

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The work of conducting the "Pilot Study on Water Use Efficiency of (i) Western Yamuna Canal (Haryana) and (ii) Upper Ganga Canal (U.P.)" was awarded to WAPCOS (I) Ltd. by the Planning Commission, Govt. of India vide their Letter No. 0-15012/94/2000-SER dt. 13.3.2001 and office order No. 0-15012/94/2Y-SER dt. 26.3.2001. The basic objective of the Pilot Study was to ascertain the percentage of the total releases of canal water at headworks, being gainfully utilized for raising of crops. These two systems were specially selected because the two canal systems are amongst the oldest in the country. The irrigation network in the northern India, specially in the commands of river Ganga and Yamuna, is traditionally secure and advanced in respect of wide spread distribution network having one of the oldest prevailing northern India canal and drainage act and rich level of productivity. Given such favourable conditions, better water management and eschew of avoidable losses can make available additional waters to bring far more dividends in foodgrain production in the fertile tracts of these two older canals than other systems. Study on water use efficiency is aimed to assess the efficiency and to pin point maladies in the system and usher in reforms for which there is ample room.

The Terms of reference interalia included an overall evaluation of the performance of the two projects vis-à-vis the benefits envisaged, review of past studies, if any, and carrying out Pilot Studies on Water Use Efficiency and overall project efficiency of the project taking into consideration water losses (i) in the conveyance and distribution network of canals, (ii) below the outlet into water courses and (iii) on the field. Recommendations have been sought on steps and measures to tone up system efficiency.

1.1 **APPROACH**

History : In case of Upper Ganga Canal (UGC), the study has been taken up tracing the history of project formulation, availability and use of water, the basis of water allocation, system of distribution network, the regulating structures, sequential improvement, modernisation and renovations leading to present level of performance. Index Map of Upper Ganga Canal (UGC) command comprising the districts in U.P. is attached (DWG 1.1). Line diagrams of canal systems passing through the jurisdictions of Meerut, Muzaffarnagar, Mathura & Aligarh Divisions are also enclosed. (DWG 1.3, 1.4, 1.5 & 1.6).

Data Collection : In order to collect the required field data, discussions were held with the Chief Engineer (Upper Ganga Canal), U.P. Irrigation and his officers from time to time and field visits were undertaken to assess the ground realities. Field data thus collected has been co-related to field studies conducted independently & results there-to analysed. The losses from control point to control point on the main UGC, on its offtakes like Mat Branch & Jewer distributary have been worked out on the basis of maintained discharge data, existing discharge tables as well as field observations. The loss per unit wetted perimeter as well as in various reaches of distribution were measured as per existing conditions of channels. Delta worked out for offtakes of Jewer distributary depict inequity, large variation, wastage, overdrawls etc.

Identification of Wasteful Leakages : Significant avoidable leakage has been observed occurring from the closed head regulators. Frequent & unchecked cross bunds, obstructions in the bed of channels, especially Jewer distributary show that there has been no enforcement of regulations at all. Significantly consistent low supplies in lower reaches of Mat Branch tend to enhance losses & vitiate hydraulics of channels. The practice

"Minimum 75% capacity of channel to be run" should be followed to keep channel as near to regime as possible.

The objectives of improving Water Use Efficiency (WUE) margin in the modernisation project is far too optimistic taking into view the existing conditions & control of channels, specially the laxity in the enforcement of canal act & criteria of equity.

Study of Losses : The study of transit losses along the system conveyance and distribution network have been systematically analysed under Chapter 4 " Analytical Study of the Losses". The losses between various control points on the main canal, branch canal, distributary and minor system as well as below the outlet in the field water course & command chak have been given in the tabular statement at Annex. 4.1. The critical significant loss occurring after application of Irrigation water is the amount of water applied beyond the consumptive use of crop (cu), crop water requirement or essentially the transpiration and the unavoidable evaporation. This too has been estimated based on PET values making use of daily meteorological variables and the estimate of diffusive resistance of crop canopy as discussed in the body of the report (Annexure 4.14).

1.2 WATER USE EFFICIENCY

The study of transit losses along the system network shows that water use efficiency in Upper Ganga Canal (U.P.) is in the range of 97.4% to 99.5% at the end of main canal head reach, 89.39% to 96.7% at the end of canal upto offtake of Mat Branch, 78.67% to 88.66% at the start of distribution into distributary & minor and 65.93% to 77.58% at the head of outlet. This efficiency falls from 51% to 66% at the end of watercourses. The overall efficiency has thus been worked out to be 45 to 51% only. Comparative statement of losses by various studies / empirical formulae /

assumptions has been drawn and is placed at Annex. 4.1. This indicates losses on the system as per UPCIP report in addition to losses as per predetermined share, empirical formula (RRI), recorded releases on various control points, field observations etc. Where watercourses are unlined, the efficiency is still lower.

Net water use efficiency after taking into account the actual consumptive use of crop & that applied is the true indicator of WUE i.e. the percentage water gainfully utilised, of the amount of water released at the head of canal, from the reservoir or intake structure. The efficiency works out to mere 33 to 38% on the Upper Ganga Canal system. Detail analysis have been given in chapter 4.

1.3 CONCLUSION & RECOMMENDATIONS

Scope of improvement in efficiency has been assessed assuming various recommendations made here-under would be implemented. Water-use efficiency on UGC system can be improved significantly by introduction of evolved modular outlets (in place of existing pipe outlets), enforcement of canal act & control over unauthorised acts of overdrawls. Statement of attainable field application efficiency (%) by different methods is enclosed (Annex 3.2). There is urgent need to introduce Participatory Irrigation Management on the tertiary system to improve equity in distribution, better upkeep & economy in O&M. Equity in distribution can be achieved by allocation / distribution of available water command area wise, by re-orienting the look on cropping pattern & overdrawl in head reach. Conjunctive use of ground & surface water and rationalising energy rates for groundwater utilisation in head reach to save water for scarcity areas & areas affected with salinity will also help equity distribution. The detailed Conclusions & Recommendations have been outlined in Chapter - 5 & Chapter -6.