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**Dr. Muhammad Akram Kahlown, Pakistan**  
**Winner of WatSave Innovative Water Management Award 2003**

*(For his rare and comprehensive approach in water resources management such as Irrigation, Drainage, On-Farm Water Management, Water Quality, Groundwater Modeling, Contaminant Transport.)*

Dr. Muhammad Akram Kahlown (B.1951) holds Ph.D. in Civil Engineering from University of Idaho, USA and presently is a Chairman of the Pakistan Council of Research in Water Resources (PCRWR). He has held various senior positions in the Ministry of Water and Power, Government of Pakistan. Dr. Kahlown may be contacted on <pcrwr@isb.comsats.net.pk>.



**Summary of Research Activities And Significant Achievements:**

Dr. Muhammad Akram Kahlown conducted research in and out side the Indus Basin on the various aspects of water resources management including improvement of water conveyance and application efficiencies as well as traditional irrigation system, groundwater management, waterlogging and salinity, reclamation of salt-affected soils.

• **On-Farm Water Management**

**A. Improvement in Water Conveyance Efficiencies**

- ◆ Quantification of conveyance and application losses;
- ◆ Study of factors affecting the watercourse losses;
- ◆ Design and evaluation of conventional and low cost linings;
- ◆ Improvement of earthen water courses with installation of pucca naccas;
- ◆ Heavy cleaning and maintenance of watercourses;
- ◆ Evaluation of compacted cores in channel banks for seepage reduction;
- ◆ Development of R.C.C naccas, culverts, washing stations and buffalo baths;
- ◆ Design of low head jet pumps for elimination of canal outlet submergence;
- ◆ Impact evaluation of roughness coefficient and cleaning of watercourse

**B. Improvement in Water Application Efficiencies**

- ◆ Field size and layouts for efficient use of irrigation water;
- ◆ Impact of leveling on field applications and crop yields;
- ◆ Improved irrigation methods for efficient use of irrigation water;
- ◆ Low cost drip irrigation of orchards;
- ◆ Irrigation application in relation to water table depth.

### **C. *Improvement in Traditional Irrigation System***

- ◆ Karez recharge rejuvenation Techniques (storage reservoirs, gabion bunds);
- ◆ Engineering interventions to increase conveyance efficiency of karez water;
- ◆ Delivery system (capping of wells, installation of flexible tubing in karez; channel);
- ◆ Innovations in Sailaba Irrigation (Improved layout and water diversion structures).

#### **• Groundwater Management**

For better management of groundwater resources the following interventions have been designed and evaluated:

- ◆ Design of Skimming wells for utilization of thin fresh water layers underlain by saline water;
- ◆ Procedure for enhancing the pumping plant efficiencies of the SCARP Projects;
- ◆ Injection well modeling in geothermal ground water systems;
- ◆ Groundwater quality changes as affected by continuous pumping of SCARP Wells;
- ◆ Evaluation of direction and quantity of flow in regional aquifer systems;
- ◆ Evaluation of well interference impacts in local well fields;
- ◆ Design and performance of pumping out test for evaluation of ground water availability;
- ◆ Design and operation of groundwater monitoring networks;
- ◆ Design and evaluation of techniques for artificial groundwater recharge in Quetta valley of Balochistan.
- ◆ Creation of storage reservoir in the saline groundwater.

#### **• Water Logging and Salinity**

In order to evaluate the impact of waterlogging and salinity on crop yields and to contain the twin-menace, following interventions have been developed:

- ◆ Impact of waterlogging on crop yields;
- ◆ Impact of Salinity on crop yields;
- ◆ Combined impact of waterlogging and salinity on crop yields;
- ◆ Impact of SCARP wells on waterlogging and salinity;
- ◆ Farm level tile-drainage systems;
- ◆ Waterlogging, salinity and crop yield relationships.

#### **• Reclamation of Salt-affected Soils**

The following technologies to reclaim the abandoned soils have been developed:

- Appropriate crop rotations for reclamation of waterlogged and Stalinated soils;
- Slotting Method for deep mixing of gypsum for soil reclamation;
- Sulphurous Acid Generator to reclaim sodic waters and soils;
- Mechanical Cultivation of abandoned soils before monsoon for higher infiltration rates and leaching of salts;

- **Technologies Developed and Under Implementation**

- On-Farm Water Management Model, which is being implemented in all the four provinces of Pakistan. This model was developed at WAPDA's Mona Project under his supervision. This model focuses on saving of water from the conveyance and application components of the irrigation system;
- Concrete control structures including R.C.C. Naccas, washing stations, buffalo baths, being used all over the country;
- Low head jet pumps are being used by the farmers to eliminate the canal outlet submergence. This technology has ensured authorized canal supplies in the SCARP areas, command of higher fields and quality of irrigation water;
- Skimming wells for utilizing the thin fresh water layer overlain by saline water. These wells are being utilized in the entire Indus Basin. By this method there is potential of using millions of cubic meters of ground water in the Indus Basin alone;
- Low cost linings developed are being used by the farmers to conserve the water in the delivery system. A wide range of linings of different materials and designs were developed and recommended for use for various field situations;
- Improved Irrigation method – Bed and furrow as constructed and evaluated by Dr. Kahlown are in use for cultivation of cotton, maize and wheat. By this method farmers are saving about 25% water and getting 10 percent higher yields and better fertilizer use efficiency;
- Contribution of groundwater in meeting the crop water requirement is resulting in enormous water saving and helping to control waterlogging and salinity at farms. For example wheat crop needs only one irrigation instead of five irrigation in areas where the groundwater is at 1.5 m deep from the ground surface;
- The impact of waterlogging on crop yields has guided the Drainage Engineers and Agronomists in deciding the depth of tile-drainage systems and appropriate cropping pattern. This has helped to reduce the tile-drainage system installation and subsequent operation and maintenance cost;
- Innovative procedures for reclamation of saline-sodic soils and sodic waters are being used by the farmers in the country. These methods include, adding of gypsum through slotting and treating sodic waters and soil with Sulphurous Acid Generator;
- Farm level tile-drainage systems and procedures for their manual installation are being adopted by the individual farmers and group of farmers in waterlogged soils; and
- Benefits of leveling the fields on water saving, better crop stand, higher fertilizer use efficiency and waterlogging and salinity is recognized by the farmers of the irrigated areas of Pakistan.

Dr. Kahlown believes in user-oriented research. The various innovative water management approaches developed by Dr. Kahlown are being practiced in Pakistan as well as in some developing countries.