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Environmental sustainability / Irrigation management / Sustainable agriculture

**SEMI-ANNUAL REPORT
ON WORK RELATED TO
MANAGING IRRIGATION FOR
ENVIRONMENTALLY SUSTAINABLE
AGRICULTURE IN PAKISTAN
(JANUARY 1994 - JUNE 1994)**

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INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE - PAKISTAN

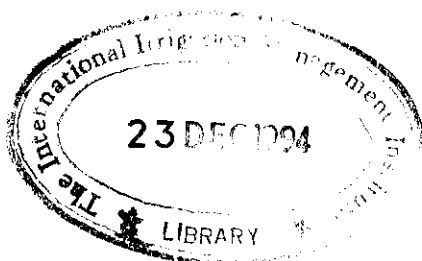
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SEMI-ANNUAL REPORT

ON WORK RELATED TO

**MANAGING IRRIGATION FOR ENVIRONMENTALLY SUSTAINABLE
AGRICULTURE IN PAKISTAN**

(JANUARY 1994 - JUNE 1994)



SEPTEMBER 1994

FIRST SEMI-ANNUAL REPORT
ON WORK RELATED TO
MANAGING IRRIGATION FOR ENVIRONMENTALLY SUSTAINABLE
AGRICULTURE IN PAKISTAN

(JANUARY 1994 - JUNE 1994)

Table of Contents

1.	INTRODUCTION	1
2.	PROGRESS AS PER ANNUAL ACTIVITY PLAN	3
2.1	IMIS-DSS Activity in the Punjab	3
2.2	Watercourse Management	4
2.3	Water Users Associations	6
2.4	Salinity Management	9
2.5	Workshops	9
3.	PROGRESS AS PER HUMAN RESOURCES PLAN	9
4.	CONSULTANTS, FELLOWSHIPS AND VISITS	10
5.	PUBLICATIONS AND REPORTS	11
6.	FINANCIAL REPORTING	11
7.	ANNEXES	
Annex-1.	Minutes of the Workshop Meeting held on 26 March 1994 at the Punjab Irrigation Secretariat.	12
Annex-2.	The "Order" Issued by the Secretary Irrigation	15
Annex-3.	Abstract of the Note prepared for Project Formulation Mission on 18 March 1994.	17
Annex-4.	Abstract of Working Paper No. 30	20

MANAGING IRRIGATION FOR ENVIRONMENTALLY SUSTAINABLE AGRICULTURE IN PAKISTAN

1. INTRODUCTION

This report summarizes the progress of IIMI Pakistan's efforts in the research project **"Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan"** during the period, 1 January 1994 - 30 June 1994.

Throughout the six-month period covered under this report, the project activities were limited to two field stations (Hasilpur and Haroonabad) located in the Fordwah - Eastern Sadiqia Canal (FES) system in the southeastern Punjab. The study activities during this period were designed mainly to continue some of the more important aspects of the Phase I research program concluded in December 1993.

Collaborative work on the Irrigation Management Information System (IMIS), Decision Support System (DSS) activity continued with the involvement of the Irrigation Department officials in Chishtian Sub-Division. Study activities on tubewell operations and management, as well as water trading also continued to develop new research designs for a "Water Markets" study. Also, part of the first two months of the year was spent in the analysis and interpretation of data collected during the Phase I Project and the preparation of its final progress report, which was presented in March 1994. Data entry and analysis were also carried out for the first part of the warabandi study in the Punjab, while its fieldwork was continued in the FES area.

A new activity was started in Haroonabad. This was to investigate the social organization processes of activities conducted during an already completed government sponsored Command Water Management Project for the 6R Distributary of the Hakra Branch Canal in the FES system.

Part of this period under review was also consumed by program development activities. The proposal for this project, "Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan" was revised on the basis of suggestions given by the Dutch authorities. The activity extended up to May 1994, when a Dutch Formulation Mission visited IIMI at its Lahore office and its headquarters in Colombo to have discussions with relevant IIMI professionals for finalizing the proposal.

All the above-mentioned activities form part of the project plan revised and finalized during the Formulation Mission.

The project activities, which are to be conducted in the Punjab and Sindh provinces, have been grouped into three broad categories:

- I. Operational Management, which covers the improvement of Main System Management through the introduction of Decision Support Packages, supplemented with Watercourse Management aspects including improved warabandi and surface irrigation practices;
- II. Institutional Development, which largely focuses on water users, farmer-agency and inter-agency coordination, and other institutional arrangements for irrigated agriculture; and
- III. Salinity Management, which aims at the development of a predictive capability of the salinity conditions over large areas.

The overall activity plan of the project, including the items under the above-mentioned three categories, and those related to information dissemination, are as given below (from III-C, page 21 in Project document).

SCHEDULE OF PROPOSED ACTIVITIES						
Obj	Activity	Year 1	Year 2	Year 3	Year 4	Year 5
Ia	Decision Support System - Punjab	■				
Ia	Decision Support System - Sindh		■			
Ib	Watercourse Management	■	■			
IIa	Water Users Associations	■	■			
IIb	Institutional Support for WUAs			■	■	
IIc	Coordinated Irrigation Agriculture Services			■	■	
IIIa	Soil Chemistry and Groundwater Management	■	■			
IIIb	Rechna Doab Salinity Management	■	■			
IIIc	Sindh Waterlogging and Salinity Management			■	■	■
	Workshops	■	■	■	■	■
	National Conference			■		
	Final Report					■

The progress during the first six months related to the annual activity plan for 1994, are given in Section 2 below.

2. PROGRESS AS PER ANNUAL ACTIVITY PLAN

2.1 IMIS-DSS Activities in the Punjab

Under Phase-I funding, some significant exploratory work was undertaken on Decision Support Systems (DSS) for Main System Management in collaboration with the Punjab Irrigation & Power Department (PID) in the Chishtian sub-division, located in the Fordwah and Eastern Sadiqia (FES) area. The results of the first phase were discussed in a workshop held on 26 March 1994 in the Irrigation Secretariat, chaired by the Punjab Secretary of Irrigation. A consensus was reached that DSS activities should be continued in the FES system with renewed emphasis on its application for management purposes. In order to make the activity a success, two conditions would have to be met. Firstly, the workshop recommended the establishment of a Working Group, consisting of both PID and IIMI representatives and chaired by the Chief Engineer, Bahawalpur Zone, to oversee and guide the present pilot activities in the Chishtian sub-division. Secondly, it would be necessary to have "an enthusiastic team in the field that is dedicated to implement the work plan as agreed upon by the Working Group.

During the discussions in the workshop, the need to structure the collaboration between PID and IIMI on DSS was highlighted. It was agreed to constitute a Planning Group that would coordinate all activities in the Punjab on DSS. The minutes of the workshop issued by PID are attached to this report in Annex-1. After the workshop, the Secretary of Irrigation has issued the order for the constitution of both the Planning Group and the Working Group (see Annex-2).

The programme on Decision Support Systems (DSS) for Main System Management will consist of the following activities:

- 1) Field application of an information system at the main canal level
- 2) Operations at the main canal level
- 3) Maintenance of distributary canals
- 4) Operation and maintenance at the main and secondary channels in relation to water supplies and salinity at the tertiary level.

The DSS work plan for 1994 addresses activities 1 and 2, continuing into 1995, while activities 3 and 4 will start only in 1995.

The work plan for 1994 was also discussed during the workshop on March 26. The application of the Irrigation Management Information System (IMIS), which had been installed during 1993 in the Chishtian Subdivision, was suggested for kharif 1994 to better match actual flows with targets. Also, the utility of a hydraulic model (SIC-Simulation of Irrigation Canals), developed by a french research institute, would be tested during 1994 to analyze present operations in Chishtian and to identify the potential for improvements. Finally, the model would be evaluated for its utility as a DSS for main system management.

Kharif 1994 would be the main focus for the collaborative activities on DSS, and as such, a number of preparations had to be made during the first half of the year. A survey was undertaken during the canal closure in January/February to determine the topography of the Fordwah Branch Canal and Fordwah Distributary (together constituting a length of 155 km) and to take the geometry of all structures in these channels. Also, training was imparted to local staff on the use of software to apply IMIS. Meanwhile, the Sub-Divisional Officer (SDO) Chishtian fixed a rotation before the start of the kharif season in order to have operational targets for local operators that were more clear and more transparent.

A visit was made to IIMI's scientific collaborator and developer of the hydraulic model IIMI is applying (SIC), the Centre National de Machinisme Agricole de Génie Rurale, des Eaux et des Forêts (CEMAGREF) in Montpellier, France during which the progress in application of DSS in Pakistan was also reviewed. An MSc student from France started his work in June on the calibration of SIC for the Fordwah Branch Canal under the collaboration of IIMI and CEMAGREF. It was agreed that one of the developers of SIC, Dr. P.O. Malaterre, would visit IIMI in the second half of 1994, to work with IIMI on the application of SIC on operations at the main canal level and to supervise the MSc student.

2.2 Watercourse Management

The research activities undertaken by the Watercourse Management component of the project have focused on the impact of water allocation and water supply on agricultural production and productivity. This is a follow-up of the work planned at the end of the Waterlogging and Salinity Project (Phase I), and is also a part of the research collaboration between IIMI and CEMAGREF.

At the same time, discussions among IIMI researchers have started for the identification of the detailed research work plan for the Watercourse Management component for this Phase II, "Managing Irrigation for Environmentally Sustainable Agriculture in Pakistan"

However, only the initial steps of the research work plan definition process have been made. A final work plan, integrating the current activities undertaken in the Hasilpur area, is expected during the first quarter of 1995.

Most of the field activities undertaken by the Hasilpur field team during the first half of 1994 were focused on the irrigation water supply and allocation within the watercourse command area. Daily canal water discharges at the watercourse head, actual water turns used by farmers, private tubewell operations and tubewell water transactions have been monitored for all of the farmers on 8 sample watercourses of the Azim and Fordwah distributaries.

In order to estimate with accuracy the quantities of irrigation water received by each farmer, a hydraulic model is currently being developed, as part of the IIMI-CEMAGREF collaboration. The model will be finalized in the second half of 1994, and further field-tested in 1995. The quantities of canal water computed by the model, the quantities of tubewell water used by every farmer and the cropping pattern of each farmer will allow the supply and demand of irrigation water to be analyzed as well as understand the importance of salinity in farmers' decisions related to irrigation.

To complement the analysis of the supply, and to investigate the relationship between canal water supply and agricultural production, a preliminary analysis of farming systems in the 8 sample watercourses has been conducted. The analysis has identified 11 homogenous groups of farmers, each group being characterized by a specific irrigation environment and socio-economic situation. The final results of the analysis and the main characteristics of each group will be summarized in the next progress report.

A representative farm has been selected for each group. Farming and irrigation practices of these representative farms will be monitored for 2 seasons (Kharif 1994 and Rabi 1994/95). The information collected will be used for building economic models for the analysis of the impact of the irrigation water supply on agricultural production and productivity.

As one of the objectives of IIMI's research at the watercourse level is to develop analytical methods and tools to be transferred to Pakistani research institutes with whom IIMI is collaborating as part of the Fordwah/Eastern Sadiqia (South) Irrigation and Drainage project, first contacts have been taken with the Watercourse Monitoring and Evaluation Directorate (WMED), WAPDA. It is expected that the collaboration between WMED and the Mona Reclamation Experimental Project (MREP), WAPDA and IIMI on the analysis of irrigation water supply and impact on agricultural production will be further developed and strengthened in the second half of 1994 and in 1995.

2.3 Water Users Associations

As a forerunner to the specific project activities related to institutional development, IIMI started in February 1994, a new Field Station at Haroonabad in the FES area to undertake a study specially aimed at social organization. To place the details of this study activity in the perspective of project objectives, some background information seems to be in order here.

- 1) Provincial legislation was passed in the early 1980s that allowed the formation of Water Users Associations (WUA) on individual watercourses. Since that time, thousands of WUAs have been organized with government subsidy and support given under the On-Farm Water Management Development Projects.
- 2) In some selected area commands, a certain degree of institutional coordination was attempted under the Command Water Management Project (CWMP). One sub-project of this program in the Punjab was located at 6R Distributary in the Hakra Branch off the Eastern Sadiqia Canal.
- 3) The various evaluations of this work has created the common impression that these attempts at farmer involvement in the management of the irrigation system so far have not led to sustained farmers participation or to lasting benefits. Apart from project-specific evaluations, other research findings related to irrigation performance, in general, also confirm that one major institutional impediment to productivity lies in the farmer-bureaucracy interface, largely due to unorganized farmer conduct. IIMI's own findings, particularly from its research under Phase-I of this project, clearly demonstrate the inequity of irrigation deliveries to watercourses located along minors and distributaries.
- 4) There is a growing awareness of the necessity for organizing farmers at the level of minors and distributaries, as well as watercourses, so that farmers will have some control over the distribution of water to each watercourse.
- 5) Meanwhile, the World Bank in their report on "Pakistan, irrigation and drainage issues and options" (March 1994) proposes a reorganization of the whole sector, including the establishment of autonomous public utilities for the management (including operation and maintenance) of the irrigation water. Yet, there is considerable pessimism by many government officials about organizing WUAs, and their impact on the productivity and sustainability of irrigated agriculture.

As an initial effort under this activity, the project plan envisaged to develop the process for establishing effective water users organizations, taking into account lessons learned from past experiences, both by the OFWM Directorates and by other special projects in the country. A Note prepared for the Dutch Mission on 18 May 1994 provided the rationale for this activity (an abstract of this note is given in Annex-3). IIMI's preliminary field work on the 6-R Distributary of the Hakra Branch Canal off the Eastern Sadiqia Canal, where Water Users Associations had been formed earlier under the CMWP, was undertaken with this purpose in view.

The specific objectives of this study item were:

- 1) to identify the main factors that influence (facilitate or inhibit) the formation of effective WUAs, with special reference to the experiences of Command Water Management Project (CWMP) interventions;
- 2) to explore the extent of prevailing organized behavior in the area and its character;
- 3) to try some elements of rapid rural appraisal techniques;
- 4) to develop models and guidelines for future interventions in promoting the establishment of effective WUAs; and
- 5) to identify a monitorable set of indicators relating to the effectiveness of WUAs.

The program of field research at 6R-Hakra Distributary has four activities:

- a) Study of processes of CWMP interventions in the 6R-Hakra Distributary;
- b) Study of watercourse management (WCM) practices in selected watercourses;
- c) Study of socio-economic background of water users in selected watercourses; and
- d) Collection of personal data of key informants, or sample farmers, who are interviewed for the purpose of collecting background information for activities a, b, and c.

The study sample consists of 16 watercourses, 4 from each quarter of the main 6-R Distributary having 113 watercourses. For data collection, a modified RRA methodology is being used, in which field data collection is done in several stages

adopting different methods, so that information can be extracted and collected more comprehensively in a progressive manner.

The first step was to do some "initial mapping" in a walk-through along each of the sample watercourses to meet any farmer or informant and obtain general information on the watercourse and its water users. The physical condition of the watercourse, its structures, its layout, lined and unlined portions, the number and a list of water users, etc., were collected at this stage. A manageable number of "key informants" was identified during this stage, with whom more in-depth interviews were held during the second stage of data collection.

The second step was to conduct "Semi-Structured Interviews" (SSI) with the selected informants, using a check-list. Eight "key informants" or sample farmers were selected for each of the sixteen sample watercourses using the method of "triangulation", which implied that a range of informants was selected representing various categories, in terms of age, educational background, biraderi, location along the watercourse, new and old settlers, etc.

The third step is "Process Documentation" to record summarized information from interviews and direct observations during the visits to the sample watercourse command areas. The information is recorded in a "field note book" and later transferred into a "clean note book", which is then used to compile reports on the processes observed. Information on each sample watercourse is kept separately. Additional information is collected from agency staff of the Irrigation Department, Agriculture Extension, On Farm Water Management, and WAPDA, and also any other field personnel working in the area. Project documents, evaluation and research reports, charts, maps, etc., are also used.

Tentative results emerging from preliminary analysis of data in the 8 completed sample watercourses show that WUAs had been formed in all of them on the initiative of the OFWM staff. All 8 WUAs have become defunct after the completion of the watercourse improvement work. Of them, 6 WUAs had not held any formal meeting ever, and only 2 had maintained their register and recorded minutes of the meetings. A majority of farmers interviewed have supported the idea of reviving these WUAs.

The field team (consisting of 3 field assistants and a team leader) is enthusiastically following the guidelines to finish the field work by October. A workshop has been arranged for mid-October 1994 to report the preliminary findings and initiate discussions with the Province's OFWM staff.

Based on the results of this work, planning meetings would be organized with key representatives of the collaborating agencies (OFWM and PID). The discussions are to produce a Research Plan detailing the contributions from various collaborating partners, identifying locations for field work, and linkages with other ongoing projects

in the area. The Research Plan would be based on the agreed research objectives, methodology, indicators, and planned output. Consultancy inputs would then lead to the development of the conceptual framework and to identify the processes to be pursued. A project inception report will be issued at the end of these activities.

2.4 Salinity management

Farmer irrigation practices and their impact on soil salinity were an important research topic during phase-I, documented in a research paper and described in Progress Report No. 10. Following the recommendations of this work, a data collection effort was initiated in kharif 94 to study the water and solute transport in the unsaturated zone to better understand the physical processes linking the irrigation environment with salinity. Four fields were selected in 2 sample watercourses in Fordwah and Azim distributaries, each representing a different irrigation environment. Criteria were access to canal water and the possession of a tubewell. Irrigation and salinity data will be collected for the kharif season. In addition, NRAP and the Soil Survey of Pakistan have taken undisturbed soil samples to determine the soil water retention curve of the soils. The data collected will serve as an input for SWATRE, a Dutch developed model that simulates water and solute transport, which will contribute to a better understanding of the physical processes.

To extrapolate the results of these four sample fields to larger areas, information on specific parameters (irrigation water quality, soil salinity, quantities of irrigation water) will be determined at a farm level for a larger group of farmers in the sample areas.

The soil and water data will be complemented by a survey that will record farmers' perceptions of salinity and how they deal with salinity.

2.5 Workshops

On March 26, a workshop was organized jointly by PID and IIMI to discuss the results of phase-I research on Decision Support Systems for Main System Management. The discussions and conclusions are described in more detail in 2.1 and the minutes of the workshop, issued by the Secretary, Irrigation & Power Department, which are attached as Annex 1.

3. PROGRESS AS PER HUMAN RESOURCES PLAN

During the period under review, the project's team leader and the Senior Management Specialist were both engaged in project activities as planned. Of the three Associate Experts, only one (the irrigation engineer) was deployed during this period; the Dutch authorities have taken action to process the recruitment of the other two (social

organization specialist and the irrigation practices specialist). An agricultural economist seconded by the Government of France has also been involved in the research activities planned under the Watercourse Management component.

Of the national staff, the GIS specialist, one Engineer and a field research economist, and two field teams were deployed during the period. Preparatory steps were taken to recruit the senior economist and the senior social scientist, for which the interviews were planned to be held in the second half of the year.

Persons have been identified for the panel of national experts and for the positions to be on secondment from the Irrigation and Agriculture Departments.

External Consultants will be arranged towards the latter part of the year when the assistance for the project is firmly in place.

4. CONSULTANCIES, FELLOWSHIPS AND VISITS

Mr. Jacques Rey, working in the research division of IIMI in Sri Lanka and developer of an information system for irrigation management (IMIS - Irrigation Management Information System) visited Pakistan for a period of 2 weeks. The main objective of his visit was to work with the DSS team in IIMI-Pakistan in finalizing the work plan for kharif 1994 and to prepare the IMIS software for implementation in the Chishtian sub-division. Also, Mr. Rey participated in the March 26 workshop, presenting the experiences of the Sri Lankan Irrigation Department with DSS and how that department had institutionalized this subject.

Mr. Nicolas Rouillé, MSc student from the Ecole Nationale Supérieure d'Electronique, d'Informatique et d'Hydraulique de Toulouse (ENSEEIH), France started a four-month practical training with IIMI-Pakistan in the month of June. His work will consist of the calibration of a hydraulic model that will help analyze the impact of present operations on the hydraulic state of the canal and the water distribution to secondary canals.

Mr. Jean-Pierre Barral and Mr. Bruno Locatelli, M.Sc. students from the Ecole Nationale du Génier Rural, des Eaux et des Forêts (France) started their practical training with IIMI-Pakistan in April and July, respectively. Both students are involved in the development of the watercourse-based hydraulic model, and the analysis of the irrigation water supply performance within the watercourse command area.

Mr. Jean-Daniel Rinaudo, M.Sc. student from the Ecole Nationale Supérieure d'Agronomie de Montpellier (France), started a 5-month practical training with IIMI-Pakistan in April. His work focuses on the analysis of farming systems in the Fordwah Branch Canal irrigation system and is a first step towards a better understanding of the relationship between irrigation water supply and agricultural production and productivity.

5. PUBLICATIONS AND REPORTS

Strosser, P. and M. Kuper. 1994. Water markets in the Fordwah/ Eastern Sadiqia area: an answer to perceived deficiencies in canal water supplies ? Colombo, Sri Lanka: International Irrigation Management Institute, Working Paper No.30. An abstract of this paper is at Annex-4.

6. FINANCIAL REPORTING

International Staff Salaries	770,208	42,919
National Staff Salaries	1,003,487	47,016
Travel	151,186	4,948
Supplies and Services	285,417	25,852
Training and Fellowships	108,936	-
Workshops and National Conference	26,000	-
Indirect Cost	750,475	38,635
(32% of all named Costs above)		-
Contract Research	327,235	-
Vehicles and Equipment	92,900	-
Contingencies (5%)	175,792	-
Monitoring and Evaluation	110,000	-
	3,801,636	159,370

MINUTES OF THE WORKSHOP HELD ON 26 MARCH 1994

COMPUTER-BASED DECISION SUPPORT TOOLS FOR OPERATION
AND MAINTENANCE OF IRRIGATION SYSTEMS: PILOT ACTIVITIES
IN THE FORDWAH BRANCH CANAL, PUNJAB.

A Workshop jointly organized by the Irrigation and Power Department Punjab and the International Irrigation Management Institute - Pakistan was held on March 26, 1994 in the Committee Room of the Irrigation and Power Department. List of participants is attached. (Annex A).

2. The workshop was opened by the Secretary Irrigation and Power at 9.30 a.m. The Secretary highlighted the importance of irrigation systems with respect to agricultural production in Pakistan. Management of these irrigation systems deserve a great deal of attention and ways should be found to improve this management. Commenting on the workshop and its objectives, the Secretary I&P, recognized the importance of the workshop and urged IIMI to continue to work in this relevant subject area. He requested IIMI to initiate studies also in the canal commands, as this would establish how efficiently the water is used by farmers. Also, the Department would be interested if research could be undertaken at higher (macro) level of the system, focusing on irrigation information systems for the whole of the Punjab.
3. Prof. Skogerboe, Director, IIMI-Pakistan emphasized that the results presented in this workshop were the outcome of a collaborative effort of the Punjab Irrigation & Power Department (PID) and IIMI-Pakistan. He added that nowadays computer software packages were available that not only supported managers in taking decisions under steady state conditions, but also under unsteady state.
4. In the first presentation, Mr. Marcel Kuper presented the objectives and the structure of the workshop. This was followed by an introduction to Decision Support Systems (DSS) in relation to irrigation management. The presentation of Mr. Jacques Rey focussed on the utility and applications of DSS that have been tested in Sri Lanka by the Sri Lanka Irrigation Department with technical assistance of IIMI. The two DSS computer packages that are pilot tested in the Fordwah Branch Canal were demonstrated on computer by Ms. Zaigham Habib and Mr. Jacques Rey. During their demonstration questions of participants regarding the details of the packages were answered.
5. The status of the pilot activities was presented by Mr. Marcel Kuper. In Kharif '93 Irrigation Management Information System (IMIS) had been installed successfully in the Chishtian Sub-division by the SDO Chishtian, including a data collection and communication network. Also, a board had been installed on which daily data are

displayed regarding water levels and discharges of control structures and distributaries (head and tail gauges) in the Chishtian Sub-division. The SDO had received training on computers to enable him to handle IMIS. A proposal for Kharif 1994 work plan was presented. Basically, four activities are proposed. One activity focuses at the divisional level providing the XEN Fordwah with better information on discharges to the three sub-divisions under his control in order to support him in taking decisions on fixing indents for these sub-divisions ("water scheduling at the XEN level"). The other three activities focus at the sub-divisional level. The first of three aims for the SDO to utilize the information provided by the XEN regarding indents for the sub-division. This information will support the SDO in fixing the targets for the different sections and distributaries in his sub-division ("water scheduling at SDO level"). The second activity aims to match as best as possible the actual water distribution with the indents. Information on actual flows is already provided to the SDO on a daily basis. Whenever deviations from indents or targets occur the SDO can intervene and correct ("water distribution"). Finally, the third activity focuses on maintenance at the distributary level. SE, XEN and SDO will evaluate the utility of a hydraulic model (SIC) in assisting them in testing out various maintenance scenarios before implementing them in the field. For this one distributary will be selected ("maintenance").

6. It was suggested that to successfully complete the pilot activity two requirements would have to be met. Firstly, a Working Group should be established, made up of the Irrigation Department officers of the area and the IIMI staff directly involved, under the chairmanship of the Chief Engineer Bahawalpur Zone. This Working Group would report to the Secretary Irrigation and to the Director IIMI-Pakistan. Secondly, it would be necessary to have an enthusiastic team in the field that is dedicated to implement the work plan as agreed upon by the Working Group.

7. The Secretary Irrigation then wrapped up the discussion and derived the conclusions of the workshop.

- a. The Secretary, I&P stated that the work that had been done under the IPD-IIMI collaboration on DSS had made important progress. He emphasized that the pilot activities in the Chishtian Sub-division should be accelerated.
- b. It was decided that under the IPD-IIMI collaboration efforts should be concentrated presently only on the pilot activity.
- c. A Working Group will be established for the pilot activity chaired by Chief Engineer Bahawalpur, as well as a Planning Group at the Secretariat level.
- d. Consideration should be given to organize integrated training courses on the use of computers, field training on hydraulic operations, etc. through the Government Engineering Academy, for which the assistance of IIMI would be appreciated.

The Director IIMI-Pakistan thanked the Secretary Irrigation & Power Department for his efforts, which had ensured the success of this workshop. He looked forward to working closely together with IPD in addressing the challenges that are lying ahead in irrigated agriculture. Mr. W. J. Plantinga, First Secretary of the Royal Netherlands Embassy, who had attended as an observer, thanked the Secretary Irrigation for organizing this workshop. Mr. Plantinga stated that he was pleased with the outcomes of this workshop, which discussed results of activities that had been supported by the Government of the Netherlands (GON).

8. The meeting was closed at 13.00 hours by the Secretary, Irrigation & Power Department. He hoped that the collaborative effort of IPD and IIMI would continue to produce results that were of use for the Department.

LIST OF PARTICIPANTS

- | | | |
|-----|-------------------------------------|---|
| 1. | Mr. Riaz Ahmed Khan | Secretary, Irrigation & Power |
| 2. | Mr. Ehsan-ul-ah Sardar | Chief Engineer, Lahore Zone |
| 3. | Syed Mubashar Hussain | Chief Engineer, Irrigation Development |
| 4. | Ch. Muhammad Ashraf | Chief Engineer, Irrigation Coordination |
| 5. | Mr. Abdul Majid Fahim | Chief Engineer, Irrigation Research |
| 6. | Mr. Muhammad Akhtar Rana | Chief Engineer, Irrigation Planning & Review |
| 7. | Mr. Riaz-ul-Haq Sheikh | Chief Engineer Irrigation Drainage and Floods |
| 8. | Mr. Abdul Aziz Ch. | Chief Engineer, Power |
| 9. | Mian Hafiz Ullah | Chief Engineer, Bahawalpur Zone |
| 10. | Mian Yousaf Ali | Additional Secretary, I & P |
| 11. | Mr. M. H. Siddiqi | Consultant |
| 12. | Ch. Muhammad Shafi | Superintending Engineer, Bahawalpur Zone. |
| 13. | Dr. Bagh Ali Shahid | Superintending Engineer, Drainage, Lahore Zone. |
| 14. | Dr. Muhammad Tariq Afzal Makhdoom | Deputy Secretary Development |
| 15. | Mr. Abdul Majeed Bhatti | Executive Engineer, Lining Fordwah/Eastern Sadiqia |
| 16. | Mr. Rab Nawaz Malik | Executive Engineer |
| 17. | Engr. Capt. (R) Muhammad Qadir Khan | Section Officer (Training) |
| 18. | Prof. G. V. Skogerboe | Director, IIMI Pakistan |
| 19. | Mr. W. J. Plantinga | First Secretary, Development, Royal Netherlands Embassy |
| 20. | Ms. Zaigham Habib | Systems Analyst, IIMI Pakistan |
| 21. | Mr. Marcel Kuper | Irrigation Engineer, IIMI Pakistan |
| 22. | Mr. Jacques Rey | Irrigation Engineer, IIMI |
| 23. | Mr. Shahid Sarwar | Field Research Hydrologist, IIMI Pakistan |
| 24. | Mr. Jerrel van Beek | Junior Research Associate IIMI Pakistan |
| 25. | Mr. Pierre Strosser | Agricultural Economist, IIMI Pakistan |

GOVERNMENT OF THE PUNJAB
IRRIGATION AND POWER DEPARTMENT

O R D E R

In pursuance of the decision made in the PID/IIMI Workshop held on "Computer-Based Decision Support Tools for Operation and Maintenance of Irrigation Systems - Pilot Activities in the Fordwah Branch, Punjab" on March 26, 1994, following two Working Groups have been formed for the subject assignment:-

A) WORKING GROUP ON IRRIGATION MANAGEMENT INFORMATION SYSTEM (IMIS)

This Group will comprise of the following officers:-

- | | | |
|------|--|----------|
| i) | Chief Engineer, Irrigation, Bahawalpur | Chairman |
| ii) | Superintending Engineer, Irrigation,
Bahawalpur | Member |
| iii) | Executive Engineer, Fordwah Division
Bahawalnagar | Member |
| iv) | Mr. Marcel Kuper (IIMI) | Member |
| v) | Ms. Zaigham Habib (IIMI) | Member |

B) PLANNING GROUP ON DECISION SUPPORT SYSTEMS (DSS)

This Group will comprise of the following officers:

- | | | |
|------|--|----------|
| i) | Mr. M. H. Siddiqui
Consultant, Irrigation & Power Department
Lahore | Chairman |
| ii) | Chief Engineer, Irrigation, Bahawalpur | Member |
| iii) | Dr. M. Tariq Afzal Makhdoom, Director
Indus Water Treaty & Regulation
Lahore | Member |

- | | | |
|------|--|--------|
| iv) | Dr. Bagh Ali Shahid, Superintending Engineer, Drainage, Faisalabad | Member |
| v) | Principal, Government Engineering Academy Punjab, Lahore | Member |
| vi) | Gaylord V. Skogerboe, Director IIMI Pakistan | Member |
| vii) | Mr. Marcel Kuper (IIMI) | Member |

On recommendations of the above Working Groups regarding training course on the use of Computers and Field Training on Hydraulic Operations etc. necessary courses shall be arranged in the Punjab Government Engineering Academy with the assistance of IIMI.

SD/-
(RIAZ AHMAD KHAN)
SECRETARY

No. 2/13-S.O.(T)/93

Copy is forwarded for information and necessary action to all the officers concerned.

SD/-
SECTION OFFICER (TRAINING)

Abstract of a Note Prepared by D. J. Bandaragoda (18 May 1994)
for the APPRAISAL MISSION ON IIMI's PROJECT "MANAGING IRRIGATION FOR
ENVIRONMENTALLY SUSTAINABLE AGRICULTURE IN PAKISTAN"

The institutional development aspects included in the project proposal can be categorized into three specific areas:

- * Organization for Water Use and Related Functions - (WUAs)
- * Organization for Water Delivery and Related Services - (Irrigation-Related Public Agencies)
- * Agency-Farmer Interface

An outline of the activities envisaged is given below:

1. Support to Organization for Water Use and Related Functions
 - a) Planning Meetings with key decision makers of OFWM and PID to discuss and decide on the scope of follow-up work of Component I as agreed at the initial stages of collaboration. For these discussions, inputs will be arranged from external consultants and expertise to be drawn from experiences of special projects in the country. While the process is to start from the perspective of water users' interests and needs, a general consensus is needed for the agencies to join as partners of a fully participatory attempt to assist the water users to form WUAs and identify their functions, procedures and rules that govern such collective functions.
 - b) Collaborate with relevant authorities on the legal framework and procedures necessary for any new requirements identified for formation and continued working of WUAs.
 - c) IIMI supported field teams will join the selected agency field staff as "social organizers" in the exercise. The relevant agency staff will be trained to undertake a continued effort in assisting and monitoring this process beyond the project period.

2. Irrigation-Related Provincial Public Agencies

- a) Undertake a systematic analysis of provincial institutional arrangements for irrigated agriculture. This activity is expected to link with the proposed World Bank initiatives for promoting government action aimed at institutional changes. The activity will involve some selected key people in the agencies to participate, jointly with IIMI, in a review of organizational arrangements and accompanying legal provisions with a view to identifying appropriate changes.
- b) Identify suitable mechanisms for inter-agency coordination between irrigation and agriculture agencies through in-depth discussions with relevant agency staff, drawing from experiences of CWMP in Pakistan and experiences in other countries such as the CADAs in India and Mahaweli Development Authority in Sri Lanka.
- c) Assist the authorities to try suitable options on a pilot basis and document the process.

3. Farmer-Agency interactions

- a) Collaborate with relevant agencies to establish an effective coordinating mechanism to promote farmer-agency interactions. A series of discussions with relevant agency staff will initiate this activity, drawing from past experiences in Pakistan, as well as from experiences in other countries.
- b) Identify and document feasible options that suit local conditions and needs, and assist in an action plan to try selected options on a pilot basis.

An important feature of the methodology to be used for new research activities will be its participatory element. IIMI will collaborate with the Punjab's OFWM Directorate for the data collection, data analysis and research dissemination through field seminars and workshops, and in the identification of options. Selected water users will participate in research design discussions at field level and some data collection activities, and in the identification of feasible alternatives. In much of this work, rapid rural appraisal methods will be deployed.

Emphasis on Local Staff: The above strategy requires a combination of international and national research staff, but with emphasis on the latter. International staff inputs will be for coordinating the collaborative work, bringing a wider experience in social organization particularly from countries where IIMI has been actively engaged in this type of work, and for helping to incorporate whatever that is appropriate for the local situation in developing a conceptual framework for this work. Thus, the staffing

arrangement will be based on the premise that social organization is situational, and heavily dependent on local needs and interests, and therefore adequate local staff capable of working at different levels of project involvement for this particular area of work will be necessary for interactions with the field and agency situations.

What is New in the Approach Towards Social Organization: Apart from the participatory approach for research, the main intended change in the approach towards organizing water users will be an attempt to start the effort from the demand side of the water management equation, by way of motivating the water users to identify why they should be organized and how best they should do it. A proposition here is that if they can identify a continuing set of functions to pursue as groups (such as those involving water distribution, maintenance, resource mobilization and conflict resolution, as against the previously tried limited activities of civil work), and if they become convinced that collective action in these identified functions will be more profitable than individual action, then more effective WUAs could be established. A much more rigorous field orientation of agency staff and research teams is required in this instance to interact with the farmers on a prolonged basis.

WORKING PAPER NO. 30

WATER MARKETS
IN THE FORDWAH/EASTERN SADIQIA AREA

An Answer to Perceived Deficiencies
in Canal Water Supplies?

By

P. Strosser and M. Kuper

ABSTRACT

This paper presents the results of a study on water markets in the Fordwah/Eastern Sadiqia Irrigation System, which is located in the southeastern portion of the Province of the Punjab, Pakistan. Based on primary data collected by IIMI-Pakistan, the study stresses and quantifies the importance of water markets in the area. The sale and purchase of groundwater pumped by private tubewells are the major activities in these markets. Other forms of water transactions are the exchange of full or partial canal water turns, the exchange of canal water for tubewell water, and the sale and purchase of canal water.

Canal water supply, seasonal variations in crop water requirements, groundwater quality and tubewell operation costs (related to the source of power) are important factors influencing the type and level of water transactions. Farm characteristics (for example, holding size and tenure status) influence the participation of farmers in water trading activities as well.

A first attempt is made to evaluate the impact of water markets on the quality of irrigation services. Via surface water and groundwater markets, the flexibility and adequacy of the irrigation water supply are improved. The purchase of groundwater enhances the equity in access to irrigation water, increasing the quantity of water supplied to non-tubewell owners who are mainly small farmers and tenants. At the same time, it makes a more efficient use of the existing tubewell capacity. Tubewell owners, however, retain the largest share of the groundwater pumped, which is translated into a higher cropping intensity and larger areas under wheat and rice. The analysis of crop yields, however, did not show any clear difference between groups of farmers characterized by different degrees of control on the irrigation water supply.

Policymakers and funding agencies are currently advocating the privatization of the water sector and the development of water markets in Pakistan. However, further research is a prerequisite to any institutionalization and further development of water markets in Pakistan, to fully understand the impact of water markets on the quality of irrigation services, agricultural production and environmental sustainability.