

CHAPTER - 2

SCOPE OF THE STUDY

2.1 TERMS OF REFERENCE

In Terms of Reference for the Pilot Study would be as under : -

- (i) An overall evaluation of the performance of the WJC project vis-à-vis the benefits envisaged at the planning stage.
- (ii) Review of the past studies, if any, carried out to evaluate the water use efficiencies of the project.
- (iii) Carrying out Pilot studies on water use efficiency and overall project efficiency of the project taking into consideration, inter alia, the following main aspects:
 - (a) Water losses in the main canals, branch canals, distributaries /minors, field channels etc.
 - (b) Water losses in the field
 - (c) Operation of conveyance and distribution systems
 - (d) Conjunctive use of surface and ground water
 - (e) Water application to important crops in Kharif, Rabi and Hot Weather
 - (f) Comparison of the evaluated water use efficiency in each case with those presently in vogue based on various empirical methods.
- iv) Recommendations for specific measures to improve efficiency, structural and non structural measures, system improvement e.g. lining of canals, introduction of rotational water supply, improvement in field applications and overall improvement in water management etc. together with development of water for commercial purposes.
- v) Indicating the likely expenditure on remodelling / modernisation; Water management measures through integration of various irrigation delivery and application system including drip; micro-irrigation projects.

2.2 APPROACH AND METHODOLOGY

2.2.1 Study of the releases

The ultimate aim of attaining an optimum or reasonably achievable water use efficiency on system is to obtain maximum coverage of area under irrigation per unit volume of water. It goes without saying that water deliveries shall be based on water allowance, intensities designed for various channel system depending upon cropping pattern; net-irrigation water requirement after taking into consideration soil characteristics; rate of infiltration; residual moisture content at time of sowing; rainfall; sub-soil water level etc. Thus the efficiency on the Irrigation water use will be related to quantum of water released at head of canal to the water delivered at the field turn-out for application on the farm for maturity of crop. The loss on the field shall depend on field application practices, layout of field, slope or topography, soil profile.

2.2.2 Components of various losses

The following approach has thus been traced to work out losses.

Losses on the canal network

- (a) Conveyance System i.e. Main Canal
- (b) Distribution System ; branches /Sub-branches; Disty and Minor which have direct offtakes.
- (c) Water courses below the outlet

The above system is generally lined upto secondary system; only some of the tertiary system is unlined on WJC in Haryana where as secondary and tertiary system at places is unlined in area of WJC outside the state but within its command.

(d) Losses in the laterals reaching the fields through turn-outs.

(e) Field application losses

This study is to work-out percentage of water actually reaching the field at turnout for raising of crop; remainder being lost in transit due to evaporation; seepage; infiltration; absorption loss; wastage, over use etc.

(f) Water use pattern study over space and time

(i) Water use study on various channels of same system

(ii) Water use study on various channel of various systems on WJC.

(iii) Percentage deliveries month-wise vis-à-vis actual requirement of crop both in Kharif and Rabi thus wastage or shortage.

2.2.3 Delta Analysis

The additional approach to study is the analysis of actual Delta. i.e. depth of water over area irrigated, observed or achieved against the delivery of water released for irrigation. This has been further detailed on selected commands .

A study has been done for actual delta figure worked out on the basis of water deliveries on various sub-systems.

2.2.4 Equity in distributions

(i) Outlet-wise Irrigation in Head reach, middle reach and tail reach of channels (Annexure 4.15)

- (ii) Irrigation of Head reach; middle reach and tail reach of same chak i.e. same outlet.
- (iii) Travel Time of water from Head to Tail on same channel (Annexure 4.14)
 - Before lining
 - After lining

2.2.5 Seepage loss

Actual observation of seepage losses on

- i) Unlined channel
- ii) Lined channel

2.2.6 Flow and sprinkler irrigation

Coverage of area irrigated per unit volume of water by flow irrigation and sprinkler irrigation and net saving of water.

2.2.7 Avoidable loss

- (i) Water loss due to leakages
- (ii) Water loss in escapes : run to waste at Tails; due to faulty regulation or lag or lack of communication.
- (iii) Excessive Water Allowance
(No longer rational as per soil characteristic; sub-soil water level conditions).
- (iv) Scenario of some existing features
 - i) Lack of Drainage / sub-surface drainage.
 - ii) Conjunctive use or availability and use of ground water.

2.3 DATA COLLECTION

The following details have been collected in respect of study.

1. Discharge data of river Yamuna and releases from Headworks. Compiled for 4 crop seasons : Kharif 1999, Rabi 1999-2000, Kharif 2000 and Rabi 2000-2001 (Annex 4.1.1).
2. Discharge releases into various canal network system of WJC i.e. Main Canal; Branches, Sub Branches (Annex 4.2).
3. Discharge augmented into Western Jamuna Canal from Bhakra system via NBK link (Annex 4.2).
4. Discharge escaped into drain / river from WJC.
5. Supplies released during various seasons into offtakes d/s Main Regulation point on WJC at Munak.

(i)	Offtakes of Parallel Delhi Branch	Annex - 4.1.1
(ii)	Offtake of Delhi Branch and Sub Branch	Annex - 4.4
(iii)	Offtakes of Jua Disty	Annex - 4.8
(iv)	Offtakes of Bhalaut S/Branch	Annex - 4.5
(v)	Offtakes of Jhajjar S/Branch	Annex - 4.6
(vi)	Dulehra S/Branch	Annex - 4.7
(vii)	Releases into Hissar Major Disty.	Annex - 4.11

6. Detailed Warabandi and farmer-wise irrigation achieved during Rabi and Kharif on three outlets; a minor, disty and sub branch for detailed analysis of field application losses etc.
7. Release on Jua Disty and effective percentage supply on tails of offtakes i.e. on Baghru Minor, Bidhana Minor, Sehri Minor, Silana S/Minor, Garur Minor, Garhi-Sissana Minor and Sissana Minor (regarding equity). Data also collected on tail system distributaries of Hansi Branch in Hissar Distt. (Annex 4.8).
8. Comprehensive data of a large set of Channel system on irrigation deliveries made crop-wise in cusec days and Delta. (Annex 4.11).
9. Irrigation figures achieved on various canal system for at least four crop seasons; intensity achieved vis-a-vis projected or envisaged in project. (Annex 4.16).
10. Some case studies of canal based sprinkler Irrigation on WJC fed areas and comparison with flow Irrigation.

11. History and development and innovation of various type of outlets and modules on WJC.
12. Pre lining and Post-lining Irrigation data on same system and comparison as a result of saving in seepage losses. (Annex 4.12).
13. Study on Pre-lining or unlined channel losses and lined system losses. (Annex 4.13).
14. Observed data on Travel-Time Reduction of Irrigation water from Head to tail of Minor /disty. percentage saving time (after lining). (Annex 4.14).
15. Available supplies and Rotational Programme.
16. Canal legislation relating to implication on cropping pattern.
17. Existing schedule of rates of irrigation and Recommendation of latest committee based essentially on water consuming criteria etc. (Annex 5.1 and 5.2).
18. (i) Losses in transit on conveyance system i.e release from Head Works to first Control Point at Munak.
(ii) On Parallel Delhi Branch (Head to tail reach RD 0 - 145000(0-44.2Km).
(iii) On Delhi Branch (RD 145000-282300 (Km 44.2 to 86+ Zero of Sub Branch to RD 73000(Km 22.3).
(iv) On Bhalaut S/Branch (head to tail).
(v) On Dulehra S/Branch (0-tail).
(vi) On Jhajjar S/Branch (0-tail) and channels like Daboda Minor, Lampur Minor; Jua Disty. Moth Minor etc.

2.4 PROJECT SITE VISITS

Site visits to the following canal network of WJC was carried out in its respect of connection with the study.

PLACE VISITED	DATE (S)
Rohtak	15-16 May 2001
Chandigarh	6-8 June 2001
Delhi and Wazirabad WTP	5 Sept. 2001
Sites on Western Yamuna Canal System	11 Sept. 2001
Hissar, Hansi and Rohtak Areas	8-9 Oct. 2001

During the above period, officers undertook visit to chaks of O/L 10180 (3104 m) Lampur and Delhi S/Branch, Nuh Disty; Faridpur Mr; Bahadurgarh Minor, Ochandi Minor further, WAPCOS officers held discussion with following officers in connection with above study.

WJC

Engineer-in-Chief (Irrigation Govt.of Haryana), Chief Engineer (Yamuna Water Services), Chief Engineer (Design and research), SE (Design), SE (Monitoring), SE (WR) Delhi, SE (WR) Hissar, SE (WR) Rohtak, SE (Quality Control) Rohtak, SE (WR) Faridabad, their Ex-Engineers and Dy. Collector, Revenue WJC. CE (UGC) for Agra Canal and Executive Engineer, Gurgaon Canal, Palwal.