INSTITUTIONAL REFORMS IN IRRIGATION SECTOR OF PAKISTAN: AN APPROACH TOWARDS INTEGRATED WATER RESOURCE MANAGEMENT

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ABSTRACT

Since 1995 the Government of Pakistan has been making efforts to restructuring the century old irrigation system by involving beneficiaries (water users) at various units of the irrigation system management. The main purposes of reforms are: to improve operation and maintenance (O&M) of irrigation system, to make balance in expenditure and revenue, to improve crop production through efficient use of water, maintain affordable drainage system and develop an integrated water resource management (IWRM) approach.

In these reforms, the Irrigation Department has been transferred to an autonomous body – Provincial Irrigation and Drainage Authority (PIDA). Under PIDA, Canal Area Water Board at each canal command area and Farmer Organizations at each secondary canal (Distributary/Minor) command area being formed. These all units are now responsible for irrigation, drainage and environment in their jurisdiction.

Because of culture, political influence, social and economic set up of Sindh Province of Pakistan; it was argued that the formation of Farmer Organizations would be hard and challenging part of institutional reforms in irrigation sector for any organization. But the International Water Management Institute (IWMI) successfully completed the experience of formation of Farmer Organizations on thirteen distributaries at the time of project. This experience has further resulted in continuous formation of FOs. Until now the formation of FO on one canal command area, having 163 distributaries have been completed.

As part of the program, the capacity building activities for members of the organizations being carried out through training and awareness which has subsequently proved that the FOs are holding regular meetings and discussing the issues relating to irrigation and drainage, organization set up, and resource mobilization.

The participation of farmer members and management committee members in all events organized at various time and purposes has proved successful as 70-75

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percent attendance was observed. For improving the physical system, all farmers contributed voluntarily in cash and kinds, which resulted in improved water distribution by 60 to 70 percent.

Paper concludes that the approach adopted for improving water conservation through giving the water rights to the end-users is one of the best tools. However, still it is at initial stage therefore, no concrete result could be made. Further paper gives the impression that without giving due consideration to basic unit organization that is farmer organization (or Bottom-up approach) the result oriented system performance would not be possible.

INTRODUCTION

Issue of distribution and access are also critical in understanding the role of water in rural livelihoods. In many cases, formal legal frameworks usually guarantee equitable distribution of water; however, in practice they are not enforced, and the powerful monopolize access. Further, some claims to water are based on informal or customary rights that may be more difficult to defend, especially in the face of social changes such as significant in/out- migration or increased market integration. Ensuring access to water quality is similarly problematic.

The developing countries have the challenges as: Increasing population; increasing demand for food and other crops; poverty and famine; human resources constraints: health, education, and training; women in development; natural climate constraints: land and water; market competition from industrial and other countries and global warming. These all are possible irrigated agriculture is given priority and integrated approaches are developed. [John Hennessy 1990].

The foremost factor is the expected population growth in developing countries. Under the most optimistic scenario, which assumes successful population programs, world population will grow from 6.2 billion in the year 2000 to at least 8 billion by the year 2025.This growth will increase the demand for food supplies and thus the demand for irrigated agriculture production necessary to produce sufficient food worldwide. This demand will in turn create serious water management challenges in countries where additional supplies of aerable land and water at reasonable costs are almost exhausted. These problems are especially serious in countries where water logging and salinity are causing a reduction in the irrigated area [Guy Le Moigne 1990].

To improve the sustainability of irrigated agriculture is the urgent need to review current practices and standards and formulate new criteria for various aspects of irrigation system design, and incorporating environmental safeguards. Further, the water logging and salinity control must be linked to sound irrigation water

management, including water saving techniques and the proper maintenance of irrigation and drainage systems [Tom Brabben, etal 1991].

This water is used predominantly in agriculture to grow the food and fiber on which human society depends. In Pakistan, more than 70 percent of the rural populace depends on agriculture and mostly they irrigate their lands through one of the worlds largest and century old contiguous irrigation system. With the passage of time, this system has deteriorated and now facing with several problems. These are: less recovery of water charges, over expenditure on operation and maintenance, poor operation and maintenance, inequitable distribution of water and unreliable supply and rent seeking. To overcome these problems institutional reforms were identified and suggested for implementation in the system that will support to water conservation, food security, poverty alleviation and sustainable agriculture.

BACKGROUND

Since the mid 1990s, Pakistan has been seeking to reform its irrigation sector. The primary motivation behind this effort is to create financially sustainable irrigation agencies and improved operation and maintenance of the infrastructure and give the responsibility to end-users of their water rights so that the system should be self sufficient and sustainable.

The entry into force of the 1997 Provincial Irrigation and Drainage Authority Acts, paved the way for the creation of three new institutions. Irrigation Departments will become semiautonomous Provincial Irrigation and Drainage Authorities (PIDA). Area Water Boards will be formed, through which farmers and personnel of PIDAs will jointly manage irrigation and drainage networks at the canal command level. Management responsibilities at the distribution level will be transferred to Farmer Organizations (FOs).

Beginning in 1995, IWMI Pakistan ran three pilot projects at Bareji and Heran Distributaries and Dhoro Naro Minor in the Sindh Province of Pakistan, later in 1999 other ten distributaries were included in the pilot project. The objective of this work was to test the viability of FOs and their capacity to participate in the management of their irrigation and drainage systems at the local level. This study specifically focuses on the pilot projects in particular and institutional progress in general in the Sindh Province of Pakistan. The pilot area is shown in Figure 1 and salient features are shown in Table 1.

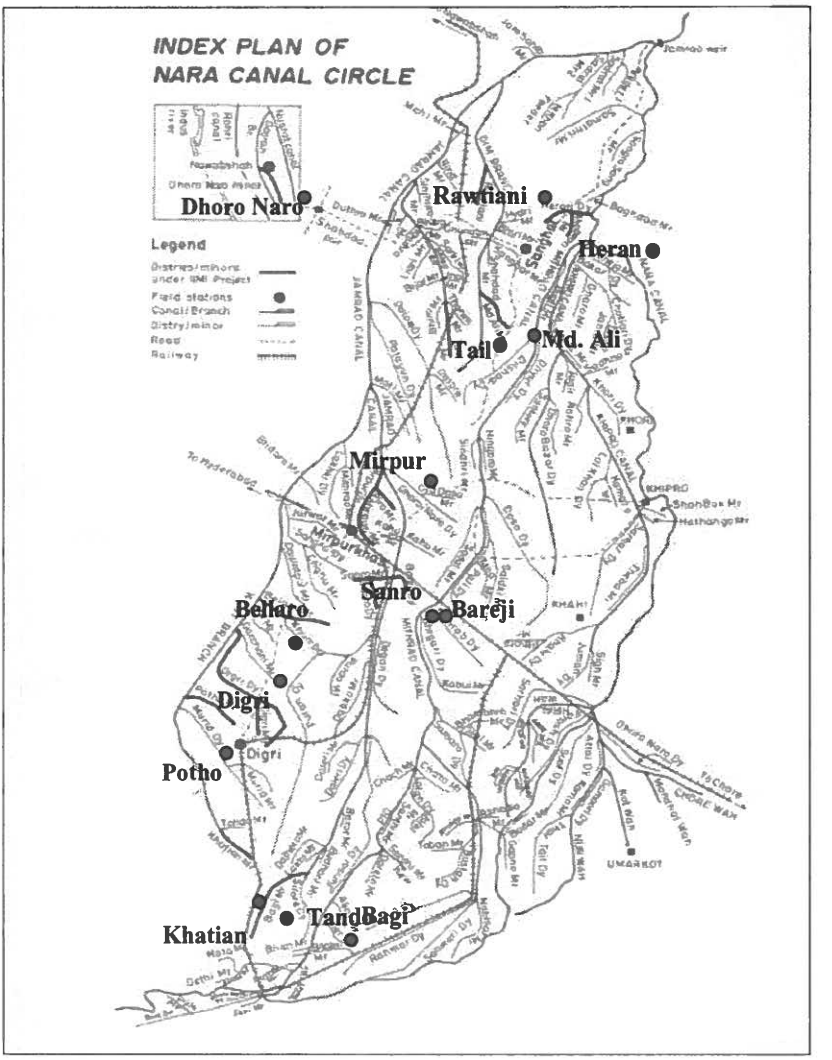

Figure 1. Location map of the pilot distributaries of IWMI projects

Table 1.Salient Features of the Pilot Distributaries

Distributary/ Minor	Command Area (ha)	Design Discharge (m3/sec)	Canal Length (m)	Number of Outlets	Canal Length/ha of command area (m/ha)
Heran	4994	1.77	9754	31	1.95
Rawtiani	3658	0.83	8382	19	2.29
Bareji	5797	1.18	11979	24	2.07
Mirpur	6566	1.74	14630	53	2.23
Potho	3264	0.82	10058	19	3.08
Dhoro Naro	5418	1.46	9836	25	1.82
Mohd Ali	1552	0.31	5182	10	3.34

IMPACTS OF PARTICIPATORY MANAGEMENT OF IRRIGATION AND DRAINAGE SYSTEM

Creating Farmer Organizations

The formation of FOs on 14 distributaries on Nara Canal Command Area was publicly recognized by oath-taking and handing over ceremony of thousands of water users from hundreds of villages, farmer members, leaders representing all watercourse associations and farmer organizations and politicians in the command area of all distributaries and civil society representatives. The Honorable Governor of Sindh Province chaired the Ceremony in April 2001.

Capacity Building

Based on training need assessment, the training programs arranged were: Social Organizer Volunteers (SOVs) workshop, Awareness on institutional reforms, Discharge measurement and walk thru survey (O&M), Organizational and financial management, FO rules, regulations, bylaws, action plan and Irrigation and Drainage Management Transfer agreement, Crop assessment and abiyana (Water charges) collection, and Workshops on agricultural production practices. In all 2,206 water users were trained. Majority of farmers were well experienced in farming. Most of the participants were landowners and owner cultivators; smaller number of managers, lessees and tenants participated and most of the members participated in more than one training programs.

Imputed and Actual Costs of Maintenance

The imputed cost of this activity is calculated on the typical labor and machinery hire rates prevailing at the time of the survey. Based on an average of Rs. 100 per day per person and between Rs.150-175 per tractor-hour, the grand total is just

over Rs. 800,000. On an average basis the cost is almost Rs.25 per ha ($0.45) which represents about 40% of the typical irrigation water fee or abiana that farmers are expected to pay. This is a substantial saving for the government who would otherwise have had to pay those labor rates to accomplish the amount of work done. If the inputs were typical for all of Sindh then the total cost of maintenance for the Province would something on the order of Rs.125 m or $2.25 m. The details are given in table 2.

Table 2. Maintenance inputs into pilot secondary canals

Distributary	Man-days	Tractor-hours	Imputed Cost (Rs)	Earth-work (m^3)	Work (man-days per ha)	Cost (Rs/ha)	Cost (Rs/ m^3)
Heran	1157	58	124100	7411	0.23	24.85	16.74
Rawtiani	586	35	64025	1351	0.16	17.50	47.40
Bareji	1020	14	105700	5601	0.18	18.23	18.87
Mirpur	1311	120	172650	9993	0.20	26.29	17.28
Potho	979	17	113611	8138	0.30	34.80	13.96
MAW	427	30	44625	3806	0.28	28.76	11.72
Khadwari	301	16	49275	n/a	0.24	39.59	n/a
Dhoro Naro	2055	292	249375	7376	0.38	46.03	33.81
Total	7836	582	923361	43678			
Average					0.25	29.51	22.83

Hydraulic Impact of Desilting

Before desilting the average DPR at the head of the eleven canals was 1.29 (i.e. 29% above design), ranging from 213% of design at Bareji which had been remodeled in 1995 and could cope with much larger than designed discharge to 58% of design at Bagi. However, the DPR at the head of the tail sections averaged only 97% of design indicating that in most canals all of the extra water was being captured by the head and middle sections of the canal (Table 4).

After desilting, the picture changed considerably. Average discharges into canals were only 20% above design: overall in the area discharges are low after desilting because it is the coolest season of the year and wheat in some areas is beginning to mature. However, tail end DPR values were, on average, also at 120% of design indicating almost uniform distribution. Data demonstrate that the inequity between head and tail was substantially reduced. However, many tail end areas got more water than the head, but in reality this will slowly be reversed as canals silt up again during the year.

Table 3. Hydraulic condition of the distributaries before and after maintenance

Distributary	Before Desilting			After Desilting		
	Head	Tail	Ratio of Head:Tail	Head	Tail	Ratio of Head:Tail
Heran	1.36	0.38	**3.53**	1.31	0.51	**2.55**
Rawtiani	1.71	1.71	**1.00**	1.54	1.71	**0.90**
Tail	1.49	1.20	**1.23**	1.15	0.96	**1.20**
Mirpur	1.02	0.39	**2.64**	0.94	0.66	**1.44**
Bareji	2.13	1.63	**1.30**	2.13	2.36	**0.90**
Sanrho	1.29	1.11	**1.16**	1.34	1.58	**0.85**
Belharo	1.11	0.36	**3.07**	1.07	0.79	**1.35**
Digri	1.17	1.12	**1.04**	1.04	0.90	**1.16**
Potho	1.02	1.28	**0.79**	0.74	0.98	**0.76**
Khatian	1.31	0.65	**2.00**	1.25	1.35	**0.92**
Bagi	0.58	0.80	**0.72**	0.71	1.36	**0.52**
Average	**1.29**	**0.97**	**1.68**	**1.20**	**1.20**	**1.14**

Reform Progress in Sindh

Experience of pilot project has lead to the formation of new canal area water boards and farmer organizations in the Province of Sindh, Pakistan. The newly established AWB and FOs are given in the table 4.

Table 4. Newly established canal area water boards under institutional reforms in Sindh

Area water Board	Barrage	CCA (Acres)	Designed Discharge (cusec)
NaraCanal Year of Establishment: 1999 FOs to be formed: 165 FOs registered: all	Sukkur	2493,029	13,600
Left Bank Canal Circle Year of Establishment: 2002 FOs to be formed: 123 FOs so far registered:05	Kotri	1,533,935	18,956
Ghotki Feeder Canal Year of Establishment: 2002 FOs to be formed: 64 FOs so far registered: 06	Guddu	855,231	8,490
Western Canal Year of Establishment: 2002 Total FOs to be formed: 183 (Board is yet to function)	Sukkur	1,070,623	13,800
Begari Feeder Canal Year of Establishment: 2002 FOs to be formed: 85 (The board is yet to function)	Guddu	958,857	14,764

LESSONS LEARNED

It is also clear that in a comparatively short period of time, and certainly in no more than two or three days if people work hard, it is possible to completely desilt secondary canals and restore them to some measure of their original design condition. This level of input does not seem unreasonable and we can speculate that if other conditions remain in place then it will be possible to expect similar inputs into the future.

There were substantial hydraulic benefits. In virtually all locations the inequity of water distribution between head and tail was reduced, and in several cases previous inequities were reversed with tail end water users getting a slightly higher proportion of available water than head enders.

CONCERNS FOR THE FUTURE

It would, however, be unwise to be complacent about the situation that was measured and observed during the January 2000 maintenance period. A number

of issues remain that continue to cast doubt on the ability of Farmer Organizations to maintain their facilities now that management transfer has occurred.

Even on those canals where IWMI had undertaken physical surveys of cross-sections and longitudinal sections desilting remained more a matter of eyeballing than of systematic and controlled establishment of design sections. The desilting was done up to a point where the profile looked more or less smooth, banks were shaped to look correct, weak sections were strengthened, and in a limited number of places, the cross-section was made narrower. Yet at no time were physical measurements taken to determine whether widths, depth or slopes were consistent with what should be required to provide effective water levels at each outlet when the canal operates at design discharge.

Although hydraulic conditions improved in most canals, these results did not become inculcated into the daily actions of water users or the Irrigation Department, instead remaining more or less as a separate and unrelated measurement exercise. So the link between maintenance and performance remains weak or non-existent, and there is no sign of any major effort to try to link them again.

The maintenance efforts described here only dealt with the issue of desilting and repair of canal banks. There was no attention paid to physical infrastructure such as regulator, bridges and outlet structures which are controlling the discharge of water. To some extent this reflected the continuing stand-off between the Farmer Organizations and the Irrigation Department that prevailed at that time.

Collecting water charges from the water users and giving the agreed portion (60%) to the canal area water board and rest (40%) keep with FO to maintain the channel and run the organization is another task that farmer organizations have to take.

Based on these concerns it would be premature to suggest that the Farmer Organizations can undertake all aspects of maintenance and organizational matters and water conflicts into the future. There is still a long way to go before they develop the technical skills and the managerial capacity to maintain canals, repair infrastructure, and upgrade it as and when the need arises.

CONCLUSIONS

The institutional reforms in irrigation sector are in progress. The impact of pilot project has indicated that the FOs jointly discusses the irrigation and drainage issues in their meetings which were not held before in any formal or informal way. A good number of water users have received technical, social and financial training, which has resulted in better management of the system.

In systems with a high degree of control over water there is some opportunity for a trade-off between operation and maintenance in order to achieve the desired water distribution pattern. In the supply-based systems of the Indus Basin and northwest India this option is not available: if canals are not maintained so that their physical condition approximates the original design, it is impossible to achieve a reasonable degree of equity of water distribution.

Irrespective of who is given operation and maintenance responsibility, be it the Irrigation Department, Farmer Organizations or private companies, the basic maintenance requirements remain the same in these supply-based systems. If ownership or management responsibility changes, there is no hydraulic basis for altering the rules of operation and maintenance unless there is a change in design.

There is no shortage of information on performance parameters, their values and tolerances, that should form the basis of an integrated operation and maintenance program that achieves the desired levels of water distribution equity and predictability that are the hallmarks of a well-managed supply-based irrigation system.

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