IWMI-TATA Water Policy Research Program

Phase II: 2006-2010

Annual Report 2008

International Water Management Institute

IWMI-TATA Water Policy Program

Foreword

Mankind's primary supply of freshwater is the renewable component (precipitation minus evapotranspiration) which flows through aquifers, streams and lakes. Globally, an estimated 3,240 cubic kilometers of fresh water are withdrawn annually. About 70 percent is for agriculture, mainly for irrigation. Although agriculture accounts for a large share of world water use, providing adequate water in a timely and reliable manner to irrigate crops is a formidable challenge in most parts of the developing world. This will be even more challenging over the next few decades.

In country like India, the livelihood of a large population depends on the availability of water not just in appropriate quality and quantity, but also at the right time during the cultivation Season. Efficient management of scarce water resources along with adaptation of suitable cropping pattern will enhance farm incomes and improve the living standards, especially of small, marginal and landless sections of the farming community.

Since 2000, the IWMI-TATA Water Policy Research Program (ITP) a joint program funded by the Sir Ratan Tata Trust and the International Water Management Institute has made significant contribution by addressing some of the critical issues in India relating to the management of water for both productive and consumptive purposes and for environmental needs. ITP has made a concerted attempt to identifying and disseminating information on water saving technology across the nation. In addition, the program has come up with various policy recommendations and action programs at state level to facilitate wider implementation of appropriate water management practices.

During the next 3 years ITP will focus translating some of the major research results and findings from other studies in India to propose appropriate policy interventions to effectively manage and utilize the India's scarce water resources . The present volume outlines the activities carried out by the ITP in 2008 and highlights some of the key policy impacts of the research carried out by the program.

Finally I like to compliment Dr. K Palinasami who despite taking over responsibilities as Director of the ITP just a couple of months ago, compiled this annual report on time.

Madar Samad
Regional Director, South Asia
IWMI, Hyderabad

Preface

Sir Ratan Tata Trust (SRTT) has extended its funding for the second phase of the IWMI-Tata Water Policy Research Program (ITP) for the period 2006-10 and the following are the major areas of action: a) Research focusing specifically on water sector issues in focused regions, b) Idea-incubation for livelihoods enhancement efforts using water as a central input, supporting the Trust in their water sector partnerships, c) Dissemination and raising public awareness, d) Widening the network of research partners, and d) Policy Influencing.

There was a change in ITP Leadership during this year. I joined as Director, ITP during mid October 2008 and could see the significant works done in the earlier periods. Research studies through partners, capacity building initiatives and Annual Partners Meets are the regular events under ITP. Now to add strength to the program, ITP steering committee (SC) has been constituted in July 2008 and already we have two important meetings, one in August and another in November 2008.

Regarding the activities in 2008, follow ups were made on the research contracts of 2007-08 studies. ITP had the Annul Partners meet PM in April 2008 and several research studies have been proposed for 2008-09 activities with the active participation of the partners and policy makers. The 2008-09 studies will be giving centralized focus covering selected states in preparing water policy sector interventions. Efforts have also been equally made to strengthen the policy impacts of ITP research activities. The first meeting was held with the State Planning Commission, Govt. of Tamilnadu on Dec 12, 2008 and the response is encouraging. ITP is now planning several such meetings and capacity building activities in 2009.

The Annual Report 2008 thus highlights the major research studies going on with the partners, the capacity building initiatives undertaken and the policy initiatives. Hope this will be useful in appraising the ITP activities to all our partners and SRTT as well.

K. Palanisami
Director, ITP
IWMI, Hyderabad

Acknowledgement

We wish to thank the IWMI, **Dr. Madan Samad**, Regional Director, South Asia, SRTT, **Mr. Arun Pandhi,** Sr. Programs Manager, SRTT, steering committee Members, Partner organization's, Govt. Officers for their support and continued interaction in carrying out the ITP activities in an efficient manner

Director ITP
&
Staff

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1. INTRODUCTION

1.1 IWMI TATA WATER POLICY RESEARCH PROGRAM - An Overview

IWMI-TATA Water Policy Research Program is a collaborative initiative between a research institution and a corporate body, the International Water Management Institute (IWMI) and the Sir Ratan Tata Trust (SRTT). This partnership emerged from a shared concern regarding the growing water stress in different parts of India.

While the issues and problems related to water have been well articulated by several stakeholders over time, the IWMI-TATA program aims at evolving fresh perspectives and sustainable solutions by drawing from the vast research carried out across the country and take these in the form of policy recommendations to the policy makers at the national, state and local level.

The IWMI - TATA Water Policy Research Program (ITP) was launched in 2000. Earlier it was functioning at Vallabh Vidyanagar, Anand, Gujarat and now it is functioning at the IWMI South Asia Regional office at Hyderabad since 2006.

ITP emerged in response to widely articulated problems of growing water stress in many parts of India, with several detrimental consequences to the society. The program aims at evolving new perspectives and practical solutions derived from the wealth of research done in India on water resources management.

The objectives of ITP are :

- To engage Indian scientific / academic institutions in addition to in-house researchers in a practical agenda to identify, analyze and document relevant water-management approaches and current practices. This program brings in the multi-disciplinary perspective in the analysis of water related problems

- To help policy makers at the central, state and local levels, address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations.

These above objectives are achieved through a number of vehicles, which include :

- Policy publications and research papers.
- Policy roundtables, consultations and workshops.
- Funding of research projects.
- Funding of projects that encourage collaborative activities and cooperation across the Indian research community.

Since its inception, ITP has worked on 21 research themes in the water sector and brought out three books, over 80 research papers in national and international journals and nearly 300 discussion papers. Approximately 155 studies have been completed so far under ITP and the theme wise break up is provided in Table 1. In addition, ITP had initiated two major field

interventions aimed at improving water resources management and enhancing water-based livelihoods of rural communities.

TABLE – 1 Studies Completed under ITP Program

No	Studies Completed (including ITP Funded Studies and External Contributions in the APM): 2002-2007	No. of Papers
1	Groundwater socio-ecology, economics and governance	18
2	Energy-Irrigation Nexus	4
3	Water harvesting and artificial recharge	13
4	Groundwater Quality	3
5	Tank dynamics and sustainable development	1
6	Viability of public irrigation systems	1
7	Irrigation Sector – institutional and financial reforms and poverty	6
8	Hydrology, water use and water economics in Narmada river basin	6
9	Virtual Water	1
10	Water saving technology – Micro Irrigation systems	4
11	Watershed Development	2
12	Tank rehabilitation and Management	2
13	Tank-boundary water conflicts	2
14	Culture fisheries revolution in India	3
15	System of Rice Intensification (SRI)	2
16	India's water future 2025-2050	5
17	Institutional and financial issues of WUAs	4
18	Dams, displacement and development	2
19	Enhancing water productivity in agriculture: technology, institutions and policy	
Topic 1	Where do we promote Micro Irrigation systems in India	5
Topic 2	Enhancement of water productivity in farming systems	4
Topic 3	Enhancing water productivity of multiple use water bodies	1
20	Changing groundwater ecology and its impact on farm livelihoods in India	
Topic 1	Groundwater depletion and its socio-economic impacts	5
Topic 2	Impact of markets and regulations on Irrigated agriculture and rural livelihoods	7
21	Water, economic growth and human well-being	4
	Unclassified / Others	50
	TOTAL (tentative)	**155**

International Water Management Institute **Box - 1**

IWMI is one of 15 international research centers supported by the network of 60 governments, private foundations and international and regional organizations collectively known as the Consultative Group on International Agricultural Research (CGIAR). It is a non-profit organization with a staff of 350 and offices in over 10 countries across Asia and Africa and Headquarters in Colombo, Sri Lanka.

IWMI's Mission is to improve the management of land and water resources for food, livelihoods and nature.

IWMI's Vision, reflected in the Strategic Plan is to be a world-class knowledge center on water, food and environment.

IWMI targets water and land management challenges faced by poor communities in the developing world / or in developing countries and through this contributes towards the achievement of the UN Millennium Development Goals (MDGs) of reducing poverty, hunger and maintaining a sustainable environment. These are also the goals of the CGIAR.

Research is the core activity of IWMI. The research agenda is organized around four priority Themes including

* Water Availability and Access

* Productive Water Use

* Water Quality, Health and Environment

* Water and Society

Cross cutting activities in all themes include, assessment of land and water productivity and their relationship to poverty, identification of interventions that improve productivity as well as access to and sustainability of natural resources, assessment of the impacts of interventions on productivity, livelihoods, health and environmental sustainability.

IWMI works through collaborative research with many partners in the North and South and targets policy makers, development agencies, individual farmers and private sector organizations. **Web: www.iwmi.cgiar.org**

Sir Ratan Tata Trust **Box - 2**

Set up in 1919, the Sir Ratan Tata Trust situated in Mumbai, is one of the oldest philanthropic institutions in India, and has played a pioneering role in changing the traditional ideas of charity. Through its grant making, the trust supports efforts in the development of society in areas of rural livelihoods & communities, education, enhancing civil society & governance, health, arts & culture.

For more information on the trusts institutional support and program areas, log on to: **http://www.srtt.org/prog-rural.html**

1.2 North Gujarat Sustainable Groundwater Management Initiative (NGI) : Independent Status

As an ITP project, North Gujarat Sustainable Groundwater Management Initiative (NGI) was started in 2002 to establish local groundwater management regimes that are based mainly on water demand management in agriculture. Improving productivity of water use in agriculture is a major strategy to manage the demand for water in agriculture. The project evolved sustainable farming system models based on technologies and practices which would enhance water productivity in agriculture, through action research, and facilitate their large-scale implementation through a well-designed extension program.

The project involves: promotion of ecologically sound and efficacious water harvesting to augment groundwater supplies locally; water efficient orchard crops such as pomegranate; large-scale promotion of water-efficient irrigation devices such as drips and sprinklers for a variety of field and row crops, including orchards; and improved land management practices through use of vermi-culture and composting in agriculture has helped cut down irrigation water requirement on a sustainable basis. The successful demonstration of pilot project in 30 villages covering four talukas, had led to formulation of a full-fledged field project in 150 villages, covering 13 talukas of three districts in north Gujarat.

The project is now being implemented by ITP's own field team and by three partner organizations (CSOs), located in different parts of north Gujarat region.

In 2008, realizing the potential for NGI to grow beyond the project phase in the region, decision was taken by SRTT and IWMI to register NGI as an independent NGO. NGI was registered as “Society for Integrated Land and Water Management” in November 2008.

A review report of NGI is provided as ANNEXURE 1

2. ITP highlights of 2008

2. ITP highlights of 2008

The program during the reporting period underwent changes at the management and staff levels, bringing in fresh ideas and approaches into the program. Some points to highlight for the reporting year, 2008, are:

1. Successfully organized the 7th APM from 2nd to 4th April 2008 and published the Conference Proceedings.
2. Change in ITP leadership, with Dr. K. Palanisami taking charge as the Director, ITP after Dinesh Kumar, Team Leader ITP left the organization.
3. Formation of the ITP Steering Committee.
4. Papers by ITP staff published and presented at both national as well as international level.
5. Development of new areas of research for the following 2 years.
6. Initiated policy dialogue with the Govt. of Tamilnadu's State Planning Commission.
7. North Gujarat Initiative (NGI) the program under ITP attained independent organization status and was registered as a NGO "Society for Integrated Land and Water Management"

Leadership change & ITP Steering Committee formation

ITP program went through a change in leadership in the month of July 2008 when Prof. Palanisami an eminent Agricultural Economist and an experienced researcher of high international repute joined as Director ITP.

A 5 member ITP Steering committee (SC) was formed in July 2008 to provide support and timely guidance where appropriate to the ITP research work through regular reviews. The details of the committee and the TOR are provided in ANNEXURE 2. The Annual Work Plan 2008-10 was prepared and presentation was made at the first steering committee meeting on Aug. 21, 2008. The committee met for the 2nd time on November 28, 2008. Major outcome of the first and second steering committee meetings are attached as ANNEXURE 3 & 4 respectively.

3. INITIATIVES

3.1 Research Initiatives

ITP aims to conduct practical research on a range of issues in the water sector and identify issues in which policy impacts can be made. Thus, for ITP Phase II, areas of action are as listed below:

- Research focusing specifically on water issues concerning underprivileged communities and regions in the country
- Idea-incubation for livelihoods enhancement efforts using water as a central input
- Dissemination and raising awareness
- Widen network of research partners
- Policy influence

While the work plan for 2008-09 will focus on research and pilot ideas, 2010 will focus on dissemination and policy influence.

3.1.1 Status of 2007-08 commissioned studies

i] Contract Research

Under contract research, a total of 14 consultancies and 6 grants that were awarded in 2006-07 are to be completed. A follow up of these contracts has been undertaken and Table 2 provides the status update. While the final reports for 6 studies have been submitted, the remaining studies are underway.

TABLE 2 - Status of contracts awarded in 2007-08

Sl.	Name of the Consultant	Title of the Study	Status
1	Dr. A Narayana Moorthy	Losers and Gainers of Groundwater Irrigation Development: An empricial study from Pennisular India.	Report follow up
2	Dr. O P Singh	Impact of Energy Pricing and Supply Regulation on Irrigated Agriculture: A comparative analysis from Water Rich and Water Scarce Regions of India.	Report submitted
3	Mr. M. V Ramachandrudu	Assessing the effectiveness of various Regulatory Mechanisms in Groundwater use.	Report follow up
4	Dr. Jos C Raphael	Review different state and National water polices of 1987 and 2002.	Report submitted

5	Mr. Ankit R. Patel	Analyze the potential impact of different modes of energy prices across different hydro-geological regimes on groundwater use.	Report follow up
6	Mr. Sunderrajan Krishnan	Study the possibility to capture groundwater information at a much lower cost and that too by involving critical local people who have much to gain or lose by what happens to groundwater.	Report submitted
7	Dr. D Suresh Kumar	An analysis of Social cost and benefits of Drip Irrigation in Tamil Nadu	Report submitted
8	Ms. Nidhi Ladha	Tank rehabilitation in Andhra Pradesh	Report submitted
9	Dr.L Venkatachalam	Study the current institutions involved in water use and allocation in the Bhavani Basin and to quantify their associated transaction costs.	Report follow up
10	Ms. Mayuri Hazarika Baishya	The scope of micro irrigation in the Hill states of North East Region	Report submitted
	GRANTS		
1	Centre for Development Studies -Dr. Niranjan Pant	Nature and Pattern of groundwater irrigation in the four states consisting of a continuum and contrast.	Report follow up
2	Inrem Foundation - Dr. R N Indu	Impact of Water Saving Technology: A study in North Gujarat	Report submitted
3	Gujarat Institute of Development Research - R K Viswanathan	To review the sector policies and acts supporting water policy such as Irrigation Management Polices on public-private participation	Report follow up
4	Foundation for Ecological Security - Mr. R Ravindranath	Assting in the field for the study on Multiple use tank systems in Chittor and Ananthapur districts of Andhra Pradesh	Report follow up

5	Society for Promoting Participative Ecosytem (SOPPECOM)	How have social movements on water emerged and/or been sustained as a collective action response to managing and meeting demand for water/promoting water saving technologies.	Continuing study
6	Rural Organization & Social Education Society (ROSES)	Technogenic Famine (GR induced Famine) and Farmer's suicides	Report follow up

3.1.2 Summary of the out come of the research studies awarded in 2007-08

A short summary out come of each of the study awarded in 2007-08 is provided below. The summary highlights the research issues under each of the above listed themes

LOSERS AND GAINERS OF GROUNDWATER IRRIGATION DEVELOPMENT: AN EMPIRICAL STUDY FROM PENINSULAR INDIA

Dr. A. Narayana Moorthy, Gokhale Institute of Economics and Politics, Pune.

Groundwater became an important source of irrigation in India especially after the introduction of green revolution. With the less than six million hectares (mha) in 1950-51, the area under groundwater irrigation increased close to 40 mha in 2005-06, which is over 60 percent of India's irrigated area. Along with the development of groundwater irrigation, the contribution of groundwater irrigation to the overall agricultural growth is estimated to have increased significantly in India. Apart from directly benefiting the farmers having own groundwater structures, the emergence of groundwater market has also benefited millions of non-well owning farmers. Studies in India and elsewhere have been predominantly deliberating the gross contribution of groundwater irrigation to agriculture and rural economy over the last many years. However, while benefiting the farmers, the rapid development of groundwater has brought out many obnoxious outcomes as well. The rapid development of tube-well irrigation has made negative impact on the performance of dug-wells, which might have affected many resource poor farmers who could not afford to shift to capital-intensive borehole technology. Because of competitive deepening of bore-wells, the water level in many places depleted. This has made severe impact in terms of cost and water availability on those farmers owning shallow tube-wells/wells. Who are the farmers affected due competitive deepening of wells? What is the present status of those farmers who owned shallow tubewells with centrifugal pumpsets earlier? What changes these farmers made due to depletion of water level? Has the competitive deepening of wells increased the capital cost homogeneously for all categories of farmers under different socio-economic settings? Has the rapid development of borewell irrigation made any change in the overall functioning of groundwater market? Though a large number of studies are available on various issues of groundwater economy, studies focusing on the above issues are not many in

India. An attempt is made in this study to find out the losers and gainers of groundwater irrigation, using survey data of 234 bore-well owning farmers and an another 133 water buyers drawn from two regions in Pudukkottai district of Tamil Nadu. The preliminary findings of the study show that the vast majority of the farmers have incurred substantial cost on altering the well structure in order to cope up with the fast decline of groundwater arising due to competitive deepening of wells. In most cases, the cost incurred on restructuring the wells was close to the fixed cost of the wells incurred initially. While the over-exploitation has increased the cost of wells for all the well owing farmers irrespective of the size of holding in both the regions, the marginal and small farmers seem to be the most affected due to changing pattern of groundwater structures. It is also found that the unit cost of water seems to be higher for those who own deep bore-wells with submersible pumpset. The changes in cost of bore-well due to exploitation of groundwater have also made considerable impact on water market where water buyers appear to be the losers. Based on the findings, the study suggests that both supply and demand management strategies need to be simultaneously introduced to reduce/check both the fixed and variable cost water as well as exploitation of groundwater. Establishing well owning farmers' association (WOFA) would also help to reduce the cost of water and exploitation of groundwater.

IMPACT OF ENERGY PRICING AND SUPPLY REGULATION ON IRRIGATED AGRICULTURE: A Comparative Analysis from Water Rich and Water Scarce Regions of India

Dr. O.P. Singh, Banaras Hindu University, Varanasi

The past one and a half decades have seen intense debate on the potential impacts of introducing electricity pricing in the farm sector on efficiency, equity and sustainability in groundwater use, and its overall socio-economic viability thereof. One of the arguments against power tariff reform is the higher marginal cost of supplying electricity under metered system, could reduce the net social welfare as a result of reduction in: 1] demand for electricity and groundwater; and 2] net surpluses individual farmers could generate from cropping. Another argument against using pricing is that for power tariff levels to be in the responsive region of power demand curve, prices are often too high that it may become socially unviable.

This paper analyzes the potential impacts of energy pricing on efficiency, equity and sustainability in groundwater use. The analysis is based on empirical data from three different locations in India on water productivity in agriculture for crops, for dairying and for the farms. For north Gujarat, the analysis uses data from well owners who pay flat rate tariff, and well owners who pay pro rata tariff. For eastern Uttar Pradesh (UP) and south Bihar plains locations, the analyses use data from well owners and water buyers from diesel and electric well commands. The analysis also uses comparison of data from diesel well owners and electric well owners from south Bihar. The findings are as follows.

Introducing marginal cost for electricity would motivate farmers to use water more efficiently at the field level from physical, agronomic and economic point of view through careful use of irrigation water, use of better agronomic inputs and optimizing costly inputs. Also, it would

motivate farmers to use water more efficiently at the farm level through careful use of irrigation water in crops; better agronomic inputs; optimizing costly inputs for crops; careful selection of crops and cropping patterns, and livestock composition that give higher return from every unit of water and low water consuming crops. It also shows that higher cost of irrigation water affected by higher energy cost will not lead to lower net return from every unit of water used as the farmers modify their farming system itself.

Further, changing the power tariff structure from flat rate to pro-rata would not have any adverse effects on access equity in groundwater in terms of increasing the monopoly power of well owners. Instead, the monopoly prices are largely governed by the number of potential water sellers against the number of potential buyers of water in an area. Also, pro rata pricing was found to cause reduction in groundwater pumping per unit of land along with reduction in aggregate pumping, which is disproportionately higher than the reduction in net returns per unit of land, meaning more sustainable groundwater use.

This means, in water scarce regions, it would be possible for farmers to maintain net farm surpluses at higher energy tariff while improving productivity of water use. Overall, the empirical evidences further reinforce the fact that the arguments against pricing are flawed, and that raising power tariff in the farm sector to achieve efficiency, equity and sustainability in groundwater us would be socio-economically viable.

WATER POLICY AND WATER LAWS IN INDIA: ARE WE CREATING PAPER TIGERS?

Dr. Jos C Raphael, CECOD, Trichur

The policies and institutions in the water sector are seen responding indifferent to ensure sustainable water use in many Indian states. Often institutions backed up with law and regulations follow a fragmented sectoral and supply side approach. They seem centralised in nature, top-down in approaches and vague in planning water development. In this backdrop the present paper attempts to analyse the existing water policies, water laws, institutions and administration from three south Indian states viz., Kerala, Karnataka and Tamil Nadu and suggests recommendations for policy adoption of state and national level governmental planning agencies.

In India water laws were initiated before Water Policy of 1987 putting cart before the horse. All three case states have framed their water policies that often not replicated to water law as a sequence. This is particularly relevant with ground water laws. Tamil Nadu has ground water law but not yet implemented. Kerala has a ground water law for nominal sake. Karnataka has not yet passed the ground water law. Irrigation laws are centered around Participatory Irrigation Management in Karnataka and Tamil Nadu. Recommendations of water experts and academia bye and large take rust or not implemented with government's programme or as a policy action. Water Policy documents are seen unattended for future follow up action. True they have been prepared once in every state. Precisely, water policy and water laws are remaining in papers than its true implementation.

It can be seen that role of common in water policy and water law formulation is weak or nil that is one of the reasons of bottleneck in enacting the water laws and the implementation of

them. Major reason behind the poor implementation of ground water law seems the governments are afraid of resistance from public in general and resultant vote in the elections. The strong exception to this is seen in Tamil Nadu about roof water harvesting rule implemented by Jayalalitha government. Many water projects are imposed from above are donor aided drawn from somewhere for replicating after their pilot testing. It looks there exists huge gap between water laws and their implementation making them paper tigers.

STUDY THE POSSIBILITY TO CAPTURE GROUNDWATER INFORMATION AT A LOWER COST, INVOLVING LOCAL COMMUNITY

Dr. Sunderrajan Krishnan, CAREWATER, Anand

Just as scientific data collection forms the backbone for national-level policy making on groundwater, there is a parallel stream of popular science that is used in decision making by farmers. These two 'dual' streams of knowledge exist together, sometimes complement, and at others times at conflict with each other in a 'duel'. People's knowledge on hydrology is not 'dying', but thriving and growing well, being refreshed continually by interfaces with science. Crude and unpolished it may be, but it is localized, pervasive and relevant to needs of people. Especially in case of hard rock areas, the high hydrogeologic variability makes observation as important as theory. Such observation over decades leads to a developing "science" such as found in hard rock Saurashtra. It is this innate knowledge in society that has enervated the action on conservation of water over the past two decades. Pockets of knowledge sources in villages are repositories of this science. Tapping such pockets, eg. that of well drillers, and harnessing them towards the state-organized data collection can potentially open up a new direction for localized groundwater management. The Jasdan area of Rajkot district is located in the midst of a region that has seen much stirring in terms of groundwater recharge and conservation. In this area, the main actors on groundwater apart from farmers are the well drillers and related professionals of different vocations. Each such professional has their own role, but as the main risk-taker, the farmer is the final decision-maker. Decisions on well drilling, location of ponds or recharge structures are made within this context of multiple points of Knowledge Sources. Innate terminology such as *Kanh, Aadwan and Pad* are used for describing hydrogeology, but these words have their roots in the local language. The main structures such as dykes and pore interspaces are easily located by knowledge generated through years of both, vertical and extensive horizontal drilling. Further, using these basic concepts, other applied subjects such as, well hydraulics, can be explained in these same terms. Comparison of this village hydrogeology with regional-level databases shows that there is much richness of information stored within these Knowledge Sources. The large level picture of surface lineaments available through geophysical and remote sensing studies, imparts a global picture to this localized knowledge and a potential fusing of these two can be highly potent.

Thus, as this case study shows, instead of launching new data collection programs at village-level or persisting with the nation-wide monitoring networks for groundwater as currently exist, it might be better to listen to the people and tap the right Knowledge Sources. There might be a large treasure hidden beneath just by scratching the surface.

AN ANALYSIS OF SOCIAL COST AND BENEFITS OF DRIP IRRIGATION IN TAMIL NADU

D. Suresh Kumar, Tamil Nadu Agricultural University. Coimbatore.

Recognising the importance of drip irrigation for its perceived ability to contribute significantly to resource saving, agricultural productivity, economic growth, and environmental sustainability, a study was conducted in Coimbatore district of Tamil Nadu, India to study the adoption of drip irrigation and its social impacts across production environments. The study revealed that adoption of drip irrigation technology increased the net sown area, net irrigated area and there by helps in achieving higher cropping intensity and irrigation intensity. There is a significant shift towards crops such as coconut, grapes and banana from annual crops like vegetables, sugarcane etc. The main reasons are the human labour and water scarcity. The water and labour intensive crops like paddy, sugarcane and vegetables area were significantly reduced in drip villages. The analysis of factors influencing drip adoption revealed that the variables age of the head of the household, farm size, cropping pattern, and participation in non-farm income activities are found to be significant determinants of adoption of drip irrigation.

The drip irrigation resulted in significant increase in yield over the flood method of irrigation. The yield of banana registered an increase of 2.38 per cent to 4.41 per cent under drip method over flood method of irrigation. The increase in yield is varied from 12.7 per cent to 16.2 per cent in coconut and 17.4 per cent in grapes. Thus, drip method of irrigation sufficiently contributing for achieving higher yield. Drip adoption considerably saves electricity energy used in agriculture. The economics of crop cultivation revealed that the drip method of irrigation has significant impact on resources saving, cost of cultivation, yield of crops and farm profitability. The cost saving due to reduction in labour is ranged from 63 per cent to 69 per cent in coconut. The cost of cultivation has considerably reduced under drip method registering a reduction of 9.1 per cent to 15.5 per cent. In grapes cultivation, a reduction in cost of cultivation by 15.6 per cent in drip farms over the control farms is found.

The total external benefits due to adoption of drip irrigation is ranged from Rs. 91085.2 / ha to Rs. 175589.7 / ha across production environments. One can conclude that the drip irrigation is a viable and more beneficial in regions where there is more water scarcity. The social benefit is worked out to Rs. 227676 / ha to Rs. 431626.6 / ha. It is clear that the social benefit exceeds the social cost. Having no significant negative externalities in region characterized by water and labour scarcity, the adoption of drip irrigation generates considerable external benefits. The social benefit cost ratio (SBCR) is varied from 4.54 to 5.17 across regions with a discount rate of 2 per cent. The SBCR is 4.32 to 4.91 at 5 per cent discount rate. This implies that one rupee private investment on drip irrigation produces Rs.4.32 to Rs.4.91. This clearly shows that wider adoption

of drip irrigation produces sufficient social benefits and huge subsidization (50 per cent at present in Tamil Nadu) on drip irrigation is justified. Thus, the micro irrigation could be promoted in regions with high water and labour scarcity. As cropping pattern decides the adoption and suitability of drip irrigation, widespread adoption of micro irrigation could be promoted in the regions where shift towards crops like coconut, banana and grapes are common. Thus our policy focus may be tilted towards promotion of drip irrigation in regions where water and labour scarcity is alarming and regions where shift towards wider spaced crops takes place.

HYDROLOGICAL ASSESSMENT OF IRRIGATION TANKS IN ANDHRA PRADESH

Ms. Nidhi Ladha, Bhilwara, Rajasthan

The paper analyzes six tanks, two from each district of Andhra Pradesh – Anantapur in Rayalseema, Khamman in Telangana and Nellore in Coastal Andhra to understand the hydrological feasibility of tanks in the present time. Must the repair and rehabilitation of tanks attract more investment? What conditions are a pre-requisite for tank irrigation to be successful? What are some of the constraints with dependence on tank irrigation and the likely limitations despite tank rehabilitation?

The World Bank has funded a high budget tank rehabilitation program in Andhra Pradesh. The project proposes to rehabilitate about 3,000 tank systems with a total command area of about 250,000 hectares in the state of Andhra Pradesh. The total project cost, based on available benchmarks is estimated at about US$ 200 million, with a loan component of about US$ 140 million. Similar tank rehabilitation projects were undertaken in the past in Karnataka, Tamil Nadu, Pondicherry and Andhra Pradesh with funding from the local and central government, NGOs and well as foreign donors, with varying success. However, we know very little about the performance of tank systems post rehabilitation especially from a hydrological perspective.

The paper tries to examine these questions by a physical, social and hydrological assessment of existing tanks in different regions of Andhra having different soils conditions, different soil cover, different rainfall regimes and different ground water withdrawals by field visits of the selected tanks and analysis of rainfall, runoff data, ground water and land use data.

Use of tube wells and in-situ rainwater harvesting in the catchment area of the tanks will adversely affect surface water levels. As studied by Kumar et al (2006), increase in groundwater draft has resulted in reduced outflows into the surface water stream. Study by Kumar has established that there is a direct linkage between surface water and ground water. Withdrawal of ground water from the catchment will reduce surface water flows and can reduce the tank yields.

The following characteristics will be reviewed for the study :

- Hydrological characteristics of Tank systems such as mean rainfall, rainfall variability, rainfall runoff ratio (and also probable variability in runoffs), geo-hydrological characteristics such as depth to water table and fluctuations.

- Tank characteristics such as type, storage capacity and silt deposition.
- GW withdrawal in the command and catchments area—and how this had changed over time; also change in characteristics of groundwater abstraction structures
- Type of soils
- Land use and land cover
- Different types of tank uses
- Institutional environment such as existence of WUA (Water User Association), role of traditional village council, leadership, co-operation among the people etc.

INSTITUTIONS FOR TRADABLE WATER RIGHTS: A CASE STUDY OF BHAVANI RIVER BASIN IN TAMIL NADU, INDIA.

Dr. L. Venkatachalam, Madras Institute of Development Studies, Chennai

The major objective of the present study is to analyse the present institutions and institutional arrangements in the study area, the associated transaction costs and farmers' willing to pay (WTP) for additional irrigation water and willingness to accept (WTA) compensation for selling excess water to the needy farmers within the basin.

In India, it is mainly the government dominated 'command-and-control method' which guides the existing water allocation policies at present. As a result, 'government failure' has become a dominant phenomenon, resulting in intense negative externality, increased scarcity and pervasive social costs in the water sector. Similarly, the 'informal water markets' that emerged as a response to the increased water scarcity in different pockets of the country have also contributed to the ever increasing externality problems. Therefore, it is suggested that 'institutional reforms' in the water sector are warranted for achieving efficient, equitable and sustainable water allocation in the agricultural sector. These reform measures are based on the assumption that apart from government and markets, there are other kinds of institutions that play a collectivist role in allocating water in a more efficient way. The currently held notion is that the water institutions prevailing at present do impose substantial amount of transaction costs on the stakeholders and therefore, it is suggested that reforming the institutions in such a way as to reduce these transaction costs would bring larger net benefits in this sector. Empirical studies have demonstrated that introducing 'market-based instruments', along with appropriate institutions, in the water sector has been found to be efficient in reducing the transaction costs thereby maximizing the net benefits. Yet, introducing market based instruments requires revamping of the existing institutions and introducing additional, supportive institutions. Among all the market based instruments, the 'tradable water rights' are considered to be more efficient in minimizing the transaction costs. In this regard, the present study makes an attempt to study the 'institutional aspects' of introducing tradable water rights in the Indian context by taking Bhavani river basin in Tamil Nadu as a case study. The preliminary findings suggest that under the present institutional arrangements, there is a substantial amount of transaction costs

embedded in different activities of water use in the basin. The WTP and WTA values obtained from the farmers imply that the net benefits will increase significantly because of not only improvements in the efficiency gains but also due to reduction in transaction costs under the proposed tradable water regime. The study also discusses in detail the policy and other institutional implications of introducing tradable water rights in the study area.

FEASIBILITY OF DRIP IRRIGATION IN THE ORCHARDS OF NORTH EASTERN HILLY TRACK OF INDIA:

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The northeastern region of India with eight states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim lies between 21°57' and 29°28' north latitude and 89°40' to 97°50' east longitude. The total geographical area of the region is 2.55 lakh km^2, which is about 8% of the country's total area. The physiographic of the region is divided into three divisions, viz., the northeastern hills, the Brahmaputra valley and Meghalayan Plateau. The NE hills alone accounts for 65% of the total land area while the Brahmaputra valley and the Meghalaya Plateau cover 22% and 13% of the area, respectively.

The region offers scope for cultivation of a wide variety of horticultural crops such as fruits, vegetables, flowers, tuber and rhizomatous crops and spices because of its diversities in topography, altitude and climatic conditions. A range of fruit crops varying from highly temperate types like walnut, apple, etc., to subtropical as well as tropical fruits are coming up well in this region. Similarly wide and diverse types of vegetables including indigenous ones are cultivated in the region. Despite the favorable factors and the scope for cultivation of horticultural crops, the development of horticulture has not picked up momentum as desired. The productivity of the horticultural crops is very low in the region.

An outsider's perception of the region is that it is a water-surplus region with higher annual rainfall and higher range of topographical variation. The mechanization of farming and infrastructural amenities is also not at part with the more developed states of the country. The use of ground water in agriculture is also very low as compared to rest of the country, except the valley portion of Assam and Tripura, which are using ground water to some extent in irrigating some of their crops. In such conditions, the farming community of the region is always skeptical about the use of modern, precision irrigation devices like drips. The concept of productivity of water is still new to the people of the region, whereas productivity of the land is the common issue. The traditional practice of agriculture like Jhum is still prevailing in a substantial acreage among the tribal people in the hilly states.

This study is tying to address the issue of improving the productivity of the available water in fruit production through its efficient with the help of drip irrigation under prevailing situation. In this study effort is being made to assess whether crops like kiwi and orange actually need irrigation for better performance in the climatic condition of higher rain fall history. The state Arunachal Pradesh is perceived s a higher rainfall zone but the distribution of the precipitation

is of an erratic pattern right through the year. The precipitation is very scanty during the winter months of December, January and February.

This study reveals that drip irrigation system is economically viable in kiwi crop in Arunachal Prades where it can be operated under the force of gravity by using perennial hilly water streams as source of water. It is economically viable with benefit cost ratio 1:1.18.

Feasibility of drip irrigation system is irresolute in Meghalaya. The feasibility of drip depends on the location of the orchard with respect to the steam and the nature of the stream (water source) and the topography of the orchard.

The die back of citrus has been imminent problem in the region in last 10 to 15 years. This leads to the lower productivity of the plant, reduce productive life of the plant and poor quality fruit. Rain fed cultivation is one of the causes of die back of the crop in the region. The acute shortage of moisture during winter and pre monsoon period causes die back of citrus in the region. Bamboo drip is a traditional method of irrigation in Meghalayan hills has been practiced by the communities since last 200 years. The major shortcoming of this system can be termed as the "location specific". Because, the system can operate within a particular range of area of a natural stream which runs with higher pressure gradient. So, farmers who posses the orchards at the proximity of a stream can very well avail the efficacy of this system. Irrigating the orchards with the help of bamboo drip irrigation is very labor intensive.

Introduction of drip irrigation system is an efficient way of utilizing water resource and providing sufficient moisture to the crops and holds a great potential in improving productivity of the major horticultural crops.

Market system having forward and backward linkages should be established to ensure the availability of horticultural produce at reasonable price and better profit realization to farmers.

It is urgent need to strengthen existing processing industry and to establish new more so that excess produce could be utilized for gainful purpose by converting it into different farms.

GROUND WATER DEVELOPMENT IN ORISSA, BIHAR, UTTAR PRADESH AND PUNJAB: A STUDY IN CONTINUUM AND CONTRAST

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The necessity of conducting a study of ground water development in the states of Orissa, Bihar, U.P. and Punjab rests on a number of reasons. The first and foremost, the four states represent a continuum as well as two compartments. This is in line with the thinking enunciated in the ITP compendium that envisages studies covering regions which have begun to experience use of groundwater as well as those which are experiencing intensive use and over-draft. States like Orissa, where vast ground water resources remain hardly tapped till today and Bihar, which is not intensifying to the extent Eastern U.P. has intensified. Then there is U.P, which contains two dissimilar regions like Eastern and the Western. While the eastern part is more akin to Bihar, the western portion is similar to Punjab both in ground water and agricultural development.

The four states representing a continuum have not been studied till date and therefore such a study is very much in line with the need of the hour.

The main objective therefore is to enquire into the nature and pattern of groundwater development in the four states. The enquiry will bring forth the main trends presenting commonalities and contrasts, which would help in providing a framework for evolving policies and strategies that are area specific as well encompassing all study areas. A priori areas with overexploiting ground water would require different policy measures compared to areas where ground water irrigation remains underexploited. In addition to this overall objective, a number of specific objectives have been set for the study, which relate to maneuvering of public policy in a way so that an optimum balance is maintained between achieving socio-economic objectives and not endangering the sustainability of land and ground water resources for future generations.

A number of study objectives that have a bearing on policy aspects have been included in the study. Not all are equally pronounced or even equally visible at this stage. It is also not necessary that all these policy issues may or may not acquire the same importance after all the data is collected and analysed. However, some that have a strong bearing on the policy issues can be stated. The one relating to accelerating the pace of ground water development in states where ground water is least developed involves a right mix of policy measures and their conditionality. An important policy choice before such state governments is to whether accelerate ground water development before installing a quality power supply or follow it? The other relates to accessibility of ground water to least resourceful farmers. This involves a choice between providing a variety of subsidies to individual farmers or providing an alternative institutional mechanism. The third issue involving a set of policy prescriptions relates to the role of land consolidation, particularly in areas where not only land holding are small but are scattered in a number of places. The fourth one relates to push and pull factor leading to in and out migration and policy prescriptions to streamline the process in control. The fifth issue relates to policy measures imposing restrictions and regulations on electricity in farm sector and its impact on access, equity and economic use of ground water.

A TURNING POINT? WATER SAVING TECHNOLOGIES IN NORTH GUJARAT'S GROUNDWATER SOCIO-ECOLOGY

Dr. Rajnarayan Indu, India Natural Resource Economics & Management (INREM) Foundation
Anand & Ajinkya Borkar, Alpa Dave - NGI, Palanpur

Introduction of technology brings about changes in socio-economic development of society, as in information technology and computers, and plastic industry. Micro-irrigation is one such technology, where water saving technology or devices is used, like drip and sprinklers. This technology saves water, energy, labour, pesticides and fertiliser as there is less scope for waste. Use of this technology increases production of crops if properly chosen

and the technology is used correctly. The North Gujarat Initiative of International Water Management Institute initiated interventions using Water Saving Technologies (WST) in Banaskantha district five years ago. They also introduced vermiculture and horticulture along with WST. So a three-way intervention has brought a 'synergic' effect in the farmers' economy. Recently with the introduction of 'revolving fund' the marginal and small farmers are able to become adopters, particularly the tiny farmers, who could not even pay the required initial cash payment. The farm and non-farm economy has been changed significantly in Banaskantha district. A large increase in the farm income has brought a new dimension in the life-style of the adopters from different categories of farmers' society. The introduction of technology has led to a 'movement' of technology adoption and perhaps reached a 'turning point'. WSTs are perhaps playing a strong role in pushing agriculture to a significantly higher level of resource-productivity.

WATER POLICY AND WATER LAWS IN INDIA: A CRITICAL REVIEW OF STRUCTURAL AND INSTITUTIONAL IMPEDIMENTS AND GOVERNANCE SYSTEMS AND OUTLOOK FOR FUTURE

Dr. P K Viswanathan & Dr. R. Parthasarathy, Gujarat Institute of Development Research, Ahmedabad

The main objective of the study is to understand the emerging policy as well as institutional reforms and regulatory regimes in water sector in India, with particular reference to Maharashtra and Gujarat states. *Inter alia*, the study also intends to: a) appraise the progress in implementing water policies; b) identify the flaws in the legal and regulatory frameworks set up by various states, particularly, Maharashtra and Gujarat for water resources management and development; and understand the technical, administrative, institutional and political factors causing hindrance to implementation of policies.

The study involves a detailed review of the of the international, national as well as state water policies of India, including Maharashtra and Gujarat. Besides, it includes interactions with experts working on water resources development/ management; academia; NGOs; persons (especially, farmers and locale at the grassroots level. The study also proposes a detailed survey among the key personnel who are involved in the initiation and implementation of the water policies and the institutional reforms.

Based on a critical review of the national water policies of 1987 and 2002, the study intends to take stock of the water sector reforms, including policy and institutional interventions initiated by the states, viz., Maharashtra and Gujarat in particular. Of particular interest is to understand the specific responses and sensitiveness of the respective states towards addressing the emerging challenges in the water sector. From a critical review of the water policy and institutional reforms underway in India, it is obvious that only Maharashtra has set up a policy framework of enabling provisions and authorities with somewhat clearly defined powers and regulatory systems. The central question that still left unanswered is, what is water right and how is it defined. For water rights to be defined two other concepts have to be defined on operational terms: one is access to water and the other is allocation principles of the resource. So far the polices only state priorities

(for instance drinking water to be first and so on) but these are clearly not with respect to the state of the resource (except in scarcity years). Also, there are serious apprehensions as regards the workability of the regulatory systems in the context of Maharashtra as there are ambiguities regarding most of the propositions, including the issues of defining water endowments and water rights across multiple stakeholders.

SOCIAL MOVEMENTS AROUND WATER IN INDIA

Mr. K J Joy, Society for Promoting Participative Ecosystem (SOPPECOM), Pune

The research is expected to contribute in four critical ways in the area of social movements around water. First, at a theoretical level, this research will contribute to the scholarship on the role of people's understanding in the emergence and sustaining of collective action. Often such knowledge embedded in cultural norms and practices is unlikely to involve any formal mechanisms or rules for use of a collective resource. Second, a comparative case study approach will enable capture variations in organized collective action based on the uses of the resource, water, location / region (rural / town / city), and scope of the organized action. Third, the case studies would provide details of the specific ways in which rules have been created for use of water and the power politics that may be involved in the development of such rules. Fourth, this project can provide useful input for sectoral policy on water.

A rough typology was suggested for this purpose that tried to capture the spectrum of variation from an obvious state end of the spectrum to the obvious social movement end of the spectrum as follows:

- State action (for example, Participatory Irrigation Management Acts and policies)
- Civil society initiatives – limited in time, space, objectives and participation (for example, small campaign groups, PIL groups with little mass participation)
- Scaling up of state actions and civil society initiatives without social mobilisation (for example, NGOs and / or the state setting up watershed development networks)
- Social mobilisation for replication of promising state and civil society initiatives (for example, Swajaldhara or Pani Roko Abhiyan)
- Social initiatives which do not necessarily aim at radical social transformation (for example, Swadhyaya Movement, Palamau initiative, Tarun Bharat Sangh)
- Social movements aimed at mobilisation around explicitly water issues – say for access to water but within an agenda of some kind of radical social transformation (for example, Pani Sangharsh Chlawal, Pani Panchayat, Ek Gaon Ek Panavatha)

Within this spectrum, the study would concentrate more on the social movements described at e) and f) respectively, though there could be some initiatives from the other parts of the spectrum that might be taken up for study for specific purposes.

- The broad research questions make an enquiry on emergence and sustenance of social movements to demand water rights, manage water and promote water saving technologies; what are the organizational characteristics, strategies, their main slogan or missions, how is the leadership structured and finally draw on the learning's from these various cases in terms of mobilizing for collective action and addressing concerns across class, caste and gender.

The study of social movements around water can have many aspects and therefore the study should be framed by a normative framework that incorporates a vision about water, equitable water access, sustainable water use and democratizing water governance that will be able to specify the relevance of the study findings and link them with such a vision. However this normative framework is a broad listing of concerns and not a rigid one, where efforts would be made to capture the different understandings and voices around the central themes of equity, sustainability and democratic water governance.

The study has been informed by several theoretical approaches around social movements. Three broad areas can be drawn from these studies and they are a) the structure of political opportunities and constraints that face movements b) the form and structure of organizations that are available or are shaped by participants and resources available or generated c) the "collective processes of interpretation, attribution, and social construction that mediate between opportunity and action"

As far as methods are concerned we would essentially be using the case study approach. Data will be gathered using multiple methods and from several sources across the macro, meso, and micro levels. FGDs, Semi-structured interviews, review of secondary sources, policy documents etc would be used to gather data.

Upto 10 cases would be selected for the study across India. Of these 6 will be supported by the project and upto 4 would be self funded.

The cases identified are as follows

1. Kengrehalla Rejuvenation Movement- Anitha Pailoor,Karnataka
2. Palathulli Movement of Malayala Manorama for Water – Kerala, Jos Raphael
3. Study of social movement on conflict over water diversion from Hirakud reservoir, Ranjan Panda
4. Megh Pyne Abhiyan's initiative in Bihar , Luisa Cortesi
5. Social Movements Against Industrial Water Pollution: Lessons From Bhavani River Basin, Tamil Nadu, Prakash Nelliyat and Ajit Menon
6. Ek Gaon Ek Panvatha, SOPPECOM
7. Water Rights Movement in South Maharashtra, Kaustubh Devale

8. Water Privatisation in Delhi, Depinder Kapur and R Rajesh

9. Tarun Bharat Sangha, Rajasthan, Mangala Subramaniam

LIVELIHOODS ASPECTS OF INCLUSION

Mr. Nitin Bassi, Scientific Officer, IWMI, Delhi

Inclusion can play a major role in improving livelihoods for those who are under privileged and marginalized ones in the society. Inclusion ensures that those who are the least attended and living in absolute \ abject poverty has greater participation in decision making which can lead to positive impact on their lives and livelihood. Being involved, allow these communities to improve their living standards and overall well being. Inclusion can further have greater role in natural resources management where entire community is a stakeholder. Having marginalized and economically weak section of society in decision making for resource management may lead to overall improvement of not only the resource but also the well being of entire community.

Quite often there is a debate that government policies / schemes / programs end up giving more benefits to the ones who already are well placed in the society and push the marginalized section further below the poverty line. The main reason for this is the top-down manner in which these policies / schemes / programs are designed and implemented. In most of the cases there is limited planning at local level involving distressed communities and implementation tends to become expenditure centric rather than problem centric. It has been estimated that of the total allocation by government of India for various developmental plans, only 17 paisa out of Rs. 1 spent reaches to the end users. This shows the large scale corruption and the manner in which programs are implemented and instead of benefiting the poor, they further gets excluded from the overall development.

Thus for the promotion of inclusion in all sections of society, new way of governance is required. Emphasis must be given on how policy and programs across portfolios and levels of government can be dove-tailed to combat economic and social disadvantage groups. Some efforts which can be useful in social inclusion and overall improvement in the livelihoods of involved can be:

1) Addressing the needs of jobless families.

2) Delivering effective support to children in need.

3) Focusing on particular locations and communities to ensure programs are getting to the right places.

4) Addressing the incidence of homelessness.

5) Employment for people living with a physical or any other disability.

ECONOMIC VALUATION OF A WETLAND AS MULTIPLE USE SYSTEM IN WEST BENGAL, INDIA

Mr. Sacchidananda Mukherjee, Senior Scientific Officer, IWMI, Hyderabad.

The main objective of this study is to assess the economic value of various functions of a wetland as Multiple Use System (MUS) in West Bengal, excluding those which are ecological in nature. The specific objectives of this study are to:

a) understand economic value of a wetland as a MUS to enhance economic and ecological performance for livelihoods of the people;

b) identify the process by which dominant functions of a MUS change over time and across ecological zones, and

c) estimate economic cost-benefit analysis of alternative uses.

Identification of Multiple Uses of Wetland:

a) Wetland cultivation

b) Irrigation from wetland

c) Wetland fisheries

d) Jute retting

e) Collection of fodder

f) Cattle grazing in wetland

g) Collection of *amaranthus*

h) Domestic uses

Total benefit (direct use) from the wetland was Rs. 3.137 million/year in 2007-2008 prices and total number of households benefited from the wetland was 250.

Conclusions:

- Multiple Use Systems (MUSs) are getting converted to single use systems depending on economic and social pressure from dominant stakeholders
- Economic benefits and number of beneficiaries are higher for MUS
- Economic and ecological functions of MUS changes over time and space
- Attempts to classify MUS according to their uses across ecological zones and economic valuation are very limited
- Future research on economic valuation of MUS should focus on ecological functions (e.g., nutrient trapping and recycling; spawning and breeding ground for indigenous fish species; groundwater recharge and impacts on hydrology; runoff and soil erosion control, and flood mitigation; regulating micro-climate on the area surrounding the wetland.

- There is a need for economic valuation of wetlands across reaches of a river basin (upstream, middle stream and downstream) and across sizes (large, medium and small) to capture the changes in economic and ecological functions.

IMPACT OF QUALITY AND RELIABILITY OF IRRIGATION ON FIELD AND FARM LEVEL WATER PRODUCTIVITY OF CROPS

Mr. Kairav Trivedi, Scientific Officer, IWMI, Hyderabad & Dr. O. P. Singh, Banaras Hindu University, Varanasi

The purpose of this study was to analyze the impact of quality and reliability of irrigation on field level water productivity of crops. This is done by comparing the physical productivity of water for individual crops; and water productivity in economic terms under different types of irrigation systems with differential quality and reliability vis-à-vis the irrigation quality and reliability index for these systems.

The two locations were carefully selected with a difference in the agro climatic region. About thirty farmers from each of the two locations were selected in the study and a year long cropping pattern for all the farmers was physically monitored. This includes the data on area under different irrigated crops; date of sowing and harvesting; the actual irrigation schedules including the timing and duration of each watering; crop outputs; the price of produce (price at which it is being procured by Food Corporation of India); the discharge of pumps; canal discharge rate.

With a year long monitoring of the cropping pattern the data was analyzed and a comparison was made between two locations of the same state of Punjab following almost similar cropping pattern with one place showing more yield with well water use and the other showing more yield with canal water use.

SOCIAL COST AND BENEFIT FROM DRIP IRRIGATION

Mr. Kairav Trivedi, Scientific Officer, IWMI, Hyderabad

The objective of the study was to analyze the social costs and benefits of drip irrigation adoption for orchards crops in Nalgonda district of Andhra Pradesh. The study is exploratory in nature and is expected to provide quantitative data on the variables influencing the direct economic benefits, and qualitative data on the variables influencing the physical, social and environmental changes associated with drip adoption that induce positive and negative externalities.

3.1.3 New Studies Awarded Under - 2008-09 Program

For 2008-09, the research themes identified are listed below, in Table 3. Contracts are in the process of being finalized and awarded, in consultation with the Steering committee. In addition, an ITP study, “Socioeconomic Impact of MI Technology in North Gujarat – With Specific Focus on Gender” is in the data entry and analysis stage.

TABLE 3 - ITP - Proposed Research Studies 2008-09

No.	Topic	Period (months)	Assigned to
1	State Water Sector Intervention: Current Status, Emerging Issues and Needed Strategies		
	Karnataka	6	Dr M.G.Chandrakanth
	Tamilnadu	6	Dr. D.Suresh Kumar
	Andhra Pradesh	6	Mr. Rahul sen
	Gujarat	6	Dr R.Parthasarathy
	Uttar Pradesh	6	Not confirmed
	Bihar	6	Not confirmed
	Maharastra	6	Dr A.Narayanamoorthy
	Rajasthan	6	Dr M.S.Rathore
2	Water transfer and value of water in alternative uses : A case of Peri-urban Chennai, Tamilnadu	4	Dr. P.T.Umashankar
	Privatization of Water Supply through Public-Private Participation: A study of the Tiruppur Model, South India	4	Dr. P.T.Umashankar
3	Water Management Research and Upscaling the Interventions	8	ICAR & ITP Team
4	Financial Performance of India's irrigation Sector: A Macro Level Analysis	12	Dr.A.Narayanamoorthy
5	SRI : How effective under different irrigation sources and farm size categories	12	TNAU & ITP team
6	Tank Irrigation in India: What Will be the Next Best Alternative? - A Meta Analysis	8	ITP team
7	Natural Vs. artificial recharge in hard rock regions	12	ITP team

While a short write up of the 2008-09 studies are provided below, a detailed concept note for each of the studies is given in ANNEXURE 5

Study title:

State Water Sector Interventions in Selected States: Current Status, Emerging Issues and Needed Strategies

Objectives of the study

1. Study of the major outcome from the completed and ongoing research studies,
2. Derivation of the demand and supply using PODIUM model results from Dr Upali Amarasinghe
3. Discussions in stakeholders meets and finalize the investment priorities for the state's water sector

Specific tasks

The study will be undertaken mostly based on the available details (published as well as unpublished reports). Discussions with different stakeholders will form the base for deriving the future investment options. Primary data wherever needed could also be collected.

1. Collection / acquisition of data / reports from for different irrigation projects from irrigation departments / individuals relevant for the study.
2. Designed questionnaires / instruments in consultation with Dr. K.Palanisami
3. Synthesize the information / data as per the expected deliverables. .

The outline of the water sector intervention study are given below

Deliverables

Two drafts reports will be prepared

1. A draft state water policy
2. A report on priority investment options for the state

In addition to project reports it is required to provide the cleaned Excel database containing primary and secondary data

Duration: 6 months

Outline of the water sector intervention study at State level

1. Description of the Existing State Water Policy
2. Current status of water supply (current and next 15 years)
    - Rainfall pattern
    - Surface water supply (reservoir and tanks - number and water quantity)
    - Groundwater supply (wells - number and water quantity)
    - Issues relating to water supplies
3. Cost and pricing of water
    - Cost of surface water in Rs / cu.m (reservoir & tank)
    - Cost of groundwater in Rs / cu.m (open & tube wells) including pricing of electricity in the state
    - Cost of municipal water supplies in Rs / cu.m
    - Cost of treated water supplies in Rs / cu.m

- Pricing of water under crops sector in Rs / acre
- Pricing of water under domestic sector in Rs / cu.m
- Pricing of water under industry sector in Rs / cu.m
- Pricing of water in other uses in Rs / cu.m
- Opportunity cost of water under different sources

6. Water use efficiency (irrigation, domestic and industry sectors)
8. Review of the watershed programs: existing status, and future strategies
9. Review of the irrigation tanks: existing status and future strategies
10. Future Investment strategies (physical quantity and cost):
    - Surface water
    - Groundwater
    - Treated water
    - Recharge programs
11. Management strategies (physical quantity and cost):
    - Crop management programs
    - Water management programs
12. Other strategies specific to states(physical quantity and cost):
13. Implementation mechanisms (who and what to be done)

Study title:

Water transfer and value of water in alternative uses : A case studies from Chennai and Tiruppur regions in Tamilnadu

Objectives of the study

To study the dynamics that exist in water scenario across space and time in the transfer of water from rural to urban and the associated costs involved.

Specific tasks

The process involves a rapid visit of the project area in the northern fringes of Chennai and Tiruppur area, intense discussions with key stakeholders and technocrats, followed by detailed documentation and framing of objectives, hypotheses and expected outcome from the study.

Deliverables

- Current and future growth of water transfers(within agriculture and other sources) in peri-urban
- Cost of water from different sources and value in different uses
- Possible impact of the water purchasing agreement signed by the Metropolitan water board with some farmers of peri-urban areas of Chennai?
- Possible on impact of private water markets that do not have an agreement with Metro water?
- Possible shift in groundwater market demand with the supply of desalinated seawater from the northern and southern fringes of CMA?
- Possibilities for increase in water use efficiency in light of heightened water transfers.
- Examination of possible linkage between water supply and sewage reuse in the non consumptive use by industries and commercial establishments
- Changes in agricultural practices and land-use patterns, the related income divergence, and alteration of socio-economic structure.

Duration: 4 months.

Study title :

Financial Performance of India's Irrigation Sector: A Macro Level Analysis

Objectives of the study

- To study the overall financial performance of the irrigation sector at national as well as different state level beginning from mid-seventies.
- To analyse the trends in gross receipts, workings expenses as well as in recovery rate across different time periods.
- To find out whether any relationship exists between the agricultural performance and the recovery rate across major states in India.
- To find out whether the reforms initiated by some of the states have made any impact on the financial recovery rate of the sector.
- To suggest policies to improve the financial recovery of the irrigation sector.

Specific tasks

The study will cover all the major states for analysis to better understand the varied performance. While using published secondary level data / information for all analysis, the study would cover data from mid-1970s to mid-2000s. In order to study the trends in operation and

maintenance (O & M) costs as well as gross receipts from irrigation and multipurpose river valley projects, growth rate will be computed. Also water rates levied by different states will be compared with its crop output.

Deliverables

A report highlighting the irrigation sector performance, methodology for project evaluation, and future investment needed will be provided.

Duration: 12 months

Study title:

Water Management Research and Upscaling the Interventions

Objectives of the study

- Study of the major outcome from the completed and ongoing research programmes,
- Derivation of the value of water from the results of the studies
- Examination of the technologies that can be upscaled with their profitability and their adoption strategies

Specific tasks

- Collection / acquisition of data / reports from different water technology centers and schemes
- Designed questionnaires / instruments in consultation with Dr. K. Palanisami
- Submit progress reports
- Synthesize the information / data as per the expected deliverables.

There are several water related schemes operating in the country. In the case of ICAR, several water management schemes are functioning in several states in addition to the three water technology centers. The Ministry of Water Resources, GOI, international organizations and other governmental and non-governmental organizations are also involved in such technology related research and outreach activities. The three water technology centers and few selected water management schemes in the country will be covered for the study.

Deliverables

- A review of the technologies developed along with their cost and benefits
- Impact of the water management technologies in increasing yield and income
- Estimation of value of water in different situations and uses

Duration: 8 months

Study title:

SRI: How effective under different irrigation sources and farm size categories

Objectives of the study

- Evaluate the SRI in different regions of the Tamil Nadu state
- Workout the water saving in SRI under the different irrigation sources
- Study the dis-adopters if any in sustaining the SRI in the state.

Specific Tasks

1. Collection of data from different irrigation sources.
2. Designed questionnaires / instruments in consultation with Dr. K. Palanisami
3. Submit progress reports
4. Synthesize the information / data as per the expected deliverables.

The proposed study will be based on both secondary and primary data on SRI projects being implemented in Tamil Nadu state. The following analytical framework will be employed. Three districts representing the canal, well and tank irrigation systems will be selected after discussing with the extension department officials and university scientists. 150 farmers under each irrigation source will be randomly selected representing the small, marginal and large farm categories. Further 50 farmers as control under each irrigation source will be covered. The survey method along with field visits will be used for collecting the data. Date relating to the past adoption behavior will also be collected and analyzed.

Deliverables

A report with the following three sections will be prepared from the results of the study:

- Adoption levels and the cost and returns with and without SRI
- Water saving scenarios under different irrigation sources
- Constraints in SRI adoption

Duration: 12 months

Study title:

Tank Irrigation in India: What will be the Next Best Alternative? A Meta Analysis

Objectives of the study

- Study the performance of tanks interms of groundwater supplementation.
- Examine the scarcity management strategies
- Impact of tank modernization already done
- Converting tanks into percolation ponds

- Assess the investment options needed for improving the performance of the tanks.
- Examining the future threats to tank irrigation

Specific Tasks

- Collection / acquisition of data / reports from different departments / individuals relevant for the study.
- Designed questionnaires / instruments in consultation with Dr. K.Palanisami
- Submit progress reports
- Synthesize the information / data as per the expected deliverables.
- Meta analysis covering different states will be done.

Deliverables

Three drafts reports will be prepared

- Tank performance indicators incorporating groundwater supplementation
- Coping strategies both at tank and farm level and the expected cost and returns
- Future physical and management strategies with expected rate of return.

Duration: 8 months

Study title:

Natural Vs. Artificial Recharge in Hard Rock Regions

Objectives of the study

- Investigation of the effectiveness of artificial recharge structures using dug wells
- Developing policy interventions for making the dugwell scheme very effective

Specific tasks

- Collection / acquisition of data / reports from different departments / regions relevant for the study.
- Designed questionnaires / instruments in consultation with Dr. K.Palanisami
- Submit progress reports
- Synthesize the information / data as per the expected deliverables.

The following issues also will be addressed

- ***Upstream and downstream conflicts***
- ***Zone of influence***

- ***Natural and artificial recharge***

Dugwell recharge scheme has been proposed in several states. The Dugwell Recharge Scheme aims to increase the recharge to the ground water reservoir by utilising the runoff generated in the agriculture fields, which otherwise goes waste. According to official release issued from Ministry of Water Resouces, the scheme has large potential not only because of its capacity to recharge shallow aquifers but also it is economically affordable for local people. The Central Ground Water Board (CGWB) and State Ground Water Departments will provide technical guidance for optimum benefit and creating awareness amongst beneficiaries.

Deliverables

Two reports will be produced :

- Impact of the dug well schemes in increasing yield and income
- An improved strategies or guidelines for increasing the effectiveness of the artificial recharge

Duration: 12 months

3.2 Fellowship Program

IWMI-TATA Water Policy Research programs "Short Term Research Studentship Program" emerged with the core idea to encourage interested students to be involved in collaborative research under the IWMI TATA Program (ITP). The main objective of this program is to provide an opportunity to undergraduate / graduate science students to familiarize themselves with water research - methodology and techniques by being associated for a short duration with ongoing research program or by undertake independent projects.

The program awards limited number of studentships to deserving students on a regular basis. The duration of the studentship will be for a maximum period of 6 months.

The process of identification and finalization of student fellows for the Fellowships Research Program 2008 -09 is in process. Institutions have been approached regarding the program and responses looked into.

As part of the capacity building component, K.Palanisami evaluated the Ph.D thesis work of Mrs. Ananthini on Jan 2, 2009 on tank irrigation management and guided the student in the draft revision. Also visited a few tanks and obtained feedback from the farmers on tank filling and irrigation aspects. Most of the farmers preferred the tanks in agriculture intensive regions with well irrigation to be converted into percolation ponds. The social forestry can also be maintained along with the tanks. As part of the exercise, worked on the cost- benefits of social forestry and tank desilting. This will also be used for briefing the policy makers.

3.3 Policy Initiatives

Policy research is an integral part of the ITP program and in the following years of Phase II of the program major focus will be on the policy research and recommend policy interventions

towards sustainable water management, that have emerged from the research carried out by ITP since 2002.

It is a known fact that the causal path to policy changes is unpredictable and complex, as water is a State subject under Constitution of India. This necessitates the need for initiation of policy dialogue in different states and however, the task is looking complex. Thus while ITP will make efforts to bring about relevant changes in policies to obtain desired results, the success depends upon on the follow ups by the implementing agencies. Hence, the approach that ITP will adopt in policy interventions is to focus on the most pressing and key issues that need to be changed at the state level and proposing policy change to achieve the desired change.

ITP team had a detailed review of different interventions/capacity building exercises and the following are short listed for subsequent follow ups by the ITP team

- Overall irrigation development – trends and opportunities
- Future irrigation investment options and returns to investment
- Groundwater pumping and energy nexus for power sector reforms
- Tank irrigation system rehabilitation strategies
- Developing decision support system for watershed management
- Technology transfer and upkeep

Further, the work on policy influences involved the following:

- Preparation of policy briefs and its dissemination to relevant administrative, political and user groups / organizations
- Provide relevant information & support material to user groups
- Help formulate memoranda and assisting State functionaries etc.,
- Raise awareness of State functionaries through workshops, field visits etc., in selected States on selected themes
- Link up with ongoing programs and offer technical support both at Central and State level.

At least 3-4 policy advocacies will be initiated during 2008-09 involving experts, officials and researchers, using ITP research results in the concerned states.

4. OUTPUT AND IMPACTS

4.1 Publications in 2008

Book Chapter/Journal Articles

1. Kumar, M. Dinesh, Ajaya Kumar Malla and Sushanta Kumar Tripathy Economic Value of Water in Agriculture: Comparative Analysis of a Water-Scarce and a Water-Rich Region in India, *Water International*, 22 (3):214-230.

2. Zankhana Shah and M. Dinesh Kumar (2008) In the Midst of the Large Dam Controversy: Objectives, Criteria for Assessing Large Water Storages in the Developing World, *Water Resources Management*, 22: 1799-1824.

3. Kumar, M. Dinesh, Ankit Patel, R. Ravindranath and O. P. Singh (2008) Chasing a Mirage: Water Harvesting and Artificial Recharge to Solve Water Problems in Naturally Water-Scarce Regions, *Economic and Political Weekly*, 43 (35): 61-71.

4. S.P.Wani, P.K.Joshi, K.V.Raju, TK Sreedevi, M.Wilson, A.Shah, PGDiwakar, K.Palanisami, S.Marimuthu,, YS Ramakrishna, SS Meenakshi Sundaram and M D'Souza, (2008). Community Watershed as Growth Engine for Development of Dryland Areas, Executive Summary. ICRISAT, 36 pp.

5. Shah, T., Bhatt, S., Shah, R.K. and Talati, J. (2008) Groundwater Governance through Electricity Supply Management: Assessing an Innovative Intervention in Gujarat, western India, *Agricultural Water Management* 95(11):1233-1242

6. Shah, T. and Verma, S. 2008. Co-management of Electricity and Groundwater: An Assessment of Gujarat's Jyotirgram Scheme, *Economic and Political Weekly*, Vol.43(7): 59-66

7. Shah, T. 2008. Groundwater management and ownership: Rejoinder. *Economic and Political Weekly*, Vol.43(17): 116-119

8. Shah, T. 2008. Governing the Groundwater Economy: Comparative Analysis of National Institutions and Policies in South Asia, China and Mexico. In Ballabh, Vishwa (Ed.) *Governance of water: Institutional alternatives and political economy*, Sage Publications, Delhi, India. pp: 237-266.

9. Shah, T. 2008. The New Institutional Economics of India's Water Policy. In Ballabh, Vishwa (Ed.) *Governance of water: Institutional alternatives and political economy*, Sage Publications, Delhi, India. pp: 237-266.

10. Shah, T. 2008. India's groundwater irrigation economy: The Challenge of Balancing Livelihoods and Environment, In Kanchan Chopra and Vikram Dayal (Eds) *Handbook on Environmental Economics in India*, Oxford University Press. Forthcoming

11. Shah, T. 2008. Needed: A new monsoon strategy – The focus should be on groundwater recharge. *Pragati*, Vol.16: 19-21

12. Shah, T. 2008. Every drop counts: Good monsoon must be used to shore up water security. *The Times of India, Ahmedabad*. July 10, 2008, p.12

13. Mukherjee, S. (2008), "*Factors Influencing Farmers' Willingness To Protect Groundwater from Nonpoint Sources of Pollution in the Lower Bhavani River Basin, Tamil Nadu*", in the proceedings of the IWMI-Tata Water Policy Research Program's Seventh Annual Partners' Meet, "*Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches*", ICRISAT Campus, Patancheru, April 2-4, 2008, Vol. 2, pp. 452-482.

14. Mukherjee, S. (2008), "*Economic Valuation of a Wetland in West Bengal, India*", in the proceedings of the IWMI-Tata Water Policy Research Program's Seventh Annual Partners' Meet, "Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches", ICRISAT Campus, Patancheru, April 2-4, 2008, Vol. 1, pp. 254-266

15. Mukherjee, S. and Z. Shah (2008), "*Large Reservoirs: Are They Last Oasis for the Survival of Cities in India?*", in the proceedings of the IWMI-Tata Water Policy Research Program's Seventh Annual Partners' Meet, "Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches", ICRISAT Campus, Patancheru, April 2-4, 2008, Vol. 2, pp. 907-922.

16. Kumar, M.D., Z. Shah, S. Mukherjee and A. Mudgerikar (2008), "*Water, Human Development and Economic Growth: Some International Perspectives*", in the proceedings of the IWMI-Tata Water Policy Research Program's Seventh Annual Partners' Meet, "Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches", ICRISAT Campus, Patancheru, April 2-4, 2008, Vol. 2, pp. 841-857.

17. Mukherjee, S. and D. Chakraborty (2008), "*Environment, Human Development and Economic Growth after Liberalisation: An Analysis of Indian States"*, in the Proceedings of Interdisciplinary Research Methodology Workshop on "Environment, Sustainable Development and Human Well-being", Madras Institute of Development Studies, Chennai.

18. Mukherjee, S. and D. Chakraborty (2009), "Environment, Human Development and Economic Growth of Indian States after Liberalisation", in Rout, H.S. and P.K. Panda (eds.), "*Human Development: Dimensions and Strategies*", New Century Publications, New Delhi (ISBN: 9788177081985).

19. Mukherjee, S. and D. Chakraborty (2008), "A Cross-State Analysis on the Relationship between Environmental Quality and Human Development in India", Chapter 3 in Chakraborty, D. and S. Nath (eds.), "*Collected Essays on Economic Development: Essays in Honour of Prof. Asok Barman* ", Bookwell Publications, New Delhi (ISBN: 8189640583).

20. Mukherjee, S. and D. Chakraborty (2009), "Environment, Human Development and Economic Growth: A Contemporary Analysis of Indian States", *International Journal of Global Environmental Issues*, Vol. 9, No. 1&2, pp. 20-49 (Inderscience Publications Ltd., London, U.K.).

4.2 ITP Website restructuring

The IWMI TATA website was updated and given a fresh look – to match with the main IWMI site. Changes in the content as well as presentation were undertaken with the assistance of the IT group at the IWMI headquarters.

The website provides program details, including the fresh approach in terms of themes and targets for period 2008 – 2010. Research studies undertaken and papers published under ITP, details of communication materials developed under the program, available ITP opportunities - Studentship as well as Small Research Grants.

The website content was put together by Ms. Vidya Ramesh, Research Officer, ITP with inputs from Director ITP. Technical backup and support was provided from IT team based at IWMI Sri Lanka. Regular update of the ITP website will be undertaken by the ITP team.

The ITP website link is http://www.iwmi.cgiar.org/iwmi-tata/default.aspx

4.3 Capacity building and Workshops

The Inception cum Methodology Workshop Social Movements around Water: July 6 7, 2008 - conducted jointly by SOPPECOM and IWMI-TATA

Abstracts from all over India were invited. Six cases which were from different parts of the country based on criteria agreed in the proposal were selected. Two case studies are being done by SOPPECOM. In all there were 9 case studies. Of these 9 studies the study on Delhi water Privatization is no longer included due to the time constraints of the concerned authors. The one by Mangala Subramaniam is a self funded one and the other 7 studies would be supported through the project grants.

The inception workshop was organized for the selected case study writers to orient them to the study objectives and to develop and agree on a common methodology.

First day of the workshop discussed the case studies and gave a detailed feedback on how they could be modified. On the second day the group discussed the methodology for the study.

The workshop began with an introduction to SOPPECOM's work and activities by Suhas Paranjape. The two days proceedings comprised of six sessions which were as follows

- Session I: Background and Rationale for the Study on Social Movements around Water- Seema Kulkarni
- Session II: Introduction to Social Movements -Mangala Subramaniam
- Session III: Discussion on Methodology -Seema Kulkarni (SOPPECOM)
- Session IV: Presentations of Case Studies
- Session V: Developing Commonality in Concepts- K J Joy (SOPPECOM)
- Session VI: Logistics

In each session, the main speaker presented a topic / case study followed by a group discussion. The aim of the workshop was to increase background knowledge, agree on methodology, clear up doubts, exchange ideas related to the case studies, and develop some sort of commonality in concepts. In essence, it aimed at developing some uniformity in the approach case study researchers would adopt.

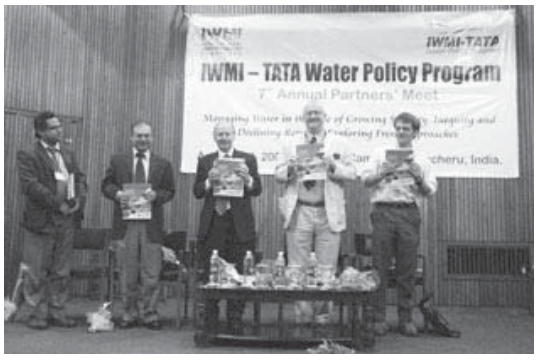
A detailed proceedings of the workshop is available for reference on www.soppecom.org

The core team has also prepared a detailed work plan which is as follows:

Activities	**Time frames**
Outlines	October 2008
First Drafts	December 2008
Peer review	January 2009
Interim meeting to discuss drafts	February 2009
Final reports	March 2009

4.4 Annual Partners Meet '08

During the first half of the year, substantial amount of time and effort was spent in organizing APM-2008. Towards APM preparation, research papers were invited from senior researchers as



well as young research scholars under six themes, selected for ITP research during the year, through announcements in journals. Out of a total of 60 papers received from researchers from within India and outside, 32 were short-listed for review by a Scientific Committee. The committee consisted of 6 senior scholars from India's water sector. The committee, after review, suggested acceptance of 26 papers, with and without revisions.

The IWMI-TATA Water Policy Research Program organized the 7th Annual Partners Meet from 2nd to 4th April 2008. The theme of this years meet was "Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches."

APM Inauguration ceremony was well attended by dignitaries including Prof. Colin Charters, DG, IWMI; Dr. Dyno Keatinge DDG, ICRISAT; Madar Samad, Director, South Asia; Arun Pandhi, Senior Programs Manager, SRTT, to name a few. Several eminent personalities from research as well as policy and administrative sector attended the APM.

A total of 64 papers were presented in the technical sessions over the 3 days

Each of the accepted paper received an honorarium - Rs. 20,000 for senior researchers and Rs. 15,000 for research scholars.

The list of external contributions selected for inclusion in the APM proceedings is provided in Table 4.

Table 4: External Contributions for Annual Partners' Meet, 2008

Sl. No	Title of Paper	Author/s
1	Economics of Drip Irrigated Cotton: A Synthesis of Four Case Studies	A. Narayanamoorthy
2	Conflict and Inequality in Surface Irrigation: A Socio-Ecological Perspective	Prem S. Vashishtha and Dalbir Singh
3	Local Perception and Use of the Multi-functionality of Water Tanks in two Villages of Tamil Nadu, South India	Victoria Reyes-García *et al.*
4	Water Allocation Policies in Coastal Karnataka: An Analysis of Nethravathy River Basin	Ramachandra Bhatta
5	Technological and Institutional Approach for Enhancing Water (logged) Productivity in Agriculture: A Case Study of Ganga Basin in Allahabad	Firdaus Rizvi
6	Impact of Organic Sugarcane Farming on Economics and Water Use Efficiency in Maharashtra	K. G. Kshirsagar
7	Water Policies and Legal Framework in India	Mohd Siddiqui

8	Scarcity in the Midst of Plenty: Irrigation Development for Water-abundant Assam	Phanindra Goyari
9	Equity in Distribution of Benefits from Water Harvesting and Groundwater Recharge – An Economic Study in Sujala Watershed Project in Karnataka	HM Seema, M. G. Chandrakanth and N. Nagaraj
10	Management of Wetlands of Non-Prominence from the Perspective of Benefit-Degradation Relation	Tuhin K. Das
11	The Co-operative as an Institution to Manage Water Distribution for Irrigation: Lessons from the Chanda Experiment in Maharashtra, India	Amita Dharmadhikari Yadwadkar
12	Estimation of Ecosystem Services of Rejuvenated Irrigation Tanks: A Case Study in Mid Godavari Basin	K. Lenin Babu, S. Manasi
13	River Basin Organizations in India: An Overview	K. V. Raju and Avinandan Taron
14	Water Table Behaviour in Punjab: Issues and Policy Options	Karam Singh
15	When Does Overexploitation Really Matter? A Case of Groundwater Extraction in Karnataka, India	Anantha K. H and K. V. Raju
16	Water Productivity in Agriculture-A Review of Evidences from Selected Asian Countries and India	K. N. Ninan and Yoichi Izumida
17	Patterns and Drivers of Dairy Development in India	Avinash Kishore and Tushaar Shah
18	Institutional Change and Water productivity: A Scenario Testing of Canal Irrigation Cooperatives in Northern Gujarat for Financial Viability	G. G. Koppa
19	Economics of Water Productivity and Institutional Changes in Major Irrigation Projects-Challenges and Opportunities: A Conceptual Framework	G. G. Koppa
20	Aerobic Rice: Water-saving Rice Production Technology	E. Subramanian *et al.*
21	Institutional and Policy Reforms in Water Sector in India: Review of Issues, Concepts and Trends	Satyapriya Rout
22	Equity, Comparative Feasibility and Economic Viability of Groundwater Investment in Saurashtra Region	Bharat Dudhat & R. L. Shiyani

22	Equity, Comparative Feasibility and Economic Viability of Groundwater Investment in Saurashtra Region	Bharat Dudhat & R. L. Shiyani
23	Impact of Water Harvesting on Groundwater Recharge, Productivity and Net Returns with Integrated Farming Systems Approach in Eastern Dry Zone of Karnataka	N. Nagaraj *et al*
24	Policy Interplays and Trade Offs: Some Issues for Groundwater Policy In India	S. P. Singh
25	Irrigation Management and its Effect on Productivity under Parambikulam Aliyar Project in Tamil Nadu	K. Sivasubramaniyan
26	Watershed Development in North-East: Problems and Opportunities	F. Shaheen *et al.*
27	Growth Impacts of Development and Management of Water Resources	R. P. S. Malik

In the Plenary Sessions of the APM, 6 presentations were made by eminent researchers, the details of which are provided in Table 5:

TABLE 5 – Plenary Sessions of the APM

Topic: Speaker:	Program for Irrigation Enhancement and Agriculture Production in Andhra Pradesh Shri Hari Narayan, Ex-Chief Secretary, Govt. of Andhra Pradesh
Topic: Speaker:	Challenges Kansas Faces on the Legal and Institutional System based on Property Rights in Groundwater John Peck
Topic: Speaker:	Managing Irrigated Agriculture through Market Reforms: Implications for Rural Livelihood Prof. Ashok Gulati, Asia Director, IFRPRI
Topic: Speaker:	Water Policies and Legal & Regulatory Framework in Andhra Pradesh S. P. Tucker, Principal Secretary, Irrigation and Command Area Development, Govt. of AP
Topic: Speaker:	Community Watersheds as Growth Engines: A Comprehensive Assessment of Watershed Programs in India S.P.Wani, Principal Scientist and Regional Theme Co-ordinator, GT on AgroEcosystems, ICRISAT
Topic: Speaker:	Land Lease Markets in India: A study of 45 Villages Tushaar Shah, Senior Advisor to DG, IWMI

Unlike in the previous years, this year, it was decided to bring out the (pre conference) proceedings of the meet for circulation. Papers were classified under six different themes, and Table 6 provided the papers presented under each of the sub themes at APM '08.

TABLE 6 – APM sub-themes

1.	Enhancing Water Productivity in Agriculture: Technology, Institutions and Policy	
1A.	Where Do We Promote Micro Irrigation Systems in India?	**7 papers**
1B.	Enhancement of Water Productivity in Farming Systems	**9 papers**
1C.	Enhancing Water Productivity of Multiple Use Water Bodies	**4 papers**
2.	Changing Groundwater Socio-ecology and Impacts on Rural Livelihoods and Poverty	
2A.	Groundwater Depletion and its Socio-economic Impacts	**7 papers**
2B.	Impact of Markets and Regulations on Irrigated Agriculture and Rural Livelihoods	**6 papers**
3.	Water Policies and Legal Frameworks in India: Are we Creating Paper Tigers?	**12 papers**
4.	Water Harvesting and Groundwater Recharging in India from Local and Basin Perspectives: Equity and Productivity	**4 papers**
5.	Water, Economic Growth and Human Well-being	**8 papers**
6.	North Gujarat Initiative	**2 papers**

A total of 58 papers and one abstract were chosen for publication in the proceedings, which included three papers from IWMI, apart from 28 papers from ITP and 27 external contributions. They were edited and proof read for printing.

The papers presented at the APM were well appreciated and found to be of high research significance by the participants. The APM Conference Proceedings, in two volumes and the APM Research Papers CD were well received by the participants.

The APM was well attended by senior researchers as well as young research scholars from across the country. There was representation from the research fraternity, NGO representation as well as policy makers & program implementers from the Government agencies. The consolidated participants list is provided as ANNEXURE 6.

It was also decided to put together a poster exhibition to highlight the major findings of ITP research during the past seven years. The exhibition was also meant for showcasing the work of Sir Ratan Tata Trust and IWMI in the water sector. A total of nine posters were produced for the exhibition based on ITP research findings.

4.5 ITP Staff - Conference and Seminars attended

i] Participation and Paper Presentation in Workshops/ Conferences/ Seminars

Table 7: ITP Representation in Seminar/Conferences

Sl. No	Title of the Paper	Name of Conference	Authors (Presenters)
1	Impact of Watershed programs in India,	Workshop on Impact of watershed programs in India, Organized by ICRISAT and Ministry of Rural Development, Ministry of Agriculture, Dept. of Land Resources, Govt. of India, New Delhi, Nov. 5, 2008.	K.Palanisami
2	Differential Efficiencies under SRI – Preliminary Results from Researcher Managed and Water and Labour Adequate Situations in Tanjore District, Tamilnadu state, India	3rd National Symposium on "System of Rice Intensification (SRI) in India – Policies, Institutions and Strategies for Scaling up" organized by Tamilnadu Agrcultural University and WWF, at Tamilnadu Agricultural University, Coimbatore. Dec 1-3, 2008	K.Palanisami, S.Senthilanthan and C.R.Ranganathan
3	Surface Irrigation and Livelihoods: Results of User-Managed Irrigation Systems in Maharashtra, India	Paper presented at XIIIth IWRA World Water Congress, 1-4 September 2008, Montpellier, France	Nitin Bassi
4	Are Sector Reforms Working? Assessing Implementation of Irrigation Management Act of Madhya Pradesh	Paper presented at SaciWATERS International Conference on Water Resources Policy in South Asia, 17-20 December 2008, Colombo, Srilanka	Nitin Bassi

ii] ITP Representation in at Meetings and Conferences

- Dr. Dinesh Kumar attended a two-day conference on "Strategic Grant Making in Water Sector" organized by Arghyam. The conference was on 27-28 June, 2008.
- Dr. Dinesh Kumar traveled to Ahmedabad to meet the GEB officials. He made a presentation to their senior management on "Alternative ways of restricting and metering electricity use in farm sector in north Gujarat" for co-management of groundwater and electricity. After the meeting, a meeting also took place between one of NGI's partners' (Cohesion Foundation) and NGI team leader in Ahmedabad on the ways to strengthen the producers' company.
- Dr. Dinesh Kumar participated in the two-day workshop organized by SOPECCOM & ITP on methodology for the study on social movements in water, at Pune on 6-7 July, 2008
- Dr K.Palanisami, Director, ITP attended the IWMI-ICAR Steering Committee meeting during July 20-22, 2008 at IWMI, Colombo.

- Dr K.Palanisami participated in the ARM in IWMI Colombo during Oct 27-30, 2008. Interacted with several IWMI scientists from different centers. Discussed with IT team on developing ITP website. Discussed with Director, HR on the recruitment of the staff for ITP

iii) Other Relevant ITP Meetings and visits by Dr K.Palanisami, Director, ITP

- Discussed on Sep 16th and 17th with Dr. Christine Croombers, Director Human Resources, IWMI on the arrangements for the recruitment of spl. project scientists for the ITP
- Participated in the discussions on Oct 16th with Dr Usha Rao Monari, IFC on developing proposals on valuation of water and water allocation based on pricing norms
- Discussed with Mr. Anil Kumar Kataria, Vice president, Jain Irrigation systems, Hyderabad on Oct. 16, 2008 on taking a join capacity building program on drip fertigation program implementation
- Discussed with Mark theme leader, IWMI, HQ and Upali, IWMI Delhi on Oct. 30, 2008 on development of irrigations sector papers using PODIUM modeling framework
- Attended a brief meeting on Sep 23rd 2008 with Madar Samad at M.S.Swaminathan Research Foundation, at Chennai. Discussed with Dr M.S.Swaminathan about the research study on more crop and income per drop being carried out by the Ministry of Water Resources, Govt. of India
- Dr K. Palanisami, discusses with Dr Wani, Principal scientist, ICRISAT on the economic impact of watershed programs in India and preparing a presentation for Delhi meeting on Nov. 5th
- Dr K. Palanisami reviewed the work progress of NGI project, Palanpur, Gujarat state during Nov. 19-20, 2008. (ANNEXURE 7)
- Discussed with Dr M.G.Chandrakanth, Professor, Agrl. Economics Dept. University of Agrl. Sciences, GKVK, Bangalore on Nov. 29, 2008 on the draft outline on Karnataka state water sector policy interventions. Also discussed with Dr Nagaraj, professor, Agrl.Economics dept, University of Agrl. Sciences, GKVK, Bangalore about the water policy interventions needed for the state.
- Met Dr. Hulagur, Agrl. Scientist and Watershed Team Leader, MYRADA, Bangalore on Dec 1, 2008 and discussed the ongoing watershed programs and the Govt. polices on watershed activities in the state.
- Discussed with Mr. Meenakshi Sundaram, Former Secretary, Dept. of Land Resources, Govt. of India on Dec 1, 2008 in Bangalore and discussed about the eco-sanitation program and the possible water savings.
- Discussed the flood control aspects in the Cauvery basin, as requested by the Vice-chairman, State Planning Commission on Dec 12 & 13 , 2008 for making brief write up. Accordingly collected information from TNAU departments on various aspects of the flood control structures needed in different locations of the cauvery delta zone.

- Made field visits to Kodangipalayam watersheds in Palladam Block on Dec 30, 2008 and had discussions with the beneficiary farmers. The major issue was how to maintain the watershed structures post watershed project.
- Visited the cauvery new delta area on Dec. 31 2008 for estimating the flood control measures as requested by the State Planning Commission. Several locations near Pudukkottai were visited and discussions were held with the Agriculture, Engineering, department engineers about the locations of the water harvesting structures. A brief summary report already prepared was discussed with the field engineers.

4.6 Policy Interface

Presentation of Irrigation Sector Interventions to State Planning Commission, Chennai

Steps have been initiated with Government of Tamilnadu, State Planning Commission (SPC) to present the major research findings from the ITP and the State Planning Commission has also agreed for the meeting. Accordingly, K. Palanisami, Director ITP presented the Lead Policy Synthesis Paper, "State Irrigation Investment Strategies" on Dec, 12, 2008 in Chennai. A synthesis paper was also prepared by K. Palanisami, Upali Amarasinghe and R. Sakthivadivel, for presentation to the State Planning Commission, Government of Tamilnadu, Chennai..

The major recommendations that were presented to the State Planning Commission, Govt. of Tamilnadu by the ITP and NRLP team are given below:

TAMILNADU: POLICY INTERFACING AND IRRIGATION DEVELOPMENT

Major Recommendations:

1. Wells

- Intensify watershed development activities especially in over-exploited and critical blocks on priority basis so that well failure will be minimized. The abandoned wells should also be used for groundwater recharge.
- Water saving techniques such as drip and sprinkler irrigation methods should be introduced to all the commercial crops and all the extension officers should be trained in the installation and maintenance of the systems for the farmers.
- Watershed programs with recharging options be implemented in rainfall range of 700-1000 mm / year
- In tank intensive regions, the programs should focus on soil and water conservation and in well intensive regions, it should be on groundwater recharges.
- Macro watershed: combining 5-6 micro watersheds will enhance the benefits of watershed programmes

- Wells in a zone of influence of 400 meters should be accounted while planning the water harvesting structures.
- Agricultural and livestock activities be combined in all the watershed programmes.
- A decision support system incorporating the above options can be developed for each district and the DSS should be used for planning the watershed programmes.
- Guidelines for post project management of the watershed programmes should be developed for better management of the watersheds.

2. Tanks

- Wherever the tanks are receiving less than 40% storages even in normal rainfall periods, they can be examined for their conversion into percolation ponds and groundwater development should be encouraged. In other tanks with 40-70 % storages, crop diversification should be encouraged with adequate market facilities and crop insurance programs.
- A tank – percolation pond conversion index should be developed. IWMI scientists will further work on this.
- Tank farmers associations should be strengthened and tank sluice management for water distribution should be practiced using the available groundwater supplies.
- Since the stabilization value of groundwater in tank systems is higher, it is always recommended to have optimum number of wells in the tank commands, viz., one well per 2 ha in well only situation, one well per 4 ha in tank cum well situation and one well per 10 ha in tank situation
- Total number of wells in the tank command can be increased by 25% . Community wells should be encouraged to benefit the small and marginal farmers in the tank command and free electricity supplies should also be available to the community wells as available to the individual well owners for irrigation in the tank command.
- Partial tank desilting as a modernization options should be introduced and the farmers should be encouraged to use the tank silts to their fields.
- Different revenue generation options will help the tank management sustainable and hence such options in the tanks should be worked out.
- While implementing the watershed programmes in the tank intensive regions, watershed structures in the tank foreshore should be avoided.

3. Canals

- Big reservoir systems have the advantage of new investment in water course improvements and tanks will be benefited by investments in main system improvements.

- In order to implement the water management strategies, investment in watercourse improvements should be given priority followed by secondary and main system management.
- Water harvesting plans for cauvery delta zone involving the existing and new tanks both in the old and new delta should be explored.

4. Water management

- Water management technology transfer and up-keep options should be given top priority in investment plans. Types of technologies suitable for different crops and regions in the future should be prepared covering the state as a whole. Also capacity building aspects should be strengthened at various levels.
- Analysis of constraints in technology adoption and the needed strategies for up scaling them be done.
- The cost of waste water treatment and the transaction cost for delivery to different locations should be worked out and compared with the alternative source of supply.

The State Planning Commission responded positively to the recommendations made by the ITP team. The cover page of the Synthesis Paper on "State Irrigation Investment Strategies" presented at the State Planning Commission, Govt. of Tamilnadu, Chennai on Dec, 12, 2008 and the Minutes of the discussion meeting received from the SPC, Tamil Nadu are provided as ANNEXURE 8 and ANNEXURE 9.

Linkages with Ministry of Water Resources Programme

K.Palanisami is acting as the Chairman Project Implementation Team (PIT) of the project "More Crop and Income per Drop" under the Ministry of Water Resources, Govt. of India. He is coordinating with the Ministry of Water Resources in the implementation of this 5000 demonstration sites in various states of India with a budget of Rs 25 crores. This program was started in 2007 and will be over by 2009.

K.Palanisami is involved in the analysis of the results of this mega outreach programs and is providing the needed policy suggestions to the Ministry of Water Resources on their impact.

Preparation of the Rainwater harvesting and flood control plans

Also, as per the request of the State Planning Commission, Govt. of Tamilnadu, the rainwater harvesting draft report "W**ater harvesting for flood control and water conservation in cauvery delta zone (cdz), Tamilnadu" by K.Palanisami and B.Chandrasekarn** was prepared and submitted to the State Planning Commission during Dec 2008 for follow up action.
(The detailed are given below).

WATER HARVESTING FOR FLOOD CONTROL

AND

WATER CONSERVATION IN CAUVERY DELTA ZONE (CDZ), TAMILNADU

Presented to the

State Planning Commission
Chennai

By

K.Palanisami
Director,
IWMI- Tata Water Policy Programme,
International Water Management Institute (IWMI),
South Asia Regional Office, Hyderabad

&

B.Chandrasekaran
Director of Research
Tamilnadu Agricultural University, Coimbatore

Summary of the policy report:

WATER HARVESTING FOR FLOOD CONTROL AND WATER CONSERVATION IN CAUVERY DELTA ZONE (CDZ)

The north east monsoon fully covers the state of Tamil Nadu with an annual rainfall of 925mm. River Cauvery is the only major river in Tamil Nadu. This is an inter State river with many tributaries lying in Karnataka and Kerala States. Cauvery Delta Zone consists of 28 blocks, 20 in Tanjore, 5 in Trichy, 2 in South Arcot and 1 in Pudukottai districts and is divided into old delta (fed by Cauvery and Vennar system) and new delta (fed by grand anicut canal system).

Tamil Nadu being at the receiving end of Cauvery flow, suffers both at the time of excessive flood and no flood syndrome – at excessive flood because the drainage condition in Tanjore delta is poor being at the vicinity of the sea and at no flood because drought is at its severity best receiving erotic and insufficient rainfall. Most of the water courses of Cauvery and Vennar Sub-basins have to play the dual role of irrigation-cum-drainage courses. Due to flat terrain water does not drain off quickly resulting in drainage congestion. A major portion of Vennar sub basin creates more water logging. About 80,000 acres are subjected to submersion for a period of 5 to 20 days with depth of submersion ranging from 1 to 3 feet at the worst. Therefore, flood protection strategies are to be planned on sound scientific principles and with adequate technical information base so that proper management will be ensured.

Water harvesting is one of the interventions that could help control flood and conserve water in the region. Various options are indicated. They include: rehabilitation of the tanks and ponds, provision of water harvesting structures in non-command areas, improving the pumping schemes and additional wells for recharging.

The total cost of the investment in controlling flood related management and rehabilitation strategies in 2007 prices will be about Rs. 6342.85 lakhs consisting of Rs. 736.54 lakhs for rehabilitation of 124 tanks, Rs 3584.50 lakhs for 270 water harvesting structures in non-command areas and Rs 2021.81 lakhs for installation of new pumping schemes as well as rehabilitation of the existing pumping schemes.

5. ISSUES ENCOUNTERED & RESOLVED

Issues Encountered and Resolved

Three ITP researchers left the program during the reporting period. They are: G. K. Ambili, Sree Lakshmi and Dr. Rakesh Tiwari. During the same period, Dr. M. V. K. Sivamohan, a senior researcher in the irrigation sector, was appointed as a Consultant in ITP for a period of five months. Ms. Nidhi Ladha was hired for editing the research papers selected for APM proceedings.

In July '08, Dr. Dinesh Kumar, ITP team leader left the program and Dr. K. Palanisami was appointed as the ITP Director in the same month. Two other ITP researchers left the program in the month of September '08. They are - Kairav Trivedi and Sacchidananda Mukherjee.

Staff Recruitment

An interview was conducted by the ICRISAT – IWMI staff to recruit the research staff to the ITP on Nov. 24, 2008. 12 persons applied for the position and 5 were short listed for the interview. Two were selected and they are expected to join during Jan. 2009.

As such some gaps existed in the implementation of the assigned tasks in the middle of the year (about 4 months) due to staff movements. The works, however have been speeded up after the joining of the Director, ITP and the formation of the Steering Committee. Now things are in place and activities will be carried out as per schedule.

6. FUTURE PLAN OF ACTION

Future Plan of Action

A major development in the overall management of ITP research during the reporting period was the selection of a three major themes for research with a long time frame. The leadership had invested significant chunk of time and resources to set the research agenda for ITP for the remaining part of the second phase, and to design strategies for achieving better impact of the research on policies and actions relating to water management in India.

ITP has moved to a new organizational phase, with new leadership, management structure (formation of the Steering Committee) and at the program level, a shifting focus from active research to policy intervention and information dissemination.

The next 2 years of the program will focus on drawing on policy interventions from the ITP research studies carried out. Policy intervention through policy notes, policy dialogues and networking with strategic partners at Central as well as at the State level will take priority.

Building capacities of various stakeholders through appropriate modes including fellowships, workshops, training and field visits is also seen as a major activity in the next 2 years.

Awareness material in vernacular will be released to cater to the needs of the farming community and extension workers at the universities and the government department. Already steps were initiated to bring out a bulletin on Water Management: Questions and Answers. This will be published in 7 states initially within the next 3 months and based on the responses, it will be extended to other states as well. Resource persons have been identified for the bulletin preparation covering about 200 questions and answers in the local languages.

Three – four policy interaction and capacity building workshops will be organized exclusively for the policy makers and other bureaucrats in the water sector during 2009. Further, institutions under SRTT funding will be given a capacity building exercise with policy focus to strengthen their ongoing as well as future activities.

ITP will also translate all the research studies carried out in different regions and will prepare a synthesis report and will be presented in selected states. To start with Andhra Pradesh, Mahatrastra and Gujarat. Will be covered during 2009.

Using the already done research studies under the ITP, selected publications (books) will be published in the next 2 years of the ITP.

ANNEXURE

ANNEXURE 1

Review report on:

North Gujarat Sustainable Groundwater Management Initiative (NGI)

A pilot project, "**North Gujarat Sustainable Ground Water Management Initiative (NGI)**" was established in 30 villages of four taluka of Banaskantha district with support of Sir Ratan Tata Trust (SRTT), Mumbai in 2002.

After successful completion of the pilot phase for nearly three years, second phase of "North Gujarat Initiative (NGI Phase-II)" was launched for another three years in July 2005 with a generous grant from SRTT, Mumbai. The project is being implemented in Banaskantha, Patan and Mehsana district of north Gujarat, in partnership with two civil society organizations (CSOs) with support from SRTT. The civil society organizations asscoated with the NGI are: M. G. Patel Sarvodaya Trust, Amirgarh, and Cohesion Foundation Trust, Ahmedabad.

Specific objectives of the NGI project are:

I. Create wider awareness about the negative socioeconomic and ecological consequences of farming practices that depend on intensive use of groundwater; and other external inputs such as fertilizers and pesticides, covering six talukas in Banaskantha district.

II. Share knowledge and information about sustainable farming models that are grounded on ecologically sound and environment friendly practices organic manuring, vermi-composting and bio pesticides, use of plastics in agriculture and introduction of low water intensive crops, and local groundwater recharging;

III. Demonstrate positive impacts of sustainable farming –micro irrigation, low water consuming crops, organic farming—on soil-plant ecosystem health, soil bio diversity, agronomic and economics aspects of crop production through setting up of on-farm demonstrations in the project villages;

IV. Facilitate large-scale adoption of sustainable farming practices in north Gujarat region;

Summary: Current status and suggestions for up-scaling:

No.	Objective	Current status & suggestions
I	Create awareness about farming practices	70% Achieved*. Need more bulletins and publications in local languages. Pump efficiency and minimization of water losses can be exposed to the farmers so that water use efficiency can be improved. Record keeping by the farmers about input use, crop yield can be encouraged for long term study of such interventions.
II	Share knowledge and information about sustainable farming models	70% Achieved. More demonstration units in selected locations be established. Also more training camps be organized in other locations in association with the local agrl departments and agrl. University/research stations. Field workers also need training on the latest agrl. practices from the agrl university.

III	Demonstrate positive impacts of sustainable farming	65% Achieved. Need more demonstrations involving local agricultural and water management experts in dealing with the calculation of the water budgeting for the farm level; preparation of fertigation schedules for different crops; soil and water testing. A mini soil and water testing lab will be more useful and can operate on the agri. Clinic mode. Dr Raman, Retired professor of water management from Junagah agrl station may be contacted for providing services in this direction.
IV	Facilitate large-scale adoption of sustainable farming	Partially addressed. Link with the ongoing government programs should be established. Weather based crop insurance programs can be introduced to the region using the already available schemes on this. Commodity groups may be registered for getting more support from the ongoing govt. programs. Exposure on supply chain management in horticulture crops be given.

Note: The percent achievement was arrived based on the mutual discussions with the project team.

ANNEXURE 2

ITP Steering Committee (SC)

No	Name	Affiliation	Position in ITP SC
1	K.Palanisami	Director of the ITP, IWMI, Hyderabad	Secretary
2	Madar Samad	Principal Scientist & Director, IWMI South Asia office, Hyderabad	Member
3	Arun Pandhi	Senior Programme Manager, SRTT, Mumbai	Member
4	Tushaar Shah	Principal Scientist, IWMI, Anand	Member
5	David Molden	Deputy Director General, IWMI, Colombo	Member
6	Mark Giordano	Principal Scientist and Theme Leader, IWMI, Colombo	Member

TOR of the SC

The committee will meet once in 3 months to-

- Review the progress made
- Suggest new ideas for incorporation in the program and linking with IWMI's priorities
- Provide overall guidance in the implementation of the ITP.

The SC has been effective from August 1, 2008 onwards.

In addition, the Director ITP will review the progress of the individual research component as per the TOR. Both the review reports and field visits by the Director ITP will be carried out for all the program

Fund release will be done according to the progress made as per the TOR and the reasons for any delay in achieving the target will be examined and needed interventions will be made accordingly.

In the agreement of the ITP (2nd phase), it is mentioned that regular reviews will be conducted to quantify the following after commencement of the project:

a) The impact of the research in the water sector focusing on issues of exclusion, issues of the distressed sections of the people and issue of unattended regions,

b) Initiation of a discourse on salient issues of finance and management facing the irrigation and water management sector in the country,

c) Contribution to policy processes at state and central level,

d) Impact of the technical; support to the trust's grant making in the field of natural resources and livelihoods,

e) The new themes evolved for initiates by the trust in the NRM field,

f) The NRM and livelihood strategy evolved for the Trust for two new regions (North east and South India) and

g) The advocacy and dissemination strategy of the ITP discussion papers.

Director ITP and the team will address each of the above components using the already completed as well as ongoing research programs.

ANNEXURE 3

Major Outcome of the 1st ITP – Steering Committee meeting held on 21.8.08 at IWMI, South Asia office, Hyderabad.

Research Proposals

1. Proposals that attract funding from other agencies can be addressed accordingly. For eg., SRI, where SDTT has more focus on SRI and this can be linked under SDTT funding.

2. Only those proposals which have more impact on the policy aspects should be taken up with the aim of ITP focusing on the short, medium and log-term objectives.

3. Number of proposal (2008-09) can be reduced so that monitoring and output delivery will be ensured.

4. Regarding the 15 pending completion reports for the studies awarded during 2007-08, the researchers / institutions will be requested to send the reports within the next 3-6 months or the contracts as such can be withdrawn.

Funds

1. The ITP funds should be utilized where there are more opportunities, where actions are possible and where actions will be significant.

2. Atleast 20% of the funds can be kept under non-committed basis so that priority spending can be done as and when necessary for policy interfacing case studies and policy dialogues.

3. While making the new contracts / grants, the 3 part activity delivery mechanism should be enforced so that according to the time frame of the contract / grant, monitoring will be easy and deliverables can be assured under the given time frame.

4. IWMI will explore a third parties to support the ITP 's ongoing research and dissemination activities.

Training and capacity building

1. Under each project, the policy, capacity building and training aspects could be connected together for more impact.

2. Best case studies and concrete results can be taken up and presented and disseminated for up-scaling

Policy advocacy and communication

The ITP will come out with an effective communication strategy to convey significant outcome / policy prescriptions to policy makers at central and state level. ITP will also prepare policy briefs to communicate interventions that could be taken up by government agencies, NGOS and other stakeholders.

Reports & Publication

1. Synthesis report should be prepared combing the topics under the themes and the research gaps should be adequately indicated so that additional research / policy focus can be given for further follow ups. In that process, few questions that are policy relevant could be identified.

2. Impact analysis should be prepared covering all the works done already as well as for the proposed works. Hiring an impact analyst could be done.

3. High quality Peer reviewed books and papers and impact-making policy briefs should be published from the results of the ITP

4. ITP should work more in the next 3 years on the consolidation of the results and effective dissemination of policy interventions to the implementing agencies.

5. SRTT and IWMI recognized the valuable contributions of ITP to date. It was agreed that ITP should explore possibilities for extending the program for the 3rd Phase.

ANNEXURE 4

Major Outcome of the 2nd ITP – Steering Committee meeting held on 28.11.08 at IWMI, South Asia office, Hyderabad.

Research Proposals

1. While agreeing for the proposed projects 2008-09 under the ITP funding the committee suggested that related components of the IWMI- Gates project can also be linked with the proposed ITP studies so that third party involvement in the ITP activities can be assured.

Also the IWMI Theme leaders can be informed of the proposed ITP funded studies so that they can explore the linkages with the ITP.

2. The SRI adoption study can also be extended to Eastern states like West Bengal or Jarkhand so that it will reflect the different water supply situations.

3. Reminders for getting the final reports of 2007-08 studies can be sent again and if no response within the next 2 months, then the studies can be withdrawn.

Training and capacity building

1. Three capacity building proposals suggested by Tushaar Shah, viz., Sardar Sarovar post project design scenarios, Dugwell recharge scheme in Gujarat and TamilNadu, Micro irrigation in Gujarat and Andhra Pradesh are taken up by IRMA students under NRLP. Similar projects can be taken by IRMA students under ITP capacity building activities.

2. Selection of M.Sc and Ph.D students for short term research (already 7 shortlisted : 1- AP; 2 – Gujarat; 2 – Tamilnadu; 2-UP (Communication through IWMI –Tata web site) can be completed soon and topics be identified. The Capacity Building expert at IWMI, HQ will be informed to get his feed back.

Publications/disseminations activities

The following activities are agreed with information to communication expert at IWMI HQ who will help in fine tuning the activities:

a. Bulletin on the important policy interventions

b. Water sector interventions – State wise for 7 states

c. Water education – Technology related questions in regional languages

d. ITP related Newsletter – 3 issues in 1year (from 2009)

e. Publish water related articles in daily newspapers, based on ITP research

Policy interventions with Govt. departments

The committee agreed to the proposed activities such as:

- Presentation of a synthesis report on Tamilnadu Irrigation – investment trends and potential for improving the irrigation performance to the State Planning Commission, Govt. of Tamilnadu on Dec. 12.2008 where Secretaries of the Govt. departments dealing with water issues will be participating

- A detailed analysis of research and development priorities in State's water sector: To start with states like Karnataka, Gujarat, Maharastra will be covered in the next 4 -6 months.

- A discussion meeting with the Secretary Ministry of Water Resource, GOI in New Delhi in January / February 2009

period (2007). The increased investment along with other efforts have not only increased the area under irrigation from 22.56 million hectares (mha) in 1950-51 to over 85 mha in 2004-05 but also increased the production of food grains and other agricultural commodities manifold.

Even though, agriculture sector still continues to be major consumer of the water resources, this sector is expected to diversify according to the changing needs of the domestic and international demand. Hence needed interventions have to be made in order to make the irrigation sector competitive to the changing scenarios of water demand. Poor operation and maintenance of canal system is leading to poor water use efficiency, which needs to be improved because of growing water scarcity across different regions in India. Further, adequate revenue generation is essential for managing and sustaining the irrigation sector and therefore, the poor recovery often considered to be a stumbling block for improving the service quality and other rehabilitation work needed for the sector.

Improved service quality, accountability on expenditures, improved assessment of irrigation charges and users participation through formation of WUAs are very important for increasing the performance of irrigation sector. Since irrigation is a state subject in the country, it is important to see how best the needed water sector reforms could be incorporated in the future investment programmes of the concerned states.

Research questions

1. What will be the future demand and supply scenarios of water in different states
2. How the cost of water varies across states and uses
3. How the watershed programs and tanks systems perform in different regions
4. What are the needed reforms in different states

Scope of the study

- Study of the major outcome from the completed and ongoing research studies
- Derivation of the demand and supply using PODIUM model with Dr Uapli Amarasinga
- Discussion in stakeholders meet and finalize the investment priorities for the state's water sector

Specific tasks

The study will be undertaken mostly based on the available details (published as well as unpublished reports). Discussions with different stakeholders will form the base for deriving the future investment options. Primary data wherever needed could also be collected.

1. Collection / acquisition of data / reports from for different irrigation projects from irrigation departments / individuals relevant for the study
2. Designed questionnaires / instruments in consultation with Dr. K. Palanisami

3. Submit progress reports

4. Synthesize the information / data as per the expected deliverables

The details needed are given in Box A.

Deliverables

Two drafts reports will be prepared

- A draft state water policy
- A report on priority investment options for the state

In addition to project reports it is required to provide the cleaned Excel database containing primary and secondary data

Duration : 6 months

BOX - A

Outline of the water sector intervention study at State level

1. Description of the Existing State Water Policy
2. Current status of water supply (current and next 15 years)
   - Rainfall pattern
   - Surface water supply (reservoir and tanks - number and water quantity)
   - Groundwater supply (wells - number and water quantity)
   - Issues relating to water supplies
3. Cost and pricing of water
   - Cost of surface water in Rs / cu.m (reservoir& tank)
   - Cost of groundwater in Rs / cu.m (open & tube wells) including pricing of electricity in the state
   - Cost of municipal water supplies in Rs / cu.m
   - Cost of treated water supplies in Rs / cu.m
   - Pricing of water under crops sector in Rs / acre
   - Pricing of water under domestic sector in Rs / cu.m
   - Pricing of water under industry sector in Rs / cu.m
   - Pricing of water in other uses in Rs / cu.m

- Opportunity cost of water under different sources

4. Water use efficiency (irrigation, domestic and industry sectors)
5. Review of the watershed programs: existing status, and future strategies
6. Review of the irrigation tanks: existing status and future strategies
7. Future Investment strategies (physical quantity and cost):

- Surface water
- Groundwater
- Treated water
- Recharge programs

8. Management strategies (physical quantity and cost):

- Crop management programs
- Water management programs

9. Other strategies specific to states (physical quantity and cost):
10. Implementation mechanisms (who and what to be done)

States to be covered:

Andhra Pradesh, Karnataka, Tamilnadu, Uttarpradesh, Bihar, Gujarat, Rajasthan and Maharastra.

2. Water transfer and value of water in alternative uses: A case of peri-urban Chennai, Tamilnadu

Background

With the growing population and shrinking water supplies, several cities are facing serious water shortages and the interventions made in providing additional supplies are always costly or not feasible. Hence it is important to see how the cost, value of water changes among sources and uses as well as the affordability of the consumers. Chennai is the fourth largest metropolis in India. The extent of Chennai Metropolitan Area (CMA) is 1189 km with a population of 7.041 million as per 2001 census. The city has a dubious distinction of receiving an average annual rainfall of 1300 mm, yet has a lowest per capita water supply of 76 lpcd. With inadequate surface water storages (There are no major surface water sources still to be tapped), the already 'stressed' Chennai basin depends largely on groundwater and through schemes that convey water both within and between States.

The dwindling groundwater table, seawater ingress and saline up coning as far as 15 km inland, complicates the problem and limits it's mining along the fragile coastline. Interstate waters

and long distance conveyance until now have not proved and could not be relied for reasons that are more than technical and managerial. Until now the managers of water (under the government) have reduced and resorted to alternate day supplies or rationed water through tankers during acute scarcities. This demand for the ubiquitous resource has led to private water markets in the region.

Emerging water transfers

Water scarcity is often a resultant of failed monsoons. Changes in time, space and spread on rainfall decide the runoff and the subsequent reservoir storages apart from recharging of groundwater. It's this time, the groundwater, which is more dependable, comes as a buffer.

When piped water supply is insufficient, commercial establishments scout for water through tankers. These radiate out along the peri-urban areas in search of relatively good quality of water, and often end up buying water from farmers who are more than willing to sell with relatively low / no investment (as required for the agricultural operations) and man power. This informal and unregulated water market, which brings water from peri-uran areas into Chennai, caters to the needs of domestic users, hotels, hospitals, educational institutions and other commercial enterprises.

Based on demographic trends of increasing population density, migration and urbanization, it is projected that by 2026 the population in CMA would be 12.582 millions, changing the patterns of competition for freshwater. It has been estimated that the future requirement (2026) of water is 1360, 1750, and 2248 MLD based on a 100, 120 and 150 lpcd. The second master plan for Chennai lists an availability of 1950 MLD during 2026 however, this is far from reality. In terms of quantity, even after all the Krishna water arrives, there will be a substantial and ever-increasing gap between the demand for, and supply of, water. Additional surface water supplies will be very expensive and very difficult to augment. The Araniar-Kusaithaliayar (A-K) basin aquifer holds enormous promise for providing Chennai with a low-cost supply of high-quality water, potentially in quantities comparable to the Krishna Phase I and Phase II supplies.

The Issues

Water from peri-urban irrigation wells are sold to the detriment of cultivation in their own lands and those of neighbouring farmers. Water transfers from peri-urban areas to the city results in a few well owners earning good money from selling water from their wells. Keeping the cultivable land fallow, in spite of the resource availability (water) results in loss of jobs, local income and reduced government revenue. The absence of high value crop, which otherwise cultivated results in increasing demand and price rise multiplier effects. Successive bad years render the current fallow into permanent fallow or transform into land put to other uses.

The ground water quality in these wells, which sell water, is a matter of concern as many sellers admit to deteriorating quality whose opportunity cost for reclamation outwits the returns one enjoys while selling. Chennai metro water itself has entered into an agreement to procure water from farmers through an agreement. The recent additions to address the water

augmentation is the establishment of two (100 MLD each) desalination plants at the north-eastern fringe and south eastern fringe. The collective availability of resource in one location could shift focus of ground water markets. Further there are several issues related to quality front and environmental sustenance has been raised by experts.

The present study forms a plat form to understand the dynamics that exist in water scenario across space and time in the transfer of water from rural to urban and the associated costs involved.

Justification

There is no likelihood of additional allocations from Krishna River. The cost of bringing additional water from outside Chennai Region is prohibitively high. Water from Cauvery River via the Veeranam Tank project would have cost over Rs.16/m^3 (as delivered to the treatment plant). Additional, affordable raw water for Metro water is primarily going to come from the Chennai Region, in the form the re-allocation of water from irrigation (which accounts for 87% of abstractions in the Chennai Region.). The output of the study will be useful in framing suitable interventions in the urban water supplies.

Methodology

The process involves a rapid visit of the project area in the northern fringes of Chennai, intense discussions with key stakeholders and technocrats, followed by detailed documentation and framing of objectives, hypotheses and expected outcome from the study.

Deliverables

- Current and future growth of water transfers (within agriculture and other sources) in peri-urban CMA?
- Cost of water from different sources and value in different uses
- Elasticity of demand
- Possible impact of the water purchasing agreement signed by the Metropolitan water board with some farmers of peri-urban areas of Chennai?
- Possible on impact of private water markets that do not have an agreement with Metro water?
- Possible shift in groundwater market demand with the supply of desalinated seawater from the northern and southern fringes of CMA?
- Possibilities for increase in water use efficiency in light of heightened water transfers.
- Examination of possible linkage between water supply and sewage reuse in the non consumptive use by industries and commercial establishments
- Changes in agricultural practices and land-use patterns, the related income divergence, and alteration of socio-economic structure.

Duration: 4 months.

3. Privatization of Water Supply through Public-Private Participation: A study of the Tiruppur Model, South India

Background

Efficient water allocation is lacking world over and the price and value of water vary across uses and regions. Tradable water is expected to help for efficient water allocation and setting investment priorities. In many parts of the Tamil Nadu State, India water sources are said to be overexploited or poorly maintained leading to certain undesirable consequences such as salt water intrusion in coastal areas, depletion of surface water flows and depletion of underground aquifers leading to secular lowering of groundwater table and salinization of water bodies, thus jeopardizing the present and future water supplies for agriculture, increasing migration and unemployment etc., especially in those areas where surface water supplies are insignificant.

In Coimbatore district, which is one the progressive districts in the State both interms of agricultural and industrial development; water resources overexploitation is prevalent in a large scale both in rural and urban / industrial uses. The number of wells with independent ayacut in the district has increased from 33,890 to 1.04 lakh between the years 1959-60 and 1999-2000. The density of wells and the number of wells per hectare of net sown area have doubled in the last 40 years resulting in severe well interference and a net reduction in the area irrigated per well. In addition, as urban areas and non-agricultural economy grows, water is allocated to high value, generally non-agricultural, uses through water transfers and the consequences of such transfer should be examined.

Context and Objectives of the PPP

In 1995, the special vehicle New Tirupur Area Development Corporation Limited (NTADCL) was set up as public limited company, with equity holders consisting of Government of Tamil Nadu, TACID (Tamil Nadu Corporation for Industrial Infrastructure Development), Tirupur Exporters Association (TEA) & Infrastructure Leasing & Financial Services (IL&FS). Floated as the first public-private partnership in the water sector, this BOOT experiment has been operational since August 2005. It is responsible for the off take, treatment and transmission of water, distribution of water to industries and the municipality for domestic consumption, and treatment of the collected sewage, and maintenance of the sewage treatment plants. The project primarily seeks to address the water needs of the industrial area in Tirupur, with bulk of the water being supplied to the industry.

NTADCL: A water revolution in Tirupur?

The Tirupur Water Supply Project originated in the context of domestic water supply being limited to a few hours on alternate days; industries not having access to piped water supply and relying heavily on water tankers for water supply; available water sources – both surface and groundwater polluted heavily by the textile industry and the fast depleting ground water in the region.

The initiative for the formation of NTADCL came from Tirupur Exporters Association (TEA). TEA, a registered society of owners of the industrial units manufacturing textiles in Tirupur, supported a plan for the development of infrastructural facilities, particularly those relating to water treatment and supply and sewage treatment for the enhancement of the productivity and export potential of the industrial units in Tirupur. The Government of Tamil Nadu mandated the Tamil Nadu Corporation for Industrial Infrastructure Development Limited (TACID) to identify infrastructure projects so as to enhance Tirupur's export and industrial potential.

TACID formulated an integrated Tirupur Development Plan (TADP) in 1993-94, for the Tirupur Local Planning Area (TLPA) which envisaged several schemes, including those relating to services of treatment and supply of potable water in the service area and the off take, treatment and disposal of sewage in Tirupur Municipality. The Government of Tamil Nadu along with TACID and TEA, with a view to leveraging the resources approached IL&FS, a non banking financial services company, for assistance in raising finances for the project. A Memorandum of Understanding was signed on 25th August 1994, between Government of India, TACID, TEA and IL&FS. The Concessionaire contract (Build-Own-Operate-Transfer) for a period of 30 years, has been granted jointly by the Government of Tamil Nadu and the Tirupur Municipality to the New Tirupur Area Development Corporation Ltd (NTADCL). In furtherance of this MoU, NTADCL has been incorporated on 24th February 1995 as a public limited company under the Indian Companies Act, 1956 with initial equity participation from GOI, TACID (representing GoTN), TEA and IL&FS. GoTN and the Tirupur Municipality have agreed to grant NTADCL a Concession, to develop, finance, design, construct, operate, maintain and transfer on strictly commercial principles on an integrated basis, the water treatment and supply facilities and sewage treatment facilities including the right to draw water from the river Cauvery.

Under this concession agreement, NTADCL undertakes, either by itself or through its subsidiaries, to implement the project, on strictly commercial principles on an integrated basis, to:

(a) provide a water abstraction, treatment and distribution service by undertaking to develop, finance, design, construct, own, operate, maintain and transfer to GoTN or its nominee, the Water Treatment Facility for the purpose of supply of Potable Water to TM and other purchasers, outside the jurisdiction of TM at the Water off take points

(b) provide sewage off-take, treatment and disposal service by undertaking to develop, finance, design, construct, own, operate, maintain and transfer to GoTN or its Nominee, the Sewage Treatment Facility, for the purpose of off taking, treating and disposing Sewage, delivered by TM at the Sewage Off take points

(c) Develop, design, finances and construct the Water Distribution System and the Sewerage system, which would be transferred to TM by NTADCL upon the issuance of the Construction Completion Certificate

The agreement provides for recovery of costs and operation and maintenance through a composite water and sewerage charges. The tariff structure provides for annual revision linked

to indexation and any unusual increases are to be approved by the Price Review Committee. The base project return is 20% pa on 185 MLD project cost. The EPC1 contractor (River intake well and pumping station; water treatment plant and booster pumping station; transmission main-56 kms; master balancing reservoir) is Hindustan Construction Co. Ltd. and EPC2 Contractors (3 Feeder Mains – 93 kms; water distribution stations; distribution network; distribution network to wayside villages; sewerage system – 124 Kms; low cost sanitation) are Mahindra & Mahindra and L & T Ltd. The O & M contract has been awarded to United Utilities, U.K and Mahindra & Mahindra.

The other related contracts apart from the concession agreement include Concession Agreement, Bulk Water Supply Agreement between NTADCL and Tirupur Municipality, Shareholders' Agreement, Common Loan Agreement, Engineer Procure Construct Contract, and Operation & Maintenance Contracts.

Bidding Process, NTADCL selected a consortium for the design and construction of the project facilities and their operation and maintenance over the concession period, through an international competitive bidding process. Global tenders were called for, and after selection the O&M contract was awarded to a consortium led by the Mahindra Group, with Bechtel Enterprises and United Utilities International, UK, being the other members of the Consortium. While ownership of the project assets lay exclusively with NTADCL in its capacity as the concessionaire, the consortium has an equity share in NTADCL.

The water supply and sewerage system is expected to supply 185 million litres per day to about 900 textile firms and over 1.6 million residents in Tirupur, Tamil Nadu and surrounding areas. About 125 million litres per day (MLD) of water is to be supplied to knitwear dyeing and bleaching industry, 25 MLD to residents of Tirupur including 60,000 slum dwellers and 35 MLD to the region's remaining rural towns, villages and settlements.

Economic gains and loss to urban water transfers through PPP model

One of the major issues in the water transfer is the third party impact on the economic base of rural farming and downstream communities. Water transfers can generate three different types of impacts namely, direct, indirect and induced impacts. Direct impacts are those employment and income impacts that are immediately and explicitly related to agriculture. The direct impacts include the loss of irrigated acreage, change in farming practices, change in employment and rural income. Indirect impacts are determined by forward and backward inter-industry linkages, i.e., the extent to which agricultural products are used in the production of other locally produced products (e.g., ginned cotton, edible oils, fruit juices, etc.,), or those agricultural products which utilize raw materials or intermediate products or services that are also provided locally. Induced impacts occur through changes in local income and population. Impacts of agriculture to urban / industrial water transfers that result in loss of irrigated agriculture may have no significant economic impacts. When viewed from a micro level, such impacts are substantial but not devastating. Farmers and other local interests' fear that water transfers will lead to idling of farmland, loss of jobs and local income, reduced government revenue, and increased costs of social programmes.

The impacts of water transfer and pollution are potentially far reaching, not only for the agriculture sector. Farming can inflict off-farm costs on land degradation through the processes of depletion and salinisation and changes in hydrological pattern and water quality. Ultimately, the continuous exploitation of water resources can reduce future economic growth considerably. Policy makers require answers to questions related to the cost and benefit structure of water transfer and its related pollution from urban and industrial use, and to prioritize problems and design incentive structure that make water conservation and management measures more attractive. An important task is to appraise the actual extent and positive and negative impact of water transfer to urban and industrial uses through Public and Private Partnership and to evaluate their economic and environmental significance. This is possible only if an appropriate assessment framework and tools are available that allow for the identification, quantification and valuation of the impacts of water transfer to urban and industrial use. In this context, it is imperative to take up a study on the economic and environmental impacts of water transfers through PPP model. The present study was taken up in Tiruppur city of Coimbatore district where river water transfer has been taken up through PPP model for the past five years and it has an increasing phenomenon on productivity and efficiency of water use in urban and industrial sectors.

Deliverables

- Pattern of water use by the urban and industrial sectors and the price and value of water in different uses including elasticity of demand
- Factors influencing river water transfer and to analyze the marketing practices related to river water transfer,
- Quantification of the impacts of economic and environmental gains / losses related to the river water transfer through Public and Private Partnership model (PPP model),
- Policy options for effective allocation of scarce river water to among urban and industrial uses.

Scope

The output will be useful for policy makers and future researchers in water economics to derive optimal water allocation and management programs covering different sectors. . The price and value of water will help for fixing the price for water.

Duration: 4 months

4. Water Management Research and Upscaling the Interventions

Background

It is argued that by improving the existing water productivity by 10%, it is possible to increase the irrigated area by 14m.ha. (MoWR, 2007). It is important to see how this could be achieved both in the short run and long run. While future water needs for irrigation, which continues to be the major source of India's future water demands, depends on water productivity, very little

is known about the current levels of water productivity in different regions. One of the ways to address this will be how best the water management research that are done in different regions of the country could be translated into the field conditions so that more people could adopt it. Among the many types of water management research done in the past as well as being continued at present, the concept of water productivity and "more crop per crop" have gained acceptance in academic and policy circles in India. Even though, efforts are being made in all aspects of technology transfer, it is still not fully understood how this is being successfully done in all the regions covering different crops and seasons. Very little understanding exists on the drivers of change in water productivity in both physical and economic terms.

On-farm water management and farm management can improve crop water productivity. But, farmers' ability to carry out on farm water management depends on the quality and reliability of irrigation water supplies. Further, their ability to carry out agronomic practices also depends on the quality and reliability of irrigation. The real issue is that significant improvements in water use efficiency in agriculture are not possible, and that there are operational difficulties in affecting demand regulations in both agriculture and domestic sectors.

Water Management Research - Important questions

a) Within the larger questions of "more crop per drop", there are questions of how water productivity (Rs / ET) varies from crop to crop; how does water productivity (Kg / ET) of the same crop vary with change in agro-climate; how does water productivity of a rain-fed crop change with supplementary irrigation; between rain-fed crop and irrigated crop, which one generates more biomass and income; how important is rain-fed production when compared to irrigated production in terms of enhancing basin water economy?

b) Many researchers believe that the huge stock of groundwater and plenty of surface water resources in locations such as the Ganga-Brahmaputra-Meghna basin could be tapped to increase India's irrigation potential and meet India's future water needs. Suggestions for policy interventions often made to boost the demand for water in agriculture had looked at the ways to overcome economic constraints, ignoring the agro-hydrological, ecological, political, and sociological features.

c) While water productivity and water saving are being cited as reasons for pushing SRI, scientific data from field trials to prove claims of real water-saving and yield gains are missing.

d) National and regional agencies had invested in rehabilitating tank irrigation systems in an effort to revive them. On the other hand, there have been limited attempts to understand the functioning of tanks as part of an integrated hydrological system comprising groundwater, surface water and catchments. In many situations, tank ecologies are embedded in regions which have experienced dramatic increase in groundwater use, and major land-use changes. While investing in tank rehabilitation, the government is also simultaneously investing in watershed development in the upper catchments.

e) It also considered some improvements in yield of rain-fed crops, which in turn means, lesser pressure on irrigation water to produce a unit of agricultural produce. Proponents of rainwater

harvesting have been successful in projecting "local water harvesting solutions" as a significant alternative to the conventional water projects that involve large engineering interventions, huge capital investments, and having major social and environmental imperatives. But, very little systematic and scientific analysis exist to show the potential of rainwater harvesting and groundwater recharging, particularly the extent to which it can reduce the supply-demand imbalances specifically in water-scarce regions. More importantly, the extensive documentation available on RWH traditions in India is silent about the economic viability issues. Very little analysis exists about how well the rainwater harvesting projects fare in terms of cost and economics, as compared to large water resource projects.

f). Drip irrigation is advocated by the government of India (GOI) as a panacea for all water problems in water-scarce regions. The Task Force on Micro Irrigation constituted by government of India estimates the area that can be brought under micro irrigation systems at an astronomical 97 m. ha. But, little attention has been paid to the constraints facing the farmers in adopting this system such as: erratic power supply conditions; and lack of clear economic incentives for saving water and energy due to inefficient pricing of electricity and water. The existing cereal dominated cropping systems and the small sizes of land holding of farmers are other physical constraints. Also, the incremental private returns from crop production with drip irrigation offset additional investments for many crops, meaning farmers even otherwise have strong incentive to go for it. Such analysis would help judicious allocation of public funds.

Focus on Water Productivity: Research to policy

Integrated Water Resources Management has been on the global water agenda for a long time, and has significantly attracted the attention of all. But the question of how it can be implemented in different socio-economic and political situations remained unanswered. Nevertheless, an important question that needs to be addressed is what type of integration really matters in water management approaches, and what kind of improvements they can bring about in water scenario, i.e., whether it is the integration of the physical systems or that of human systems or a combination of both.

Globally research on water productivity had its accent on increasing biomass output per unit of depleted water. But there are complex considerations involved in assessing water productivity in agriculture. They change with stakeholder interests, the objectives of water productivity analysis, and the unit of analysis. Transposing the findings of the research from the west to Indian situations would be meaningless. The distinct features of India that make the conventional "more crop per drop" approach less versatile are: smaller land holdings; relatively lower volume of water handled by farmers; inefficient pricing and zero marginal cost of water, or the energy used for pumping groundwater; uncontrolled water deliveries from public systems; and lack of institutional regimes governing access to groundwater in particular and surface water in general.

The use of economic concepts such as the "value of water in its use" for managing water allocation decisions is extremely limited, if not absent. While conventional economic theory

suggests that the value generated from the use of a resource would be high in regions where it is scarce, and low in a region where it is abundant, this had rarely found application in planning and designing water transfer projects. Given the fact that the country is characterized by regions of differential water resource endowments, and water demands that juxtapose with high demands in regions of natural shortage and low demands in regions of resource plentiful-ness, the concept of incremental economic value has great relevance in managing water economies.

Water policies and water laws relevant for India

Equally important is the concern how the research could be translated into policies and what policy questions are more relevant. What existing policies and laws are handled by different sections of the community? What has been the motive behind the recent policy initiatives by various state governments in the water sector? How far the recent water policies reflect the true concerns of various stakeholders in water management? Do the policies and acts get implemented in their true spirits and under what conditions? If not, what are the technical, administrative, institutional and political bottlenecks in implementing these policies?

Scope of the study

- Study of the major outcome from the completed and ongoing research programmes,
- Derivation of the value of water from the results of the studies
- Examination of the technologies that can be upscaled with their profitability and their adoption strategies

Specific Tasks

- Collection / acquisition of data / reports from different water technology centers and schemes
- Designed questionnaires / instruments in consultation with Dr. K. Palanisami
- Submit progress reports
- Synthesize the information / data as per the expected deliverables.

Methodologies

There are several water related schemes operating in the country. In the case of ICAR, several water management schemes are functioning in several states in addition to the three water technology centers. The Ministry of Water Resources, GOI, international organizations and other governmental and non-governmental organizations are also involved in such technology related research and outreach activities.

The three water technology centers and few selected water management schemes in the country will be covered for the study.

Deliverables

Three drafts reports will be prepared

- A review of the technologies developed along with their cost and benefits
- Impact of the water management technologies in increasing yield and income
- Estimation of value of water in different situations and uses

In addition to project reports it is required to provide the cleaned Excel database containing primary and secondary data

Duration: 8 months

5. Financial Performance of India's Irrigation Sector: A Macro Level Analysis

Background

The importance of irrigation development in the growth of agriculture and others sectors has been very well corroborate by a number studies. The government sector alone has invested over Rs.1556 billion (in current prices) for irrigation development upto the end of tenth plan period (2007) in India. The increased investment along with other efforts have not only increased the area under irrigation from 22.56 million hectares (mha) in 1950-51 to over 85 mha in 2004-05 but also increased the production of food grains and other agricultural commodities manifold. While the contribution of irrigation to the overall development of agriculture has been well recognized, the financial position of the sector, which is key for sustaining the sector, has been deteriorating over the years partly because of increased operation and maintenance expenditures as well as low and unrevised water rates. The financial rate of recovery was close to 100 percent in 1975-76, but went down sharply to 7.90 percent in 2002-03. Historical data suggests that the irrigation sector in fact was making a net positive contribution to the government finance up to early 1950s; revenues from irrigation water charges exceeded the government expenditures for operation and maintenance plus imputed interest on investment. But, this has completely changed by late-sixties, where capital costs were no longer being recovered and a net annual loss was reported.

The issue of improving the recovery rate is one that has occupied the attention of policy makers in India for quite some time now, in the context of not just maintaining the existing irrigation potential, but also expanding it through future projects. According to the recent study of World Bank (2005), much of the irrigation infrastructure has been crumbling owing to paucity of funds for operation and maintenance. Poor operation and maintenance of canal system is also lead to poor water use efficiency, which needs to be improved because of growing water scarcity across different regions in India. Adequate revenue generation is essential for managing and sustaining the irrigation sector and therefore, the poor recovery often considered to be a stumbling block for improving the service quality and other rehabilitation work needed for the sector. The existing literature seems to suggests that the poor financial performance of the Indian irrigation sector occurs mainly because of increased operation and maintenance expenditures as well as low and unrevised water rates by different states. Though improved service quality, accountability on expenditures, improved assessment of irrigation charges and users participation through formation of WUAs are very important for increasing the recovery performance of irrigation

sector, studies have conveniently ignored these issues. Importantly, not many elaborate studies have been carried out on the issue of financial recovery covering national and state level data, after the submission of the Vaidyanathan Committee report (1992) on pricing of irrigation water.

The Problem

It has been more than a decade since the Vaidyanathan Committee submitted its report on pricing of irrigation water in India, which suggested, among others, periodic revision of water rates so as to cover at least the operation and maintenance (O & M) costs of irrigation projects. During the last 15 years, i.e., after submission of the Vaidyanathan Committee report, many changes have been introduced in the pricing, financing as well as other areas of irrigation sector. A few states have also initiated bold reforms in the irrigation sector so as to bring radical changes in the overall performance of the sector. Some states have revised the water rates expecting that it would help to improve the financial recovery. A few states have transferred the management of the systems from state agency to water users group by enacting act to bring overall improvement in irrigation sector, including financial recovery. Can the revision of water rates alone help to increase the revenue and recovery rate? Why is the financial recovery of the irrigation sector poor in India? Is the poor financial recovery same across different states and time points? Is there any relationship between revision of water rates and financial recovery at different time points? Is it correct to say that the increased operation and maintenance expenditures are the main reason for poor recovery? Since there are no detailed studies covering these issues in the recent years, in this study, an attempt will be made to study the overall financial performance of the irrigation of sector covering national and state level data from mid-seventies.

Objectives

1. To study the overall financial performance of the irrigation sector at national as well as different state level beginning from mid-seventies.
2. To analyze the trends in gross receipts, workings expenses as well as in recovery rate across different time periods.
3. To find out whether any relationship exists between the agricultural performance and the recovery rate across major states in India.
4. To find out whether the reforms initiated by some of the states have made any impact on the financial recovery rate of the sector.
5. To suggest policies to improve the financial recovery of the irrigation sector.

Study Area, Data and Method

The study will cover the whole of India, which has one of the largest irrigation sectors in the world. Water is the state subject in India and therefore, each state follows its own policy in water pricing and distribution of water for different crops and seasons. Moreover, the level of irrigation development as well as the demand for irrigation water is not the same across the states because of varied agro-climatic conditions. In view of this, the study is proposed to cover

all the major states for analysis to better understand the varied performance. While using published secondary level data / information for all analysis, the study would cover data from mid-1970s to mid-2000s. Data on water price, investment on irrigation sector, O & M charges, and receipts from irrigation sector will be collected from various publications of Central Water Commission, Ministry of Water Resources. Agriculture and irrigation development related data will be collected from the publication of the Ministry of Agriculture, New Delhi. The financial recovery rate of irrigation sector of different states will be calculated by dividing the gross receipts of the irrigation sector with the expenditures on operation and maintenance works. In order to study the trends in operation and maintenance (O & M) costs as well as gross receipts from irrigation and multipurpose river valley projects, growth rate (log-linear) will be computed. One of our aims is to study whether the states are following the ability to pay principle (productivity linked water rate as suggested by the Second Irrigation Commission of India) in charging water price from the farmers. To judge this, water rates levied by different states will be compared with its crop output. A multiple regression analysis will be carried out to understand the factors that are influencing the financial recovery taking the data from major states.

Deliverables

A report will be submitted on or before the deadline to the sponsoring agency. Soon after submitting the report, a research paper will be made out from the report and published in a standard refereed journal.

Duration: 12 months

6. SRI: How effective under different irrigation sources and farm size categories

Background

Government departments are taking up the SRI in different states through different research and development programs. Also, several NGOs / farmer organizations are taking up SRI as part of their extension activities. Several reports have reported the performance of SRI with varying yield levels. During experiments in 2003-2004 at the Agricultural College and Research Institute and Tamil Nadu Agricultural University (TNAU), Killkulam, Tamil Nadu, it was found that, on average, 53 per cent less irrigation water was used in SRI farms. In these experiments, 21 day old seedlings were transplanted 15 x 10 cm apart on the conventional farm. The SRI farms had 14 day old seedlings transplanted 20 x 20 cm apart. Water depth on the SRI farms was maintained at 2.5 cm, with alternate wetting and drying cycles up to the panicle initiation stage. The farms were flooded to the same depth thereafter until harvest. On the conventional rice cultivation farms, the depth of the water was maintained at 5 cm throughout the standing crop. The experiments showed that SRI recorded higher water productivity of 0.699 kg / m3 compared to conventional farm water productivity of 0.253 kg / m3. The partial factor productivity of nitrogen was 28.3% more under SRI. The SRI farms recorded 28% higher grain yield than conventional rice cultivation farms. The results from two on-farm, state government-funded evaluations by TNAU one of which was in the Tamirparani basin in south Tamil Nadu showed that mean grain

yields under SRI and conventional cultivation were 7,227 and 5,637 kg / ha respectively, showing an overall yield advantage of 1,570 kg / ha (maximum yield advantage: 4,036 kg / ha) for SRI. Around 31 farmers recorded grain yields of over 8 t / ha under SRI (Himanshu Thakkar, 2005).

SRI practice was test verified in many of the research stations of Tamil Nadu Agricultural University and in farmer's fields in various districts in the State. Considering the success of this practice in terms of low quantum of water usage, improvement in soil health due to application of organic manures in combination with inorganic fertilizers, reduction in cost of production due to low level of seed requirement, the State has taken efforts to propagate this technological package to the farmers by providing the subsidies including conoweeder. TNAU is taking up the SRI in various regions of the state through IAMWARM and NADP programmes mainly to increase productivity and save irrigation water.

The issue is how the farmers are responding to SRI over years. If there are non-adopters, what are the major constraints in their adoption in a sustained manner? How the SRI is responding to different irrigation sources such as canal irrigation and well irrigation sources, as water control is varying across the sources and regions. Hence this study is focused to address these issues.

Scope of the study

- Evaluate the SRI in different regions of the Tamil Nadu state
- Workout the water saving in SRI under the different irrigation sources
- Study the dis-adopters if any in sustaining the SRI in the state.

Specific Tasks

1. Collection of data from different irrigation sources.
2. Designed questionnaires / instruments in consultation with Dr. K. Palanisami
3. Submit progress reports
4. Synthesize the information / data as per the expected deliverables.

Methodology

The proposed study will be based on both secondary and primary data on SRI projects being implemented in Tamil Nadu state. The following analytical framework will be employed. Three districts representing the canal, well and tank irrigation systems will be selected after discussing with the extension department officials and university scientists. 150 farmers under each irrigation source will be randomly selected representing the small, marginal and large farm categories. Further 50 farmers as control under each irrigation source will be covered. The survey method along with field visits will be used for collecting the data. Date relating to the past adoption behavior will also be collected and analyzed.

Deliverables

A report with the following three sections will be prepared from the results of the study:

- Adoption levels and the cost and returns with and without SRI
- Water saving scenarios under different irrigation sources
- Constraints in SRI adoption

Duration: 12 months

7. Tank Irrigation in India: What will be the Next Best Alternative?

A Meta Analysis

Background

Tanks and ponds were created essentially as multiple-use structures for irrigation, livestock, and human uses. The predominance of tanks in the Deccan Plateau and in eastern India, including Chhota Nagpur plateau, is due to the unique topo-graphic characteristics of the areas. In the case of the Deccan Plateau, the tracts with undulating to-pography and rocky substrata are ideally suited for locating tank in the valley depression and carrying out gravity irrigation. Tank irrigation has a rich heritage on account of long historical antecedents in eastern India, consisting of eastern Uttar Pradesh (UP), south Bihar (plains as well as plateau), West Bengal and Orissa. In the eastern region, tanks and ponds have been an important supplementary source of irrigation over centuries.

South India has more tanks because of its geogra-phy, climate, and terrain situations. Gentle slope (3-5%) facilitates the tank construction. Most of the land lying between Western Ghats and the eastern coast misses the intensive rainfall of the dependable south-west monsoon. But the north-east monsoon, which is less dependable, brings more rain over these areas. However, the north-east monsoon is often accompanied by cyclones and pours heavily in short spells. Unless this rain water is collected and stored, these areas will have acute water short-age and drought during the rest of the year. Hence tanks have come into existence in this part of the country in large numbers. Tank-irrigated area started declining after the 1970s i.e., only after the introduction of the Green Revolution when groundwater development was significant. Government also started doing the periodical repair works involving panchayats and farmers over years through government programmes. All the above attempts by the Government have not resulted in the expected outcome, thus leading to continuous deterioration of the physical condition of the systems and affecting their performance. What was previously seen as local village property is now seen as government property as well as responsibility.

Water Scarcity and Performance of Tanks

As a consequence of declining rainfall and poor management, number of tanks reporting under scarcity has increased during the period 1990-91 to 2006-07 from 25.7% to 35%. Tank performance is generally measured as the ratio of actual area irrigated by the tanks to the total command area. This definition, however, does not accurately reflect the actual tank performance

since the wells in the tank command also contribute to tank performance, both as a supplemental irrigation source in the wet season and as a sole source of irrigation during the dry season. The data on area irrigated exclusively by wells and tanks are not available at the tank level from the village records, but a higher number of wells reflects the uncertainty in tank water supply. There is strong evidence to show that the excessive growth of wells has contributed to the decline in the actual performance of tanks. Hence, comparing the performance of tanks without accounting for the positive / negative influence of the wells will be misleading. Therefore, tank performance should be redefined by excluding the probable area accounted for by those numbers of wells which are above the threshold number of wells (sample mean) in the tank command and the adjusted tank performance should calculated accordingly.

Farm and Tank Level Scarcity Management Strategies

Farmers adopt various scarcity management strategies to cope with inadequate supply of tank water. Increasing the interval of irrigation, reducing the depth of irrigation and groundwater supplementation are the major strategies of the farmers smaller tanks, while groundwater supplementation and reducing the depth of tank water application are the major strategies of the farmers in larger tanks.

Supplemental well irrigation is one of the important factors that influence the rice yield, particularly during tank water scarcity. Farmers with the optimum number of supplemental irrigation recorded higher yields than farmers who under-irrigated. At tank level management strategies include the tank modernization programmes by different agencies, additional revenue from multiple uses, water market etc.,

Threats to tank system

Given the going water scarcity and the management strategies being adopted both at tank and farm level, it is also important to see how the tanks can sustain?. Numbers of threats have been identified for poor performance of irrigation tanks. Given the scope and the issues related to the tank irrigation, it is important to see how the tanks can be made as viable investment entities in the future. In this connection, the study is focused with the aiming of arriving at alternative tank management strategies.

Scope of the study

- Study the performance of tanks interms of groundwater supplementation.
- Examine the scarcity management strategies
- Impact of tank modernization already done
- Converting tanks into percolation ponds
- Assess the investment options needed for improving the performance of the tanks.
- Examining the future threats to tank irrigation

Specific Tasks

- Collection / acquisition of data / reports from different departments / individuals relevant for the study.
- Designed questionnaires / instruments in consultation with Dr. K.Palanisami
- Submit progress reports
- Synthesize the information / data as per the expected deliverables.

Methodology

Meta analysis covering different states will be done.

Deliverables

Three drafts reports will be prepared

- Tank performance indicators incorporating groundwater supplementation
- Coping strategies both at tank and farm level and the expected cost and returns
- Future physical and management strategies with expected rate of return.

Duration: 8 months

ANNEXURE 6

7th Annual Partners' Meet

Managing Water in the Face of Growing Scarcity, Inequity and Declining Returns: Exploring Fresh Approaches

April 02-04, 2008 at ICRISAT campus, Hyderabad

Participants List

1	Dr J K Chawla	Punjab Agricultural University, Ludhiana
2.	Dr R Krishnan	Irrigation Management Training Institute, Trichy
3.	Mr John Kurien	Trivandrum, Kerala
4.	Dr K N Ninan	Institute for Social & Economic Change, Bangalore
5.	Dr Phanindra Goyari	University of Hyderabad, Hyderabad
6.	Dr P K Viswanathan	GIDR, Ahmedabad
7.	Mr Gurulingappa G Koppa	Institute of Rural Management, Anand, Gujarat
8.	Mr Amitangshu Acharya	Arghyam, Bangalore
9.	Dr S P Singh	IIT, Roorkee

10.	Mr V Gandhiraj	MIDS, Chennai
11.	Mr. A. Narayanamoorthy	Centre for Rural Development, Karaikudi
12.	Dr N. Nagaraj	UAS, Bangalore
13.	Dr R Sreenivasan	Dhan Foundation, Madurai
14.	Ms Surekha Sule	Pune
15.	Dr. Sanjiv Phansalkar	Sir Dorabji Tata Trust
16.	Mr. Palugula Ramakrishna	Reporter, The Indian Express
17.	Mr K V Kurumanath	Principal Correspondent, The Hindu
18.	Dr K G Kshirsagar	Gokhale Institute of Politics and Economics, Pune
19.	Prof R P S Malik	University of Delhi, Delhi
20.	Dr. Amita Yadwadkar	University of Pune, Pune
21.	Dr. E. Subramanian	Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Pondicherry.
22.	Dr Ravi Chopra	Director, PSI, Dehradun
23.	Dr R Parthasarathy	Director, GIDR, Ahmedabad
24.	Dr Farhet A Shaheen	Sher-i-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar
25.	Dr Jos C Raphael	CECOD, Trichur
26.	Dr Soumya Chatterjee	JNU, New Delhi
27.	Dr Sara Ahmed	Gender & Water Alliance, Ahmedabad
28.	Dr K.Sivasubramanyan	MIDS, Chennai
29.	Dr Ramachandra Bhatta	College of Fisheries, Mangalore
30.	Dr Rajendra Bansilal Shukla	Chief Engineer, MWRDC, Aurangabad
31.	Dr Ashok Gulati	Director, IFPRI
32.	Dr Bharat Sharma	IWMI, New Delhi
33.	Dr S A Kulkarni	ICID, New Delhi
34.	Dr Balaji Narasimhan	IIT-M, Chennai
35.	Dr Prakash Nelliyat	CWR, Chennai
36.	Mr Sunderrajan Krishnan	INREM, Gujarat
37.	Dr H. Chandrasekharan	IARI, New Delhi
38.	Dr Colin Chartres	DG, IWMI, Srilanka
39.	Dr K G V K Rao	Indwa Technologies, Hyderabad
40.	Dr Hardeep Singh	SPWD, New Delhi
41.	Mr K H Anantha	ISEC, Bangalore

42.	Dr Nitai Kundu	Centre for Environment Management, Kolkata
43.	Mr Jamshed Bamji	SRTT, Mumbai
44.	Dr Satyapriya Rout	University of Hyderabad, Hyderabad
45.	Dr Firdaus Fatima Rizvi	Council for Social Development, New Delhi
46.	Mr. Ganesh Neelam	Collectives for Integrated Livelihood Initiatives, Jharkand
47.	Mr Vinod Kothari	SRTT, Dehradun
48.	Mr Avinandan Taron	ISEC, Bangalore
49.	Mr John C Peck	University of Kansas, USA
50.	Mr Vishal Narain	MDI, Gurgaon
51.	Mr Hemani Rushabh Kishor	RUCHINI, Gujarat
52.	Dr A Amarender Reddy	ASCII, Hyderabad
53.	Dr Akkineni Bhavani Prasad	Sir Arthur Cotton's Agril. Service Center, Hyderabad
54.	Mr Pere Ariza Montobbio	ISEC, Bangalore
55.	Mr V Mohan Reddy	ROSES, Hyderabad
56.	Mr Varun Sharma	FES, Anand, Gujarat
57.	Mr Rex Buchanan	Deputy Director, University of Kansas, USA
58.	Dr Maitreyi Kollegal	Kolkata
59.	Ms Mayuri Hazarika	Aurangabad
60.	Dr Biksham Gujja	WWF, ICRISAT, Patancheru
61.	Ms Malavika Chauhan	SRTT, Dehradun
62.	Mr Amit Patel	Consultant, Anand
63.	Ms Alpa N Dave	Palanpur
64.	Dr O P Singh	Institute of Agril Sciences, BHU, Varanasi
65.	Dr Vinod Goud	WWF, ICRISAT Patancheru
66.	Dr Jeena Srinivasan	CESS, Hyderabad
67.	Mr. Ramachandradu Mochera	Director, WASSAN, Hyderabad
68.	Dr Yashpal S Bisht	NRM, Dehradun
69.	Mr Nirmalya Choudhury	CInI, Jamshedpur
70.	Dr D Suresh Kumar	TNAU, Coimbatore
71.	Mr Binayak Das	Arghyam, Bangalore
72.	Dr Rajnarayan Indu	Joint Director, Carewater, Gujarat
73.	Mr R Ravindranath	FES, Anand, Gujarat
74.	Prof. Prem S Vashishtha	Institute for Human Development, New Delhi

75.	Dr Mukesh B Joshi	SSNNL, Gujarat
76.	Mr Manojkumar Sharma	IWMI, Palanpur
77.	Dr L Venkatachalam	MIDS, Chennai
78.	Mr Divy Ninad Koul	CInI, Jamshedpur
79.	Mr Aniruddha Brahmachari	IDEI, New Delhi
80.	Dr M G Chandrakanth	UAS, GKVK Campus, Bangalore
81.	Dr Sumana Bandyopadhyay	University of Calcutta, Kolkata
82.	Dr Mohd. Shawahiq Siddiqui	Enviro Legal Defence Firm, Noida
83.	Dr Himanshu Kulkarni	ACWADAM, Pune
84.	Mr Akshay Kumar Malik	Institute of Rural Management, Anand, Gujarat
85.	Mr. Mohammed Junaid	IRMA, Anand, Gujarat
86.	Dr. Niranjan Pant	Director, Centre for Development Studies
87.	Mr P Parthasarathy Rao	ICRISAT, Patancheru
88.	Ms. Sunitha Nadhamuni	Aghyam, Bangalore
89.	Ms Margarita Triguero	Hubli, Karnataka
90.	Mr Marc Olomi	Hubli, Karnataka
91.	Dr M L Chadha	Director, AVRDC, Patancheru
92.	Dr Upali Amarasinghe	IWMI, New Delhi
93.	Dr Philippe Cullet	New Delhi
94.	Mr Amit R Wajpe	SRTT, Ahmedabad
95.	Mr Sujit G Kumar	Coastal Salinity Prevention Cell, Ahmedabad
96.	Dr Victoria Reyes-Garcia	ICRISAT, Patancheru
97.	Mr Rajesh Kapoor	Cohesion, Ahmedabad
98.	Mr Hasmukh Patel	Secretary, MGP Sarvoday Kendra, Palanpur
99.	Mr S P Tucker	PS, Irrigation Dept, AP.
100.	Mr N C Narayanan	SACI Waters, Hyderabad
101.	Dr Tushaar Shah	IWMI, Hyderabad
102.	Dr Madar Samad	IWMI, Hyderabad
103.	Dr T K Sreedevi	ICRISAT, Hyderabad
104.	Dr Dyno Keatinge	ICRISAT, Hyderabad
105.	Dr S P Wani	ICRISAT, Hyderabad
106.	Mr M Prabhakar Reddy	ICRISAT, Hyderabad
107.	Mr H Hanumanth Rao	ICRISAT, Hyderabad

108.	Dr Dinesh Kumar	IWMI, Hyderabad
109.	Mr Kairav Trivedi	IWMI, Hyderabad
110.	Mr S Mukherjee	IWMI, Hyderabad
111.	Mr Kaushal Kishore Garg	IWMI, Hyderabad
112.	Mr.J.Kiran	IWMI, Hyderabad
113.	Mr T Parthasaradhi Rao	IWMI, Hyderabad
114.	Mr Sreedhar Acharya	IWMI, Hyderabad
115.	Dr Massuel Sylvain	IWMI, Hyderabad
116.	Ms Vidya Ramesh	IWMI, Hyderabad
117.	Dr Priyanie Amerasinghe	IWMI, Hyderabad
118.	Mr J Harinarayana	Ex Chief Secretary, Govt of AP
119.	Mr Suresh Prabhu	MP, New Delhi
120.	Mr Arun Pandhi	SRTT, Mumbai
121.	Prof B S Bhavanishankar	Sahayoga, Bangalore
122.	Mr Nitin Bassi	IWMI, New Delhi
123.	Dr Nidhi Nagabhatla	IWMI, Srilanka
124.	Ms M Gayathri Devi	University of Melbourne, C/o IWMI, Pantancheru
125.	Dr M V K Sivamohan	IWMI, Hyderabad
126.	Prof Ratna Reddy	CESS, Hyderabad
127.	Mr K J Joy	Soppecom, Pune

ANNEXURE 7

Draft report (Summary):

TAMILNADU: POLICY INTERFACING AND IRRIGATION DEVELOPMENT

K.Palanisami
Upali Amarasinghe
R.Sakthivadivel

A synthesis paper on State Irrigation Investment Strategies
Presented at the State Planning Commission, Govt. of Tamilnadu,
Chennai on Dec, 12, 2008

International Water Management Institute
Hyderabad, India

ANNEXURE 8

Minutes of the Discussion on the Presentation of "Tamil Nadu Water Studies Key Findings"

By Dr.K.Palanisami, Director, IWMI

Date & Time - 12.12.08 at -11.30 A.M

Venue - HDVC Hall in the State Planning Commission

Under the Chairmanship of Prof. M. Naganathan, Vice- Chairman, SPC

Initiating the discussion, Prof. M. Naganathan, Vice-Chairman, State Planning Commission, welcomed all the participants.

D K.Arulmozhi, I.A.S:, Member Secretary, State Planning Commission- appreciated the initiatives of the ITP and welcomed the ITP for having continued partnership with the SPC in deriving the needed policy framework in the State's .Water Sector .

Dr K. Palanisami, Director, IWMI- Tata Program made the detailed presentation on "Water Policy Interfacing Aspects' and the role of ITP and IWMI-CPWF project on National River Linking project in such initiatives . Dr. Upali Amarasinghe, IWMI New Delhi office and Dr. R. Sakthivadivel, former IWMI staff clarified certain points raised by the participants. The State Planning commission has shown interest to consider few of IWMI's suggestions. It also requests to give a brief policy write-up on the recommendations and a detailed report for further follow up.

The following are the key points discussed in the meeting:

1. Revenue generation in tanks should be further studied and the details need to be documented. eg., Fisheries auction should go to the Farmers Association
2. In toto, Paddy is the safest option for the farmers. However, in tanks with 40-70% storage, crop diversification can be suggested, provided market and crop insurance should be integrated.
3. Dug well recharge scheme is useful for water management. But dug wells could not be possible in the future due to declining water table in the hard rock regions and it is important to see how the tube wells could be sustained in the future.
4. Tank modernization is important, but it is important to see how best the tank modernization could be introduced keeping the existing tank related constraints such as encroachment, siltation etc..,
5. Fixing electricity meters and taking periodical reading on electricity consumption at farm level will be difficult as the farmers used to have free electricity in the state.

6. Watershed programs in the tank foreshore regions focusing on storage structures should be avoided.

7. In the watershed programs, post project maintenance is a serious constraint and hence ITP should suggest measures how this could be addressed.

8. Converting tanks into percolation ponds is a .good initiative where the tank storages are less than 40%. However suitable methodology should be developed in selection of tanks for converting it into percolation ponds. Construction of percolation ponds in up stream without detrimental to downstream. Community wells should also be considered while tanks are converted into percolation ponds. Mostly tanks with less than 40 ha (PU tanks) should be considered for conversion.

9. Use of silt from the tank for the fields shall be considered. Water harvesting during heavy rains should be given importance so that future demand for water could be minimized.

10. 60% of the domestic demand for reuse is good and in general only isolated cases of reuse is seen. Any specific technique available such as Sewage water treatment. in the urban areas should be given top priority as suggested in the ITP presentation.

11. The employment generation schemes being operated in the rural areas should be directed to tank related works e.g., the possibility of inclusion of Dugwell recharge schemes under National Rural Employment Guarantee Programme may be explored

12. Capacity building initiatives on water management for the extension staff and farmers needs to be increased.

The SPC has further identified the following areas where IWMI-Tata program can have impact while strengthening the Government programs under policy advocacy:

I. Analysis of constraints in technology (Water Saving) adoption and the needed strategies for up-scaling them e.g., Occurrence of blocks in the Drippers

2. Developing water harvesting plans for preventing the flood in the Cauvery delta zone

3. Developing a decision support system for watershed programs for implementation

4. Developing guidelines far post project management of the watershed programmes in the state

Apart from the above the SPC has shown interest on few of the recommendations made by the IWMI-Tata Program for further fine tuning the policy write-ups and plan documents for implementation in the state.

IWMI-Tata program-and IWMI-CPWF NRLP project will jointly prepare the synthesis report based on the recommendations made and then a detailed report on State's Irrigation Sector will be prepared and presented to the Government.

The meeting ended with the vote of thanks to the Chair.