

# **Water, Equity and Development<sup>1</sup>**

## ***Report of the fifth IWMI-Tata Annual Partners' Meet At IRMA from 8 to 10 March '06***

Sanjiv Phansalkar

### **I) Introduction**

Indian economy is in a strong and growing phase, recording over 6% growth each year. The share of agriculture in GDP stands around 23% in 2005-06 and has been declining faster than the share of the workforce engaged in agricultural and allied activities. Agriculture sector in itself is perhaps stagnating and unable to overcome the numerous structural and resource constraints under which it operates. The dimension of equity in the current pattern of Indian development is distinctly subdued causing the earlier President to raise a concern about it and requiring the present Government to devise specific programmes to address it. While the overall economy might have become more resilient than before and able to shake off the fluctuations and down turns caused by the uncertain monsoons, agriculture does remain a prisoner to the behaviour of rains showing wide variations in output across years. Variable access to water; whether the natural precipitation or water stored in dams, tanks or in aquifers influences performance of agriculture. That in turn greatly determines the income and livelihood security of almost 650 million Indians already losing out in relative sense to those in cities and metros due to differential rates of growth in the two sectors. The connection between water, equity and development is thus quite strong and will remain so at least till such time when a bulk of the population will be engaged in non-agricultural occupations if it happens ever.

### **II) Equity and Water Issues**

The notion of equity falls short of equality and has a substantial or at least residual value element that defines it. It is relative, at times determined by history and social conditioning and permits no universally acceptable definitions. It is also a matter of vantage point, the eye of the beholder. An Anglophone metro dweller may find the situation in which rural women trudge large distances to fetch daily drinking water for the family extremely inequitable (largely as he compares them with his sisters) while may be the women themselves and certainly their husbands or fathers may find it quite a usual thing. The concept is value laden.<sup>2</sup> The extrinsic bases of these values could be “generally

---

<sup>1</sup> Research contained in over sixty discussion papers on ten themes (see Annex 1 for details) was presented at the Fifth Annual Partners Meet of the IWMI-Tata Water Policy Programme during March 8-10, 2006. The central questions addressed in each theme were specific to its own subject matter. An effort is made here to explicate the common thread that can be discerned in these discussion papers. These papers can be obtained from [iwmi-tata@cgiar.org](mailto:iwmi-tata@cgiar.org)

<sup>2</sup> Ray Debraj “Development Economics” Oxford University Press, New Delhi, 1998, p.237

accepted” human values of fair-play and justice or be much more specific and established notions such as the Millennium Development Goals.

Even if it were possible to obtain a universally operational acceptance and universal validity to the concept of equity so far as water is concerned, the ability of the Indian State to enforce it remains in severe doubt. The State has for a Century, since the Queens’ Proclamation<sup>3</sup>, played a significant role in the water sector. It still continues to play a reduced but domineering role now only in regards to two aspects: creation of large storage and diversion structures and network of canals and channels for the purpose of irrigation; and undertaking almost a forced responsibility for supplying water and sanitation facilities in large cities. It also plays a significant role with regard to provision of drinking water particularly in water scarce regions of the country and during the periods of acute water scarcity. However in the main, the extent of self-provisioning exceeds the role of the State. India faces the truly mind-boggling task of governing a colossal anarchy so far as water sector is concerned<sup>4</sup>.

But the problem is more basic. The concept of equity in most cases has no definitive operational significance and of even less universal acceptance. Specific manifestations of inequity or demands for equity are not unchallenged by groups who do not deem them to be obviously justified. Not only do the down stream users of water but at times even the engineers who build dams resist any attempts to restore equity in access to and use of water by the poor people residing on the hilly or undulating catchment in the upstream of these very dams. Superior water productivity in agricultural lands in the lower reaches or prior right of the people in valleys are cited to justify such resistance. Industry pre-empts underground water for industrial purpose and resists measures to control damage to streams and aquifers caused by its effluents citing the need for competitive industrial environment as the justification. Individual farmers and even village Panchayats resist the demands for equitable access to water by poor and migrant livestock owners taking shelter behind either the claim that the agricultural or domestic water demand of the local people have greater merit or just that the legal rights to water under their land are unassailable. At the macro-level, the State has mediated these claims and attempted to address the question of equity in a prosaic and non-controversial manner by defining the priority for water use in the National Water Policy<sup>5</sup>. Irrespective of the fact that the policy offers bland prescriptions that are blind to the existence of diverse classes and interest groups, the universal application of the said policy is itself in question. For instance, while the NWP assigns the highest priority to drinking water and the second priority to irrigation, Maharashtra assigns second priority to industrial uses of water and irrigation ranks below it<sup>6</sup>. The concept of equity is thus both emergent and contested.

---

<sup>3</sup> Whitecombe Elizabeth “Irrigation” , in Dharma Kumar (ed)”The Cambridge Economic History of India Vol II,Cambridge University Press, 1982 pp.677-678.

<sup>4</sup> Mukherji A and Shah Tushaar Socio-Ecology of ground water irrigation in South Asia: an overview of issues and evidence

<sup>5</sup> National Water Policy, 2002 <http://wrmin/nic.in/policy/nwp2002.pdf>

<sup>6</sup> Maharashtra State Water Policy [ielrc.org/water/documents/MHpolicy.pdf](http://ielrc.org/water/documents/MHpolicy.pdf)

Equity is also a resultant of the development dynamic. Indian economy comprises many overlapping interest groups. The salaried Government employees stridently strive to protect the unrealistic levels of rates of return on their savings and wishing to maintain unsustainable levels of salaries and post-retirement benefits. The persons employed in the organised sector of the economy continue to be at a relative advantage compared those who are either self-employed or work in the unorganised sector. Industry on the other hand presses for liberalizing labour laws to make it more competitive and flexible. The denizens of metropolitan and other large cities continue to press for huge public investments to make their cities better and more attractive investment destinations. These are but a few examples of interest groups about which the popular press writes a great deal. The interest groups press for and force negotiation of their interests and this jostling translates into how much tax and non-tax revenue accrues to the State and how they are applied. Rates of economic growth, relative contributions of diverse sectors in this growth and their impact on equity across classes of people and their individual members are the resultants of the development dynamic which itself is shaped by the global economic situation as also the action of the State seeking to mediate the interests of all these diverse interest groups. Specific aspects applicable to water sector that get thus determined relate to levels of investment in water sector, its distribution across different types of water infrastructure and in different geographic locations, pricing policies pertaining to use of water for agricultural, industrial or drinking purposes, fiscal support to administrative machinery related to water sector, framing of rules and laws to water sector etc.

Equity in regard to access to and use of water and share in beneficial public expenditure in water sector can be understood in at least four overlapping connotations. Spatial equity<sup>7</sup> refers to equity between people living in different regions. Social equity refers to equity between different groups of people living broadly in the same locale. Gender equity refers to equity between genders in regard to share in labour costs, efforts in access and use of water and share in its beneficial uses and products. Finally, inter-generational equity<sup>8</sup> refers to equity in enjoyment of natural resources including water across generations of people. The specific issues of interest in the water sector regarding these four aspects are as below;

- Social equity: Does the access to, control over and use of water differ across different social groups and their individual members? What is the basis of this difference? What are the impacts of these differences in terms of income, well being, life style, social power etc.? Do these differences create dependencies on those with access to water and those without? What do these groups and individuals do to cope with these differential accesses to water, how and with what effect? What role does the State play, if any in this regard and what are impacts of the State action in this subject?

---

<sup>7</sup> Saleth R Maria and Dinar Ariel "Institutional Economics of Water :A Cross Country Ananlysis of Institutions and Governance" , Edward Elgar Publishing Limited, Cheltenham , 2004 ,p.100.

<sup>8</sup> Divan Shyam and Rosencranz Armin "Environmental Law and Policy in India", (Second Edition, Seventh Imprint,) Oxford University Press, New Delhi, 2005, pp 41-86.

- **Spatial Equity:** The same questions are asked except with the recognition that the physical distance between the two groups may intervene to make the impacts in terms of social power less direct.
- **Gender Equity:** Do men and women have different power over water? Do they have to spend differential labour for accessing water? Why and how do these differences arise and how are they mediated at the level of family? How do these differences impact on well being of men and women?
- **Intergenerational equity:** How does the use and abuse of water resources (and land and forest resources as they effect water resources) by current generation influence the condition of the resources which the subsequent generations can enjoy? What are the constraints and interests of the different members of today's society that shape the current resource use pattern? What are the ways in which interests of current and future generations be balanced?

It needs to be recognised that action of people, groups and even the State are oriented towards managing the technical input-output relationships (abstracting water for irrigation of a crop for income, allowing small ruminants to browse in forests for better income from the herd, diverting water from a canal to irrigate one's crop rather than allowing it to flow down etc.) between resources and end products and values. They are not overtly, leave alone solely, motivated by considerations of equity. Equity effects are in some sense side effects of the process of individual, group or State's economic action. The equity effects thus are inexorably interlinked with patterns of relationship between resources, action of people, inputs, and outputs and need to be discerned.

### **III) The Research Presented**

Two features of the research presented at the conference deserve special mention. In the first place, ITP adopted a multi-location format for research in 2005. The central pieces of research in eight themes were based on data gathered in several locations (ranging between 5 and 13) in the country. Adequate number of respondents was chosen at each of these locations and thus the research is based on substantial nationally representative samples (sample size varying between 300 and 1000). While questions of adequacy of these sample sizes and locations to draw inferences that can claim validity for the states or the zones in which they are located can be raised, the following discussion uses words like States or "parts of the country" for the sake of ease of understanding. Research on two clusters of issues; namely assessing the dimension of water requirements of India in 2050 for assessment of the National River Link Project and water issues in Krishna basin were also presented in the conference. We restrict this synthesis to the multi-location research on eight themes undertaken by ITP. *Secondly*, the research was targeted at understanding the current status of the phenomena under question, not necessarily to find its causality or pathology. The conference also had papers presented by other scholars, papers that addressed the issue of characterization along with explanations about the

causality. It is perhaps fair to state that much of the research devoted itself professedly or substantively to issues of spatial and social equity and the issues of gender or inter-generational equity did not receive as much attention. The following paragraphs are devoted to discussion of the specific dimensions of equity issues studied and researched.

## 1) Dalits and Water

Under this study, the phenomenon investigated was to understand the current status of discrimination experienced by dalits in regard to access and use of water for drinking as well as for production purpose. In a sense, this issue has archetypal equity dimensions. Dalits represent the powerless, asset-less and socially despised sections of the Hindu society. They face the double burden of deprivation and discrimination. We look at deprivation first. Their economic status is weak and they have much smaller assets compared to the non-dalit sections of the society. Right to ground water being so closely aligned with possession of land, the dalits have weak legal rights over ground water, often the major source of water in the Western and Southern parts of the country. They also lack the capital needed to dig wells or tube wells and to install pumps necessary to draw water even if they had equal access to ground water (Thangraj, 2006). Thus it is not surprising, as the research brings out, that the dalits are constrained to depend on a single crop and have much smaller proportion of their lands under irrigated second crops compared to their non-dalit counter parts (Tiwary,2006,a). In regard to drinking water and sanitation, the more recent schemes have provisions for creating Village Committees with adequate representation of dalits to ensure that they are included as beneficiaries. While this structural arrangement is conducive, the poor economic status of dalits implies that they are unable to contribute their share in the investments of the drinking water and sanitation facilities as required by these schemes and hence still remain excluded (Veerashekhappa, 2006).

Let us see what the situation about discrimination is. The research shows that while reportedly reduced in extent and severity, several forms of discrimination continue in most parts of the country. Discrimination manifests itself in several ways: dalits stand in their own separate queue at a common source, dalits may not be allowed to operate or directly use the water source (e.g. a tap or a hand pump) but must wait till some one else fills their buckets, dalits may have to go at a specified time to the common water source, they may have to go to a specified corner of the pond or a specified *ghat* on the river, they may have to use separate tumblers in restaurants, panchayats buildings and schools and so on (Tiwary,2006,b). All these have been noticed to be continuing to some extent in different parts of the country. Non-dalit households may self-provide water from their privately owned sources such as wells, tube wells or hand pumps. Dalits have little land and less money to create such sources. Their dependence on water infrastructure created by the public agencies is higher than that of the non-dalits. Dalits invariably walk longer to fetch water from the common source since such sources are located in the “main village” and not the dalit hamlet or basti (Rizvi and Thorat, 2006). The brunt of both the deprivation and discrimination comes upon dalit women who on an average spend over

three hours fetching the daily drinking and domestic water for the families from common sources. Being present on the spot, they also have to experience and put up with the discrimination and indignities at these places. Interestingly, these forms of discrimination seem to have reduced most noticeably in UP<sup>9</sup> and Bihar, perhaps due to the strident awakening of dalit consciousness or may be due to the explicit state policies to create a multitude of drinking water sources for dalits.

Several elements make the dynamic. In the first place, there is widely an ingrained social legitimacy to ascribed status that arises due to birth in a social group and stays frozen. While there may be some loosening of this rigidity that in rural areas of India there is social legitimacy to unequal treatment towards different individuals in a village owing to their caste is an established fact. This established social hegemony of the upper castes becomes more strident imposing greater discrimination against dalits in regions which have greater water scarcity due to natural conditions (Soni, 2006). Secondly, the distribution of land and other assets across different sections of society is generally quite loaded against the dalit communities in villages. Right to ground water or surface water is aligned with land which implies that there is larger landlessness among dalits than among non-dalits. This makes them dependent upon generally unskilled wage labour with its consequences on their ability to save and create wealth. The poor savings reduce their ability to invest in every thing, inter alia facilities for drinking water and sanitation. The new government schemes require people to contribute a proportion of the total cost of new infrastructure with a view to increase their stake and ownership. But dalits have much less money to contribute to such purposes and absence of this ability reduces their bargaining power. Governments have passed several enactments for the benefit of dalits and introduced through the 73<sup>rd</sup> Amendments a system of reservations in Gram Panchayats. As per the rules, many village panchayats are presided by dalits as their *Sarpanch*. These are structural interventions which, it is hoped will ameliorate or cure issues of discrimination and deprivation. These latter are process issues. Limitations of structural interventions in correcting process ills are well known. On the other hand, structural interventions stand the risk of being hijacked or reinterpreted to suit the established, powerful groups.

It is hoped that as economic development progresses, economic solidarity amongst people would tend to dominate these issues of social discrimination. The force of social discrimination also seems to reduce with education and urbanization. In the intervening period, multiplying the number of water sources so as to reduce dependence of dalits on common village sources appears to be the only viable solution that has the potential of reducing discrimination against dalits in regard to drinking water. To what extent this would work depends on the relative abundance of water: in ground water rich Indo-Gangetic region this seems to have worked very well but in the Western and Southern regions the efficacy of this route is in question. The problem of deprivation of water for productive purpose seems to be of an economic nature and there is evidence to argue that market transactions do occur irrespective of caste discrimination.

---

<sup>9</sup> Vinod Jain and Javed Rasool “ Dalits and Water: Site Paper from Uttar Pradesh from Multilocation Study” Paper presented at IWMI Tata Water policy Program APM ,2006.

## 2) Livestock and Water Interactions

The phenomenon investigated relates to how the poor people manage the water requirements of their livestock, what are physical interactions between livestock and water sources and what are the social interactions arising out of the dependence of the poor on others for watering their livestock. India has a livestock population of 480 million of which ruminants account for a dominant majority. Livestock provides power for tillage and also provides for manure, livestock products such as milk, meat, wool, hair etc. It has been found that the poor households hold more animals per unit of their land and among them more small ruminants and yet derive less income per livestock head compared to the national average. The poor have no water source of their own. An overwhelming majority of the poor practice free grazing based husbandry, taking their livestock to forests, revenue wastelands, other common lands and fallow fields for the purpose. Livestock drinks water en route their grazing path from water sources in the public domain (Phansalkar, 2006a). These sources include rivers, streams, ephemeral water collected in depressions, ponds, canals, water leaking out of canals and public water supply pipelines etc. The livestock is also given water at homes each day. They depend on public sources situated on an average 100 metres away from their homes. Such water sources include hand pumps, wells and tube wells, village ponds and specific watering tanks created by Gram Panchayats. The poor give on an average about 13 litres of water per head of livestock. The feeding regime practiced by the poor depends substantially on biomass obtained from the common lands. Small ruminants are given very little fodder at home. Cattle and buffaloes are given on an average 3 and 6 kilograms of fodder at home per head of these livestock. It appears that poor access to virtual water in the form of biomass results in low productivity and income from livestock of the poor. (Phansalkar, op cit)

A large number of migrant cattle or small ruminant owners live in Gujarat, Maharashtra and Rajasthan. They stay in their own village during monsoon and migrate in the dry season, travelling on an average 350 kilometres (Kher, 2006). They have no legal right to either biomass or water any where en route and have to either depend upon the public sources such as forest and common lands or negotiate with individual farms where their animals sit. Breeding service, sale of young animals and applying manure to the farms in which the livestock sits are the services rendered by these migrant herd owners while the farmers contribute to them by way of places for camping, water and biomass in the harvested fields for the animals and grain and/or cash to the herd owners. At times, the herd owners perform services such as clearing a field of harvested banana plants as the biomass of banana roots benefits them and clearing of the farm benefits the farmers. Such mutually beneficial exchanges between farmers and migrant herd owners have existed for decades or even centuries. However, of late the symbiotic relationship that existed

between the migrant livestock owners and the farmers in hinterlands seems to be under strain. Increasingly the successive herds of migrant animals are seen as public nuisance since they tend to browse every thing in site often leaving bushes and trees bereft of leaf canopy. The strain becomes particularly oppressive in years of drought when both water and biomass becomes scarce and the farmers see little value from applying manure to their barren fields. The migrant herdsmen have to propitiate forest guards, irrigation machinery and Sarpanch or other village elders for continuing to avail of the facilities like freedom of movement in forests/villages, access to water sources and access to biomass. The recent trend of some what possessive protection of forests and wild life in it has been increasing the hiatus between forest staff and the herdsmen leading to numerous and repeated conflicts (Dhas 2006). The gradual but definite reduction in slack in biomass and water availability at times accentuated by failure of rains causes conflicts between the herdsmen and farmers.

This research brings out the sharp aspects of equity. The poor depend for a larger proportion of their household income basket on livestock and yet have no control on water they need for maintaining the livestock. Their dependence on public sources is near complete and is at times supplemented by their dependence on water sources owned by large farmers. Neither the legal institutions nor the decentralized governance at village level seems to provide any direct assistance to the migrant herd owners. The assistance available to the settled poor owners of small herds of bovines or small ruminants is indirect: they simply use water sources created for human population to water their animals, but this causes strains in periods of water scarcity. Specific arrangements made for watering of bovines exist in the Western part of the country while elsewhere the problem is not addressed in any systematic manner. The Western states of Gujarat and Rajasthan also have a vibrant social institution of “*Jeevdaya*” which encourages and motivates better off farmers to provide water to all living creatures from their own sources. Similar institutions are weak in other parts of the country and in a neighbouring state even the manager of a temple trust was reported to have charged money for allowing water for animals of migrant herdsmen. Sale of water for livestock kept for commercial purpose is legitimate and common in Kolar or Prakasam in South India. The poor use public watering sources, other than surviving village ponds by default rather than by explicitly recognised rights. The State steps in only when entire regions face acute scarcity and at that time bans use of all public water for irrigation. Under normal circumstances, the poor have got to fend for themselves and for their animals, often by providing explicit or tacit services to their richer brothers or by making payments for the water. While it is conceivable that Gram Panchayats will remain sensitive to the water needs of livestock of village residents, the migrant herdsmen are really dependent on charity such as *Jeevdaya* or are vulnerable to exploitation by the powerful as there is neither legal nor formal institutional support of any kind available for them.

### **3) Institutional and Financial Issues in Surface Irrigation**

The phenomenon investigated relates to the current state of canal irrigation, the level of services received by users, their willingness to pay, the reforms that are under way for



improving the performance of the sector, the associated changes in legal institutions and the new experiments for the involvement of private sector in improving the irrigation service. After investing over a trillion rupees in creating irrigation infrastructure and raising the irrigation potential five fold to 95 million Ha, the sector remains sick with utilized irrigation command hugely trailing behind the created potential. Perennial and seemingly intractable problems of maintenance of canal network, consequent problems of lack of access to canal water in tail reaches, mismatch in time of the need and supply of water, low levy of charges and poor recoveries of whatever is levied leaving the department cash strapped to undertake any meaningful repairs of the infrastructure are some of the burning issues in the sector. The country has been experimenting with irrigation management transfer to farmers' institutions created under the participatory irrigation management (PIM) programmes for some time but these institutions take time to take root and work effectively. There also have been sporadic attempts to bolster the efficiency of the system by involving private sector actors in some of the tasks in irrigation. Simultaneously private sector itself is taking some initiative in repairing and putting into productive use small irrigation infrastructure and there have been instances of non-government actors including private sector using the public infrastructure to provide more satisfactory irrigation services to farmers.

Research based on a study of eight irrigation systems (Choudhury, 2006) found that tail end farmers usually receive much less water than they need for growing mandated crops, the adequacy ratio falling to as low as 43%. Even in canal commands no more than 58% farmers rely on canal water for irrigating their crops. The complaints about mismatch between the time at which water is required for the crops and the time at which it is delivered are ubiquitous. Farmers find the irrigation staff unresponsive to their complaints regarding lack of water or poor conditions of canals and further suffer losses due to no water or excess water and water logging. All these problems are particularly accentuated for the tail end farmers across all the systems studied. Similar results were obtained by another study done in Karnataka by PAC (2006). Farmers report their willingness to pay for not only current but perhaps enhanced water charges if only they receive better services. In fact the farmers paid up to 30 times more for purchase of water for irrigation to ground water providers or others (Pandya, 2006). Participatory irrigation management does seem to provide salutary results in terms of enhanced land value, higher crop output etc (Sudan, 2006). But there are issues of neglect of stakeholders in water who may wish to use the water for purposes such as livestock. The legal reforms under way seem to be guided by prescriptions of foreign donors and seem to actually goad further centralization of control in the hands of the State (Cullet, 2006) whose future responsiveness to water users can remain in doubt. There have been efforts to involve private sector players in canal maintenance and operation of gates for distribution which appear to provide better services (Shah, 2006). In canal commands where the topography of the command rules out gravity flow irrigation, a plethora of irrigation service providers have come up and their performance is satisfactory to the farmers. They have received leadership from agro-processors such as co-operative sugar mills in better management of the infrastructure and enforcement of distribution discipline leading to salutary impacts. These mills in turn benefit due to increased security in inflow of raw materials (Choudhury, 2006b). Private sector companies have taken interest in reviving small

defunct infrastructure for the benefit of the farmers who perhaps provide them raw materials. The business interest in the crop produce does seem to be an influential variable that nudges the business house to take interest in irrigation service provision. Private sector participation in financing of irrigation infrastructure appears theoretically possible but infeasible in the current socio-political ethos surrounding private sector participation in public services in general (Phansalkar, 2006b).

This research brings into focus three specific aspects of equity. The first is the clearly identified aspect of spatial equity between head and tail end farmers. The second relates to the equity between irrigators and those who need flowing water for purposes such as livestock. The third relates to dependency experienced by irrigators on the response of the irrigation administrators. This is created by an administrative system in which Government staffs that are expected to look after provision of irrigation services to farmers are not accountable to the users of the services. While the reform of the PIM-IMT type is oriented towards improving service delivery by placing the tertiary distribution system under the control of irrigators, thus reducing the dependence on an unresponsive bureaucracy, this by itself is unlikely to address the problem of equity fully in the absence of a sufficiently alert and influential catalyst agency which deliberately sets about mitigating the spatial inequity caused by the nature of distribution system. It is quite unlikely to ensure that the interests of stakeholders who wish to use water for other purposes are protected. By structuring the incentives of service providers in such a manner that it is in their interest to service every desirous irrigator, partial or full reliance on private sector operations has the potential of reinforcing spatial equity but there appears to be no guarantee that such private sector involvement will degenerate into cosy, mutually convenient and unproductive arrangements between the private sector actors and the supervising bureaucracy. Legal reforms that further concentrate all powers regarding the water sector in the hands of a single regulatory authority may tend to bring back the dependency on the functionaries with a vengeance. The issue of better governance that results in acceptable levels of equity in surface irrigation does not appear to offer scope for any easy solution.

#### **4) Dams, Displacement and Development**

The phenomenon that has been investigated relates to understanding the long term trajectory of people who were displaced from their original habitat due to dam construction. The research work reported was at an initial stage and will continue in future. The estimates of the number of people displaced vary widely-almost wildly with some scholars putting the figure at an astonishing 50 million persons. More credible estimates suggest that in India there are over 300 major dams that have caused displacement of over 2 million persons. Lacking a uniform national policy<sup>10</sup> on resettlement, States in whose territory the dams and displacement occurred followed their own policies which seem to have varied from case to case. A negligible portion of the total investment of the irrigation development project is spent on the rehabilitation

---

<sup>10</sup> The policy has been under discussion since the last fifteen years but is still in the making. See para 10 of National Water Policy, <http://wrmin/nic.in/policy/nwp2002.pdf>

process (Jethoo, 2005). The care in resettling the oustees varies a great deal; resettlement colonies have been created with good amenities in some places, cash compensation and jobs to an adult member of the displaced family followed elsewhere while land was allotted at a new location to the oustees with attendant cash compensation for constructing house etc; at times they were provided land in forest areas but due subsequent enactments could not get possession of their land (Shah & Choudhury, 2006). The major issues of concern are about how the governments are dealing with the issues of land quality, livelihood diversification, and political entitlements of the displaced families. The decision of adapting a land based rehabilitation policy seems to be acceptable to all concerned, but it does not generate desirable impacts due to allotment of waste lands and other such poor quality lands to the displaced. Loss of availability of natural resources and livelihood sources are the major threats to the displaced communities, and so livelihood restoration is to be given higher considerations in rehabilitation process (Kher & Ghosh, 2006). Livelihood diversification after rehabilitation is a most likely phenomenon (Indu & Tewari, 2006). The research started with the premise that studying outcomes in terms of changes in family income and living standards after resettlement under different conditions would help better design and apply such policies. The situation worsens when the displaced do not get a political voice at the new place among the host communities even in a long run. Resettled oustees are usually treated as outsiders and so their problems do not get required attention. Can this be avoided by establishing the rehabilitation sites as separate Gram Panchayats? This issue of losing the political identity was reported as very common. It is also believed that there is a need to develop methods to calculate the benefit cost ratio for post evaluation of the rehabilitation process, where the issues of livelihood diversification, political strengthening and benefit/loss due to changes in social cohesion and to incorporate it in ex-ante assessment of the projects (Shah, 2006).

The subject of resettlement surely brings in equity question in a sharp focus. Here whole communities are uprooted for constructing a dam that will benefit people living miles down stream and would also contribute to the “national prosperity”. Initial indications seem to point callousness towards equity considerations and a tendency to ride roughshod over those displaced for larger goals. Resettlement of the oustees in command areas of dams so constructed would appear to answer the equity concerns well but this is more often an exception (e.g. the case of Upper Wardha project in Maharashtra) than a rule.

## **5) Inland culture fisheries**

The phenomenon investigated relates to the emerging governance mechanisms and institutional arrangements for culture fishery in village water bodies across different locations in India. By virtue of its geographical location in monsoon belt, India is endowed with good rainfall and consequently extensive network of inland waters. These waters may be classified as closed (ponds, tanks, wetlands, etc.) and open (rivers, reservoirs, lakes, deepwater paddy areas, wetlands, etc.). In general, rivers have capture-based fisheries; other open/large waters are more suitable for culture-based fisheries and the closed/small waters to aquaculture. The inland culture fishery sector in India has seen

quantum growth over the last few decades from 0.67 million tonnes (MT) in 1970-71 to 3.2 MT in 2002-2003 and is expected to further grow at the rate of 6% per annum (Katiha, 2002). The main factors responsible for this growth are the increasing demands for fish, introduction of three carp culture and extension efforts by the Fish Farmer Development Agency (FFDA). The trend of inland fish production in India showed major contribution of capture fisheries till mid eighties, but afterwards it reversed in favour of aquaculture. Aquaculture has emerged as a fast-growing enterprise and a viable alternative to the declining open natural water fisheries. Now, it contributes over 80% in inland fish production (Bhatta, 2001). Though freshwater aquaculture has observed tremendous growth in the past two decades, immense scope still exists for horizontal expansion and increases in productivity. This is evidenced by the facts that i) despite immense efforts for horizontal expansion, only one third of the available area (0.85 m ha) could be brought under scientific aquaculture, and ii) the average fish yield is only one-third of that achieved (6 t/hect) in farm trials. (Krishnan, 2000)

Most of the ponds and tanks as aquacultural water bodies are the community village ponds (CVP) with multiple uses under single or multiple-ownership. These are being administered and controlled under different institutional arrangements or property rights regimes (PRRs). Fisheries/aquaculture is a State subject (Katiha, 2002). Most of the state governments favour co-operative governance structures or small fisher groups to manage these common pool water bodies. Aquaculture in Village water bodies (VWB) in India, in general, utilizes poly carp culture and is practised with the utilisation of low to moderate levels of inputs, especially organic-based fertilisers and feed. The main problems faced by fish farmers are *poaching, water availability and credit*. Despite these problems, there has been a marked increase in the intensity of fisheries in Gujarat, Haryana, West Bengal and Assam. This change is brought about by the entrepreneurial acumen of individuals who adopt innovative management practices to tackle the problems and further intensify culture practices. The institutional structure has slowly shifted from the community management model or co-operatives which have been propagated by the government to a bounded service provider model which has evolved spontaneously. The need for higher investments and building relations to establish ones fishing right on village water bodies have led to the entry of the economically and politically influential people in this profession (like Reddys from AP, Jats in Haryana, Vaishnav community in Assam, Patels in South Gujarat), who see this as an opportunity for economic gains. But this strengthening of fishing rights of few fishing contractors and increase in production have come at a cost of the traditional fishing communities (like *Kahars* in Gujarat and UP, *Hanjis* from J&K, *Mullahs* from Bihar, *Keuta* from Orissa and *Mudiraj* from AP) who have been relegated to providing labour for these fish contractors. These fishing communities are the marginalized sections of society who depends on fishing for their livelihood throughout the year.

The government in many states have formed fisherman co-operatives and given them priority rights for fishing in the CVP. Most of the co-operatives have become defunct or converted to “one man co-operatives” controlled by a local politician. Some co-operatives have further leased out these ponds to private contractors. Also in many cases the membership of non-fishermen in the fishery cooperatives has enabled non-fishermen

families to get access to social welfare benefits provided by the government. Further, the migratory fishermen who were hitherto dependent on tanks, rivers and reservoir fisheries have been left out of the main stream and in many cases out of the cooperative structure. These migratory fishermen are alleged to indulge in poaching as that is the only means for them to sustain their food security. Thus intensification of culture fishery and formation of property rights for fishing in erstwhile open access water bodies is creating serious equity issues. As fisheries become more vibrant engines of wealth creation, these may exacerbate.

The research clearly highlights the adverse equity consequences of commercialization of a hitherto traditional subsistence occupation. While intensive commercial fishery surely does boost asset productivity and also shows the potential of contributing to the benefit of the village as a whole, there is a need to address the equity issues as well. The development dynamic is transparent. The assets are multi-purpose and often common pool resources. State prefers to have co-operatives of fisher-folk or other poor to harness the productive potential of these resources. Economic incentives available in the trade combines with the well known difficulties in making cooperative action succeed leads to the transfer of effective control of these resources in the hands of private entrepreneurs. This then deprives the poor of the small livelihood support which the hitherto unproductive asset was providing and they take to subversive behaviour. Leasing policies governing the VWB is the chief instrument available to the State to influence the dynamic. To what extent the instrument of leasing policy regarding VWB achieves, this is moot.

## **6) Socio-economic Impacts of Ground water Contamination**

The phenomenon investigated relates to ill-effects on human health caused by contamination in ground water. The dependence on groundwater for irrigation, domestic and industrial purposes has been increasing over the years. Simultaneously, there has also been greater contamination of fresh groundwater sources either due to natural reasons or from human-induced factors. Contaminants such as Salinity, Fluoride and Arsenic and industrial pollution affecting groundwater are occurring in increasing proportion of aquifers. The primarily chemical-based contamination of groundwater is emerging at a time when simple biological treatment of water itself is an expensive option for vast majority of rural people. They are unable to afford simple treatment such as boiling even for small children and this result in a large number of deaths due to Diarrhoeal infections (Krishnan et al, 2006). The impacts of further chemical-based contamination in water, therefore, makes the situation even more grave for such people since these impacts are generally long-term. Fluoride and arsenic contamination were also studied.

In case of Fluoride, all states across the country but a few have reported incidences of Fluorosis. Many areas of Western and Southern India have pockets of high Fluorosis severity. In these areas, there is already high dependence on groundwater for irrigation and domestic use in rural areas resulting in depletion of aquifers. Adding to this problem of depletion; the burden of contamination results in the additional costs of medical

expenses and loss of wage due to afflictions. It has been seen that this burden of contamination for poor rural families can amount to a significant proportion of their family income (Indu et al, 2006). The hidden social costs of Fluoride contamination are less difficult to capture due to social stigma. On the other hand, solutions for avoiding effects of Fluorosis are seemingly not very difficult. Identification of the problem and supply of safe water along with proper nutrition and monitoring of health has shown to lead to remarkable improvement in suffering from Fluorosis (Susheela, 2006). In many cases, improvement in both nutrition and safer water has led to reversal of symptoms without much medication. However, the feasibility of implementing a Fluorosis mitigation programme is not so straightforward. It involves close cooperation between public health agencies, education workers and water supply engineers. Simple introduction of water treatment infrastructure in villages have shown to be ineffective unless there is recognition of the problem, and willingness to maintain these systems. Maintenance requires resources as these systems are generally expensive (Anand, 2006). There is also the issue of poor development of supply chain for the necessary material inputs. Even though there might be some local sources of water that are prone to less contamination, their identification requires proper monitoring which again requires sufficient investment (Saxena et al, 2006).

The problem of Arsenic contamination is no different in terms of impacts, but is more severe. The health costs and medical costs are higher in this case (Indu et al, 2006). The afflicted persons are usually the poor who are badly placed to pay for medication which is also not very effective. Water treatment in this case necessarily involves costly reverse osmosis systems which are highly expensive to implement and maintain in rural areas (Anand, 2006). With the problem of Arsenic contamination spreading to Bihar and Assam, the full magnitude of the problem is yet to emerge (Chakraborti et al. 2006).

Contamination of groundwater due to industrial effluents imposes significant externalities on users of water for irrigation and drinking in the downstream areas. The brunt of pollution emerging from industrial pockets is often borne by rural areas that use this effluent water for irrigation, either directly from the stream or indirectly through groundwater. In either case, severe loss in agricultural productivity has been observed (Nagraj et al, 2006) and increase in medical expenses and cattle mortality have been reported (Varuni et al, 2006). There are other issues affecting water quality. Activities such as sand mining in river beds further accentuate the effects of pollution (Manjunatha et al, 2006). When one looks at the problem from a broader perspective, the situation that emerges is that of developing industrial pockets that are thirsty for fresh water often arriving from surrounding pockets coming at the expense of water for irrigation. This fresh water is then used for industrial purposes and let out as effluents that can harm agriculture and ecological health downstream. Towns such as Tiruppur in Tamil Nadu are now experimenting with ideas aimed at addressing this problem through institutional and economic tools. For examples, the polluters, in this case dyeing units, the users i.e. the farmers downstream and private water treatment units are together involved in addressing the problem. The industrial units are involved in supplying fresh water to Tiruppur city, who pay for water treatment cost to the treatment units from where better quality water is supplied downstream to farmers for irrigation. A similar exercise is being attempted in

Bhavani river basin where an Environmental task committee has been formed to monitor the pollution situation (Mukherjee et al, 2006).

It is clear that aquifers need to be protected from heavy long-term pollution to safeguard sources of safe water for future generations especially since some impacts are already emerging. There are also wide differences in access to safe drinking water across rural areas and income levels play an important role in determining local access to safe water. The question of intra and inter-generational equity in access to safe quality drinking water emerges as an important challenge facing our country in the coming years.

This phenomenon involves all the four forms of equity. Spatial equity issues arise between upstream polluters and downstream water users need careful handling by involving both the parties. The high cost associated with medical treatment of afflictions caused by contamination implies that the poor are more at risk than the better off. Social stigma caused by physical deformities and visual disfigurement of body parts affects women, particularly unmarried girls more than others. Finally, ecological effects such as irrevocable damages to aquifers have obvious intergenerational equity effects. The tragedy is that these effects have not been adequately taken into a comprehensive public policy that still seeks to offer piecemeal and often post-facto and placatory solutions.

## **7) Urban Water Management in Small Towns**

The phenomenon investigated related to the effectiveness and efficiency with which municipality administration manages the water supply in small towns in India. While urban water supply is a subject of intense interest and debate in the Press, much attention is focused on the situation as prevailing in metropolitan and large cities and on the issue of private sector participation that has been assiduously promoted by Asian Development Bank and others. This investigation attempted to address the question as to whether improvement in management of the water supply agencies is possible and whether it can lead to significant improvement in performance. While urban renewal including improvement in water supply infrastructure needs over Rs. 40000 crores, these investments are not really beyond the capacity of the country given its GNP of Rs. 39 lakh crores. The problem that beset the fast growing small towns are inadequate upkeep and expansion of water supply infrastructure that fails to keep pace with rising urban population, inability to offer reliable and regular water supply, inability to levy realistic charges and even smaller ability to recover the levied charges and finally, inability to reduce the unaccounted for water. While investments in upgrading and expanding infrastructure are certainly warranted, there appears to be a reason to believe that in the absence of improvement in administrative efficiency, mere investments would not solve these problems. Involvement of private sector participation in the task could perhaps address both these needs but is invariably accompanied by stiff hike in water charges, a decision that is unpopular with the rulers. Besides, there have been numerous examples of disastrous consequences following hasty privatization. The research notes that there have been examples of sharp turnaround in performance of cities in water supply administration brought in by dedicated administrators and that there is much for cities to

learn from such successful examples. The research points to the need of upgrading the staff skills through training and improvement in motivation and morale by sustained administrative leadership.

The research highlights specific dimensions of spatial equity in the key resource of government attention and resources: how the small towns as a group tend to be ignored and relegated to secondary priority in comparison with metro cities. The research also points to the problems of social and spatial inequities in urban water supply within cities.

## **8) Future of Indian Agriculture**

The phenomena investigated relates to the momentous changes occurring in Indian agriculture, changes that will gather momentum in the coming years. The proportion of population involved in agriculture is poised to fall at a fast pace leading to far reaching impact on the way agriculture is organized and practiced. In order to get a glimpse of the future it is important to observe changes in agricultural demography and how it impacts the organization of agriculture in terms of increase in size of operational land holdings, diversification in agriculture, withdrawal of young and able bodied men from farming, increased mechanization and increased participation of women in farming. Technological advances including precision farming as well as mechanization are likely to occur as well. The research done by ITP showed that a large number of youth practiced farming as a part-time activity (Sharma, 2006). The incidence of part-time farming was higher among high caste population and in villages close to towns. Another study on “women in farming” showed that as countries passed from one stage of demographic transition in agriculture to the other, women had a larger role to play in farming (Sharma, 2006). Research on agricultural water use identified the western and southern parts of the country as “agricultural groundwater hotspots” based on the changes in consumptive water use and groundwater fluctuations in the region (Sahu and Mukherjee, 2006). Another ITP study lent greater credibility to the emphasis (in recent years) on supplemental irrigation as a major strategy for enhancing yields in rain fed areas (Didyala, 2005). A study pointed out that contract farming as a way of organising agriculture was going to assume a much larger form and was here to stay (Singh, 2006). It was going to lead to a number of changes, including consolidation of landholdings. In order to make farming viable for the small holders the need of the hour was to find out appropriate arrangements with better definition of roles and responsibilities of different actors and strengthen regulations. Finally another study pointed out the new possibility of significantly enhancing paddy production from existing land and water resources and thus mitigating the food imbalances at household level by adopting the Systems of Rice Intensification (SRI) (Rao et al, 2006).

The research brings out the dimensions of equity that are likely to be heightened in future: impact on women due to increasing feminization, effect on absolute and relative status of small holders due to consolidation of land holdings and increasing importance of contract farming, problems of agriculture in Southern and Western parts of the country due to rising scarcity of water etc.



#### **IV) Summary: Water, Equity and Development**

The forgoing discussion brings out the following points.

- In the first place, the current social and institutional arrangements regarding control over and use of water create inequities regarding access to water for sheer survival in several locations and specific social groups. Dalits face a brunt of these inequities in several rural locations and the intensity of these inequities becomes more pronounced where there is greater water scarcity.
- Secondly, the prevalence of inequitable access to water for livelihoods is quite ubiquitous and again seems to be correlated with water scarcity. The poor and landless animal holders face problems of access to water for their animals in most of the Western and Southern parts of the country. Migrant livestock owners face problems of accessing water for their herds every where except when social institution of Jeevdaya comes to their help. These issues of subsistence and livelihoods were presumably handled through traditional mechanisms of mutual negotiations and informal arrangements till greater intensification of production set in.
- Thirdly, there is perhaps even more pronounced prevalence of inequities in access to and use of water for income generation and wealth creation. The difference between water control enjoyed by head end farmers and tail-enders has been substantially documented in the research presented herein. Inability of dalits to access water for growing second (irrigated) crop has also been demonstrated.
- Fourthly, the research brings out how the effects of geo-genic factors (possibly exacerbated by human action) such as presence of fluorides or arsenic in ground water causes differential impacts on people given their differing income status and strength of coping strategies.
- Fifthly, action of economic actors in industrial actors imposes negative externalities on farmers. Considering the significant differences in the relative social and economic standing of the two sets of actors, this too becomes a facet of equity concerns.

As population pressure on limited land and water resources becomes higher, there is the Boserupian response in the form of intensification of resource use. This overall Boserupian response results from action of atomistic economic actors each working to maximize their own economic wellbeing in accordance with their individual rationality.

These responses are isolated from each other, contingent upon the specific configuration of circumstances and are based on the assumption that the extant institutional arrangements such as regarding rights to water are frozen in time. The equity concerns are generally neglected till they threaten to pose major problems of a wide scale problem; such as manifested in mass migration due to shortage of drinking water as seen in 1985-87; and either are mediated by innate social institutions such as Jeevdaya (or remnants of jajmani in the North and the Eastern parts) or by placatory and short term responses by the State. Even when there is a stable response from the State, it takes the form of attempting to ameliorate the situation through structural responses in undertaking public programmes (such as inclusion of dalits in the village Water Users Committee) and seldom address the root institutional or process causes. Examples where the institutional order of right to water was sought to be changed have come about in response to pressures from external donors as in the case of PIM or change in water laws; seem to not explicitly recognise the equity issues and tend to further centralize powers in the hands of the State. Whether structural or institutional responses of this ilk will redress equity issues inherent in the water sector is moot. The need for equity is felt most strongly by the resource-less and the powerless and they seem to be condemned to satisfy themselves with such drops of water that fall from the overflowing jugs of the more powerful.

### Annex 1: Themes and Papers

SN	Theme Title	# Papers presented by ITP members	# Papers presented by other partners	# Presentations only	Total number of discussion papers
1	Dalits and Water	2	5	-	7
2	Livestock-Water Interactions	3	1	3	4
3	Institutional and Financial Reforms: Irrigation Sector passing through New Era	5	4	1	9
4	Dams, Displacement and development	2	1	-	3
5	Inland Culture Fisheries	2	4		6
6	Socio-economic impacts of ground water contamination	2	6	3	8
7	Urban Water Management	2	4	-	6
8	Future of Agriculture	3	4	1	7
9	National River-link Project	3	6	3	9
10	Water and Poverty in Krishna basin	-	5	-	5
11	Others (Including CInI)	6	3	-	9
	<b>Total</b>	<b>21</b>	<b>36</b>	<b>11</b>	<b>73</b>



## REFERENCES

- Anand P. S., 2006, *CSMCRI's Activities in the field of Water Treatment and removal of minor constituents such as Fluoride and Arsenic*, Presented at ITP APM 2006.
- Amrita Sharma, 2006, *Women in Farming: A cross-country analyses of trends in agricultural labour force*, Presented at ITP APM 2006.
- Amrita Sharma, 2006, *Rural Youth and Indian Agriculture*, Presented at ITP APM 2006.
- Andre Beteille, 1980, *The idea of Natural Inequality*, London School of Economics.
- Andre Beteille, 1972, *Inequality and Social Change*, Oxford University Press, New Delhi.
- Anjani. K., Joshi. P. K. & Pratap. S. B., 2003, *Fisheries Sector in India: An Overview of Performance, Policies and Programmes*, In: Anjani, K., Pradeep, K.K. & Joshi, P.K. (Eds.), *A Profile of People, Technologies and Policies in Fisheries Sector in India*, pp.1-16.
- Anonymous, 1996a, *Handbook on Fisheries Statistics*, Ministry of Agriculture (Department of Agriculture and Co-operation, Fisheries Division), Government of India.
- Bhatta. R., 2001, *Carp Production and Consumption in India: Socioeconomic Analysis* (unpublished), report submitted to ICLARM.
- Chakraborti. D., Mukherjee. A., 2006, *Groundwater Arsenic Contamination in the Ganga-Padma-Meghna-Brahmaputra Plain of India and Bangladesh*, Presented at ITP APM 2006.
- Cullet Philippe, 2006, *Water Law Reforms In The Context Of Water Sector Reforms*, Presented at ITP APM 2006.
- Choudhury. N. and V. Kher, 2006, *Public-Private Partnership in Surface Water Irrigation: A Case Of Kolhapur*, Presented at ITP APM 2006.
- Choudhury. N. and Z Shah., 2006, *Improving Canal Performance Through Partial Privatisation: Issues, Options, Experiences And Opportunities*, Presented at ITP APM 2006.
- Choudhury. N., 2006, *Irrigation Service Delivery In Canal Systems: A Study On Eight Canal Systems In India*, Presented at ITP APM 2006.
- Dhas Madhukar, 2006, *How the Migrant Sheep and Goat Rearers of Maharashtra Manage the Water Requirement of Their Herds*, Presented at ITP APM 2006.
- Dr. S. Chandra, (2006), *The Shape of Indian Agriculture –Present Scenario and the Way Ahead*, Presented at ITP APM 2006.

Dr. S. Singh, 2006, *Future of Contract Farming in India*, Presented at ITP APM 2006.

Firdaus, Fatima Rizvi & Sukhdeo Thorat, 2006, *Dalit and Water: Reflection Accessibility and Discrimination*, Paper presented at IWMI TATA Water Policy Program APM, 2006.

Ghanshyam Shah, 2001, *Dalit Identity and Natural Politics*, Sage Publications, New Delhi.

Indu. R. and R. Tewari, 2006, *Long Term Socio-Economic Impacts of Displacement: A Case Study of Kadana Irrigation Project*, IWMI-TATA Water Policy Research Program, Anand APM, 2006.

Indu R., Krishnan S. and T. Shah, 2006, *Impacts of using Groundwater Contaminated with Fluoride and Arsenic in India: Affliction Severity, Medical cost and Wage loss*, Presented at ITP APM 2006.

Jayshree Soni, 2006, *Water Accessibility and Marginalization of Dalits (Scheduled Caste): Some Observations of Rural Gujarat*, Paper presented at IWMI TATA Water Policy Program APM, 2006.

Jethoo. A., 2005, *Effect of Resettlement Costs on Financial Feasibility of Irrigation Projects*, Paper presented at IWMI TATA Water Policy Program APM, 2006.

Katiha Pradeep. K., 2000, *Freshwater Aquaculture in India: Status, Potential and Constraints*, In Krishnan. M. and Birthal. P.S. (eds), *Aquacultural Development of India: Problems and Prospects*.

Kher. V, and S. Ghosh., 2006, *Long Term Socio-Economic Impacts of Displacement in Upper Wardha Project*, IWMI-Tata Water Policy Research Program, Anand.

Kher Vivek, 2006, *How the migrant livestock herd owners of Gujarat and Rajasthan manage water for their livestock*, Presented at ITP APM, 2006.

Krishnan. S., Kumar S., Kampman. D. and S. Nagar., 2006, *Groundwater and well-water quality in Alluvial aquifer of Central Gujarat*, Presented at ITP APM 2006.

Lingaraja Sahu and Prodyut Mukherjee, 2006, *Agri-water Accounting: A Spatial Dimension*, Presented at ITP APM 2006.

Malkit Singh Didyala, 2006, *Supplemental Irrigation*, Presented at ITP APM 2006.

Manjunatha A. V., Chengappa P.G. and M. G. Chandrakanth, 2006, *Externalities Due to Sand Mining and Distillery Effluent in Water Streams of India*, Presented at ITP APM 2006.

M. Marriott (ed.), 1955, *Village India*, University of Chicago Press, Chicago.

M.N. Srinivas., 1962, *Caste in Modern India and other Essays*, Asia Publishing House, Bombay.

M. Krishnan and Pratap Birlhal (Ed.), *Aquaculture Development in India: Problems and Prospects*, Workshop Proceedings 7, National Centre for Agricultural Economics and Policy Research, New Delhi.

M. Thangraj, 2006, *Dalits and Water*, Paper presented at IWMI TATA Water Policy Program APM, 2006.

Mukherji A and Shah T *Socio-Ecology of ground water irrigation in South Asia: an overview of issues and evidence*; Selected Papers on intensive use of ground water

Mukherjee. S. and P. Nellyat, 2006, *Ground Water Pollution and Emerging Environment Challenges of Industrial Effluent Irrigation: A case Study at Mettupalayam Taluk, Tamilnadu*, Presented at ITP APM, 2006.

Nagaraj. N., Mangala K. P. and H. Chandrashekar, 2006, *Assessing the Impact of Groundwater Pollution on Production, Productivity and Health - A case Vrishabavathi River Basin, Karnataka, Peninsular India*, Presented at ITP APM, 2006.

Pandya. S., 2006, *Factors Affecting The Willingness Of Farmers To Pay For Canal Irrigation- A Micro Level Survey In Ten Villages In Fatewadi Canal Command Area*, Presented at ITP APM, 2006.

Phansalkar. S., 2006, *Private Sector Participation in Financing and Managing Surface Irrigation: Chasing a Mirage?* Presented at ITP APM, 2006.

Phansalkar. S., 2006, *How The Poor Manage The Water Requirement Of Their Livestock*, Presented at ITP APM, 2006.

Rakesh Tiwary, 2006a, *Explanations in Resource Inequality: Exploring Schedule Caste Position in Water Access Structure*, paper presented at IWMI TATA Water Policy Program APM, 2006.

Rakesh Tiwary, 2006b, *Dalits water scarcity and Coping Mechanisms: Findings of Multilocation Study*, IWMI TATA Water Policy Program APM, 2006.

Rao. K. C., Rao. P. P. and Sridevi. K., 2006, *Evaluation of System of Rice Intensification in Andhra Pradesh*, paper presented at IWMI TATA Water Policy Program APM, 2006.

Reddy. N. & L. Narasimha, 2006, *Participatory Irrigation Management (PIM) in Andhra Pradesh: The Need for Promoting Inclusive Institutional Arrangements*, paper presented at IWMI TATA Water Policy Program APM, 2006.

Saxena. A., Kumar. S., Shukla. A. B., Rai. P. K., and D. Rai, 2006, *Causes of Fluorosis and socio-economic factors, Unnao District, Uttar Pradesh*, Presented at ITP APM, 2006.

Shah. Z., 2006, *Dams, Development and Displacement: An Issue Paper*, IWMI-Tata Water Policy Research Program, Anand, 2006.

Shah. Z. and N. Choudhury, 2006, *Long Term Socio-Economic Impacts of Displacement: A Case Study of Mahi Bajaj Sagar Dam*, IWMI-Tata Water Policy Research Program, Anand, 2006.

Shah. Z., 2006, *Canal Management Practices In Sardar Sarovar Project: A New Window Of Opportunity*, Paper presented at IWMI TATA Water Policy Program APM, 2006.

S. K. Thorat and R. S. Deshpande, 2001, *Caste System and Economic Inequality: Economic Theory and Evidence*, in Ghanshyam Shah (ed.), *Dalit identity and Natural Politics*, Sage Publications, New Delhi.

Sinha. M and Pradeep. K. Katiha, 2002, *Management of Inland Fisheries Resources under Different Property Regimes*, in Dinesh Marothia (ed.) *Institutionalising Common Pool Resources*, Concept Publishing Company, New Delhi.

Sudan. F., 2006, *Users' perceptions and impact of participatory irrigation management in ecologically fragile watershed areas of Jammu and Kashmir*, paper presented at IWMI TATA Water Policy Program APM, 2006.

Susheela. A. K., 2006, *The Triumphs in Fluoride and Fluorosis Mitigation in India*, Presented at ITP APM, 2006.

Varuni. C. N., Chandrakanath. M. G. and P. S. Srimathmurthy, 2006, *Externalities of Groundwater Contamination due to Pollution and Effects on Human and Animal Health in Karnataka*, Presented at ITP APM, 2006.

Veerashekharaappa., 2006, *Participation in Water Supply and Sanitation Programmes by Dalits : Myth and Facts*, paper presented at IWMI TATA Water Policy Program APM, 2006.

Vinod Jain and Javed Rasool, 2006, *Dalits and Water: Site Paper from Uttar Pradesh from Multi-location Study*, Paper presented at IWMI TATA Water policy Program APM, 2006.



Filename: Anual Partners Meet - 2006 (Full report)  
Directory: C:\Premlata\backup\srtt\130606  
Template: C:\Documents and Settings\Administrator\Application  
Data\Microsoft\Templates\Normal.dot  
Title: Water, Equity and Development  
Subject:  
Author: abc  
Keywords:  
Comments:  
Creation Date: 6/13/2006 4:40 PM  
Change Number: 2  
Last Saved On: 6/13/2006 4:40 PM  
Last Saved By: Jamshed  
Total Editing Time: 1 Minute  
Last Printed On: 6/14/2006 10:14 AM  
As of Last Complete Printing  
Number of Pages: 24  
Number of Words: 9,727 (approx.)  
Number of Characters: 55,448 (approx.)