

memorandum

DATE: June 4, 1986

REPLY TO
ATTN OF: *John R. Adania* John R. Adania, Project Officer, O/ARD, USAID/IslamabadSUBJECT: Water Management Research (WAPDA)
Project No. 391-0441391-
0413
PD [signature]

TO: Ms. Pat Matheson, ANE/PD Room 3327-A NS, AID/Washington

The Water Management Research (WAPDA) Project 391-0441 was initiated in August 1980 and completed on December 31, 1984. The project was administered by Water and Power Development Authority (WAPDA) and was a pilot activity to supplement the dollar-funded On-Farm Water Management Project. A total of 24 person months of short-term advisory services was provided by the USDA/Soil Conservation Service through a PASA. The project was funded by a Mondale Rupee Grant of Rs.12,505,000 of which Rs. 12,476,000 was utilized. The objectives (i.e. generation of research documents and application of new techniques) were successfully accomplished. A copy of the Project Completion Report is attached for your information and records.

Encl: a/s

cc: 1. PDM:RWNachtrieb - w/a
2. PRO:PDavis - w/a
3. RLA:SJSpielman - w/a
4. Central Files - w/a

Clearances:

1. ARD:ACHankins (Draft)
2. PDM:RWNachtrieb (Draft)
3. PRO:FWTate (Draft)

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PROJECT COMPLETION REPORT

WATER MANAGEMENT RESEARCH PROJECT (WAPDA)

391-0441

**UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT
MISSION TO PAKISTAN
ISLAMABAD, PAKISTAN**

May 1986

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I. BASIC DATA

Title of Project: : Water Management Research (WAPDA)
: at Mona, Bhalwal

Project No. : 391-0441

Project Agreement No. : 391-0441

Date Authorized : August 18, 1980

Date Agreement Signed : August 18, 1980

Amount Authorized : Rs. 12,505,000.00

Amount Disbursed : Rs. 12,476,000.00

Amount Deobligated : Rs. 29,000.00

**Project Assistance
Completion Date (PACD)** :
Original : December 31, 1984
Revised :

**Grantee's Authorized
Representative** :
1. Mr. U.D. Khan
Deputy Secretary
Economic Affairs Division
Government of Pakistan
Islamabad

2. Dr. Mohammad Abdullah Khan
Project Director
Mona Reclamation and
Experimental Project
WAPDA Colony, Bhalwal

Implementing Agency : Water and Power Development
Authority (WAPDA) -- Mona Experimental
Research Station

II. PURPOSE OF THE PROJECT

The purpose of the Water Management Research Project was to initiate a five-year research and training effort to supplement the On-Farm Water Management Project (391-0413). The OFWM project is a pilot activity consisting of improvement of irrigation watercourses,

precision landleveling and improvement of water management practices. The Water Management Research Project was administered by Water and Power Development Authority (WAPDA) at the Mona Reclamation Experimental Research Station. The research conducted under this project was designed/adapted to the socio-economic conditions and suited to the size of land holding of the small and medium size farmers. The project also included provisions for developing methods for dissemination of the research results in a form and manner suitable for small farmer use. These farmers were defined as those having up to 25 acres of land in Punjab and NWF Provinces and up to 32 acres in Sind province. Within this group, a Target Group was further defined for project activities -- (in the Punjab and NWF Provinces this target group consisted of farmers with operational holding of 12.5 acres of land or less and in the Sind Province, 16 acres or less). To achieve the proposed results a number of research studies were completed.

III. SERVICES AND GOODS PROVIDED BY AID AND GOP

A.I.D.

1. Commodities:

The following commodities were procured locally to support the project's research activities as was indicated in the project proposal :

Vehicles :

Jeeps, Motorcycles, Tractors, Bicycles, Wagon

Office equipment and machines:

Typewriters, Camera, Films, Projector

Printing of about 50,000 reports/publications

Farm Implements:

Land Levellers, Ridgers, Tractor Drills, Cultivators

Bullock-drawn Furrow and bed makers

Seeds, Fertilizers, Insecticides

Laboratory and Field Equipment:

Rain Guages, Evaporator Pans, Pakka Flumes, Portable Flumes,

Seepage Meters, Flow Meters, Dump Levels

Equipment Storage Sheds, Cement

Tubewell Drilling related materials:

Bailer, Strainer, Pipes, Valves, Centrifugal Pumps, Electric

Motors, Water Meters, Gate Valves, Foot Valves, Kerosene and

Diesel Fueled Pumps, Tubewell spare parts

Workshop Tools and Equipment for tubewells, etc.

2. Technical Assistance :

Technical assistance was provided in Ground Water Hydrology (including Skimming Wells studies) and Irrigation Scheduling. Long-term consultants under the OFWM project were also available during the life-of-the project. In addition, 24 person months of short-term advisors were utilized. Technical services were provided by the Soil Conservation Service (SCS) through a "Participating Agency Services Agreement" (PASA).

3. Funding :

A.I.D. provided financial assistance for implementation of the project through a rupee grant of Rs. 12,505,000 to finance only the local currency costs of goods and services. An element-wise break-up of the budget and the expenditures incurred was as follows :

<u>Title of Research Field</u>	<u>Budget</u>	<u>Expenditures</u>
1. Watercourse Improvement Management	3,937,000	3,832,000
2. Water, Soil and Crop Management	1,690,000	1,730,000
3. Extension of Water and Crop Management	1,139,000	1,167,000
4. Economics of Water and Crop Management	1,148,000	1,155,000
5. Groundwater Management	1,839,000	1,848,000
6. Tubewell Operation Maintenance and Management	2,280,000	2,285,000
Contingencies (10 to 15%)	472,000	459,000
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Total :	12,505,000	12,476,000

B. Government of Pakistan:

The office and the research facilities already existed at Mona Reclamation Experimental Station. The resources further

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provided by GOP to complete the research studies for the project amounted to Rs. 5,000,000 including costs on an "in-kind" basis. Seventy-five percent of the research positions were filled at all times and the services of a senior level sociologist from Planning Division were available to assist with the research.

IV. STATUS OF COMPLETION OF PROJECT ELEMENTS

The research project was administered by WAPDA at the Mona Reclamation Experimental Project (MREP) station from July 1979 to December 1984. Two types of research works were carried out. There is a research farm under operational control of MREP scientists where plot type research was conducted. The other type of research was applied and action oriented and involved working with farmers on their fields. The water management research was conducted from mogha (canal outlet) to tail end of the watercourse. The research work established recognition of water conveyance losses within the watercourses as well as during field application. The targeted research was carried out in the following six fields and a total of 23 research studies were completed :

<u>Field of Research</u>	<u>Number of Studies Completed</u>
1. Watercourse Improvement and Management	7
2. Water, Soil and Crop Management	6
3. Extension of Water and Crop Management	3
4. Economics of Water and Crop Management	3
5. Ground Water Management	2
6. Tubewell Operation, Maintenance and Management	2
Total :	23

1. Watercourse Improvement and Management

One of the numerous causes established which rank Pakistan among the world's lowest agriculture production country was

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the "waterlosses" from the watercourses during conveyance and at farm application. MRRP initiated a watercourse improvement research program to reduce the water losses and to increase the delivery efficiencies. The research work done indicated that watercourse delivery losses could be substantially reduced depending upon the type of improvement applied. One obvious alternative presented was "concrete/brick lining" technique, but costs involved were high. To develop new and economical techniques for watercourse improvement and "on-the-farm" management of water, the following studies were completed :

Study No. 1 : Testing and Evaluation of Improvement Techniques

Study No. 2 : Improved Structures Designs

Study No. 3 : Monitoring of Improved Watercourses

Study No. 4 : Equipment Development

Study No. 5 : Surface Drainage

Study No. 6 : Energy Resources for Rural Areas

2. Water, Soil and Crop Management

Irrigation water quality, climate, drainage, salinity/sodicity and type of soil play a major role in variety of crop yields. Different crops respond differently to soil salinity at various growth stages. Drainage of saline waters also posed a serious problem and the possibility of using saline ground water for reclamation of sodic soil was examined. It was found that high sodium waters could be improved by gypsum application to bring them within safe limits for agriculture use. Along with above factors, weeds also compete for light, space, irrigation water, thus affecting crop yields. To address these concerns, the following six research studies were completed :

Study No. 1 : Land and Water Use Capability Classification.

Study No. 2 : Stand Establishment on Salt-Affected Soils.

Study No. 3 : Use of Saline Ground Water for Reclamation of Saline Sodic Soils.

Study No. 4 : Methods of Using Gypsum to Optimize Crop Production from Sodic Irrigation Water.

Study No. 5 : Weed Control (Agronomy).

Study No. 6 : Effect of Pre-Sowing Tillage Practices on Water Application, Fertilizer Use Efficiency and Crop Yields.

3. Extension of Water and Crop Management

In this field of research, efforts were made to develop and refine the procedures for most efficient utilization of irrigation water. The research work was done in partnership with farmers. In this, the following three studies were successfully completed :

Study No. 1 : Motivating and Organizing the Farmers for Improvement of Their Watercourses and Water Management Practices.

Study No. 2 : Watercourse Cleaning and Maintenance.

Study No. 3 : Water Users Associations.

4. Economics of Water and Crop Management

The major objective of research in this sector was to find out how to obtain maximum benefits by optimal use of water as a scarce resource. A study was conducted by interviewing 100 percent of the farmers in a command area and their responses were recorded on pre-planned and field-tested interview schedules. The research studies completed under the "Economics of Water and Crop Management" section were as follows :

Study No. 1 : Developing Cropping Intensity Coordinated to Actual Water Supplies.

Study No. 2 : Evaluation of the Command Area Selected for Application of Soil, Water and Crop Management Technology Package.

Study No. 3 : Benchmark Survey of Watercourse Command Areas Selected for Development.

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5. Ground Water Management

The Ground Water Management field of research was covered by two field studies for developing safe, economical and practical methods for lowering the fresh and saline water tables to reduce waterlogging and salinization. The aim was to provide a fresh water reservoir which could accept monsoon rains and provide water for the peak irrigation season. In addition, the cost-benefit ratio was also analyzed. The two field studies completed were :

Study No. 1 : Tubewell Installation at village Sher Mohammad Site-1, one deep well, 237 ft. and three shallow wells - study under GWRMP 1978-79.

Study No. 2 : At village Sakesar, 2 deep wells, 62 ft. each, with one shallow well and 10 observation wells, study under GWRMP 1979-80.

6. Tubewell Operation, Maintenance and Management

The main problems of the Tubewell Operation, Maintenance and Management Program under SCARP were motor and pump operations, choking of strainer, closure of many tubewells on demand of water user members because the water from the tubewells in most cases was saline and the decline in pumping rates. Due to the permanent closing of about 18 tubewells, it became impossible to lower the water table in affected areas. The following two research studies were completed on tubewell maintenance, operation and management related problems :

Study No. 1 : Preventive Maintenance and Rehabilitation of Tubewells.

Study No. 2 : Modifying and Re-boring of Closed Tubewells to obtain Water Acceptability Quality.

V. SUMMARY OF ACCOMPLISHMENTS OF THE PROJECT

The research studies completed under the Water Management Research Project received wide recognition and acceptance both within and outside the country. The most important accomplishment and contribution of this research program was the recognition by government officials of watercourse conveyance losses and the development of suitable techniques to reduce these losses. Field

application losses were also evaluated and the impact of land leveling to reduce these losses was demonstrated. Colorado State University research and surveys established the fact that crops suffer from both over and under irrigation practices. Targets set forth i.e., generation of research documents and application of new techniques and methodology were successfully accomplished. Research was conducted in six different sites and a total of 23 research studies were completed, published and distributed. Dissemination of the findings to the farmers was done through printed pamphlets in Urdu language.

The production of gypsum for use on saline sodic soils has increased to more than 3,000 metric tons per day in Punjab as a result of the research program which is an indication that farmers are realizing the importance of gypsum as a means of to reclaim saline soils. 1/

The Water Management Research Project played a major role in the development of the "Irrigation Systems Management Project"/Water Management Research Component. During 1982, WAPDA specifically requested USAID to add additional funds for water management research at Mona as well as substantial assistance to permit development of a similar research facility in Sind Province, "Lower Indus Water Management Reclamation Research Project" (Mona-LIM).

Similarly, ADB and World Bank also entered into the water management field during the 1980's financing a number of on-farm water management projects.

1/ "Pakistan Agriculture", November 1985 - page 57. A magazine publication of Economist Publications Ltd., Karachi, Pakistan.

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