



**GOVERNMENT OF PAKISTAN
MINISTRY OF SCIENCE AND TECHNOLOGY
PAKISTAN COUNCIL OF RESEARCH IN WATER RESOURCES**

YEAR BOOK 2005-06

Khyaban-e-Johar, Sector H-8/1, Islamabad

2006

1. Introduction

The Pakistan Council of Research in Water Resources (PCRWR) is the only national research organization in water sector mandated to plan, conduct, coordinate and promote research in all aspects of water resources. Since its inception, the PCRWR has played its role as national apex research organization by undertaking and promoting applied as well as basic research in all disciplines of water resources, such as irrigation, drainage, hydrology, desertification, glaciology, water conservation, water quality, *etc.* through its 6 research centers located at Tandojam, Bahawalpur, Quetta, Lahore, Islamabad and Peshawar. The Council contributed in national economy by providing solutions to problems in water sector and is pioneer in developing/introducing various technologies like low cost farmer managed tile drainage systems, skimming wells, locally fabricated low cost soil and water measurement instruments and devices, low cost drip and sprinkler irrigation systems, rainwater harvesting, artificial groundwater recharge techniques, desertification control, groundwater mapping, and low cost arsenic removal filters and testing kits. The PCRWR has been declared as a focal point to perform surveillance and monitoring for the provision of safe drinking water and now helping implement a national program for the provision of safe drinking water. Moreover, this Council has developed strong working relations with national, regional and international organizations in various areas of water resources. The major collaborative organizations includes UNESCO, IIMI, ICIMOD, UNICEF, INWRDAM, ICID, IHP-HKH, DFID, UNDP, IWASRI, PARC, PAEC and various agricultural and engineering universities.

Budgetary Allocation

(Rs. in million)

Fiscal Year	2001-02	2002-03	2003-04	2004-05
Development	24.850	42.630	93.738	172.617
Non- Development	41.200	43.135	47.864	46.574
Total:	66.050	85.765	141.602	219.191

Establishment Size

- i) Non-Development side 299 (Professional: 154)
- ii) Development side 113 (Professional: 108)

2. Objective and Functions

The specific objectives and functions of the Council are:

- § Conduct, organize, coordinate and promote research on all aspects of water resources including irrigation, drainage, reclamation, navigation, drinking water, industrial water, and sewerage management and to set up national research centers wherever necessary;
- § Design, develop and evaluate water conservation technologies for irrigation, drinking and industrial water;
- § Initiate national water quality monitoring programmes including urban and rural areas of Pakistan and develop technologies for providing safe drinking water to the public;

- § Conduct and coordinate research on desertification, drought and flood mitigation;
- § Develop and maintain national water resources database for use by the planning, implementing agencies and public;
- § Advise the government and submit policy recommendations regarding water quality, development, management, conservation and utilization of water resources;
- § Establish liaison with other related national and international research and development organizations, universities and non-government organizations;
- § Undertake contractual research, provide consultancy services and collaborate with other organizations in the public and private sector;
- § Provide financial and technical support to universities and research institutions for collaborative research projects and fellowships;
- § Design and develop water related technologies and items of utility for various users according to market demand and undertake design and development projects on contract;
- § Undertake human resources development through training in skills related to the specialized functions of the Council; and
- § Commercialize its research and development results from sale of products, patents and services as well as collaboration with other organizations.

3. Regular Activities

3.1 Training Courses

Two training courses were held in the year on the following topics:

- § Two weeks training in water quality analysis at Quetta
- § One week training on collection of lysimeter, meteorological, and infiltration data, and groundwater recharging techniques at Quetta

3.2 Equipment Purchased

Water quality laboratory equipment

Atomic Absorption Spectrophotometer; Binocular Microscope; Automatic BOD measurement system; Biological Safety Cabinet; and Auto-titrator

Others

Laser land levelers, tractors and drills, and surveying equipment

3.3 Research Outcomes

- § Development of low cost safe drinking water technologies including Field Testing Kits for Basic Water Quality Parameters and Arsenic, Arsenic Removal Technologies, Chlorinators, Water Treatment Plants, Reverse Osmosis Unit
- § Evaluation of agricultural water management techniques like Rainwater harvesting, Trickle Irrigation System, Sprinkler Irrigation System, Bed and furrow irrigation, Skimming Well, Tile Drainage Technology

- § Harvested and collected about 400 million gallons of rainwater in 92 reservoirs constructed in Cholistan desert for drinking of human beings and livestock.
- § Development of soil moisture instruments (Tensiometer, Gypsum Block, Soil Water Extractor), Water Level Indicator, Salinity Sensor, Bubbler, Water Sampler, Sprinkler

3.4 Seminars/Symposium/Presentation

Following two workshops were organized on:

- § Assessment of Socio-economic Impacts of Drought in Pakistan, 19-20 July, 2005, Islamabad
- § Sustainable Management of Marginal Dry land (SUMMAD), 27-31 January 2006, Islamabad

3.5 Visits

- § Honorable Prime Minister Islamic Republic of Pakistan Mr. Shoukat Aziz visited PCRWR and inaugurated National Water Quality Laboratory (NWQL) on 2nd July 2005
- § US delegation visited NWQL on 18th July 2005
- § Federal Minister for Science and Technology visited NWQL on 29th July, 2005
- § High Level Australian Mission, visited Drainage Research Center (DRC), Tando Jam on 16th August 2005
- § PCRWR professionals visited USA under Pak-US Agreement on Science and Technology
- § Parliamentary Secretary Dr. Firdoos Ashiq Awan visited NWQL on 19th January, 2006
- § SUMAMAD Workshop participants visited Regional Office Bahawalpur, Field Research Station Dingarh and rainwater harvesting pond at Nagra Cholistan desert on 29-30, January 2006
- § Dr. Sharma from Nepal visited NWQL on 12th March 2006
- § Chairman CDA, Islamabad Mr. Kamran Lashari visited PCRWR on 5th April 2006
- § Secretary MoST Mr. Pervaz Ahmad Butt visited PCRWR on 14th April 2006
- § A Thailand delegation comprising 14 people visited PCRWR on 3rd May 2006
- § Minister for Housing and Urban Development Punjab Syed Raza Ali Gallani visited PCRWR on 19th May 2006
- § UNICEF Team visited DRC Campus Tando Jam on 24th May 2006
- § Secretary MoST, Mr. Pervez Ahmad Butt and Secretary Ministry of Environment visited NWQL on 25th May 2006
- § Minister for Parliamentary affaires, Mr. Kamel Ali Agha visited NWQL on 7th June 2006
- § Dr. John Consultant from UNESCO visited NWQL on 9th June 2006
- § Senators Mr. Azam Khan Swati, S.M. Zafar and DG, PNAC Abdul Rashid visited NWQL on 13th June 2006

3.6 Miscellaneous

Chairman, PCRWR Receives Tamgh-I-Imtiaz

Dr. Muhammad Akram Kahlowan, Chairman, Pakistan Council of Research in Water Resources received the prestigious Tamgh-I-Imtiaz from the President of Pakistan on 23rd March 2006 in recognition of his efforts in the field of Water Resources Management.

Publications

- § Muhammad Akram Kahlowan, Muhammad Azam and W.D. Kemper, “Soil Management Strategies for Rice-Wheat Rotations in Pakistan’s Punjab”. *Journal of Soil and Water Conservation, USA*, Vol.: 61 (1), 2006: 40-44.
- § Muhammad Akram Kahlowan, Abdur Raouf, Muhammad Hanif, Muhammad Zubair and W. Doral Kemper “Water Use Efficiency and Economic Feasibility of Growing Rice and Wheat with Sprinkler Irrigation in the Indus Basin of Pakistan”, *International Journal of Agricultural Water Management, Netherlands* (accepted).
- § S.A Prathapar, Muhammad Aslam, Muhammad Akram Kahlowan and A.S. Qureshi, “Mechanical Reclamation of Abandoned Saline Soils: Field Evaluation”. *Journal of the International Commission on Irrigation and Drainage* (accepted).
- § S.A Prathapar, Muhammad Aslam, Muhammad Akram Kahlowan and A.S. Qureshi, “Use of Gypsum Slotting Technique to Ameliorate Sodic Soils of Pakistan”. *Journal of the International Commission on Irrigation and Drainage* (accepted).
- § Muhammad Akram Kahlowan and W.D. Kemper, “Factors Affecting Success and Failure of Trickle Irrigation Systems in Balochistan”, *Journal of Irrigation Science, USA* (accepted).
- § Muhammad Akram Kahlowan, Muhammad Azam and Faizan-ul-Hasan “Methods and Estimation of Artificial Recharge of Groundwater”. *Proceedings of Regional Workshop on Training of Trainers on Management of Artificial Recharge and Rainwater Harvesting Projects, 25th April to 2nd May, 2005, Lahore – Pakistan.*
- § Muhammad Akram Kahlowan, Muhammad Akram and Muhammad Azam, “Water Conservation and Management in Hyper Arid Areas of Pakistan”, *Proceedings of 7th Gulf Water Conference, 19-23 November, 2005, Kuwait.*
- § Muhammad Akram Kahlowan, “Water Resources Management Strategies in Dry Land Areas: A Case Study of Biosphere Reserve in Cholistan Desert – Pakistan”, *Proceedings of International Workshop on Water and Ecosystems: Water Resources Management in Diverse Ecosystems and Providing for Human Needs, 14-16 June, 2005, Hamilton, Canada.*
- § Muhammad Akram Kahlowan, Muhammad Aslam Tahir and Hifza Rasheed “Development and Evaluation of Arsenic Removal Technologies for the Provision of Safe Drinking Water”, *Proceedings of 6th AASA General Assembly Meeting and International Symposium on Science and Technology of Water, October 11-13, 2005, Seoul, Korea.*
- § Muhammad Akram Kahlowan, “Groundwater Recharge in Arid Regions of Pakistan”, *Proceedings of International Symposium on Groundwater Sustainability, January 23 – 27, 2006, Alicante, Spain.*
- § Water Quality Status in Pakistan (3rd Report 2003-04). Publication No. 131-2005.

4. Development Activities

a. On-going Projects

∅ **Project Title:** National Water Quality Monitoring Programme

Objectives:

- § To establish a permanent water quality monitoring network on countrywide basis to monitor changes in surface and groundwater quality and groundwater levels.
- § To set up a computer data base (National water quality data bank) for easy access of water users through Internet to inform about any potential health hazard.
- § To prepare National water quality map.
- § To suggest remedial measures for improving the water quality.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Identification of water quality problems
- § Improvement in water quality
- § Reduction in expenditures on medication
- § Increase in productive time
- § Decreased child mortality and morbidity rate
- § Free of cost availability of information on water quality profile and problems/issues for policy makers, students and researchers

Achievements/Progress statistics:

- § Released technical report, phase- IV
- § Finalized technical report, phase-V
- § Identified problem parameters and suggested remedial measures for improvements
- § Provision of water quality data on website

Financial/Economic Impact:

- § Improvement in health adopting suggested remedial measures for safe drinking water quality
- § Poverty reduction by less expenditure on medication and child mortality

∅ **Project Title:** Mitigation of Drought Disaster in the Cholistan Desert by Management of Water Resources (MDDC)

Objective:

- § Development of drinking water source by rainwater harvesting system and collection in the storage ponds prepared based on scientific data.

- § Pumping of usable quality ground water for drinking of human beings as well as for livestock when collected rainwater in the ponds is exhausted.
- § Desalination of saline ground water through reverse osmosis system for making it drinkable to human and livestock population for maintaining good health.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Development of water sources of 1700 million gallons per annum in the desert to meet the water requirement of human and livestock population.
- § Increase in production of livestock in the form of meat, milk and other utilities.
- § Saving of more than 6000 million rupees per drought/dry period due to livestock migration, mortality, diseases, and damage of crops.
- § Reduction of migration of human and livestock from desert towards irrigated area.
- § Generation of 49 jobs directly and more than 1500 indirectly.

Achievements/Progress statistics:

- § Constructed 5 ponds making total ponds over 80 Nos. (Each with water storage capacity of 15000 cubic meter).
- § Installed one Reverse Osmosis plant making total 2 Nos.
- § Twenty turbine tubewells have already been installed.

Financial/Economic Impact:

- § Income of Rs. 6000 million by saving in terms of crops damage and livestock irrigation and modality by developing water resources in the area.
- § Provided facility of drinking water to 2.0 million livestock and more than 0.1 million human population.
- § Inhabitants have been provided 4000 US gallon water per day with Reverse Osmosis Plants for drinking.

Ø **Project Title:** Impact Assessment of Sewerage and Industrial Effluents on Human Health, Water Resources and Agriculture Productivity in Faisalabad

Objective: Major objective of the study was to document the impact of wastewater on surface and groundwater resources, agricultural soils, crops grown with wastewater, and human health in Faisalabad city.

Benefit to Public Industry – Jobs Directly/indirectly: The project was of research in nature and it created awareness among community regarding hazardous impacts of wastewater irrigation. Similarly, disposal of untreated wastewater by the industries and its contaminating affects on ground and surface water was highlighted.

Achievements/Progress Statistics: The impact of untreated wastewater disposed off by the industries was quantified for different variables/ elements and their intensity was indicated.

Financial/Economic Impacts: The findings of the project are useful to overcome the issues of contamination of crops and vegetables by wastewater. The identification of poor drinking water quality will lead to improve the health structure.

Ø **Project Title:** Strengthening of PCRWR Regional Office Lahore for Undertaking Research on Irrigated Agriculture

Objectives:

- § Establishment of a Research and Demonstration Centre to conduct research on soil and water related issues of irrigated agriculture
- § Evaluation of various soil and water management techniques for efficient utilization of the available resources
- § Development of infrastructure for soil and water testing laboratory at Regional Office. Lahore

Benefit to Public Industry – Jobs Directly/indirectly:

- § Establishment of Research Center facilitated the evaluation, development and dissemination of advance and efficient water management techniques for irrigated areas.
- § More cropped area adopting developed efficient water conservation techniques would provide employment opportunities in agriculture sector.
- § The project provided employment to 40 persons.

Achievement/Progress Statistics

- § Established Agriculture Research Farm on 34 acres.
- § Completed design and tender document of office block and laboratory building.

Financial/Economic Impact:

- § Helped identify gray areas of low water productivity evaluating technologies for better use and management of water resources in irrigated areas.
- § Research outcome will benefit the farmers and indirectly economy of the country by increasing crop production per unit of water use.

Ø **Project Title:** Strengthening of Pakistan Council of Research in Water Resources by Establishing Geographical Information System (GIS), Hydrologic Modeling Centre and Water Resources Data Bank

Objectives:

- § To establish a Geographic Information System (GIS) and Remote Sensing (RS) for water resources assessment, investigation and database management at Islamabad and Lahore.
- § To establish Hydrologic Modelling Centre to undertake research on various water resources issues.

- § To establish a National Water Resources Data Bank through sharing information and active linkages with the National Institutions involved in water resources research, planning, development, management, forecasting, etc.

Benefit to Public Industry – Jobs Directly/indirectly: The project generated 10 jobs. The project will also help monitoring and mapping groundwater quality and quantity, surface water quality and quantity, floods, desertification processes, waterlogging and salinity etc.

Achievements/Progress Statistics:

- § Established GIS and Modeling Laboratory at PCRWR Head Office Islamabad.
- § Prepared digitized base of different parts of Indus Plain for developing thematic maps for demarcation of groundwater quality zones in Indus plain.
- § Prepared data files for development of groundwater quality maps of Thal doab.

Financial/Economic Impact:

- § Strengthening of research infrastructure to undertake advance research in various areas of water sector.
- § Helping in provision of GIS based information and data to planners, researchers, engineers, etc.
- § Development of manpower in GIS applications and hydrologic modelling would reduce much reliance on foreign experts and also save foreign exchange.

Ø **Project Title:** Water Quality Monitoring in Rural Areas of Pakistan and Installation of Low Cost Water Conditioning and Filtration Units

Objectives:

- § To establish permanent water quality monitoring network in rural areas to monitor changes in drinking water quality, groundwater levels and document existing sewage disposal practices.
- § To suggest remedial measures for improving the quality water for various uses.
- § To design and install water conditioning and filtration units for the provision of safe drinking water.
- § To setup a computer database and link with database of National Water Quality Monitoring Programme for preparing national water quality map using GIS facilities.

Benefit to Public Industry – Jobs Directly/indirectly:

- § A countrywide water quality network is being established covering 24 rural areas.
- § Development of database about drinking water quality in rural areas proved to be helpful for the researchers.
- § Provision of safe drinking water to community, which would be helpful in reduction of child mortality and morbidity rate.

- § Availability of information on water quality for the researchers and policy makers for future planning.
- § Improved water quality and health status of the nation by management of water quality.
- § The life expectancy rate will be increased by improving water quality.
- § Installation of water conditioning and filtration units will certainly helpful for the provision of safe drinking water to the community.

Achievements/Progress statistics:

- § Completed collection and analysis of water samples of districts Ziarat, Gujranwala, Hyderabad, Gujrat (30%), Sargodha (50%), Bahawalpur, and Mardan.
- § Installed 3 water conditioning and filtration units at Fateh Jang, Golra Sharif, and Islamabad.

Financial/Economic Impact:

- § Reduction in expenditures occurred directly or indirectly on hospitalization for water related diseases, major infections and parasitic diseases e.g. cholera, typhoid, dysentery, hepatitis, giardiasis, cryptosporidiosis and guinea worm infections.
- § Quality of services to the users will be improved after strengthening of laboratory capabilities and improvement in infrastructure.
- § Water quality awareness will be created which leads to improve economic status.

Ø **Project Title:** Arsenic Monitoring and Mitigation in Pakistan

Objectives:

- § To conduct prospective survey for arsenic contamination in Punjab and Sindh provinces.
- § To provide low cost arsenic removal technologies developed by PCRWR in the affected areas.
- § To conduct research for the identification of causes of arsenic in ground water and develop remedial solutions.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Promotion of low cost arsenic removal technologies.
- § Low cost arsenic removal technologies will be helpful for provision of arsenic free water to the locality of arsenic affected areas.

Achievements/Progress statistics:

- § Provided 200 Nos. of low cost arsenic testing kits to regional offices for field testing.

- § Completed collection and analysis of water samples of districts Attock, Sargodha (50%), Badin, Hyderabad, Tando Allah Yar, Tando Muhammad Khan, Matiari, Khanewal.
- § Installed 60 Nos. of community level arsenic removal units.
- § Developed low cost household arsenic removal filter and monitoring is in progress.

Financial/Economic Impact:

- § Reduction in expenditures on medication by improvement of water quality.
- § Creation of awareness about arsenic contamination which leads to improve economic status of the society.

∅ **Project Name:** Participatory National Ingenerated Water Management Programme

Objectives: Major objective of the project is to study the impact of water conservation technologies on water saving and crop production.

Benefit to Public Industry – Jobs Directly/indirectly: The project is of research in nature and its findings will help the farming community to improve their agricultural productivity by judicious use of scarce irrigation water.

Achievements/Progress statistics:

- § Purchased laser land leveling systems, tractors, surveying equipment and drills
- § Selected and developed 11 pilot sites in irrigated, rainfed, desert, mountainous and coastal areas of the country for execution of water conservation technologies including watercourse improvement, construction of check structures and mini dams, dug wells, lift, sprinkler and drip irrigation systems, and laser land leveling.

Financial/Economic Impact: The findings of the project would benefit the country by increasing crop productivity by optimum use of scare irrigation water resources. The increased crop productivity will ultimately improve the GDP of the country.

∅ **Project Title:** Integrated Land and Water Management Studies for Agriculture Development in Pothwar Region

Objectives: The main objective of the project is to alleviate poverty by enhancing agriculture productivity through integrated land and water management activities in Pothwar. In this regard, the following research and dissemination studies will be undertaken:

- § Assessment of water resources potential in Pothwar Region for sustainable management of water resources.
- § Evaluation of soil and water conservation activities for sediment control and land management for agriculture in Pothwar.

- § Evaluation and dissemination of integrated land and water management activities by establishing a Research and Demonstration Centre in Pothwar.
- § Demonstration of efficient land and water management techniques to the farmers by establishing pilot sites at farmers fields with their participation.

Benefit to Public Industry – Jobs Directly/indirectly: The testing and optimization of local trickle and sprinkler irrigation systems would guide local industry to improve quality as well as curtail cost. The project activities would help improve land and water utilization by farmers for increased crop production and ultimate farm income by dissemination of information and undertaking research at field research station/farmers lands as pilot sites.

Achievements/Progress Statistics:

- § Water resources assessment in Pothwar region is underway by collecting primary and secondary data on various aspects of water and agriculture in all basins of Pothwar.
- § Sediment data from basins of Pothwar is being collected.
- § Establishment of Integrated Land and Water Research and Demonstration Station is in progress.
- § Four pilot sites are being established for research and demonstration of high efficiency irrigation system and crop management.

Financial/Economic Impact: The improved land and water management activities would help improve crop production *inter-alia* resulting in better socio-economic conditions.

∅ **Project Title:** Demarcation of Groundwater Quality Zones in Indus Plain and its Marginal Areas for Sustainable Development and Management of Groundwater (Phase-1) Upper Indus Plain

Objective:

- § Demarcate fresh groundwater quality zones in the Indus plain and its marginal areas.
- § Develop groundwater quality maps for the Indus plain for future sustainable development of groundwater.
- § Predict the future behavior of groundwater regime pumping/recharge through computer modeling.
- § Create awareness among the end users i.e. farmers, public, private and industrial sector about the quality of freshwater and its sustainable use.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Generated 14 jobs
- § Helped in sustainable development of groundwater
- § Created awareness among farmers, public, private and industrial sectors about quality of freshwater and its sustainable use

Achievement/Progress Statistics

§	Electrical Resistivity Survey 5x5 km Grid	Thal Doab 80%
		Bari Doab 60%
§	Test Bore drilled at 25x25 km Grid	Thal Doab 100%
		Bari Doab 80%

Financial/Economic Impact:

- § Increase in agriculture yield by sustainable water use.
- § Effective use of groundwater.

∅ **Project Title:** Mitigation of Desertification for Poverty Alleviation by Integrated Management of Land and Water Resources in Cholistan

Objective:

- § To develop demonstrative-cum-desertification control research farms at 20 locations in Cholistan.
- § To develop innovative, sustainable and economical technologies for wind erosion control and transformation of sand dunes into productive lands.
- § To disseminate desertification control techniques/methods for large scale adaptation.

Benefit to Public Industry – Jobs Directly/indirectly:

The project seeks to establish 20 micro-farm research stations in the Cholistan desert to develop ideas and provide practical witness for Cholistani people to convert whole Cholistan into productive land.

Achievements/Progress statistics:

- § Developed 7 Field Research Stations planting orchard, afforestation, and grasses.
- § Converted about 175 acres desertified land into productive land by using available ground water resources.

Financial/Economic Impact:

- § Millions of rupees will be saved by afforestation, grassland development, rangeland development and saline agriculture.
- § Cholistani breed cattle are being up-reared.

∅ **Project Title:** Improved Water Conservation Practices for NWFP and Northern Areas of Pakistan

Objectives:

- § To identify water and soil management issues/problems, their extent and to develop water conservation plan in NWFP and the Northern Areas of Pakistan under changing global environment;

- § To implement the proposed water conservation plan by establishing demonstration units at appropriate locations in the project area with active farmers participation; and
- § To monitor water quality of surface and groundwater sources in project areas and suggest remedial measures for improving the quality of water for various uses.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Expected employment generation is about 900 persons.
- § Promotion of water conservation technologies including high efficiency systems (trickle/sprinkler) supporting with lift and storage facilities would generate directly/indirectly the business of related industries.

Achievements/progress Statistics:

- § Selected 35 sites for water conservation technologies package in project area.
- § Completed baseline and topographic survey.
- § Installed trickle irrigation system at 3 sites
- § Awarded contract for provision of water conservation technologies at 18 sites.

Financial/Economic Impact, if any:

- § Most effective use of available land and water resources
- § Conversion of rain-fed lands into irrigated lands
- § Promotion of high value orchards in mountainous areas
- § Poverty reduction by increasing farm incomes
- § Improvement of health by adopting suggested remedial measures for water quality issues

∅ **Project Title:** Result Oriented Short Term Research Studies to Improve Water Resources of Mountainous Area

Objectives:

- § Development and propagation of appropriate water harvesting techniques in swat valley of Pakistan.
- § Development of testing of methodologies to rejuvenation of glaciers to improve the frozen water resources.
- § Monitoring the behavior of selected glaciers.
- § Development of snowmelt stream flow relationships.
- § Improvement of channels for efficient conveyance of water in the mountainous areas of Pakistan

Benefit to Public Industry – Jobs Directly/indirectly:

- § Expected employment generation is about 100 persons.
- § Propagation of water harvesting techniques would generate business of the related industry.

Achievements /progress Statistics:

Under this project five different research studies are under implementation as follows:

Study No.1: Baseline survey completed, slop terraces developed and stabilization accomplished, high irrigation systems installed, piezeometer installed and ground water monitoring being carried out.

Study No. 2: Glacier monitoring is in progress.

Study No. 3: Three glaciers have been grafted which are being regularly monitored and relevant data collected.

Study No. 4: Collected and processed 30 years data. Developed snowmelt stream flow relationship.

Study No. 5: Channel design reviewed and civil work carried out on one channel. Contract awarded for the second channel. Evaluation of the channels is in progress.

Financial/Economic Impact:

- § Enhance potential of depleting glaciers undertaking various technical and physical measures.
- § Increase agricultural productivity through promotion of efficient water management techniques and methods.
- § Poverty reduction by sustaining management of available water resource.

Ø **Title of the Project:** Enhancement and Management of Groundwater Resources in Balochistan

Objective:

- § Assessment of existing status of groundwater resources;
- § Development and implementation of plan for sustainable management of groundwater resources through artificial groundwater recharge techniques and rainwater harvesting; and
- § Impact assessment and dissemination of efficient recharge techniques for wide scale adaptation to manage groundwater potential in water scarce areas.

Benefit to Public Industry – Jobs Directly/indirectly:

- § More job opportunities would be created for the people of the project area
- § Public industry will become more familiar with groundwater recharge techniques.
- § Sustain depleted groundwater resources in Balochistan

Financial/Economic Impact: Low cost pressurized irrigation system being introduced which would help save more than 60% of water and would reduce stress on the groundwater resources of the Province.

Ø **Project Title:** Sustainable Technologies for Efficient Water Management in Irrigated Areas of Southern Indus Plain

Objectives:

- § To identify water management and agriculture related issues and problems in Southern Indus Plain and develop plan for sustainable water resources management to enhance water productivity.
- § To implement and evaluate efficient technologies at appropriate locations by establishing pilot projects with active farmer's participation.
- § To devise strategies for wide scale extension of efficient technologies.

Benefit to Public Industry – Jobs Directly/indirectly: The results obtained would directly benefit the farmers and indirectly to the industrial sector as well as the Country by increasing crop production per unit of water used.

Achievements /progress Statistics:

- § Investigation of sea water intrusion (50%)
- § Refinement of skimming well technology (50%)
- § Impact of private tubewells (40%)
- § Impact of marginal quality groundwater (40%)
- § Use of municipal wastewater (30%)
- § Introduction of pressurized irrigation system (50%)
- § Introduction of water conservation technologies (30%)
- § Implementation of irrigation scheduling (30%)

Financial/Economic Impact:

The project would lead to optimum use of land and water resources, which are otherwise left unutilized. This would help increase crop production per unit of water used thus reducing the gap between demand and supply of water.

b. Programme Initiated During 2005-2006

Ø **Project Title:** Provision of Safe Drinking Water

Objectives:

- § To establish 18 water quality monitoring laboratories in 18 districts to provide dependable water analysis facilities for the provision of safe drinking water.
- § To conduct Water Quality Monitoring to identify the problems hindering in the supply of safe drinking water.
- § To install pilot/demonstration water conditioning and filtration plants for larger scale adoption by the federal and local Govts.
- § To impart training to the technical staff of all water supply schemes for the four Provinces, AJK, FATA and Northern Areas.

- § To investigate and identify the causes of pollution in water resources and to suggest the remedial measures for water quality improvement.

Benefit to Public Industry – Jobs Directly:

- § More than two hundred jobs are being generated.
- § Reduction of expenditure on medication.
- § Quality of life will improve in the country.
- § Productive time i.e. 1/10th of each person can be saved which is sacrificed due to water- related diseases.

Achievements/Progress statistics:

- § Recruited project staff and training of the newly recruited staff is in progress.
- § Purchase of equipment is in progress.
- § Completed 40% site selection for water quality laboratories in 18 districts.
- § Monitoring of water supply schemes of Rawalpindi district is being started.

Financial/Economic Impact:

- § Reduction in expenditures on medication by improvement of water quality.
- § Creation of water quality awareness for a healthy society.

Ø **Project Title:** Integrated Development and Management of Water Resources in Water Scarce Areas

Objective:

- § Assessment of existing status of surface and groundwater resources, agriculture and socio-economic conditions in the project area.
- § Development of water sources for human and livestock consumption and for supplemental irrigation.
- § Impact assessment of project activities and dissemination of effective techniques to other water users/farmers for wide scale adoption.

Benefit to Public Industry – Jobs Directly/indirectly:

- § Promotion of groundwater exploration technologies
- § Generation of jobs

Achievements/Progress statistics:

- § Constructed 2 water storage reservoirs.
- § Installed 1 turbine and desalination unit.

Financial/Economic Impact:

- § Increase in farm income through provision of freshwater.

Ø **Project Title:** Combating Drought and Desertification in the Thar Desert by Management of Water Resources

Objective:

- § To carry out a comprehensive survey to document the existing status of water resources management and agriculture activities in the project area.
- § To conduct research for effective utilization of land and water resources by establishing a Research and Dissemination Station in Thar desert.
- § To develop viable techniques of rainwater harvesting, saline and fresh groundwater utilization and desertification control in the area for agriculture, livestock, and human consumption.
- § Dissemination of efficient techniques for large scale adoption for agriculture and socio-economic development.

Benefit to Public Industry – Jobs Directly/indirectly: The project seeks to establish research stations in the Thar desert to develop ideas and practical witness for the inhabitants to convert desert into productive land.

Achievements/Progress statistics:

- § Acquired 200 acres land from District Administration Tharparkar for establishment of Research and Development Center near Mithi.
- § Floated tenders for excavation/construction of earthen ponds, deep well and dug wells while contouring survey at field station is in progress.
- § Started survey to classify the area for land use of 200 acres area for saline agriculture, desertification control and to introduce efficiency irrigation system (Trickle & Sprinkler).

Financial/Economic Impact:

- § Increase in income by developing freshwater resources and utilization of saline water for agriculture.
- § Increase in production of livestock in the form of meat, milk and other utilities.

Ø **Project Title:** Rainwater Harvesting and Desertification Control in the Kharan-Chagai Desert of Balochistan

Objective:

- § To assess the existing water resources of the area.
- § To manage the catchments and store streams runoff due to precipitation using advanced rainwater harvesting technologies.
- § To establish a Desert Research Centre in the Kharan-Chagai desert for conducting desertification control research.

Benefit to Public Industry – Jobs Directly/indirectly: The human and livestock population of the desert will get more drinking water annually resulting more production of livestock in the form of meat, milk and other utilities.

Achievements/Progress statistics:

- § Established an office at Noshki.
- § Baseline survey and land acquisition are in progress.

Financial/Economic Impact:

- § Increase in income by developing freshwater resources and utilization of saline water for agriculture.
- § Increase in production of livestock in the form of meat, milk and other utilities.

Ø **Project Title:** Strengthening of WRRC Peshawar for Undertaking Research in Water Resources Management

Objectives:

- § To establish Soil and Water Testing Laboratory facility at WRRC Peshawar.
- § To establish a field research and demonstration station to conduct research on various soil and water related issues of NWFP and Northern areas.
- § To establish lysimeter station at the proposed station to study soil-water-plant relationship, irrigation scheduling, groundwater contribution etc.

Benefit to Public Industry – Jobs Directly/indirectly:

The project activities would help improve land and water utilization by farmers for increased crop production and ultimate farm income by dissemination of information and undertaking research at field research station/ farmers lands as pilot sites.

Achievements/progress Statistics:

Land for the construction of office building and laboratory has been acquired and construction will be started in the next financial year. The layout has been approved and funds have been allocated for construction. Acquisition of State land for research station is likely to be matured very soon.

Financial/Economic Impact, if any:

The project would help evaluate various technologies for better use and management of water resources in irrigated areas. The results obtained will directly benefit the farmers and indirectly to the economy of the country by increasing crop production per unit of water used thus reducing the gap between demand and supply of water.