maharashtra also has a sizeable section of farmers with landholdings of 1–2 acres, while in Japan, the

size of landholdings is as little as half an acre, but this has not deterred them from forming strong, functional farmers' associations.

PIM requires drastic revisions before it can be implemented efficaciously, for which 3 years is an inadequate period. The election process itself takes a year and a half. Further, the requirement is for a 6-year tenure for officials of the managing or executive committee of the pani panchayat, with one third of them being replaced every 2 years.

Farmers' organizations are also demanding improvements in the system before they take on O&M responsibilities. However, funds are not adequate to undertake system improvements, and without it, such rehabilitation of the system and maintenance would be prohibitively expensive. A schedule needs to be developed in this context, specifying the quantity of water required for each type of crop and the charges devolving on the users, for effective implementation of PIM in the state.

