CHAPTER - 5

CONCLUSIONS

5.1 GENERAL

Evaluation of modernisation project and various studies done earlier on the losses on field channels and conveyance system have been reviewed. Table 5.1 depicts the result of earlier studies.

Planning Commission entrusted WAPCOS for carrying out a fresh appraisal by a Pilot Study on Water Use Efficiency of System.

Results can be replicated with minor correction factors as even though soil characteristics may be similar, sub soil water level conditions fluctuate over space & time. Study has been also conducted on lift areas.

This has been accomplished by analysis of losses on the conveyance & distribution network on a number of sub-system of W.J.C. and an average drawn.

5.2 ABSTRACT OF LOSS & WATER USE EFFICIENCY

Average of losses in the conveyance system of WJC and field application losses on various field channels & chaks of individual outlets have been abstracted as under. W.U.E. has been worked out at end of conveyance & distribution system upto head of outlet as well below the outlet as also overall WUE has been worked out both for entirely lined system as well as where field water courses are unlined. Canal system including distributaries & minors are generally lined on WJC.

Losses upto end of main canal	3 to 5%
Between main canal & Ist distribution control point	8.3 to 9%
On branches & disty.	10.4 to 11.4 %
On lined W/C	11-13 %
On unlined W/C	16-18%
Field Application loss	20%

a) Overall losses when entire system including field W/C lined = 48 to 55%

b) Overall losses when field W/C unlined 44 to 48%. Thus water use efficiency varies in case of a) 45 to 52% & b) 52% to 56%

A Comparison of losses by earlier studies / present pilot study is given in Table 5.1

TABLE - 5.1

COMPARISON OF LOSSES BY EARLIER STUDIES / PRESENT PILOT STUDY AS WELL AS EMPIRICAL FORMULAE & PERFORMANCE IN DELTA

1	2	3	4	5	6	7
Losses in various reaches of Canal Network / Watercourse / Field as per UNDP Studies	**Losses in various reaches of Canal Network / Watercourse / Field as per Haryana Agriculture University Study**	**Losses as per Empirical formula based on research (per million sq.ft of wetted perimeter) or (cumec / Sq.m)**	**Losses envisaged to be saved on lining of canals as per World Bank Projects**	**Losses observed post lining**	**Percentage Achievement of targeted saving as per Column (4)**	**Losses as per /Gauge/ discharge maintained at control points**
1. Main Canal & Branches 17%	**Unlined Canal System** Canals 15% Disty. 7% Watercourse 22% Field Application 27% Total loss 71% Efficiency 29%	8Cs per million sq.ft of wetted perimeter (2.44 cumecs per million Sq.m of wetted perimeter)	6 cusecs per million sq.ft of wetted perimeter (1.83 cumecs per million Sq.m) of wetted perimeter.	Range between (2.5 cs to 6.59 cs) (0.80 to 2 cumecs)	18 to 68%	Some gauge/ discharge do not reconcile & even gain shown upto sub-branch. Such data discounted
2.Distributaries 8%	**All system lined** Canals 4% Disty 2% Water course 6% Field 42% Total loss 54% Efficiency 46%					
3. Water courses 20%	**System lined W/c not lined** Lined Canal 4% Disty 2% Watercourses 26% Field loss 32% Total loss 64% Efficiency 36%					Range of overall efficiency on other data varied from 38% - 41%

8	9	10	11	12	13	14
Losses as per field measure ments	**Efficiency as per Delta on ground vis-à-vis ideal delta**	**Scope of increase in efficiency over conveyance system & distribution network (if recommendat ions implemented)**	**Scope in increase in efficiency by micro-irrigation practices in selected areas**	**Scope of increase in efficiency by rationalizing water allowance & water rates (as recommended)**	**Scope of increase of overall efficiency (if recommen dations implem-ented)**	**Scope of increase in efficiency by participatory Irrigation Management & Supply in Bulk at Tertiary level**
Between 4cs to 6.5 cs per million sq.ft of wetted perimeter & overall efficiency between 47% & 57% where system lined upto field water course & 41 to 49% when system unlined beyond disty.	Variable on various channels as also reaches of same channel as per annexes	10 to 15%	25 to 40%	10-20 %	20%	15-35 %
Main canal 4.6% Branches 8.3% Sub branches, distributar y 10.2 to 16% Lined W/c 7% Field applicatio n loss 20%						

Overall WUE(excluding plant transpiration and unavoidable use-up) 36 to 43%

It is recommended that detailed study on the following aspects to distill realization of objectives may be got carried out. Cost involved would be meagre but results would be lasting & rewarding.

1) Evaluation of Water Resources Consolidation Project O&M as well as modernization component.
2) Cost recovery vis-à-vis O&M costs, equity in distribution; performance & WUE in head reach, middle reach & tail reach.
3) Evaluation of huge investment on Command Area Development (CAD). Whether PIM working, if not, whether extension of minors, conversion of water courses into Minors and formation of outlet committees not a retrograde step as per northern India canal & Drg. Act.
4) Evaluation of schemes under NABARD loan - Objectives & Achievements
5) Rationalization of Water Allowance
6) Cropping pattern- persuation & education (area specific recommendation) water-charge according to consumption of water or volumetric charge.
7) An integrated module of irrigation water management by dovetailing application practices in flow & lift areas introducing also the micro-irrigation based on water-availability; sub-soil water level conditions; soil characteristics, rainfall pattern, as of now.

5.3 FACTORS AFFECTING WATER USE EFFICIENCY

Field visits to various network of Western Jamuna Canal System and discussions with the officers of Irrigation Department, Haryana in the head office at Chandigarh and with field officers revealed a host of complex features needing attention to bring about improvement, but only those related closely to affect water-use efficiency are being outlined here for taking remedial measures.

STRUCTURAL DEFECTS & AVOIDABLE INEQUITIES & LAG IN IMPLEMENTATION AFFECTING ADVERSELY THE WATER USE EFFICIENCY

(1) The installation of automotive control of head works & head regulators and installation of gates & gearing is still backward even at very important control points & regulators of branch canals. Manual control with wooden needles is still in practice & as noticed avoidable leakages of precious canal water was occurring through head regulators of canals, distributaries & minors which were supposed to be closed according to rotational programme. This leakage if totalled up was substantial & was a wastage; it was also more of a routine than an exception in all the manually operated head regulators.

(2) There was also a time lag in closing down of channels under rotational programme in case of certain channels

(3) Hathnikund Barrage started in 1996 was completed as per time schedule in 1999 but surprisingly it was not made operative even till March 2002 the last visit made by WAPCOS officers. Reasons forwarded were:-

i) The Haryana State Electricity Board which was to construct power channel; failed to start the work in time & secretary, Irrigation & Power being responsible for both deptts; prevailed on Irrigation Department to continue running old Tajewala works; he made such suggestion as far back as 1997-98 even to continue operating Tajewala.

ii) The link channel from barrage to Main Canal was also delayed by a year or so as it was found at the time of acquisition of land that due to wrong certificate given by an officer; whole exercise of preparation of land papers had to be gone through again.

Completion of both canals at i) & ii) above were to synchronise completion of barrage in April 1999.

iii) Non-commissioning of Hathnikund Barrage thus resulted in

a) losses of precious supplies of canal water as flows from river had to be routed through bed of river between Hathnikund Barrage & Tajewala & pondage U/s Tajewala even for such a long period of three years upto now despite completion of Hathnikund Barrage. This loss of water due to avoidable mismanagement runs into crores worth of rupees; every week for the last 160 weeks. If HKB had been operated; supplies would have been released directly into canal from barrage & routing through river bed avoided.

b) It has resulted in loss of power which was to be generated by routing supply through power channel. This again runs into crores of rupees everyweek.

c) Every year after monsoons & sometimes even additionally in winter; forcing bund is constructed u/s Tajewala to feed Eastern Jamuna Canal, this expenditure running into lakhs each year was also avoidable as with operation of new barrage; there is no need of forcing bund. This also results in loss of water.

The estimated loss even with empirical formula @ 2.44 cumecs / million sq. meter of wetted premier (for unlined canals) works out to an average of 15 cumecs days each day & taking cost per cusec days on basis as per Haryana Canal Act Schedule of rates revised 1997 the loss for the period works to over Rs. 100 crores. This 15 cumecs specially in the lean period of winter & summer is sufficient to meet the drinking water requirement of Delhi if additionally made. If utilised for irrigation this amount on the basis of rational water allowance can irrigate in two to three crops per year an area of three lakh acres. This

loss is also irretrievable as it does in no way contribute to environment improvement or recharge in effected area.

Thus total avoidable loss due to such malfunction is over Rs. 300 crores besides national loss by loss of production of foodgrains & less productive out-turn of industries due to non-generation of power and a score of resultant setbacks; which can be elaborated.

OPERATIONAL ASPECTS ON WATER USE EFFICIENCY

(4) There is urgent need to rationalise the water allowance. A water allowance of 0.18 cumecs at disty. head per 1000 hectares of command area was fixed long back in the remodelling of WJC project. This water allowance is also applicable on Bhakra System. Whereas it is reasonable to keep this water allowances in most of the area; water logging is caused due to abundant availability of surface water in head reaches & by supplemental irrigation by tubewells. Water logging has also been caused in certain areas adjacent to Bhakra Canal Command and excessive irrigation in areas of saline ground water has caused drainage problem & spread of salinity. A re-appraisal of water allowance in keeping with SSWL conditions; salinity syndrome & soil characteristics needs to be made. An upward revision of water rates needs consideration to bring home value of water. Prevailing schedule of rates & latest recommendation based on water consumption etc. Annexure is given at 5.1 & 5.2.

LIFE-LINE CANAL REHABILITATED UNDER WORLD BANK PROJECT IN 2000-2001 NOT BEING RUN EVEN 75% CAPACITY. RESULTING LOSS IN WUE

(5) Augmentation canal was constructed lined, in the mid-seventies with a designed capacity of 128 cumecs so that when supplies in river were limited & releases d/s Dadupur were limited to 128 cumecs all the supplies

could be routed to Munak the cardinal control point & offtake of Hansi Branch, Parallel Delhi Branch etc. through this canal to minimise losses & avoid its old route of unlined WJC canal. This was specially essential and critical when river supplies in winter months fell to as low as 85 cumecs. This augmentation canal as informed by Chief Engineer (Yamuna Water Services) in 2000 then Engineer-in-Chief in 2001 and field offices were renovated and rehabilitated at huge cost; recently in 2000 to take authorized discharge of 128 cumecs but surprisingly the canal has never been run to over 85 cumecs ! even when supplies were needed & precious supplies in river were low. Daily discharge supplied as depicted at annexure 4.9 show under running of lined canal & routing still part supplies through unlined route. Explanation given has been that canal has not been run over 85 cumecs even after rehabilitation & is not in a position to take even 75 % of designed supplies.

RETROGRADE STEPS AFFECTING WUE

(6) Participatory Irrigation Management

Command Area Development Programme envisages take over of maintenance & even administering of tertiary level channels by beneficiaries by formulation of water-committiees or societies. Not a single minor or disty. in Haryana either on WJC or Bhakra has so far been taken over by beneficiaries. Some outlet committees have been made for O&M of water courses below the outlet. This in fact is a retrograde step. The Haryana canal & Drainage act 1974 earlier; Northern India canal & Drainage Act 1873 already provides that maintenance of water courses is the duty & responsibility of beneficiaries & even provides that in the event of its not being maintained satisfactorily, it can be maintained by the Irrigation Department at the cost of beneficiaries & cost recoverable as arrears of land revenue. The formulation of outlet committees & funds of CAD at places serve as cosmetic whitewash. Watercourses are being

lined at Govt. cost without recovery of lining charges; which was not the practice earlier.

Water use efficiency is the casualty as non-maintenance & lack of participation is resulting into inequities in distribution & extra losses.

(7) Extension of Minors / New Minors

With the loan from NABARD or otherwise some schemes of extension of minors and new minors have been taken up. Conversion of watercourses into minors increasing liability of the deptt to maintain that length of channel which as water course is responsibility of shareholders of the outlet is taking a retrograde step and against concept of Participatory Irrigation management.

State Water Plan was as per HWRC Project required to be prepared by 1997-98 i.e. ahead of completion of project to advise whether new schemes could be taken up on water availability or water saving due to lining but projects taken up under NABARAD. An evaluation of all schemes under NABARD etc. needs to be got carried out as discussion with field officer elicited that no benefit worthy of mention were achieved.

CONTAMINATION IMPEDES EFFICIENCY

There is pollution of water bodies - especially drains & canal network in the command of WJC fed Agra canal, Gurgaon Canal, which carry polluted waters to the fields; debris & pollution has caused shoaling, impeding velocity; vegetable growth and thus losses.

INEQUITY IN DISTRIBUTION

There is serious threat to ground water contamination. No studies are available with the Haryana Irrigation Deptt; nor any studies undertaken on the quality of ground water. There is urgent need to monitor ground water quality in distts of Yamuna Nagar, Panipat, Sonipat, Gurgaon, Faridabad, specially as far as WJC is concerned because ground water has to act as conjunctive source of irrigation water.

a) There is high incidence of unauthorised irrigation specially reported as a system-Malady in the WJC circles; at Rohtak in Sonipat & Karnal distt. where surprise raids with the help of police were being conducted to check the menace. This results in overdrawl in head & middle reaches at the cost of tail-enders resulting in poor conveyance of area per unit volume of water & thus reduces WUE.

b) Hydraulic Parameters Vitiated

   The condition of Delhi Branch, Dulehra Branch, JSB , Jua Disty; offtakes of DB, Offtakes of Dulehra Branch; offtakes of Gurgaon canal, Agra canal, Bhiwani Branch and other channels etc. showed whether due to paucity of funds or otherwise channels were not kept in designed section resulting in silted sections, vegetal growth, obstructions in internal section and more delivery time from head to tail & reduction of WUE.

c) Discharge tables were not being revised at regular intervals

   Current meters were not available for discharge observations & discharge observation done with velocity rods / floats. This results in overdrawal / underdrawal and affects the irrigation per unit volume adversely.

d) The water claimed saved due to lining of canal being consumed on the same system despite no increase in command area; though part supplies used for rural drinking water supply schemes. This results in

ad-hocism and differential water allowance & inequity. It is proposed that water claimed saved be diverted to water -scarcity areas and discharge at head released corresponding to fixed water allowance for the area by suitable hydraulic adjustment which does not entail cost.

Conserving Surplus / Spare Waters to boost WUE

There is ample scope of running the system with surplus supplies during monsoon to recharge the dry south-west areas of Haryana; as done in 1996-97 to boost irrigation & derive benefit from available surplus waters. There is scope to build small innovative regulators on Drains in the WJC command on flood channels & escapes to encourage irrigation by lift & flow as well as for recharging as done on Ujina diversion drain etc. in 1996-97.

5.4 FINANCIAL REPERCUSSION OF MEASURES FOR IMPROVING THE WATER USE EFFICIENCY

a. Measures

1. Replacement of regulation by wooden karries to Gates & Gearing at control points and head regulators to arrest leakage.

2. Construction of meter flumes at suitable places or combined with falls on all channels to cross-check discharge.

3. Marking of full supply level on all structures such as at piers or face walls of outlets to examine at a glance relative delivery of supply.

4. Maintaining efficiency diagrams of outlets.

5. Equipping the control sites with wireless; computer based communication network & automation to eliminate delay in affecting

reduction on revision of indent or incidence of rain or mishap to avoid wastage.

6. Remodeling of head regulators & even section of channels resultant to reduced capacity due to urbanization, transfer of command area or savings due to lining etc.

7. Balancing & rationalising water rates of flow irrigation & energy to optimize conjuctive use of ground water & surface waters.

8. Integrating water management practices to encourage micro & mechanized irrigation practices to save losses.

9. Clearance of silt, weed & regular upkeep of channel.

10. Monitoring & surveillance on unauthorised irrigation by empowering irrigation officers & enhancing penal rates to deter the miscreants.

11. Lining of water courses / left out areas excepting sweet water zone & paddy growing areas to reduces transit loss.

12. Experimenting warimetric supplies or metered supply to irrigators.

13. Generation of revenue by

    a. Upgrading water rates
    b. Auction of sand / gravel
    c. Raising plantations along canals, Distributaries, Minors
    d. Cess on drainage
    e. Penalty on Polluters of water-bodies

b. Estimate

1) Replacing old regulation practices & automation & gates & gearing control will cost about Rs. 8 Crores phased over 5 years i.e. Rs. 1.6 crore/year if executed departmentally.

2) No financial involvement is expected in modernising communication network by computers, wireless, since these are already provided for in the departmental budget. Provision exist in ongoing project.

3) Rationalisation of water allowance is likely to generate income & no financial repurcussion is involved.

4) Introduction of micro-irrigation practices which result in more coverage of area under irrigation & generate more food production, since subsidy available under Government of India schemes & investment by State Governments, under various programmes is not likely to burden the budget.

5) Clearance of silt & head about Rs 1 Crore per year.

6) Lining of water courses mainly done; balance can be covered under CAD programme. Other items are not likely entail additional expenditures.

Total cost involved 10 crores spread over five years.

Pilot Study on Water-use efficiency has been conducted on W.J.C (Haryana) by selecting representative channels on its entire command; extending over district of Karnal, Kurukshetra, Panipat, Sonipat, Delhi, Gohana, Rohtak, Bhiwani, Hissar, Gurgaon, Faridabad, Rewari etc. on various Branch & Sub Branch system of Parallel Delhi Branch, Delhi Branch, Delhi Sub Branch, Dulehra sub branch, Jhajjar Sub Branch, Gurgaon canal, Hissar major disty. etc.

Annex - 5.1

SCHEDULE OF OCUPIERS RATES

(Water rates for irrigation purposes)

Statement showing occupiers rates in force on the Canals in Haryana with effect from 2nd Dec. 1994

Class	Crop	Rate per Acre				
		Bhakra Canal ncluding Ghaggar and Saraswati Canals		Western Jamuna Canal, Gurgaon Canal, Rewari, Jui, Indira Gandhi Canal, Birender narain Chakravvarti(Sewni)		Per Crop
		Flow	Lift maintained and operated by Cultivators	Flow	Lift maintained and operated by Cultivators	
1	2	3	4	5	6	7
1	Sugarcane (except on Kharif Channels)	44.00	22.00	37.40	18.70	Per Crop
II	Sugarcane on Kharif Channels	36.30	18.15	36.30	18.15	- do -
III	Waternuts	36.30	18.15	36.30	18.15	- do -
IV	Rice	33.00	16.50	33.00	16.50	- do -
V	Indigo and other dyes tubacco, poppy, spices and drugs	27.50	13.75	27.50	13.75	- do -
VI	Cotton	27.50	13.75	27.50	13.75	- do -
VII	Gardens and Orchards and Vegetables except turnips	27.50	13.75	27.50	13.75	Garden & Orchards per half year, the rest per crop
VIII	Barley and Dats (except Kharif channels)	29.70	14.85	29.90	10.45	Per crop
IX	Wheat (except on 27.50 Kharif channels)	27.50	13.75	19.80	9.90	- do -
X	Melon, Fibres (other than cotton and all crops not otherwise specified)	25.30	12.65	25.30	12.65	- do -
XI	Maize	22.00	11.00	22.00	11.00	- do -
XII	Oil Seeds (except Rabi oil seeds on Kharif channels)	22.00	11.00	22.00	11.00	- do -
XIII	Oil Seeds Rabi Crops	29.70	14.85	20.90	10.45	- do -

XIV	All Rabi crops on Kharif channels (except Wheat and Gram)	14.30	7.15	9.90	4.95	- do -
XV	Wheat and Gram on Kharif channels	13.20	6.60	8.80	4.40	- do -
XVI	Bajra, Masur and pulses	22.00	11.00	22.00	11.00	- do -
XVII	Gram	22.00	11.00	15.40	7.70	- do -
XVIII	Jawar, Chana, Grass & all fodder crops including turnips	22.00	11.00	22.00	11.00	- do -
XIX	Watering for ploughing not followed by a crop in the same or succeeding harvest	3.30	1.65	3.30	1.65	- do -
XX	Village and Zila Parishad and Panchayat Samities Plantations					
	(i) Any number of watering in Kharif	5.50	2.75	6.50	2.75	- do -
	(ii) One Watering in Rabi	5.50	2.75	4.40	2.20	- do -
	(iii) Two or more watering in Rabi	10.00	5.00	7.00	3.50	- do -
XXI	Grass					
	(i) Single watering in Kharif	5.00	2.50	5.00	2.50	- do -
	(ii) Single watering in Rabi	5.00	2.50	4.00	2.50	- do -

NOTE : -

(i) Grass given two or more watering falls in class XVIII

(ii) Hemp Indigo, Guara, Jantar and Arher ploughed in as green manure before 15th September not assessable to water rates.

LOWER CHAUTANG CANAL

Class	Crop	Rate per acre		
		Flow	Lift maintained and operated by cultivators	Per Crop
1	2	3	4	5
I.	Sugarcane, Rice and Waternuts	20.00	13.00	Per Crop.
II.	Cotton, Indigo and Maize	12.00	8.00	- do -
III.	Other Kharif crop.	10.00	5.00	- do -
IV.	Special rates single watering before ploughing for Rabi except Wheat and Gram followed by a crop	5.00	3.00	- do -
V.	Special rates single watering before ploughing for Wheat and Gram followed by a crop.	5.00	3.00	-do-

Note :	Additional watering after 31st October	4.00	3.00	Per acre. All crops except fodder crops including turnips
		2.00	1.50	For fodder crop including turnips

SCHEDULE OF RATES FOR SUPPLY OF WATER FOR PURPOSES OTHER THAN IRRIGATION OF THE CANAL IN HARYANA

S.No.	Purposes	Rs. Rate
1.	Brick making and pisewall buildings	Rs. 1.00 per cubic feet
2.	Laying concrete & brick or stone masonry	Rs. 1.00 per cubic feet
3.	Metalling Roads	Rs. 84.00 per Mile
4.	Consolidation of Kacha service Roads	Rs. 100.00 per mile per annum for a maximum of 8 watering in the 10 months December to September
5.	Water supplied in bulk	Rs. 5.00 per 2500 cubic feet.
6.	Manufacture of charcoal	Rs. 10.00 per kiln per season crop, provided kiln in use
7.	Watering road side or avenue trees	Rs. 16.00 per canal mile of 5000 feet per Kharif crop Rs. 32.00 per canal mile of 5,000 feet per Rabi Crop
8.	Sprinkling water on roads in the Kharif season	Rs. 32.00 per mile
9.	Sprinkling water on roads in the Rabi season	Rs. 64.00 per mile

Provisions : -

1. Except within the limits of civil stations, Cantonments and Municipalities, no charge shall be made for water used for the manufacture of bricks not subsequently burnt in a kiln doe pisewall buildings, if taken from a water course or tank lawfully supplied from a canal.
2. No charge additional to Rs. 100.00 for flooding per mile should be levied for sprinkling water on kacha servoce roads.
3. No charge will in practice be levied for a sprinkler water on roads where the amount of water used is negligible.
4. Water supplied in bulk to Municipalities (including notified area and small town committees and other public bodies for use by public in general and washing purposes but not for commercial purposes) is to be charged at the rate of Rs. 3.00 per 6000 cubic feet.
5. No charge shall be made for water used for watering avenue or road side trees growin by villagers alongside water courses, fields and village roads and within the village abadi.

IRRIGATION REQUIREMENT OF VARIOUS CROPS AT DIFFERENT GROWTH STAGES (RECOMMENDED BY HAV)

S.No.	Crops	Number of Irrigation	Depth of Irrigation (Cm)	Time of Irrigation (Days after sowing)	Total Irrigation requirement (**) (Cm)	Critical Stages
1.	Rice	20-25	5-6	Disappearance of ponded water or saturation to 2-3 cm water film	120-140**	Tillering to flowering and grain filling
2.	Maize	IP* I II III	8.0 6.0 6.0 6.0	25-30 Vegetative state 55-60 Tasselling 75-80 Silking	25-30	Tasseling and Silking
3.	Pearlmillet	IP* I II	8.0 6.0 6.0	50 Grand growth 51 70-75 Milking	15-20	Milking
4.	Jowar	IP* I II III	8.0 6.0 6.0 6.0	60-65 Grand growth period 80-85 Milking 105-110 Grain Formation	25-30	Flowering
5.	Cotton	IP* I II III IV	12.20 6.0 6.0 6.0 6.0	40-45 Seedling 65-70 Pre Flowering 90-95 Flowering 115-120 Fruiting	30-35	Flowering and Boll formation
6.	Groundnut	IP* I II III	8.0 6.0 6.0 6.0	40-45 Peg formation 65-70 Fruiting 90-95 (only to facilitate digging operation)	25-30	Peg formation
7.	Arhar	IP* I II	8.0 7.0 7.0	Flowering A month after flowering	20-25	Floral initation
8.	Kharif Pulses Moong/ Urg/Cpwpea	IP* I	8.0 6.0	35.40	15-20	Flowering
9.	Wheat (Tall)	IP* I II III	8.0 6.0 6.0 6.0	35 - Crowning 85-Flowering 105-Milking	25-30	Tillering
10.	Wheat (Dwarf)	IP* I II III IV V	6.0 6.0 6.0 6.0 6.0 6.0	22-Crowning 45-Late tillering 65-Jointing 85-Flowering 105-Milking	35-40	Criwning

11.	Barley	IP* I II	8.0 6.0 6.0	22-Crowning 45-Late tillering 65-Jointing 85-Flowering 105-Milking	35-40	Crowning
12.	Gram	IP* I	10.0 8.0	60/120 Pre-flowering if sown without pre-dowing irrigation otherwise at podformation stage	15-20	Pre-flowering/Pod Development
13.	Peas	IP* I II	8.0 6.0 6.0	45 Flower initiation 110 Pod-devlopment	20	Flowering initiation
14.	Lentil	IP* I II	8.0 6.0 6.0	50-Pre-flowering 110 pad-Development	20	Pod Development
15.	Oil Seeds Raya & Sarson	IP* I II	8.0 6.0 6.0	45-Floral/bud initiation 110-Pod filling	20	Floral bud initiation/Pod filling
16.	Dats	IP* I II III IV	8.0 6.0 6.0 6.0 6.0	 25-Crowning 50-Late Tillering 70-Late Jointing 90-Flowering	30-35	Tillering & Jointing
17.	Bersee m	IP* I II III,IV V,VI VII VIII IX,X	6.0 5.0 6.0 5.0 5.0 5.0 5.0 6.0	3-5 Ist irrigation 3-5 days after sowing in light soils and 8-10 days in the heavy soils and subsequent irrigation at 15-20 days interval	50-55	First Irrigation with in a week
18.	Sugarca ne*	11-16	8-10	First Irrigation after 40-45 days after sowing and subsequent irrigation at an interval of 15 days during pre-monsoon and 25 days during post monsoon period	140-150	Grand growth period and tillering
19.	Potato*	7-9	3-4	First Irrigtion 4-5 days after sowing and then at an interval of 8-10 days	25-30	Stalonization, tuberization and tuberenlargement

*** Pre-sowing irrigation**

**** It exclude rain fall which is 5-6 cm. during Rabi and 3-40 cm. During Kharif season, but inlcuding prosowing irrigation**

***** Includes 25-30 cm, extra water needed for pudding operation**

NON - PLAN BUDGET GRANT, EXPENDITURE AND REVENUE

RECEIPTS

(Rs. in Lakhs)

Year	W.J.C. SYSTEM (Including Non-Commercial)			BHAKRA SYSTEM		
	Budget Grant	Expenditure	Revenue Receipt	Budget Grant	Expenditure	Revenue Receipt
1980-81	1428	1353	46	438	450	554
1981-82	1468	1514	461	490	558	620
1982-83	1424	1336	341	562	680	469
1983-84	1350	1299	373	663	831	425
1984-85	1418	2393	489	726	872	631
1985-86	1445	1441	423	764	1499	736
1986-87	1911	1629	649	944	1025	716
1987-88	2149	1869	709	1123	870	75
1988-89	3310	2783	1379	1165	1453	176
1989-90	3179	3653	1261	1285	1527	96
1990-91	2039	2217	1297	1887	1224	434
1991-92	4513	4367	1312	2225	2758	269
1992-93	6658	6745	1139	2331	2640	657
1993-94	7138	7191	1344	2392	3006	694
1994-95	32123		1616(B.E.)	3139		844 (B.E.)
1995-96	2193		1726(B.E.)	2922		855 (B.E.)

Annex - 5.2

No. 1501-12 /C/R//97 Date :

From

Engineer-in-Chief,
Irrigation Department, Haryana,
Chandigarh.

To

1. The Vice Chancellor, Agriculture University, Hissar
2. The Special Secretary, Revenue Deptt. Haryana, Chandigarh
3. The Commissioner & Secy. Agriculture Department haryana, Chandigarh
4. The Commissioner & Secy. Irrigation & Power Department, Haryana, Chandigarh

Subject : Minutes of the meeting of the Committee constituted by Government of Haryana to review the number of categories for charging Canal Water Rates and Recommend Possible Reduction in the number, held at Chandigarh on 17.9.1997.

Kindly find enclosed a copy of the minutes of meeting at subject for information and necessary action.

Director / W.R.
For Engineer-in-Chief,
Irrigation Deptt., Haryana,
Chandigarh.

Member Secretary of the Committee

C.C. :

1. Dr. R.S. Mehra, JDA(Sts.), Agriculture Department, Haryana, Chandigarh
2. Sh. Shnil Kapoor, Hydrologist, Agriculture Deptt. Haryana, Chandigarh
3. Sh. M.G. Thukral, Chief Engineer / HSMITC
4. Sh. B.S. Phanghal, Professor, Haryana Agriculture University, Hisaar
5. Sh. D.P. Singh, Prof. Haryana Agriculture University, Hissar
6. Sh. M.C. Aggarwal, Chief Scientist, Haryana Agriculture University, Hissar
7. Sh. S. Talwar, Deputy Secy., Revenue
8. Sh. J.L. Gambhir, S.E. / Vigilance, Haryana

Copy of the minutes of the meeting is also enclosed for ready reference.

Vice-Chancellor HAU, Hissar, Chairman
Minutes of the meeting of the Committee constituted by Government of Haryana to review the number of categories for charging canal water rates and recommend possible reduction in the number held at Chandigarh on 17.9.1997.

List of participants is enclosed :

The Member Secretary welcomed the Chairman and other participants. He explained to the members, the difficulty being faced in booking of irrigation because the number of categories in the Schedule of Water Rates is quite large. It creates difficulty for the illiterate and semi-illiterate farmers and is taken advantage of by unscrupulous revenue officials. He also stated that some of the States in India have abolished the water charges for irrigation while in some other states the water charges were quite high as compared to those of Haryana.

Member Secretary explained the procedure in recommending the clubbing of different categories as per agenda stating that the clubbing had been done, as far as possible, keeping in view the water requirement of the crops. He requested the participants, particularly, the Agriculture Scientists and Experts in the field of agriculture to suggest any other suitable method for such clubbing.

The Member Secretary explained the reasons of different rates of Bhakra and WJC areas. He stated that the Bhakra areas had better and more assured supply because of the existence of storage reservoir in the system, the system which is in contrast with the supplies in WJC. Even though there have been some improvements in the Yamuna system and more improvements are likely to come with the construction of the Hathnikund Barrage already taken in hand and storage dams likely to be taken up in the near future, he recommended that the rates on the two systems should be made equal as additional availability of water on Bhakra had resulted in additional area irrigated and also the two systems are interlinked. It was felt that the distinction between the crops on Kharif channels and perennial channels may also be removed as the cost of water to the farmers is a very small component of over all inputs.

The participants from the Agriculture University and the Agriculture Department agreed with the views of the Member Secretary. All the participants were unanimously of the view that the water rates should be rationalised by reducing the number of categories to as few as feasible. The participants also felt that the water rates which are too low should be rationalised and revised.

After discussions, it was unanimously decided to recommend the following grouping ; -

Part - I	
Category	**Crops**
A.	Dhaincha (Jantar), Sunhemp, Moong, Gwar, Cowpea and any other crops used for green manure.
B.	Urd, Moong, Gram, Gawar, Rapeseed & Mustard, Til Soyabean, Masur, Rajmash, Linseed, Dhaincha or Sunhemp (for sed and fibre), Castor.
C.	Barley, Groundnut, Bajra, Maize, Peas, Jawar, Arhar, all grasses and fodder crops, Agroforesty
D.	Wheat, Oats, Kharif and Rabi vegetables (except onion, arvi and potatoes), Sunflower, Winter maize
E.	Paddy, Sugarcane, Potatoes, Onion, Arvi, Chilli, Waternuts, Tobacco, Poppy, Spices, Dyes, Medicinal and aromatic plants, Berseem
F.	Orchards and Floriculture

The participants also felt that water rates for using modern means of irrigation by water saving devices like drip and sprinkler should be half of the normal rates. Similarly, the water rates for manual lift by the farmers (Jallar) may also be 50% of the normal rates.

It was also brought out during discussion by the representative from Haryana Agriculture Department that the rise of water table in the saline areas and a similar depletion in the water table in the sweet water areas was causing a lot of damage to the agricultural lands. It was, therefore, recommneded that Scientists of the Haryana Agricultural University and the extension worker of the Haryana Agriculture Department should carry out a compaign to educate the farmers for better water management and suitable cropping pattern to check the over-use of waters for irrigation.

The meeting ended with a vote of thanks to the Chair.
Officer who attended the meeting on 17.9.1997

S.No.	Name & Designation
1.	Sh. S.Y. Quaraishi, Commissioner & Secy. Irrigation, Haryana
2.	Sh. S.K. Dua, Engineer-in-Chief, Irrigation Deptt. Haryana
3.	Sh. V.N. Grover, Director / W.R.
4.	Sh. R.K. Kashyap,
5.	Sh. J.L. Gambhir, S.E. / Vig.
6.	Dr. R.S. Mehta JDA (ST), Chandigarh
7.	Sh. Sunil Kapoor, Hydrologist
8.	Sh. M.G. Thukral, C.E. /
9.	Sh. B.S. Panghal, Prof. / HAU, Hissar
10.	Sh. D.P. Singh, Prof. / Agromony
11.	Sh. S. Talwar, Deputy Secy.
12.	Sh. M.C. Aggarwal, Chief Scientist/

S. no	Name of Crop	Area irrigated (in acres)	Water Rates Rs. per acre per crop			Assessment of Abiana (in Rs. lacs)		Total Increase / decrease of abiana
			Existing Rates					
			BWS	YWS	New proposed with rounding off	Existing Rates	New Rates	
1.	**Wheat**	836360/663905	30.30	21.80	50/-	398.15	750.13	+351.98
2.	**Barley**	58280/20155	32.70	23.00	40/-	23.70	31.37	+7.67
3.	**Gram**	40377/194100	24.20	17.00	20/-	42.71	46.90	+4.19
4.	**Mustard**	1491010/388203	32.20	23.00	20/-	137.27	107.44	-29.83
5.	**Bajra**	900475	24.20	24.20	40/-	218.16	360.60	+142.44
6.	**Maize**	5478	24.00	24.00	40/-	1.31	2.19	+0.88
7.	**Jawar**	207675	24.20	24.20	40/-	50.26	83.07	+32.81
8.	**Rice**	586770	36.30	36.30	70/-	213.00	410.74	+197.74
9.	**Cotton**	12502	30.30	30.30	60/-	37.91	62.55	+24.64
10	**Sugarcane**	22335/121260	40.00	40.00	70/-	57.44	100.52	+43.08
11	**Spices**	4275	30.50	30.50	70/-	1.30	3.00	+1.70
12	**Vegetable**	13680	30.30	30.30	50/-	4.15	6.84	+2.69
13	**Pulses**	1790	24.20	24.20	20/-	0.43	0.36	(-)
14	**Burseem**	20805	24.20	24.20	70/-	5.03	14.56	+9.53
15	**Fodder**	32725	24.20	24.20	40/-	7.92	13.09	+5.17
16	**Tobacco**	130	30.50	30.50	70/-	0.04	0.09	(+)
17	**Jute**	440	27.90	27.90	50/-	0.12	0.22	+0.10
18	**Waternuts**	68	40.00	40.00	40/-	-	-	
19	**Jantar**	6138	-	-	-	-	-	
20	**Garden**	12055	30.30	30.30	100/-	3.65	-	
21	**Plantation**		6.10	6.10	50/-		12.06	+8.40
							Total (Approx.)	**+857.57**

S. No	Name of Crop	Clause No.	Water rates (Rs. per acre per crop)		Now proposed with rounding off
CATEGORY 'A'					
1.	Dhancha(Jantar)				
2.	Hemp		Previously (at present) Hemp, Indigo, Guara, Jantar and Arhar ploughed in as green manure before 15th Sept. are not assessable to water rates.		
3.	Cowpeas(Rawan) (any other crop used for green manure)				
CATEGORY 'B'					
1.	Urd	16	24.20	24.20	Rs. 20/-
2.	Moong	16	24.20	24.20	
3.	Gram	17	24.20	17.00	
4.	Guara	18	24.20	24.20	
5.	Mustard	13	32.70	23.00	
6.	Til	12	24.20	24.20	
7.	Masur	16	24.20	24.20	
8.	Soabeen	16	24.20	24.20	
CATEGORY 'C'					
1.	Barley	8	32.70	23.00	Rs. 40/-
2.	Groundnut	12	24.20	24.20	
3.	Bajra	16	24.20	24.20	
4.	Maize	11	24.20	24.20	
5.	Peas	7	30.30	30.30	
6.	Jawar	18	24.20	24.20	
7.	Arhar	16	24.20	24.20	
8.	All grass and fodder crops	18	24.20	24.20	
CATEGORY 'D'					
1.	Wheat	9	30.30	21.80	Rs. 50/-
2.	Oat	8	32.70	23.00	
3.	Vegetables except onion arvi potatos sunflower Winter Maize cotton Sugarbeat & Agroforestry	7	30.30 30.30	30.30 30.30	

CATEGORY 'E'					
1.	Paddy	4	36.30	36.30	Rs. 70/-
2.	Sugarcane	1	48.40	41.20	
3.	Potatoes	7	30.30	30.30	
4.	Onion	5	30.50	30.50	
5.	Arvi	7	30.30	30.30	
6.	Chillies	5	30.50	30.50	
7.	Barseem	18	24.20	24.20	
8.	Waternuts	3	40.00	40.00	
9.	Tobacco	5	30.50	30.50	
10.	Popy	5	30.50	30.50	
11.	Spices	5	30.50	30.50	
12.	Dyes	5	30.50	30.50	
13.	Medical	5	30.50	30.50	
14.	Aromatic Plants	7	30.50	30.50	
CATEGORY 'F					
1.	Orchards & Floricultures	7	30.30	30.30	Rs. 100/-