CALIBRATION AND COMPARISON OF HARGREAVE'S EVAPOTRANSPIRATION EQUATION FOR LOCAL CONDITIONS

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THESIS SUBMITTED

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ABSTRACT

The major objective of the study was to calibrate Hargreave's ET equation for Pakistani conditions. The equation was calibrated for Sargodha station using ten years climatic data. The ET estimates obtained from the calibrated Hargreaves equation, Penman, Jensen-Haise, Penman-Monteith, pan evaporation and Hargreaves Davis methods were compared for Sargodha, Farooqabad, Multan and Peshawar stations. In all the stations better results were observed from the calibrated Hargreaves equation than pan evaporation, Penman-Monteith, Jensen-Haise and Hargreaves Davis methods while Penman method gave underestimation of ET than from other methods.

Consumptive use of sugarcane, cotton and wheat were computed empirically and compared with observed values for Mona Reclamation Project, Bhalwal. Both Jensen-Haise and Hargreaves Davis methods overestimated, and Penman method underestimated while better CU estimations were obtained from the calibrated Hargreaves equation. Results computed by the calibrated Hargreaves equation matched closely with the observed values.

The calibrated Hargreaves equation gave minimum standard error of estimates and percent seasonal CU deviations than other methods. Ratios, obtained from the sum of observed to computed CU values, were nearly equal to one in case of the calibrated Hargreaves equation and coefficient of correlation was within acceptable range.

All the above results were compared by considering 10-daily cumulative CU values of sugarcane, cotton and wheat. In order to see the actual trend, 10-daily discrete CU values of sugarcane and cotton, computed by Jensen-Haise, Penman and the calibrated Hargreaves equations, were compared with the observed values. Although results of the calibrated Hargreaves equation showed good association with the observed values. But all the three methods gave overestimation or underestimation. Therefore for better estimation of CU, crop coefficients of sugarcane and cotton were recalculated. Consumptive use, computed by applying the calibrated Hargreaves equation and modified crop coefficients, were compared with the observed values. Both the curves of computed and observed values showed better association with each other.

From this analysis, it can be predicted that Hargreaves equation was well calibrated for local conditions. Therefore it is recommended for irrigation scheduling in Pakistan.