# WATER RIGHTS
## Pro Poor Interventions in Irrigation

SOUTH ASIA PARTNERSHIP-PAKISTAN

# Water Rights:
# Pro-Poor Interventions in Irrigation System for Poverty Reduction

**Mazhar Arif**

**South Asia Partnership-Pakistan**

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| Writer: | Mazhar Arif |
| Research Coordinator: | Anwar Chaudhary |
| Editor: | Mohammad Asif |
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# C O N T E N T S

## Glossary of Acronyms

| | |
|---|---|
| ADB | Asia Development Bank |
| AWB | Area Water Board |
| DMP | Drought Management Plan |
| EPA | Environmental Protection Agency |
| FO | Farmer Organization |
| GDP | Gross Domestic Product |
| IMT | Irrigation Management Transfer |
| O&M | Operation and Maintenance |
| PIDA | Provincial Irrigation and Drainage Authority |
| SAP-PK | South Asia Partnership-Pakistan |
| UN | United Nations |
| USA | United States of America |
| WHO | World Health Organization |
| WUA | Water User Association |

## Preface

## 1- Introduction

### Water—A Scarce Commodity

Fresh water is globally a scarce commodity. The optimum utilization of water resources is of utmost importance because the world as a whole is suffering from vast water shortages. The water deficit has emerged and is growing rapidly in recent times and remains largely unnoticed. In terms of remedial, most countries are "managing" water shortage problem, rather than "solving" it. Many countries do not have any options and are thus relying on gradually increased import of grain and water-related products.
For instance, in Yemen, ground water is being mined at such a fast rate that parts of rural economy could disappear within a generation. Yemen's capital Sana is facing a situation worse than Balochistan's Quetta city.

Villages in eastern Iran and those near Mashad are being abandoned, generating a swelling flow of water refugees. Egypt and Sudan, co-sharers of River Nile, are both facing growing grain deficits as a result of water shortages. Mexico is in similar trouble. Once self-sufficient, both Iran and Egypt are now importing more than 40 percent of their grain demand (wheat & rice). Morocco is importing half of its grain needs while Algeria imports 70 percent. A similar situation prevails in Central Asian and many other countries. Israel is importing more than 90 percent of its food requirement. Since a ton of grain requires approximately 1,000 tons of water, importing grain appears to many countries a most expedient way of

importing water, but the question is: To what consequence?

When China starts importing grain (currently 40 million tons of annual shortfall is being met out of their vast reserves), and enters the world grain market, grain prices can be expected to shoot up despite the heavy subsidies being provided by USA and some other rich countries, partly for food security and partly to keep the world prices stable. The trend over the past decade is for staple food prices to fall and for some crops this has been dramatic. Yields in many countries are still low, which means there is the potential for sufficient food to be available in the short-term future. However, climatic and political changes could push the food prices one way or another.

In Pakistan, the water requirements over the next several decades have to be realistically assessed and then related to the water-resource availability for further development, aside from potential increase in yields or productivity, so that the country may not fall again into the category of grain deficit countries. With vast resource of cultivable land and skilled farmers who have been tilling the lands generation after generation, it would be most unfortunate if due to lack of understanding and vision, Pakistan fails to meet its food security needs. According to world economic experts, poverty in various countries is largely attributable to lack of proper utilization of their national resources. In Pakistan, water will remain a critical resource for sustained economic development. (1)

**Pakistan Water Resources**

The Irrigation Network of Pakistan is the largest infrastructural enterprise accounting for approximately $ 300 billion of investment (at current rates) and contributing approximately $ 16 billion, or nearly 25% to the country's GDP. Irrigated agriculture provides 90% of food and fiber requirements while "barani" (rain fed) area contributes the remaining 10 percent. Irrigated area in Pakistan has increased from 8.40 million hectares in 1947 to 18.09 million hectares in 2000 due to construction of large number of irrigation interventions and a huge number of tube wells. As a result, Pakistan now owns the largest contiguous irrigated area in the world. The Indus Basin System has 3 super dams (besides 68 other large dams), 19 river barrages, 12 inter-river link canals, 45 huge canal commands, and over 600,000 tube wells, besides nearly 18,000 km of drainage network to dispose of agricultural effluent with one drain taking a sizeable part of the saline effluent right into the sea.

At present, irrigation uses about 93% of the water currently utilized in Pakistan. The rest is used for supplies to urban and rural populations and industry. However, with Pakistan's population set to increase by 50% by year 2025, the percentage of water required, particularly for urban water supply, is set to increase dramatically. This will place further pressure on water resources which are already deficient in meeting demands across all sectors.

Besides, the rising competition for water must be seen against increasing concerns about the deterioration of

water quality and the environment. Lack of effective waste water treatment facilities and saline drainage effluent are resulting in increasing pollution loads on the river system as well as the salinization of farm lands. Gradually declining water availability and quality raises serious concerns for wetland, riverine and delta ecology.

Pakistan's National Water Policy emphasizes upon the need to develop a **"Blue Revolution",** which over the first quarter of the 21st century may provide the necessary quantum increases in availability, service delivery, usage efficiencies and equities in the most important input, namely, water, in order to meet the production, the public health and the environmental needs.

Therefore, for sustained self-sufficiency in food, alleviation of poverty and combating environmental degradation, every drop of available water should be conserved and production per unit of water maximized. Past strategies for the development and exploitation of ground water resources have raised questions as to what is a judicious and balanced resource management. (2)

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## 2- Pakistan Irrigation

The Indus River, which flows from the Himalayas to the Arabian Sea, is very much the heart of Pakistan. Channeling monsoon rains and summer snow melt, its annual rise and fall has supported a long history of civilization in a largely arid region. Extended by a third of their original size since independence, the irrigated flood plains of the Indus and its tributaries now yield 90% of all crop production in the country. With over a million miles of channels and ditches, covering 16 million hectares, the Indus basin contains the largest contiguous area of irrigation in the world.

Pakistan's farmers grow a huge range of crops in their richly varied landscape, but there are essentially two main cropping systems. In the far north, the Himalayan foothills are best know for their orchards, but farmers here also grow rain fed wheat, potatoes, legumes and vegetables. At the foot of these hills, the north Indian rice-wheat belt sweeps across the country from west to east, with a southern offshoot following the Indus to a huge delta on the Arabian Sea. Kharif (summer) crops include rice, sugarcane, cotton and maize; typical Rabi (winter) crops are wheat, gram (a pulse), oilseed rape, barley and mustard. To the west of the Indus, desert plains and scrubby hills are home to migrant pastoralists herding mixed flocks of sheep and cattle, who supplement their earnings from livestock by cultivating food and fodder crops in isolated pockets of irrigation.

Most rural families keep a few buffaloes or cattle for milk and manure, and around a third of these regularly market surplus milk. Women generally take responsibility for dairy production in the household, and also earn income from poultry, sheep and goats; typically this may be the only income over which they have complete control. However, in the areas of mixed farming these earnings are threatened by the pressure for grazing land to be ploughed and cultivated, and in the western areas, particularly the province of Balochistan, successive years of drought have reduced livestock numbers by up to 60%.

**Productivity Problem**

Pakistan has managed to significantly increase its agricultural yield over the last half century but, worryingly, this increase has been achieved almost entirely through extending the irrigated area; little progress has been made in raising productivity. Land exhaustion and water degradation are also reducing crop yields. For the irrigated areas water-logging and salinization are the two biggest problems. An estimated 75% of irrigation water is brackish, caused by over-extraction of fresh ground water, which leads to contamination from saline aquifers.

Severe salinization has taken approximately 10% of cultivable land out of production, with another 15% giving greatly reduced yields; there are also fears that poorly managed fertilizer and pesticide application are adding to the problem of ground water contamination. In addition to this, over 20% of cropped land is partially or very water logged as a result of poor

drainage structures. Despite two major dam building projects in the 1960s and 1970s, intended to store and regulate water flows throughout the cropping season, 85% of irrigation water is targeted at the summer crops and only 15% is available for the winter season.

However, reversing the problems of the irrigated fields, and the poor farmers, that are so vital to the country's food security and financial health require enormous government commitment. In Pakistan's ailing heartland, major surgery, both for the physical and organizational structures, are desperately needed, and without it, Pakistan's history may continue to be one of struggles. (3)

Water management is based largely on objectives and operational procedures dating back many decades and is often inflexible and unresponsive to the needs for greater water use efficiency and high crop yields. Charges for water use do not meet operational and maintenance costs, even though rates more than doubled in the 1970s and were again increased in the 1980s. Partly because of its low cost, water is often wasted by farmers. Good water management is not practiced by government officials, who often assume that investments in physical aspects of the system will automatically yield higher crop production. Government management of the system does not extend beyond the main distribution channels. After passing through these channels, water is directed onto the fields of individual farmers

whose water rights are based on long-established social and legal codes.

Traditionally, groups of farmers voluntarily manage the water courses between main distribution channels and their fields. In effect, the efficiency and effectiveness of water management relies on the way farmers use the system. The exact amounts of water wasted have not been determined, but studies suggest that losses are considerable and perhaps amount to one-half of the water entering the system. Even greater amounts are probably lost because farmers use water whenever their turn comes even if the water application is detrimental to their crops.

The attitude among almost all farmers is that they should use water when available because it may not be available at the next scheduled turn. As a result, improvements in the irrigation system have not raised yields and output as expected. Some experts believe that drastic changes are needed in government policies and the legal and institutional framework of water management if water use is to improve and that effective changes can result in very large gains in agricultural output. (4)

**Waste Water Use in Pakistan**

Untreated waste water is used for irrigation in over 80% of all Pakistani communities with a population of over 10,000 inhabitants. The absence of a suitable alternative water source, waste water's high nutrient value, reliability, and its proximity to urban markets

are the main reasons for its use. Two case studies in Pakistan studied the impact of untreated waste water use on health, environment, and income. The results showed a high increase in hookworm infections among waste water users and a clear over-application of nutrients through waste water. Heavy metal accumulation in soil over a period of 30 years was minimal in Haroonabad, a small town with no industry, but showed initial signs of excess levels in soil and plant material in Faisalabad, a city with large-scale industry.

The impact of waste water irrigation on household income was considerable as waste water farmers earned approximately US$300/annum more than farmers using fresh water. Both case studies showed the importance of waste water irrigation on local livelihoods. The lack of financial resources at municipal and provincial levels for waste water treatment calls for other measures to reduce the negative impact of untreated waste water use on health and environment, for example to manage ground water, regular (canal) irrigation water, and waste water conjunctively, and regular deworming treatment of those exposed to waste water.

Preliminary results from a country-wide survey in the four main provinces showed that untreated waste water was used in 50 out of 60 visited cities. The three main reasons for the use of waste water were the high salinity of ground water, recent droughts that have led to a decline in ground water tables, and the nutrient value of waste water. Other important

reasons were the proximity of urban markets and the reliability of waste water, which unlike regular irrigation water is not subjected to a rotational schedule.

In more than half of the visited cities some sort of fee was paid by farmers to either the municipality or the local waste water utility for the use of waste water. For example, in the city of Quetta, 212 farmers cultivating 800 hactares collectively paid US$12,000/ annum for the right to use waste water. This was 2.5 times more than the fee for regular irrigation water. Land rent in all cities reflected the importance of waste water with the rent for land that had access to waste water being at least double and in some cases up to six times that of land without access to waste water.

Waste water used for irrigation in Haroonabad and at two sites in Faisalabad was not fit for unrestricted irrigation according to microbiological guidelines set by the World Health Organization (WHO *Health Guidelines for the Use of Waste water in Agriculture and Aquaculture* (WHO, 1989). However, the WHO guidelines state that the guidelines can be relaxed when vegetables are eaten cooked, and in this case, the main vegetables cultivated, cauliflower, spinach and aubergine, are almost exclusively eaten cooked. The high values of electrical conductivity and total nitrogen loads of the waste water placed medium restrictions on the use of this waste water for agricultural production as its use could result in limited crop growth and hence yield reductions.

During the course of the studies farmers mentioned that they were limited in their choice of crops, though some crops considered unsuitable by one farmer were grown by another. There seemed to be a consensus among farmers that such root crops as carrots, radishes, onions and potatoes were unsuitable for waste water irrigation, because as a result of their foul smell, poor color, and in the case of carrot and radish, the development of several short, not single straight roots, these could not be sold in the local market.

## Health Impact

### Intestinal Nematodes

Preliminary results from a health survey in Faisalabad and a completed study in Haroonabad show a similar trend. Waste water farmers had a 4 to 5 fold higher risk of hookworm infection than a group of non-waste water users. There was no difference in risk of hookworm infection between children of waste water farmers and children of non-waste water irrigators.

### Vector Breeding

Vector studies in Haroonabad and Faisalabad revealed that waste water stabilisation ponds and other waste water bodies favoured the breeding of *Anopheles* and *Culex* mosquitoes. Within the waste water-irrigated zones, each vector species was found to be associated with specific breeding site types and environmental characteristics. The presence of potential vectors of human diseases such as malaria, filariasis, West Nile fever, and Japanese encephalitis

indicated that waste water systems could contribute to vector-borne disease risks in addition to other associated health risks among poor human communities that depend on waste water use for their livelihoods.

However, the studies say, this potential role of waste water stabilisation ponds to serve as breeding sites for mosquito vectors of human disease has received little attention. Poorly managed waste water treatment ponds have thick emergent vegetation and floating solid waste along their margins. The vegetation and floating waste offer ideal habitats for the breeding of mosquitoes by attracting them to oviposit and also by providing them with protection against predators. The creation of such perennial water bodies close to large urban areas in an arid environment could pose a significant health risk for communities living around such treatment schemes.

In Haroonabad waste water farmers spent more money on insecticides, labour and land rent than farmers using regular canal water. The major input cost for regular farmers was for fertiliser and although this was a substantial cost, on average the total costs for regular farmers were less than those for waste water farmers. However, the average gross margin for a waste water farmer, about US$173/ha (Rs 10,000/ha), was substantially higher than for a fresh water farmer using canal water, about US$43/ha (Rs 2,500/ha) because of higher cropping intensities and the ability to cultivate crops with higher market values. (5)

## Irrigation Water Reforms

### PIDAs

A program of water reforms was begun in the late 1990s, which focused on improving institutions and overall governance in the water sector. In the irrigation sector, these reforms aimed to decentralize irrigation management, improve farmers' participation in management, and develop the physical, financial and environmental sustainability of irrigation systems. At the provincial level, therefore, systems are overseen by Provincial Irrigation and Drainage Authorities (PIDAs)—financially autonomous bodies that formulate policy and enforce laws. At the canal system level, a three-tier irrigation management structure has been established:

***Area Water Boards*** (AWBs)—one per canal command (each covering 0.4 million hectares on average). These have similar functions to utility companies, and consist of (among others) representatives of the PIDA, the Agriculture Department, and farm-household organizations. **A pro-poor legal requirement is that representatives** from households in both head and tail reaches, and those with large and small landholdings, are included.

***Farmer Organizations*** (FOs)—one per distributary. These receive water from the AWBs, and distribute it to farmers. They operate and maintain distributary canals, and assess and collect irrigation charges—60% of which are passed on to AWBs for upstream operation and maintenance (O&M).

***Water Users' Associations*** (WUAs)—one per outlet. These represent farm households sharing water below each outlet along a water course.

According to the INPIM e-newsletter (August 02, 2006), each farmer group has nine members elected by water users and must include three members from the most disadvantaged sections of the community. "This arrangement has led to some panic among the staffs at the irrigation department who now fear that they could lose jobs," says M. Aslam Qureshi, general manager, PIDA. The farmer groups also have authority to hire and fire employees so they are in full control, he adds. Today many government employees have begun to seek jobs at the newly created institutions, including the farmer groups.

PIDA officials said putting the system in place was not easy especially because of the opposition by farmer groups that had found ways to beat the system. "We had to recruit social mobilizers to visit rural areas and explain the idea to locals, the system was introduced only after we had convinced the people of the benefits of participatory management," says Qureshi. The system has been so successful that now other provinces have begun following the path shown by Punjab.

**Water Pilferage**

Pakistan's irrigation systems have been frequent victims of water theft. Successive governments spent decades attempting to solve the problem until farmers began to organize themselves. According to INPIM e-

newsletter, farmer organizations have come up with an effective solution to stop water pilferage: managing, policing, and owning their irrigation systems. Pakistan farmers empowered with rules to run their own irrigation systems have found ways to deal with problems that successive governments failed to resolve in decades.

The newly set up Area Water Boards (AWBs) and Farmer Organizations (FOs) have effectively prevented illegal use of the community resource and have also helped to generate revenue for the central coffers. Pakistan began forming farmer groups and regulatory bodies to promote ownership of irrigation systems about a year ago. The early results of the policy shift are already evident.

An evaluation of performance of 85 farmer groups of Lower Chenab Canal (East) Circle, Faisalabad says that many farmer groups have attained 100 per cent reduction in water theft. The average recovery of water tariffs has also grown to about 75 per cent compared to 52 per cent when the government operated the system. The public system was not fair and large farmers could use more water than what they paid for while the poor did not get adequate water as a result of which they refused to pay. The idea was to involve the people to tackle these problems, and it is working, said Sajjad Siddiqui, who heads the communications department at the Punjab Irrigation and Development Authority (PIDA). According to Siddiqui, the problem had become acute and sometimes farmers would even pull down canal

banks to let water flow into their fields or siphon it using pipes in collusion with officials of the irrigation department.

Even though, theft is punishable under the law flouting the rules had almost become cultural and people had begun to take pride for stealing water and cheating on tariffs.

Under the PIDA Act, the farmer organizations are put in charge of policing field-level distribution, controlling theft, resolving disputes and collecting water tariffs.

According to Sagheer Ahmed, president of a farmer organization in Faisalabad, “if any one steals water, he deprives another farmer of his rights and believe me, no one is ready now to let go of a single drop of water from his share”. People who take more than their share or steal are first issued warnings and those that continue to do so after being warned are charged fines as high as 20 times the price of the stolen water. When everyone uses a fair share everyone, even those at the tail end of the canal, get to use water. (6)

## 3- National Water Policy 2002

The Government of Pakistan drafted a new National Water Resources Policy in 2002 acknowledging a number of issues and problems facing the water sector. The policy document says water resources management and development in Pakistan faces immense challenges for resolving many diverse problems. The most critical of these is a very high temporal and spatial variation of water availability. Nearly 81 % of river flows and 65% of precipitation occurs during the three monsoon months, while quality of ground water largely varies with depth and location. Ever expanding water needs for the growing economy and the population for meeting its food and fiber requirements, and the advent of frequent floods and droughts, add to the complexity of water management.

**The policy document encompasses issues particularly related to irrigated agriculture, water rights and allocation, equitable distribution of irrigation water, stakeholder participation, drought management and water quality. The policy, or the guiding principles, can not be termed as pro-poor as it does not mention the protection of water rights of the poor farmers or tail-end farmers. However, it identifies the following key issues and suggests policy measures:**

- Growing need of water to meet requirements of rising population besides socio-economic demands.

- Very high variations, both in terms of space and time, in the availability of water resources.
- Reduction in the availability of surface water, due to silting of dams.
- Lack of proper maintenance of the canal system leading to unsatisfactory service.
- Water logging and salinization of areas in various canal commands of Indus Basin System.
- Lack of commitment by various organizations on the need for provision of drainage network as a part and parcel of the irrigation network.
- **Over exploitation of ground water resources, thus, rendering large areas out of reach of poor farmers and exhaustion of ground water aquifers.**
- Pollution of aquifers due to lateral movement of saline water or upward movement of highly maineralized deep water.
- Lack of proper disposal of saline effluent.
- **Contamination of river water due to disposal of industrial waste, household waste water and field overflows contaminated with fertilizer and pesticides.**
- Inadequate participation of consumers.
- Frequent floods and droughts.
- Lack of inter-provincial consensus on developmental strategy and mistrust between provinces on equitable water distribution.
- Proper pricing/valuation of water.
- Quality of water in all sub-sectors.

The National Water Policy highlights and focuses on the change in concepts, policies, planning

approaches, institutional framework and mechanisms to achieve sustainability, proper development and optimal benefits from this resource.

**Guiding Principles**

The foregoing summarized version of the studies, analyses, options and conclusions, together with the following guiding principles, have formed the basis of the formulation of the National Water Policy emphasizing upon equitable distribution of water among all users:

- By the year 2025, Pakistan should have adequate quantity as well as quality of water, equitably distributed to meet the needs of all users through an efficient management, institutional and legal system that would ensure sustainable utilization of its water resources.
- Water has to support economic and social development with due consideration to the environment, quality of life, economic value of resources, ability to pay and the participation of all stakeholders.
- Insofar as is feasible, planning, development, and management of water resources should be decentralized to appropriate levels responding to basin boundaries and/or canal systems.
- Delivery of specific water services should be delegated to autonomous and accountable public and/or cooperative agencies providing water services in a defined geographical area to their customers and members for an appropriate charge, but with proper and effective regulatory

functions to be performed by an independent body.

- Water use in society should be sustainable with appropriate incentives, regulatory controls, public education, promoting economic efficiency, conservation of water resources, and protection of environment, within a transparent policy framework.
- Shared water resources within and between provinces should be appropriately allocated, delivered equitably and efficiently for the mutual benefit of all riparian users.
- Water sector activities should be participatory and consultative at each level, leading to commitment by stakeholders and action that is socially acceptable.

**Irrigated Agriculture**

**Issues**

According to the policy document, irrigated agriculture is by far the largest sector/user of water and is also the prime mover of the economy. To meet the food and fiber requirements of the growing population and to ensure sustained economic development (including exports) through to year 2025, there is need to increase agricultural output significantly. This will require yields to be raised as well as the cropping intensity and the area under irrigation. The latter two categories will require additional water which will have to be found through enhanced efficiency and conservation as well as through increased storage and better ground water management. Rainfall is

another potential source of water. Rainfall harvesting and other techniques can be used in hill torrents areas for irrigated agriculture.

**Policy**

Towards this end, among others, there is a need to:

- Ensure that sufficient food is produced to meet Pakistan's growing food requirements and food security.
- Improve the productivity per unit of water. This should be the primary goal in irrigated agriculture. High delta crops and canal irrigation of marginal areas should be discouraged.
- Target production of higher value export crops such as "Basmati" rice, cotton, fruits, vegetables, etc., without sacrificing the wheat crop.
- Promote and support higher efficiencies in conveyance of irrigation water, prioritize farmer education, encourage recycling, equitable delivery and reuse of water and other demand management techniques.
- Ensure sustainability of irrigation infrastructure through (a) awareness of farmers and government service delivery personnel, (b) increasing the level of cost sharing and (c) increasing community and farmer participation in the management decisions related to infrastructure.
- Enforce high maintenance standards for irrigation infrastructure to avoid system deterioration.
- **Ensure more equity in water distribution, with particular emphasis on tail-end farmers, by supporting and strengthening farmers' organizations.**

- Promote the transfer of management of irrigation schemes to AWBs and FOs, with prior infrastructure rehabilitation, and establishment of independent regulators to ensure equitable water distribution while facilitating conflict resolution.
- Promote empowerment of FOs to collect O&M charges and to impose fines for non-payment.
- Encourage and support harnessing of hill torrents for enhancing agricultural production and to reduce floods.
- Develop farmer education programmes to improve water use efficiency.
- Encourage farmers to grow low delta crops with higher economic returns.

**Water Rights and Allocations**

**Issues**

The policy document acknowledges that within the irrigated agriculture sector, water rights are well defined, but neither they promote efficiency nor take into account the economic value of water. Moreover, the system is not designed to allow users to know whether they are getting their due allocation.

Recognizing the fact that during acute water crises, no amount of organizational improvements, or mechanisms can eliminate the basic cause of water shortages, the underlying problem has to be solved rather than managing it.

**Policy**

Towards this end, it is necessary to:

- Ensure that all citizens have an equitable right of access to clean water and sanitation facilities.
- Ensure the water rights of the provinces in accordance with the 1991 Water Accord in full.
- Expand the installation of an automatic hydro telemetric network so that inflows, outflows, canal withdrawals and water levels at all critical points of the Indus Rivers System, are available to all the provinces and the concerned federal agencies at all times, for reasons of transparency of operation, and to create an environment of mutual understanding and trust.
- Harness and develop more water resources in economically and socially desirable ways to eliminate/minimize water shortages, particularly during the critical crop-demand periods.
- Initiate and facilitate an agreement among provinces on safe disposal of surplus drainage effluent, that is, a Drainage Accord similar to the Water Accord.
- Establish mechanism for conflict resolution of water issues at various levels.
- Promote the extension of mandate of AWBs to include water allocation and other issues of potable, industrial and environmental water supplies and water for the environment.

## Stakeholder Participation

### Issues

The conservation and extension of water resources of Pakistan is undertaken basically for the people of Pakistan to support their health, economic and social development. The operational management has been historically the responsibility of governmental organizations. Due to system inefficiencies, indifferent attitude of managers and condemnation of unilateral actions of governmental functionaries by users, it has lately been accepted to enhance the participation of all water stakeholders, namely, those with an active involvement in water use such as farmers and rural communities as well as those who rely on water services for their health and livelihoods.

Stronger linkages are, therefore, required between the system operators and the beneficiaries. This will instil greater confidence of farmers as they participate in the O&M activities and introduce improved management. **Improved equity in water distribution will be another benefit.**

There have been and will be difficulties in developing functional farmers' organizations to manage the irrigation and drainage networks. However, the process should continue to be promoted, and their contribution will gradually evolve, though government is likely to remain the major partner.

To effectively participate at all levels; the public must be aware of and have a fuller understanding of the

issues in the water sector as well as their rights and responsibilities. It is the responsibility of the federal and provincial governments to ensure that the level of public awareness is raised. Change is always difficult (even though it may ultimately be rewarding) particularly because the participatory approval calls for a new type of relationship between the farmers and the government.

**Policy**

To achieve the policy objectives, there is need to:

- Create an enabling environment for active stakeholder consultation and participation at all levels and in all aspects of the water sector including irrigation, drainage, rural water supply and flood protection, and drought activities.
- Focus initially on water user's involvement in i) water distribution to ensure that water reaches all members as per their due share; ii) adequate maintenance; iii) proper assessment and collection of water charges; iv) monitoring water and soil quality and v) resolution of local disputes among members.
- Promote, support and ensure that participatory programmes are effectively coordinated with policies and programmes of all other public and private bodies to encourage partnership and to avoid conflict.
- Evolve public awareness programmes to highlight the objectives, namely, that farmers could receive more secure deliveries, government agencies would experience cost savings and the government staff would be re-allocated to new

assignments both within the government and with the new water-user organizations.
- Develop and implement a strategy to engage private sector participation in all aspects of the water sector.
- Promote modern water resources management and its emphasis on community and individual confidence and participation in the performance, operation and ownership of water assets.

**Drought Management**

**Issues**

Droughts are frequent events the world over, specifically in arid and semi-arid regions in which a major part of Pakistan is located. Irrigated agriculture has largely provided a substitute to direct rainfall on cultivated land. However, large areas are affected by drought conditions when river supplies are adversely affected by reduced rainfall in the catchment areas. In non-irrigated areas, droughts are particularly devastating such as in Balochistan, Thar Desert, Thatta and Dadu districts in Sindh, and Cholistan Desert, Bahawalpur and Rahim Yar Khan Districts in Punjab.

Response to emerging drought conditions and management of water resources under those conditions are poorly developed in Pakistan. A Drought Management Plan (DMP) is an essential tool for government to ensure that appropriate institutional and legal structures are in place prior to the onset of drought conditions and that the necessary action is

well-thought out in advance. DMP has to be tailored to the specific requirements of a river basin. For Pakistan, two types of DMPs would be required separately; one each for Indus River Basin and the Hill Torrent Basins.

**Policy**

To improve the situation under drought conditions, there is need to:

- Encourage development and dissemination of water conservation technologies for rainfall harvesting in non-irrigated areas.
- Plan and expedite measures to carry surplus river flows through diversion and other structures to drought-prone areas.
- Consider seriously the need for construction of carry over storages which is the only effective way of overcoming drought year(s).
- Encourage and support Meteorological and other Departments/Agencies in carrying out research work in reliably predicting droughts (in terms of several months or even a year ahead) so that feasible counter-measures can be timely taken through modified releases from reservoirs and other water management strategies. Research should aim at developing appropriate mathematical models.
- Encourage and support provinces to prepare drought management plans (DMPs) for different drought prone areas.

**Water Quality**

**Issues**

Measures have to be adopted to eliminate contamination of surface water bodies and ground water aquifers from industrial and domestic waste water and pollutants, agrochemicals and urban sewage, all of which adversely affect water quality, natural ecosystems and public health.

The deteriorating quality of surface and ground water resources has been given a lower priority to date than water quantity. However, quality will become an increasingly important issue and needs to be addressed. The objectives are to establish and maintain standards for potable/domestic water; ensure that effluent from waste water is treated before disposal; and the preservation of surface and ground water resources to ensure sustained supply.

**Policy**

To achieve the foregoing, it is necessary to:

- Make the water quality in rivers, reservoirs, coastal areas and other water bodies including ground water a national priority for improvement to acceptable standards by 2025 through improved agricultural drainage, municipal, rural and industrial waste water treatment and effluent disposal. Achieve full compliance with EPA standards for drinking water.
- Promote measures, as part of all future plans, for water resources development that reduce or eliminate contamination of surface water bodies and ground water aquifers from industrial and

domestic emissions of pollutants, over-use of agro-chemicals and urban run-off, all of which adversely affect water quality, natural eco-systems and public health. Achieve full compliance with EPA standards for waste water disposal.

- Reduce the incidence of water pollution by regulating disposal of effluent in the municipal, industrial and agricultural sub-sectors.
- Initiate a study to establish and implement a National Water Quality Monitoring Programme which will:
  - establish water quality standards for potable water and for surface and ground water;
  - develop regulations for effluent disposal; and
  - develop a comprehensive programme of water quality monitoring; and support the development of an Information Management System for data storage and assessment.

## 4- Control of Influentials

However, concerns have been raised about the amount of control that influential people and larger land holders wield over water resources, due to the huge inequities in land distribution and the resulting highly inequitable rural power structures in all over Punjab.

According to a news report, in about four years, those managing the PIDA programme realized some of its inherent weaknesses. The pilot programme for the original model, in which three farmers` organizations (FOs) were formed in Bahawalnagar district, ran into trouble when the Irrigation and Power Department took its hands off them. The organizations were expected to control water distribution, collect abiana (water charges), and resolve disputes and document water economy. Their one-year evaluation pointed to problems in all these areas.

The problems were largely because of misplaced emphasis. The planners concentrated on social mobilization with relatively less stress on capacity building. Farmers received some training in upkeep of distributaries but were totally ill-equipped to deal with vital areas of dispute resolution and assessment and collection of water charges. The department took the FOs as its replacement and took its hands off, thus depriving them of crucial institutional support. The stress shifted to management of such issues rather than maintenance of outlets etc.

The managers argued that in Pakistan's socio-political set up, drastic institutional changes could result in more harm than good. Risking the century-old irrigation system for undefined objectives is not a chance worth taking. It is, therefore, necessary to keep the pace and extent of change to a manageable level. There was a realization among PIDA managers that most of the problems faced by the farmers related to distribution of water through water courses and if remedies were to be made available to them at their doorsteps, a forum at water course level would be most beneficial.

"This exercise is doomed to fail," an Irrigation and Power Department official in Punjab said. He said,"The basic idea of the PIDA is privatization of irrigation water and delinking it from land. The concepts are not made for Pakistan. How could one expect farmers to pay commercial rates for irrigation water? Once the water is commercialized, farmers would be expected to buy it like other farm inputs. The FOs cannot increase supply of water to a farmer even if he wants to buy more because no water is available in the country. Nor could the FOs punish an individual defaulter because water courses are designed to carry water for, say, 100 farmers. The World Bank came up with the idea, and the then government agreed to it to get the loan. Otherwise, the suggestions have never been taken seriously." (7)

**Pro-Poor Interventions needed**

Reducing poverty should be a major development goal. However, a study conducted by

Asian Development Bank-International Water Management Institute (ADB-IWMI) in 2004 has raised some basic questions: What contribution does irrigated agriculture make to reducing poverty? How does the performance of irrigation systems impact upon poor men and women? Have recent irrigation reforms improved access to water and lifted the poor out of poverty?

According to the study, the country's rural economy still faces three major interrelated problems affecting the poor men and women most. The problems are: low levels of productivity, degradation of land and water resources, and increasing water scarcity. Only 75% of crop water requirements are currently being met using irrigation. So, there is an urgent need to increase the supply of irrigation water and improve overall water-use efficiency—including delivery efficiency of canal system which is only 35-40% at present. Particularly, inequities in water distribution within systems need to be addressed, as farms in tail reaches often receive less water per hectare than those in head and middle reaches. Other problems concerning irrigation systems include centralized bureaucracies and little accountability on the part of officials, and poor transparency, lack of information-sharing, inadequate maintenance of infrastructure, and insufficient implementation of operational rules.

To address the problems, a number of land reforms have been introduced, new dams, canals and water-storage systems have been established but these

reforms largely remained ineffective as far as reduction of rural poverty is concerned.

The main purpose of the study was to evaluate the impact of water reforms introduced in late 1990s with the establishment of PIDA and farmer organizations and water users associations to decentralize irrigation management, improve farmers' participation in management, and develop the physical, financial and environmental sustainability of irrigation systems.

According to the ADB-IWMI study, till 2004, some 150 FOs have been established. But in Punjab, management has only officially been transferred from a PIDA to an FO in one distributary (4R) of one system (Hakra) in District Bahawalnagar, through an Irrigation Management Transfer (IMT) Agreement. This system was included in in-depth study of 10 irrigation systems in the upper Indus basin in Punjab. The study assessed irrigation system performance, poverty, and relevant institutions, and included interviews with 1,224 households in 2001-2002. All systems other than Hakra-4R are government-managed. Two poverty lines were used for rural Pakistan: i) the national poverty line of Rs1 730/capita/month (equivalent to US$1.46/day); and ii) a line of Rs530/capita/month (equivalent to US$1.06/day), which is closer to the internationally used poverty line of US$1/day and allows comparisons to be made with other countries.

**Large Land Holders benefit most**

The study focused on the relationship among poverty, agriculture and irrigation systems.

The findings are that in the study areas, land is very inequitably distributed, as 25% of sample households own 60% of the available land. The Gini coefficient for landholdings (where a value of 0 indicates that all households have equal areas of land, and 1 indicates that one household owns all the land) was therefore high: 0.51 on average, with a range of 0.31 to 0.56. Water is also distributed inequitably, because households are allocated water according to the size of their landholdings. So, large landholders benefit most from irrigation water and are less likely to be poor than households with small landholdings.

The net values of the crops produced in the irrigation systems were generally low and varied greatly—from US$62 to US$245/hectare. But, they were always higher than the US$35/hectare found in rain fed areas. So, the net benefits of irrigation ranged from around US$26 to US$210. In general, productivity and the benefits of irrigation were low in systems where land and water distribution is inequitable. So, in these systems poverty was higher.

In the systems studied, the incidence of income poverty (the percentage of people below the national poverty line) was 59% on average, varying between 40% and 77%. Within systems, there was a lower incidence of poverty in the middle reaches (where land quality, crop productivity and access to water are

better) than in the tail reaches. Poverty was high among households with large families, a large number of dependants, and no land for cultivation, or only small landholdings (generally less than 2 hectares). Poverty was also high among those located in areas with lower agricultural productivity, few opportunities in the non-farm sector, and poor access to good-quality canal water or ground water.

**Irrational Water Charges**

In Pakistan, the state/provincial government sets the level and structure of irrigation charges. At the farm level, charges are not based on the amount of water a farmer receives. Instead, they are based on the area cropped, crop type, crop condition, and cropping season (dry/wet). In each season, irrigation/revenue department officials assess the charges due per field. Even in the transferred system (Hakra-4R), charges are set by the government. And, though the charge due is assessed by WUAs, government officials often have a hand in this. In all systems except Hakra-4R, charges are paid to the government, and there is no direct link between funds collected and funds spent on Operations and Maintenance (O&M). Annual irrigation charges are low: Rs 274/ha to Rs 635/ha (US$4.4/ha to US$10.1/ha), which is equivalent to 1.7% to 3.9% of the gross value of crops produced per hectare. The charge-collection rate in the studied systems is fairly high (80-99%). On overall basis, collection rate in Punjab as a whole is around 60%.

**Water Charging System--Not Pro-Poor**

Poor small-scale farmers pay more for irrigation per hectare/year than large-scale and non-poor farmers. Because the charge is based on cropping intensity, which is generally higher on smaller farms, they pay more in canal-water charges than larger farmers. Plus, because they are often not allocated enough canal water to crop their land intensively, they also use (per hectare) more ground water—which is nine times more expensive than canal water. Thus, overall cropping-intensity-based irrigation charging benefits large land holders more than small land holders and the poor.

After the handover of the system's management to farmers in May 2000, irrigation charges in Hakra-4R were increased by 14% (to Rs199/hectare). This has provided around Rs one million in revenues—which means more funds for O&M. It was found that the management and condition of irrigation infrastructure have been improved (through desilting, bank strengthening and other repairs), as have fee-collection rates, service delivery, and overall system performance (crop productivity, equity in water distribution, and access to water by tail-end users). In Hakra-4R, the head-tail equity ratio was around 1—the most equitable water distribution found in the study. In other systems, the ratio ranged from 1.23 to 2.50, indicating significant inequity in water distribution.

However, concerns were raised about the amount of control that influential people and larger land holders

might wield over water resources, due to the huge inequities in land distribution and the resulting highly inequitable rural power structures - not only in Hakra-4R but also in all other systems studied in Punjab. (8)

**Water Right in Water Law**

Water Right in water law refers to the right of a user to use water from a water source, e.g., a river, stream, pond or source of ground water. In areas with plentiful water and few users, such systems are generally not complicated or contentious. In other areas, especially arid areas where irrigation is practiced, such systems are often the source of conflict, both legal and physical. Some systems treat surface water and ground water in the same manner, while others use different principles for each.

In general, a water right is established by obtaining an authorization from the state in the form of a water right permit. A legal right is formally consummated, or perfected, by exercising the water right permit and using the water for a beneficial purpose.

## 5- Water Rights as Human Rights

At the international level, there is growing acceptance of a "human right to water," where the term "right" is used in the sense of genuine rights under international law. The initial focus of human rights law was to address violations of moral values and standards related to violence and loss of freedoms. But, in recent decades, the international community has increasingly expanded rights laws and agreements to encompass a broader set of concerns related to human well being. The United Nations approved General Comment 15 in 2002, explicitly acknowledging a human right to water.

## 6- Policy Recommendations

For the reduction of poverty and protection of water right as human right, and in order to optimize the development of both surface and ground water and to get more crops per drop, the formulation of a pro-poor water policy is an essential requirement. Such a Policy is expected to contribute to food security by fostering sustainable increases in productivity of water through optimal supply and better management, aiming at to achieve particularly equitable water distribution in various areas and canal commands. In this regard, the key recommendations are:

**Traditional Water Harvesting System**

- Water, from rivers and rain, is the primary and the most valuable resource for life activities. As a counter strategy to the ongoing faulty water management system, creative use of water is emphasized. Traditional water harvesting system, building small dams and their management with participation of local communities is key to sustainable water conservation and use for drinking as well as agriculture.
- Use of deep wells must be stopped while the farmers should evolve innovative irrigation systems with surface water. The problem lies with water distribution and management and the agricultural practice that is heavily dependent on ground water extraction which should be radically transformed.
- Crop diversification is a key way forward, as it enhances the benefits of irrigation and increases

farm incomes. Besides, small-scale cultivation and resource-conservation technologies—such as bed-and-furrow cultivation, zero-tillage technology, and precision land leveling—increase crop yields by 15-20%, lead to water savings of 20-30%, and benefit farmers by reducing production costs and increasing returns to farming.

**Create Assets for Poor Men and Women**

- Pro-poor governance should be encouraged and safety nets and physical, social and economic assets created for the poor. Redistribution of land to landless rural household is a key first step. Currently, 0.29 million hectares of land taken from large landowners during land reforms, and 0.89 million hectares of largely undeveloped state lands are available.
- The government should introduce incentive- and market-based land reforms—even if this means buying land for distribution to the landless poor (who constitute the bulk of the rural poor) and to poor and marginal male and female farmers.
- All holdings should be large enough to support a family. The effective creation of land assets for the poor would improve the distribution of benefits from water-sector investments and significantly reduce rural poverty.

**Improve Service Delivery in Irrigation System**

- The performance of Pakistan's irrigation systems could be improved significantly, greatly reducing poverty. Institutional reforms--which benefit the poor by improving water distribution and crop

productivity—should be introduced in all canal commands, with due considerations to the differences in underlying socio-economic and resource distribution structures across communities.
- Strong regulatory backup and monitoring is needed, to ensure that the poor receive the expected benefits, and that poor small-scale farmers and those at the tail ends are represented in WUAs and FOs.
- Management organizations should meet performance-improvement and pro-poor targets. Irrigation reforms should be linked to broader agricultural improvement and poverty reduction strategies.

**Access to Water**

- Access to canal water and ground water quality both vary greatly among canal commands. Poor farmers often rely more on ground water than larger farmers do, and conjunctive management of surface water and ground water boosts productivity and is pro-poor. The two resources need to be managed jointly, especially in poor areas.

**Pro-Poor Water Charges**

- The present water charging policy harms the poor, so the level and structure of charges should be corrected, with charges being related to service delivery. The differential-rate strategy could be adopted to benefit the poorest.

**Benefits of Irrigation to the Poor**

- Crop diversification and the use of resource conserving technologies have significant impacts on farm incomes of small holders. The benefits of available irrigation water resources could be enhanced by diversifying into high-value crops (including non-conventional crops).
- The effective dissemination of existing resource-conserving technologies and the development of new technologies also offer ways forward.

**New Investments to the Poor**

- In many areas, investments are needed to further develop, improve and rehabilitate surface-water supply systems. New investment should target poor men and women, both geographically and socio-economically.

**Options other than Waste Water Treatment**

- It is unlikely that Pakistan will be able to treat all waste water currently used by farmers up to WHO guideline standards. Enforcement of crop restrictions will deprive many farming families of their livelihoods and there is therefore a need to look at options other than full waste water treatment.
- The WHO guidelines offer such other options as partial treatment for irrigation of vegetables eaten cooked, and the use of de-worming medication, which could be appropriate for the economic and environmental situation prevailing in the country.

- De-worming campaigns, with or without partial waste water treatment, could potentially be very successful.
- Encouraging farmers to wear foot-wear and other protective gear, such as gloves and long trousers, is suggested as a possible additional measure to protect farmer health. Many farmers might consider footwear and gloves impractical and uncomfortable under field conditions, and therefore the acceptability of such an intervention needs to be investigated prior to its implementation.

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