3. SUMMARY OF RESOURCE PAPERS

3.1 CASE STUDY OF THE PUNJAB AGRICULTURE DEPARTMENT[3]

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3.1.1 Introduction

The case study of the Punjab Agriculture Department forms part of the activities undertaken by the International Irrigation Management Institute (IIMI)-Pakistan under its research project "Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan". The main objective of the case study was to: (i) review irrigated agricultural institutional developments in the Punjab Province in an historical perspective; (ii) analyze the Punjab Agriculture Department in the context of its objectives and functions, human and financial resources and performance problems; and (iii) suggest recommendations for improvement. Based on the experience of irrigated agricultural practices and learning from the various pilot projects on participatory irrigation management (PIM), the paper also explores possibilities for institutional arrangements to promote coordinated irrigated agricultural services in the province.

3.1.2 Irrigated Agriculture Institutional Developments in Historical Perspectives

Developments in irrigated agriculture in this part of the world can be divided into four different time periods, i.e., irrigated agricultural developments in (i) ancient times (3,000BC to 711AD); (ii) Muslim Rule (711 to 1808AD); (iii) British Rule (1800 to 1947AD); and (iv) Post-independence (1947 to date). All these periods have been distinctive contributions to agriculture development. *(See: Gill, M. and K.Rana. 1998. Case Study of the Punjab Agriculture Department, Lahore. IIMI-Pakistan.)*

The post-independence period (after 1947AD) was very challenging for irrigated agricultural developments in the Punjab Province, and the country in general. This period witnessed initial difficulties, breakthroughs during the Green Revolution, and problems in the post-Green Revolution eras in the irrigated agricultural history of the province.

Initial Difficulties

The Partition of Indo-Pak in 1947 brought about great uncertainties, vast population movements and riots. Some of the major initial hurdles in the way of agricultural development in the newly created Pakistan, including the Punjab Province, were:

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[3] Abridged version of the case study, "Case Study of Punjab Agriculture Department", published by IIMI-Pakistan.
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- Massive population movements, riots and resettlement.
- Major agricultural administration, research and training institutions headquartered in India.
- Agricultural knowledge available in libraries at the Lyallpur Agriculture College destroyed during riots.
- Migration of many professors and research workers to India.
- Severe financial resource constraints.
- Water dispute with India (April 1948 to 1952).
- Agriculture Department attained low priority, with major emphasis on communication, industry and ports.
- Severe floods, drought and population pressure.

Green Revolution Era: 1960s

Despite the initial difficulties, the Green Revolution era (1960s) witnessed great development in the irrigated agricultural history of the country and the Punjab Province. The following institutional and technological developments took place:

- Establishment of Water and Power Development Authority (WAPDA) (1958).
- Land Reforms were introduced (1959).
- Commissioning of Food and Agriculture Commission (1960).
- Signing of Indus Water Treaty (1960).
- Establishment of Agricultural University and Research Institutes (1961).
- Construction of major water reservoirs (e.g. Mangla Dam during 1964).
- Introduction of high yielding crop varieties.
- Establishment of Agriculture Development Corporation.

Deficiencies Realized in Irrigated Agricultural Practices during the 1960s

The gap in coordination linkages between the Agriculture Department within itself and the Irrigation Department to meet new challenges in irrigated agriculture in Pakistan were realized during the 1960s. The following coordination and technical deficiencies were observed during this period:

- Irrigation, of course, increased agricultural production, but the agency responsible for its supply was essentially engineer-based, i.e., supply water at the field outlet, leaving farmers to distribute and use it as they like.

- The engineers were not agriculturists, and the agriculturists had not applied themselves sufficiently to the problems of irrigated agriculture.

- Very little research had been done on the interrelation between crops and irrigation in different parts of the country, and no extension service was provided to advise farmers on the subject.

- Land leveling benefits, improved water conveyance, preparation of land for uniform water distribution, and proper irrigated practices in terms of the timings and amounts of water applied for various crops are not demonstrated.
- Lack of inter- and intra-departmental coordination among various irrigated-agriculture agencies.
- Irrigation problems (inequity, inadequacy, unreliability, low irrigation application efficiencies, inadequate O&M).
- Emerging problems of salinity and waterlogging.

Post-Green Revolution Era: 1970s

To address the challenges of irrigated agriculture in the province, the scope and objectives of the agriculture department were revised. The department was, accordingly, reorganized and different departments were created, i.e.: (i) Livestock and Dairy; (ii) Forest; (iii) Fisheries; (iv) Food; and (v) Agriculture. The Agriculture Department was further expanded to include: (i) Agriculture Extension wing; (ii) Research wing; (iii) Field wing; (iv) Water Management wing; (v) Punjab Seed Corporation; (vi) Punjab Agriculture Development and Seed Supply Corporation; (vii) Punjab Land Utilization Authority; and (viii) various ancillary organizations.

The objectives of the Punjab Agriculture Department were broadened to bring about socioeconomic improvement among the farming community by modernizing agriculture along scientific lines. Efforts were made to introduce high yielding crop varieties and farm technology suitable under local conditions. Research, education and training in agriculture geared up. Farm mechanization, timely input supply and improved marketing for agricultural produce and land and water resources management were implemented.

Establishment of OFWM Wing

The creation of the On-Farm Water Management (OFWM) wing is the most recent structural change in the Punjab Agriculture Department (PAD). This structural change led to a shift of emphasis in the traditionally extension-oriented PAD, from extension services to construction efforts by involving the water users. The creation of OFWM can be linked with the recommendations of the Food and Agriculture Commission (1960) to fill the gap between the activities of the Irrigation and Agriculture Departments. The activities of OFWM are to promote irrigated agriculture. The OFWM Program envisages (i) community mobilization through Water Users Associations; (ii) improving watercourses through cost sharing; (iii) increasing irrigation application efficiencies through improved irrigation agronomic practices; and (iv) capacity building for participatory management.

Much institutional development has taken place within the Water Management Wing of the Agriculture Department to address various issues. The Water Users Association Act was promulgated in 1981 to provide legal cover to associations of water users, known as "Water Users Associations" (WUAs). The concept of On-Farm Surface Drainage through the construction of on-farm drainage sites was introduced to address waterlogging and salinity problems, and the participation of the farming community (beneficiaries) into Drainage Beneficiary Groups along lines similar to that of WUAs. Communities were organized to form

Farmers' Organizations (FOs) to transfer public tubewells (installed under SCARP) into community-operated tubewells to reduce the financial burden on the national exchequer. In order to create a sense of ownership of the structures by the farmers, cost sharing for construction materials, promotion of participation, and appropriate programs were carried out under OFWM works.

Participatory approach in Irrigation Management

The following are some examples of participatory irrigation management:

OFWM Projects

All OFWM projects are participatory in nature. Some of the achievements regarding the promotion of participatory irrigation management in the irrigation and drainage sector are outlined below:

- Command Water Management Project (1985-92): A step towards the sustainability of farmers' institutions.
- Participatory On-Farm Surface Drainage Pilot Project (1988-92): Pioneer of installation of On-Farm Surface Drainage facilities with the involvement of beneficiary farmers.
- STWs to PTWs to CTWs: Transfer of the O&M of public sector SCARP Tubewells (STWs) to Private Tubewells (PTWs) and the shift from PTWs to Community Tubewells (CTWs) to ensure the equitable distribution of groundwater among the water users.
- Participatory water resources management inside, and outside, canal commands.
- Shift from cost recovery mechanism to cost sharing.

3.1.2 Pilot Testing PIM Models for Institutional Development

- The experiences of the OFWM have exhibited that the potential of farmers' institutions could not be exploited as they were unorganized or inadequately organized. Another emerging problem is the lack of coordination among various government organizations involved in the country's agricultural system. A multi-disciplinary approach, along with the involvement of the farmers, is necessary. In view of these considerations, from the early 1990s, many multi-disciplinary projects with a participatory approach have been introduced into irrigation management programs at the minor and distributary levels.
- Fordwah Eastern Sadiqia (South) Irrigation and Drainage Project, Bahawalnagar.
- SCARP Transition Project (Participatory Groundwater Management).
- Pilot Project for Participatory Irrigation Management (under OFWM-III Program) in the NWF and Punjab Provinces.
- Farmer-managed irrigated agriculture under the Left Bank Out-fall Drain Stage-I Project (LBOD-I) in the Sindh Province [International Irrigation Management Institute-Pakistan (IIMI-Pak)].

- Action Research on social organization at the Hakra 4-R Distributary (IIMI-Pak).
- Social organization for improved system management and sustainable irrigated agriculture in small dams.

An interesting point in some of these projects is that the PADs (OFWM and agriculture extension.) and PIDs are involved in implementation. This will help both, for organizations to understand the limitations of the component projects and the benefits of implementing integrated projects.

3.1.3 Future Strategy: PIDs to PIDA

The secondary irrigation system in Pakistan, which is mainly operated and maintained by Provincial Irrigation Departments (PIDs), has been transformed into autonomous bodies known as Provincial Irrigation and Drainage Authorities (PIDAs) in each province. This breakthrough in the present irrigation and drainage network has been proposed under the National Drainage Program (NDP) with a view to achieving this objective. Establishing self-accounting Area Water Boards (AWBs) have been proposed as autonomous bodies responsible for effecting the policies of the Authority, and to make them financially self-supporting organizations. The authority would be fully empowered to revise water charges under a well-established procedure. The Authority is proposed to work under the provincial government.

The successful implementation of PIDAs as imposed by the World Bank as a pre-requisite towards implementing the National Drainage Program is, however, in doubt, not only due to its direct and abrupt promulgation, but also as a consequence of its top-down approach. The experience is that the authoritative top-down approach is not conducive for the success of participatory models. Moreover, the direct creation of Area Water Boards under PIDAs on a larger scale without having been tested on a pilot basis is a great risk. Therefore, it would be advantageous if the results of several pilot projects on Participatory Irrigation Management currently being implemented in Pakistan are analyzed in the context of coordinated services to irrigated agriculture.

3.1.4 Human and Financial Resources of the Punjab Agriculture Department

The number of agricultural staff in the province has increased by 212 percent since 1980-81. The increase in human resource was due to the broadening scope of the Agriculture Department. New wings and sub-formations were created in the department to cope with the need of the time. This increase in human resources resulted in lowering the ratio of cultivated land per unit of agricultural personnel. The coverage of cultivated area per agriculture technical staff has also considerably improved from 1,770 hectares/personnel in 1980-81 to 1,060 hectares/personnel in 1996-97 (a decrease about 40%). Though it is a significant decrease, the current ratio of about 1,000 hectares per agriculture technical staff is quite challenging in the meantime.

The coverage ratio of farm families by technical staff of the Agriculture Department has improved from 391 farm-families/technical staff in 1980-81 to about 280 farm families/technical

staff during 1996-97. These ratio indicate that the agriculture sector still requires more technical manpower, not only per unit of land, but also per unit of farm family.

The inference that expenditure on establishment is gradually increasing with a decreasing percentage share on operational cost (developmental activities) in the agriculture budget can be made. In other words, 18 percent spent on establishment and 82 percent on operational cost during 1980-81, against 43 percent spent on establishment and 57 percent on development programs during 1996-97. Moreover, ratio for technical to non-technical staff has decreased from 47 percent; 53-39 percent in 1980-81: 61 percent during 1996-97. This is an indication of increasing operational and maintenance costs with respect to developmental efforts. Another indication is that agencies responsible for generating and disseminating knowledge are poor in program funding when compared to expenses made on salaries.

3.1.5 Impact of Irrigated Agricultural Services on Agriculture

Since the creation of Pakistan in 1947, the impact of irrigated agricultural institutions can be witnessed from the considerable achievements made in the area, the production and yields of major crops like wheat, rice, cotton, sugarcane and maize. The services of the Agriculture Department for evolving an increase in cultivated and cropped area, and a reduction in culturable waste lands, and that of the Irrigation and Power Department for ensuring canal supplies on expanded cultivated areas are commendable.

(a) Impact on Crop Production

The area under wheat crop has increased from 2.90 million hectares in 1947-48 to 5.97 million hectares during 1995-96 (an increase of 106%). Similarly, wheat production registered an increase of about 380 percent (from 2.6 million tons in 1947-48 to 12.4 million tons in 1995-96). Accordingly, the wheat yield has increased from 0.89 tons/hectare in 1947 to 2.08 tons/hectare during 1995-96; an increase of about 2.3 times over the productivity level at the time of independence. The figures of comparison over a fifty-year period are impressive. When these figures are compared with the yield potential, it is not encouraging. When the productivity level of the yield is compared with the neighboring country, they remain low. Hence, it begs for coordinated services for irrigated agriculture to be considered.

Area under rice crop has increased from 0.27 million hectares in 1947-48 to 1.33 million hectares during 1995-96 (an increase of 390%). Rice production registered an increase of about 620 percent (from 0.25 million tons in 1947-48 to 1.8 million tons in 1995-96). The increase in the rice yield is also considerable, from 0.93 tons/hectare in 1947-48 to 1.36 tons/hectare in 1995-96, which is about 47 percent higher. The area under sugarcane crop has increased from 0.13 million hectares in 1947-48 to 0.61 million hectares during 1995-96 (an increase of 370%). Similarly, sugarcane production registered an increase of about 587 percent (from 3.91 million tons in 1947-48 to 26.88 million tons in 1995-96). The increase in the sugarcane yield is also considerable, from 29.26 tons/hectare (296 mounds/acre) in 1947-48 to 44.40 tons/hectare in 1995-96, about 52 percent higher.

The area under cotton crop has increased from 0.9 million hectares in 1947-48 to 2.5 million hectares during 1995-96 (an increase of 178%). Similarly, cotton production registered an increase of about 1086 percent (from 0.735 million bales in 1947-48 to 8.72 million bales in 1995-96). The cotton yield also increased considerably from 140 kg/hectare in 1947-48 to 603 kg/ha about 330 in 1995-96, about 330 percent higher.

(b) Impact on Land and Water Resources Development

The cultivated area has increased from 8.89 million hectares in 1947-48 to 12.14 million hectares during 1995-96 (an increase of 37%). Similarly, cropped area has increased from 7.94 million hectares in 1947-48 to 15.91 million hectares (an increase of 100%) in 1995-96. In the meantime the culturable wasteland has decreased from 4.41 million hectares in 1947-48 to 1.81 million hectares (a decrease of 60%) in 1995-96. It is important to note that cropping intensity has increased from 89% in 1947-48 to 131 % during 1995-96 (47%).

The achievements made in the increased irrigated area are also commendable. An increase in canal irrigated area of about 138 percent over a period of 50 years is evident. Canal irrigated area and canal-tubewell and canal-well have been increased from 4.58 million hectares in 1947-48 to 10.90 million hectares in 1995-96. The area irrigated by tubewells alone (outside canal command) has increased from almost nil to 2.46 million hectares. This large-scale development of groundwater resources started with the initiation of SCARP Projects to control waterlogging and salinity in the province's canal command area. These SCARP tubewells had a significant demonstrative effect in starting private tubewell development in fresh groundwater areas. As a result, private tubewells grew rapidly and at present there are more than 0.4 million tubewells in the Punjab Province. The rise in the number of tubewells in irrigated and *barani* (rain-fed) areas of the province also resulted, due to the government providing subsidies for drilling and diesel engine pumping sets.

3.1.6 Current Issues in Management of Irrigated Agriculture

Agriculture is the mainstay of Pakistan's economy. Despite the availability of natural resources, the potential growth rate for agricultural sector has not been achieved. Once, it dropped down to merely 2.5 percent during 1993-94. On the other hand, the population constantly and continuously increases. Strenuous efforts, therefore, are required to achieve a satisfactory rate of agricultural growth, at least to match the population growth rate. For most crops except cotton, the average yields are far less than their potential.

Of Pakistan's total cropped area, almost 70 percent are in the Punjab Province. The province's share in the country's total agricultural production is more than 70 percent for wheat, almost 80 percent for cotton, nearly 60 percent for sugarcane and 50 percent for rice. The overall provincial contribution to the agriculture sector is estimated to be more than 80 percent. Therefore, it is extremely vital to gear up agricultural growth in the Punjab Province to soundly establish the agriculture sector in Pakistan.

(i) Institutional

Institutional problems are mostly inter- and intra-departmental in nature. The most important of these problems include (a) unattractive working environment; (b) job insecurity; (c) political influences; (d) lack of in-service training facilities; and (e) inadequate work distribution.

(ii) Lack of Coordination

At present, satisfactory co-ordination among all the wings of the Agriculture Department, and between the Agriculture and Punjab Irrigation and Power Departments is lacking. The major coordinated problems within the PAD may be associated with (i) de-linking University Education from Research and Extension; and (ii) overlapping activities, which can otherwise be optimized.

Coordination problems between the Agriculture and Irrigation and Power Departments and with the farming community at both, on-farm and off-farm levels are directly related to the operational problems of the irrigation system.

(iii) Operational Issues

Operational problems in the irrigation system are mainly (i) inefficiency; (ii) inadequacy; (iii) inequity; and (v) unreliability. These problems have emerged due to:

(a) The average cropping intensity in the Punjab Province is about 122 percent against an average designed intensity of 63 percent;
(b) Water losses through seepage, spillage and over-topping water channels (seepage losses up to 25% in the canal system and 40-50% in the watercourses);
(c) Poor irrigation application efficiencies (about 25% water is being lost during field application);
(d) Unsatisfactory operation and maintenance (technical and financial);
(e) Inadequate on-farm and off-farm drainage facilities; and
(f) Non-conducive system of assessment and collection of water charges, i.e. canal water is provided proportionate to the land owned, but farmers are charged on the basis of crops grown. Consequently, the farmers have to pay for the crops raised from their private tubewell supplies as well.

(iii) Other Issues

In addition to institutional, operational and coordination issues, other problems faced by the agriculture sector are (i) inadequate level of mechanization; (ii) non-conducive agricultural marketing system; and (iii) unattractive input and output prices.

3.1.7 Recommendations

The following few recommendations are provided to improve the performance of the irrigated agriculture in the province, and the country.

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a) Good Governance

Good governance can ensure a favorable working environment, i.e., job satisfaction, rewards and reprimands, control on external influences, maintenance of optimum balance between establishment and operational finances.

b) Institutional Linkages

Proper and effective coordination among all the wings of the Agriculture Department needs to be ensured to overcome any duplicity of developmental efforts. The reorientation of various wings of the Agriculture Department is imperative not only to ensure a coordinated approach, but also to optimize the strength of the department, which seems excessive at the moment due to inadequate planning and coordination. For the purpose, the Agriculture Departments may be divided into the following two wings:

(i) Development Wing (Land and Water Resources Development and Management)

Reorienting the existent Water Management and Field Wings, which comprises Engineering and Soil Conservation may aid the creation of the Development Wing. In this way, all land and water resources developmental activities will be combined and the duplicity of works will be avoided. For example, rough Land Leveling and Precision Land Leveling activities can be united and Soil Conservation Practices can be combined with *Barani*/Rain-fed On-Farm Water Management activities. Similarly, groundwater augmentation activities can be collaborated with On-Farm Water Management practices in canal commanded areas, etc..

(ii) Services Wing

All agricultural services may be covered under an umbrella of a Services Wing, which may be constituted through:

- Integration of Agricultural Research, Education and Extension;
- Agricultural Marketing;
- Punjab Seed and Supplies Corporation; and
- Agricultural Credit Institutions.

An integrated approach, as mentioned above, needs to be followed whereby agricultural education, research and extension are closely integrated. With adequate research funding and coordination of agricultural education, research and extension, an impressive breakthrough in the agriculture sector can evolve. Moreover, education, research and extension under one umbrella will result in better training for students at the university level. Faculty members and students will acquire the opportunity to work on practical problems facing the agriculture sector. They can easily get feedback from the farming community about realistic problems in the field. In addition, both, undergraduate and graduate students may be involved in the development activities as agents of agricultural change and progress.

(iii) One-window Operation

An effective way to ensure an integrated approach to facilitate agricultural supplies, services and supervised credit may be the introduction of a "One-window Operation (OWO)" at the *tehsil*/union council level. Under the one-window concept, the Agriculture Department, Irrigation and Power Department and the farming community participate equally to ensure sustainable agricultural production in their area. The one-window option allows the farmers to coordinate with all line agencies at one place for related supplies and services with other associated inputs. Such an arrangement will not only help to save the farmers' precious time, but will help to curtail unnecessary expenses on communication between public sector agencies and the farming community. The anticipation is that the One-window Operation will also help to promote participatory management of agricultural resources at the grassroots level, whereby farmer-groups can be organized to play an active role with public sector agencies to ensure agricultural development on a sustainable basis.

(iv) System Management Improvement

A holistic approach towards a solution is to address the issues of efficiency, equity, adequacy and reliability of the irrigation system through participatory resource management (participatory irrigation management). This can be achieved by encouraging community-based organizations, rationalizing the assessment and collection of water charges, developing a legal regulatory framework for surface/ground water and drainage management, and solid political support.

The successful implementation of the PIDAs to introduce institutional reforms in the irrigation sector as a pre-requisite to implement the National Drainage Program is in doubt, not only due to its direct and abrupt promulgation, but also as a consequence of its top-down approach. The experience is that an authoritative top-down approach is not conducive to the success of participatory models. Before taking a giant risky leap, it would be advantageous to stagger the journey into smaller and approachable paces towards the destination. The apprehensions about PIDA covenants can be remedial only by the implementation of the PIM strategy, which is a bottoms-up approach. The PIM strategy however, needs to be applied in small fragments, so that each PIM package in succeeding fragments could be in line with preceding actions. For example, the ultimate goal to involve the key actors, i.e. farmers into O&M of the irrigation and drainage network, can be achieved by establishing a strong feedback system of the experiences of various PIM pilot projects.

3.1.8 Discussion: Questions and Answers

Question: Khalid Saleem, Halcrow. Mr. Mushtaq Gill said that there are operational issues like inefficiency, inadequacy, inequity and unreliability. Who is responsible for these issues, the PAD or PID?

Answer: Mushtaq Gill. We should consider the Indus Basin as a system, integrate soil, water and human relationships and improve this with the users' involvement. A participatory approach on a

cost-sharing basis could address these issues.

Question: Dr. Munnawar Hussain Shah (a general inquiry to all presenters). Any transitional management needs an effective regulatory framework to protect the interest of all stakeholders. Nobody seems to have focused on this institutional issue in a prioritized basis.

Answer: Mushtaq Gill. We should come up with some homegrown model by learning lessons from successes and failures. We should not expect miracles from FOs. There should be a will to change and commitment to act. One example is that of the Mexican President, who decided to involve users, and followed through accordingly. We cannot wait for a longer period. The bottoms-up approach is favorable. Ministers, or influential people, should not be the authority for PIM.

Question: Akhtar Bhatti: The Agriculture Extension Department is organized on a per-district basis, whereas the PID is organized on a per-canal command basis. How do you feel about reorganizing Agriculture Extension on a per-canal command basis? Will this not help to improve the coordinated services for irrigated agriculture?

Answer: Mr. Gill. The boundary is not whether on a per-canal command or at the district level, but the commitment and determination to help farmers. This situation alone will help improve the condition.

Question: Sultan Ali Burq. A condition was that PIDA envisages PIM at all levels. In most provinces, irrigation secretaries and officials head the PIDAs. This factor alone introduces a number of negative trends in the system. As for Agriculture Extension, contact with lower level extension workers is poor, and they lack training. Therefore, advanced agriculture knowledge travels from progressive farmers to extension workers. The process should be the other way around.

Answer: Mr. Gill. I agree.