

REPORT ON
Agricultural Practices in Water Logged Areas of Haryana –
Problems and Solutions



Submitted to:

**National Bank of Agriculture and Rural Development, Haryana
Regional Office, Sector-34, Chandigarh**

Submitted by:

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ABBREVIATION

NABARD	National Bank for Agriculture and Rural Development
CSSRI	Central Soil and Salinity Research Institute
SPACE	Society for Promotion and Conservation of Environment
CGWA	Central Ground Water Authority
HOPP	Haryana Operational Pilot Project
SSD	Sub Surface Drainage
ICAR	Indian Council of Agricultural Research
FAO	Food and Agriculture Organization
CBIP	Central Board of Irrigation and Power
GOI	Government of India
GOH	Government of Haryana
HLRDC	Haryana Land Reclamation and Development Corporation
UNDP	United Nations Development Program
HORP	Haryana Operational Research Project
HAU	Haryana Agricultural University
HSMITC	Haryana State Minor Irrigation and Tubewells Corporation
MORD	Ministry of Rural Development
RKVY	Rashtriya Krishi Vikas Yojana
DPR	Detailed Project Report
KVK	Krishi Vigyan Kendra
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INR	Indian Rupee
PVC	Poly Vinyl Chloride

EXECUTIVE SUMMARY

With the decreasing per capita land holding due to rise in population in India, it has become quite imperative that every parcel of arable land must be put to productive use to meet the challenges of food security. Paradoxically, 147 million hectare land is reported to be suffering from different processes of land degradation and about 14.3 million hectare (m ha) area has been reported as water logged out of which 8.60 mha is permanently submerged. In the fast developing state of Haryana having acute scarcity of cultivated lands, 0.45 m ha (around 10 percent of total geographical area) suffers from the problem of water logging and salinity imposing serious limitations for raising crops in eight districts of the state. Water logging has adversely affecting the cropping pattern and crop productivity in irrigation command area of South-Western districts of Rohtak, Jhajjar, Charkhi Dadri, Bhiwani, Hisar, Jind, Sirsa and Fatiabad resulting in huge socio-economic losses as farmers have lost their primary source of income. The problem further got aggravated when these irrigated areas were brought under paddy cultivation in late sixties and early seventies.

The state government being quite concerned about this problem, several state and foreign funded projects operated in this area over selected pockets basically as research cum development initiative. The Central Soil Salinity Research Institute(CSSRI) Karnal and Haryana Agricultural University Hisar also provided research and extension support for technology generation and replication but no holistic project was implemented to cover the whole region under a comprehensive project to tackle this gigantic problem. The formulation of such an ambitious project requires critical review of the problems, possible solutions based upon lesson of research and implementation experience and also dovetailing the perceptions of the farmers as key players. Such an exercise may bring out the need and scope of best agricultural practices for such water logged and saline areas. The present comprehensive study supported by the National Agriculture and Rural Development Bank (NABARD) through its Haryana Regional office was commissioned in October, 2019 through the Society for Promotion and Conservation of Environment (SPACE) a Chandigarh based agricultural expert group. The primary objectives of the study were:

- Comprehensive review of water logging and salinity problem
- Compilation of data of previous projects and critical analysis of success and failures
- Stakeholder consultation at farmer, village and block level and interaction with institutions
- The impact of past projects on hydrology, salinity levels, crop production and productivity
- Post project sustainability issues and concerns
- Emerging best agricultural practices

The methodology adopted includes comprehensive review of literature on the problem of water logging and salinity in general and Haryana in particular. The preparation of proforma for collecting data at household, village and block level covering both treated and untreated areas and their due approval from NABARD office was mandated. Out of eight districts impacted by

this problem, five districts were selected and from each district two blocks and from each block ten villages and from each village ten households were selected representing small, medium and large farmers. The expert team having relevant experience and expertise was selected and timeframe was set and got approved. The deliverables included development of Performa and their approval, a workshop of resource persons, submission of draft and final report after integrating suggestions and improvements within the agree time frame.

The critical review covered the topics of defining water logging and soil salinity, water logging problem in the world, extent of problem in india and **Haryana**, effects of water logging including environmental effects, district wise information on water logged and saline soils,, causes and effects of water logging on plant growth. In the geo- hydrological domain, the review covered ground water exploitation and consequences, drainage basins in Haryana, ground water decline/rise. In the chapter on reclamation of saline/ water logged soils, surface drainage and subsurface drainage system, bio-drainage and its advantages are included.

Chapters are added on analysis of previous projects, outcomes and lessons of experiences which this also included comprehensive overview of Haryana Operational Pilot Project (HOPP) with details of operation at Gohana and Kalayat pilot projects. It emerged that presently out of total 119 assessed blocks, the number of Over Exploited, Critical, Semi Critical and Safe blocks in the State are 64, 14, 11 and 30 respectively. The Central Ground Water Authority (CGWA), New Delhi has notified 21 blocks to regulate groundwater development in the State.

In a separate chapter, the topic of bio-drainage for combating water logging and salinity has been thoroughly covered. This also covered the results of field experiments and emerging recommendations. The best agricultural practices skimmed from these chapters covered crop management and water management practices, sub-surface drainage, bio drainage and vertical drainage, disposal and management of saline drainage water, alternate land-use options for management of such lands and use of saline groundwater in agro-forestry. An attempt has been made to suggest good agricultural practices for reclamation of alkali and saline alkali soils including crop varieties developed and agro-forestry-based agricultural systems on alkali soils and agro-forestry in sodic lands.

The interaction with the farmers through group discussions, their perceptions of the problem and impacts on the livelihoods has been summarized in one chapter. Based on the implementation of HOPP project, several sustainability issues and technical and management concerns have been highlighted. Reduction of area under paddy, minimum tillage, laser leveling of land, drip irrigation. organic manures incorporation, mulching, application of soil test based application of gypsum in alkali soils, proper maintenance and lining of canal irrigation system are suggested as best agricultural practices. It is also suggested that alternate occupations like dairy and fishery should be promoted by providing easy loans and crop insurance program implemented more effectively.

Out of 1000 farmers interviewed, the land of 90 families was covered under the SSD projects and in the case of remaining; their land is suffering from the problem of water logging and salinity but were not covered under any drainage project. It is seen that in case of Bhiwani and Jhulana block of Jind district, no project operated in spite of the serious problem of water logging and salinity. The results of sub-surface drainage projects in terms of increase in crop yield and income before and after the project is given below in the following tables.

Table: The average crop yield (q/acre) and income (Rs) before (B) and After (A) the operation of SSD projects in selected villages of Haryana State.

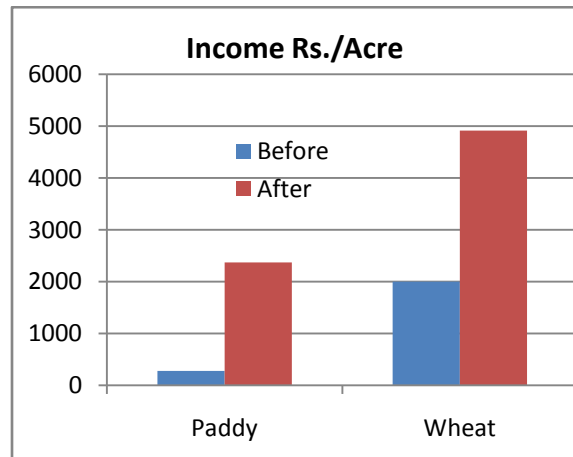
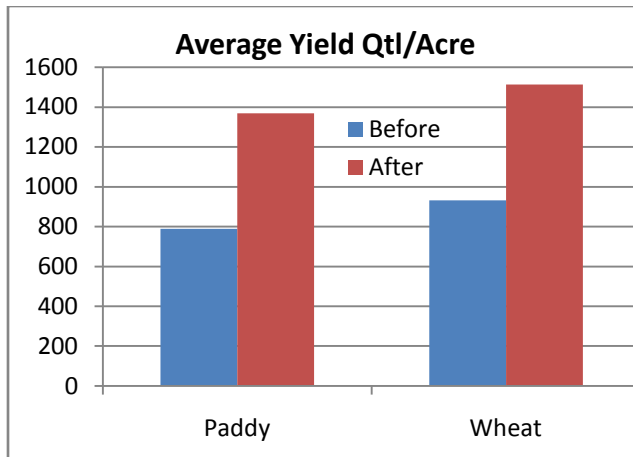
Sr. No	Village	Paddy Yield		Wheat Yield		Paddy Income		Wheat Income		Net Primary Income (Rs.)	
		B	A	B	A	B	A	B	A	B	A
1	Bhagpur	977	1313	1115	1479	2942	5385	4444	7139	631500	882750
2	Basana	736	1586	979	1864	1734	8169	2936	9448	279800	955000
3	Siwana Mal	860	980	1160	1350	2971	3807	6851	7561	723250	841550
4	Bakra	788	1369	931	1513	275	2370	1997	4914	375750	830000
5	Gochhi	560	1350	673	1480	848	4298	1210	5725	1158900	1744750
6	Katwara	748	1265	790	1385	5217	9458	6393	11159	1433250	2509000
7	Wazirpur	714	1261	819	1400	830	4737	2704	6700	335250	1099500
8	Mokhra	621	1420	758	1243	1843	7033	4727	8750	465550	545500
	Average	751	1318	903	1464	2083	5657	3908	7675	675406	1176006

Table: Percent Increase in the Paddy and Wheat yield after the operation of the SSD Projects

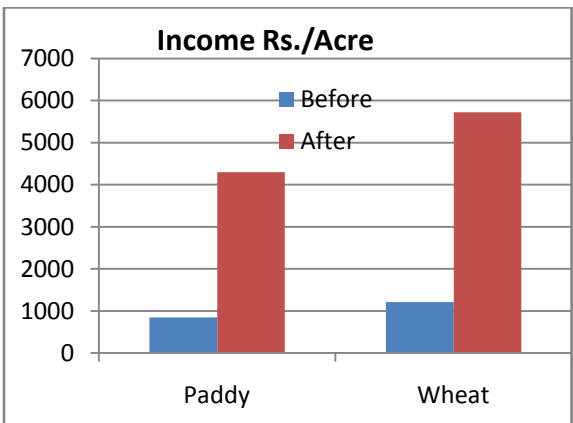
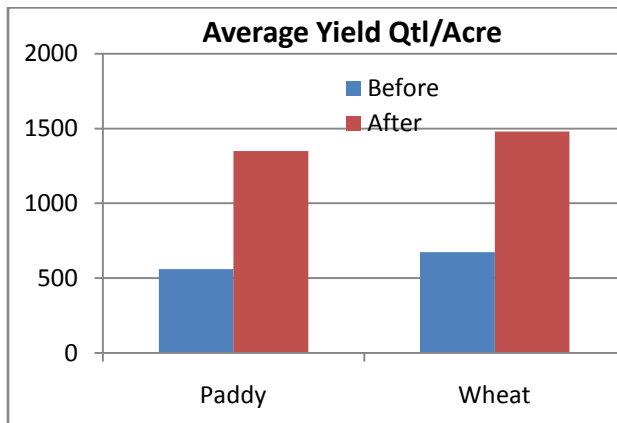
Sr. No	District	Block	Village	Percent increase in crop yield after the Project		Remarks
				Paddy	Wheat	
1	Jhajjar	Beri	Bakra	762	146	Fully Functional
2	Jhajjar	Beri	Gochhi	407	373	Fully Functional
3	Jhajjar	Beri	Wazirpur	471	148	Fully Functional
4	Rohtak	Kalanaur	Basana	371	222	Fully Functional
6	Rohtak	Rohtak	Katwara	81	75	Partly Functional
7	Jhajjar	Beri	Bhagpur	83	61	Partly Functional
8	Sonepat	Kathura	Kathura	38	34	Partly Functional
9	Jind	Safidon	Siwana Mal	28	10	Limited Function

The paddy and wheat yield and income from these crops registered a quantum jump after the operation of the drainage projects. However, the increase was very high when the projects remained fully functional but that percentage decreased when projects operated partially or had limited operation. This information is also presented graphically in figures given below.

DISTRICT: JHAJJAR BLOCK: BERI VILLAGE: BAKRA (TREATED)



DISTRICT: JHAJJAR BLOCK: BERI VILLAGE: GOCHHI (TREATED)



DISTRICT: JHAJJAR BLOCK: BERI VILLAGE: WAZIRPUR (TREATED)

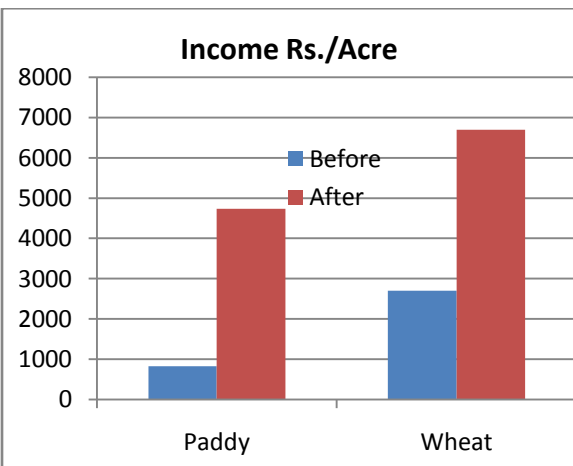
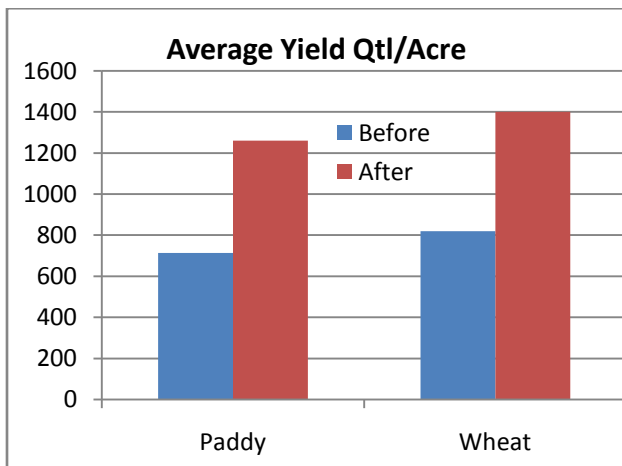


Table: Average crop yield (Kg/acre) and income (Rs/Acre) in selected selected control villages of the Haryana State.

Sr. No	District	Block	Village	Average Crop Yield		Average Income		Net Primary Income (Rs.)
				Paddy	Wheat	Paddy	Wheat	
1	Sonepat	Gohana	Kheri Dhamkal	290	433	628	644	60017
2	Sonepat	Kathura	Ahulana	320	485	3201	5202	260500
3	Bhiwani	Bhiwani	Mundal Khurd	364	458	528	897	38850
4	Bhiwani	Bhiwani	Mundal Kalan	253	295	0	857	24000
5	Bhiwani	Bhiwani	Jatai	205	265	338	417	24550
6	Bhiwani	Bhiwani	Tigrana	335	395	987	1055	85130
7	Jind	Pilukhera	Gagoli	320	456	925	1066	98735
8	Jind	Julana	Jai Jaiwanti	328	432	658	717	46760
9	Sonepat	Kathura	Chhapra	533	725	1362	1310	81858
10	Rohtak	Rohtak	Simli	520	800	3440	4810	663300
	Average			347	474	1207	1698	138370

The mean crop yield of paddy and wheat was 347 and 474 kg/acre and income Rs.1207/- and Rs.1698/- per acre respectively. The average family income from agricultural sector was Rs.138370/- only. However, the mean crop yield and income compared to the treated villages is several times more than these figures (Table)

Table: Mean Crop Yield (Kg/acre) and Income (Rs./acre) from Control and Treated Villages

		Control	Treated
Yield Qtl/acre	Paddy	347	1318
	Wheat	477	1464
Income (Rs./acre)	Paddy	1207	5657
	Wheat	1698	7675
Income from Primary Source		138370	1176006

It is concluded that there is lot of water logged and saline areas waiting for reclamation in the state but only limited area has been covered. In case of treated areas, projects operated properly and there is quantum jump in crop yield and income but there was sub optimal operation of the projects due to variety of reasons discussed in the report and those bottle necks needs to be removed. The data clearly brings out that there is possibility of increasing crop yield and income by several times in case the sub-surface drainage projects are properly implemented.