

## PIM: A REALITY IN ASIA?

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### ABSTRACT

Agricultural sector has been the largest beneficiary of aid world over and the lions share has gone to irrigation but the benefits have not matched the investment. Water is wrongly treated as a free and inexhaustible commodity. The consumption of water has been doubling every 21 years and seventy percent of all water used is utilized for irrigation though half of it only, reaches the crops. Coupled with increased demand from industry and urbanization, there is severe pressure on water now. As signs of "water stress" is becoming more pronounced, and issues relating to water are assuming political overtones, water has to be treated as an economic commodity and ways and means have to be found for increasing the performance of the irrigation systems. Among the various reasons for the non-performance or under-utilization of the created irrigation potential, non-participation of the beneficiaries and poor upkeep of the system by the administrative and development machinery of the government at the various levels, deserve special mention and attention. "Participatory Irrigation Management" (PIM), where the beneficiaries share responsibility in partnership with the governmental agencies has now become indispensable for efficient running of a system. It may be pointed out that this approach is not a new one. From time immemorial, the natural resources, in all the civilizations, were treated with respect and there were rigid laws governing their use. It appears that over the passage of time the beneficiaries became indifferent to the use and management of natural resources, causing the government agencies to step in. PIM has taken off in the last two decades in South East Asia where Philippines has been the trailblazer and also in Latin America. The success in Mexico can be attributed to political will at the highest level. Different approach, have been adopted for PIM, but no single model can be adopted as a role model to succeed unless it takes into care the local conditions as well. PIM is not an exact science where, the formulae would be applicable in all conditions. Socio-economic and cultural backgrounds have to be taken into consideration. Applicable pre conditions in general are:

1. Improvement in irrigation delivery system,
2. Legal rights to farmers,
3. Economic viability of the system as well as the farmers organization,
4. Ensure viable returns of the agricultural produce, and
5. Inculcate sense of responsibility in farmers towards the system.

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## BACKGROUND AND PROBLEMS FACING IRRIGATION SECTOR

Most of the water related problems stem from the fact that the value of water has never, even remotely, been close to its true worth. Even today, when "free economy" is being advocated in the developing countries, it is highly under priced commodity leading to the illusion that it is available in plenty and need not be conserved. With the ever growing population and increasing demand on water from different sectors, more and more countries are marching towards water stress zone.

In India as elsewhere, irrigation took its shape as a small community project developed by local groups. Natural flowing streams were diverted for irrigating the land. Management of small tanks and dug wells for irrigation has been in practice from centuries. The importance of the irrigation need not be emphasized. It may be pertinent, to point out that irrigation sector has been the largest beneficiary of aid in the post war era but its performance has not been commensurate with the investment. Due to various reasons, the performance of this sector, in the developing countries specially, began declining though it would be erroneous to assume that irrigation from canals has always been a losing proposition. Economic History of India, (CUP) states that in 1846-47, a surplus of 19% over total expenditure was generated in this sector. In earlier times i.e. ancient and medieval, there were rigid rules governing the usage of natural resources and they were strictly enforced. In the 6<sup>th</sup> century BC, Megasthenes observed that "the sluices by which water is let out from the main canals into other branches so that every one may have equal supply of it." In the 2<sup>nd</sup> century AD the Chola dynasty in southern India built anicut in the Cauvery River. In the 13<sup>th</sup> to 16<sup>th</sup> century AD the Vijaynagar empire built many irrigation schemes and all of these were locally managed. This does not mean that in those times the situation was absolutely perfect, even Buddha is reported to have mediated in a water dispute in the ancient Patliputra! Canal irrigation in India had always been a profitable enterprise in old times. The Western Jamuna Canal, in India, constructed during the Mogul period and later remodeled by Warren Hastings in 1817, yielded a net return of 13% on the capital invested. Lord Curzon, in his budget speech in 1905, observed "The Government of India, have spent 31 million sterling pound upon state irrigation works in all the above classes. With it they have dug nearly 50,000 miles (80,467 km) canal and distributaries, they have irrigated an area of 21½ million acres (8.6 million ha) out of a total irrigated area in the British India of about 47 million acres (18.8 million ha) and they derive from it a net revenue of £2,700,000 per annum, or a net revenue of on capital outlay of approximately 7 percent. If we capitalize the net revenue at 25 years purchase, we obtain a total of 67½ million sterling, or considerably more than double the capital outlay." Almost similar situation existed every where, and as the pressure was not much on water, because of less demand on it from other sectors there was not much concern for its better management. Navalawala, has estimated that in India, the total losses in the irrigation sector between 1985-86 to

1989-90 amounted to Rs. 88927.8 million. The losses were due to many reasons, chief amongst them being,

- budget constraints for operation and maintenance due to uneconomic pricing of the water,
- inadequate response from the staff responsible for O & M, and
- to some extent inappropriate design of the structure and highly centralized form of governance leaving no role for the beneficiaries and NGOs.

This malady became so deep rooted in India, that irrigation coverage started declining so much so, that the water rate collection was not enough even to meet the cost of establishment kept for its collection. The revenue collection was found to be satisfactory only in those states where the revenue collectors were given a fixed amount as percentage of the total amount collected, like Haryana and Uttar Pradesh. In other states like Bihar and West Bengal the situation was alarming, while the cost of collection in Bihar varied from 55 percent to 210 percent, in West Bengal it varied from 95 percent to more than 600 percent. Even in those states where the revenue collection was not a costly proposition the cumulative arrears of the revenue were mounting up. Almost similar situation prevailed in all the Asian countries where PIM in its different flavor has been adopted. One may ask whether the Governments of these countries embraced PIM because they found it hard to set things right because of socio-political reasons. Whatever may be the reason PIM came in as a handy tool and was thought to be panacea for these shortcomings. So far it has eluded the desired results. Some of the countries where PIM is being practiced are Mexico, Columbia, Turkey, Sri Lanka, Philippines, Indonesia, Japan, Italy and Taiwan besides India. The situation in Japan, Italy and Taiwan can not be taken as indicative of its success because these are developed nations.

#### Case Studies of a Few Countries

A brief discussion about the status of PIM in Columbia and Mexico has been furnished because in the former country the farmers voluntarily embraced PIM while in the latter, it was a part of the economic reforms and was backed by a strong political will for its implementation. A passing reference has been made about other countries, before in depth analysis of the case study at Paliganj is taken up.

Colombia: The situation leading to adoption of PIM in this country is unusual in the sense that the farmers themselves initiated it. Since 1976, 16 out of 24 large and medium schemes stand transferred to Federation of Water Users Association of Irrigation Districts (FEDERRIEGO). The area covered by these associations is about two-third of quarter million hectares of cultivable land. The remaining schemes are expected to be difficult to transfer. In 1991 a federation of the water users association was formed. This association looks after the interest of the water

users and has a seat in the top land development council of policy making, of the country, but it has not been able to provide much assistance to its members association. Over the years the main areas requiring corrective actions according to Luis E. Quintero Pinto are:

- social issues,
- institutional presence,
- administration, and
- finance and budget.

The recovery of water charges has not been very consistent. An interesting factor that emerges is that the highest fee collections are from those irrigation districts (Coello/Salda) where the users have made substantial contribution for the system, and is the lowest, in those irrigation districts where only the government, has made investments. Out of the twenty-four, water districts only seven are self reliant and others receive subsidy from the government to the tune of 5 percent to 100 percent of their budget. This subsidy is also not sufficient in some of the cases for the operation and maintenance, as it is determined on the basis of past collection. The water rates, has two components. One is the basic or fixed fee, which represents cost per hectare of land for creating infrastructures like road, drainage etc. and the other is usage fees, based upon volumetric supply to the users. The volume of water supplied to the user is calculated on purely estimated basis; as most of the time the water is delivered without actual measurement. The employee delivering the water guesses the flow and records the time. On the basis of these two parameters the volume is determined. The associations are non-profit entities, and can not therefore distribute the profits amongst the members. Vermillion and G-Resterpo (1999), have reported that after the transfer, high priority was given to improve cost efficiency, but majority of farmers reported no change as far as "administration and communication" was concerned. Though there was significant reduction to the government in cost of irrigation, but this resulted in an upward trend of irrigation cost to the farmers. No significant change was reported in agricultural productivity and no clear pattern has emerged so far as total cost of irrigation is concerned.

Mexico: The transfer program in Mexico was initiated in 1988, which was a part of the sweeping economic reforms. The topography and climatic conditions of the land precludes rainfed agriculture hence there is a need for irrigated agriculture. The reform process, which was initiated in 1988, led to the creation of National Water Commission (CNA) in 1989 and a new water law in 1992. 87 percent of the area under major/medium irrigation districts were transferred to the water users association for management of irrigation by 1996. Before the process of handing over the irrigation system began there was a series of meetings with the farmers exhorting the benefits of participation in the management of water. During these meetings, with the ejitarios and small landowners, it was also promised that the Government, will assist with the rehabilitation of the system

and provide fund for purchase of machinery. This was partially fulfilled. As a measure of fostering goodwill between the ejitarios and the small landowners it was decided that the post of the President and Treasurer of the Water Users Groups will alternately, be held by their representatives. The problems being faced can be broadly classified as:

- social issues,
- conflicts due to poorly specified water rights,
- insufficient revenue to support O & M, and
- poor accounting and book keeping practices.

Enrique Placios has reported that, there have been dramatic savings, to the Government by way of lowering of its share of O & M component. Earlier it was in the region of 80 percent but now it stands reduced to 25 percent. 80 percent of the farmers felt that the irrigation services have improved after transfer of the system, but the systems are generally in poor condition, partly because the government did not fulfill its commitment about restoring the system before its transfer. Another serious malady was noticed, which is not part of the physical system. In reality it is a social problem i.e. indiscriminate hiring and firing of staffs when the directors change, nepotism in staff hiring and the use of "director's position as political spring board." Duplication of efforts and poor co-ordination between the CNA and the Water Users Associations has been cited as "second generation" problem. Water Users Associations are exempt from paying for the rights to use water. They are supposed to pay the cost incurred by CNA for bulk delivery of water to modules or districts. However in practice the Water Users Association's directors negotiate with the users, the amount they will pay and it varies. In some of the modules it is based upon the area irrigated, yet in another it is based on crop and the area planted, and in fewer cases it is on the basis of volumetric supply.

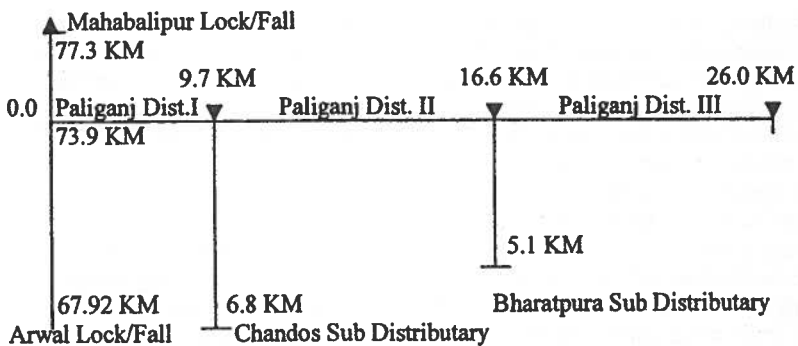
Philippines: To the die-hard supporters of PIM it may sound archaic, but Namika Raby opines that "the immediate objective of forming irrigator associations in the national irrigation system was the cost recovery, through collection of irrigation service fees." During 1983-87 the cost of O & M per hectare stood at US\$ 16.40, out of which the major portion, US\$ 13.10 was spent on salary and wages of staff. The per hectare cost, of O & M rose to US\$ 30.00, with the ratio of salary and O & M charges almost remaining same. PIM in Philippines has worked best in smaller areas, best performance has been reported in systems having homogeneous social unit and having a command of 50 hectares and the optimum has been rated as 200 hectares. Strong leadership quality for mobilizing groups of people for construction, operation and maintenance, and conflict management has been attributed as reasons for the success of the communal system. The present impasse has been attributed as "this direct transfer of communal PIM model without taking into account the social, technical and managerial requirements of a

national system." The main bottleneck in success of PIM has been described as the inability to secure voluntary compliance from its members.

**Sri Lanka:** Sri Lanka has been experimenting with PIM since 1977. An important factor, which must not be overlooked, is that historically the farmers have been managing tank irrigation according to well-defined ethical values of the traditional Sinhalese Community. The model of PIM, adopted was that of Philippines. In 1984 the Government decided to charge 50 percent of the O & M cost from the beneficiaries and subsequently this was to increase, gradually over a period of 5 years to 100 percent, but there has been very low level of collection. This is attributed to "political lobbies discouraged farmers" from paying and when some farmers did not pay, others followed suit, because neither the farmers organization nor the Government could initiate corrective measures. In order to strengthen the farmer's organization, amendments were made in 1994. It has a important provision-in such inter-provincial systems, where the farmers organization have taken over the whole or part of a distributary canal, it exempts them from paying revenue to the Government, and instead empowered them to levy and collect amount from the farmers for O & M of the canal. The levy can be collected from both the tenant-cultivator as well as the owner-cultivators, unlike previously, when it was collected only from the owners. According to the National Development Council's report Sri Lanka intends to hand over all systems below 400 hectares to farmers and for the systems bigger than 400 hectares, the distributary level management will be handed over.

#### India, Paliganj (Bihar): a Case Study

Paliganj Distributary, (Culturable Command Area, 12197 Ha) is a subsystem of Main Eastern Low Level Canal of Sone Canal System in the State of Bihar, India. Schematic diagram of the system is given below.



Schematic Drawing of Paliganj Distributary System.

The river Sone, originates, from Amar Katak plateau in Madhya Pradesh and then passes through Bihar. A sizeable population of the Bihar, 17.43% falls under its command covering about 13% of the total area of Bihar. The Sone Canal System is one of the oldest canal systems in the country; dating back to the times of East India Company. In 1853, an army engineer, Lt. Dickens, while visiting the Sahabad district conceived the idea of irrigating the land of the district by tapping several streams in the Kaimore range of hills. The actual construction was started in the year 1868-69 and was completed in 1875. In the original project report it was envisaged that the collection of revenue, will offer a net return of 8.75 percent on the outlay. From the very beginning the project was treated as a commercial enterprise. Initially the Government of India decided that the execution of the Sone Canal System should be left to private entrepreneurs and its execution was entrusted to East India Irrigation & Canal Company, which subsequently, was bought by the Government. The system over the years has undergone changes, and the process is still continuing, but as a whole it has been performing well as would be evident from the Table 1.

Table 1, Irrigation Achievement of Sone Canal System

Period	Average irrigation in Ha.	Coefficient of variance (%)
1875-1883	60358.85	50.44
1883-1891	129001.55	11.32
1891-1901	171420.76	14.91
1901-1911	221657.00	11.16
1911-1921	229611.08	9.85
1921-1931	226450.56	4.60
1931-1941	234638.72	4.84
1941-1950	252890.80	5.26
1950-1958	289661.30	11.73
1958-1968	353446.92	24.70
1968-1979	523419.08	6.84
1979-1989	541816.24	2.39

(Cropping Pattern and Operation Schedule in Sone Irrigation System, Basawan Sinha, 1992, WALMI, Bihar)

The different groupings of the year has been done taking into account certain factors, viz. in the year 1950-1958 augmenting the canal flow by tubewells was started, in 1968-1969 the Sone barrage was commissioned and the canals were remodeled, while the Action Research Program in Paliganj, was started in 1988. It would be evident that there has been gradual but steady increase in the irrigated area, but the collection of the revenue in the State, has been far from satisfactory, as would be evident from the Table 2.

Table 2, Cost of Expenditure Incurred in Revenue Collection. (in million Rs.)

Year	Expenditure on the revenue collection establishment	Demand raised	Actual collection
1987-88	954.53	122.80	73.50
1988-89	969.51	147.30	59.00
1989-90	1417.98	143.50	67.82
1990-91	Not available	155.50	48.42
1991-92	do	120.50	173.42
1992-93	do	200.00	204.16
1993-94	do	150.00	152.20
1994-95	do	170.00	170.64
1995-96	1814.78	190.00	281.42
1996-97	2071.83	400.00	285.50
1997-98	2308.42	400.00	181.12
1998-99	2300	450.00	221.96

(Water Resources Department, Govt. of Bihar, Programme and Achievements Reports for the years, 1998-99 and 1999-2000.)

The reason for low collection could be due to the fact that earlier, a distinct system of revenue collection existed, known as *satta* system. It was a form of lease agreement between the farmer and the Department of the Government. In this system the farmer had to procure the right to use canal water. They had to apply for getting water every year and permission was accorded by the canal officer on the basis of the condition of the canal, village channel and clearance of the dues of the previous years. There was provision of long term lease also, say from 2 years to 15 years. When due to certain reasons there was shortage of water the long term lease holders got preference over the annual-lease holders. For implementing the *satta* system, there was a hierarchy of officers. The entire system hinged on *Lambardars* also called *sattadars* who were farmers having say in the village matters. *Patrol*, the lowest government functionary of the Department, used to inspect the land in his daily inspection and note the progress of water in the field. He never interfered in the operation and management of *Lambardars*, who had the sole responsibility of operation and management at the microlevel, even though he i.e.; *patrol* was instrumental in assessing the area irrigated. Over the passage of time due to certain changes in the concept of the irrigation, the *satta* system was abolished. But the abolition of the *satta* system could neither bring about any improvement in irrigation nor in the rent collection. Difficulties in irrigation increased further. Revenue collection arrears started mounting up and the cost of collection continued to be more than the amount collected. This situation seriously compelled the government to start looking for alternatives of water management and, PIM, appeared prima facie to be the solution.



**Description of the Paliganj System:** An action research program, in Paliganj distributary was taken up in the year 1988, under US AID, by Water & Land Management Institute, Bihar. It was finally handed over to the farmer's organization in the year 1997. Paliganj distributary is part of Patna canal, which in turn is a part of the Main Eastern canal of the Sone Canal System. Paliganj distributary offtakes from 46.2 miles (67.92 Km) of Patna canal between Arwal and Mahabalipur locks. Patna canal in this reach has a full supply depth of 6.5 feet (2 m), width of 60 feet (18.6 m) and bed slope of 1:7000 and a capacity of 905 cusecs (26 cumecs). The total length of the Paliganj distributary is approximately 26 km and has two sub-distributaries, Chandos offtaking at 9.7 km and Bharatpura at 16.6 km. The designed discharge of the Paliganj distributary is 180 cusecs (5.14 cumecs). The details of the area under the action research program was as follows:

Table 3, Area Under Paliganj Water Users Association.

S N	Name of channel	Length of channel in miles (km)	Capacity in cusecs (cumecs)	Culturable command area in acres (ha)
1	Paliganj reach I	6.06 (9.70)	178.5 (5.10)	5770 (2308)
2	Chandos sub-dist.	4.25 (6.80)	24.5 (0.70)	6075 (2430)
3	Paliganj reach II	4.31 (6.90)	109.2 (3.12)	4910 (1964)
4	Bharatpura sub-dist.	3.18 (5.10)	24.5 (0.70)	4360 (1744)
5	Paliganj reach III	5.87 (9.40)	54.6 (1.56)	9377.5 (3751)
	Total			30492.5 (12197)

(Bench Mark Survey Report, Technical Publication No. 51, WALMI, Bihar)

In the bench mark survey carried out by the action research team they had identified the following reasons for poor performance of the system:

- complete absence of micro level planning,
- lack of proper and adequate control structures in the canal,
- inadequacy of water courses, and
- unauthorized withdrawal of water by bank cutting.

In the above report the Action Research Programme team had spelled out several measures to be adopted for the situation to improve, but the following are more important ones:

- modern scientific water management techniques,
- suitable and equitable distribution of water, and
- evolving effective water scheduling for the entire distributary command.

Basawan Sinha in his seminal study "Cropping pattern and Operation Schedule in Sone Irrigation System" 1992, has carried out a very thorough sampling of farmers regarding adequacy, timeliness. Their perception regarding the whole system amongst other parameters and the sample survey for the Patna canal system, of which Paliganj distributary is a part of the tail end system, is revealing. In the tail end system, only the large farmers appear to be comfortable as far as the canal efficiency is concerned. As far as timeliness of water supply is concerned the same story is repeated. About farmer's perception for non-availability of timely and adequate irrigation by canal every one decried the poor conditions of the canal and negligence of the canal operators. It should therefore have been desirable to rehabilitate the canal system to its original condition before handing it over to the beneficiaries. The new managers of the system could hardly be expected to improve the long neglected canal system overnight. Little that could have been done was to ensure that the structures were at least rehabilitated before the system was handed over.

Since the start of the Action Research Program till September 1992, the government had spent approximately Rs. 57,00,000.00, an amount that does not include the salary and other expenditure of a large number of staff engaged in this program. Audited figures for the subsequent years are not available. The performance of the water user's group too has not been encouraging, keeping in view that this program has been going on since last 11 years. The farmer's organization of the Paliganj, after it was transferred to them, could collect only 30 percent of the total revenue over last three years. The revenue due is piling up, as was the case before the turnover. The most sad part is that it has not been replicated anywhere in the State so far. There is a program of replicating it in 40 other systems but the majority of the farmers of these 40 systems complain about the poor condition of the structure and behavioral attitude of the staffs. They cited lack of co-operation amongst themselves, bad condition of the canal and its structure, lack of resources after the turnover to carry out O & M and non willingness to pay the water rent (a legacy of the past), as main impediments in managing their affairs. Except the constraints of the fund to carry out O & M activities after turnover all are social problems.

### CONCLUSION

There is no single model of PIM, which can be replicated everywhere because to make PIM a success it has to be viewed with a socio-cultural angle. It would be evident from the case studies of Columbia and Mexico that "social issues" have been cited as requiring corrective measures. The per hectare cost on staff is a major issue of concern for the government in Philippines and PIM has been successful in smaller areas of 50 to 200 hectares and strong leadership quality has been attributed for its success. Sri Lanka had a long tradition of community management of irrigation system. So is the case with Turkey. But in Asia, where the rural masses are a heterogeneous conglomeration can it succeed? Probably,

only if there are rules clearly defined and they are rigidly enforced. This takes us to the next logical question. Can the rule be enforced? If so, then what was the need to introduce PIM? The canal system as a whole was delivering the required results say three to four decades earlier. Only when the system started developing cracks and no remedial measures were taken, the present situation developed.

Water has also to be treated as economic good, and sooner it is done the better. As every country has its own unique water-pricing problem due to socio-political reasons, it appears that it is an elusive goal. Those who put forward arguments that increased prices will make water un-economical are not entirely correct. For example Mexico raised the water prices by almost 400 percent at the time of turn over, and even in Some Canal System in India there was increase in water rates but the demand for the irrigation did not fall. In the age of international funding it should also be obligatory on the part of the donor agencies to insist upon economic pricing of the water. Subsidies must be done away with, because it leads to wastage of water and there should be realistic pricing of agricultural produce. The Governments in the less developed countries also do not want to make the water users agencies more independent because it gives the government an opportunity to exercise discretion. Duane is of the view "to keep such agencies firmly in the political domain where there is maximum opportunity to exercise discretion and minimum constraints from the rules of the commercial undertakings."

Management of human resources i.e.; capacity building is a very important factor and it should be coupled with performance requirements that means accountability, both by the government and by the farmers, as Chamber has observed that there is incentive for bad management. There have been many instances where the conflict of interest, of different Water Users Groups has hindered its functioning in the social and political environment, which favors "grabbing any thing one can get away with".

The most important part is that case studies by people, who advocate, or oppose the water users group are highly biased. Some of the notable successes like Sri Lanka's Gal oya system is highly projected and though it has been implemented in many countries since then, its replication has, not been so successful elsewhere. One can not wish away the water users group, they are necessary, at least theoretically, but to make them successful the Water Users Groups should be given executive power and authority (if the Governments are willing to lose their control). In USA and France, where the farmers own the irrigation systems, they can influence the transfers, promotions of the staffs. Mass and Anderson, have rightly observed about solution to frictions amongst the cultivators of a distribution system regarding equity of supply "no irrigation community has been able to settle except by long and costly experience."

As mentioned earlier, the donor agencies have a crucial role to play. Levine has observed that World Bank's National Water Management Projects and US AIDS's training program in India left the questions of organizational and infrastructure changes to other programs. The donor agencies must insist on performance indicators and aid should not be a part of bigger political game. For PIM, to succeed the first and foremost pre-requisite is political will at the highest level as is the case in Mexico. It is too premature to comment on Andhra Pradesh, India, where it has the support of the highest political executive of the State.

Participation can be termed as conscious involvement. In the Asian context, it seems to be elusive. The rural masses lack community character and it is heterogeneous mass of conflicting interests. Social factors like religion, caste, gender bias further add to this woe. Lack of legal rights to the farmers and poverty, is another impediment in participation. This leads us to the challenges facing the millenium. What is to be done? One option could be "ostrich" like situation. Just imagine that it does not exist. The other option could be to let the matter drift, with donor agencies pumping funds for "action research" studies, training, seminars etc. After a decade or so there would be discussions on "third generation" problems based upon highly biased case studies, put forward by protagonists and antagonists of the PIM. In the prevailing Asian context, we feel that one of the options to improve the situation is will at the highest level. For example the Act Number 11 of 1997, Chapter II, clause 14.5, governing the PIM in Andhra Pradesh, India, lays down that "A person having more than two children shall be disqualified for election or for continuing as a Chairman or a President or a Member of the Managing Committee." Such rules may not have to do any thing with PIM, but it sends down a strong signal to all concerned that business is intended.

Emerging social changes have raised many new issues in water management. The state has always played a leading role in water resources management, but the inefficient use, poor recovery of revenue and widespread malaise of corruption has forced the governments to look for alternative methods of management. It is an accepted fact that user based allocation is more effective than that practiced by the state, but participatory action is also not equally effective everywhere and it will succeed only where there is strong demand of water coupled with a history of cooperation amongst the users.

#### REFERENCES

1. A Management Perspective on the Performance of the Irrigation Subsector, Charles Nijman, IIMI.
2. Bench Mark Survey Report of Paliganj, Technical Report 51, WALMI, Bihar.
3. Benefits and Second Generation Problems of Irrigation Management Transfer in Colombia, Louis E Q-Pinto, EDI Participatory Irrigation Management Case Studies Series.

4. Benefits and Second Generation Problems of Irrigation Management Transfer in Mexico, Enrique Palacios V, EDI Participatory Irrigation Management Case Studies Series.
5. Cambridge Economic History of India, CUP, Cambridge, UK.
6. Chandragupta Maurya and his times, Sir William Meyer Lecture, 1940-41, Madras University.
7. Conflict, Growth and Justice in Arid environments, Mass & Anderson, R E Krieger Publishing Co. Florida, 1986.
8. Cost recovery in Irrigation Projects: Perceptions from World Bank operations evaluation, expert consultation on irrigation water charges, P. Duane, paper no. 5, FAO, 1986.
9. Cropping Pattern and Operation Schedule in Sone Irrigation System, Basawan Sinha, 1992, WALMI, Bihar, India.
10. Economic Aspects of Irrigation and Pricing of Water, B N Navalawala, Water Management Forum, 1992, Seminar on Irrigation Water Management.
11. From Participatory Irrigation Management to Irrigation Private management Transfer: The Process and progress in Sri Lanka (draft), Namika Raby, EDI, The World Bank.
12. Impacts of Colombia's Current Irrigation Management Transfer Program, Research report no. 25, Vermillion and G-Resterpo, 1999.
13. Managing Canal Irrigation: Practical analysis from South Asia; R Chambers, Institute of Development Studies, UK, Oxford and IBH Publishing Co., India.
14. Participatory Irrigation Management in the Philippines: National Irrigation Systems, Namika Raby, EDI, Participatory Irrigation Management Case Studies Series.
15. The Marchioness of Bute (ed.), The Private Journal of the Marquess of Hastings, K.G; Governor-General and Commander-in-Chief in India.
16. The World Bank and India's Irrigation reforms, R Wade, the Journal of Development Studies, vol. 18, 1982.
17. Transferring Irrigation Systems from the State to Users: Question of Management, Authority and Ownership, David Groenfeldt, EDI, The World Bank.
18. Water Resources Department, Govt. of Bihar, Programme and Achievements Reports for the years, 1998-99 and 1999-2000.

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