

**THESIS**

**ASSESSMENT OF WATER PRODUCTIVITY OF MAIZE CROP  
OF KHIKHI WATERSHED COMMAND AREA**



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## ABSTARCT

Canal irrigation system comprising of canals, distributaries and minors play the role of backbone in irrigated agriculture of Pakistan. At the distributary and minor levels considerable variation in water supplies from head towards the tail of distributaries, minors and watercourses have been reported that also cause reduction in crop yields. The impacts of water variation differ in its magnitude in different canal irrigation systems, mainly due to variations in water availability (timings and amounts), crop types and soil fertility status. This necessitates to conduct site specific research and studies to evaluate impact of variations in water availability at farm level for specific crops. The findings of such studies will then be utilized to rationalize the irrigation supplies at farm level keeping in view the level of variation. Accordingly, this study was undertaken for the assessment of inequality in canal water distribution and its impacts on the yield and water productivity of maize in the command area of Khikhi distributary. For this purpose three watercourses at head, middle and tail reaches of the distributary were selected. On each selected watercourse three maize fields at head, middle and tail were chosen. Discharges measurements were taken and yield of maize crop was recorded.

A significant variation in discharge was observed in the head reaches (inlet point) of watercourses off taking from head, middle and tail of distributary which was 11.23%, 18.3% and 23.0% reduction in flow against the allocated discharges, respectively. The average Delivery Performance Ratio (DPR) at head was 0.82 and at the tail of all watercourses was 0.57 that indicated the significant difference between discharges received by the farmers and allocated discharge. These variations in discharge ultimately reduced the maize crop yield and production from 11 to 54%.

The percentage gap in yield from head to tail was upto 54% and the water productivity decreased upto 26% for tail end section of watercourses. Variations in crop yield and water productivity were also significantly effected with the different agronomic factors such as fertilizer application, seed variety and sowing method etc. With applying farm yard manure the water productivity increased from 0.88 to 0.93 kg/m<sup>3</sup> (3.4%) while water productivity was 14% less in case of flat sowing as compared to the sowing on ridges. Similarly the application of low quality seed decreased the yield up to 17.5%. These results clearly showed the inconsistency in canal water distribution at tertiary (watercourse) and secondary (distributary) irrigation system levels and variable agronomic practices significantly reduce the crop yield and water productivity for tail end farmers.

As one of the objectives of the studies, the constraints and solutions were identified by preparing questionnaire and personal meeting with farmers. It was worked out that irrigation system does not provide management flexibility to fulfill the irrigation requirements of small farmers having landholdings in the area. It was also observed that the influential farmers get more share of water due to unfair means and negligence of concerned departments. It was also concluded that farmers can solve this problem themselves by mutual collaboration and cooperation within the community. The most reported problem for deprivation of farmers was un-equitable share of water due to theft and illegal tempering of mogas. This problem should be overcome by informing the irrigation department by the concerned farmer as well as remolding of mogas on regular basis keeping in view the variation in water distribution.