Chapter IV

AGRICULTURE AND IRRIGATION

Introduction

Bhiwani is primarily an agricultural district and the vast majority of its population lives in villages. Agriculture provides sustenance to about 86 per cent of its inhabitants, either through direct cultivation or through allied occupations. There is isolated mechanisation here and there, yet traditional methods of farming are still being followed. The result is a low yield per hectare. Government has been propagating the need of modern implements, better seed and chemical inputs, but the impact has not been perceptible or signficant. New ideas are taking time.

Irrigation farming has been unknown to the farmers of this district except in small pockets. The implementation of the multi-stage canal lift irrigation schemes will, however, lead to far-reaching changes in cropping patterns and these arid lands may well blossom into a miniature granary. The result of whatever little water has reached the thirsty lands, is a harbinger of prosperity.

The Haryana Government is keen to accelerate the pace of rapid mechanization of agriculture and in fact much ground has been covered lately but is handicapped because of lack of resources and traditional orthodoxy. For some time to come bullocks and camels will continue to paly a key role in farming. The area being almost desert, its rural economy depends on the sale of bullocks and camels. Therefore, improved animal husbandry will have to guide people in improving livestock. Cross-breeding and artificial insemination centres have already started making an impact. Steps are under way to increase the milk potential of the district and to provide facilities for its marketing, chilling and storage. Similarly, efforts are being made to boost poultry so that people may supplement their otherwise meagre earnings.

The people of the district are, by and large, vegetarians and local fish consumption is negligible. Therefore, fish export has a very great future. Government is laying much stress on the development of pisciculture.

Forestry prevents spread of the desert and helps in the conservation of soil. It increases the timber, fuel and fodder resources by afforesting both State and private lands. The district is menaced by wind erosion caused by

dust storms blowing from the adjoining Great Rajasthan Desert. Besides damage to the agricultural land, the active wind erosion is a serious threat to proper functioning of the irrigation system and lines of communications. The local shifting sand-dunes aggravate the problem. Therefore, intensive programme of sand-dune fixation and tree planting has been undertaken by the State Forest Department.

Land Utilization

The total area of the district according to village papers was 5,08,846 hectares in 1975-76. The land utilization pattern during 1972-73 to 1975-76 is given below :

(Figures in hectares)

Year (ending June 30)	Total area according to village papers	Area under cultivation	Land not available for cultivation	Other uncultivable land excluding fallow	Area under forests
1	2	3	4	5	6
1972-73	5,04,584	4,57,278	22,476	24,830	3,268
1973-74	5,08,842	4,55,586	26,765	26,491	4,925
1974-75	5,08,842	4,55,940	21,311	31,591	5,202
1975-76	5,08,846	4,56,212	52,634	17,271	5,214

	Fallow land	Net area sown	Area sown more than once	Total cropped area	Area in which crops failed
	7	8	9	10	11
1972-73	29,991	4,27,287	1,91,420	6,18,707	2,64,972
1973-74	14,653	4,40,933	1,83,515	6,24,448	30,370
1974-75	12,369	4,43,571	1,25,992	5,69,563	2,95,399
1975-76	15,296	4,40,916	2,54,532	6,95,448	37,382

Cultivated area.—In revenue terminology, land is termed as cultivated if it has been sown even once during the previous four harvests. The cultivated area comprises current fallows and net area sown. Every effort is being made to make available as much water as possible to the centuries old thirsty lands of this district with the implementation of canals lift irrigation and minor irrigation schemes. Total area under cultivation in this district during 1975-76 was 4,56,212 hectares. Of this, 15,296 hectares remained fallow and 4,40,916 hectares was sown. An area of 2,54,532 hectares was sown more than once. Thus the total cropped area was 6,95,448 hectares. Crops, however, failed in 37,382 hectares.

Land not available for cultivation.—This includes land which cannot be brought under the plough except at an exorbitant cost as well as the land covered by buildings, roads, railways, rivers and canals or otherwise provided for non-agricultural purposes including forests. 52,634 hectares of land accounted this category in 1975-76.

The forests mainly consist of waste strips on sides of the roads, canals and railways; protected forests in Loharu, Nangal Mala, Nawan, Naurangabad, Digrauta and Rawaldhi; and some private land closed under section 38 of the Indian Forest Act, 1937 and sections 4 and 5 of the Land Preservation Act, 1900. In 1975-76, 5,214 hectares of land was under forests in the district[1].

Other uncultivated land excluding fallow.—This category of land includes permanent pastures and other grazing land, land under miscellaneous tree crops and groves not included in net area sown and cultivable waste. An area of 17,271 hectars was under this category in 1975-76.

WATER-LOGGING AND EROSION BY WATER

Water-logging is not a problem in this district. The erosion by water is a localised problem around low hills. Afforestation is being done on the hills which are with the Forest Department so as to provide vegetative cover to reduce the run off.

IRRIGATION

An area of more than 14-lakh acres (5,66,560 hectares) in the districts of Hisar, Bhiwani, Mahendragarh, Gurgaon and the Jhajjar tahsil of the Rohtak district, bordering Rajasthan on the south-west of the State, and known as the Bigar tract, has remained chronically drought and famine affected because of the absence of good and timely rainfall or irrigation. About 1/3rd of this

1. The forest area according to the calssification area statistics maintained by the Deputy Commissioner, Bhiwani, is 1,777 hectares and relates to private forests.

area lying in the present district of Bhiwani is the worst. There was nothing to impede the universal sand. The common characteristics of the area are : low and erratic rainfall, high wind velocity especially during the months of April to June, extreme variation of temperature coupled with lack of vegetation cover causing soil erosion and shifting of sand-dunes. Due to high temperature during summer and low humidity, the rate of evaporation is extremely high. The sub-soil water is either scanty or brackish or both, which renders it, where available, unfit for human or plant consumption. Constant soil erosion adversely affects the land, both in quality and even area. The low rainfall, lack of irrigation and reduction in the fertility of land, all combine to reduce the yield of crops as well as the intensity of cropping. Recurring droughts, famines and mass migrations have thus been a normal phenomenon. At times, even the stock of drinking water gets depleted to dangerous limits, causing large-scale misery.

Drought and famines which are the living reality have been described separately in subsequent pages. The area is not only sandy but also higher in level and therefore has remained un-commanded by the existing canal system in the State which is based on gravity flow. The extension of irrigation by lifting water to these higher areas was never attempted and was assumed an impossibility. The whole tract thus appeared doomed to remain perpetually undeveloped, and its people backward.

Prior to the achievement of Independence in 1947, a portion of the eastern part of the Bhiwani district (90,000 hectares) was served by the Western Yamuna (Jumna) Canal System through the Bhiwani and Sunder Distributaries along with their minors. The area being at the tail, this water-supply was highly inadequate. The Dadri Irrigation Scheme was executed in 1952-53, at a cost of Rs. 46.50 lakhs by the erstwhile PEPSU (Patiala and East Punjab States Union) Government to irrigate the arid area of that tahsil of the Mahendragarh district by utilising its share from the Western Yamuna (Jumna) Canal System. This covered about 35,000 hectares. But the position of water-supply was the same as in the Bhiwani area. When the Bhakra Canal System was extended into the Hisar district during 1954, 25 villages of the Bhiwani district (23 of the Bawani Khera tahsil and 2 of the Bhiwani tahsil) were served through minors taking offfrom the Dewa Distributary at its tail end.

The drought of 1966 which affected about 15 lakh acres (6 lakh hectares) in the south-western portion of the State, with a population of 8 lakhs inhabiting 744 villages, caused a loss of 43.44 lakh quintals of foodgrains worth Rs. 25.43 crores. This was followed by another drought in 1968 which affected 3,234 villages and caused a damage of 70 lakh quintals of foodgrains worth Rs. 40.30

crores. The State Government allocated the highest priority to extension of irrigation to the drought areas, towards removal of obvious regional imbalances and for stabilising the economy on a permanent basis. Canal irrigation, which had proved successful in Hisar (Hissar) district through the Bhakra Canal System, was the only solution of the problems of the Bagar area where a sturdy people had continued to live under distressing conditions for centuries. The level of this area rises towards the south with the result that water from gravity flow canals which all start from the north could not be automatically utilised to irrigate it. Accordingly, in 1969, it was decided to take up multi-stage lift irrigation schemes. For this purpose, the waters had first to be imported through a feeder system and fed into a canal. The canal would then be raised through successive pumps operated by electricity. At suitable points, off-taking distributaries were located to irrigate the land through outlets and water courses. Some of the distributaries were also provided with pump houses to lift water for the purpose of irrigating farther higher areas. The new multi-stage lift irrigation schemes which serve the Bhiwani district are : Jui Lift Irrigation Scheme, Loharu Canal Lift Irrigation Scheme, and Siwani Canal Lift Irrigation Scheme .

Canal Irrigation in the District prior to the Formation of Haryana

Western Yamuna (Jumna) Canal System.—Prior to the formation of Haryana, the eastern portion of the district, previously a part of the Hisar (Hissar) and Rohtak districts, was served by the channels of the Hansi Branch of the Western Yamuna (Jumna) Canal System. Since the water in river Yamuna depends entirely on rain and melting snows in the catchment areas, supplies are inadequate during *rabi* season and the channels have to run depending on the available waters. The approximate discharge which is delivered to the Bhiwani district works out to about 903 cusecs.

Prior to 1952, the following irrigation facilities existed in this district :—

Name of distributary	Length	Total discharge
1	2	3
	(Thousand feet)	(Cusecs)
(A) Bhiwani Distributary System		
(i) Bhiwani Distributary	195.6	218

1	2	3
(ii) Bamla Minor	47.1	50
(iii) Kharak Kalan Minor	21.6	14
(iv) Badesra Minor	16.7	10
(v) Chang Minor	12.5	10
(vi) Naurangabad Minor	7.0	3
(vii) Paluwas Minor	7.0	7
(viii) Haluwas Minor	31.5	19
Total :	339.0	331
(B) Sunder Distributary System		
(i) Sunder Distributary	106.7	315
(ii) Bawani Khera Minor	40.7	31
(iii) Bhurtana Minor	83.0	70
(iv) Balyali Sub-Minor	35.0	24
(v) Umra Minor	33.5	17
(vi) Khanak Minor	35.9	30
(vii) Dhamana Minor	38.7	25
Total;	373.5	512

The above systems provided irrigation facility in an area of 2.20 lakh acres (0.89 lakh hectares) by these systems.

Bhiwani Distributary is a part of old Western Yamuna (Jumna) Canal System which was constructed in the Mughal period. Record is not available as to the correct year during which Bhiwani Distributary was constructed. The detail of the channels falling under this system along with their respective length and discharges is given above. The following additional channels also

under this system:—

Name of channel	Length	Total discharge
	(Thousand feet)	(Cusecs)
Talu Minor	25.00	50.60
Talu Sub-Minor	20.00	10.00
Nawla Minor	3.30	4.00

Sunder Distributary is also a part of the Western Yamuna (Jumna) Canal System, which was constructed during the Mughal period. Here again it is not known when exactly channel was constructed.

In the Dadri tahsil, then a part of the PEPSU, there was no irrigation. The area was level and soil was generally good. The Western Yamuna (Jumna) Canal System irrigated the adjoining areas of the then Punjab. It was intended by the PEPSU Government to construct channels for irrigation of this area by delivering the PEPSU share from the Western Yamuna (Jumna) Canal and as such the Dadri Irrigation Scheme came to be executed in 1952-53 to bring the arid area of the Dadri tahsil under irrigation. The project, details of which are given below and which cost Rs. 46.50 lakhs, brought under irrigation 97,882 acres (39,611 hectares) of culturable commanded area :

Name of distributary	Length	Total discharge
	(Thousand feet)	(Cusecs)
Dadri Distributary System		
(i) Dadri Distributary	108.0	134
(ii) Phoolpura Minor	12.0	5
(iii) Sanga Minor	35.9	20
(iv) Phogat Minor	10.5	4
(v) Manheru Minor	45.0	40
(vi) Misri Minor	13.0	6
(vii) Rawaldhi Minor	13.0	5
Total:	237.4	214

All these schemes provided irrigation in an area of about 3 lakh acres (1.21 lakh hectares). Average intensity of irrigation was about 30 to 35 per cent. This position continued till 1966, when the Haryana State was formed.

PROGRESS AFTER THE FORMATION OF HARYANA STATE

During 1968 to 1975, the intensity of irrigation was increased from 30 to 50 per cent by constructing additional new minors or extending the existing minors. During this period there was persistent demand from the cultivators for lining the existing channels and for extension of channels because area being sandy, irrigators were not able to maintain their water courses and there was heavy absorption losses in the channels. There were also practically no reliable source of drinking water. The following new schemes were taken up and completed during the period 1968 to 1975:—

	Cost	Length	Total discharge
	(Rs. in lakhs)	(Thousand feet)	(Cusecs)
1. Naurangabad Minor	1,00	7.0	3
2. Increase in the water-supply for Bhiwani town water works (from 6.86 to 31.86 cusecs)	2,77	195.6	218
3. Alakhpura Minor	1,36	31.6	18
4. Kairu Minor	1,945	85.0	44
5. Dang Minor	173	80—88	2
6. Bhurtana Minor Extension	206	54—83	12
7. Khanak Minor Extension	108	26.9—35.9	2
8. Tigrana Minor	124	9.4	4

Besides, the work on the lining of Sanga Minor, Haluwas Minor and Phogat Minor is in progress.

Details about the existing channels and the villages of the Bhiwani district benefited under the Western Yamuna (Jumna) Canal System are given in Table II of Appendix. Under this system about 85 per cent of the area is covered by irrigation. The rest depends on rainfall. Authorised intensity of irrigation under this system is 50 per cent against which an overall intensity of 68 per cent, as shown below, was achieved during 1974-75 :

Name of the system	Gross area	Culturable commanded area	Authorised area for irrigation	Irrigation achieved during 1974-75
1	2	3	4	5
	(Hectares)	(Hectares)	(Hectares)	(Hectares)
Sunder Sub-Branch (in the Bhiwani district)	2,881	2,597	1,091	..
Sunder Distributary and Mitathal Feeder	87,124	74,501	31,291	..
Bhiwani Distributary and Dadri Feeder	64,209	53,016	22,267	..
Total:	1,54,214	1,30,114 (85 per cent of column 2)	54,649	88,558 (68 per cent of column 2)

The following year-wise figures show the area irrigated and the value of additional foodgrains produced during 1972-73 (*rabi* crop only) to 1976-77 :—

Year	Area irrigated	Value of additional foodgrains
	(Hectares)	(Rs. in lakhs)
1972-73 (*rabi* only)	46,690	747
1973-74	96,914	1,558
1974-75	88,558	1,417
1975-76	1,33,608	2,240
1976-77	1,07,638	..

The Bhakra Canal System.—Twenty-five villages of the Bhiwani district (23 of the Bawani Khera tahsil and 2 of the Bhiwani tahsil) are served by irrigation from the Bhakra Canal System through the minors taking off from the Dewa Distributary and its tail end. Irrigation from these channels was introduced in this area in 1954. The

details about these channels and the villages served by these are given in Table III of Appendix. These channels are controlled by the Fatehabad Division, H.B.C.C. (Hisar Bhakra Canal Circle), Hisar (Hissar).

NEW CANAL IRRIGATION SCHEMES

Jui Lift Irrigation Scheme.—Named after village Jui, situated on the Bhiwani-Loharu Road (S.H.14), this is the first project in the series of multi-stage lift irrigation schemes, work on which was started in November 1969. The first phase covering 50 miles (80.5 kilometres) of channels and 3 of the seven pumping stations and bringing water to about 40,000 acres (18,190 hectares) of land, was commissioned on July 15, 1970, and the scheme was completed in October 1971 after incurring an expenditure of Rs.2.79 crores. Thousands of persons worked on this project. Since the trucks could not ply on the sandy surface, hundreds of donkeys, camels and camel carts were deployed to maintain the lines of communication carrying loads of steel, cement, bricks and the many items required for canal construction. The area of operations was inhospitable. The sun was scorching, dust-storms whipped up sand to fill the excavations the workers made. Water had to be pumped for a length of 30,000 metres to the site for drinking and construction work. The work was completed in record time. The water which would have otherwise gone waste below Tajewala headworks on river Yamuna in the rainy season (for 69 to 90 days in the monsoon period of July to September) was brought to this desert area by taking off supply from Sunder Sub-Branch (a branch of the existing Western Yamuna (Jumna) Canal System), the capacity of which could be raised conveniently by about 300 cusecs. Taking off from the sub branch at R.D. 121350 and running along the Mitathal Feeder, which brings the waters of the Sunder Sub Branch to Dang and Gujrani Minors, maintained already, the Jui Feeder flowing over a length of 52.86 kilometres, brings surplus waters into the Jui canal starting off from near the western outskirts of Bhiwani. Going up to near village Serla for 27.25 kilometres, the canal ends in the Bahl Distributary which takes the water right up to the Rajasthan border (25.81 kilometres). In the process, the water is lifted through a series of seven pumping stations to a height of 107 feet (32.6 metres) from the starting point of the canal. The scheme has benefited a gross area of 90,440 acres (36,599 hectares).

In pursuance of the decision of the State Government in 1972 to increase the water allowance from 3.5 cusecs to 4.5 cusecs per thousand acres culturable commanded area in the drought prone areas, a scheme for raising

the capacity of channels and constructing additional minors to cover more areas under irrigation is under execution. Against an estimated cost of Rs. 2.27 crores (Rs. 1.56 crores on stage I and Rs. 0.71 crore on stage II), a sum of Rs. 2.67 crores had been spent by March 31, 1977.

The salient features of the Jui Lift Irrigation Project are :

1.	Gross area	90,440 acres (36,599 hectares)
2.	C.C.A. (Culturable Commanded Area)	74,528 acres (30,160 hectares)
3.	Water allowance at head of distributary (perennial period)	3.50 cusecs per 1,000 acres
4.	Water allowance at head of outlet (perennial period)	3.05 cusecs per 1,000 acres
5.	Water allowance at head of outlet during monsoon	4.00 cusecs per thousand acres
6.	Total length of channels	258 kilometres as shown below :

Channel	Length completed (Kilometres)		
	Lined	Unlined	Total
Jui Feeder (1969-70)	8.35	44.51	52.86
Jui Canal (1969-70 and 1970-71)	27.25	—	27.25
Bahl Distributary (1970-71 and 1971-72)	25.81	—	25.81
Minors (completed up to 1973-74)	91.97	—	91.97
Total:	153.38	44.51	197.89
Additional minors under construction (taken up in 1974-75)	60.00	—	60.00
Grand Total :	213.38	44.51	257.89

7.	Total number of pump houses	7
8.	Aggregate list of all pump houses	148.75 feet (45 metres)

9.	Number of pumps	Varying from 9 at Pump House No. 1 to 2 at Pump House No. 7
10.	Discharge at head of Jui Feeder	(i) 250 cusecs with 3.5 cusecs water allowance (ii) 410 cusecs with 4.5 cusecs water allowance
11.	Original estimated cost of project	Rs. 3.31 crores
12.	Revised estimated cost of project including additional minors and increased capacity with 4.5 cusecs water allowance	Rs. 5.59 crores

Some significant details about the channels constructed and the villages benefited are given in Table IV of Appendix.

During the period 1970 to 1972, Jui Canal ran only when surplus waters were available at Tajewala. However, the scheme became perennial from January 28,1973 on the availability of additional supplies from the Western Yamuna (Jumna) Augmentation Canal and Augmentation Tubewells. The following year-wise figures show the area irrigated and the value of additional foodgrains produced during 1970-71 to 1976-77 :—

Year	Area irrigated	Value of additional crops
	(Hectares)	(Rs. in lakhs)
1970-71 (trial)	256	4.27
1970-71	2,614	43.59
1971-72	2,614	43.59
1972-73	4,495	74.98
1973-74	5,254	129.88
1974-75	5,873	100.54
1975-76	7,648	..
1976-77	7,320	..

The canal is now run in rotation like other perennial channels of the Western Yamuna (Jumna) Canal System. It has been assessed that the Jui Canal has been a landmark in irrigation development. It paved the way for Loharu and other irrigation schemes. The feasibility of converting desert land to all weather fertility, by lift irrigation, was established.

Loharu Lift Irrigation Scheme.—This is the second project in the series of lift irrigation schemes, and was taken up soon after the first phase of Jui Scheme had been commissioned in July 1970. It was intended to cover over 3 lakh acres of land of the drought area of the Dadri and Loharu tahsils in two stages. This was four times the area of the Jui Project. Stage I was to cost Rs. 4.31 crores, involving the construction of about 109 miles (175 kilometres) of new channels and remodelling of about 24 kilometres of unlined channels. 450 cusecs of water was needed for stage I with provision to increase it to over 850 cusecs when stage II was completed. The proposal was to make use of water causing havoc through Drain No. 8, in Jahazgarh areas. About 1,000 cusecs of water was to be led into a feeder, which could substantially reduce the inflow of flood waters. In the event of lack of rains, this supply was likely to fail. Since assured supplies were needed for the *kharif* crop, i.e. for 60—70 days in 3 months of July to September each year, it was provided that additional water would be drawn from river Yamuna (Jumna) going waste below Tajewala and brought through the Western Yamuna (Jumna) Canal System in Hansi Branch and picked up at Anta near Safidon. From Anta, the supplies would be led into Nai Nallah drain to Gohana (about 32 kilometres) where these would be regulated between Diversion Drain No. 8 and Drain No. 8. The feeder (29.56 kilometres in length) taking water from the drain at R.D. 213000 —R, about 4 miles (6.4 kilometres) south of Kahnaur in the Rohtak district, brought it to Charkhi Dadri from where the canal was to start.

The new area to be irrigated is a table-land with ramifications of the Aravalli jutting out of sands and bushes. The slope rises gradually through a series of sand-dunes. The problems were complex and the operational difficulties and obstacles far greater than posed by Jui canal. The area to be covered was four times bigger. The undulating landscape made it necessary to distribute waters by pumping up not only the main canal but also the small channels. For stage I, 25 pumping stations were needed to lift water over an aggregate height of about 225 feet (69 metres). The biggest near Charkhi Dadri was to push up 800 cusecs. At one stretch, the pumping up was so difficult that it needed setting up eight pump houses in a length of about 8 miles (13 kilometres) to make waters flow 142 feet (43.28 metres) higher

than at take off. The field channels too were to be different from those found elsewhere. Normally these run along the canal, but in the tract in question the field channels were to run backward to take advantage of gradient.

In spite of these formidable difficulties it was decided to take up the Loharu Lift Irrigation Project. The foundation stone of the first pump house of the main canal was laid on January 13, 1971. A part of the scheme comprising 4 pump houses with 96-kilometre length of channels was completed in July 1971. An additional length of 144-kilometre of channles with 8 more pump houses was commissioned on July 30, 1972. The commissioning of Pump House No. 6 at R.D. 97050 of Loharu Canal was done on October 26, 1972.

In pursuance of the decision of the State Government in 1972 to increase water allowance in drought prone areas from 3.5 to 4.5 cusecs per thousand acres culturable commanded area, the remaining channels of the project provided the increased water allowance. The original scheme was completed by July 1974 with a total expenditure of Rs. 12.41 crores. Adding cost of increase in capacity of channels, the cost of the project may increase to Rs. 22 crores. Construction of additional minors with a total length of 111 kilometres is in progress. This will reduce the length of water courses from 3 kilometres to 1.5 kilometres and lead to speedy spread of irrigation. Salient features of the project are :

1. Gross area	3,29,629 acres (1,33,394 hectares)
2. C.C.A. (Culturable Commanded Area)	2,63,703 acres (1,06,715 hectares)
3. Water allowance at head of distributary (perennial)	3.5 cusecs per 1,000 acres of C.C.A.
4. Water allowance at head of outlet (non-monsoon)	3.05 cusecs per 1,000 acres of C.C.A.
5. Water allowance at head of outlet (during monsoon)	4 cusecs per 1,000 acres of C.C.A.

6. Total length of channels 570 kilometres shown below:

Channel	Length completed (Kilometres)		
	Lined	Unlined	Total
Loharu Feeder (1971-72)	—	29.56	29.56
Loharu Canal (1971-72 and 1972-73)	35.20	—	35.20
Badhwana Distributary (1971-72 to 1973-74)	12.19	18.89	31.08
Distributaries (completed up to July 1974)	276.70	—	276.70
Minors completed under original Project (up to 1973-74)	86.41	—	86.41
Total :	410.50	48.45	458.95
Additional minors under construction (taken up in 1974-75)	111.00	—	111.00
Grand Total :	521.50	48.45	569.95

7. Total number of pump houses 17

8. Aggregate lift of all pump houses 338.4 feet (103 metres)

9. Number of pumps ..

10. Discharge at head of Loharu Canal System
    (i) 1,023 cusecs with 3.5 cusecs water allowance at distributary head
    (ii) 1,315 cusecs with 4.5 cusecs water allowance at distributary head

11. Original estimated cost of project Rs. 11.24 crores

12. Revised estimated cost of project including additional minors and increased capacity with 4.5 cusecs water allowance — Rs. 22 crores

The system is non-perennial for the present and is being fed from flood waters of Drain No. 8 and surplus water available in river Yamuna at Tajewala through the Hansi Branch. It is expected to become perennial when Haryana's share in Ravi-Beas waters become available. Some details about the channels constructed and the villages benefited under this scheme are given in Table V of Appendix. The following year-wise figures show the area irrigated and the value of additional foodgrains produced during 1971-72 to 1976-77 :—

Year	Area irrigated	Value of additional foodgrains
	(Hectares)	(Rs. in lakhs)
1971-72	1,722	24.01
1972-73	5,374	78.68
1973-74	8,433	172.94
1974-75	9,931	183.30
1975-76	12,290	..
1976-77	10,507	..

The full benefit from this scheme would accrue after its completion and on availability of designed supplies in the channel; in short when the system becomes perennial.

Siwani Lift Irrigation Scheme.—The Siwani Lift Irrigation Scheme is the third major lift irrigation project taken up by the State Government in October 1971. The gross area covered is 96,982 hectares, out of which 73,563 hectares will be commanded by irrigation when full development takes place. The whole of this lies in the Bhiwani, Bawani Khera and Loharu tahsils in the north western portion of the Bhiwani district, which is very undulating, sandy, devoid of

any natural source of water and with erratic and scanty rainfall. In all previous irrigation schemes, it had been left out because of its reverse slope and difficult terrain. It was, therefore, evident that it also needed a well-planned independent lift irrigation system. The Siwani Lift Irrigation Project was divided into four stages which represent the groupings of areas. Stage I covered the lining of the 30-mile (48-kilometre) long Petwar distributary which was lined with precast cement concrete blocks during winter closures, to save losses and carry about 200 cusecs over its old capacity for the Siwani Canal Lift Irrigation Project. Stage -I areas are irrigated by Deosar Feeder and the length of channels is 59 kilometres and two pumping stations will lift the waters to irrigate higher areas, Stages II anp III are irrigated by the main Siwani Canal. It is a network of 250 miles (402 kilometres) of lined channels and nine pumping stations. Stage IV areas which were neither covered by the existing Western Yamuna (Jumna) Canal System nor included in the original project to get their supplies through Nigana Feeder which takes off from Jui Feeder whose capacity has been increased to feed stage IV, by about 100 cusecs. Earlier the stage IV areas which are sprawled north, south and west of Tosham were planned to be irrigated by the extention of tails of Guranpura, Khanak, Bhurtana, Kairu and Dang minors of Bhakra and W.J.C. Systems. Experience showed that satisfactory irrigation could not be developed by extension of these minors. These areas were, therefore, included as stage IV of Siwani Canal Lift Irrigation Project. Some significant details of various stages are given in Table VI of Appendix.

The construction of stages I, II and III was taken up in October 1971. The phasing of construction was done in such a manner that every year some new channels were run for irrigation. The construction of the pump houses was also correspondingly phased. Consequently, four pump houses were commissioned in 1972, three in 1973, two in 1974 and one in 1975. The commissioning of the eleventh pump was to follow.

The final system, as it has now emerged, has many more channels and pump houses than originally envisaged. Some of the minors and sub-minors were constructed during 1974-75 under the drought-relief programme of the State Government.

The main components of this scheme, described below, give an idea of the working of this project :

Stages I,II and III.—The supplies for feeding channels of stages I and III of the project will be carried through Western Yamuna (Jumna) Canal System

up to the tail of Hansi Branch. For this purpose Hansi Branch has been lined from R.D. 0 to 60 and remodelling work is in hand from R.D. 60 to tail.

From the tail of Hansi Branch waters would be carried through lined Petwar Distributary and Siwani Feeder which is under construction.

At the tail end of the Siwani Feeder, starts the Siwani Canal which is lifted right at the head by about 4.35 metres at pump House No. 1. This is the starting point for Siwani Project, Stages II and III areas.

About 25 kilometres upstream of Siwani Canal Pump House No. 1, Deosar Feeder takes off from the Siwani Feeder and carries waters to stage I areas. After acting as a carrier channel for a length of about 30 kilometres, this chaanel becomes a distributary from which minors take off.

Siwani Canal and Pump Houses.—About 23 kilometres long, the Siwani Canal taking off at the tail of the Siwani Feeder is the main canal for irrigating areas of Siwani Lift Irrigation Project Stages II and III. It has five pump houses on its main stem and four on individual distributaries taking off from the canal. In any one direction, the waters are raised to a maximum lift of 31.1 metres.

Two pump houses are also located on the channels in Stage I area. The maximum lift in Stage I is 3.2 metres.

Net work of distributaries and minors.—In the three stages of Siwani Lift Irrigation Project, the total length of the distributaries, minors and sub-minors is 300 kilometres. This entire length is lined with brick tiles. Unlined watercourses taking off from these channels carry the waters to the fields.

The networks of distributaries and minors have been so planned that the length of the watercourse is restricted to about 1.6 kilometres. This is essential in view of the highly undulating country and sandy soil.

Stage IV.—It is an unlined channel for a length of 25.5 kilometres and is lined in the balance reach of its total length of 28 kilometres. This channel, with a capacity of 288 cusecs at head, feeds water into the Nigana Canal and its distributary system. This system has 86 kilometres of channels and has 10 pump houses, two of which are located on the main stem of Nigana Canal and the other 8 on the distributaries. A channel has been constructed which links the Nigana to the Siwani Canal. This channel is 17 kilometres long and has a capacity of 100 cusecs.

Some details about the channels constructed and the villages benefited under this scheme are given in Table VII of the Appendix. The location of various pump houses is given in Table VIII of the Appendix. The following figures show the area irrigated and the value of additional foodgrains produced during 1972-73 to 1976-77 :—

Year	Area irrigated	Value of additional foodgrains
	(Hectares)	(Rs. in lakhs)
1972-73	1,409	1.22
1973-74	4,474	8.9
1974-75	6,235	12.5
1975-76	7,040	..
1976-77	8,480	..

The channels of Siwani Lift Irrigation Scheme after their commissioning got only non-perennial supplies from 1972 to 1975. The scheme has been made partly perennial from January 1976. The channels of the project will be perennial when Haryana gets its share of Ravi-Beas waters.

The lift irrigation schemes described above are unprecedented in many ways particularly the tremendous speed with which these have been completed. By any standard this is an engineering feat of which any country could be proud. A network of irrigation channels has been spread out in the Bhiwani district, an area which had remained uncared for and neglected for centuries, in a matter of 4 to 5 years. With increasing supplies of water in the irrigation channels, this area will never again suffer the miseries of a drought or famine. Jui, Loharu and Siwani Lift Irrigation Systems provide a permanent solution to remove poverty and distress in the chronically drought affected area of the district. By March 31, 1977, a sum of Rs. 41.83 crores was spent on the three

schemes as follows :—

1.	Jui Lift Irrigation Scheme	Rs. 546.14 lakhs
2.	Loharu Lift Irrigation Scheme	Rs. 1,853.47 lakhs
3.	Siwani Lift Irrigation Scheme	Rs. 1,783.48 lakhs
	Total;	Rs. 4,183.09 lakhs

The various lift irrigation schemes were originally receiving only non-perennial supplies by utilising surplus Yamuna waters and flood waters of drains. Jui has been made perennial and Siwani channels have started getting partially perennial supplies by utilising waters being put into the canal system by Augmentation Tubewells. All the lift scheme channels will start getting perennial supplies as soon as Haryana gets its share of allocated Ravi-Beas waters. At that stage the lift schemes will make substantial impact on the economy of the State.

Well Irrigation

Well irrigation is possible only in areas where the sub-soil water is sweet and available in plenty. The quantity of ground water depends on many factors, such as rainfall, depth of water table in the area, type of underground strata and its proximity to a canal or a natural stream. Its quality of salinity or sweetness depends upon the salts in the clay underneath. On the basis of analysis of 1,535 water samples received by the Haryana Agricultural University from 251 villages of the Bhiwani district, it was observed that 27 per cent of waters were of normal quality, 16 per cent sodic, 18 per cent marginally saline and 29 per cent saline sodic (poor quality). On an average 26—38 per cent of the waters in Dadri-I, Loharu and Badhara blocks were deficient in calcium (sodic) and could be economically exploited by using them along with gypsum.

The availability of underground water and its further exploration has been discussed subsequently under a separate heading. However, the area under well-irrigation in this district is insignificant. The wells are primarily meant for drinking water. They are generally near the village site or round the village pond.

The following statement regarding the Bhiwani tahsil[1] shows that

1. *Hisar District Gazetteer, Stastical Tables*, 1935, Table 18.

even in the pre-Independence period, there was not much well irrigation in the area and whatever there was, constantly declined :—

Year	Number of pakka wells in use	Number of kacheha wells, *dhenklis* and *jhalars* in use	Total cultivated area	Total *chahi* area of all kinds
			(Hectares)	(Hectares)
1890 Settlement	204	58	1,55,150	438
1901-02	14	67	1,60,025	515
1906-07	92	80	1,58,493	444
1911-12 Settlement	42	..	1,63,998	416
1916-17	39	10	1,67,332	284
1921-22	88	7	1,61,145	206
1926-27	58	7	1,64,411	152
1931-32	72	5	1,65,850	228

In Loharu State, where the number of pakka wells was 152 in 1911-12, the well irrigation did not exceed more than 2,000 kacheha bighas, the total cultivated area being over 4 lakhs kacheha bighas in that year.[1]

In the Dadri area also, well irrigation was on the decline prior to 1947. In 1960-61, only 2,835 hectares of land out of the total cultivated area of 1.32 lakh hectares was under well irrigation.[2]

The following table gives the number of wells (tubewells and others) existing in the district during 1972-73, 1973-74, 1974-75 and 1975-76[3] :—

1. *Hisar District and Loharu State Gazetteer, Stastical Tables (Loharu State), 1912, Table 18.*
2. *Census of India, 1961, Mahendragarh District Census Handbook, 1966 p. 41.*
3. (i) *Statical Abstract of Haryana*, 1973-74, p. 90.
   (Issued by the Economic and Stastical Organisation, Planning Department, Government of Haryana)
   (ii) Deputy Commissioner, Bhiwani.

Particulars	1972-73	1973-74	1974-75	1975-76
I. Tubewells used for irrigation purposes	2,801	2,833	2,881	3,197
(i) Government	—	3	3	26
(ii) Private	2,801	2,830	2,878	3,171
II. Other wells used for irrigation purposes only	2,753	2,761	871	324
(a) Government :				
(i) Masonry	—	—	—	—
(ii) Non-masonry	—	—	—	—
(b) Private	2,753	2,761	871	324
(i) Masonry	2,751	2,759	871	324
(ii) Non-masonry	2	2	—	—
III. Wells used for domestic purposes only	2,388	2,410	2,399	2,389
IV. Wells not in use	—	45	45	55

The two traditional methods of well irrigation used in the district are known as *charas* and *jhalar*. The former is in use in some parts of the Bhiwani tahsil, Loharu tahsil and many parts of the Dadri tahsil while the latter is found scattered all over the district. The working of these two devices is explained below :

Charas.— This consists of a large leather bag (*charas*) holding 140 to 180 litres of water fastened to one end of a rope which passes over a small strong wheel (bhaun or chak) fixed over the well. When the bag has been lowered, the other end of the rope is attached to the yoke of a pair of bullocks or a camel who then walk down a ramp of a length approximately equal to the depth of the well. The driver sits on the rope near the yoke to keep it in position. By the time the bullocks/camel arrive at the end of the ramp, the bag has been drawn up to the top of the well, and its water is emptied into a cistern, generally by a man who stands by, but sometimes

by a self-acting mechanical arrangement. The rope is then detached from the bullocks/camel, the bag is lowered again and the bullocks/camel return by a less steep incline parallel to it, and the operation is recommenced.

To work a well with one *lao* (rope) at least four pairs of bullocks are required, with a driver to each pair. The bullocks raise the *charas* by pulling the *lao* (rope) down the *gaun* or inclined slope adjoining the well; two pairs (*joris or gatas*) of bullocks work at one and the same time while one pair walks down the *gaun* and thus raises the *charas*, the other pair is walking up and by the time it reaches the top the *charas* having been emptied into the *parcha* of water reservoir, has fallen again by its own weight. The bullocks are then attached to the *lao*, the bucket is filled by a peculiar jerk given to the rope by the man (*baria*) who stands at the wheel, and the bullocks start down the *gaun* again; the first pair meanwhile have started on their upward journey. Two pairs in this way work for six hours or two *pahars*; if irrigation is to be carried on all day, four pairs at least are needed.

The bullock drivers are called *kilia* from the *kili*, the peg which fastens the bullock harnessed to the *lao*. Another man is required to arrange the flow of water from the *dhora* or water channel into the *kiaris* or beds in which the field is divided. He is termed the *panyara* or *paniuala*.

Well irrigation by *charas* has considerably declined because of speedy installation of tubewells and pumping sets. This is supported by the fact that the number of irrigation wells which was 2,761 in 1973-74 decreased to 871 in 1974-75.

Jhalar.— This is a sort of lift irrigation. It is employed to lift canal or tubewell water to the lands situated at a higher level. *Jhalar* is just like a *harat* or persian wheel. It consists of a continuous chain of 25 *dolis* (buckets) or 12 to 14 *patras* passing over a vertical wheel fixed over the top and rotated by means of a wooden or an iron gear which is worked by a pair of bullocks or a camel walking round a circular tract called *perd*.

Well Sinking Scheme

In an effort to increase irrigation facilities in every way, the Government advances *taccavi* loans to cultivators up to Rs. 4,000 for sinking a new well and up to rupees one thousand for repairing an old one. Facilities to obtain cement and bricks are also made available. The following data show

the progress of this scheme during 1972-73 to 1976-77 :—

Year	New wells sunk		Old wells repaired		*Taccavi* advanced
	at private expense	from *taccavi* advance	at private expense	from *taccavi* advance	
					(Rs.)
1972-73	18	31	23	5	73,000
1973-74	21	39	23	3	81,000
1974-75	17	15	16	—	57,000
1975-76	40	7	19	—	11,01,114
1976-77	41	6	17	—	3,32,470

TANK IRRIGATION

No area of the Bhiwani district is under tank irrigation. However, the sullage water of the Bhiwani town and suburban colonies is collected at the disposal works on the south-west of the town. About 15,00,000 gallons of sullage water is daily pumped into a sullage carrier for irrigation of lands around Bhiwani and nearby villages. An area of about 101 hectares is under such irrigation and mainly vegetables are grown here.

MINOR IRRIGATION (GROUND WATER EXPLORATION AND DEVELOPMENT)

Ground water occurs in pleistocene and recent unconsolidated sediments. The main source of ground water recharge in this district is rainfall seepage. The average depth of water varies from 30.5 to 45.7 metres below ground surface. However, in the eastern part of the district the sub-soil water level is between 5.2 to 15.2 metres. The ground water is mostly either scanty or brackish, sweet water occurs in parts of Loharu and Badhara blocks. The construction of open wells under such conditions is quite difficult. Similarly, installation of shallow tubewells is expensive as the water lift involved is excessive and the conventional centrifugal pump is problematic even with pump settings at deeper depths. The installation of deep tubewells is feasible in the fresh water belt of the district. The yield of such tubewells varies from 375 to 1,280 litres per minute.

Exploration.—Groundwater exploration was started in 1957 by the Central Ground Water Board (the then Exploratory Tubewells Organisation), Government of India, to locate the water bearing formations at deeper level

and to determine the quality of groundwater. In the first phase during 1957-58, 8 exploratory boreholes were drilled to depths between 111.5 and 192.3 metres below ground surface but all of them had to be abandoned due to high salinity electrical conducting of water ranges up to 45,630 mm/cm. In the second phase (1964), one exploratory borehole was drilled in village Chhapar to a depth of 193 metres. Unfortunately the water was found again very saline with EC value as 21,825 mm/cm. During the third phase (1970-71), 7 additional exploratory boreholes were drilled by the Central Ground Water Board, out of which 2 boreholes (one at Satnali and the other at Budhera) proved successful. The discharge of these boreholes was between 420 and 1,130 litres per minute at a drawndown of 3.65 and 8.53 metres.

The Underground Water Survey Division of the State Irrigation Department, Haryana took up exploration work in the Bhiwani district in 1969. None of the 3 exploratory boreholes which were drilled, proved successful. Later, in 1970, the Haryana State Minor Irrigation (Tubewells) Corporation, to whom the responsibility of ground water exploration was entrusted by the State Government, took up further exploration in this area. In all, 14 exploratory boreholes were drilled including 2 slim holes, out of which 9 (including 2 slim holes) proved successful, 4 were abandoned and 1 has yet to be developed. The successful ones are at Loharu, Gignow, Puritiakhera, Gokalpur, Bahl, Sher, Hui, Manfera (slim hole) and Shampur (slim hole). Yield of these tubewells varies from 600 to 1,280 litres per minute. The quality of water is suitable for irrigation.

The results of exploratory drilling in the district have shown that the quality of ground water in the northern part of the district is mostly saline while the fresh water zone is confined to the southern part of the district. The fresh water belt to the extent of 738 square kilometres has been roughly delineated on the basis of water quality analysis from the samples collected from exploratory boreholes while marginal quality of ground water is encountered in 518 square kilometres. However, detailed geophysical survey of Loharu and Badhara blocks has since been completed by the Haryana State Minor Irrigation (Tubewells) Corporation in order to demarcate the boundary of fresh and saline ground water more precisely. The results will be available shortly.

The re-charge into the ground water body is mainly provided by rainfall seepage apart from the limited ground water inflow from ephemeral streams in the adjoining area of Rajasthan. Computations of ground water re-charge and figures for the present pumpage in different blocks of the district

jointly evaluated by the State Agriculture Department and the MITC (Minor Irrigation Tubewells Corporation) during 1974, and the figures of ground water balance being worked out by the Agriculture Department every year, are given below :

Ground water balance as on April 1, 1977 (Acre feet)

Block	Total usable recharge	Total draft as on April 1, 1977	Balance
Bawani Khera	65,034	1,653	63,381
Badhara	43,141	18,064	25,077
Bhiwani	10,986	8,432	2,554
Dadri-I	37,282	15,902	21,380
Dadri-II	19,930	11,349	8,581
Loharu	12,951	18,340	(—)5,389 (over discharge)
Tosham	All saline	—	—
Total :	1,89,324	73,740	1,15,584

The above fugures do not include the ground inflow from Rajasthan side. Seepage from the areas to be irrigated under the various lift irrigation schemes is expected to provide substantial quantum of additional ground water re-charge which will improve the quality of the water as also provide additional potential for exploration through tubewells.

Development.— With the demarcation of fresh/marginal water boundary in the district, the ground water potential can be usefully exploited for irrigation through tubewells. By March 31, 1976, only 1,141 dug wells and 4,651 pumping sets/shallow tubewells were installed. Block-wise break-up, given below[1] shows that the dug wells are mostly concentrated in the Dadri area. Hardly any well has been installed in Bawani Khera, Tosham and Loharu blocks. The pumping sets/shallow

1. *Source :* Director of Agriculture, Haryana.

tubewells are employed mainly in Bhiwani, Loharu, Dadri-I, Dadri-II and Badhara blocks :

Block	Dug wells	Pumping sets/ shallow tubewells	Total
Bawani Khera	—	79	79
Bhiwani	20	492	512
Tosham	—	75	75
Loharu	—	883	883
Dadri-I	150	896	1,046
Dadri-II	815	817	1,632
Badhara	156	1,409	1,565
Total :	1,141	4,651	5,792

The 8 successful exploratory boreholes drilled by the MITC (Minor Irrigation Tubewells Corporation) have also been converted into production wells and irrigation started. The MITC has also taken up two direct irrigation tubewells schemes, namely :

(i) Installation of 50 Direct Irrigation Tubewells in Loharu area estimated to cost Rs. 58.57 lakhs.

(ii) Installation of 25 Direct Irrigation Tubewells in Badhara Block phase I estimated to cost Rs. 47.44 lakhs.

These schemes are being financed jointly by the Marginal Farmers and Agricultural Labourers Development Agency (MFAL), Bhiwani and the Agriculture Refinance and Development Corporation (ARDC). Forty-eight tubewells have been drilled. On completion of these schemes an area of 3,600 hectares (9,000 acres) is likely to be covered.

Lining of Kachcha Watercourses

A lot of valuable water is being lost as seepage from kachcha watercourses into the sandy lands of the district where losses are as much as 40 to 90 per cent. To save this water from waste, the State Government

embarked on an ambitious programme of making the watercourses pakka by lining them. Apart from saving the absorption losses and utilising the water thus saved in improving irrigation particularly in the tail reaches of watercourse which otherwise remain un-irrigated and un-commanded, some other important benefits from lining of watercourses include the following :—

(i) In a lined watercourse the bed is of a uniform grade and, therefore, no water is wasted on account of unevenness as in the case of a kachcha bed. There is no jungle growth in the bed and the sides. Thus there being less obstruction and friction to its flow, the velocity of water increases and reduces the *bharai* (filling) time considerably.

(ii) Usually depressions occur in a kachcha watercourse. Area beyond such a depression generally remains un-irrigated. No such difficulty is experienced in a lined watercourse.

(iii) By reducing the slope in a lined watercourse, the uncommanded tail areas are also brought under irrigation.

(iv) Loss of water due to leakage and breaches is avoided. This also helps in reducing water-logging.

(v) The maintenance of line watercourses is much easy. *Nakkas* (offtakes with steel plates to close them) are provided at appropriate places along the lined watercourse. While their opening and closing is simple, the chances of unauthorised opening for stealing water are reduced. As the steel plate cannot come out of its own, the thieves' earlier plea that the *nakka* breached of its own, no longer holds good.

(vi) Extra revenue to the Government due to increase in irrigation is an added advantage.

The work of lining of watercourses is being done by the Haryana State Minor Irrigation (Tubewells) Corporation by taking loans from the banks and Agricultucal Refinance and Development Corporation which is recovered from the cultivators with interest in easy instalments under the provision of Haryana Canal and Drainage Act, 1974.

The work of lining of watercourses was started in 1973-74. Since then 9,62,649 feet (2,93,218 metres) length has been lined in this district till the

end of March 1977. The year-wise progress of lining is indicated below :

Year	Progress (in r ft.)
1973-74	1,55,292
1974-75	2,58,185
1975-76	2,14,382
1976-77	3,34,789
Total :	9,62,648

CLOUD-SEEDING EXPERIMENTAL OPERATIONS FOR INDUCING ARTIFICIAL RAINFALL

For the drought-stricken areas of the Bhiwani district, water is precious and welcome from any source. In addition to the network of canals constructed in the area, the possibility of augmenting rainfall by artificial means was also considered. The cloud-seeding experimental operations were started in July and ended in September 1973. These operations have continued during the monsoon months of 1974 and 1975 also.

The cloud seeding operations for the purpose of inducing artificial rainfall consist of dispersing very finely ground mixture of common salt and soap stone in the atmosphere by means of ground-based generators. The basic assumption for these operations is that a substantial portion of the hygroscopic particles released from the ground, drift in the direction of the mean wind and eventually reach cloud heights. This is also facilitated by the fact that wind generally has an updraft during hotter parts of the day. These salt particles on contacting the cloud base help in the formation of nuclei which in turn leads to the production of cloud droplets to stimulate rainfall.

The decision whether a particular day is seedable or not is based on meterological data received daily in the morning hours from Safdarjang Airport, New Delhi. If the indication is positive, messages are immediately sent to the generator-stations to start the dispersal of salt mixture. Generally the ejection of salt mixture is started at 10 a.m. and continues up to 4. p.m. If the upwind at any particular station is not strong enough to carry the salt mixture skyward and there is tendency for the mixture to fall back on the ground, the operation is suspended temporarily until prevailing wind conditions are again favourable.

In 1973, three generator stations were installed in the Bhiwani district at Isharwal, Tosham and Bawani Khera. Another station at Mangali in the Hisar district also worked in conjunction with these three stations. For the purpose of assessing rainfall, 25 new rain-gauges were installed in the operational area in addition to the four already existing. During the operational period, rainfall was measured and recorded twice daily at each of these rain-gauge sites.

The analysis of results showed very encouraging results. The percentage rainfall increase during the threemonths was much higher for the operational area than the adjoining areas outside. However, it was indicated that the number of generator stations was not large enough.

In 1974, the number of staions was increased to five by adding another at Beer in the Hisar district. However, the cloud activity in the region during the months of August and September was almost negligible and the data collected being meagre, no conclusive results could be obtained.

During 1975 monsoon operations, the number of stations has bee n increased to ten, eight out of which are located in the Bhiwani district, viz. Isharwal, Tosham, Sumra Khera (near Bawani Khera), Sungarpur, Deosar (near Bhiwani), Talwandi Raka, Siwani and Kuari. The other two are in the Hisar district at Mangali and Beer. The operations were started in July 1975 and were to continue during the entire monsoon season.

AGRICULTURE

Set-up of the Agriculture Department

The Agriculture Department in the district is represented by a Deputy Director of Agriculture who is responsible to the Director of Agriculture, Haryana, Chandigarh. At the district level, he is assisted by two Agricultural Officers, one each at the two sub-divisional headquarters, Bhiwani and Charkhi Dadri. For implementation of the Agricultural Production Programmes, 4 to 6 Agricultural Inspectors have been provided in each of the 7 development blocks of the district. Although the Block Development and Panchayat Officer[1] is in charge of all the development activities going on in a block, the

1. A block Development and Panchayat Officer is borne on the strength of the Development Department but functions under the direct supervision of the Sub-Divisional Officer (Civil).

main responsibility of agricultural development is that of the Deputy Director of Agriculture and the Agricultural Officers/Agricultural Inspectors working under him. However, the Agricultural Inspectors at block level work under the guidance and supervision of the Block Development and Panchayat Officer.

The Agriculture Department guides the farmers in the latest technological advances in agricultural production. These include intensive methods of cultivation for higher production per unit area through new cropping patterns suited to their conditions. These also comprise preparation of crop plans, control of various pests and diseases affecting agricultural crops and gardens, use of fertilizers and good seeds, and laying out of demonstration plots to show to the cultivators the superiority of new strains and agronomic practices recommended for the district. The Agricultural Inspectors impart training and education to the farmers in their respective areas on matters relating to improved techniques resulting in better management for getting more production, use of improved seeds, fertilizers, improved agricultural implements and appropriate agricultural practices.

Training of all the functionaries is organised. In every crop season, an officers' workshop is arranged in H.A.U. (Haryana Agricultural University) for mutual discussions to solve field problems and to acquaint officials with the latest technology results available in the University. Immediately thereafter, a district training camp is organised at district headquarters for the benefit of the whole extension agency of Agriculture Department and the allied functionaries. They are given training in technology and campaign strategy to be followed in the particular season. The training facilities are further extended in the shape of block level training camps and the training of farmers in villages. For intensifying the training efforts, village to village mass contact programmes are organised through teams of extension agencies and HAU experts. Likewise at the time of sowing, village to village demonstration programmes based on the full package of practices are conducted in every crop season. A follow-up programme is also pursued to achieve maximum results. Necessary inputs like seeds, fertilizers and pesticides are made available at convenient supply points. The farmers are given information for managing the crops throughout the growing season and field days are organised at harvesting time at various places to convince the farmers about the results of following the package of practices. Efforts are also made on campaign basis for introduction of new crops (through demonstration) in newly covered irrigated areas. The students of local village schools are also involved in various campaigns for creating immediate and wide-spread awakening among the farmers.