

3.2 Irrigation Department of the Punjab Province⁶ Asrar-ul-Haq⁷

3.2.1 Introduction

Pakistan has the largest contiguous gravity flow irrigation system in the world. The irrigation system serves as a lifeline to sustain the agriculture in this part of the world, having an arid to semi-arid climate. Irrigated lands supply more than 90 percent of agricultural production and accounts for 25 percent of the GDP. Employing 54 percent of the labor force that supply most of the country's needed food grain, it is also the source of raw materials for major domestic industries, particularly cotton products, which account for 80 percent of the value of Pakistan's exports.

The existing canal network of the Punjab Province is a gigantic and integrated system with limited flexibility. The length of main and distributary canals exceed 37,000 kilometers, and serves over 8.5 million hectares of culturable commanded area through about 50,000 outlets in 21 main canal systems. The irrigation system also comprises over 7,500 km of drains and about 2,500 km of flood embankments. In addition, about 8,000 public and over 400,000 private tubewells have been installed in the province. These tubewells provide supplemental irrigation water in the FGW zone and also cater to drainage requirements.

The main objectives of the summary paper is to evaluate the performance of irrigation agency in the context of its historical perspective, assess the available resources, identify the current constraints and issues and suggest the strategies and measures to optimize irrigation management.

3.2.2 Performance Review of the Irrigation Agency: The Historical Perspective

The Irrigation Department had played a key role in developing the world's largest contiguous irrigation network that converted desert wastes into lush green fields. Also, it had long traditions of performing the lead role in the country's economic and social development. This pattern continued even after independence up to the 1960s. The PID constructed several new canals and barrages. High O&M standards were generally maintained. After the 1960s, the stagnation in PID started with the creation of new federal agencies to construct Indus Basin Replacement Works and SCARPs. The external socioeconomic and environmental changes aggravated the trend of declining performance.

3.2.2.1 Objectives and Functions of the Irrigation Agency

A multitude of state agencies and departments share the responsibility for management of irrigated agriculture in Pakistan. The broad division of responsibilities between irrigation and agriculture and the support services starts at the federal level with two separate ministries, and runs through the sector's entire structure up to the farm level. Thus, irrigation management in Pakistan follows a segregated organizational structure.

⁶ Abridged version of "Case Study of the Punjab Irrigation Department". 1998. IIMI-Pakistan, Lahore.

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The major responsibility for irrigation system management rests with the Provincial Irrigation Departments (PIDs). PIDs undertake some construction works, but primarily attend to the O&M of the irrigation facilities extending from barrages and main canals to outlets, the upkeep and maintenance of drainage and flood works, assessment of water charges, and resolution of conflicts among water users. The On-Farm Water Management (OFWM) Directorate of the Department of Agriculture carries out watercourse lining and on-farm water management, while the Agriculture Departments are responsible for agricultural research, extension and productivity enhancement.

The two most striking facts need emphasis. The first is the lack of clear objectives and specific targets for irrigation management in Pakistan. The second is the current water requirement, which by far exceeds the canal system capacity during peak demand periods. However, the organizational goals have remained unchanged. This gives rise to the conflicts between the irrigation agency and farmers, and reflects on the performance and image of the irrigation agency. Therefore, the need to redefine the objectives of irrigation management is urgent.

3.2.2.2 Adequacy and Compatibility of the Organizational Set-up

The Secretary for Irrigation and Power heads the Punjab Irrigation Department under the direction of the Minister for Irrigation. Thirteen Chief Engineers who carry out various functions of the Department serve under the minister. In order to perform identified functions, the PID has acquired a large number of human resources. The Punjab Irrigation Department is a large organization with over 52,000 employees.

Agricultural development and population pressure over time has led to increased inequitable distribution of water and disputes among the irrigators. Organizational structure, distribution of responsibilities and even the size of organizations have basically remained the same as was left by the Colonial administration. The workload has increased considerably at all levels of field formations. Increased emphasis on developmental activities, sociopolitical assignments, and coordination meetings at the departmental, district, divisional and government levels have compounded the situation. As a consequence, mid-level managers cannot focus attention on their primary function of irrigation system management.

3.2.3 Irrigation Management Issues

The apparent declining performance of the Irrigation Department has drawn the attention of many national and international agencies and experts in the recent past. While some departmental officers attributed this aspect to inadequate maintenance, funding for performance declined. Some other experts and funding agencies consider the government's treatment of irrigation water as a public good that lacks market incentives. There is, however, a growing recognition that the issues of irrigation management are multi-faceted and multi-dimensional in nature.

Irrigation performance needs to be reviewed in the context of system design objectives, operational constraints, institutional systems, and the broader socioeconomic frameworks. The changes in the physical environment, like those of population growth, an increased demand for land and water, ecological threats, modern technology and new developments in groundwater pose new challenges to irrigation management. The sustainability of an irrigation system depends not only on the economical, technological and ecological factors, but also on the institutional framework within which these factors interact. The present performance problems and issues facing the Irrigation Department have been identified under six broad categories. These include system and supply constraints, technical and managerial inadequacies, financial issues, environmental problems, institutional issues, and external sociopolitical influences.

3.2.3.1 System and Supply Constraints

The Indus Basin Irrigation System was designed with the objective of bringing as much land under canal command as possible. The designed annual cropping intensities were generally kept low at 60-80 percent, and the diversion capacity of canals aimed at spreading the water thinly over a larger area. A study by the NESPAK on the Lower Bari Doab Canal (LBDC) System concludes that the canals supply 44 percent of the overall net crop water requirements, while groundwater contributes 34 percent. This still leaves a deficit of 22 percent in a well-developed canal command area. A more recent study by JICA (1997) on the Lower Chenab and Lower Jhelum Canals reports that the available surface water supplies meet only 40-50 percent of the crop water requirements. These overall deficits in canal supplies become more pronounced during the peak seasons. The system constraints, therefore, impose serious limitations on the efficient performance of the irrigation agency.

The second important constraint in system performance relates to the overall water scarcity, stagnating water availability, and large variations in the seasonal river inflows. Low water availability during critical crop sowing and maturing periods has an adverse impact on agriculture. Groundwater depletion also affected the conjunctive ground water use. This state of affairs poses a serious concern to the sustainability of irrigated agriculture in the Indus Basin.

3.2.3.2 Technical and Managerial Issues

Sub-optimal Operations: The operation of an irrigation system is as important as its design in determining the level of system performance. As the Irrigation Department attempts to satisfy the increased demand of various individuals and groups of farmers who use their power to influence the distribution of water in their favor, it has become increasingly difficult to follow the operational rules based on their analysis of system operation. That the canal systems continue to be operated on the basis of the historic withdrawals is reported. This mode of operation leads to sub-optimal performance.

Inadequate Maintenance: The irrigation network has progressively deteriorated because of inadequate maintenance funding, over-stressing the channels to meet an escalating water demand, and a phenomenal increase in the use of canal banks by human, animal

and vehicular traffic. Enhanced trespassing has been on the increase due to the rapid population growth, farm mechanization, changing social order, and weakening controls. The maintenance failure is often attributed to inadequate maintenance funding. While this does represent one major cause of deferred maintenance, there are also other factors that reflect on systematic maintenance. Problems of maintenance are not generally anticipated through managed programs of prevention. Management responds to either, actual or near-threatening crises.

Inequitable Distribution of Irrigation Water: Growing inequities in canal water distribution have been identified as the major issue that reflects on system performance. The issue has become increasingly severe over the last two decades. The increasing water demand and deferred maintenance, siltation of channel prisms, excessive withdrawals by outlets, and illegal water extractions contributed to the increasing inequity in the system. This has eroded the confidence of the tail users in the system's integrity.

Lack of Systematic M&E: At present, the management of the Punjab Irrigation system is severely constrained due to inadequate monitoring and evaluation. While modern methods have not been introduced, even prescribed monitoring activities, like those of discharge measurements, L-Sections and H-observations, etc. are either totally neglected, or only partly implemented.

3.2.3.3 Financial Issues

The main issues under this category include inadequate maintenance funding, inappropriate distribution of budget allocations, a rise in maintenance expenditure for public tubewells and flood works, escalating expenditures on establishment, stagnation of *abiana* rates, and a widening gap between the expenditure and cost recovery. During the appraisal of the Irrigation Systems Rehabilitation Project, it was determined that inadequate funding was the major reason for deferred maintenance, which threatens the operational safety of the irrigation network.

The Irrigation Department used to be revenue earning, with a significant positive balance sheet during the colonial period. Irrigation revenues, apart from covering full O&M costs, also used to finance the capital cost of irrigation schemes in a phased manner. With the passage of time, revenues started to decline, as water rates could not keep pace with the rising inflation. Until the early 1970s, however, revenues still met the full O&M cost of the irrigation system. The situation could not be maintained in all the subsequent years due to a number of reasons, i.e., the gradual build-up in the O&M cost of public tubewells, flood works and establishment, stagnation of water rates, and declining collections.

3.2.3.4 Environmental Problems

Irrigation without adequate drainage in an environment like that of the Indus Basin inevitably leads to rising water tables and salinity. An increase in the diversion of river flows for irrigation, seepage from canals, watercourses, and irrigated areas have resulted

in a progressive rise of the groundwater table. Despite the implementation of several drainage projects, over 30 percent of the gross commanded area in the country are waterlogged and about 14 percent are considered highly waterlogged. Although irrigation water is relatively free of salts, repeated irrigation events and the rise in the groundwater levels mobilize the dissolved salts, and results in the build-up of salinity. The estimate is that about 6 percent of the gross canal commanded area is severely salt-affected and another 8 percent are moderately affected. The impact of salinity on agricultural productivity is severe; a 25 percent reduction in the production of Pakistan's major crops is attributed to soil salinity alone.

3.2.3.5 Institutional Issues

Irrigation institutions are defined broadly to include both, the rules and the organizations. Rules include purposely-established formal rules (laws, regulations, and procedures) and socially evolved informal rules (practices, norms, customs and conventions). Viewed from this perspective, irrigation rules become as important as organizations to influence the performance of irrigation agencies. Their changes lag behind those that have taken place in the resource base and technology over the years. To sustain irrigation performance, therefore, much greater attention is needed for adaptations in the institutional framework in keeping with social and environmental changes. The other institutional issues reflecting on the Irrigation Department's performance include a) lack of water-agency co-ordination, b) inadequate farmer-participation in irrigation management and c) declining agency discipline.

3.2.3.6 External Influences

Irrigation systems form an integral part of the total institutional framework of any society. Irrigation management, therefore, has to be considered in the broader perspective of the socioeconomic and political conditions, as well as the prevailing law and order situation. As for many developing countries, there has been a general decline in societal discipline in Pakistan. On the canal systems, this has been manifested by frequent violations of law by the more powerful and influential users.

3.2.4 Improvement Strategies

The Framework: Irrigation management issues are multi-faceted and multi-dimensional in nature. Comprehensive and integrated improvement strategies, therefore, need to be conceived and evolved to address all these identified issues that impinge on the management and performance of irrigation agency. Isolated interventions are neither expected to transform the system performance to any great extent nor to bring about sustainable improvements in the system management. For instance, it appears unlikely that merely changing the institutional framework or fiscal policies of irrigation schemes in isolation of the overall context, without addressing the physical constraints, can significantly improve the system performance. This brings to focus the need to appreciate and clearly understand all the complex issues that impinge on irrigation management.

Structural Measures: The need for structural measures stems from the system and supply constraints in the backdrop of rapidly escalating water demands. To comprehend any worthwhile and long-lasting improvements in the irrigation system performance if the necessary structural interventions are not implemented, is difficult. In the absence of structural measures, the pressure for additional water would continue to mount and shortages would become increasingly acute.

Management Interventions: Management interventions represent the most important attribute that can transform and optimize irrigation management under the given set of physical infrastructure. There has been a growing consciousness around the globe that structural measures alone cannot significantly improve irrigation performance, however elaborate. In many cases, management interventions have to precede the structural measures when implementing the reform agenda in order to identify the real structural constraints that need to be addressed. Identified management interventions include the improvement of the system operation and maintenance, demand management and an effective management information system.

Organizational Improvement: The most significant measures for organizational improvements comprise: managing external influences, reorganizing the irrigation agency, effective performance monitoring, stability of tenure, restructuring the audit system, exclusive legal staff, and improved communication.

Financial Measures: The design and impacts of fiscal policies on irrigated agriculture also require careful consideration. Most farmer-forums have identified the transfer of resources from the agriculture sector to other sectors of the national economy as a major issue that reflects on the sustainability of agriculture. Responding to the issue of self-sustainability of the irrigation system, many progressive farmers postulate that they would be willing to pay the full O&M cost if state control and unfavorable cross subsidies are removed.

The proposed financial measures need to focus on adequate funding for maintenance works, reducing deficits and optimizing budget utilization, alternative modes to finance the O&M expenditures of drainage and flood works, improving the existing system of water rates assessment/collection, and identifying new avenues to enhance revenue generation.

Institutional Reforms: Recently, the need to improve irrigation management figures high on the agenda of most national and international agencies. This was triggered off by the declining irrigation performance despite sizeable investments in the rehabilitation of irrigation infrastructure. International financing agencies, therefore, changed their strategy by arguing that institutional issues constrain the overall irrigation management in Pakistan. They maintained that the worsening situation could only be addressed by implementing broad-based institutional reforms in the irrigation agencies. Initiated by a World Bank proposal in 1993 to privatize and commercialize the water service, the agenda for reform has been the topic of an open, comprehensive and discrete public discussion. This public discussion and dialogue, benefiting from the views of all the major stakeholders had been very worthwhile in a clearer definition of irrigation issues and in identification of alternative strategies to design the conceptual framework of institutional reforms. Despite micro-level divergence on the extent and contours of the reforms, the public debate appeared to indicate a general consensus on a gradual and phased implementation of irrigation reforms through participatory management, and decentralization

without changing the current water allocation framework. This model was considered more responsive and easier to implement in the context of the local environment, as it provided for farmer-participation and obviated the risk of system disruption.

After extensive and thorough debate on the pattern, extent and feasibility of the institutional reforms in the irrigation sector, the following set of institutional changes was agreed upon, which is currently under implementation:

- (a) The existing Provincial Irrigation Departments (PIDs) would be converted into autonomous authorities to be known as provincial irrigation and Drainage Authorities (PIDAs). One of the existing circles of each PID would be transitioned to the financially self-accounting Area Water Boards (AWB) on a pilot basis. Further transitioning of AWBs would be planned in view of the performance of the pilot AWB.
- (b) The formation of farmer-controlled FOs would be promoted on a pilot basis. These formations would play an increasing role in the operation and maintenance of distributaries and minors. Based on results of such pilot projects, a workable model would be evolved for adoption on the countrywide basis.

Participatory Irrigation Management: Participatory Irrigation Management (PIM) refers to the association of farmers in the operation and management of irrigation systems. The extent of participatory management may range from minimal user involvement to the transfer of nearly all management functions. The main objective of PIM is to improve irrigation management by providing a better irrigation service to the farmers, ensure physical sustainability of irrigation infrastructure, and to promote a sense of partnership between the farmers and government agencies.

The farmers' participation in irrigation management can have a profound impact on irrigation management. The main reported advantages of PIM include management efficiency, transparency, accountability, cost saving, higher collection rates, and a sense of ownership. On the other hand, the concerns about PIM include the difficulty to organize farmers, particularly in the large systems, lack of technical/professional expertise among farmers, risk of manipulation by influential farmers, and the issues related to the development of new institutions and their sustainability. In order to implement participatory management successfully, there has to be a favorable environment and enabling framework in place.

Participatory Irrigation Management can best be achieved by the government and the irrigation agency following a gradual and phased approach with reference to both, the level of management and management functions. This model for PIM appears to be more realistic and easier to implement in the context of Pakistan's social set-up and in view of irrigation system constraints.

3.2.5. Coordinated Services for Irrigated Agriculture

The need for integrated and holistic strategies to optimize the resource use for irrigated agriculture requires careful strategic planning. In the backdrop of Pakistan's institutional set-up for irrigated agriculture, it is increasingly important to provide coordinated services to support

agricultural development. Towards this end, it is vital to identify principal stakeholders and service providers for various activities that include irrigation, agriculture, marketing, credits, fertilizers and seeds, communications, and technology transfer, etc..

The Punjab Irrigation Department has already initiated action to provide coordinated services for irrigated agriculture. The specific interactions in this regard include close liaison and coordination with the Agriculture Department and farmer-representatives to enable coordinated planning and monitoring of canal operations, maintenance planning and prioritization, and coordinated efforts to check water theft.

3.2.6 Discussion: Questions and Answers

Comment: Mr. Masood Ahmad, World Bank. There has been an increase of water storage capacities, but the PID has not updated their records yet. They are talking of the Water Rights of 1935. We have to be clear about water rights, increased water supplies and the provision of additional tubewell water.

Comment: (From a participant). We follow a half-hearted approach. This is not helpful to sustain the systems. We are shy to accept the realities. We have not learnt from the past.