CHAPTER IV

AGRICULTURE AND IRRIGATION

INTRODUCTION

As in the past, agriculture constitutes the main economy and is the mainstay of the majority of the people. After Independence, most of the area fit for cultivation had been brought under plough and spectacular progress was made in the field of agriculture after the creation of Haryana. The problem of greater production of foodgrains and cash crops is intimately connected with the provision of better irrigation facilities on the one hand and measures of flood control on the other. Animal husbandry, fishery and forestry play a subsidiary but an important part in the economy of the district. This chapter deals with vital features relating mainly to agricultural production.

Land Utilization

The table below shows the utilization of land since 1984-85 to 1987-88 :—

(Thousand hectares)

Classification of area	Year			
	1984-85	1985-86	1986-87	1987-88
1. Total area according to village papers	218	222	222	222
2. Forests	8	8	8	8
3. Land put to non-agricultural uses	17	10	10	10
4. Barren and unculturable land	1	5	5	4
5. Permanent Pastures and other grazing lands	2	7	7	7
6. Culturable waste	10	6	6	6
7. Current fallow land	7	14	8	9
8. Net Area sown	172	171	177	176
9. Area sown more than once	84	77	86	48
10. Total cropped area	256	248	263	224

mud ut was adjusted through settlement authorities with whom they had filed compensation applications in lieu of their verified claims. Only the cost of land was recovered from the non-claimants while the rest of the cost of mud hut was recoverable in three annual instalments. However, in the case of destitute widows, these huts were offered free of cost.

Shopping Centre.—A shopping centre known as Punjabi Market was also set up at Ganaur. Shops numbering 82 were constructed by the displaced persons who were advanced loans at the rate of Rs. 500 each by the Rehabilitation Department.

Other Housing Schemes.—The housing problem remained acute because most of the Muslim emigrants were labourers and artisans and therefore, their houses were modest whereas the incoming persons were businessmen and shopkeepers, used to better dwellings. Keeping the above situation in view, the Government established a new township, 8-marla (cheap) housing colony and 4-marla (cheap) tenement. The details of houses constructed and plots laid out under various schemes are given below :—

New Township, Sonipat	200 houses	10 shops	.. 288 plots
8-Marla (cheap) Housing Colony, Sonipat	200 houses		.. 17 plots
4-Marla (cheap) Tenement, Sonipat	108 Tenements		.. ..

Houses and sites were also sold at reserved price, under the East Punjab Refugees Rehabilitation, Building and building sites) Act, 1948. In the beginning, only 46 houses and 50 plots were sold. Later, it was decided by the Government on June 11 , 1963 that the houses and plots in the rehabilitation colonies should be disposed of in accordance with the provision contained in rule 28 and 90 of the Displaced persons (Compensation and Rehabilitation) Rules, 1955. In case of sale of these properties to displaced persons, 20 per cent of the sale price was to be recovered in cash and the balance in 7 equal instalments together with interest at the rate of 4½ per cent per annum. In case of their sale to non-displaced persons, the sale price was to be recovered in accordance with the provision of rule 90 *ibid.*

During 1987-88, the total land of the district measured 2,22,000 hectares, of which the area of 8,000 hectares (3.67 per cent) was under forests, 10,000 hectares (4.59 per cent) put to non-agricultural uses, 4,000 hectares barren and unculturable land, 6,000 hectares (2.70 per cent) culturable waste, 9,000 hectares current fallow land and the remaining 1,76,000 hectares (79.27 per cent) was the net area sown ; of which an area of 48,000 hectares (21.62 per cent) was sown more than once.

Forests.—The forests mainly consist of waste strips on sides of the roads, canals and railways. In 1987-88, 8 thousand hectares of land was under forests in the district. The same figures of the forest area stood during 1979-80.

Cultivated Area.—In revenue terminology, land is termed as cultivated if it has been sown even once during the previous four harvests. Cultivated area comprises current fallows and net area sown. During 1979-80, the area of current fallow land was of 10 thousand hectares but it reduced to 9 thousand hectares during 1987-88. With the growing trend for intensive cultivation, the practice of taking crops from the same plots successfully for a number of years is coming into vogue. There was an increase of 2 thousand hectares in the net area sown from 1979-80 to 1987-88. The area sown more than once was 84 thousand hectares in 1984-85 which went down to 48 thousand hectares during 1987-88. Every effort was made to utilize every strip of land for growing crops despite the pressure of growing population for non-agricultural uses.

The position pertaining to the category of land put to non-agricultural use decreased during 1984-85 to 1987-88.

The Government is taking keen interest to ensure the cultivation of every available piece of land. To achieve this object it applied the East Punjab Utilization of Lands Act, 1949, and threatened to take away from the owners of the lands which they were not cultivating. The Panchayats also have started using their lands for cultivation. The Governmental agencies are also encouraging the panchayats and individuals to bring cultivable waste under cultivation by advancing loans for the purchase of tractors and implements and for sinking of wells and tubewells.

Water logging.—Water-logging is a serious problem affecting the productivity of the land which supports only some aquatic plants like grass and weeds. The following factors mainly contribute to water-logging :—

1. The worst condition of water-logging appears just after rains. It becomes a menance in the unlined canal irrigated area due to seepage and in the areas along the drains which overflow during the rainy season. The railways, roads and canals restrict the natural clearance of water during monsoon which results in the sub-merging of a large area under water.

2. The poor internal and surface drainage also causes water-logging. The water-logged area generally develops into alkine land where no crops can grow. As a sequence to water-logging, the land is spoiled by *thur*[1] *kallar* and *sem*. The cultivated area which owing to sub-soil moisture has become unfit for cultivation, or is badly affected that it does not produce more than a four anna crop, is classed as *sem*.

The water-logged area in which the water table is only 0—5 feet is a serious problem. The water table between 5—10 feet indicates the danger zone. There has been an alarming rise in the water table in the area during three decades and in areas adjoining the canals it is generally between 5—10 feet. The rise of water table leads to the appearance of *thur* on the surface of the soil-followed by *sem*.

An area of 464 acres became uncultivable by 1959 in the Gohana tahsil alone and similarly a considerable area became unfit for cultivation in Sonipat tahsil. The area of *thur* and *sem* in the district during 1988 was 5,000 hectares.

The total area under water-logging in the district was 28,898 hectares during 1988-89.

AGRICULTURE

Set-up of Agriculture Department.—The Agriculture Department in this district is headed by the Deputy Director of Agriculture under World Bank Programme Project Scheme, who is responsible to the Director of Agriculture, Haryana, Chandigarh. He is assisted by 3 Agricultural Officers, i.e. SMS (T&I), QCI and ASO at district level and 2 SDAOs at Sub-Division level at Sonipat and Gohana. Each SDAO has a team of Agricultural Officers, viz. SMS (PP), SMS (Agro), SMS (Trg.). The SMS (H) has also been posted at Sonipat as this sub-division has sufficient area under vegetables. For implementation of Agriculture Production Programme, 8 CAOs in Sonipat Sub-division and 4 CAOs in Gohana Sub-Division have been provided and each CAO has been provided with 8 Base level workers for the guidance of the farmers.

1. *Thur* is a white or ash-coloured material consisting of harmful salts. It seems to subside after rains, but crispness of the crust forming over the powdered earth beneath, betrays its existence. *Kallar* is also classed with *thur*. There is not much to distinguish the one from the other in appearance.

Recommended steps for Improving Agricultural land

In almost all the blocks of the district, there is problem of salinity, alkalinity and salinity-alkalinity. To make the saline soils fit for cultivation growing of salt resistant crops and levelling is recommended. It is proving quite useful in improving the soil.

Since 1979-80, the progress of land reclamation was under operation with the help of HLRDC. In 1980-81, 75 per cent subsidy was given to small farmers upto land holding of 7.5 acres and 50 per cent to others and it resulted in the reclamation of 361 acres of land with the use of 643 metric tonnes of Gypsum. Bunding and levelling is also practised to reclaim alkaline soils.

The number of watering and fertilizer requirement of major crops are given below :—

Crop	No. of watering	Doses of fertilizer (Kg./Ha.)		
		Nitrogen	Phosphate	Potash
Paddy (Dwarf)	15—20 irrigations (Dwarf)	120	60	60
(Tall)	are necessary to mature the crop (Tall) after transplanting	60	30	..
Bajra (Hybrid) Irrigated	One (for the normal year during September)	120	60	..
Sugarcane (Plant Crop and Ratoon Crop)	Irrigate of 10 days intervals during pre-monsoon and at 25 days intervals during post-monsoon period	150	..	..
Wheat (High Yielding Irrigated)	5 to 6 (22, 45, 65, 85, 105 and 120 after sowing)	120	60	30

The main responsibility of agricultural development is that of the Deputy Director of Agriculture and the Agricultural Officers/Agricultural Inspectors working under him.

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

Recommended steps for Improving Agricultural land

In almost all the blocks of the district, there is problem of salinity, alkalinity and salinity-alkalinity. To make the saline soils fit for cultivation growing of salt resistant crops and levelling is recommended. It is proving quite useful in improving the soil.

Since 1979-80, the progress of land reclamation was under operation with the help of HLRDC. In 1980-81, 75 per cent subsidy was given to small farmers upto land holding of 7.5 acres and 50 per cent to others and it resulted in the reclamation of 361 acres of land with the use of 643 metric tonnes of Gypsum. Bunding and levelling is also practised to reclaim alkaline soils.

The number of watering and fertilizer requirement of major crops are given below :—

Crop	No. of watering	Doses of fertilizer (Kg./Ha.)		
		Nitrogen	Phosphate	Potash
Paddy (Dwarf)	15—20 irrigations (Dwarf)	120	60	60
(Tall)	are necessary to mature the crop (Tall) after transplanting	60	30	..
Bajra (Hybrid) Irrigated	One (for the normal year during September)	120	60	..
Sugarcane (Plant Crop and Ratoon Crop)	Irrigate of 10 days intervals during pre-monsoon and at 25 days intervals during post-monsoon period	150	..	..
Wheat (High) Yielding Irrigated)	5 to 6 (22, 45, 65, 85, 105 and 120 after sowing)	120	60	30

The main responsibility of agricultural development is that of the Deputy Director of Agriculture and the Agricultural Officers/Agricultural Inspectors working under him.

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 demonstrat ion 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 H.A.U. 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.

Besides, the Haryana Agricultural University, Hisar established a Krishi Gyan Kendra (Farm Advisory Service Centre) at Sonipat in 1974 under the overall charge of Senior Scientist known as Co-ordinator. He is assisted by a team of Subject Matter Specialists in different fields such as Agronomy, Soil Science, Horticulture, Vegetable crops, Plant Pathology, Entomology, Farm Management, Agriculture Engineering, Animal Sciences, Veterinary Sciences and Home Sciences for disseminating the latest technology in their respective subjects to the farmers and rural folk. The Subject Matter Specialists at district level organise training camps, demonstrations, field days, Kisan melas, campaigns, exhibitions and film shows. They also organise adaptive research trials at farmers' fields for testing the technology generated by the scientists in different departments of the University. Field days in different crops are organized for demonstrating the potential of the latest package of practice to the farmers. Cattle shows, vegetable and fruit shows, calf rallies and clinical camps are organized and the winners are awarded prizes. The district has developed a very intensive vegetables growing area by adopting the latest agricultural technology of Hisar Agricultural University. The

increase in yield of the crops in the district is the ultimate result of the work carried out by Krishi Gyan Kendra and the Agriculture Department of the State.

At present the Kendra has adopted 3 villages, namely ; Gopalpur, Khizarpur Ahir and Ahmadpur Majra under 'Lab to Land' programme and one village, Farmana has been selected as a model village under 20-point programme. Intensive agricultural, Animal and Veterinary Sciences and Home Science Development activities are carried out in these villages and they serve as models for the farmers of other areas.

Soils

The district is situated on the western side of the Yamuna river and the whole of area forms a part of Indo- Gangetic Alluvial plain. The soil of this district varies from sandy to clayey loam. On an average 67 per cent soil is sandy loam, 25.5 per cent sandy and 7.25 per cent clay. Gohana block contains maximum sandy loam which forms about 79 per cent of the total soil texture. In Kharkhoda block, loam and clay soils are to the extent of 45 per cent and 15 per cent respectively.

The soil is deficient in organic matter in almost all blocks and there is a problem of salinity and alkalinity also. The sub-soil water is mostly brackish, unfit for irrigation. However, the sub-soil water in the north block, i.e. the Delhi-Ambala railway line is quite fit for irrigation.

Depending upon the period of alluvial deposition, the area is sub-divided into the following categories :—

(i) Recent alluvial plain or khadar

(ii) Old alluvial plain or Bangar

Alluvial is composed of clay, silt and sand. Yamuna alluvial plain is nearly level and is formed by thick sediments brought by the river. The extent of sand dunes is less than the undulating land slope which constitutes about 4,500 hectares. The low lying area of undulating land is affected by the problem of salinity and alkalinity.

In general, the drainage of the area is from north to south-east. The flood water is drained into the river Yamuna through various channels. Most of the area is sub-merged under water during rainy season.

Old alluvial plains are well drained except basins. The recent alluvial plains is undulated with 1 to 3 per cent slope and its height from sea level (MSL) ranges from 215 to 222 metres and the old alluvial plains is nearly levelled with a height range above MSL 226 to 229 metres.

The soil has good water holding capacity. Paddy, wheat, sugarcane and *bajra* are generally grown. The soils are fit for intensive cultivation.

Crops

The crops grown in the district are divided into two main categories, viz. *kharif* and *rabi*, locally called *samni* and *sadu*. The former is the summer season harvest and the latter winter season harvest. Any crop which does not strictly fall within these two harvests is known as a *zaid* crop and its harvest is called the *zaid kharif* and *zaid rabi*. *Toria* (an oilseed) is cultivated as *zaid kharif*; vegetables, melon, tobacco and green fodder as *zaid rabi*.

The major *kharif* crops of the district are paddy, *bajra* and sugarcane which occupy about 17 per cent, 22 per cent and 17 per cent respectively of the total cropped area. The other *kharif* crops are *jowar*, maize, cotton and *moong*. The *Jowar* and *gwar* are mainly used as fodder crop. To grow paddy and sugarcane is economical and these crops do well in sandy loam soils. Vegetables, onion, *arhar* and *mush* also deserve mention.

The major *rabi* crop is wheat which occupies about 85 per cent of the total cropped area. The other *rabi* crops are gram, barley, oil seeds, *rabi* pulses and vegetables.

Bajra, *gwar* and *jowar* (during *kharif*) are comparatively grown under barani conditions and grow well in sandy soils. Similarly, gram, oil seed and barley which are rabi crops are also suitable for these soils. The high yielding varieties of wheat cover 85 per cent of the total area and are grown in irrigated areas. The cotton cultivation has also been introduced in Gohana sub-division of the district. An area of 3,000 to 4,000 hectares was under these crops in the district. The table below gives the details about the sowing and harvesting of *kharif* and *rabi* crops :—

Name of crop	Soil required	Time of sowing	Time of harvesting
Kharif Crops :			
Paddy	Loam clay/loam	15th May to 15th July	October-November
Bajra	Sandy loam, sandy	June to July	Middle of September
Gwara	Sandy loam, loam	July to middle of August	September to November
Moong	Sandy loam/ loam/clay loam	April to July	June to September

1	2	3	4
Arhar	Sandy loam/loam	June to July	October to November
Jowar	Sandy loam	April to July	July to September
Maize	Sandy/sandy loam/loam	June to July	September
Cotton	Sandy loam/ sandy	April	September to November
Sugarcane	Loam/clay loam	Middle of February to Middle of April	End of November to end of April
Rabi Crops			
Wheat	Sandy/sandy loam/loam and clay loam	October to December	April
Gram	do	October	March
Barley	Sandy/sandy loam	October to December	March to April
Rabi (Oilseeds)	Sandy/sandy loam/loam	September to October	March

Production of principal crops during 1986-87 to 1988-89 is given in the Table V of Appendix.

Cropping Pattern

The cropping pattern adopted in the district during 1986-87 to 1987-88 is given below :—

Name of crop	Percentage of area under each crop	
	1986-87	1987-88
Kharif		
Paddy	24	18
Jowar	16	16
Maize	3	1
Bajra	10	5

Cotton	2	4
Sugarcane	10	16
Kh. Pulses	3	3
Vegetables	4	4
Others	16	14
Fallow	12	19
Total :	100	100
Rabi		
Wheat	85	83
Gram	3	2
Barley	1	1
Oilseeds	4	4
Rabi Pulses	1	1
Vegetables	2	2
Others	1	1
Fallow	3	6
Total :	100	100

Rotation of Crops.—The cultivators of the district have long been aware of the advantages of crops rotation. The general rotation of crops followed by the farmers in canal irrigated, well irrigated and *barani* areas is as follows :

Canal Irrigated

bajra-wheat or gram and sarson

paddy-wheat or gram or wheat and gram
jowar-gram

cotton-wheat-*gwara*-wheat

gwar (for fodder or grain)-sugarcane

Well-irrigated

maize-wheat-fodder

chillies-wheat or onion

gwar fodder-paddy-onion or vegetables

Barani areas

jowar or bajra or *gwara*-gram and sarson

jowar or bajra or *gwara*-gram or barley and sarson

jowar or bajra or *gwara*-fallow

Fodder Crops

The main fodder crop is jowar. It is grown during *kharif* and covers 16 per cent of the total cropped area. When fed green, *jowar* is called *chari* and when harvested after ripening and turned into hay, it is called *kaib* or *karbi*. Generally Jowar is not sown grain, if seed setting takes place then the grain is taken. In addition, *barseem* is the fodder crop during *rabi* season and is taken as green fodder. Oat is also sown during *rabi* season and is taken as fodder. But only marginal area is brought under this crop.

Foodgrain Crops

Gram, wheat, rice, *bajra* and maize are covered under this category in the district.

Gram.—This is a *rabi* foodgrain crop and is mostly sown in the areas of Gohana tahsil. It is generally sown after harvesting *jowar* and *bajra* if some moisture is still available in the land. It forms a good diet both for human beings and cattle. It is consumed right from the time of germination to grain development stage and is used for a variety of purposes. The area under this crop during 1987-88 was 2.0 thousand hectares. The average yield of gram during 1987-88 was 331 kg. per hectare. It rose to 936 kg. in 1988-89.

Wheat.—This is the principal *rabi* foodgrain crop. It is grown mostly under irrigated conditions. It is the main crop of the district. The main varieties sown in the district are : *Kalyan, Sona* and *Sonalika.*

The area under this crop was 124 thousand hectares in 1987-88. The average yield of wheat during 1987-88 was 2,724 Kg. per hectare. It rose to 3,013 Kg. per hectare in 1988-89.

Rice (Paddy).—It is mostly grown in the water-logged areas of Sonipat and Gohana tahsils. *Jhona* 349 is grown in soil of average quality and *basmati* 370, which is a fine variety, is grown in rich soil where a plentiful supply of water is available. The area under the crop during 1988-89 was 29 thousand hectares. The average yield in 1988-89 was 1957 Kg. per hectare.

Bajra.—In the rainfed areas this crop is more suitable than any other crop. It gives grain and fodder to the farmers. *Bajra* constitutes an important item of food during the winter season. But due to low price and high cost of cultivation, the farmers do not want to incease area under its cultivation. The area under this crop during 1988-89 was 13 thousand hectares. The average yield of *bajra* during 1988-89 was 793 Kg. per hectare.

Maize.—It is chiefly grown in the Sonipat tahsil. The new variety of hybrid maize is becoming quite popular with the farmers. During 1988-89, the area under its cultivation was 2.00 thousand hectares. The average yield of maize during 1988-89 was 385 Kg. per hectare.

Commercial Crops

Sugarcane.—It is an important cash crop of the district and is grown mostly under irrigated conditions. Due to installation of sugar factory and an extention of irrigation facilities, the farmers grow sugarcane crop in abundance. Greater emphasis is being laid on both early and late varieties in order to extend the factory working season. The main varieties sown in the district are: CO. 1148, CO. 767 and Haryana No. 3. The area under this crop during 1988-89 was 13 thousand hectares. The average yield of sugarcane (gur) during 1988-89 was 5,293 Kg. per hectare.

Chillies.—Chillies are sown in the *khadar* area of the Sonipat tahsil where sufficient well irrigation is availble. The area under this crop during 1987-88 was 0.5 thousand hectares.

Mushroom.—It is felt that Sonipat is heading for mushroom revolution. The cropping pattern is changing rapidly in the areas adjoining Delhi with more and more farmers switching over to the cultivation of vegetables, especially mushroom. A large number of schemes are being executed by the District Rural Development Agency (DRDA) to promote the cultivation of mushroom in the district. These schemes ensured speedy transmission of benefit of production to the farmers. There are many farmers who bring the seed from Solan (Himahal Pradesh) for the cultivation of mushroom.

Though Sonipat is the biggest market for mushroom in Haryana due to its proximity to Delhi, suitable transport facilties do not exist for the growers to take their produce to the market. Besides, lack of cold storage has added to

the losses of the producers. As already stated, there is also shortage of quality seed and credit facilties. Mushroom worth Rs. 50 lakh was produced during 1986-87. In 1989, there were about 300 growers producing 600 tonnes of Button mushrooms in the Sonipat area alone. There were over 170 growers in Bhadana and Kakroi villages, both within 10 km of Sonipat.

Oilseeds.—*Sarson, toria* and *tarmira(tira)* are the oil seed crops of the district. *Sarson* is generally sown as a pure crop or in rows with gram in *barani* areas and in rows with wheat in irrigated areas. *Taramira* is generally sown as a pure crop mostly in poor land and also in rows in gram fields. *Toria*, however, is grown only in irrigated areas. Linseed is minor oil-seed crop.

Different varieties of oil-seed crops are listed below:—

Crop	Seed per hectare (Kg.)	Variety
Taramira	.. 5	Selction-A
Raya	.. 5	Parkash, RL-18 Varuna, RH-30
Rapeseed	.. 5	BSH-L and local

Fruit Crops and Gardens

A variety of fruits like malta-orange, sweetlime, *kaghzi* lime, mango, grape and *ber* are grown in the district. The yield of different fruits in the old gardens was *ber* 42 per cent, *anar* 18 per cent, *amrud* 15 per cent, citrus 10 per cent, mango 10 per cent and other 10 per cent. The table below shows the yield of fruits:—

Fruits	Average oield per tree
Malta (Orange)	.. 250 to 300 fruits
Sweet lime	.. 200 fruits
Kaghzi lime	.. 33 Kg.
Mango	.. 40 to 80 Kg.
Amrud (guava)	.. 40 to 60 Kg.
Anar (Pomegranate)	.. 40 to 100 Kg.
Grapes	.. 40 to 80 Kg.
Ber	.. 75 to 100 Kg.

In 1950, two garden colony co-operative societies were established at Panchi Gujran and Kharkhoda. The fruit trees that receive prominence in

these garden colonies are malta, mango, kaghzi lime, sweet lime and guava. There is a good scope for gardens in the district.

The *khadar* area is suitable for mango cultivation while the rest of the district is suitable for guava, *anar* and other fruits. Now some cultivators are also trying for grapes. Under the D.R.D.A. scheme, 80,000 plants have been distributed amongst the cultivators.

There are two planting seasons, viz. spring (February-March) and Monsoon (July to October) for evergreen plants like malta, sweet lime, *kaghazi* lime, mango, guava and *ber*, while the planting of deciduous plants like pomegranate, grape and phalsa is done in January-February.

The area under fruits during 1987-88 was as follows:—

Name of the fruits	Area (Hectares)
1. Citrus	220
2. Mangoes	130
3. Peaches and pears	100
4. Other fresh fruits	673

Vegetables

With the incease of irrigation facilities, the cultivation of vegetables has increased considerably. The increase is notable particularly in or around the towns and adjoining villages as marketing facilities are easily available. The eating habits of the people in the villages are also changing and vegetables are becoming an important part of their diet. Consequently, a majority of farmers in villages having water enough for irrigation have started growing vegetables not only to meet their own requirements, but also to make additional money out of it. The increase in production of vegetables in the dstrict is borne out by the fact that at present a large quantity of vegetables is being daily supplied to Delhi from Sonipat, Rai and Murthal.

According to their growing season, the vegetables are divided into main groups, i.e. (i) Summer vegetables (ii) Winter vegetables. Summer vegetables include *tar* or *kakri*, *ghia*, *kadoo*, *tori*, *Petha*, *tinda*, *karela*, brinjal, tomato, *Bhindi* (lady finger) and sweet potato. Winter vegetables include a wide range of vegetables such as (a) root crops like radish, turnip, carrot; (b) and leafy crops, like *Palak*, *methi*, cabbage. Recent researches carried in the improvement of vegetables by the Indian Council of Agricultural Research, New Delhi and Haryana Agricultural University, Hisar introduced many new varieties which not only gave higher yield over the old type but also improved their quality and nutritive value. The area under vegetables (potatoes, sweet potatoes and onion) was 5,400 hectares in 1987-88.

PROMOTION OF SCIENTIFIC AGRICULTURE THROUGH ADMINISTRATIVE MACHINERY

Besides land and irrigation, the agricultural operation depend on many resources which must be scientifically exploited in the face of growing need of foodgrains. Scientific agriculutre today requires knowledge of various kinds based on the application of fundamental research to local conditions. It is the responsibility of the State to make this knowledge available, to encourage its understanding and to provide financial and other facilities to cultivators who are keen to use scientific methods in their cultivation to a limited extent. Any notable achievement in this direction on the part of Government as well as cultivators will be revolutionary in character because so far the Indian cultivator has been tradition-bound. Today, agriculture has assumed national importance, as India like other countries cannot hope to feed its growing millions without developing the means to produce enough food for all her people. The State involved on many fronts in an effort to improve all factors of scientific agriculture. To this end, Government has been spending a large sum of money to achieve self-sufficiency in food production so that India may not have to purchase large quantity of food from other countries.

The different Agricultural Development Officers/VEWS carry out work of agricultural production on the lines laid down by the Department of Agriculture. They educate the farmers in matters related to improved seeds, manures and fertilizers, agricultural implements, plant protection, horticulture, and scientific agricultural practices by laying out demonstration plots.

Besides, for technical guidance in the field of horticulture, one Agriculture Development Officer (Horticulure) was posted at Sonipat and another at Gohana.

The administrative machinery not only provides knowledge and practical demonstration but also administers financial and other help under various heads as provided by the State.

Agricultural Implements

The implements of the old type still in use are listed below:—

Locally called	Meaning
1. *Hal*	Plough
2. *Kuhari*	Hatchet
3. *Dikri*	Drag rake dragged by men for levelling high land
4. *Kasola*	Smaller mattock for weeding and hoeing

5.	*Jeli*	Six-pronged fork
6.	*Jua*	Yoke
7.	*Dranti*	Sickle
8.	*Kassi*	Large mattock spade
9.	*Gori*	A dikri-like implement, but dragged by bullocks
10.	*Santa*	Ox goad
11.	*Maij or Sohaga*	Flat clod crusher
12.	*Gandari*	Long handled chopper used for cutting sugar-cane, cotton sticks and bushes
13.	*Khurpa*	Grass spade
14.	*Kasola*	Large mattock for weeding and hoeing
15.	*Jeli-Chausang*	Four pronged fork
16.	*Chhaj*	Winnowing basket
17.	*Baguri*	Small khurpa like implement
18.	*Orna*	Seed drilling tube
19.	*Jandra*	Used for wat bandi in the irrigated areas
20.	*Tipya*	A wooden stand used while winnowing wheat, etc.
21.	*Gandasa*	Fodder-cutter
22.	*Gadi*	Cart

The farmers are now taking to improved agricultural implemets like iron plough (Haryana Plough), cotton drill, bar harrow, tirphali, etc. The tractors are also in great demand both for agricultural operations and transporting agricultural produce.

Any improvement in agriculture is inconceiveable without a corresponding improvement in the implements used. The modern implements are also being popularised by the Government through different schemes. A brief description of important agricultural implements in common use is given below:

Plough.—In this district, ploughing of the fields is done with the help of bullocks. The wooden and iron ploughs are being used by the people. The iron or wooden plough scratches the soil upto 4 or 5 inches. The chief defect in

it lies in the fact that it leaves ridges of unploughed land between the V—shaped furrows which it makes. The plough also fails to eradicate weeds properly. In the small land holdings and fragmented and non-contiguous plots, the plough is very much suited and it does not disturb the level of the land. It consists of three major parts: the beam (hala), wooden body (*hal*) and the coulter (*Panhari*) and kuis. In 1987-88, there were 43,842 ploughs (35,185 wooden and 8,657 iron).

Tractor.—As already stated that by and large cultivation is done with the help of animal power (bullocks and *Jhotas*). Although tractor is also appearing rapidly. Due to small land holdings, the farmers have to use tractors on hire basis. Only big landlords have their own tractors. These tractors are also used for pumping out water from tubewells during the power failure or shortage of electricity. The number of tractors during 1988-89 was 7,272.

Ghani (Oil expellers).—The oil expellers have been installed privately by the people. The total number of *ghanis* was 149; 122 having the capcity of 5 Kg. or above and 27 having the capacity of less than 5 Kg.

Sugar cane crushers.—Although there is a sugar mill in the district yet there are many sugarcane crushers. During 1982-83, there was an area of 18,000 hectares under sugarcane crop. The farmers who do not fall in the mill zone area, crush their sugarcane. During 1988-89, there were 271 sugarcane crushers in the district. The people mostly use iron-made crushers; being used with the help of power or diesel engines.

With the popularity of tractor in the use of agricultural operations, the trend of mechanized farming is moving fast in the district. The Haryana Land Reclamation and Development Corporation is also extending help to the farmers in the mechanized farming. The Haryana Agro-Industries Corporation has 2 service centres, one at Sonipat and another at Gohana. The centre at Sonipat has one combined harvester which is available at the harvesting season on reasonable rates.

Seeds

Good seed is the basis of successful agriculture. The Agriculture Department pays much attention to ensure the multiplication and supply of seed of improved quality. The better yielding varieties of seeds recommended for this district are as under:—

Kharif

Bajra	.. BJ-104, HS-I
Moong	.. Varsha, H-45

Gwara	..	FS-227
Groundnut	..	PB No. 1
Arhar	..	UPAD-120, Prabhat
Rabi		
Wheat	..	HD-2209, HD-1553, HD-2204, WH-147, WH-157, C-306
Barley	..	C-164, C-138, BG-25, BH-75
Gram	..	C-235
Raya	..	L-18, Parkash, Raya, Varuna, RJ-30
Sarson	..	BSH-I
Taramira	..	Selection No. 1
Toria	..	Sangam

The district is notified under the East Punjab Improved Seeds and Seedlings Act, 1949 under which it is an offence to sow varieties of seeds, particularly of wheat and cotton, other than those on the approved list of the State Agriculture Department.

The seed farms at different places are functioning in the district for the improvement of quality seeds. The details of the seed farms are as under:—

Location	Year of establishment	Area (Acres)	Crops sown for seeds
Panchi Gujran ..	1959	24·77	Wheat, gram, *bajra*, cotton
Kharkhoda ..	1958	26·37	Ditto
Rai (Govt.) ..	1977	48·5	Wheat, paddy, oil-seeds

The table below shows the progressive increase in seeds distributed during 1986-87 to 1988-89:—

Year	Improved seeds distributed (Tonnes)		
	Paddy	Wheat	Bajra
1986-87	110	1,122	10
1987-88	45	707	4
1988-89	37	650	5

MANURES AND CHEMICAL FERTILIZERS

It is a well recognised fact that different crops, while growing, remove various plant nutrients in substantial quantities from the soil. The continued deterioration of plant food elements from soil leads to low soil fertility and lower agricultural yields. It is, therefore, essential that plant nutrients are replenished through the increased use of manures and fertilizers so that crops continue to give good yields.

Compost manure.—Farmyard manure or cattle dung manure is an all round good manure for the maintenance and improving the soil fertility. However, the farmyard manure commonly used by the cultivators is poor both in quality and quantity. This is largely due to faulty method of its preparation and imcomplete utilisation of the useful ingredients contained in cattle dung. In the context of emphasis on high yielding varieties programmes, it has been inevitable that larger quantities of good quality manure are produced in the villages; Department of Agriculture is making all-out efforts in this repsect. For this reason, the entire district was notified under the East Punjab Conservation of Manure Act, 1949, whereunder the farmers are required to conserve the cattle dung and other vegetative wastes in pits of proper dimensions.

Another important source from which large quantity of good quality manure could be obtained in the refuse of urban areas. Almost all the municipalities in the district have taken up the work of composting of urban wastes.

Green manuring.—This is a very important for soil fertility as it directly adds nitrogen to the soil. Experiments have revealed that an increase of about one quintal of foodgrains per acre results through green manuring. It also improves the soil texture by the addition of humus or organic matter. The addition of organic matter improves both heavy and sandy soils; for it has a binding effect on the loose particles of sandy soil and makes the tough and heavy soil friable. The water holding capacity of the soil is also increased. Further, it creats better conditions for the increase of useful bacteria in the soil. Green manuring with sunn-hemp, *gwara* and *dhaincha* is recommended. Practice of green manuring is being popularised by distributing of free seed packets of *dhaincha.*

Chemical Fertilizers.—The soils in the district are alkaline in nature and poor in organic matter. So, apart from green manuring, chemical fertilizers are also very essential for increasing crop yields. Following a large number of field demonstrations, farmers are now becoming keen to use fertilizers. *Taccavi* loans are given for purchase of fertilizers and their supply is arranged by the Government at controlled rates. Distribution of fertilizers is done by the

Haryana Agricultural Marketing Federation through agricultural societies. The supply of fertilizers to the distribution points is regulated by the Deputy Director of Agriculture by co-ordinating this programme between Extension Agency and Supply Agency. The following data regarding the distribution of chemcial fertilizers show that its use is becoming increasingly popular:

Year	Chemical fertilizers distributed (Tonnes)		
	Nitrogenous	Phosphatic	Potash
1986-87 ..	16,875	4,347	119
1987-88 ..	18,531	5,666	186
1988-89 ..	20,678	6,829	184

Agricultural Co-operatives

The agriculturist stands in need of help of various kinds during the course of his multiple operations. If he can obtain short, medium or long term credit when required, improved implements, adequate quantity of fertilizers, improved seeds, insecticides, pesticides, irrigation facilities and facilities for storage and marketing of his agricultural produce, he may be able to get the best out of his efforts. It is only through agricultural cooperatives that he can get all these facilities in time and in a reasonable manner. If he goes a step further to engage in cooperative farming, his scanty resources can be pooled with those of other farmers in order to bring all the participants the gains of large-scale intensive farming.

Agricultural Pests and Diseases

The crops are occasionally exposed to damages from an immense variety of diseases and pests. Some pests and diseases are listed below:

(1) **Crop Pest and Diseases**

(a) Sugarcane top-borer

(b) Sugarcane stem-borer

(c) Sugarcane Pyrilla

(d) Gurdaspur borer

(e) Cotton jassid

(f) Rice bug

(g) Sarson aphis

(h) Gram cut-worm

(i) Loose smut of wheat

(j) Toka or Phirkala

(k) Covered smut of barley

(2) Fruit Pests and Diseases

(a) Citrus pyrilla

(b) Lemon caterpillar

(c) Mango hopper

(d) Mango mealy bug

(e) Citrus canker

(3) Vegetable Pests

(a) Red pumpkin beetle

(b) Brinjal hadda

(c) Potato and Bhindi jassid

(d) Singhara beetle

(4) Store Grains Pests

(a) ***Khapra***

(b) ***Susri***

(c) ***Dhora***

(2) Miscellaneous Pests

(a) Field rats

(b) Jackals

(6) Obnoxious Weeds

(a) ***Pohli***

The Agricultural Department is advocating through intensive propaganda control measures to reduce the damage. Fumigation work is being done by the Department on a large scale by the staff working under the Fumigation Scheme.

ANIMAL HUSBANDRY

The animal husbandry activities in the district are looked after by the Epidemiologist, animal husbandary, who is assisted by 22 Veterinary Surgeons, 23 Stock Assistants and 37 Veterinary Compounders. The main officers at district level of this Department are S.D.O. (A.H.), Gohana, S.D.O. (A.H.), Sonipat, Assistant Rinderpest officer, Sonipat and Project Officer, Research Disease surveillance, Sonipat. Animal husbandry activities relate to Cattle breeding, artificial insemination work, control of the out break of Contagious diseases amongst livestock, improvement of livestock and provision of veterinary aid.

The major part of population is engaged in animal husbandry which is next to agriculture. As the human population is sharply increasing day by day so the demand of milk, eggs and meat is also increasing. In order to meet the increasing requirement of milk, eggs and meat, the department is taking up various livestock development programmes.

The district possesses a fairly large number of livestock including cattle, buffaloes, horses, and ponies, goats and pigs. The livestock population in the district as per 1977 and 1982 Censuses was as under:—

Numebr (in Lakhs)

Particular	1977	Per-centage	1982	Per-centage
1. Cattle ..	1.64	36.10	1.22	26.0
2. Buffaloes ..	2.34	51.5	2.44	51.9
3. Sheep ...	0.16	3.5	8.26	5.5
4. Goats ...	0.09	2.0	0.16	3.4
5. Pigs ...	0.21	4.6	0.23	4.9
6. Camels ...	0.01	0.2	0.01	0.2
7. Horses, Ponies ...	0.03	0.6	0.03	0.6
8. Donkeys and Mules ...	0.07	1.5	0.05	1.1
9. Poultry ...	1.07	0.00	0.37	...
10. Others ...	0.30	...	...	6.4

On comparing the livestock population of 1982 with respect of 1977, it is observed that there is an increase in each category of livestock but there is a decrease in cattle population during 1982 as compared to 1977 census.

Cattle and Buffaloes

Animals, especially cattle, play an important role in the economy of the district. The essential equipment of the peasant-farmer includes a pair of oxen or buffaloes to do the ploughing and to draw his cart. Even though bullocks have been replaced by tractors, motor transport and electric power in some cases, yet many farmers, particularly the small cultivators, still depend upon them.

The Royal Commission on Agriculture in India remarked about cows in India that " in most parts of the world, they (cows) are valued for food and for milk ; in India their primary purpose is draught for the plough or the cart. The religious veneration accorded to the cow by the Hindus is widely known. To at least half of the population of India the slaughter of the cow is prohibited and this outstanding fact governs the whole problem of improvement of cattle in this country. It is necessary to recognize the obligations under which the country stands to the cow and to her offspring, the trusty ox. without the ox no cultivation would be possible; without the ox, no produce could be transported".[1] This is largely true even today.

The Sonipat district has a long history of cattle rearing. Before 1820, large herds of cattle were kept by individual landowners. As the grazing area was abundant, the stocking of grazing lands was usually light ; therefore, the question of a real fodder famine grew acute only when rains failed for two to three years in succession. In case of a severe famine, it was customary to move the cattle to the banks of the Yamuna or wherever grazing was available after the local fodder reserves had been exhausted. In a way famines did good to the quality of the breed by compelling owners to select their best cattle to be sent to places where fodder was more plentiful. The relatively poorer cattle were left behind to die in large numbers. This periodic, but vigorous, selection in those days was probably one of the most significant factors in keeping up the quality of the cattle.

The history of catle breeding after 1820 is closely connected with various economic factors such as famines, the spread of canal irrigation and the breaking up of grazing areas. Each ofthese factors in its own way hastened the decrease of feed and forage available. Whenever a period o f scarcity occurred, both man and beast suffered, the latter much more. There are no accurate records of cattle mortality due to famines prior to 1800, but references to different famines in district songs and folklore give some idea of the extent of ruffering and loss of cattle. The extensive breaking-up of grazing lands after 1840

1. Report of the Royal Commission on Agriculture in India, 1928 p. 169.

consequent on the introduction of flow irrigation greatly restricted the grazing grounds of the villages; the fodder-supply grown in the fields was barely sufficient for the yearly consumption of the cattle, and left but a small margin as reserve against drought.

In the beginning of the twentieth century the cattle of this district were reported to be famous on account of their fine conformation and size.[1]

The district has the distinction of being one of the areas regarded as the home of *Murrah* and *Haryana* breeds. *Murrah* buffalo-cows are amongst the most efficient milk and butter-fat producers in India. They are reared for milk and *ghee* production in almost all the big cities and in rural areas. The best specimens of this breed in the district are found in the Gohana tahsil. Although average lactation yield in these herds varies from 1,500 to 2,000 Kg. The butter-fat content varies from 4 to 13 per cent, the average being about 7 per cent.

The Murah buffalo-cow has a very deep massive frame with a comparatively light neck and head, short tightly curled horns, well-developed udders and long tail with white marking reaching the fetlock. While the popular colour is jet black, animals of brown colour are also found. The white markings on face and extremities common in *Nili* and *Ravi* buffaloes are not present in the true *Murrah*.

The bullocks are good work animals, particularly for fast ploughing and road transport. The typical mature males measure 1.42 to 1.45 meters in height behind the hump and weigh from 380 to 500 kg; while mature females measure 1.32 to 1.35 meters in height and weigh about 300 Kg. The head is carried high and gives them a graceful appearance. The popular colour is white or light grey. In some of the males particularly when entire, the head, neck, hump and quarters develop a dark grey colour, but this colour often changes to white on castration. The long and narrow face with a flat forehead and a well-marked bony prominence at the centre of the poll are the indications of purity of breed.

The cows are good milkers and for this reason they are very much in demand all over the country. Pedigree herds of this breed are maintained in Government farms.

Measures to improve quality of cattle breed

As early as 1897, the District Board, Rohtak recognised the importance of protection and improvement of animals. It maintained quality bulls and subsidised the breeding cows and buffaloes. Such work was continued and extended in various ways both by the local bodies and the Government.

---

1. *Rohtak District Gazetteer*, 1910, p. 111.

A key village scheme was started in 1958. Under the scheme, which was a centrally co-ordinated project aiming at the improvement of cattle and buffaloes in selected villages, pedigree bulls from the Government Livestock, Farm, Hisar, were provided. An artificial insemination centre was set-up at Sonipat. Bulls of superior quality were supplied at the centre. All unapproved bulls were castrated or removed from the key village block and no bull other than the selected one was allowed to breed.

Selected male calves born out of high yielding dams were taken up for subsidised rearing under the scheme. A subsidy of Rs. 15 per month was allowed to the owner of the selected calf till the calf was matured (2 /½ years). The Government had the first right to purchase such calves, when they matured, for its cattle development activities.

After the formation of thedistrict in December, 1972, a comprehensive plan for increasing the milk production and working efficiency of cattle was launched. It envisaged systematically planned method for the best utilisation of superior germ-plasm obtained from superior bulls by its proper distribution throughout the district. Technique of artificial insemination is used to maximise the utility of available number of approved bulls through cross breeding in cows and selective breeding in buffaloes. Controlled breeding was progressively brought through the removal of scrub bulls in the area. Haryana bulls known for their high qualities are being extensively used for breeding. Besides, exotic semen is being used to meet the requirement of semen. Bulls of high quality are stationed at Sonipat from where semen is collected artificially. Additional cow-buffalo semen is brought from other semen banks of the State.

To provide breeding facilities effectively, 1 Regional Artificial Insemination Centre, 5 Stockman Centres, 13 Vaterinary hospitals, 22 hospital-cum-breeding Centres and 41 Veterinary dispensaries were available in the district during 1988-89. The figures of artificial insemination done and calves born during 1986-87 to 1988-89 are given below :—

(Figures in 000)

Year	Artificial insemination done		Calves born	
	Cows	Buffaloes	Cows	Buffaloes
1986-87 ..	22	22	5	6
1987-88 ..	21	19	5	6
1988-89 ..	18	18	5	5

Sheep breeding.—According to 1982 Livestock Census, the sheep population in the district was 0.26 lakh. Sheep provide necessities of vital importance, e.g. meat forfood, wool for clothing, skin for industrial enterprise and manure for agriculture. As the number of sheep in the district is small, so the sheep development work is looked after bythe vaterinary institutions functioning in the district.

Piggery development.—The pig population according to 1982 Census is 0.23 lakh in the district. To improve and develop piggery, the pigs produced at the govenrment livestock farm at Hisar and Pig Breeding Farm at Ambala are supplied to the breeders at subsidised rates. The veterinary institutions functioning in the district also attend to such work.

Poultry farming.—According to 1982 Livestock Census, there were 0.37 lakh poultry birds. On account of its proximity to Delhi and Grand Trunk Road passing through it, the Sonipat district has a great potential for poultry development. The poultry and eggs find a ready market in Delhi. To develop the poultry, there are 2 Poultry Extention Centres and 1 Poultry Disease Diagnostic Laboratory. The breeders of the district are supplied W.L.H. chicks at subsidised rates either from Hatchery-cum-Poultry Farm, Hisar or Government Poultry Farm, Ambala. Mass-scale vaccination and debeaking are carried cut at the Poultry Extention Centres and other veterinary institutions.

Animal Diseases And Vaterinary Hospitals

Animal diseases.—The common diseases prevalent in the district are rinderpest or cattle plague (*birla, wah, mata* and *khuni dust*), haemorrhagic septicaemia (*ghotu , gal qhotu* or *gal sujan*), black quarter or black leg (*sataha, patsuja*), fect and mouth swelling (*muuh khur, rora chapka*) and parasitic infections. These diseases are controlled with prophylactic vaccinations and curative measures. Since regular campaigns for inoculation and vaccination against these diseases are conducted, none of these has taken any epidemic form. With the introductoin of Rinderpest Eradication Project in 1958, the incidence of this disease has been much reduced.

Surgical treatment developed by Haryana Agriculture University, Hisar has proved very useful. The university provides Animal Disease Investigation Staff and diagnostic service to the field veterinarians and livestock owners. In case the field staff are not able to diagnose the disease, the matter is referred to the disease investigation staff of the University. After conducting the laboratory examination, the suitable preventive and curative treatment is recommended for the control of diseases.

Veterinary hospitals.—At the time of the creation of the district (1972), there were 12 veterinary hospitals and 6 dispensaries in the district, Now (on

March 31, 1989), there is a net work of 13 veterinary hospitals, 22 hospitals-cum-breeding centres, 41 veterinary dispensaries, 1 regional artificial insemination centre and 5 stockman centres. The list of veterinary institutions may be seen in the Table VI of Appendix.

During 1988-89, the number of Veterinary personnel in the district was 282 (Veterinary Surgeons 34, Vetey. Live stock and Development Assistants-97, Dressers and Farriers-1 and Class IV-150.)

A veterinary hospital generally functions under the charge of Veterinary Surgeon, who is assisted by a Veterinary Compounder and Stock Assistant besides other class IV attendants. A stockman centre is run by a Stock Assistant with the help of Class IV attendants.

During 1988-89, 1.23 Lakh animals were treated in the various veterinary institutions. The details about number of inoculations and vaccinations performed in the district are given below :—

(in Lakhs)

Name of disease	Number of animals vaccinated and inoculated
1. Rinderpest	1.02
2. Haemorrhagic-Septicaemia	3.67
3. Black quarter	0.04
4. Ranikhet	0.47
5. Fowl pox	1.22
6. Sheep pox	1.65
7. Foot-Mouth	0.31
8. Swine fever	0.06
9. Enterotomia	0.16
10. Others	0.89

Slaughter houses.—There are three slaughter houses in the district, located at Sonipat, Gohana and Ganaur. The animals (goats, sheep and pigs) are

inspected by the Veterinary Surgeon before and after their slaughter, to ensure that meat being made available for human consumption is free from disease. The year-wise number of animals slaughtered in the district is given below :—

Year	Animals slaughtered (000)
1986-87 ..	8.8
1987-88 ..	9.4
1988-89 ..	10.4

Problems of stray animals.—There is a Cattle Catching Party in the State to round up wild, stray and useless cattle which create problems for the farmers. The panchayats approach the Gaushala Development-cum-Cattle Catching Officer, having headquarters at Chandigarh, who deputes the cattle catching party to the affected area for rounding up the animals. The rounded animals are put to auction and the unsold are sent to Mandawala Gosadan in Ambala district.

Gaushala development.—According to the old concept, *gaushalas* were institutions inspired by religious sentiments to house the unproductive and useless cattle and were run on charity. To give new meaning to the old concept, an idea was mooted to convert these institutions into Cattle Breeding-cum-Milk Producing Centres with some financial assistance and technical guidance. The 4 registered *gaushalas* in the district are at Gohana, Sonipat, Sisana and Jakhauli.

Dairy farming.—Not only in the State but also all over the country, the district is known for the quality of its milch animals, both cows and buffaloes. As per 1972 and 1982 Livestock Censues, the number of buffaloes and cows is as under :—

(Figures in lakhs)

	1977		1982	
	Cows	Buffaloes	Cows	Buffaloes
In milk ..	0.21	0.67	0.19	0.73
Dry ..	0.17	0.50	0.11	0.32
Not calved even once ..	0.02	0.04	0.03	0.08
Others ..	..	..	..	..

The farmer can be interested in maintaining quality milch animals for commercial milk production if he finds ready and remunerative market for milk at hand. In 1959, Delhi Milk Scheme was initiated by the Government of India to cater to the milk requirements of Delhi in an organized manner. It was also to provide a fair remunerative market for milk producers in areas in the neighbourhood of Delhi. Later the Delhi Milk Scheme commissioned its milk collecting and chilling Centres at Kharkhoda and Sonipat.

The venture of Delhi Milk Scheme could not succeed in this district for various reasons. First, Delhi Milk Scheme did not take any measures to increase milk production in the area. Secondly, the attractive prices were not offered to the milk producers (farmers). The price at which milk was sold for local consumption was generally higher than what the Delhi Milk Scheme offered. With industrialization and the resulting urbanisation in some of the areas of the district, such as Sonipat and Gohana, local demand of milk increased considerably. The milk collection and chilling centres put up by Delhi Milk Scheme could not succeed.

As in other parts of the State, the milk trade remained disorganized in the district and the prices of milk and milk products ruled high during summer season. The dairy on modern lines was absent. To develop the dairy industry on commercial lines, the Dairy Development Corporation was set-up in Haryana in 1970 .

To develop the dairy and animal husbandry in the State, two training centres were established at Karnal and Gurgaon in 1976-77 and 1981-82 respectively. The Sonipat district was tagged for training purposes with Karnal Training Centre. Those youngmen who have a desire to install a dairy are given training for 21 days under the self-Employment Scheme. During 1987-88 and 1988-89, 327 and 174 persons from this district received training at Government Dairy Training Centre, Karnal.

A Mini Dairy Scheme was also initiated by the Government during 1979-80 to provide self-employment opportunities to the young persons. Under this scheme rural youngmen/women are assisted in securing loan through various institutional finances and the Department provides insurance margin money and attractive subsidy to the loanee. The 5-milch cattle and 3-milch cattle units are being launched by a group of ten persons on cooperative basis. The 3 -milch cattle unit could only be run by the educated members of Scheduled Castes separately.

The achievement made pertaining to the Mini-Dairy Schemes (5-Milch Cattle Scheme and 3 -Milch Cattle Scheme) is as shown below :—

Name of the Scheme	Persons who were given loans		Buffaloes purchased with the loan	
	1987-88	1988-89	1987-88	1988-89
1. 5-Milch Cattle Scheme	27	18	97	74
2. 3-Milch Cattle Scheme (S.C.)	43	40	98	103
3. 3-Milch Cattle Scheme (G.C.)	39	40	109	95
	109	98	304	272

FISHERIES

The Fisheries Development Officer was overall incharge for the fish development in the district. In 1988-89, he was assisted with 3 Fisheries Officers with thier head-quarters at Sonipat, Gohana and Kharkhoda; 1 Assistant Fisheries Officer having headquarters at Rai and other lower technical staff. He (F.D.O.) functioned under the administrative control of Director Fisheries, Haryana, Chandigarh.

The district of Sonipat has a huge water resources in the form of river, drains, canals and ponds. These resources offer a significant potential for increasing fish production and for generating income for the economically weaker sections.

The notified water in the district are: river Yamuna, Diversion Drain No. 8, Drain No. 6, Drain No. 5, Nai Nala and Delhi Branch Canal. Close season is observed from Ist July to 31st August. The notified waters were auctioned by the Director of Fisheries, Haryana in open auction. The amount fetched through auction during 1988-89 was Rs. 93,000.

The village ponds can be utilized for fish culture. Departmental survey was conducted in the district and found about 750 ponds covering a water area of about 1,100 hectares. Most of the ponds are seasonal, but by proper reclamation/renovation, these can prove useful for fish culture.

The rights and management of the village ponds are with the panchayats. Some panchayats put their ponds on lease to the fish farmers on long-term basis. The technical guidance, financial assistance and supply of quality fish seed are provided to the fish farmers by the Fisheries Department.

In 1988-89, total water area brought under fish culture was 240.05 hectares and 2053.50 tonnes of fish was produced. The fish produced during 1988-89 earned Rs. 205.35 lakh.

The block-wise area brought under fish culture during 1988-89 was as under :—

Block	Area in hectare	Fish seed stocked (in lakhs)
1. Sonipat	29·4	2·89
2. Ganaur	17·0	1·50
3. Kharkhoda	39·00	2·91
4. Rai	34·0	2·90
5. Gohana	38·6	1·42
6. Mundlana	42·0	1·46
7. Kathura	40·5	2·37
Total :	240·5	15·45

The important varieties of food fish available in the district are as under :—

1. Carps of family Cyprinidae

Labeo rohita (Rohu) .—It is a column-bottom feeder, and grows to three feet or more in length. It is a very popular variety.

Labeo calbas (Kalbas) .—It is relatively slow growing and attains a size of about 3 feet.

Catle Catla (Thaila) —It is a surface feeder and the fastest growing carp fish in India. It is quite popular when not exceeding two feet in size. The large specimens, reaching up to six feet, are rare.

Cirrhina mrigala (Mobi) .—It is a bottom feeder and grows to 3 feet or more.

II Cat fish

Wallago attu (Malhi) .—It is a predacious and piscivorous fish, and grows to a size of about six feet. It is a good game fish.

Mystus seenghala(Seenghara) .—It attains a length of over four feet.

Notopterus notopterus (Pari) .—It also attains a size of 1½ feet.

Notopterus chitala (Moh) .—It is a game fish grow ng to 1 ¼ feet in size.

Silonia silondia (Silond) .— It prefers strong streams and clear deep waters. It grows to a size of six feet and is considered good for eating.

III Minor Carp

The fish of this type are : *Labeo gonius* (*Seercha*), *labeo bata* (*Bata*), *Cirrhina riba* (*Reba*), *Pangasius pangesius* (*Pangus*), *Bagaruis bagruis* (*Gonch*), *Chella baccila* (*Chilwa*), *Mastacemblus armtus* (*Bain*), *Callichrous patoa* (*Paboda*), *Callichrous bimaealatus* and *Mugil Carusla.*

FORESTRY

The Sonipat Forest Division which was created on October 1, 1974, covered the entire revenue district of Sonipat. This division is under the charge of the Divisional Forest Officer (also called Deputy Conservator of Forests) with headquarters at Sonipat. He is assisted by 3 Range Forest Officers (Forest Rangers), one each at Sonipat, Rai and Gohana Ranges. The other staff include 3 Deputy Rangers, 10 Foresters and 50 Forest Guards. The Divisional Forest Officer acts as a Co-ordinator, with the Deputy Commissioner and other officer at district level while at the State level he is answerable to the Chief Conservator of Forests, Haryana, Chandigarh through the Conservator of Forests, North Circle, Panchkula

Each range of the forest in the district is co-terminous with the civil boundary of community development block. Rai range covers the community development blocks of Rai and Kharkhoda, Sonipat range the blocks of Sonipat and Gnaur while the community development blocks of Mundlana. Gohana and Kathura fall under the Gohana range. The forest ranges have been further divided into different forest blocks under the charge of Deputy Rangers)/ Foresters. Each blockhas been further sub-divided into forest beats under the charge of a Forest Guard.

The area under forests is classified according to ownership, private and the State,. Forests owned by panchayats/communities and private individuals

are included under private forests The State forests, on the basis of legal status, are categorised as reserved, protected and unclassified. The reserved forests are permanently earmarked to the production of timber or other forest produce and in them, the right of grazing and cultivation is seldom allowed.

There is no reserved forest under the control of this division. Forests of this district mainly comprise waste strips on both sides of the railway lines, canals, drains and bunds. The following area was under forests in the district during 1988-89:—

Classification of forests	Area (in Hectares)
(A) State	
(i) Reserved	..
(B) (1) Protected	7,400
(a) Compact blocks	..
(b) Strips	..
(i) Railway lines	332
(ii) Roads	1,641
(iii) Canals and bunds	5,478
Total	7,451
(c) Unclassified	324
(d) Private Forests	
(i) closed under Section 38 of the Indian Forest Act, 1927	9
(ii) Closed under Sections 4 and 5 of the Land Preservation Act, 1900	61
Total :	70
Grand Total :	7,845

are included under private forests The State forests, on the basis of legal status, are categorised as reserved, protected and unclassified. The reserved forests are permanently earmarked to the production of timber or other forest produce and in them, the right of grazing and cultivation is seldom allowed.

There is no reserved forest under the control of this division. Forests of this district mainly comprise waste strips on both sides of the railway lines, canals, drains and bunds. The following area was under forests in the district during 1988-89:—

Classification of forests	Area (in Hectares)
(A) State	
(i) Reserved	..
(B) (1) Protected	7,400
(a) Compact blocks	..
(b) Strips	..
(i) Railway lines	332
(ii) Roads	1,641
(iii) Canals and bunds	5,478
Total	7,451
(c) Unclassified	324
(d) Private Forests	
(i) closed under Section 38 of the Indian Forest Act, 1927	9
(ii) Closed under Sections 4 and 5 of the Land Preservation Act, 1900	61
Total :	70
Grand Total :	7,845

The strips along railway lines, roads, canals and bunds are under the ownership of respective departments. These strips are maintained by the Forest Department for afforestation purposes. The areas closed under Section 38 of Indian Forest Act, 1927 were voluntarily handed over by the owners to the Forest Department for optimum utilization of the waste land by increasing the density of growing stock for benefit of the society. The areas under Sections 4 and 5 of the Land Preservation Act, 1900 were closed compulsorily in the interest of better habitat and preservation and conservation of the site.

This district has twin problems of water-logging and salinity. Large areas have been affected by the salinity. A special effort is needed to tackle these problematic areas for optimum utilization. Strip areas are managed for economical and protective use.

Farm Forestry

Plants are raised under this scheme and are supplied to the farmers at subsidised rates for creating awareness and love for plants among the village folk. The supply of these plants will improve the ecology of the tract and the farmers' income. It will meet his daily requirements of fire-wood and small timber. The forests must be raised and maintained constantly for the gainful employment for the poor.

The following works were done under different schemes in Sonipat Forest Division during 1987-88 to 1988-89 :—

Name of the Scheme	Area under forest	
	1987-88	1988-89
1. P. Scheme (Rail, Road and canal) ..	..	..
2. P.S. Farm forestry, fuel wood plantation	..	..
3. Normal ..	..	..
4. P.S. Quick growing species ..	..	50 hectares
5. P.S air Strips ..	..	..
6. P.S. mixed plantation, waste land and suitable land	..	..

7.	P.S. Plantation on p/Lands	..	..
8.	P.S. Extension forestry	.. 465 RKM	600 RKM
9.	C.S.S. development of social forestry including reafforestation of degraded forests and raising of shelter belts	..	..
10.	P.S. make India green	..	..
11.	C.S.C. Shelter belts	..	..
12.	Raising of fuel wood plantation on degraded forest land	..	..
13.	Social forestry Project (World Bank aided project)	..	..
14.	P.S. Problematic sites	.. 10 hectares	20 hectares
15.	P.S. Industrial and Commercial use	..	.. 50 hectares
16.	P.S. rural wood plantation	.. 200 hectares	350 hectares

The forest produce is divided into two main categories; major and minor. The major forest produce consists of timber and fuel-wood. The minor forest produce consists of grasses, fruits, etc. As per decision of the Government, all major forest produce is being harvested through departmental felling except few dry fallen trees which are auctioned to the private contractors.

The following figures show income from dry and fallen trees: —

Year	Income
	Rs.
1975-76	1,85,768
1976-77	5,41,212
1977-78	2,15,885

1978-79	4,63,938
1979-80	5,53,055
1980-81	5,47,981
1981-82	2,48,585
1982-83	2,85,500
1983-84	3,51,970
1984-85	2,58,310
1985-86	5,02,297
1986-87	1,29,926
1987-88	3,23,415
1988-89	8,53,296

The forests have played a very important role in the economy of the district by providing timber and fire wood for local requirements. *Sisham, kikar, neem*, eucalyptus, etc. are the important plantation species raised by the Forest Department. The Department created enough scope of employment directly in forest works and indirectly in the forest-based industries such as saw mills, packing cases, ply-wood and furniture.

Social Forestry Division, Gurgoan/Panipat came into existence during the 1982-83 and since then instensive social forestry and farm forestry programmes have been implemented in this district too.

Natural Calamities

Floods

Due to the extension of irrigation in the district from the Western Jamuna (Yamuna) Canal, there has been much precipitation. The Yamuna, passing along the eastern boundary of the district is the only natural drainage line which provides a suitable natural outfall for the drains of the district

The district suffered from floods many times. "Tradition says that in the 17th century the dam of the old royal canal of Nawab Mardan Alikhan

(Ali Mardan Khan) broke below Gohana and a flood came down which destroyed the city of Lalpura whose foundation stilllie a mile or so west of Rohtak, but time has probably exaggerated the catastrophe"[1]

Some of the worst floods which hit the district during the present century occurred in the years 1924, 1925, 1960, 1961, 1963, 1964 and 1967. The floods in 1924 in which the notorious Drain No. 8 caused considerable damage, were caused by the overflowing of the Yamuna. Sonipat tahsil was badly affected and considerable damage was caused in the Gohana tahsil

There were unprecedented rains in 1960 especially during the month of August. These resulted in very heavy floods in Gohana and a number of surrounding villages. Most of the roads leading to the town were cut off, The accumulated water at Gohana and surrounding villages had only one outlet, i,e, Drain No 8 which outfalls in the Bhindwas Lake This accumulated water and heavy rainfall resulted in breaches in the banks of the drain and 533 villages (out of a total of 761 in the then Rohtak district) were flooded.

Floods again hit the district in August, 1961. Notorious Drain No. 8 again spilled over Gohana and the bund to the north-west of the town was breached at many places. Another stream coming from Jind side flooded areas across Butana, Baroda and Ahulana. Then another stream flooded about a dozen villages lying between Rithal and Samchana for some 32 kilometres. The West Juan Drain badly flooded a tract about 48 kilometres long and many places 5 kilometres wide. The 15-kilometre Jhundpur-Takrol-Mihrampur bund on the Yamuna in the area of the then Sonipat sub-division breached and water rushed through a number of villages. The residents of Jhundpur had to be encamped at Sonipat.

During 1963, the breaches in various drains and heavy rainfall flooded various low-lying areas, i.e. Baroda, Jagsi, Bhandari, Khandrai, Chhapra, Bhanwar and Kathura

Again in 1964, the heavy rainfall resulted in floods in the then Sonipat tahsil. Almost the whole of the tahsil was under water. Breaches in Drain No. 6 were the main cause of floods in this area. After closing the breaches, pumps were installed at various places to de-water the area. The area in 1967 also witnessed extensive floods in the Sonipat tahsil. The overflowing of the Yamuna resulted in the inundation in quite number of villages in the Sonipat tahsil too.

Prevention of floods —Drain No. 8 starts opposite Gohana town and after covering 88 kilometres falls into Bhindwas depression. To check the

1. *Rohtak District Gazetteer*, 1910, p. 23.

over flowing of this Drain, its left bank towards Rohtak town) was raised by 3 feet and the right bank by 1 foot. Further, flood water of this drain was diverted to the Yamuna through a newly constructed Diversion Drain No. 8 which is 73 kilometres in length from Gohana to the Yamuna. Most parts of the Gohana and Sonipt tahsils benefitted by this diversion drain.

The other two minor drains are : Dobheta Drain and Chhapra Drain. The former, 20 km. long, is tributary drain to Diversion Drain No. 8 and serves Dobheta village in Sonipat tahsil and Bidhol, Kalwal, Lath and other villages of Gohana tahsil, while the latter, 13 kilometres long caters only to the Gohana tahsil and outfalls into Drain No. 8.

The remodelling of Drain No. 6, which is an old drain, 41 kilometres in length, was taken in hand after the monsoon of 1964. This project benefitted very much to the Sonipat tahsil. The remodelling work on Issapur Kheri Drain, Nai Nallah Drain No. 3., Drain No. 4, etc protected the district from floods.

After the formation of Haryana as separte State, many schemes pertaining to bunds proved a boon to the flood affected areas of the district.

Famines and Droughts

The record of famines is a bad chapter in the history of the district. With insufficient means of irrigation and notoriously precarious rainfall, it was natural that it should be frequently visited by famines.

Each of these was given a specific name based on the year of its occurrence and is like an epoch in the history of the countryside. The famines (*kal*, or *akal*) best remembered, are mentioned below[1]:—

Year		Local name[2] of famine	Brief description
A.D.	Samvat		
1753-54	1810	*Dasa*	..
1782-83	1840	*Chalsa*	Lasted for three years ; grain sold at 5 *seers* to a rupee; a large number of villages date their refoundation in whole or in part from this famine.
1802-03	1860	*Satha*	Grain sold at 10 *seers* to a rupee, two consecutive harvests failed.

1. For a detailed description of famines see *Rohtak District Gazetteer*, 1910, pp. 146—52.

2. The local names of the famines convey the *Samvat* years in which they occurred.

1817-18	1874	*Chauhattra*	Chiefly a fodder famine like that of A.D. 1877-78; grain sold at 12 *seers* to a rupee.
1833-34	1890	*Nawbia*	Very severe grain famine, grain unprocurable.
1837-38	1894	*Chauranwa*	Not so severe as in A.D. 1833-34.
1860-61	1917	*Sattrah*	More severe than the *Chalisa*, rains failed for two years; three preceding harvests bad; people had to resort to berries of karil bushes; the rains of 1859-60 were poor, and those of 1860-61 failed almost entirely so that Najafgarh Jhil ran dry-an occurrence unknown before, grain sold at 8 *seers* to a rupee. First famine in the district in which relief was regularly organised by the British Government.
1868-69	1925	*Pachisa*	Provincial famine; grain sold at 10 *seers* to a rupee; loss of cattle 90,000 head; another 50,000 head of cattle sent off to the hills.
1877-78	1934	*Chautisa*	Very severe fodder famine; loss of cattle greater than ever before.
1886-87	1940	*Chalisa*	Light famine.
1896-97	1953	*Tirepana*	Not very severe. With 1895-96 a cycle of lean years began which lasted eleven years, with three famines and four years of scarcity.
1899-1900	1956	*Chhapana*	Very severe; great fodder scarcity. Twenty thousand cows and buffaloes sold at fairs and prices fell from 28 to 14 rupees per head; many persons employed on relief work.

1905-06	1963	*Tiresatha*	Fodder 10 bundles of *jowar* per rupee; imported from Bhatinda and other parts of the Punjab. In some villages no cattle was left.
1909-10	1967		Grain at 8 *seers* to a rupee. In 1911 only *rabi* was good, *khari* failed.
1913-14	1971		Grain at 8 to 10 *seers* to a rupee. Great fodder scarcity.
1918-19	1976		Scarcity of fodder and grain. Also severe epidemic of influenza.
1928—30	1986—88		Lasted for three years; effects aggravated considerably by world-wide agricultural depressions.
1938	1996		There had been a succession of three poor crops when the monsoon failed in 1938 and caused acute and widespread distress. The famine lasted for about three years.

Before adoption of systematic relief measures famines resulted in deserted sites. With the spread of irrigation, the increase in the means of communications and famine relief measures such disasters as famines ceased to recur.

The efforts were made by the Government to mitigate the sufferings affected by the natural calamities (floods, hailstorms, drought, fire and lightening). As already explained, Sonipat is a flood-prone area as the Yamuna flows in the territory of this district. Besides, there are many distributaries for irrigation purposes.

In case of floods, the Government provides the relief on the following items :—

(i) Free or concessional supply of food ;

(ii) Cash payments to indigent persons for purchase of necessities;

(iii) Cash doles to disabled ;

(iv) Free or concessional supply of clothing and blankets ;

(v) Free or concessional supply of fodder ;

(vi) Free or concessional supply of seed ;

(vii) Measures for prevention of cattle epidemics;

(viii) Provision for drinking water;

(ix) Provision for transport facilities for goods to be moved on relief account ;

(x) Repairs to houses damaged by the calamity;

(xi) Relief works such as major, medium and minor irrigation works, soil conservation , forests, road and rural works.

The seed is supplied to the affected persons on the subsidised rates i.e. 50 per cent of the cost of the seed. In sanctioning the seed grant, the grantees' amount of loss of the Kharif crops and capacity of sowing Rabi Crops is kept in mind. Mostly, Deputy Commissioner decides the eligibility and scale of the relief.

Scale of rations and essential commodities is as follows:—

Rations.—Free rations may be supplied to the affected families upto 15 kg. of flour per affected family weekly till the village is again in a position to get its supply line restored.

Free Concessional Food.—Where any village/area is marooned and the population has been evacuated to a safer place, i.e. camps, chaupals, dharamsalas, etc., preferably cooked food should be supplied. However, if the supply of cooked food is not feasible, only then free *atta* be supplied to such population till the time they are in the relief camps.

Free Concessional Fodder.— Where any village/area is surrounded by water and water has entered the *abadi* area but the cattle as well as the persons are staying in their villages and have some means of transportation to move out of the villages, subsidised fodder is supplied and subsidy may be upto 50% of the cost of fodder. The scale of fodder has been fixed as 40 Kg. green or 13 kg. dry fodder for adult animal and this would be half in case of minor. This provision of fodder help is maintained till such time the village is again in a position to get its supply line restored.

Where any village/area is marooned and the population(human as well as cattle) has been evacuated to a safer place (camps, chaupals, dharmashalas etc.), the free fodder will be suplied till such time the animals are staying in the camps.

Provision of Essential Commodities to the flood-affected persons.—Other essential commodities such as kerosene, sugar, dal, milk, match boxes, salt, ghee, etc are supplied at the rate of Rs. 7 per family per day. The supply of free rations in the marooned villages is based on the situations and local availability of material.

House Repair Grant.—The grant is allowed at the rate of Rs. 400 per katcha house and Rs. 600 per pucca house to those persons whose houses have been substantially damaged and who are not left with any habitable accommodation. The damage would be considered substantial if it is assessed above 25%. It is paid only to the head of the family.

Supply of Sirkis for temporary help.—Sirkis are also provided to the deserving flood-affected persons.

Compensation for the loss of cattle and human life.—There is a provision of Rs. 10,000 as an *ex-gratia* grant for the loss of one person in a family due to drowning in flood water or due to house collapse in the heavy rains.

On the death of the following animals due to floods, collapse of house under the heavy rains, the gratuitous relief is given at the scale noted against each:—

Name of the Cattle	Rate of relief
	Rs.
He Camel/She Camel	1,000
Horse/Mare.	1,000
Bullock/Buffalo	1,000
Cow	1,000
He donkey/She donkey	150
Mule	400
He Buffalo (more than three years of age)	700
He Calf/SheCalf (upto 3 years of age)	100
Sheep/Goat	100

The above relief is admissible to those persons who cannot resort to insurance and are unable to bear the loss.

The Financial help in case of Hailstorms

For the loss of standing crops.—The damage affected by the hailstorms is assessed onthe basis of actual loss to the standing crops and the payment thereof be made for each damaged acre on the following basis:—

(i) Where the loss to the standing crops exceeds 75%	Rs. 400 per damaged acre
(ii) Where the loss to the standing crops exceeds 50% but does not exceed 75%	Rs. 300 per damaged acre
(iii) Where the loss to standing crops exceeds 25% but does not exceed 50%	Rs. 200 per damaged acre

An amount equal to 5% of the total amount given as compensation for hailstorm damage to the farmers in any village is given in cash to the agricultural workers of the village.

On the death of animals due to hailstorms, the same compensation is given as admissible in case of floods.

Financial relief in case of fire and lightening

In addition to workers of poorer classes, the relief is given to deserving petty traders and farmers (in rural and urban areas) who cannot resort to insurance and who are unable to bear the loss. The gratuitous relief to the fire and lightening sufferers is to be granted at the scale noted below :—

For the loss of personal property		Rate of relief
On first Rs 2,000	..	50%
On next Rs. 3,000	..	25%
On next Rs. 5,000	..	15%
On next Rs. 5,000	..	10%
On next Rs. 15,000	..	7%
Above Rs. 30,000	..	Nil.

The gratuitous relief is also granted to the damage caused to crops in the following kinds of eventualities :—

1. The Standing crops
2. The harvested and stacked crops
3. In case of loss by fire to the standing crops

The relief be granted per damaged acre as follows :—

1.	Where the loss to standing crops exceeds 75%	.. Rs. 300 per acre
2.	Where loss to the standing crops exceeds 50% but does not exceed 75%	.. Rs. 200 per acre
3.	Where loss to standing crops exceeds 25% but does not exceed 50%	.. Rs. 100 per acre

In case of occurrence of loss to harvested and stacked crops by fire, relief is granted 20% of the total loss subject to a maximum of Rs. 6,000 in an individual case.

Damage to Crops by Electric Sparks.—Many cases have come to the notice of Government from the whole state where stacked crops/harvested crops were destroyed thereby causing a great loss to the farmers. In such eventualities S.D.O.(Civil) recommends to the Government the quantum of relief.

Financial Relief/Other help in case of drought.—Relief works such as major, medium and minor irrigation works, soil conservation, forests, roads and rural works are started on the occurrence of drought to provide gainful employment to the affected people. Taccavi and other sorts of financial help is provided to the people.

Fodder is also supplied on subsidised basis.

The distribution of financial relief in case of all the natural calamities is made by the Tahsildars and Sub-Divisional Officers (Civil) under the supervision of Deputy Commissioner.

The State of Haryana was adversely affected by drought during 1986-87, 1987-88 and by floods during 1988-89. Consequent upon this, the Sonipat district too was hit by these natural vagaries over these years. With a view to give relief to the affected farmers whose crops were hit by these calamities, large scale financial assistance by Central as well as State Government was given to them. The assistance was provided in the form of subsidies on the cost of agricultural inputs such as seeds, fertilisers weedicides etc. The extent of

assistance given to the farmers in the district from 1986-87 to 1988-89 is given below:—

Year	Amount provided (Rs. in lakhs)	No. of beneficiaries
1986-87 ..	30·90	All the affected farmers covered for providing the subsidy on agricultural inputs under the natural calamities.
1987-88	40·74	
1988-89	24·13	

IRRIGATION

The district has a sub-tropical continental climate. From relief point of view, it is plain area. The river Yamuna on the eastern side forms a flood plain along its bed. Loam (*Bhangar* and *Nardak*) and silty loam (*khadar*) soils are found in the district. The underground water is comparatively high. The sub-soil water alongwith Yamuna river belt and towards north side of Delhi-Ambala railway line is fit for irrigation except parts of Gohana and Mundlana blocks.

The general slope of water in the ditrict is from north to south. The natural drainage is a problem in some parts of Gohana tahsil. Efforts are being made to solve this problem. Irrigation in the district is mostly done by canals and tubewells. However, there are wells in the *Khadar* area for irrigation purposes.

The net irrigated area by different means during 1985-86 to 1987-88 is as follows :—

(000 hectares)

Year	Government canals	Wells	Tube-wells	Total	Percentage to net area sown
1985-86	68	..	60	128	75
1986-87	65	..	73	138	78
1987-88	84	..	82	166	94
1988-89	Not available				

During 1973-74, the net area under irrigation was 97 thousand hectares. It increased to 131 thousand hectares in 1982-83. The Irrigated area as on March 31, 1988 was 166 thousand hectares. During 1973-74, the area irrigated by canals was 59 thousand hectares which went to 84 thousand hectares in 1987-88. There was a nominal area under well irrigation in the district from 1973-74 to 1987-88.

Crop-wise gross area irrigated in the district during 1985-86 to 1988-89 is as follows:—

(hectares)

Crop	Year			
	1985-86	1986-87	1987-88	1988-89
1. Rice ..	24,308	29,063	15,369	..
2. *Jowar* ..	8,138	10,732	11,043	..
3. *Bajra* ..	1,234	2,910	2,437	..
4. Wheat ..	1,19,876	1,26,178	1,22,752	..
5. Barley ..	571	424	808	..
5. Maize ..	1,125	2,207	1,222	..
7. Gram ..	1,319	1,140	1,322	..
8. Other pulses ..	3,993	4,368	6,520	..
9. Sugarcane ..	10,521	12,126	13,749	..

Canal Irrigation.—The canals form the chief means of irrigation in the district. The major area in the district is covered by the canals. The Western Jumna (Yamuna) Canal is the oldest canal in the district. All the distributaries depend upon the Yamuna canal for water requirement.

The Western Jumna (Yamuna) Canal has a long history. Dug originally during the reign of Firuz Shah to conduct water to the royal gardens at Hisar and Hansi, it incidently irrigated the intervening tracts also. It was also re-excavated in Akbar's reign to bring perennial supplies from the Yamuna and So

into the Chauting and to Hansi and Hisar. It was further improved in 1643 A.D. during the reign of Shah Jahan by Ali Mardan Khan with the object of diverting water to Delhi. The river supply was tamed about 22.5 kilometers below the present headworks of the canal and water was led along the drainage line through Panipat and Sonipat to Delhi.

When the British took over, the discharge of the Canal was 2,500 cusecs. Between 1870—1882, remodelling was done with a view to improving the drainage, securing increased control over the supply and its distribution and providing greater facilities for navigation. The discharge was increased to 5,000 cusecs in 1877. The Sirsa Branch was sanctioned in 1888 and subsequent minor extension greatly increased the irrigation potentiality of the canal. Its discharge augmented to 6,433 cusecs in 1891 and 9,000 cusecs in 1940-41 and in 1966 it stood at 14,000 cusecs.

The canal takes off from the Yamuna at Tajewala headworks (Ambala district) where a very strong masonary weir is built across the river. Between Tajewala and Dadupur, the canal for the most part flows through an old river bed. The slope is fairly steep and the current strong. At Dadupur there is a level crossing over the combined Patherala and Somb torrents. From Dadupur the canal flows south in an artificial channel to Buria, below which a remarkable spur of the *Bangar* high lands forces it to make an abrupt curve to the east.

There is a regulator at Indri (Karnal district) with lock and escape head where the canal bifurcates into Sirsa Branch and Main Branch. About 48 kilometres further down at Munak the Main Branch bifurcates into Hansi and Delhi Branches and the Gohana Distributary.

The following water channels (Distributaries) irrigate the district:—

1. Israna Distributary
2. Gohana Distributary
3. Bajana Ditributary
4. Rohtak Distributary
5. Bhalot Sub Branch
6. Dobehta Distributary
7. Bhinswal Distributary
8. Juan Distributary System
9. Pai Distributary System

10. Ganaur Distributary
11. Rajpura Distributary System
12. Sardhana Distributary System
13. Sonipat Distributary System
14. Kakroi Distributary
15. Harsana Distributary
16. Ladpur Distributary
17. Nahri (Major) Distributary
18. Nahri Distributary
19. Butana Distributary
20. Sunder Branch
21. Direct Offtake of Delhi Branch—
    (i) Munshi Ram Minor
    (ii) Bavanpur Minor
    (iii) Bidnauli Minor
    (iv) Turakpur Minor
22. Direct Outlets of Delhi Branch

Well Irrigation. —Well irrigation is possible in areas where sub-soil water is sweet and available in plenty. The quantity of underground water depends on many factors such as rainfall, depth of water-table in the area, type of underground strata and its nearness to a natural stream. Its quality of salinity or sweetness depends upon the type of salts inthe clay underneath.

The sweet water belt lies along the Yamuna in Sonipat tahsil and comprises mostly the areas lying between the Delhi Branch and the Yamuna. The low lying area between the Grand Trunk Road and the Yamuna is called *Khadar* area. It is the old bed of the Yamuna. Due to river action in the past, all the salts inthe clay were washed away, water in the area is sweet and available in plenty at shallow depths ranging from 4 feet to 15 feet.

The sub-soil water in the Gohana tahsil is brackish. In Sonipat tahsil the upper layer of water is brackish while lower layers are sweet. This is most probably due to the effect of the Yamuna in the lower layers.

The well irrigation is mostly done in the *khadar* area.

The various devices used for lifting water in the district generally depend on the depth of the sub-soil water. An important method used for lifting water from the well is described below.—

This consists of a large leather bag (*charas*) holding 30 to 40 gallons 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 leather bag has been lowered, the other end of the rope is attached to the yoke of a pair of bullocks, who then walk down a ramp of a length approximtely 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 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 mechanical arrangement. The rope is then detached from the bullocks, the bag is lowered again and the bullocks return by a less steep incline parallel to it, and the operation is re-commenced.

Tubewells and Pumping sets.—Tubewells and pumping sets were introduced after Independence. The pumping-sets initially replaced the old traditional manual method of raising water from the wells. With the electrification of villages, electricity operated tubewlls being economical, are getting popular. The Government encourages the installation of tubewells by providing loans on easy terms. Special schemes have been formulated for advancing loans under the Agriculture Refinance Corporation Scheme, from the Land Development Banks and Small Farmers Development Agency.

The tubewells and pumping sets serve to reduce the water-logging and check the rise in the water table. The total number of tubewells during 1987-88 was 82.

Minor Irrigation Schemes.—Ground water exploration was started in the district in 1971 by the Central Ground Water Board. It drilled a total of 10 exploratory boreholes in the villages of Panchhi Jattan, Khizarpur Kheri, Pinana, Issapur, Kheri, Chirana, Nahra, Rohat, Kami and Kheora.

The Government undertakes the installation of tubewells through Haryana State Minor Irrigation Tubewells Corporation for providing irrigation to the farmers. It drilled 10 exploratory boreholes in the villages of Bali, Kheri, Garhibola, Sardhana, Siwana Mal, Bhatgaon, Muzam Nagar, Gohana rural and Mundlana. Out of these 10 exploratory boreholes, one in village Sardhana was converted into the production well. Other boreholes had to be abandoned because of the bad quality of ground water.

As per the exploration done, the ground water is fresh alongwith the courses of the river Yamuna and it is brackish or saline in the western direction

of the district. Out of the total area of the district, it is underlain in shallow acquifers with fresh ground water in 783 square kilometres, brackish ground water in 1,279 sq. Km. and saline ground water in 144 sq. km. In the deep acquifers, at the ground water is fresh in 570 sq. Kms., brackish in 104 sq. km and saline in 1,532 square kilometers.

The assesement of ground water recharge and the level of exploitation was evaluated by the Agriculture Department. The usable recharge which includes fresh ground water and brackish ground water comes to 45,294 ham. The level of exploitation is 11,917 ham and the balance ground water still available for exploitation is 33,377. However, most of the balance ground water is brackish.