Evaluation of Irrigation System Losses for Upper Ganga Canal Area

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ABSTRACT

Optimal utilisation of water resources requires a proper estimation of conveyance losses from the water conveyance system and the application losses. The losses from the canal conveyance are mainly due to seepage and evaporation. The seepage losses specially in unlined canals has been reported to vary between 20% to 60% of the flow rate in the canal whereas the evaporation loss varies between 0.25% to 1.00% of the flow rate. Though the percentages of loss rate are small, in the case of UGC system where the flow rate is higher throughout the year, the losses from the conveyance are predominant. Since the conveyance losses in the UGC system are significantly high, their evaluation is much more important both for optimal use of surface water and for the water balance studies in the basin. The various methods of measurement of canal losses, their advantages, limitations are discussed briefly. The evaluation of the system losses for the study area are made under the following three headings.

(1) Evaluation of main/branch canal losses.

(ii) Evaluation of conveyance losses in distributary command areas.

(iii) Evaluation of field percolation losses.

The Upper Ganga Canal system has a Main canal (290 km.long) and the four important branches namely i) Deoband branch (80 km. long) ii) Anupshahr branch (206 km.long), iii) Mat branch (128 km. long) and Hathras branch (74 Km. long). Using the inflow-outflow method, with the available discharge data (1971-79), the conveyance losses of main and branch canals of UGC in reach wise as well as season wise were evaluated. The canal losses are expressed in mm/day as well as m^3 /sec/million cubic meters, to facilitate for easy comparison amongst losses of various reaches under different flow conditions like variable discharge, change in perimeters etc. The following assumptions were made while conducting the study.

(i) The evaporation losses were neglected.

(ii) The canal losses were estimated using mean year monthly data for the period 1971-79, since for certain reaches, either the inflow our outflow data were not available completely. However, it was seen that losses estimated by using mean year data are not significantly different from those of average monthly losses for a particular reach.

(iii) For expressing the canal losses in mm/day (in depth units), the wetted perimeter is assumed to be constant even under different flow conditions, since a) The change in wetted perimeter is marginal in comparison to the changes in discharges, b) There will be continuous drying and wetting conditions prevailing because of frequent discharge fluctuation.

The losses from the 115 distributaries/minors of the UGC system were estimated by adopting the suitable loss rate coefficients available from the published works.

The field channel losses of the system were evaluated by outlet studies and based on the estimation from a selected field channel distribution.

Besides estimating conveyance losses, the field percolation losses were also estimated by considering the agronomic and irrigation practices over the area.
The losses thus obtained were presented.