(*patra*) ; and some large baskets (*pitar*) to store clothes in. There are some small shallow baskets (*dalri*) for bread and grain; and some narrow-mouthed ones (*bijri*) to keep small articles in.

In urban middle class houses, chairs and tables may also be seen. The homes of the well-to-do are tastefully furnished and decorated in the modern style. Sofas, wardrobes, *palangs*, *moorhas*, tables and chairs of different description and other items of modern furniture fill the houses. Possession of furniture is considered to be a sign of social status and taste. The paucity of furniture in an average home is partly offset by ordinary framed pictures and calendars which are readily available. Urban influence has led even some villagers to go in for chairs, tables and better type of cots though on a modest scale.

The metal vessels consist of large narrow-mouthed cauldrons (*tokna, tokni*) for storing water in and cooking at feasts; smaller vessels of similar shape (*batloi*) for ordinary cooking and carrying water to the fields; still smaller ones (*lota, gadwa, banta*) for dipping water and drinking from; some cups (*sarda*) without handles ; some tumbler-shaped drinking vessels (*gilas*, corrupted from English glass) ; a broad shallow bowl or saucer (*kotora, bela*) for drinking hot liquids from; a large tray (*thali*); a larger tray for kneading dough in (*parant*); a brass ladle (*karchi*); a spatula for turning bread (*koncha, palta, khurchna*); a thin iron plate (*tawa*) for baking cakes, and some pairs of iron tongs (*chimta*), a fry-pan (*karai*) and a sieve (*chalni*), both of iron; and an iron bucket (*dol*) for drawing water from the well. The utensils are made of brass, and perhaps a few of bell-metal (*kansi*). One may, however, come across earthen kitchenware in the poorer families. Most common of these are: *pharva* (a utensil for cooking vegetables, *dals*, etc.) and *kadhoni* (a utensil for boiling milk). Karnal is known for such kitchenware.

Lately, the use of kerosene oil stoves of various kinds for cooking purposes has gained sufficient popularity. The dearth of fire-wood consequent upon the reckless cutting of forests in the recent past has also helped in popularising the use of stoves. Utensils and decorations have undergone a change particularly in urban areas. Side by side with the copper and brass utensils, porcelain and glasswares are finding favour with the people. Stainless steel utensils are costly and though in use, have not been so much popular. The use of electrical appliances like heaters and table lamps is gaining popularity even in the villages. The radio receivers have come to be regarded as a necessity and larger and larger numbers of people, both in

towns and villages, are using these. Transistor sets are found to be particularly useful even in places which have no electricity.

Dress and ornaments.—The dress of the rural people is simple. The every-day clothes are always made from the course cloth whether mill-made or handicraft. The men wear a *pagri* (turban) or *dopatta* (a strip of cloth) wound round the head, a shirt or *kurta*, an *angarkha* (a long overcoat) or *mirzai*/*kamri* (a small overcoat) fastening with a flap at the side, a *dhoti*, *arband* (a short *dhoti*) or *langar* (a still shorter one) and a pair of shoes. A *chadara* (thin sheet) or *chadar* (thick sheet) in hot weather and a *khes*, blanket or *razai* (quilt) in cold weather may be used as a wrapper. An *agoncha* (handkerchief) is used occasionally. Men in service wear pants or pyjamas while others at large generally wear *dhotis*. A complete suit of male clothes is called *jora*.

Although in the recent past, men used to wear jewellery,[1] it is not in vogue now. However, a gold finger-ring is worn by most people in urban areas.

The women wear an *angi* or *angia* (a bodice) to support the breasts, a *kurti* (a small shirt down to the hips) buttoning to the right, a *ghagri* or *lehnga*[2] (a petticoat) or *paijamah* (drawers), and an *orhna* (a wrap). A complete suit of female clothes is called *til* or *tiwal*.

Women wear a band of silver *kauries* (cowries) going up the parting of the hair and fastening to pins on the back, *bindi* (a frontlet on the fore-head); *bujni* (plain earring); *bali* (earrings on the top of the ear with loops of chain); *nat*, *nath* (nosering); necklace of 14 coins (if all rupees *jhalra*, if one a gold mohur *tikawal*); *tad*, *tadia* (bossed armlets); *pachheli*, *chhan*, *kangni*, *chura* (bracelets in the following order from the elbow to the wrists); *dharu* (a breastplate of silver chain); *pallu* (chains and bells fastened to the right-hand corner of *orhna*); *ghimgat* (bosses and chains fastened to the front of the *orna* so as to fall over the case); *nara* (a silver tassel on the petticoat over the right hem); *pajeb* (a bunch of chains and tassel on the ankle); *bauk* (solid anklets). Of course the varieties have innumerable

1. Previously the ornaments worn by men included *gokru* (earrings), *kangan todar* (bracelets made of a cylindrical bar of metal), a single necklace with a small locket (often sacred to Shiv) or rosary always containing beads *(mala)*, a *kantla* (broad necklace made of chains), a *kanti* (locket) *agunthi* (ring) and if a headman, a ring with a seal in it. Boys often wore *tagri* (waist bands of silver chain).

2. The use of *lehnga* lingers among elderly women alone.

names. A woman's social standing is greatly determined by her jewels. The nosering, the plain armlet, and the *chura* or wristlet have a social significance. The armlets and bracelets and anklets, being solid and not easy to remove, are worn always; the rest only on special occasions, such as fairs and the like. The ordinary investment for spare capital is to buy jewels for one's wife, as the money can always be realized when needed.

The practice of tattooing (*khinna, godna*) once common among women[1] (other than the Rajputs and Brahmans) has almost disappeared. Men had small holes drilled in their front teeth, and gold let in (*chaump*), but that too is rare now.

After the Partition, displaced persons from Pakistan brought with them their own traditions. The last two decades witnessed a significant cultural fusion between the old residents and the new. Thus the *salwar* and *kamiz* are being increasingly adopted by young girls studying in schools, and even some of the grown-up women have started discarding the old graceful *ghagri* in favour of the *salwar*. They have also almost given up the use of their heavy silver ornaments. The tall and well-built Jat women appear very graceful in their *ghagris* and their bright clothes lend charm and colour to the countryside. The gradual disappearance of the *ghagri* with its bright colours is perhaps not altogether a welcome feature.

People belonging to the learned professions, officials, college students, etc., irrespective of their origin (whether rural or urban), caste and creed, generally dress in western style.

Food.—The simple food of the people has little veriety. The number of meals varies according to seasons of the year and the nature of work done by the people. The morning meal of a farmer often taken to the field at midday by the housewife, consists of three or four loaves of *bajra* or wheat or wheat and gram mixed and the evening meal taken at home consists of *khichri* (a porridge) of *bajra* (millet) and *moong* (a pulse) and sometimes of rice and *moong* or *dalia* of wheat is eaten. People in urban areas—shopkeepers and those working in offices eat their morning meal before going to work. Of the flours *bajra* is preferred though *bejhar* (gram and barley mixed) and *jowar* are often used. Wheat flour is now being increasingly used, and is particularly offered to guests or when the Brahmans are fed at the time of *kanagat*. Vegetables including *saag* and pluses are eaten with bread, and

1. They used to tattoo the chin, the inside of the forearm, the outside of the upper arm, the sides of the waist and the calf of the leg.

in its season a good deal of *gur* is consumed as a necessary protection against cold. Milk and buttermilk are consumed daily, and salt and chillies are freely used.

In urban areas during the past few years the use of vegetable oils has become common. People also grow vegetables and fruits which are freely consumed. Since the Partition, the habit of meat eating has been on the increase and *jhatka* shops where meat is sold, are seen in a number of towns. While the Jat has acquired a taste for meat eating and enjoys his meals in a *dhaba* on his visit to the town, the Bania may also enjoy his meat dish surreptitiously in one or the other of the restaurants which are sprining up in the towns.

So far as drink is concerned, tea as a stimulating drink has become very popular with both urban and rural people. Tea stalls are found in every town and big villages. In summer months some people prefer to drink a glass of sherbet or *lassi*. Coca-Cola as a soft drink is becoming popular with younger people. Local country-made liquor is consumed practically in every village. Drinking has now become a matter of habit with a larger number of people, the rich and the poor alike.

Men are much addicted to the use of tobacco — cigarette and bidi smoking in towns and hookah in villages. Women do not touch it.

COMMUNITY LIFE

As everywhere else, community life is somewhat more effectively organised in villages than in towns. A growing town cannot claim to be the nucleus of a single community. Its various social and economic groups are more exclusive than inclusive. They do not come into such frequent contact with one another. Civic responsibilities no doubt, are applicable to all, but these are not cohesive in their nature. And this is more true of an expanding town which is sprawled over a large area. There is a growing tendency for voluntary social agencies to establish themselves in local areas or small towns and organize community life in some form or other. They also organize mass celebration of important festivals in their respective areas.

The social situation in villages is different. Big and small land-owners, agricultural labourers and other workers are not far apart from each other. The limited amenities and amusements of village life are equally shared by all of them and require their combined attention. The Community Development

Programmes have given a fillip to community activities of various kinds and the *panchayats* have also become a nucleus of community activities.

Folk Culture

Folk culture is reflected in folk-songs, dances and theatre. With fast changing conditions, urban life is slowly but surely making an inroad into rural life taking away some of its inherent beauty and cultural wealth. The gramophone-record is an onslaught on the song of the village *ragi* and the radio seeks to replace the group festivals of folk-songs and dances. However, folk culture still continues to enliven the countryside which hums with songs and dances on festivals and other numerous occasions. Of late, All India Radio is giving good attention to the revival of folk culture and broadcasts 'Lok Manas' featuring programmes on Haryana culture.

Folk-songs.—Folk-songs with their burden of love and labour have a peculiar charm of their own. In these songs, the heart-beats of the rural people vibrate with their hopes, aspirations, love longings, joys and sorrows. We also hear about the changing season, tinkling of bells of the cattle returning home at sunset, waving of fields of green wheat speckled with yellow *sarson* and the emotional outbursts of married couple at their union and separation.

There is a variety of folk-songs, each connected with a particular occasion. A good number of these are nature songs sung in particular months. The month of Sravana (July-August) brings ecstasy in its wake. The impact of the season on the emotional life is obvious. With the onset of black clouds of the monsoon and the raging torrential rains, love longings are evoked. When the sky is overcast with the hanging clouds, young women come out of their homes and get lost in the raptures and ecstasies of nature. Their hearts echo in songs and they sing while the swing :

O mother ! torrential rains have come,
All the tanks and ponds are full of water,
O mother ! the month of Sravana has come,
Swings are seen on every tree,
O mother ! *bajra* and *jowar* have sprouted,
The landscape has turned green,
O mother ! plants are growing speedily
Like a newly wedded girl.

O mother-in-law ! the month of Sravana has set in,
Get me the seat of swing made of sandal wood,
O mother-in-law ! the month of Sravana has set in,
Get me the swing made of yellow yarn.

Teej or Haryali Teej is the main festival of Sravana, falling on *sudi* 3 (third of the lunar month). It is observed throughout Haryana. By this time the rainy season starts gathering momentum replacing the scorching summer. To celebrate this change, young girls of the countryside yearn for the approach of Teej. It is an occasion for the newly-married girls to go back to their parents. The mother-in-law is approached for permission. The following lines beautifully depict a dialogue between the *bahu* (daughter-in-law) and her *sasar* (mother-in-law) :—

There comes, O mother-in-law ! the month of Sravana,
Let us to our father's home proceed.

O my bride ! who the accompaniers 've come ?
With whose permission will you proceed ?
To your father's home indeed !

O mother-in-law ! brother, the accompaniers 've come,
With your permission I'll proceed,
To my father's home indeed !

The mother-in-law would not object to her going but what about the field and domestic affairs ? Who would attend to these jobs in her absence ?

Who will do the hoeing ?
Who will grind the allotted grain ?
Who, O my bride ! will wash my head ?
And who will fry the *kasar* ?

The intelligent daughter-in-law works out the problem very ably :

Elder *jeth*, O mother-in-law ! will do the hoeing,
Elder *jethi*, O mother-in-law ! will grind the allotted grain,
Barber's wife, O mother-in-law ! will wash your head,
The Barber's wife will fry the *kasar*.

The month of Phalguna (February-March) is a pleasant period which inspires the women to singing and dancing. It announces the advent of spring; the wintry veil of fog and mist is lifted from the face of the earth

and the whisper of spring is in the air. In moonlit nights after they are free from daily chores, the women congregate and sing songs :

Two daughters-in-law in a house,
Both go for water,
O dear ! colourful Phalguna has come.
The scorpioid ring slipped from a daughter-in-law's foot finger,
And the daughter-in-law behind picked it up,
O dear ! colourful Phalguna has come.

In blooming spring buoyant feelings spring up and find expression through folklore :

Mangoes ripen in Sravana,
In Phalguna even old women get young.
Ask my sweetheart to come uninformed
In Phalguna and escort me to his place.

Indispensable attendants to various rituals and ceremonies are the ceremonial songs, marriage songs and songs on married life. The following lines which are usually sung at wedding ceremony contain a specific satire in which the target is the marriage party :—

We invited the handsome youth, but the ugly ones have come ;
We invited the fair-coloured, but the black ones have come ;
We invited the slim youth, but the bulky ones have come ;
We invited the robust youth, but the old and weak have come.

A woman sings a lullaby when she rocks the cradle. Invariably such a song has soft and tender feeling quite natural to the theme :

Your grandmother is rocking your cradle,
O my dear son !
May you always swing eternally in life's cradle !
Your grandfather is rocking your cradle,
O my darling son !
May you always swing eternally in life's cradle !

The folk-songs are essentially lyrics giving a glimpse into the woman's heart. These describe a girl's longings for love and marriage, her initial inhibitions, her usual apprehensions, her emotional reaction to the dreary lot in a strange house, complaints from the young wife regarding the monotony of domestic life and the various types of odd work which she is compelled

to do, pangs of child birth, etc. Love songs are the most common since love in its varied forms provides numerous themes. The socio-economic aspects too sometimes find expression. Indeed, it is the village woman who has preserved the tradition of folklore.

Folk-dances.—Folk-dancing, an outburst of surging emotions, at times accompanies folk-singing. The celebration of Phag is a significant festival and its celebration continues for a month. Locally, it is also called Dhuhlaindi because it is celebrated in a season when dust storms blow. In March, after their daily chores, women congregate in the village in an open space and sing and dance till late at night. Their melodious sound spreads through the village and resounds in gaiety. The dance usually starts with the lines :

O dyer's son ! beat the *daph* rhythmically,
Beat it so beautifully that
The Yamuna water may hear
And turn more charming.

The women sit in a circle and sing to the sound of drum-beats or pitcher-beats. Two, sometimes four, women dance in a circle to the tune of the song. Though the congregation is only of women, they sometimes dance with their faces covered. The style of the dance on this occasion resembles *gidda* of the Punjab.

The Magha *sankrant* (first day of Magha month) is an occasion to rejoice for the village girls. According to a prevailing custom, the wedding *sehra* of the bridegroom is kept safely in the bride's house. It is taken out on the following Magha *sankrant* and is considered auspicious to break it into pieces on this day. The ceremony is called *sehra todna* or *mod todna* and is performed by the girls who sing, dance and frolic about in merriment.

Folk-tales.—The region is rich in legends and folk-tales many of which form the theme of folk-theatre and the songs of village bards. The impact of folk-tales on social life of the people is manifest in the characters from the tales forming the motifs of the facades of houses and *chaupals*.

Among the popular folk-tales of Sorath, Hira Mal Jamal, Nautanki, Bhartri Hari, Gopi Chand and Nihal Dey, the last mentioned finds much favour with the people. Nihal Dey was the daughter of a ruler of Indergarh. Tradition assigns the location of Indergarh near present Indri. The ruins of Naulakha Bagh of Nihal Dey can still be seen there.

Folk-theatre.—*Swang*[1] or *saang* is the main form of the folk-theatre of the region. It owes its origin to Ram Lila. Folk tinge was given to the stage some 80 years ago by Hardeva and Deep Chand. Later, Mai Chand, Baje Ram and Lakhmi Chand popularised the *swang*. Lakhmi Chand endeared *swang* among the general public by introducing the local dialect. He rendered about 200 dramas in *ragini* and staged these in the form of *swangs*. In later years vulgarity and nuisance crept into *swangs*; it made them unpopular and they now seem to have become a thing of the past.

Games and Recreations

Wrestling, *kabaddi*, *gindo tora* or *gindo khuli* and *gulli danda* (tip cat) are popular indigenous games in the district, the last two being usually played by children. *Gindo tora* or *gindo khuli* is the indigenous version of the game of hockey and is played with a stick and a ball made of rags and twigs. *Gulli danda* is played in the streets and in a ground outside the village. Wrestling and *kabaddi* are, however, popular sports among the young and the middle-aged men. *Kabaddi* is often played in the moonlit nights during the months of Phalguna and Chaitra (February-March). *Kabaddi* matches are enthusiastically arranged during festivals particularly Teej and Raksha Bandhan and at fairs like Kurukshetra Fair and Pehowa Fair. Two teams take part in this game. Of a number of varieties in which the game is played, the two types popular in this district are Haryana style and National style. Haryana style *kabaddi* is played in a circular field with a periphery of 75 feet (23 metres) with 10 players on each side while the field for National style *kabaddi* is marked as a rectangle of 13 metres by 10 metres. In Haryana type, a player of one team goes to the court of the other team repeating *kabaddi kabaddi* or *kaudi kaudi* in one breath. If the player after touching and encountering any player of the opposite team returns to the boundary dividing the two courts still uttering *kaudi kaudi* in the same breath, the particular player of the opposite team is considered to be out and that team loses one point. In case the player does not return to the boundary in one breath, he is considered to be out and his team loses one point. In the National style, the player going to the court of the opposite team may be encountered by any number of players

1. *Swang* is a form of open-air theatre and the stage is in the midst of the audience. The formalities of the drama like costumes, curtains and make-up are hardly observed. The audience sit on all the four sides whereas orchestra takes its seat in the middle of the stage. Generally, the leader of the *swang* party plays the role of hero and other actors play different roles including that of females. In summer it is played late at night and continues till the early hours of the morning, while it is performed at noon in winter. The mythological stories and folk-tales generally provide the theme.

of the other team. If he does not return to the boundary line dividing the court, his team loses one point but if he reaches the boundary line in one breath the other team loses points corresponding to the number of players who encountered him. The playing time for the game in both the types is the same, *viz.* 45 minutes including an interval of 5 minutes. The team securing more points wins.

To encourage sports in the rural areas, the State Government gives grants for the construction of playgrounds and also provides coaching facilities. In addition, the State Sports Department has constructed seven playgrounds at Siwah and Ugra Kheri (Panipat block), Shamgarh and Kirmach (Nilu Kheri block), Bastali (Nisang block), Kaul (Pundri block) and Guhna (Kaithal block).

Modern games like hockey, cricket, football, volleyball and basketball are popular among students of urban areas where there are facilities of playgrounds while games like *kho kho*, netball, skipping, etc., are popular among girls.

There are a number of sports associations functioning in the district, *viz.* District Hockey Association, District Football Association, District Kabaddi Association, District Basketball Association, District Athletic Association and District Volleyball Association. These associations organise tournaments at district level and select the teams to compete in the tournaments at State level. This also helps in discovering promising talent for national and international events.

Chess, cards and *chopar* are some of the indoor games which are played in urban as well as rural areas. The villagers enjoy these games in *panchayat ghars, chopals* or wherever convenient along with a puff of hookah or while inhaling *bidi*. Having no other engagement, the *baraatis* accompanying the *baraat* to the bride's village eagerly indulge in these games to while away time.

The State Public Relations Department has provided radio sets to *panchayats*, co-operatives and schools under the 'Community Listening Scheme'. In addition to the occasional drama shows, this Department frequently exhibits films, mostly documentaries, with the help of a mobile cinema unit both in the urban and rural areas. Gossiping and listening to the radio are common pastimes. The portable transistor has become a fashion of the day with everybody without distinction.

The universal media of mass entertainment, particularly in the towns, is the cinema. It suits the pocket of the rich and the poor alike and by and large

is the only place of public entertainment. The district which had only 3 picture-houses (one each at Karnal, Panipat and Kaithal) prior to Independence, now is well provided with 12 picture-houses and 3 touring talkies.[1] Recorded film songs and music are freely played by the lottery ticket sellers and on marriages and other festive occasions.

GENERAL

As stated above, economic and professional groups and classes play an important part in social life. We have farmers' co-operatives of various kinds in villages which bring people together in pursuit of their objectives and give them opportunities of working together. This subject is treated in detail in the Chapter on 'Agriculture and Irrigation'. Since the abolition of *ala malikiyat* and *talukdari* there has been a levelling down of the higher landlord classes. This, combined with other measures of tenancy reforms and a progressive land policy have brought people together on more equal ground and the distinction between the very rich and the very poor is not so great as it was before.

In towns more than in rural areas professional groups of various kinds are organized for the defence of their interests. The lawyers, the medical practitioners, the teachers are all inclined to think of themselves as members of their professional communities whose interests must be safeguarded in every way. The labour unions of various kinds in big and small industries also function to protect the interests of their members. The over-riding feature of these associations in urban as well as rural areas is to strengthen the economic interests of different kinds of groups in the total life of the community.

The foregoing pages, while dealing with the population of the district, the language and dialects spoken by the people, the religions professed by them, the observance of the caste system together with important aspects of social and economic life have brought out the slow pace of change being effected under the influence of modern conditions of living. An important fact in this connection is the introduction in the district of large numbers of displaced people from areas in Pakistan which previously had no social affinity with the people of this district. In more than one way, as explained in the foregoing text, the social, economic and cultural pattern of the urban and rural communities has been undergoing a slow but profound change as a consequence of the Partition. It is no doubt true that while the urban, and,

1. The picture houses are located at Karnal (4), Panipat (3), Kaithal (2), Thanesar (2) and Shahabad (Shahbad) (1) while there is one touring talkie each at Pehowa, Ladwa and Samalkha.

more particularly, the rural people of the district, have their own distinctive Haryana culture, their way of life is generally evolving in conformity with the national rather than the regional pattern.

REHABILITATION

Introduction

The Partition in 1947 was followed by horrible communal disturbances which inflicted untold sufferings and led to mass migration of population from Pakistan to India and *vice versa*. Lakhs of homeless Hindus and Sikhs from Pakistan entered what was then called East Punjab; their immediate location in a large number of camps and eventual rehabilitation in rural and urban areas created numerous problems which Government faced with courage. The areas now covered by the Haryana State took a leading share in the re-settlement of these immigrants. According to the 1951 Census, the Karnal district alone absorbed 2,50,471 of which 1,32,709 persons settled in rural areas and the remaining 1,17,762 in urban areas as shown below :—

Tahsil	Number of displaced persons settled		
	Total	Rural	Urban
Karnal	92,908	49,201	43,707
Panipat	59,435	19,614	39,821
Kaithal	50,819	37,090	13,729
Thanesar	47,309	26,804	20,505
	2,50,471	1,32,709	1,17,762

Although accurate statistics are not available, it is estimated that 3,00,688 Muslims migrated from this district to Pakistan. They consisted of Afghans, Baluches, Muslim Rajputs, Sayyids, Gujars and Sheikhs. The immigrants into the district were mainly Brahmans, Virks, Mazhabi Sikhs, Aroras and Khatris from the Shekhupura, Gujranwala, Multan and Muzaffargarh districts of Pakistan.

Refugee Camps.—As a first step, the displaced persons were given shelter under canvas tentage in relief camps. Five such camps were set up

at Kurukshetra, Karnal, Panipat, Kaithal and Shahabad (Shahbad). The biggest of these was established at Kurukshetra which accommodated the largest number of refugees. The educational institutions which remained closed for months up to February 1948, provided additional accommodation. The services of the staff and students were utilised in the management of the relief camps. Students who rendered three months social service in refugee camps were considered eligible for the award of certificate/degree of the newly established Panjab University without taking the examination.

Camp life was made reasonably agreeable by the provision of a number of facilities. Free ration was distributed in these camps. Fruits, multi-vitamin tablets and other special items of diet were issued to refugees on medical advice. Blankets, quilts and clothes were supplied during the winter. Dispensaries were opened in tents for immediate medical relief. These camps provided much needed relief to the displaced people and gave breathing time to all concerned to plan their future.

By the summer of 1948 the routine of camp life and administration of relief was well organized. The stage had arrived to take the next step of enabling displaced persons to find independent means of existence. To achieve this, the issue of free rations was limited to those families who had no adult male member and could not, therefore, maintain themselves. The able-bodied male adults between the ages of 16 and 60 years, who began to do some work or who refused to do work when it was available were de-rationed along with their dependents though they were allowed to live in camps. Those entitled to allotment of land were obliged to leave soon after temporary allotment of the evacuee land had been made to them.

During the process of this gradual elimination of gratuitous relief, the unattached women and children and infirm and aged persons who were living in these general camps, were encouraged to shift to Mahila Ashram, Karnal. A Sewa Sadan accommodating nearly 250 women and children was earlier established at Karnal but was wound up on the establishment of the Ashram there.

In the Ashram gratuitous relief at the full prescribed scale was given to women and children and educational facilities were provided for the latter. Various cottage industries and crafts such as weaving, spinning, knitting, tailoring, embroidery, laundry, toy-making, carpet making, *niwar* and durrie making were established to train women and to equip them for earning their livelihood. Arrangements were also made for training them in midwifery

and nursing. On completion of their training in selected industries and crafts, the trainees were encouraged to form industrial co-operatives for earning their livelihood.

Rural Rehabilitation

The early allotment of evacuee land helped the Government in the speedy resettlement of rural refugees in camps. It was first made on a temporary basis to groups of cultivators who wished to live together. Apart from resettling people the idea was to promote the sowing of rabi crop of 1947-48. All agricultural refugees who owned or held land and were cultivating in Pakistan were eligible for such allotment. These temporary allotments were later converted into quasi-permanent in April 1948. This was a significant step toward the final resettlement of the displaced cultivators on the lands allotted to them and was to serve as an incentive to improve their lands. Claims were invited from displaced persons and orally verified at tahsil headquarters. Unfortunately, in spite of their sufferings many unscrupulous displaced persons made exaggerated claims, and obtained excessive allotments. To meet this difficulty Government obtained original revenue records from Pakistan to verify claims of the displaced persons. These also showed that there was substantial difference between the land left behind in Pakistan by the incoming displaced persons and that abandoned by the Muslims in East Punjab (India). The latter was less. To overcome this problem the available land was converted into standard acres, and graded cuts were applied in making allotments to displaced claimants. The cuts were in proportion to the size of the claim. Bigger claimants lost more in comparison to the smaller claimants.

The quasi-permanent allotments were followed by the conferment of proprietary rights in 1955. While doing so, bogus and excessive allotments were cancelled, and only the genuine claims of each displaced person, verified from the revenue record received from Pakistan, was admitted. This resulted in the return to the evacuee pool of lakhs of acres of evacuee lands usurped by unscrupulous displaced persons.

Lands in the Karnal district were allocated to displaced persons mainly from Gujranwala, Shekhupura, Lyallpur and Montgomery districts, Chunian tahsil of Lahore district and the colonists originally belonging to the Karnal district. Every effort was made to allot land of the similar quality as that left by the claimant in Pakistan. Suburban land was allotted to claimants of similar land or to other claimants on a valuation basis.

AGRICULTURAL LOANS

Allotment of land on a quasi-permanent basis was not enough. The allotees were given assistance by way of agricultural loans for purchasing bullocks, agricultural implements, fodder, seeds, etc., and for repairing houses and wells. In order to minimise the chances of misuse, these loans were advanced in kind. The following amount was disbursed for this purpose :—

Year	Amount
	(Rs.)
1947-48	5,73,505
1948-49	17,68,278
1949-50	9,26,024
1950-51	13,08,967
1951-52	16,65,570
1952-53	4,91,500
1953-54	3,12,761

The disbursement of the loan was stopped after 1953-54.

RURAL HOUSING

Rain and floods had damaged a large number of houses abandoned by the Muslims and many of them got damaged beyond repairs. According to the statistics available immediately after the Partition, there were 19,169 undamaged houses, 9,715 reparable houses and 10,633 damaged houses beyond repairs. Even these houses were unevenly distributed. In some villages the number of houses was in excess of the needs of the allottees while in others almost the entire *abadis* had crumbled and not a single house was available.

Like land, the houses were also allotted on a temporary basis in the first instance. Rules for their distribution, analogous to those for quasi-permanent land allotment, were framed afterwards. Records were prepared regarding the exact accommodation available in each house, its general condition and its approximate value, along with the list of allottees and the quality and value of houses left by them in Pakistan. The Halqa Revenue Officer, usually a Naib-Tahsildar, was entrusted with the job of allotment of rural houses. A list giving the order of precedence was prepared. After setting aside a few houses for common purposes, allottees were given a chance of selection according to their place in the merit list.

URBAN REHABILITATION

The general trend of shift towards urban areas after Independence made the problem of providing residential accommodation to displaced persons in urban areas more acute. The Government rose equal to the occasion and evolved schemes to utilise the available Muslim abandoned properties and develop more housing colonies. All Muslim-abandoned properties were taken over as evacuee properties and were governed by the Punjab Evacuee Ordinance IV of 1947, later on supplanted by the Administration of Evacuee Property Act, 1950. Such properties comprising houses, shops, vacant stites, *kholas* (dilapidated houses) and industrial establishments were temporarily allotted to displaced persons on rental basis. Their permanent disposal started in 1953-54. Properties valued below Rs. 10,000 (below Rs. 50,000 for industrial establishments) were declared allottable while those assessed above these amounts were sold by open auction. Properties lying vacant or in unauthorised possession were similarly auctioned.

In the urban areas of Karnal, Shahabad (Shahbad), Pundri, Kaithal, Samalkha, Thanesar, Radaur, Ladwa, Tirawari (Taraori) and Panipat, there were 14,385 evacuee properties: 11,433 valued below Rs. 10,000 and 2,952 valued above Rs. 10,000. These became a part of the evacuee pool for payment of compensation to displaced persons having verified claims.

Allottable properties were given away permanently to claimants against their verified claims. If the value of a property was in excess of his compensation amount, claimant concerned was allowed to deposit the excess in instalments. Properties occupied by non-claimants were offered to them on annual instalments.

HOUSING SCHEMES

The properties abandoned by the Muslims were insufficient to provide shelter to all the displaced persons settled in the district. While the Muslim migrants were generally labourers or artisans with a comparatively low standard of living, the in-coming non-Muslims were businessmen and shopkeepers and were used to a much better standard of living. To meet the grave situation arising from the inadequate residential accommodation available in East Punjab, and to provide shelter to the in-coming population according to its income groups, the Government established new townships, in addition to 8-marla (cheap) housing colonies and 4-marla (cheap) tenements. The new townships accommodated the rich and upper middle class displaced persons; the 8 marla (cheap) housing colonies provided houses to the lower middle class and the 4-marla (cheap) tenements to the poor, particularly to displaced

persons occupying places of worship or living in dharmasalas, infirmaries, and those living on pavements. The statement below gives details of houses and sites and shops constructed and plots laid out under various schemes:

	Houses	Shops	Plots
New Township, Karnal	500	24	262
New Township, Panipat	498	26	830
8-Marla (Cheap) Housing Colony, Karnal	200		436
8-Marla (Cheap) Housing Colony, Panipat	150		—
		Tenements	Sites
4-Marla (Cheap) Housing Colony, Karnal		150	
4-Marla (Cheap) Housing Colony, Panipat		400	18
4-Marla (Cheap) Housing Colony, Thanesar		100	
4-Marla (Cheap) Housing Colony, Samalkha		100	
4-Marla (Cheap) Housing Colony, Tirawari (Taraori)		50	
4-Marla (Cheap) Housing Colony, Shahabad (Shahbad)		50	
4-Marla (Cheap) Housing Colony, Pehowa		100	

The houses and plots in new townships and 8-marla (cheap) housing colonies were disposed of at the reserve sale price, under the East Punjab Refugees Rehabilitation (Buildings and Building Sites) Act, 1948. The cost of houses and plots sold, was treated as loan to be recovered in 30 half-yearly instalments. Subsequently with the implementation of the compensation scheme in 1954-55, the benefit of adjustment of public dues against the verified claims was extended to the purchasers of houses and plots in all these rehabilitaion colonies. The allotment of 4-marla (cheap) tenements was made under the executive instructions issued with the approval of the Government of India.

In all these colonies, satisfactory arrangements for underground drainage, water-supply and electricity were made and provision existed for amenities such as school buildings, public parks, hospitals and clubs. Most of the plots, earmarked for schools, hospitals, clubs, libraries and religious places have been sold to private registered bodies at half the reserve sale price on the

condition that the plots sold would be utilised for the purpose for which these were earmarked. Shopping centres have also been provided in these colonies.

Mud-hut colonies.—Besides the new houses detailed above, mud-hut colonies were constructed in 1950 for providing accommodation to the residual population in refugee camps. These were constructed on the respective sites of camps in Karnal and Panipat with 1,600 and 600 mud-huts respectively and each mud-hut covered an area of 210 square feet (1905 square metres). These were immediately offered to the occupants of refugee camps who belonged to Scheduled Castes and Backward Classes and to persons who were resourceless and landless.

In 1953, it was decided to transfer proprietary rights of mud-huts to the inmates. Occupants with claims were required to pay the cost of land and super-structure from their claims and others were charged only the cost of land recoverable in 3 annual instalments, the cost of super-structure having been treated as a grant. It was also decided that nothing should be charged from destitute widows and disabled persons.

Small Urban and House Building Loans

The scheme of advancing loans and grants was introduced in February 1948, to help the poor and middle class displaced persons re-start their business, trade or other profession. Under the Punjab Refugees Rehabilitation (Loans and Grants) Act, 1948, the loan was limited to Rs. 5,000 to an individual. The grants were restricted to unattached women, widows and others who were unable to repay loans but at the same time wanted monetary help in their resettlement. The maximum amount of grant was limited to Rs. 500.

Small urban loans.—These loans were advanced to displaced persons to enable them to establish themselves in different vocations. All classes of displaced persons comprising traders, shopkeepers, artisans, industrialists, students, lawyers and medical practitioners were helped under the scheme. The loans carried an interest at the rate of 3 per cent and the recovery of loans started after 2 years of their disbursement. The loans togetherwith all interest were repayable in equal instalments spread over a period of 6 years. The loans and grants were strictly to be utilised for the purpose for which they were asked for by the applicant or sanctioned by the Government. The details of the loan of Rs. 14,81,750 advanced to 2,130 displaced persons during

1948-49 to 1956-57 are as follows :—

Year	Amount (Rs.)
1948-49	8,38,300
1949-50	3,68,250
1950-51	1,80,000
1951-52	—
1952-53	3,500
1953-54	—
1954-55	22,400
1955-56	30,300
1956-57	39,000
Total :	14,81,750

The scheme to advance small urban loans was discontinued in 1956-57.

House building loans.—House building loans were advanced to purchasers of plots sold out by the State Government in new townships. These loans enabled displaced persons to build their own houses on easy terms of repayment. The following amounts were advanced to 294 displaced persons for the construction of houses, during 1949-50 to 1955-56 :—

Year	Amount (Rs.)
1949-50	3,18,875
1950-51	1,50,000
1951-52	3,99,475
1952-53	2,95,447
1953-54	—
1954-55	36,100
1955-56	—
Total :	11,99,897

These loans, too, were discontinued from 1956-57 onwards.

PAYMENT OF COMPENSATION

Compensation was paid to displaced persons who had abandoned immovable property in Pakistan, after verifying their claims, under the Displaced Persons (Claims) Act, 1950. Interim compensation was sanctioned for certain categories of displaced persons who were in urgent need of relief. The interim scheme was later replaced by the Displaced Persons (Compensation and Rehabilitation) Act, 1954. Under it scaled compensation was prescribed. It gave more to smaller claimants and less to the bigger claimants. This compensation was paid out of the compensation pool, to which the Government of India had contributed.

In this manner the rehabilitation of displaced persons was completed, and now only minor residuary problems remain, e.g. correction of clerical mistakes in allotments or rectification of deficiencies, if any. The Rehabilitation Department has been disposing of surplus evacuee properties purchased by the erstwhile Punjab Government from the Government of India. The properties situated in Haryana are being disposed of by the Tahsildar (Sales), specially appointed, in auctions restricted mostly to Harijans. This process also helps in the detection of usurped properties and their disposal brings in additional revenue to Government.

SOCIO-ECONOMIC BLEND

The rehabilitation of displaced persons proved to be as much the glory of the Punjab as the Partition and the consequent uprooting of millions was its misfortune. The effect of the exchange of population is a phenomenon of great historical importance in the evolution of the socio-economic pattern of life of the people of the Punjab and Haryana, and the Karnal district has had it in abundant measure. The process of change is at various stages in the manifold aspects of life and a complete picture can emerge only after some time. As a result of the Partition, as population in urban areas increased, manifold and new industries sprang up and old ones were expanded. This tended to attract artisans and labourers to a great extent and shopkeepers and others dependent on non-agricultural professions to a lesser extent, from rural areas to towns. A modern township came into existence at Nilu Kheri (Nilo Kheri). This township which is a product of the Partition, later came to be the nucleus of the Community Development Programme which in some ways has revolutionised the country.

The Virks from the Gujranwala and Shekhupura districts, who were allotted land in the district, were maligned in the beginning as professional

thieves and distillers of illicit liquor. Their rough talk and gruff exterior created an impression of aggressiveness. They were ill-equipped and were without security of tenure. But with the quasi-permanent allotment they took to agriculture most earnestly and became an asset to the agricultural economy of the district. Khatris and Aroras from Multan and Muzaffargarh districts, who owned land in the West Punjab, were mostly non-agriculturists and small land holders. They successfully set up themselves as shopkeepers and traders and completely changed the outlook of bazaars and brightened rural life by providing the paraphernalia of civilised life like soap, pottery, mirrors, hair-clips and celluloid toys even to the obscure distant villages.

The energy and resourcefulness displayed by displaced persons influenced local population to shake off its inertia. Local people are now more practical and are very keen to educate their children. The appreciation for cleanliness and the desire for neat clothes, furniture, crockery and other necessary cooking utensils are symbols of a general awakening which has been accelerated by the intermingling of populations.

In the social sphere, there has not been much intermingling and the marriages are strictly confined to the respective communities. The dress habits have, however, undergone a change. The *salwar* and *qamiz* has been adopted by young girls and even some of the grown-up women have started wearing *salwar*. The Jat women are discarding their heavy silver ornaments.

With the lapse of time, the displaced persons have almost completely integrated themselves with the local population of the district. The process of intermixture of dialects is afoot and the Aroras, Khatris and Virks from Pakistan have mastered the local dialect. It is only a matter of time when the older generation passes away and the younger generation takes over and is able to identify itself completely with the life and culture of the new homes in which they were born.

Chapter IV

AGRICULTURE AND IRRIGATION

Introduction

This Chapter deals with vital features relating mainly to agricultural production, which is the basic concern of the majority of people. 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 life. Scientific agriculture coupled with irrigation and other facilities which is fast becoming the life-blood of growing population is dealt with in this Chapter. The difficulties experienced, the developments achieved and the gaps still remaining unfilled present the total picture of this vital sector of the district economy.

Land Utilisation

The table below shows the utilisation of land since 1950-51 :

(Thousand hectares)

Year	Total area according to village papers	Area under forests	Land not available for cultivation	Other uncultivated land excluding fallow land	Fallow land	Net area sown
1950-51	804	2	96	230	86	390
1955-56	802	2	97	166	40	497
1960-61	796	5	93	107	35	556
1965-66	801	10	93	55	24	619
1966-67	801	10	95	54	14	628
1967-68	801	11	94	52	13	631
1968-69	801	11	97	41	33	619
1969-70	803	11	99	40	18	635

According to the figures for 1969-70 the total land of the district measured 8,03,000 hectares of which 11,000 hectares (1.4 per cent) was under forests, 99,000 hectares (12.3 per cent) not available for cultivation, 40,000 hectares (5 per cent) other uncultivated land excluding fallow land, 18,000 hectares (2.3 per cent) fallow land and the remaining 6,35,000 hectares (79 per cent) was the net area sown of which 2,66,000 hectares was sown more than once.

Forests.—As a result of various Government actions, the area under forests which ranged between 1,000 and 2,000 hectares prior to 1951, registered a substantial increase. In 1969-70, 6,026 hectares (excluding avenue strips) of land was under forests as against 2,000 hectares in 1950-51. Avenue strips along railways, canals and roads have been transferred to the Forest Department for purposes of plantation.

Land not available for cultivation.—The area of this category of land, amounting to 99,000 hectares has virtually remained the same. It includes land which cannot be brought under plough except at an exorbitant cost as well as the land covered by buildings, roads and railways, rivers and canals or otherwise appropriated for non-agricultural purposes.

Other uncultivated land excluding fallow land.—This category of land includes permanent pastures and other grazing lands, lands under miscellaneous tree crops and groves not included in net area sown and cultivable waste. As the table shows, such areas have been steadily reduced from 2,30,000 hectares in 1950-51 to 40,000 hectares in 1969-70.

Cultivated area.—In revenue terminology land is termed as cultivated if it had been sown even once during the previous four harvests. Cultivated area comprises current fallows and net area sown. The reduction in the proportion of current fallow land is sufficiently marked as the figures for 1950-51 and 1969-70 would indicate. With the growing trend for intensive cultivation, the practice of taking crops from the same plots successively for a number of years is coming into vogue. In 1950-51, 48.5 per cent of the district area was under cultivation which rose to 79 per cent in 1969-70. Every effort is being made to utilize every strip of land for growing crops despite the pressure of growing population for non-agricultural uses.

Reclamation of cultivable waste.—Reclamation of land for purposes of cultivation has progressed as the following figures pertaining to the area

comprising cultivable waste in 1952-53, 1962-63 and 1966-67 to 1969-70 show :—

Year	Cultivable waste
	(Thousand hectares)
1952-53	174
1962-63	41
1966-67	29
1967-68	27
1968-69	18
1969-70	17

Water-logging.—Three factors mainly contribute to water-logging[1]. It becomes a menace in the un-lined canal irrigated areas 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 the monsoon which results in the sub-merging of a large area under water. The poor internal and surface drainage also causes water-logging. The water-logged area generally develops into alkaline land where no crops can grow. As a sequence to water-logging, the land is spoiled by *thur*[2], *kallar* and *sem*[3]. The extent of damage done by *thur* and *sem* in the district during the period 1962 to 1969 is shown in the following statement :—

		Cultivated	Ex-cultivated	Un-cultivated (never broken)	Total
		(Acres)	(Acres)	(Acres)	(Acres)
1962	*Thur*	9,874	7,894	69,915	87,683
	Sem	1,235	384	1,671	3,290
	Total	11,109	8,278	71,586	90,973

1. The worst condition of water-logging appears just after rains. The figures of observations of November are, therefore, adopted for calculation of water-logged areas.

2. It is a white or ash-coloured material consisting of harmful salts. It seems to subside after the rains, but the 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.

3. The cultivated area which owing to sub-soil moisture has become unfit for cultivation, or is so badly affected that it does not produce more than a four-anna crop, is classed as *sem*.

		Cultivated	Ex-cultivated	Un-cultivated (never broken)	Total
		(Acres)	(Acres)	(Acres)	(Acres)
1963	*Thur*	11,189	8,363	74,725	94,277
	Sem	427	532	1,256	2,215
	Total :	11,616	8,895	75,981	96,492
1964	*Thur*	13,337	8,434	74,713	96,484
	Sem	299	461	1,282	2,042
	Total :	13,636	8,895	75,995	98,526
1965	*Thur*	15,633	10,547	74,173	1,00,353
	Sem	356	652	1,480	2,488
	Total :	15,989	11,199	75,653	1,02,841
1966	*Thur*	17,212	14,098	73,831	1,05,141
	Sem	243	597	1,383	2,223
	Total :	17,455	14,695	75,214	1,07,364
		(Hectares)	(Hectares)	(Hectares)	(Hectares)
1967	*Thur*	7,088	7,450	30,181	44,719
	Sem	53	227	509	789
	Total :	7,141	7,677	30,690	45,508
1968	*Thur*	6,536	8,298	30,258	45,092
	Sem	46	199	493	738
	Total :	6,582	8,497	30,751	45,830
1969	*Thur*	6,371	9,279	29,649	45,299
	Sem	55	184	440	679
	Total :	6,426	9,463	30,089	45,978

Salinity and alkalinity.—Large tracts of arable land are rendered uncultivable because of salinity and alkalinity[1]. It is estimated that in Haryana State about 13 lakh acres (5,26,092 hectares) of land are affected by salinity and alkalinity of which about 5 lakh acres (2,02,343 hectares) are in the Karnal district alone. Reports about the development of salinity and alkalinity in the Karnal district were received as early as 1855 from the area round village Munak. Now large areas of land are lying uncultivated in nearly all parts of the district but the worst affected areas are in the Panipat and Karnal tahsils. Most of these soils have not only high salt but also have high alkalinity (PH. 9.0 to 10.6). Many of these soils have hard pan of cemented *kankar* and clay at a depth of about one metre. The predominant salt is sodium carbonate and bicarbonate with some chloride. The salt affected soils in the district have also high boron content which is difficult to get rid of.

Generally speaking, the total salt concentration in the underground water is not high but at some places and particularly in the Gula (Guhla) tahsil, it contains very high amount of sodium carbonate and bicarbonate. Use of such waters would render the soil unproductive unless amendments are added. The sub soil water in many parts of the district comes to within two metres of the surface during the rainy season, but is below three metres during the summer months. Surface drainage is a problem in these soils on account of their low permeability.

During the last two years, a number of experiments for the improvement and utilization of these soils have been conducted at the experimental farm of the Central Soil Salinity Research Institute, Karnal.[2] Most of the land of this experimental farm had been lying uncultivated for the last 80 years or so. The experimental work in the Institute has shown that these soils can be made as productive as normal soils, particularly for crops like paddy, wheat, barley, oilseeds and sugarcane if proper technology, based on scientific research, is applied. Detailed investigations for proper utilisation of water resources, particularly with respect to the utilisation of rain-water,

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1. A conservative estimate indicates that in India nearly seven million hectares of otherwise productive land are lying barren due to salinity and alkalinity. Such areas are particularly extensive in Uttar Pradesh, Punjab and Haryana, though saline soils also occur in the coastal regions of Maharashtra, Andhra Pradesh, Gujarat, Tamil Nadu, Kerala, Orissa and West Bengal.

2. For the set-up of this institute, see Chapter on 'Other Departments'.

and improving the drainage for different crops are in progress.

IRRIGATION

The district forms part of the region which is liable to frequent droughts.[1] The rainfall is seasonal, inadequate, and subject to frequent variations. Its erratic nature may injure crops and, therefore, it is necessary to have recourse to artificial irrigation.

In 1960-61, 38.3 per cent and in 1969-70, 58.5 per cent of the net area sown was irrigated. This included even those fields which received artificial application of water only once in the year and depended on nature for the rest of the period. A large part of the cultivated area, 61.7 per cent in 1960-61 and 41.5 per cent in 1969-70, was entirely at the mercy of nature for a successful harvest. The variations in rainfall affect the sowing as well as the harvesting of the crops-particularly those of the *kharif* season. The success or failure of the gram crop in particular much depends on such variations. A fair amount of rainfall in the end of June or in the beginning of July leads to an all-round sowing activity, while the failure of rain in the second half of July, August and September results in the scorching of crops.

The artificial supply of water for purposes of agriculture is, therefore, necessary to take advantage of the richness of the soil and to ensure against droughts. Fortunately, there has been no significant physical handicap in the way of developing artificial irrigation. In the western section of the district, where the water-table is nearly 150 feet below the soil surface and well irrigation is not possible, the difficulty has been removed by the construction of canals. In other parts the depth of water-table varies from 5 to 10 feet only and, sometimes, it is even less at places along the main Western Jumna (Yamuna) Canal[2].

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1. Samuel Van Valkanvurg, *Agricultural Regions of Asia*, (Part IV-*India*) *Economic Geography*—Volume I, April 1953, p. 118.

2. The Western Jumna (Yamuna) Canal includes Main Line Upper from Tajewala to Dadupur, Main Line Lower from Dadupur to Indri and Main Branch from India to Munak.

The progress of irrigation during 1960-61, 1966-67 and 1969-70 is given below :

(Thousand hectares)

Tahsil	Net area irrigated		
	1960-61	1966-67	1969-70
Karnal	52	54	66
Panipat	45	46	47
Thanesar	23	25	89
Kaithal	93[1]	159[1]	113
Gula (Guhla)			56
Total :	213	284	371

Panipat tahsil benefits both from canals and wells. The Western Jumna (Yamuna) Canal traverses the tahsil and the nearness of the water-table favours well irrigation. Karnal tahsil has a similar advantage, but to a lesser degree. In the western portion of the tahsil the water-table falls to a considerable depth with a consequent decrease in irrigation from wells. Areas not covered by canals remain unirrigated. In Kaithal tahsil where the water-table is about 150 feet deep, canals are the only means of irrigation. The Ghagghar, the Saraswati and their tributaries cause floods in Gula (Guhla) tahsil and water stagnates for months together preventing most of the *rabi* sowings. Thanesar area is also frequently flooded in the rainy season. As the slope provides a quick flow of water, the flooding thus compensates the deficiency of irrigation.

Development of irrigation.—The net area under irrigation increased from 213 thousand hectares in 1960-61 to 371 thousand hectares in 1969-70. This increase has been due to the construction of Narwana Branch of Bhakra Main Line and feeding of the Sirsa Branch and the Saraswati Canal from the perennial canal of Bhakra Main Line and also to the installation of tubewells.

1. The figure for the Gula (Guhla) tahsil is included in the Kaithal tahsil for the former till August 13, 1968, was a sub-tahsil of the latter.

The table below shows the net area irrigated in the district during 1960-61 to 1969-70 by different means of irrigation:

(Thousand hectares)

Year	Net area irrigated				
	Government canals	Tanks	Wells	Other sources	Total
1960-61	123	2	88	—	213
1961-62	122	2	89	—	213
1962-63	134	2	91	—	227
1963-64	155	2	94	—	251
1964-65	155	2	94	—	251
1965-66	155	1	94	—	250
1966-67	192	1	91	—	284
1967-68	196	1	90	—	287
1968-69	162	1	154	—	317
1969-70	161	1	209	—	371

IRRIGATION FACILITIES

The irrigation system of the district can be divided into two main categories, *viz.* river works and lift irrigation represented respectively by canals and wells. Another mode is storage tanks and reservoirs. The canals do not cover the whole area and, even in the area so covered, the intensity of irrigation is not sufficient to produce two to three crops annually which is an essential requirement for adequate food production. The next source of irrigation is ground-water reservoir which generally exists under all the alluvial soils and is tapped according to its suitability and the depth at which water is available. The wells and tube-wells are sunk into the ground and water is lifted by different means. Tank irrigation, though prevalent in some parts of the district, is not much in vogue.

Canal Irrigation

The canals form the chief means of irrigation in the district. The source for supplies of canal irrigation is river Yamuna (perennial)

and the streams like the Chautang and Saraswati (non-perennial). The Western Jumna (Yamuna) Canal is the oldest canal in the State. Dug originally during the reign of Firuz Shah to conduct water to the Royal Gardens at Hisar (Hissar) and Hansi, it incidentally irrigated the intervening tracts also. It was re-excavated in Akbar's reign for supplies from the Yamuna and Somb into the Chautang and on to Hansi and Hisar (Hissar). This was a perennial canal as is testified by the ancient bridges at Karnal[1] and Safidon (district Jind). It was further improved in c.A.D. 1643 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 kilometres below the present headworks of the canal and the water was led along the drainage line through Panipat and Sonipat (Sonepat) to Delhi. During the decline of the Mughal empire the canal which by then was known as Shah Nahar gradually silted up.

In 1821, a small instalment of the waters of the Yamuna was diverted into the Delhi Canal and the original alignment was adhered to. This alignment was, however, by no means satisfactory and as early as 1846 it was noticed that the concentrated irrigation, the defective drainage and the high banks which cut off the flow of natural drainage of the country, all contributed to the rapid deterioration of the soil and decline in the health of the people. Saline efflorescence was rapidly spreading and the inhabitants of the water-logged area suffered from chronic disorders of liver and spleen[2]. General Strachey, in 1867, described the canal area in the following words :—

> "The portion of the canal near Karnal is a disgrace to our administration, and has been for years past. It creates most pestilential swamps which must be got rid of, unless we are content to perpetuate this abominable nuisance, which has been talked about for the last 25 years, during which period no serious attempt has been made to abate it. For my own part, I distinctly reject all share in any counsel which tends to delay in meeting this most crying evil. I most fully admit the great importance of doing what has to be done with the most scrupulous regard to economy, and I am ready to sacrifice all thought of elegance or congruity for the purpose of avoiding any considerable outlay, which is really not needed to secure efficiency.

1. This old bridge called the Mughal Bridge (*Badshahi Pul*) on the Grand Trunk Road (N.H. 1) was abandoned in 1972.

2. *Imperial Gazetteer of India—Provincial Series*, Volume 1, 1908, pp. 202-03.

> But it is impossible for me to affirm, with too great positiveness, the moral obligation which rests on our Government to put an end, with all possible speed, to the discreditable condition of the large tracts of land along the Western Jamna Canal, which are converted into swamps of the most pestilential nature, not only destructive to the health and life of the population, but occupying in a manner for worse than useless some of what might be the very best lands. It will be necessary to do something, and what is necessary should not be delayed till other works, which have no relation to this part of the scheme, are completed."[1]

It was only in 1885 that the old canal (Wazir Khan Mughal Canal) was closed, and relegated to a position of a drainage line, and the new re-aligned canal was opened. This irrigation work piercing the district, came to be known as Western Jumna (Yamuna) Canal.

There was sharp increase in irrigation between 1895 and 1900 due to the opening of the Sirsa Branch of the Western Jumna (Yamuna) Canal in 1890 and the Nardak Major Distributary in 1898. Since the western portion of the district was not well provided with irrigation means, the Saraswati Inundation Canal was opened in the thirties of the present century.

Western Jumna (Yamuna) Canal had long rotational closures during *rabi* and thus formed a limiting factor in the extension of area under *rabi* food-grains. The Saraswati canals, being inundation canals, were also non-perennial. To remove this deficiency, the Narwana Branch from the Ist Bhakra Main Line was linked up with the Saraswati Canal and the Sirsa Branch in 1954-55, so as to feed and make them perennial. A brief description of the canals irrigating the district is given below:[2]

Western Jumna (Yamuna) Canal.—The canal takes off from the Yamuna at Tajewala headworks (Ambala district) where a very strong masonry weir is built across the river. Between Tajewala and Dadupur the canal follows for the most part an the old river-bed. The slope is fairly steep, and the current very strong. At Dadupur there is a level crossing over the combined Pathrala and Somb torrents. From Dadupur the canal flows south in

1. *Karnal District Gazetteer*, 1883-84, pp. 272-73.

2. A reference to the economic map appended to the volume will illustrate the course of the canals irrigating the district.

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. During the rest of its course in Jagadhri tahsil (Ambala district) it hugs the Bangar bank (the old high bank of the Yamuna) pretty closely, and flowing south-west passes below the railway bridge at Abdullapur (Yamunanagar) and finally leaves the tahsil at Daurang. After about 61.46 kilometres below Dadupur, there is a regulator at Indri[1] with lock and escape head where the canal bifurcates into Sirsa Branch[2] and Main Branch. About 49.9 kilometres further down at Munak the Main Branch bifurcates into the Hansi Branch, Delhi Branch, and the Gohana Distributary.

The Main Line Upper up to Dadupur was graded by the interposition of a number of falls and the old river creeks were canalized in a properly designed channel under the 1942 project. Two-thirds of the Yamuna water as is available for irrigation is taken as far as Indri in one united stream. Two falls combined with village-road bridges were constructed at Zainpur (R.D.[3] 1,75,950) and Badarpur (R.D. 1,59,000) during 1942. Another 3.5 foot fall combined with a village-road bridge has been constructed at R.D. 1,14,000 under Remodelling of Western Jumna (Yamuna) Canal Project, 1959. These falls reduce the slopes and meandering. For providing a passage for the flow of natural drainage, syphons have been provided at R.D. 1,57,000 and R.D. 1,11,250 on the Main Line Lower.

The capacity of Main Line Lower was raised to 8,050 cusecs in 1943 after the head regulators at Tajewala and Dadupur had been remodelled for such a discharge. The capacity was again raised to 9,000 cusecs in 1952 and finally to 12,000 cusecs.

The Main Line Lower is navigable [raft-flow up to Yamunanagar (Ambala district)]. The Chautang feeder, taking off at Indri head regulator, feeds the Chautang Canal System in order to ensure proper supplies during *kharif*. Between Indri and Munak where the Hansi Branch strikes westward to irrigate Jind and Hisar (Hissar), several subsidiary channels are given off. Fed by the torrents of the Rakshi and Chautang streams, the Chautang Canal System mainly consists of inundation canals. The Chautang canals irrigate Karnal tahsil through Rambha, Rakshi, Chautang, Saidpur, Sambhi,

1. As far as Indri the alignment of the old Badshahi Canal is followed.

2. Sirsa Branch has a capacity of 2,800 cusecs and runs for 126 kilometres, watering the arid tract of the country between Indri and Sirsa.

3. R.D.stands for running distance in foot.

Gitalpur and Gholpur minors/distributaries. Gogripur and Kheri distributaries, constructed in 1956 and 1957, respectively, have been taken out at R.D. 700 right of Karnal Mill Channel and R.D. 27,200 left of Main Branch on account of construction of the N.B.K. (Narwana Branch Karnal) Link. Gogripur distributary now takes off at R.D. 85,358—R and the reach R.D. O—3000 has since been abandoned.

Nardak distributary, constructed in 1897-98, takes off (R.D. 58,400—R) the Main Branch at Uchana and irrigates Nardak tract of the Karnal and Kaithal tahsils. The capacity of this distributary was increased from 370 cusecs to 488 cusecs under the Revised Western Jumna (Yamuna) Canal Project, 1959. The distributary was cut off by the construction of the N.B.K. Link at R.D. 27,000. It was, however, provided with a regulator below N.B.K. Link. The cut-off distributary is now fed from the N.B.K. Link through Sirsa Branch. The old Nardak distributary takes off at R.D. 19,400. The Budha Khera and Karnal distributaries irrigate land in the vicinity of Karnal town. The Goli distributary taking off above the regulator at Munak irrigates a few villages in the south-west part of the tahsil.

The main supplies of canal water for the Panipat tahsil are drawn from the Delhi Branch and the Hansi Branch which bifurcate at Munak on the borders of the Karnal tahsil. The Delhi Branch through its main distributaries, Naraina, Israna, Samalkha and Hulana, irrigates the greater part of the Bangar circle. The Samalkha distributary was taken out at R.D. 98,600 left from the Delhi Branch to irrigate the Panipat tahsil in 1955. The Joshi distributary and Butana sub-branch of the Hansi Branch serve the villages of the Jind district bordering the Karnal and Rohtak districts respectively.

The Bazida distributary, taking off at R.D. 94,600 left Main Branch at Ghogripur, serves the centre of the Karnal tahsil and extends to the villages in Panipat. The distributaries of the Delhi Branch are the most satisfactory in their working. They are controlled from Binjhaul, the headquarters of the Panipat canal sub-division.

The Sirsa Branch which was opened in 1890 was taken out of the main canal at Indri and strikes due west. No irrigation was done from this main canal in the Karnal tahsil, but the Habri sub-branch which takes out at Budhera irrigates a few villages in the Karnal tahsil. With the construction of Bhakra Dam, the area which was served by the Sirsa Branch below R.D. 88,000 (Budhera) is fed by Bhakra waters through Narwana Branch. The Sirsa Branch (R.D. 0—88,000) from Indri to Budhera is run from the Western Jumna (Yamuna) Canal during the monsoon when there

are surplus waters. The Bhakra supplies are accordingly reduced to conserve water in the dam. The supplies thus made available by this transfer have been utilised for the extension of irrigation in the Karnal and Rohtak districts. The most important factor in the development of the Nardak and Bangar circles is, of course, the opening of the Sirsa Branch which runs from north-east to south-west parallel to and about 6.5 kilometres to the south of Kaithal-Thanesar road. The Shudkan distributary and the Habri sub-branch irrigate the country between the Sirsa Canal and the drainage line of the Chautang which was formerly the boundary of the territory belonging to the Bhai of Kaithal. The villages lying to the south-east of drainage line were without irrigation until the opening of the Nardak distributary in 1898. All these distributaries have been aligned on the most approved principles, and when clear of silt their command of the irrigation area is almost perfect.

The Sirsa Branch irrigation is controlled by the Sub-Divisional Officer at Mundri. The Nardak distributary is under the immediate charge of the Sub-Divisional Officer, Nardak Sub-Division, Karnal. The southern villages of the tahsil bordering Jind are irrigated from the Moana distributary of the Hansi Branch which gives excellent supplies.

The area of the district irrigated by the Western Jumna (Yamuna) Canal and its branches is given below :

Year	Karnal tahsil	Kaithal tahsil	Panipat tahsil	Thanesar tahsil	Total for Karnal district
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
1957-58	1,00,193	2,20,430	47,523	—	3,68,146
1958-59	84,636	48,308	40,848	—	1,73,792
1959-60	93,882	50,044	53,297	—	1,97,223
1960-61	1,02,520	41,831	51,521	—	1,95,872
1961-62	1,06,665	47,987	51,259	—	2,05,911
1962-63	1,07,710	49,758	47,999	—	2,05,467
1963-64	1,09,422	49,996	48,267	—	2,07,685
1964-65	1,14,857	47,823	51,102	—	2,13,782
1965-66	1,14,828	44,776	64,067	—	2,23,671
1966-67	1,25,284	54,178	68,717	—	2,48,179
1967-68	1,27,469	55,571	63,216	—	2,46,256
1968-69	1,25,344	38,977	57,745	—	2,22,066
1969-70	1,38,972	51,433	61,826	—	2,52,231

Narwana Branch of Bhakra Main Line.—The canal was excavated in 1954 and feeds the Sirsa Branch of Western Jumna (Yamuna) Canal and Saraswati Canal so as to make them perennial canals. With the opening of this canal the load on the Western Jumna (Yamuna) Canal has been reduced and the supply has become regular in other distributaries of the latter canal. The Saraswati Canal System which constituted the inundation canals was opened in the beginning of the present century. The canal irrigated the western portion of the district only during the rainy season when the water in the Saraswati was sufficient to feed the canal. In 1954-55, the Saraswati Canal began to be fed by Narwana Branch of the Bhakra Canal and became a perennial one. The area of the district irrigated by the Narwana Branch and its distributaries is as follows :—

Year	Karnal tahsil	Kaithal tahsil	Panipat tahsil	Thanesar tahsil	Total for Karnal district
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
1957-58	1,643	96,038	—	11,824	1,09,505
1958-59	1,855	1,14,075	—	14,275	1,30,205
1959-60	2,110	1,21,853	—	13,555	1,37,518
1960-61	1,839	1,14,615	—	12,739	1,29,193
1961-62	2,222	1,48,481	—	12,047	1,62,750
1962-63	2,355	1,13,615	—	12,267	1,28,237
1963-64	2,821	1,39,758	—	12,761	1,55,340
1964-65	2,893	1,32,486	—	13,642	1,49,021
1965-66	3,804	1,60,993	—	16,996	1,81,793
1966-67	3,827	1,70,015	—	15,607	1,89,419
1967-68	3,783	1,71,358	—	14,900	1,90,041
1968-69	3,479	91,248	—	16,408	1,11,135
1969-70	3,143	89,859	—	16,185	1,09,187

Narwana Branch Karnal (N.B.K.) Link.—The new-lined branch canal was constructed in 1959-60 to pass Bhakra waters to the Gurgaon Canal System, Delhi Water Supply and Delhi Power Station through the Western Jumna (Yamuna) Canal. It takes off at Budhera from the left bank of the Sirsa Branch and joins Main Branch of the Western Jumna (Yamuna) Canal at R.D. 80,050. Having a capacity of 2,716 cusecs, it is only a feeder or link channel.

Sirsa Branch.—The Sirsa Branch was opened in 1890. It takes off from the Western Jumna (Yamuna) Canal at Indri. This canal irrigates the western portion of the district. It was not perennial because with the receding of the flow in the Yamuna all the distributaries of the Western Jumna (Yamuna) Canal could not be fed at the same time. Hence the different distributaries were run alternately. In 1954, the Narwana Branch of the Bhakra Main Line was excavated with its outfall into the Sirsa Branch near Budhera, a village ten kilometres south-west of Thanesar and this made the latter perennial.

The total irrigation by the Sirsa Branch in the district is as follows :—

Year	Karnal tahsil	Kaithal tahsil	Panipat tahsil	Thanesar tahsil	Total for Karnal district
	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
1957-58	..	..	—	—	..
1958-59	13,115	1,56,782	—	—	1,69,897
1959-60	13,806	1,67,347	—	—	1,81,153
1960-61	16,102	1,38,369	—	—	1,54,771
1961-62	17,252	1,54,712	—	—	1,71,964
1962-63	17,318	1,62,602	—	—	1,79,920
1963-64	19,497	1,84,575	—	—	2,04,072
1964-65	22,965	1,71,426	—	—	1,94,391
1965-66	24,595	1,72,316	—	—	1,96,911
1966-67	24,477	1,97,888	—	—	2,22,365
1967-68	25,407	1,93,417	—	—	2,18,824
1968-69	24,939	1,74,244	—	—	1,99,183
1969-70	26,049	2,00,252	—	—	2,26,301

WELL IRRIGATION

Next in importance to canals, as a source of irrigation, are percolation wells. There is a direct and intimate co-relation between the sub-surface water supplies and the means for tapping them for purposes of agriculture. Throughout the eastern portion of the district, the water-table does not fall below 10 feet, while it shows an abrupt fall in the west, particularly in the Kaithal tahsil. The number of wells varies according to the depth of the water-table. It is the largest in the southern portion of the Panipat tahsil because of the nearness of the water-table. The number decreases as one proceeds towards the western side of the district.

Karnal occupies the first place in Haryana in respect of the net well irrigated area. During 1969-70, an area of 209 thousand hectares was irrigated from wells. Water is almost invariably raised either with manual labour or by using bullocks. Different methods of well irrigation are devised according to the depth of sub-soil water and employed in the district as shown below :

Dhingli.—The lever contrivance for raising water with manual labour is known as *dhingli*. It is not a very popular device and is mainly practised in Thanesar, and Indri Khadar circle. The water is lifted by means of a bucket suspended with a long rope, tied to one end of a long wooden bar. The bar is pivoted on a perpendicular post to form a sort of see-saw. The height of the post depends on the depth of water. The bar is not pivoted at the centre in order to make one portion short. There is also adjustment to allow the bar to revolve on a vertical plane for emptying water from the bucket into the water channel. The short end of the bar is weighted so as nearly to counter-balance the weight of the long arm and bucket full of water. The bucket is lowered by the man in charge who draws the long end of the lever by a pull at the rope. This method is normally used for a lift of about 15 feet (4.6 metres) or less.

Charas or Mot.—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 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 approximately equal to the depth of the well. The driver sits on the rope near the yoke to keep it in position. By the time the bullocks arrive at the end of the ramp, the bag has been drawn up to the top of the well, and its water is emptied into a cistern, generally by a man who stands by, but sometimes by a self-acting

mechancial 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 recommenced. Before the construction of the Saraswati Inundation Canal, this method was quite common throughout Bangar-Pehowa circle but this slow and time-consuming process of irrigation is gradually diminishing and is now rarely seen in villages.

Harat, **Well-gear or the Persian wheel.**—The alternative to the *charas* is *harat* or the persian wheel. It consists of a continuous chain of buckets, passing over a vertical wheel fixed over the top of the well and rotated by means of a wooden or an iron gear which is worked by a pair of bullocks walking round a circular tract called *perd*.[1] This device is used extensively in eastern portion of the district, *viz.* the Thanesar, Karnal and Panipat tahsils.

Well irrigation is mainly a function of private enterprise. The State only encourages their construction by agricultural loans and by liberal rules in the matter of land revenue assessment. The Government grants *taccavi* loans up to the extent of Rs. 2,000 for sinking a new well and Rs. 500 for repairing an old and abandoned one. Whenever there is scarcity, the supply of cement at controlled rates and of bricks through approved kiln contractors is also arranged. The following table shows the number of wells sunk/repaired during 1951—69 at private expense and on receipt of

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1. Ibbetson wrote in the seventies of the last century :

"The Persian wheel or *harat* consists of a horizontal cogged wheel driven by bullocks yoked to a beam (*gadal*) fixed to its vertical axis (*balaur*). This wheel gears into and drives a vertical toothed wheel (*chakli*), half of which is under ground, and the horizontal axle of which (*belan* or *lat*) projects over the well. On this axle and over the well is fixed a vertical lanthern wheel (*har* or *od*) on which hangs the *mal*, a sort of rope ladder made of two side ropes and cross sticks. To the cross sticks are tied the earthen vessels (*tindar*) which raise the water. As they come up they discharge the water through the lanthern wheel into a water trough (*nisar*) inside the wheel, which returning on itself twice at right angles, passes out of the wheel, on the outer side, or that further from the centre of the well, where there are no spokes, and delivers the water into the cistern (*parcha*), whence it flows off by small channels (*khand*) to the fields." (*Report on the Revision of Settlement of the Panipat Tahsil and Karnal Parganah of the Karnal District*, 1872-80, p. 160.)

Since then there has been no change except that the earthen vessels have been replaced by the iron buckets.

taccavi :—

During the year ending *rabi*	New wells sunk		Old wells repaired	
	At private expense	From *taccavi* advanced	At private expense	From *taccavi* advanced
1951	15	178	20	37
1952	—	81	—	9
1953	11	58	15	15
1954	63	33	17	7
1955	21	55	25	23
1956	29	52	25	20
1957	25	39	12	10
1958	21	46	9	16
1959	15	64	34	11
1960	20	65	29	51
1961	10	130	11	27
1962	7	22	9	15
1963	11	27	17	19
1964	8	33	20	17
1965	21	24	4	10
1966	4	16	19	12
1967	28	35	30	21
1968	41	20	25	..
1969	—	—	45	..

Tubewells.—Tubewells and pumping sets were introduced after 1947. They serve to reduce the water-logging, check the rise in the water-table and irrigate lands. As against ordinary wells, tubewells tap deeper layers of underground water. They are becoming increasingly popular for the ordinary

wells give only a small discharge up to 0.15 cusecs as against 1.50 cusecs of a Government tubewell. The following comparative data present an interesting study:—

Well irrigation device	Approximate cost	Capacity for irrigation
	(Rs.)	(Acres)
Pakka open well	2,500 to 3,000	5
Well with pumping set	Cost of well plus 3,500	25 to 30
Private tubewell	5,000 to 6,000	50 to 60
Government tubewell	80,000 to 1,00,000	300 to 400

The installation of tubewells varies from one area to another according to the availability of electrical energy. Since it is more economical to work a tubewell with electrical energy than with diesel, there are fewer tubewells in areas where electricity is not yet available. Government provided 429 tubewells during the First and Second Five-Year Plans. Tahsil-wise distribution of these tubewells is as follows :—

Tahsil	Number of tubewells
Panipat	65
Thanesar	288
Karnal	76
Total :	429

Besides, 24,550 tubewells were energised by March 31, 1970. The district, by March 31, 1971, had 3,868 pumping sets (1,746 run by diesel and 2,122 run by electric energy) and 34,112 tubewells (8,881 run by diesel and 25,231 run by electric energy).[1] The tubewell irrigation has popularised sowing of cash crops like vegetables, sugarcane and cotton.

Tank Irrigation

Tank as a means of irrigation is prevalent only in some parts of the Karnal and Thanesar tahsils and does not play any significant role in the

1. According to the information supplied by the Divisional Soil Conservation Officer, Karnal, the Karnal District topped among all other districts in the State in minor irrigation facilities. On June 30, 1971, this district alone had 35,000 tubewells out of a total of 90,000 tubewells in the State. The tubewell irrigated area in the district was 2,87,800 hectares as against 1,61,400 hectares of canal irrigated area.

agricultural economy of the district. In 1969-70 only 1,000 hectares of land was under this type of irrigation.

Flood-Embankments and Marginal Bunds

Flood-embankments and marginal bunds are constructed to confine a river in prescribed reach and stop its water from flooding the adjoining area. As per agreement with the Government of Uttar Pradesh, no major flood-embankment can be constructed on the Yamuna unless approved by the Yamuna Committee.[1] Flood-embankments and marginal bunds have, however, been constructed on the Ghagghar, the Tangri and the Markanda.

Thanesar Bund, Bibipur Bund and Kanthala Bund.—All the three bunds were constructed in 1895-96 and form a 'C' shaped enclosure on the southern, south-western and western sides of the depression called the Bibipur Lake. This lake impounds the water of the Saraswati and part of the water of the Markanda, which is diverted into Bibipur Lake. This water is used for the irrigation of rice cultivation during the *kharif* season, and the surplus water escapes through the Saraswati Drain which outfalls into the Ghagghar.

Ghagghar Bund.—It was constructed in 1954-55 as a safeguard against floods. This bund prevents the spilling of the left side of the Ghagghar and saves villages namely, Urlana, Kasaur, Bhatiyan, Sadar Heri and Tityana of the Gula (Guhla) tahsil. It is about 30 miles (48 kilometres) long and a portion of it also lies in the Patiala district (Punjab).

Tangri Diversion Bund.—It is on the left side of the stream and is constructed near Jharauli village. The bund saves the villages Nalwi, Basantpur, Bijharpur, Kurri and Dalla Mazra of the Thanesar tahsil from a heavy spill. It also protects the villages of Thaska Miranji and Thol and the Thaska distributaries.

Right Marginal Bund, Markanda.—This bund is constructed on the right side of the Markanda from Jhansa (tahsil Thanesar). Its length is about 29,200 feet (8,900 metres) and the whole of it lies in the Karnal district. The bund has been constructed to check the overflow of river Markanda. It protects irrigation channels and also the village of Thaska Miranji.

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1. It is an inter-State body consisting of representatives of the Haryana, Uttar Pradesh and the Government of India. Its Chairman is the Chief Engineer Floods, Central Waters and Power Commission, Government of India.

Left Marginal Bund, Markanda.—This bund is constructed on the left side of the Markanda, Shahabad (Shahbad) to Jhansa, and is about 10 miles (16 kilometres) long. The bund checks the spills of the stream on its left.

Markanda Distributary Bund.—The Markanda distributary is quite near to the river and its right bank is strengthened properly to serve as a bund.

AGRICULTURE

As in the past, agriculture constitutes the main economy and is the mainstay of the majority of the people inhabiting the Karnal district. After Independence, most of the area fit for cultivation has been brought under plough and the district has made spectacular progress in the field of agriculture after the creation of Haryana in November 1966. This can be gauged from the fact that in 1969-70 the foodgrain production registered an increase of 84 per cent (118 per cent increase was recorded in the case of wheat) over 1966-67. It is expected that an overall 8 per cent growth rate in agriculture may be achieved in this district as compared to an all-India growth of 5 per cent to be attained in this sector by the end of the current Fourth Five-Year Plan (1973-74).

Set up of the Agriculture Department.—Prior to March 1967, the district was included in the Agricultural Circle, Hansi. The circle comprised a number of districts, each under the charge of a District Agricultural Officer. Since March 1967, Intensive Agricultural District Programme[1] has been started in this district and it is now under the charge of a Deputy Director, Agriculture. He is assisted by a team of specialists of different subjects which includes one Deputy Registrar, Co-operative Societies, one Statistical Officer, one Agricultural Engineer, one Assistant Agricultural Engineer, Subject Matter Specialists (one each for Agronomy and Farm Management, Plant Protection, and Fertilizers and Soils), one Agricultural Information Officer, one Training Officer and other Gazetted and Non-Gazetted staff including the field staff, *viz.* Agricultural Inspectors, Fieldmen and Co-operative Inspectors.

The Agriculture Department guides the farmers in the latest technological advances in agricultural production. These include intensive

1. Karnal is the only district in the State selected for this programme. Popularly known as the Package Programme it "aims at a break-through in agriculture and its raising its production potential. An integrated and intensified approach is envisaged for maximising agricultural production in the shortest possible time. It seeks to introduce new techniques of modern farming, or lent current practices, emphasise pooling and utilisation of available resources and strengthen them wherever possible." (B.K. Sinha, *Co-operatives in India*, 1968, p. 93.)

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

SOILS

In general, the soils of the district on which so much of the success of agriculture depends are sandy loam to loam in texture. According to physical characteristics, these soils may be divided as below :

Sandy.—These soils, locally called *retli dharti*, are found mostly near the banks of river Yamuna and other streams traversing the district. Little cultivation is possible in sandy areas.

Clay.—These soils, locally called *dakar*, are found in Naili and also in patches in other parts of the district. The clods of clayey soils are not easily broken. These soils do not yield autumn crops and the tillage for *rabi* crops is per force rough, for the land can only be ploughed immediately after heavy floods. If once the surface dries, nothing can be done with it. If properly managed, these soils are very suitable for paddy which is becoming one of the major crops of the district.

Kallar or Rehi.—These soils are found in stretches of varied extent almost throughout the district. The general appearance of the landscape of these soils is just like a white floor with brownish-black background having alkaline salts of 3 to 4 inches depth over the surface. The soils have, in general, an alkaline reaction. The reclamation of *kallar* soils calls for the lowering down of excessive salts by flooding and rice-*berseem* cultivation preceded by green-manuring with *dhaincha*. In the soils with high alkalinity, the application of gypsum or press-mud (a waste product of the sugar mills) also proves beneficial.

In general, the soils are deficient in nitrogen and organic matter, but the phosphorus content ranges from low to medium. It is, therefore, evident that, for obtaining good yields, the soils need heavy manuring with nitrogenous and phosphatic fertilizers. It is further obvious that on account

of the deficiency of organic matter, the soils be also treated with organic matter like farm-yard manure, compost and green-manure. For the improvement of alkaline soils green-manuring occupies an important place in the development of agricultural programme.

The menace of alkalinity and salinity is constantly increasing due to the rise in the water-table and because of defective drainage. Low soil fertility, salinity, alkalinity and water-logging are the major problems affecting the crop yields in this district.

CROPS

The crops grown in the district are divided into two main categories, *viz. kharif* and *rabi*, locally named as *sammu* and *sadhu*. The former is the summer season harvest and the latter the 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* or *zaid rabi*, according to the harvest with which it is assessed. *Toria* (an oil-seed) is cultivated as *zaid kharif*; vegetables, melon, tobacco and green fodder as *zaid rabi*.

The major *kharif* crops are sugarcane, cotton, paddy and maize, while the minor ones or subsidiary crops are chillies, *bajra*, *kharif* pulses (*moong*, *mash* and *moth*), *kharif* vegetables, *til* and *sani*. The major *rabi* crops are wheat, gram, barley and *rabi* oilseeds (*sarson*, *rai* and *taramira*) while the minor ones are *berseem*, *methi*, potato, onion and other winter vegetables.

Tobacco, potato, onion, chillies, vegetables, cotton and sugarcane are the main cash crops of the district. Vegetables are generally cultivated around the towns where there is comparatively greater demand for them.

Table IX of Appendix gives details about the sowing and harvesting of *kharif* and *rabi* crops ; Table X shows the area under principal crops ; Table XI, the yield per hectare and Table XII, the production of principal crops from 1961-62 onwards.

FOODGRAIN CROPS

Rice (Paddy).—Paddy cultivation in the district has increased considerably. In 1950-51, the area under this crop was only 40 thousand hectares. It rose to 102 thousand hectares in 1961-62, 138 thousand hectares in 1967-68 and 155 thousand hectares in 1969-70. The district tops in the production of rice in the State. The main producing area are the Thanesar, Karnal, Panipat and Gula (Guhla) tahsils. The increase has been relatively more in the areas

traversed by the main Western Jumna (Yamuna) Canal, and is largely attributable to rise in the water-table and alkalinity which, however, have assumed in certain areas the shape of a menace. The popular varieties grown are :

High yielding : T.N.I., IR 8 and IR 8-68

Local improved : *Jhona* 349 and *Jhona* 351, *Basmati* 217 and *Basmati* 370

Maize.—It is the second major *kharif* foodgrain crop of the district. The area under this crop during 1969-70 was 50 thousand hectares as against 34 thousand hectares during the previous year and only 13 thousand hectares in 1950-51. Thus, the increase in the acreage of this crop, since 1950-51, has been about four times. Maize is grown almost all over the district except in areas where paddy and *bajra* are the main *kharif* crops. The main varieties grown are Hybrid: Ganga 5, Composite : Vijay and Sona. But the major area still continues to be grown with local varieties.

Bajra.—*Bajra* is mostly grown in the *barani* areas of Kaithal tahsil. It constitutes an important item of food during the winter season. In the south-western portion of the district, it is cooked almost every evening for dinner and is preferred to wheat and gram. Consequent upon the introduction of new varieties specially hybrid *bajra*, the area under this crop is likely to increase in future. It shows variation from year to year and was 48 thousand hectares during 1967-68, 30 thousand hectares in 1968-69 and 50 thousand hectares in 1969-70, depending upon timely rains. Varieties recommended for this district are : Hybrid Bajra No. 1, and Hybrid Bajra No. 4.

Wheat.—This is the principal *rabi* foodgrain crop. It is grown mostly under irrigated conditions, and is the leading crop of the district. The area under this crop increased from 95 thousand hectares in 1950-51 to 242 thousand hectares during 1967-68 and 322 thousand hectares in 1969-70. The progressive increase in its acreage is largely due to increase in the irrigated area of the district, assured production and the introduction of new local and exotic high-yielding varieties. The main varieties grown in the district are : C 281, C 273, C 306, PV 18, Kalyan, Sona and Sonalika.

Gram.—This is also an important *rabi* foodgrain crop. 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. It is mostly grown under *barani* conditions and therefore its

acreage shows wide variation from year to year. The area under this crop during 1969-70 was 95 thousand hectares as against 101 thousand hectares in the previous year and 121 thousand hectares in 1967-68. It had reached the highest figure of 207 thousand hectares in 1960-61. The important varieties grown in the district are Pb. 7 and S 26.

Barley.—The area under this *rabi* crop has, like wheat, shown significant increase since 1950-51 when it was grown only on an area of five thousand hectares. During 1967-68 it was 41 thousand hectares. The increase was due to regular supply of irrigation water at the time of sowing and alkalinity as barley does better than wheat on alkaline soils. However, with the reclamation of alkaline and saline soils and the introduction of better yielding varieties of wheat, the area under this crop has decreased. It was 31 thousand hectares in 1968-69 and 18 thousand hectares in 1969-70. The main varieties of this crop sown in the district are : C 138 and C 164.

COMMERCIAL CROPS

Sugarcane.—It is an important cash crop of the district and is grown mostly under irrigated conditions. The area under this crop rose from 13 thousand hectares in 1950-51 to 51 thousand hectares in 1965-66 but it decreased in subsequent years to 32 thousand hectares in 1967-68. Similar figures for 1968-69 and 1969-70 are 37 and 45 thousand hectares respectively. The increase could be attributed to several factors including the installation of sugar factory at Panipat. The decrease has been due to the introduction of better yielding varieties of foodgrains, red rot disease and low selling price of sugarcane. The main varieties sown in the district are : Co. 453, Co. 312, Co. 1148, Co. L 29 and Co. L 9. Emphasis is being laid on covering large areas with early varieties Co. L 29, Co. L 9 ; mid-season variety Co. 975 and late variety Co. 1148 so as to extend the factory season.

Cotton.—It is an important cash crop of the Kaithal tahsil. The crop has two varieties, *viz. Desi* and American. There has been almost no change in the area under *Desi* varieties since 1950-51 but American cotton started gaining importance in 1955-56 when the area under it was the highest, *i.e.* 20 thousand hectares. In 1969 the area under *Desi* variety was 7 thousand hectares while it was 8 thousand hectares under American variety. The increase or decrease in acreage is due to the availability of water-supply at the time of sowing. The main variety of American cotton sown in the district is H. 14.

Potato.—It is another important cash crop and is sown under irrigated conditions alone both in winter and spring but the autumn crop

covers more area. The area under this crop which was only 690 hectares in 1950-51 rose to 2,120 hectares in 1965-66 and 2,580 hectares in 1969-70. The main varieties are: Patna Red, Upto date, 555 and Kufri Sandori.

Chillies.—Chillies are sown in *Khadar* areas of Panipat, Karnal and Thanesar tahsils. Owing to heavy rains during the last few years, the crop received a setback and there has been a considerable decrease in its area and production. The area under this crop during 1969-70 was 2,370 hectares.

Among the minor crops, mention may be made of onion, tobacco and vegetables. The former two crops are generally grown in loam and sandy loam soils and the area under these crops was 1,766 and 120 hectares respectively during 1966-67, and 1,965 and 95 hectares respectively during 1967-68. Brinjals and cauliflowers are amongst important vegetables which occupied 1,200 and 546 hectares respectively in 1966-67, and 1,350 and 595 hectares respectively in 1967-68.

Oilseeds.—*Toria* and *sarson* are the main oilseed crops and linseed, groundnut and *til* the minor ones. The area under these crops during 1965-66, 1966-67 and 1967-68 was as follows :—

Crop	Area (Hectares)			
	1965-66	1967-68	1968-69	1969-70
Rape and Mustard	15,000	21,000	16,000	17,000
Linseed	190	320	270	180
Til	250	440	300	380
Groundnut	140	450	180	160

Toria is a *zaid kharif* and is grown as an irrigated crop in pure form, while *sarson* and *rai* are mostly grown in mixture with wheat, barley and gram in 8 to 10 feet (2.5 to 3 metres) wide rows. *Toria* being a short duration crop, it has good future in the cropping pattern of this district.

PULSES

Moong, mash (*urd*) and *masur* (*massar*) are the three main pulses grown throughout the Karnal district. The former two are *kharif* crops and require loam to light loam soil. Although both of these depend upon rain, heavy rain at the time of flowering proves harmful. Generally no irrigation is required but in case of failure of rain for a longer period during the growing season,

the crop needs irrigation towards the end of September when it is nearing maturity. On the other hand *masur* is a *rabi* crop and all types of soils except alkaline and water-logged areas, suit this crop. It is grown in rainfed areas. If, however, the rains fail, two applications of irrigation become necessary—one at flowering stage and the other at milking stage.[1] The varieties of seed used are shown below :

Moong ..No. 305, 54, Shining *Moong* No. 1

Mash ..*Mash* 48, *Mash* 1—1

Masur ..No. 9—12

The area under each of the three pulse crops has been as under since 1965-66 ;

Year	Area (Thousand hectares)		
	Moong	*Mash*	*Masur*
1965-66	0.04	1.52	15.00
1966-67	0.04	1.42	18.41
1967-68	0.17	1.84	17.76
1968-69	0.03	1.43	15.87
1969-70	—	1.40	13.40

FODDER CROPS

About 12 per cent of the total cropped area of the district is under fodder crops. Apart from these crops, the stalks of *bajra, jowar* and maize and the chaff of wheat, gram and minor cereals are used as animal feed. The forage crops are generally sown in the un-irrigated area and are mostly concentrated in the *kharif* season served by the monsoon rains. The important among fodder crops are *chari*, green maize, *gwara, methi, jayee, berseem* and lucerne. Of these *chari* is the leading crop and covers about 52 per cent of the forage crop area. The following table gives the area under different fodder crops

1. Milking stage is the period when formation of grain begins in the crop.

during 1961-62 and 1969-70 :—

Fodder Crops	1961-62 (Acres)	1969-70 (Acres)
(a) *Kharif* **Crops**		
Jowar (Chari)	81,102	80,473
Gwara	13,329	13,874
Other fodders	16,747	16,672
Total (a)	1,11,178	1,11,019
(b) *Rabi* **Crops**		
Berseem	31,422	76,412
Lucerne	969	646
Oats	4,611	2,598
Other fodders	34,788	21,020
Total (b)	71,810	1,00,676
Grand Total (a) & (b) :	1,82,988	2,11,695

An area of about 40,000 hectares was under permanent pastures and grazing land during 1960-61. The corresponding figure for 1967-68, 19,871 hectares, is much lower owing to the fact that some pasture lands have been brought under cultivation.

Fruit Crops And Gardens

A variety of fruits like *malta*, orange, lime, grape-fruit, grapes, guava and mango are grown on a commercial scale in this district. In view of the favourable agro-climatic conditions, irrigation and other facilities available in the district, there is a wide scope for the expansion of area under fruits. Pedigreed fruit-plants are supplied from the registered nurseries. Private nurseries are also located roundabout Karnal and Panipat. In 1963, the area under fruit crops was 3,538 acres. It rose to 3,890 acres in 1967. In order to bring more area under fruit cultivation, long-term loans are advanced to the growers under the 'Development of Horticulture Scheme'. The rise in water-table has, however, hindered further expansion of gardens under citrus fruits.

Two co-operative garden colonies, comprising 2,403 acres were established at Jundla (tahsil Karnal) and Kachrauli (tahsil Panipat) after the Partition. Water-logging and the appearance of *kallar* due to a rise in sub-soil water have, however, retarded the progress of these colonies.

AGRICULTURAL IMPLEMENTS

Any improvement in agriculture is inconceivable without a corresponding improvement in the implements used. Modern implements are being gradually adopted by the farmers in accordance with their utility and scope for use. These are popularised by the Government through different schemes. The description of agricultural implements in common use is given below:

Plough.—It may be of wood or iron, but one in common use is generally of *kikar* wood, made by the village carpenter. It merely scratches the soil up to 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. However, a sturdy and intelligent farmer makes full and efficient use of the plough with a strong pair of oxen. Still, 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 (*halas*), wooden body (*hal*) and the coulter (*panhiari* and *kuis*). In 1961, there were 1,01,688 wooden ploughs in the district. The number decreased to 47,500 in 1967 owing to an increasing use of iron ploughs by the farmers. Their number increased from 1,336 in 1951 to 45,686 in 1961, and 68,450 in 1967. The iron plough is more popular among the farmers who came from Pakistan and its adoption is changing the outlook of the local farmers.

Tractor.—The use of the tractor is limited to a few big farms. Still the number of tractors in use increased from 98 in 1951 to 632 in 1961, 1,442 in 1967, and 4,259 in 1969.

Bullock-cart.—This is the usual load carrying device of the farmer. It is commonly used for carrying the farm produce to the thrashing ground, grains to the homestead and surplus, if any, to the market and for other transportation needs. The carts are locally manufactured but some of them are imported from Muzaffarnagar district of Uttar Pradesh, which has specialised in the manufacture of carts. There is no difference between the type and their prices of the carts used in one corner of the district or another, but slight variations do occur owing to varying nature of the soil and certain other factors. Wheels made exclusively of iron are fast replacing the wooden ones. There were 45,685 carts in the district in 1961, 56,760 in 1967 and 78,177 in 1969.

Cane-crusher.—It is another important agricultural implement used, mostly on a co-operative basis, for crushing the cane. Wooden crushers, in vogue some three decades back, have been discarded and those of steel have taken their place. Much of the sugarcane produced in factory areas is supplied to sugar mills at Panipat, and Yamunanagar (Ambala district) and the rest is crushed locally for making *gur* or *khandsari*. There were 4,211 steel cane-crushers in 1961, 7,540 in 1967 and 4,420 in 1969.

Other implements.—A number of other tools and implements are used such as spade, *kasola*, *pora*, *kuhari* (axe), *dranti* (sickle), seed-drills and cotton-drills. Although the scope of mechanised farming is limited because of the small land holdings, the modern implements are being gradually adopted by the farmers. Scarcity f labour and improved economic conditions of cultivators have accelerated this process. The following comparative study for the years 1961 and 1967 is revealing :—

Particulars	Number	
	1961	1967
1. Plough		
(i) Wooden	1,01,688	47,500
(ii) Iron	45,686	68,450
2. Tractors	632	1,442
3. Carts	45,685	56,760
4. Sugarcane-crushers	4,211	7,540
5. *Ghanis* (Oil expellers)	165	270

SEEDS

Better varieties of seeds enhance considerably the output of agricultural produce. The Agriculture Department does much publicity in favour of improved seeds and concentrates on multiplying and distributing improved seeds to the farmers. The better yielding varieties of some seeds are as under:

Wheat : Local improved : C 281, C 273 and C 306
Exotic better yielding : PV 18, Kalyan, Sona and Sonalika[1]

1. This is a new better yielding semi-dwarf variety. In yield it has excelled C 306. It bears uniform bold ambre grains as compared with un-uniform and relatively small grains of Kalyan, Sona and red grains of PV-18. It is recommended for cultivation under high fertility, normal fertility and for late sowing conditions in Haryana, Punjab and Himachal Pradesh.

Rice : Local improved : *Jhona* 349, *Jhona* 351, *Basmati* 217 and *Basmati* 370

Exotic better yielding : T.N.I. , IR 8 and IR8-68

Gram : Pb. 7 and S 26

Maize : Hybrid Ganga 5 Composite Vijay and Sona

Barley : C 138 and C 164

Sugarcane : Co. 453, Co. 312, Co. L 29 and Co. L 9, Co. 975, Co. J 46 and Co. 1148

Bajra : Local improved : T 55, A 1/3 and S 530

Exotic better yielding : Hybrid *Bajra* No. 1 and Hybrid *Bajra* No. 4

Jowar : J.S. 263, J.S. 20 and J.S. 21

To ensure a regular supply of improved seeds, there is a Government Agricultural Demonstration Farm at Karnal, besides 12 seed farms in different blocks where improved seeds are grown for distribution among the cultivators. Relevant details of these farms are given in Table XIII of Appendix.

The varieties of improved seeds distributed by the Agriculture Department and the area under improved varieties in the district during 1961-62 to 1967-68 were as under :

Year	Improved seeds distributed (Metric tonnes)					Area under improved varieties (Thousand hectares)
	Paddy	Wheat	Cotton	*Bajra*	Maize	
1961-62	32.6	304.3	77.2	2.0	2.3	15.2
1962-63	47.4	282.3	234.6	—	—	16.3
1963-64	150.4	211.0	178.6	1.3	—	27.2
1964-65	233.1	275.2	308.8	0.2	—	18.4
1965-66	243.0	481.1	296.3	1.6	—	36.7
1966-67	168.2	970.4	255.6	4.0	12.0	68.2
1967-68	161.5	1,653.8	262.8	7.7	16.8	81.1
1968-69	42.0	622.2	165.0	5.0	33.6	214.2
1969-70	10.5	390.0	150.0	6.5	33.9	200.0

Since the farmers, in the beginning were not aware of the benefits to accrue from the use of improved varieties of seeds, the demand and consequent distribution was less. As the farmers got enlightened about more yields, larger quantities of seeds were distributed year after year. The decline in the figures for 1968-69 and 1969-70 is again significant. By now the farmers had enough of the improved seeds produced on their own fields. The distribution of improved seeds of maize was started during 1966-67, because it was in that year that the first local hybrid maize was introduced.

The district is notified under the East Punjab Improved Seeds and Seedlings Act, 1949. It is an offence to grow varieties of crops, particularly wheat and cotton, other than those on the approved list of the Agriculture Department. The defaulters are liable to a fine which may extend up to one hundred rupees.

Manures and Chemical Fertilizers

Next to water and improved seeds manures and chemical fertilizers are the most important inputs for increasing crop yields. In recent years, the use of manures and fertilizers has increased considerably. At present, not only are compost and dung used but farmers have been adding chemical fertilizers to increase crop production. Night-soil and other urban wastes were neglected about 20 years ago, as the people did not like to use them due to social prejudices. Now they are being used in considerable quantities. Green-manuring with leguminous crops add to fertility of the soil. Among all kinds of manuring practices, green-manuring has been found to be the cheapest. Chemical fertilizers give better results when aided with green-manuring.

Chemical fertilizers.—The soils of the district are alkaline in nature and are poor in organic matter and nitrogen. Chemical fertilizers are indispensable for increasing crop yields quickly and these are used alone as well as in combination with organic manures.

As a result of a large number of village demonstrations the cultivators are taking to fertilizers for increased production. *Taccavi* loans are given for the purchase of fertilizers and their supply is arranged by the Government at controlled rates. The district wholesale co-operative society distributes the fertilizers to marketing societies and the sale depots. In 1961-62, there were 160 depots functioning in the district. The number rose to 443 in 1969-70. The following data regarding the distribution of chemical fertilizers shows that the use of chemical fertilizers is getting increasingly

popular among the cultivators :—

Year	Chemical fertilizers distributed (Metric tonnes)		
	Nitrogenous	Phosphatic	Potash
1961-62	4,600	390	—
1962-63	5,600	424	—
1963-64	9,382	870	—
1964-65	16,681	1,610	—
1965-66	15,300	1,351	10
1966-67	17,075	963	161
1967-68	53,022	4,929	432
1968-69	83,305	18,537	978
1969-70	1,07,000	34,000	9,000

Urban compost.—Urban wastes are a potential source of plant-food ingredients. To conserve these wastes for manurial purpose, efforts have continued over the past few years. The Municipal Committees, Karnal, Panipat, Thanesar, Kaithal, Shahabad (Shahbad), Ladwa, Radaur, Gharaunda and Pundri are carrying on the work of composting. The compost produced at these places is sold to the cultivators. The Government advances subsidies to the municipal committees for the initiation and intensification of compost work. The production of urban compost steadily increased during 1961-62 to 1967-68 but declined thereafter as is evident from the following figures :—

Year	Production
	(Metric tonnes)
1961-62	9,971
1962-63	10,539
1963-64	15,840
1964-65	21,745
1965-66	42,836
1966-67	55,320
1967-68	90,625
1968-69	16,164
1969-70	13,758

Rural compost.—The work for the development of local manurial resources (rural compost and dung manure) is being done in the district. It has the following three main objectives :—

(1) Larger and better utilisation of local manurial resources.

(2) Preparation of night-soil compost in bigger *panchayats*.

(3) Intensification of green-manuring.

Extension workers who advise the cultivators in the manufacture of compost are trained in the technique of scientific composting. The total quantity of rural compost prepared during the period 1959-60 to 1969-70, as given below, indicates greater awareness in this regard in the rural areas :

Year	Compost prepared (Metric tonnes)
1959-60	3,10,264
1960-61	5,38,187
1961-62	7,61,623
1962-63	6,31,426
1963-64	8,53,642
1964-65	10,48,345
1965-66	13,24,843
1966-67	15,53,309
1967-68	16,52,000
1968-69	14,00,000
1969-70	11,50,000

The main activity consists of the digging of new compost pits and repairing the old ones for the proper conservation of farm and household wastes. No alternative has been offered to the villagers to discourage them from using dung as fuel. At the same time it is being realized that dung does not contain sufficient percentage of nitrogen, phosphorus, potash, etc. The chemical fertilizers, green-manure and urban and rural compost are better substitutes.

Green-manuring.—This is very important for soil fertility as it directly adds nitrogen to the soil. 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 creates better conditions for the increase of useful bacteria in the soil. Green-manuring with sunn-hemp, *gwara* and *dhaincha* is recommended. Experiments have revealed that an increase of about one quintal of foodgrains per acre results through green-manuring. The practice of green-manuring is being popularised by the distribution of free seed packets of *dhaincha*.

The total area under green-manuring crops during the years 1957-58 to 1969-70 shows an appreciable increase :

Year	Area under green manures
	(Acres)
1957-58	8,485
1958-59	11,784
1959-60	29,052
1960-61	42,599
1961-62	56,699
1962-63	78,899
1963-64	97,000
1964-65	1,04,999
1965-66	93,715
1966-67	73,650
1967-68	60,000
1968-69	85,000
1969-70	83,000

CROP ROTATION

Two crops in a year is the common practice in areas of assured water-supply. In swampy lands where nothing but rice can be grown, the fields

used to be left fallow during *rabi*. With the adoption of the new strategy of 'intensive cultivation', the majority of such areas are now put under *rabi* crops also. Single cropping is in vogue particularly in *barani* areas where either the *kharif* crop is taken or the *rabi*. However, in times of adequate rains in September-October, gram, wheat and gram mixture, *sarson* or *toria* are also sown. Mixed crops are commonly grown in *barani* tracts. Gram and wheat or gram and barley with rows of *sarson* or *toria* are sown mixed to provide safeguards against uncertainty of weather. If the rains are favourable, wheat comes off better, but should the rains be scanty then at least gram may be expected to bear a yield. Rows of *sarson* are drawn in wheat fields; *sarson* thus sown is removed early for fodder and wheat is allowed to grow. It is a common practice to grow pulses which are short growing crops along with *kharif* cereals, *e.g.* maize and *mash*, *jowar-bajra* and *moong*.

The rotation varies from soil to soil and it differs under irrigated and *barani* conditions. The general rotation of crops[1] followed by the farmers is given below :

1. Wheat—fallow—*toria*—cotton
2. Rice—*berseem*—rice—wheat
3. Rice—wheat (gram)—rice—wheat
4. Maize—*berseem*—maize—wheat
5. Wheat—*chari*—gram—maize
6. Wheat—cotton—fallow—*toria*—sugarcane
7. Cotton—*berseem*—maize—wheat
8. Wheat—*toria*—sugarcane
9. Maize—wheat—maize—wheat
10. Wheat—*bajra* or *chari*—fallow—wheat
11. Wheat—*bajra* or *chari*—gram
12. Maize—potato—onion
13. Maize—potato—potato

Agricultural Pests and Diseases

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

(1) **Crop pests and diseases**

(a) Sugarcane top-borer

(b) Sugarcane stem-borer

1. The time of sowing and harvesting of *kharif* and *rabi* crops is given in Table IX of Appendix.

(c) Sugarcane pyrilla
(d) Gurdaspur borer
(e) Cotton jassid, white fly
(f) Rice bug
(g) *Sarson* aphis
(h) Gram cut-worm
(i) Toka (Chrotogogonus sp.)
(j) Loose smut of wheat
(k) Covered smut of barley
(l) Rusts of wheat
(m) Maize top-borer

(2) **Fruit pests and diseases**

(a) Citrus paylla
(b) Lemon cater-pillar
(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) **Stored grains pests**

(a) *Khapra*
(b) *Susri*
(c) *Dhora*

(5) **Miscellaneous pests**

(a) Field rats
(b) Jackals

(6) **Obnoxious weeds**

Pohli, Piazi, Bathua, Kurund, Khli, Mena, etc.

These pests and diseases attack the standing crops and stored grains with varying intensity. The Agriculture Department is advocating through intensive propaganda, the different control measures to reduce the damage caused by these weeds. Legal action under the East Punjab Agricultural

Pests, Diseases and Noxious Weeds Act, 1949, can be taken against the cultivators who do not eradicate weeds, pests and diseases before the maturing of seeds.

AGRICULTURAL CO-OPERATIVES

Increased agricultural production depends upon a variety of factors. Amongst them the important ones are : provision of timely and adequate credit, supply of chemical fertilizers, improved seeds, insecticides, pesticides and facilities for marketing of agricultural produce as well as storage arrangements. The agricultural service co-operatives can meet all these requirements. It is through co-operative farming that the scanty resources of the agriculturists can be pooled thus bringing to them the gains of large scale intensive farming. Through co-operative marketing, the drifting away of profits to the middlemen can be checked and in turn high dividends can be secured to the farmers for their produce.

The total number of co-operative societies of all types excluding industrial co-operatives, at the end of the 30th June, 1968, was 1,910 with a membership of 1.62 lakhs. Their owned funds and working capital amounted to Rs. 4.31 crores and Rs. 12.82 crores respectively. Although their number decreased to 1,901 at the end of the 30th June, 1969, their membership increased to 1.74 lakhs and owned funds and working capital to Rs. 4.56 crores and Rs. 19.17 crores respectively. All the inhabited villages numbering 1,350 stand covered by one type or the other type of a co-operative society.

For meeting credit, chemical fertilizers and consumer goods requirements, there were, at the end of the 30th June, 1968, 1,204 agricultural credit service societies with a total membership of 0.98 lakh. Their number at the end of the 30th June, 1969, stood at 1,202 with a total membership of 1.04 lakhs. These societies advanced short term and medium term loans to the extent of Rs. 1.80 crores during 1967-68 and Rs. 3.48 crores during 1968-69. Besides, in 1967-68 the societies distributed 663.17 metric tonnes of chemical fertilizers through a net-work of 578 regular sub-depots in the district. The consumer goods worth Rs. 49 lakhs were also supplied by the agricultural co-operative societies. Similar figures for 1968-69 were : chemical fertilizers—539.28 metric tonnes, sub-depots—665 and consumer goods—Rs. 92.92 lakhs.

The Karnal Central Co-operative Bank Ltd., Karnal advances short term and medium term credit to the various types of co-operatives. As compared to Rs. 1.54 crores advanced during 1966-67, a sum of Rs. 2.07 crores

was advanced during 1967-68 and Rs. 4.21 crores during 1968-69 by this bank. Its membership on the 30th June, 1968, was 2,030 with owned funds amounting to Rs. 59.20 lakhs and working capital amounting to Rs. 322.76 lakhs. The total amount of deposits held by the Bank amounted to Rs. 1.55 crores. Similar figures at the end of the 30th June, 1969, were : membership—2,082 , owned funds—Rs. 89.13 lakhs, working capital—Rs. 478.62 lakhs and deposits—Rs. 1.70 crores.

The long term credit requirements of the cultivators in respect of sinking of tubewells, purchase of tractors, purchase of land, etc., are met with by the 6 primary land mortgage banks (one each at Karnal and Kaithal, and two each at Thanesar and Panipat), which have a membership of 10,443. During 1968-69, these banks advanced Rs. 265.08 lakhs as long term credit.

Joint farming/collective farming societies have been organised in order to secure gains of large-scale farming without losing individual proprietorship in land. Government provides financial assistance to such societies and gives various concessions. The co-operative farming societies have, however, not met with a real success. Most of the societies organised in the district are of landless labourers and the waste land could be made available to a few of these. To accelerate the pace of co-operative farming, a pilot project was launched at Nilu Kheri (Nilo Kheri) during 1962-63. Another such pilot project was started at Thanesar during 1964-65. The total number of farming societies in the district at the end of the 30th June, 1969, was 169 with a membership of 3,710. Of these, 128 were joint farming and 41 collective farming societies.[1]

The only sugar mill in the district namely, the Panipat Co-operative Sugar Mills Ltd., Panipat, has a membership of 17,812 and a working capital of Rs. 337.44 lakhs. It crushed 1.70 lakh metric tonnes of sugarcane and produced sugar worth Rs. 1.81 crores during the crushing season of 1968-69.[2]

The other agricultural co-operatives in the field are co-operative marketing societies, garden colonies societies, irrigation societies, poultry societies, dairy and milk supply societies, cattle breeding societies, fishermen's societies,

1. Similar figures at the end of the 30th June, 1968, stood at 183; 4,201; 138 and 45 respectively.

2. Similar figures for 1967-68 were 1.23 lakh quintals and Rs. 2.13 crores respectively.

primary co-operative consumer stores, piggery societies, better farming societies, veterinary societies, etc. The co-operative marketing societies have been mentioned in the Chapter on 'Banking, Trade and Commerce'. Other more important societies in the agriculture or allied fields in 1966-67 to 1968-69 were :

Society	Number		
	1966-67	1967-68	1968-69
Garden Colonies Societies	2	2	2
Irrigation Societies	13	13	12
Poultry Societies	25	22	14
Cattle Breeding Societies	3	2	2
Dairy and Milk Supply Societies	30	32	50
Fishermen's Societies	1	1	1

STATE ASSISTANCE TO AGRICULTURE

It comprises subsidies, *taccavi* loans and other loans advanced to the agriculturists. The loans thus advanced during the period 1961-62, 1965-66 and 1967-68 to 1969-70 are detailed in Table XIV of Appendix.

ANIMAL HUSBANDRY

Animal husbandry in the district is looked after by the District Animal Husbandry Officer at Karnal. He is assisted by the Veterinary Assistant Surgeons, Animal Husbandry Assistants, Stock Assistants, Veterinary Compounders, etc. His main activities relate to cattle breeding, artificial insemination work, control of the outbreak of contagious diseases amongst livestock, improvement of livestock and provision of veterinary aid.

The district possesses a fairly large number of livestock including cattle, buffaloes, horses and ponies, sheep, goats, mules, camels, donkeys and pigs and ranks second (next to Hissar) among all the districts of the State. The livestock population of the district as per 1951, 1961 and 1966 Censuses was 9,40,059, 11,08,209 and 12,03,662 respectively. It recorded an increase of about 22 per cent during the period 1951—66. The following table gives

tahsil-wise relative figures of livestock for the years 1961 and 1966 :—

(hundereds)

Particulars	Karnal		Panipat		Kaithal[1]		Thanesar		Total	
	1961	1966	1961	1966	1961	1966	1961	1966	1961	1966
Cattle	1,516	1,613	765	732	1,925	1,980	1,164	1,164	5,373	5,489
Buffaloes	1,077	1,407	705	773	1,687	1,970	693	798	4,162	4,948
Sheep	131	222	121	97	227	248	77	126	556	693
Horses and Ponies	28	33	19	14	32	26	15	12	94	85
Goats	79	70	58	31	196	136	51	52	384	289
Donkeys and Mules	46	41	34	32	92	69	11	11	183	153
Camels	14	51	17	30	9	19	8	16	48	116
Pigs	84	69	59	51	111	109	28	34	282	263
Total :	2,975	3,506	1,778	1,760	4,279	4,557	2,047	2,213	11,082	12,036

The population of the district being mainly vegetarian, killing of animals is not common. However, there are seven recognised slaughter houses for pigs, sheep and goats at Karnal, Panipat, Kaithal, Shahabad Shahbad), Nilu Kheri (Nilo Kheri), Ladwa, and Pehowa.

Cattle and buffaloes.—Animals, especially cattle and buffaloes, play an important role in the economy of the district, and animal husbandry forms an integral part of agriculture. The essential equipment of the peasant-farmer includes a pair of oxen or buffaloes to do the ploughing and to draw the cart. Even though bullocks have been replaced by motor and electric power in some places, yet the importance of cattle in agricultural economy has remained almost unchanged on account of the yield of milk, manure, skins and hides in addition to meat and wool.

Every farmer has at least either a cow or a buffalo. The cows are kept mainly for breeding calves, and partly on religious grounds also. The Royal Agricultural Commission of India remarked that "in most parts of the world, they (cows) are valued for food and for milk; in India, their primary

1. Figures for the Gula (Guhla) tahsil are included in the Kaithal tahsil since prior to August 13, 1968, Gula (Guhla) was a sub-tahsil of Kaithal.

purpose is to produce bullocks for 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 recognise 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 to-day.

In certain tracts of the district, especially in the Rajput villages, the ordinary agricultural crops held an entirely subsidiary position, the chief agricultural care of the people being to secure a plentiful supply of fodder from their fields for their animals. In those tracts whatever scanty grass sprang up, was eaten up before it disappeared under the burning heat of the sun. Thereafter the cattle were taken away in large herds to the *duns* of the Siwaliks or to the riverain tracts and villages irrigated by canals in the beginning of April when the supply of fodder began to run short and the pools dried up. Large pastures and grazing areas were left by the villagers for the cattle. With the development of irrigation facilities and under the Grow-More-Food Campaign, areas under pastures and fodder grasses have been reclaimed and brought under cultivation. Cattle-breeding has, therefore, shifted to the non-irrigated area all over the district where rainfall holds the key to the situation.

The cattle and buffalo population which numbered 10,43,700 in 1966, accounted for 86.6 per cent of the total livestock. Out of 5,48,914 cattle and 4,94,810 buffaloes, the breedable (*i.e.* female) population of cows and buffaloes was 1,44,400 and 2,63,900 respectively. Their relative figures *vis-a-vis* those of their male counterparts have been shown below :

	Females above three years					Males above three years		
	Total	In milk	Dry	Not calved	Others	Total	Breeding bulls	Other bulls and buffaloes
Cows	1,44,400	78,500	59,000	5,600	1,300	2,37,700	1,200	2,36,500
Buffaloes	2,63,900	1,30,000	1,16,800	16,100	1,000	21,400	700	20,700
Total :	4,08,300	2,08,500	1,75,800	21,700	2,300	2,59,100	1,900	2,57,200

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

The Department of Animal Husbandry has taken up the improvement of cattle-breeding through the Key Village Scheme which envisages a systematically planned method for the best utilisation of superior germ-plasm obtained from superior stock.[1] The technique of artificial insemination is adopted to utilise the available, though limited, number of approved bulls to the maximum extent. Controlled breeding is brought about through elimination of scrub bulls. Simultaneously attention is paid to the increased production of feeds and fodders for feeding cattle on a proper, nutritious and balanced feed. The bulls of different breeds are provided to the villagers for better breeding. There are 1,158 approved cow bulls and 592 approved buffalo bulls in the district. The artificial insemination centres with their key village centres are making up the shortage of pedigree bulls for the improvement of cattle-breeding. The National Dairy Research Institute, Karnal maintains some of the best breeds of milch animals, namely Tharparkar,[2] Red Sindhi and Sahiwal Cows and Murrah Buffaloes. The Swiss breed is of recent introduction. The institute distributes pedigreed bulls to different States for their livestock development programmes and to key villages attached to it. The semen from good sires is supplied for artificial insemination of cattle in the villages within a radius of about 10 miles.

Cattle rallies and cattle shows are held in the district and prizes are awarded to the owners of good cattle. Such shows provide an impetus to the cattle owners and to the breeding operations. Subsidies for the maintenance of different kinds of good-quality animals are given under different development schemes.

Stray animals which have been on the increase during the last few years are impounded and owners are fined. A systematic cattle-catching scheme was launched during 1961. It produced good results. The animals caught under the scheme were sent to southern India or were handed over to *gosadan* at Mandewala (Ambala district). There is no *gosadan* in the district

1. To locate the superior germ-plasm in the breeding tract as also to study the production records and select top quality animals by introducing intensive milk recording in the tract, a scheme for the Registration of Top Quality Animals sponsored by the Government of India has also been introduced in the district. Selected animals are registered under this scheme for making optimum and the best possible use of these quality animals.

2. Tharparkar Bull of the National Dairy Research Institute, Karnal, was declared the best animal (opposite sex) at the All-India Cattle Show held at Bangalore in 1959. Again, Tharparkar Cow of the institute was declared the best animal (opposite sex) and the highest milk yielding animal (38 pounds per day) of the show at Western Regional-cum-All-India Cattle Show held at Nagpur in 1964.

but three subsidised registered *gaushalas* at Panipat, Samalkha and Kaithal are doing useful work. There are also three unregistered *gaushalas* at Kurukshetra, Naultha and Shahabad (Shahbad).

Gaushalas, according to the old concept, were the institutions opened under a religious sentiment 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. Accordingly, the three registered *gaushalas* at Panipat, Samalkha and Kaithal have been developed under the Scheme for the Development of *Gaushalas*. The income from the sale of milk and animals from the *gaushalas*, helps a lot in running these institutions. These institutions now also serve as Breeding Units.

Intensive Cattle Development Block, Karnal (Central Project).—To improve the livestock wealth in the country, the Government of India has laid down a policy to establish Intensive Cattle Development Blocks. In pursuance of that policy, one such block under the charge of a Project Officer, has been established at Karnal in 1967. Presently, this project envisages augmentation of the milk procurement for the Delhi Milk Supply Scheme to meet the demand of milk for the rapidly increasing population of Delhi.[1]

This project would go a long way in increasing the production of milk and also help improve the socio-economic conditions of the people engaged in cattle breeding in the Milk Shed Areas[2] in the district, *viz.* the Panipat tahsil and part of the Karnal tahsil. It aims at an all-round improvement of animal husbandry practices. This project is to cover about one lakh breedable population of cows and buffaloes of this area for intensive breeding operations. The facilities for breeding are to be provided through natural services as well as by artificial insemination. This is to be done with the help of quality bulls (Jersey, Haryana and Murrah Buffalo Bulls) kept at the Semen Station and the Stockmen Centres, and by the provision of veterinary aid and mass-scale castration of scrub bulls roaming about. A Central Semen Collection Station has been set up at Karnal with well equipped laboratory to serve as a Central Semen Bank. Jersey Bulls are kept here.

1. The expenditure on the project has to be met by the Government of India as 75 per cent grant and 25 per cent loan.

2. Milk Shed Area means an area or locality from where a milk plant gets its milk supply.

Improved Haryana and Murrah Buffalo Bulls are kept at the four Regional Artificial Insemination Centres at Asandh, Samalkha, Panipat and Gharaunda. These centres serve the respective regions for providing artificial insemination as well as natural service through the establishment of Stockmen Sub-Centres. At present 75 such Sub-Centres[1] have been set up with an eye on making available improved breeding facilities at the door of the breeders.

The development of feeds and fodder is also to be undertaken by giving various kinds of incentives for growing more fodder and for adoption of new fodder cultural practices. Demonstration plots set up in cultivators' own fields and construction of silo towers have to be subsidised. The programme also envisages the organisation of Milk Producers' Co-operative Societies which would be given loan for obtaining necessary dairy equipment, cattle feeds and fodders, and milch stock.

Intensive Cattle Development Project, Pehowa (State Project).- Consistent with the latest breeding policy enunciated by the Government of India for introducing exotic strain in the non-descript cattle for increasing milk production, five medium-sized Intensive Cattle Development Pojects are to be opened in the State, especially in the Milk Shed areas, during the current Fourth Five-Year Plan. Out of these, one project has been set up at Pehowa (now at Thanesar) during 1969-70. The object of this medium sized project is to cover 50,000 breedable population (buffaloes and cows) of the Pehowa Project area under Intensive Cattle Development Programme. The Central Semen Bank maintains five Murrah Buffalo Bulls for providing prompt and effective breeding service to the live-stock through the agency of 30 Stockmen Centres (detailed in Table XVI of Appendix) attachedto the three Regional Artificial Insemination Centres at Pehowa, Kaithal and Gula (Guhla) and the Semen Bank, Thanesar.

Sheep-breeding.—The district with a sheep population of 69,326 has a fairly good scope for the development of sheep and consequently of wool industry. Sheep provide necessities of vital importance, *e.g.* meat for food, wool for clothing, skin for industrial enterprise and manure for agriculture. In order to bring about improvement in sheep stock, a Sheep and Wool Extension Centre has been functioning at Goli[2] from where pedigreed

1. For details see Table XV of Appendix.

2. A Stock Assistant is in charge of this Centre and works under the supervision and guidance of the Sheep Supervisor, Bhiwani (district Hisar).

rams are supplied to the breeders for upgrading their sheep. Improved rams are kept at this Centre and given to the breeders during the tupping season[1] for ensuring scientific and systematic breeding. The total number of sheep registered for improved breeding in this district is 5,016. This centre does useful work in educating the breeders in the improved methods of rearing, breeding and management of sheep, including the shearing and grading of wool. It also provides veterinary aid to protect sheep from contagious and non-contagious diseases, which cause heavy losses.

Horses and ponies.—With the introduction of speedier modes of travel, there has been an overall decrease in the population of these animals. In 1920, their number stood at 13,029 but in 1966 it fell to 8,500.

Donkeys and mules.—The number of donkeys decreased over the past forty years from 21,000 in 1920 to 15,300 in 1966. Mules, on the other hand, have shown an increase as they are in greater demand to pull carts with pneumatic tyres over short distances.

Poultry farming.—Since the Partition, displaced persons from the West Punjab (Pakistan) have given a stimulus to poultry farming. Previously people were vegetarian and had religious prejudices against the eating of poultry and eggs. With the spread of education and under the influence of modernisation, these prejudices are now being shed gradually.

According to the 1966 Census, there were 1,44,383 poultry birds in the district. On account of its proximity to Delhi and the Grand Trunk Road traversing through it, the district has a great potential for poultry development. The poultry and its eggs find a ready market at Delhi. One Poultry Extension Centre at Shahabad (Shahbad) and one Intensive Poultry Development Block at Karnal with two Poultry Service Stations at Nilu Kheri (Nilo Kheri) and Thanesar are functioning for the improvement of poultry. In addition to the poultry extension work and disease control programme, the centres provide improved breed of poultry birds, eggs and poultry feed. Facility has been provided for the incubation of eggs at a nominal charge of 12 paise per egg.

Piggery.—Although, majority of Haryana's population is vegetarian, yet piggery development work in the Karnal district deserves a special mention. Of all the districts of Haryana, according to the 1966 Census, this district tops in piggery population with 26,259 animals. Earlier, no

1. The period March to June and September to November constitutes the tupping season.

improvement in the breed could be brought about since only Harijans with meagre resources and indigenous stock were engaged in pig breeding. As a part of the development plans, the Animal Husbandry Department introduced 'Large-White Yorkshire Pigs', a foreign breed, at the Government Livestock Farm, Hissar. The progeny thus reared at the Hissar farm was distributed to the breeders at subsidised rates. The pure breeding and cross breeding of indigenous stock with the Yorkshire Pigs has brought about tremendous improvement in the piggery wealth and this district has also benefited. Another Pig Breeding Farm has been established at Ambala which will no doubt further improve and develop piggery in Karnal. To give this programme further push one Intensive Piggery Development Block has been set up in this district where pigs of Large-White Yorkshire breed are issued at concessional rate, *i.e.* Rs. 10 per Boar and Rs. 100 per Sow, for raising the pure Yorkshire breed and improving the local stock by cross breeding with exotic Boars. Yorkshire Boars are also available for service at the various centres of the block. A feed subsidy of Rs. 5 per month is given to encourage the breeders to raise Yorkshire Boars.

Animal diseases.—The common animal diseases prevalent in the district are haemorrhage, septicaemia, rinderpest, foot-and-mouth disease, surra black quarter and parasitic diseases. These diseases are controlled with prophylactic vaccinations and curative measures. Regular campaigns of inoculation and vaccination against these diseases are conducted.

Veterinary hospitals.—It was in the year 1900 that a veterinary hospital at the district headquarters was started and subsequently three more hospitals were established at the tahsil headquarters. There is now a network of 28 Veterinary Hospitals,[1] 6 Government Permanent Outlying Dispensaries, 5 First Aid Centres and 5 Surra Centres, as shown in Table XVII of Appendix to provide veterinary aid to the livestock in the district. A veterinary hospital functions under the charge of a Veterinary Assistant Surgeon who is assisted by a Compounder or Stock Assistant and miscellaneous class IV establishment while a veterinary dispensary functions under a Veterinary Compounder. At the First Aid Centres, only medicines and instruments of First Aid are kept with the village Lambardar or Sarpanch.

To help the field staff to arrive at proper diagnosis for the control of contagious and non-contagious diseases, a Clinical Diagnosis Laboratory

1. 21 Local Bodies and 7 Government Veterinary Hospitals.

(Veterinary) has been set up at Karnal in 1967. Blood, faecal and other material received from the field are examined to find out the causes and etiology of various diseases. This laboratory examined 3,473 samples during 1969-70. The unit will thus prove very useful in the Disease Control Programme. Besides, there are 80 outlying dispensaries which are attached to hospitals and are visited by the veterinary doctors once a week. In this way facilities for the treatment of sick animals have been extended to the remote areas of the district.

Dairy farming. Milk is derived mostly from cows and buffaloes. According to the 1966 Census, the breedable (*i.e.* female) population of cows and buffaloes was 1,44,400 and 2,63,900 respectively. The total quantity of milk produced daily in the district was estimated at 7,500 quintals in 1966 compared with about 6,400 quintals in 1961.

Milk is mostly produced in small quantities by individual cultivators who keep one or two cows and buffaloes for this purpose. Attempts were made to organise the milk producers in some areas by setting up co-operative societies. In all, 30 co-operative milk producers' societies with 448 members were registered, but more than 50 per cent of these are not functioning properly due to lack of interest on the part of the members. Milk trade remains disorganised, adulteration of both milk and its products is rampant, and their prices rule high during the summer months when adulteration, too, is at its highest. Shortage of milk at that time is the basic reason for the latter. The milk trade is in the hands of middlemen who, generally, do not pay a reasonable price to the milk producers.

Of all the districts in Haryana, Karnal has the largest number of milch animals per 100 square kilometres. It has also the largest irrigated area from canals and tubewells in the State. Therefore, the district offers rich potentialities for developing milk production and a milk industry. The following significant developments have taken place in this regard in recent years :—

(i) The National Institute for research in dairying was shifted from Bangalore to Karnal in 1955. The institute has grown very much since then and has now come to be the premier institute for dairy education and research in Asia. The institute provides instruction in dairying at the Diploma, Degree and Post-Graduate levels. Separate courses have been instituted for Dairy Husbandry and Dairy Technology for the Diploma,

Graduate and M.Sc. courses. Scholars from all over India and outside India attend these courses.[1]

(ii) The Ministry of Food, Agriculture, Community and Development and Co-operation, Government of India, has set up an Intensive Cattle Development Project, covering one lakh cows and buffaloes of breedable age in the district. This project covers the Panipat tahsil and some of the adjoining areas. Its aim is to increase milk production for procurement by the Delhi Milk Scheme.

(iii) M/s Haryana Milkfoods are setting up a Milk Plant at Pehowa. The plant will be equipped to manufacture sweetened condensed milk, milk powder, butter and ghee, its ultimate installed capacity being about 40,000 kg per day.

FISHERIES

The Fisheries Department in the district is represented by a Fisheries Development Officer who is in charge of all the development activities. He is assisted by 4 Fisheries Officers, 1 Farm Assistant, 1 Pumping Set Driver and other technical staff. A small Fisheries Research Unit headed by a Fisheries Research Officer has also been established at Saidpur (near Karnal).

The natural sources of fisheries in the district include the Yamuna and its tributaries, the Rakshi, Chautang, Saraswati, Markanda, Omla and Ghagghar. Of these, the Yamuna and the Ghagghar are more productive. Fishing rights in these rivers and streams are controlled by the State Government. These are leased out annually through an open auction. In addition, fish culture is practised in 137 ponds covering a water area of 464 acres (187.8 hectares). The area has a rich potential for the development of fisheries but the rural population being vegetarian is appathetic towards its development. Government, however, provides sufficient incentive by way of financial assistance for the improvement of ponds and by supplying fish seeds at concessional rates. A fish Seed Farm in an area of 4 acres (1.6 hectares) has been established at Saidpur. The seed of suitable varieties of fish is stored and distributed from this centre.

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

1. For further details, see Chapter on 'Education and Culture'.

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 Calbesu (**Kalbans**).—It is relatively slow growing and attains a size of about three feet.

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

Cirrhina mrigala (**Mori**).—It is a bottom feeder and grows to three feet or more.

2. Cat fishes of sub-order *Siluroidae*

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

Bagarius bagarius (**Gonch**).—It grows up to six feet in size and is probably the laregest fish caught on rod and line in India.

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.

Mystur seenghala (**Seenghala**).—It attains a length of over four feet.

Mystus aor (**Seenghari**)
Mystus cavasius (**Tengra**)
Rita rita (**Khagga**)

3. Fishes of family *Notopteridae*
Notopterus notopterus (**Pari**)

Notopterus chitala (**Moh**).—It is a game fish growing to about 14 feet in size.

4. Murrels of family *Ophiocephalidae*
Ophiocephalus[1] *marulius* (**Saul**)
Ophiocephalus[1] *striatus* (**Daula**)
Ophiocephalus[1] *gachua* (**Dauli**)
Ophiocephalus[1] *punctatus* (**Kartar**)

1. The word 'Ophiocephalus' has been replaced by the word 'Chana' by the Zoological Survey of India.

5. Spiny eels of family *Mastacembelidae*[1]

Mastacembelus pancalus (**Groj**)
Mastacembelus armatus (**Groj**)

Approximately 1,158 quintals of fish is produced in the district annually. After meeting the local requirements it is exported to Delhi and Calcutta. The income to the State from this source is about one lakh rupees per annum. The fisheries industry provides employment opportunity to about 250 persons and subsidiary avocation to about 450 demobilised men in the district.

FORESTRY

The Karnal district is under the charge of the Divisional Forest Officer, Karnal Forest Division, with headquarters at Karnal. This division falls in Haryana Circle with headquarters at Pinjore.[2]

The six forest ranges covering the district are: (i) Karnal Range, (ii) Saraswati Range, (iii) Panipat Range, (iv) Kaithal Range, (v) Pehowa Range and (vi) Forest Extension and Soil Conservation Range, Karnal. The technical and the executive staff looks after the existing forest areas belonging to the Government as well as private areas which are notified under section 38 of the Indian Forest Act, 1927, and sections 4 and 5 of the Land Preservation Act, 1900. Nurseries of different species are raised for afforestation and re-afforestation. The staff also attends to the soil conservation works and anti-erosion measures.

Forests and forest produce have a recognised place both in the rural and urban economy of the district. Forests supply the much needed wood for fuel and timber for building purposes and the making of agricultural implements. They also support the small-scale industries like furniture making and saw milling located largely at Karnal and Panipat. With an established system of canal irrigation and imperfectly developed surface drainage, there has been a rapid rise in the water-table and an increased menance of water-

1. This variety is not as commonly found in the Karnal district as in the Rohtak district.

2. The Forest administration is under the charge of the Chief Conservator of Forests, Haryana. Under him the Conservator of Forests is in charge of the Haryana Circle which covers the whole of the State. The circle is divided into controlling charges called forest divisions, each under the charge of a Divisional Forest Officer. A forest division is divided into sub-divisions and ranges or executive charges which are further sub-divided into blocks comprising beats or protective charges. The charge of a range is ordinarily held by a Forest Ranger. The charge of a block is held by a Deputy Ranger or a Forester and of a beat by a Forest Guard.

logging. The forests play a vital role in improving soil drainage by using plenty of sub-soil water and thus mitigating the evil effects of water-logging.

Area under forests is classified according to ownership, *viz.* private and State. Forests owned by corporate bodies and private individuals are included under private forests. The State forests on the basis of legal status are categorised as reserved, protected and unclassified. Reserved forests are permanently dedicated either to the production of timber or other forest produce and in them the right of grazing and cultivation is seldom allowed. In protected forests, these rights are allowed subject to certain restrictions. The following area was under forests in the district during 1969-70 :—

Classification of forests	Area (Hectares)	
State Forests		
Reserved	1,802	
Protected	4,144	
Strips	6,487	(Approximately)
Unclassed	40	
Private Forests		
Closed under section 38 of the Indian Forest Act, 1927	40	
Closed under the Land Preservation Act, 1900	—	

The indiscriminate cutting of trees resulted in the scarcity of fuel and timber requirements of the district. Again, the reckless cutting of trees during the consolidation of holdings further aggravated this problem. The firewood and timber prices shot up. The rural population was consequently forced to burn dung as fuel, which, if returned to the soil, would increase its productivity. It was decided to bring in more Government lands under the control of the Forest Department for raising fuel and economic plantations. Therefore, in 1951, railway strips of Northern Railway and strips along the national highways were put under the charge of the Forest Department. Likewise, all the P.W.D. road strips and canal strips were transferred to the Forest Department in 1956. The lengths of such rail/road

and canal strips in the Karnal district under the control of the Forest Department are, as under :

(i) Rail strips	.. 219	kilometres
(ii) Road strips	.. 825	kilometres
(iii) Canal strips (including bunds, drains and minors)	.. 2,282	kilometres

This will go on increasing gradually with the construction of more roads, canals, drains, etc. To augment the fuel wood and timber supply in the district, an area of 9,662.17 acres (about 3,910 hectares) of waste lands was acquired by the Government in 1956-57 in Gula (Guhla) sub-tahsil.[1] The greater part of this land has been taken for plantations of *shisham* and exotic plants called Eucalyptus hybrid. This is a unique feature of forestry practised in this district and no parallel exists anywhere in the country. These irrigated plantations are known as Saraswati Plantations. Some set-back to these plantations was caused by fires, floods, and grazing. The successful introduction of Eucalyptus hybrid in 1962 is an outstanding feature of the tree planting activities.[2] It is a fast growing species and within five years attained an average height of 11.10 metres in the plantations along the Grund Trunk Road near Shahabad (Shahbad). This species is being raised as a part of the programme of raising plantation to meet the raw material needs of the paper and other industries. Further, an intensive programme of raising tree plantations along the avenue strips of roads, canals and railways has been in progress. Many Government waste lands called Birs[3] amounting to 6,842 acres (3,416 hectares) have also been brought under forest during 1957-58 to 1969-70.

1. Gula (Guhla) was raised to the status of tahsil on August 13, 1968.

2. Such trees have been planted on canal banks, road sides and other compact plantation areas such as Saraswati Plantations (about seven miles from Pehowa), Kohli Khera Forest near Gula (Guhla), Siwan Forest near Kaithal and Khanda Kheri Forest near Asandh.

3. Most of the Government waste lands, called Birs, were transferred to the Forest Department for management in the years starting from 1940. An area of 1,801.43 hectares was declared as Reserved Forests and 4,099.13 hectares as Protected Forests (other than Rail, Road, and Canal Strips) under the Indian Forest Act, 1927.

Reserved Forests : Bir Senothi (173.11), Bir Roherian (45.08), Bir Khanda Kheri (103.43), Bir Bassi (92.67), Bir Kohali Kheri (604.20), Bir Nikate Pura (8.37), Bir Theh Majibula (308.15), Bir Barason (450.82).

Protected Forests : Seonsar (505.20), Navach (464), Papsar (223.59), Bichhian (254), Kakior (471.60), Rewahar (356.57), Helwa (98.80), Kaheri (31.14), Macchheri (482.80), Theh Newal (118.17), Bakhli (93. 27), Theh Majibula (98.40), Ramgarh alias Rohar (445.60), Siwan (188.88), Guhla (27.60), Baragaon (83.65), Sheikh Pura (63.71), Upli (44.75), Bhalai (8.18), Bir Sujara (36.60).

The acute shortage of fuel wood and timber has made the farmers conscious of the role of raising trees on farm lands as a part of Farm Forestry Programme. The Eucalyptus tree has attracted their attention because it grows fast and its interference with the crops is minimum. On an average 14,500 plants are supplied to the public every year.

Forest produce.—The produce from the forests consists of timber, firewood, *babul* bark, grasses and gums. The steadily increasing income derived from the sale of major and minor forest produce for the years 1957-58 to 1969-70 is shown below :

Year	Income from forest produce
	Total Revenue
	(Rs.)
1957-58	1,91,500
1958-59	4,20,200
1959-60	2,52,400
1960-61	3,80,300
1961-62	6,15,200
1962-63	3,87,200
1963-64	3,27,200
1964-65	6,10,700
1965-66	4,90,900
1966-67	5,68,800
1967-68	9,35,400
1968-69	4,97,651
1969-70	5,17,073

NATURAL CALAMITIES

Floods

The seasonal overflow of the Yamuna, the Ghagghar, and the Markanda, Saraswati, Chautang and Rakshi streams is responsible for floods in the Karnal district. The Ghagghar and Markanda are responsible for floods in the northern and the north-western parts, the Yamuna in the

eastern part, *i.e.* the Khadar area, and the Chautang and Rakshi in the central and the south-western parts of the district. The carrying capacity of the existing main and tributary drains is insufficient. The other contributing factors are : (i) natural calamities such as heavy and incessant rains ; (ii) cuts and breaches in canals and drains made by the villagers in order to protect their own area from flooding which result in flooding of the other areas; and (iii) non-excavation of the field drains (link drains) constructed on voluntary basis.

The Markanda stream is joined by the Tangri, Salani, Satkumba, Runchoe, Bangna Nadi and other small hill torrents above the Ambala-Saharanpur Railway Line from where the discharge of accumulated water starts causing havoc in the lower areas. Floods in the upper catchment are not so severe as in the middle or the lower reaches. Prior to the construction of Bhakra canals, the flood-water used to spill over only in the upper region, *i.e.* the Ambala and Karnal districts, and the Patiala district (Punjab). The inundated area gave bumper crops especially in the *rabi* season. The flood-water was used economically and usefully. Now the floods are abnormal and instead of being useful, cause hinderance in the utilisation of regular supplies from the Bhakra Canal System. During the last three years there have been breaches in the Damli Bund near village Khanpur (district Ambala) causing heavy floods in tahsil Thanesar. The water used to flow in the low lying area starting from village Padlu of tahsil Thanesar and passed through 21 villages[1] in the form of a vast stream. The Markanda sometime overflew near village Jogi Mazra and caused damage to about ten surrounding villages. The Damli Bund has now been extended and breaches repaired with the result that no damage was caused in the Thanesar tahsil during 1969-70 and 1970-71.

In the Kaithal tahsil, the area surrounding Pehowa and Kaul slopes steadily towards south-west with the result that the collected rain-water moves into Kaithal town. During rainy season, a lot of water collects within the area bounded by the Saraswati Distributary and Sirsa Branch and it starts flowing towards Kaithal town. In the days gone by, rain-water was collected in big ponds around Kaithal town and other villages and in the forest lands between Pehowa, Kaithal and further down to Khanauri (tahsil Rajpura, district Patiala, Punjab). The forests having been cleared and brought under

1. Sirsila, Rawal Kheri, Kanepla, Chanarthal, Sanwala, Partab Garh , Ratgal, Padlu, Rawa, Chhapra Zabti, Jandheri, Chhapra, Dig, Teora, Dhantori, Khanpur Kaulian, Masana, Machhroli, Bakana, Salimpur and Jogi Mazra.

plough, the natural drainage line has been disturbed. With the advent of canal irrigation the water level has risen considerably. The land, therefore, being already saturated, there is practically no absorption of water during heavy rains. The monsoon of 1968 submerged the whole of the area around Kaithal town to a depth of 2' to 4' for a number of days causing enormous damage to the standing crops and property.

Kaithal drain has been excavated for draining out this water into the Ghagghar. The drain starts from a big depression near village Keorak and empties into Ghagghar near village Khanauri. The length of the drain is 32.72 miles (about 52.7 kilometres) with a peak discharge of 1,168 cusecs. A protection bund on the left side of the drain has been constructed to safeguard the town of Kaithal from flood-water.[1]

In the Gula (Guhla) tahsil, flood-waters of Saraswati Nadi and river Markanda are collected into Bibipur lake (near Bibipur village) for irrigation. Saraswati drain is an escape channel in which surplus water of Bibipur lake is drained. The drain starts from D/S of Regulator on Bibipur lake near village Murtazapur and outfalls into river Para (a tributary of river Ghagghar) near village Pasawal. The present capacity of the drain is 16,000 cusecs and it provides an effective drainage line for the area through which it passes. Banks have been provided on both sides of the drain as a safeguard against overspilling during peak discharge. This drain has eliminated to a great extent the flood problem of its catchment area.

The full benefit of main drains will accrue only by digging link drains to drain out the flood-water from local depressions. Government encourages the construction of such drains on a voluntary basis. A few of the link drains, *i.e.* Sila Kheri, Manas, etc., have already been constructed by the villagers. Other villages are being persuaded to dig out link drains in their area.

In the Karnal tahsil, damage used to be caused by the overflowing of river Yamuna which submerged most of the Khadar area. The Kunjpura Bund, Jarauli Retired Bund, and Dabkauli Chaura Bund have been constructed to safeguard the villages against flooding. Some spurs are being constructed near village Jarauli along river Yamuna for protecting the face of Kunjpura Bund.

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1. Two more tributary drains, *viz.* Amin and Pundri, which will outfall into the main Kaithal drain are proposed to be dug out. These drains will take care of the flood-water on the left side and right side respectively of the Sirsa Branch. On their completion the area of the Kaithal sub-division will become immune from flood-water and water-logging.

In the Panipat tahsil, the following flood protection works are in progress :—

(i) Spurs near villages Bilaspur and Hathwala (Hatwala) are being repaired. The Yamuna has a tendency to change its course towards the right side and erode lands of Bilaspur and Hathwala (Hatwala) which are to be protected by the construction of two new studs.

(ii) To save villages Sanauli, Tamsabad and Nawadha which lie on river Yamuna, a flood protection bund along the Yamuna is being constructed.

(iii) A flood protection bund near villages Nanhera and Rana Majra is being constructed to save the villages from erosion by the Yamuna.

(iv) The Tributary Drains No. 1 and 2 (tahsil Panipat) of Nai Nallah Drainage system are being remodelled.

The drainage system is being improved and existing drains such as Indri Drain, Nisang Drainage system, Main Drain No. 2 and Jundla Drain are being remodelled and their banks strengthened.

The damage caused by floods and heavy rains in the district since 1955 is shown in Table XVIII of Appendix.

FAMINE

Besides the *chalisa* famine of 1783, the district has been visited by famine many a time, perhaps one of the most terrible being that of 1833. Relief works seem first to have been established in the famine of 1861 when 22,237 persons were provided relief in one month. In 1869 the famine was more severe in Karnal than in any other part of the Punjab, and hundreds of people were reduced to semi-starvation. Cattle numbering 65,000 died. From 1875 to 1877 there was not a single good harvest, and though the scarcity hardly assumed the proportions of a famine, the cattle suffered terribly. There was grass famine in 1883-84. In 1896-97 areas affected were the Nardak tracts of Karnal and Kaithal, and the Naili tract of Kaithal. In 1899-1900 the Nardak in Karnal, and a part of Nardak in Kaithal were protected by Nardak Branch of the Western Jumna (Yamuna) Canal. The tracts affected were chiefly the Naili and Bangar tracts of the Kaithal tahsil and parts of the Thanesar tahsil.

Famine is now a thing of the past, because means of transport are sufficiently developed to cope with any emergency and food can be easily transported from one place to another in case of shortage of supply in any part of the country.

AUGMENTATION CANAL PROJECT

Haryana has been chronically short of water resources as there is no river passing exclusively through the State. The two main sources of supply of water for irrigation in the State are the rivers Satluj and Yamuna. The available water in the river Yamuna is shared between Haryana and Uttar Pradesh roughly in the ratio of 2 : 1. The Haryana share which is passed through the Western Jumna (Yamuna) Canal irrigates the eastern and south-western portions of the State. The water in the Western Jumna (Yamuna) Canal gets reduced to as low as 1,800 cusecs during winter against the requirement of over 9,000 cusecs for the *rabi* crops. Augmentation of canal supplies is, therefore, a matter of prime importance for agricultural development. Surface water being inadequate, ground water is the only hope for increasing the canal supply.

The Yamuna ground water basin is rich in sweet water down to great depths. To augment the water-supply in the Western Jumna (Yamuna) Canal, 256 tubewells were installed during 1948—1955. After the formation of Haryana, 128 more tubewells were installed during 1966—1971. Water from these tubewells is pumped into the canal. It was, therefore, decided to explore further the possibilities of tapping to full advantage the underground water of this basin. The ground water contours based on water observations in open wells along grid lines revealed the presence of additional underground water which could be tapped. Under the scheme as originally conceived in 1969, it was proposed to instal 500 deep tubewells for tapping about 1,000 cusecs of ground water in the Yamuna Groundwater Basin extending from Dadupur to Panipat. Later, it was decided to combine the augmentation of canal supplies with saving of absorption losses through a lined channel. The augmentation from the ground water resources was restricted to augmentation from Jagadhri to Munak. In other words, during the *rabi* season, the available water-supply in the Western Jumna (Yamuna) Canal was to be diverted into the Augmentation Canal which was also to receive water from the augmentation tubewells and coupled with the savings from seepage losses, was to provide additional water-supply of about 1,000 cusecs for the distribution system of the Western Jumna (Yamuna) Canal below the outfall of the Augmentation Canal near Munak. The result of this planning has been the Augmentation Canal Project, the construction of which at a cost of Rs. 12.69 crores was achieved within 14 months. Undertaken in November 1971, it was commissioned in January 1973.

The project consists of the following four units :—

Unit-I : Augmentation Canal

Unit-I is a 75.25—kilometre long lined channel, known as the Augmentation Canal, taking off from the Western Jumna (Yamuna) Canal (Main Line Lower) near Yamunanagar. It outfalls into the main Branch of the Western Jumna (Yamuna) Canal upstream of Munak with a capacity ranging from 3,240 cusecs to 3,931 cusecs in the first stage. The channel traverses a steeply inclined tract in the head reach and 15 falls with an aggregate drop of 10.7 metres have been provided at suitable distances. It has a section of 12.2 metres bed width and 3.4 metres depth of water in the head reach, which is increased to 4.6 metres lower down. The bed width is later reduced to 7.3 metres. Other masonry works, which make a total of 86, include 20 drainage crossings of capacities varying from 400 cusecs to 3,300 cusecs below the canal for flood water, 10 district road bridges, 35 village road bridges, one foot bridge, one national highway bridge near Karnal, one rail-road bridge on the Ambala-Panipat-Delhi railway line, one cross regulator, one head regulator, one outfall, 7 falls and 8 fall-cum-bridges. All the masonry works on the canal have been designed to carry finally a discharge of 4,500 cusecs, which is the anticipated *rabi* discharge of Western Jumna (Yamuna) Canal.

Unit-II : Tubewells

168 tubewells of capacity varying from 2 to 5 cusecs have been installed for a total installed capacity of about 660 cusecs and a firm pumping capacity of 500 cusecs. These tubewells, drilled up to depths varying from 91.4 metres to 228.6 metres for tapping maximum discharge from water-bearing strata, have been developed with high capacity pumps.

Unit-III : Underground Tubewells Channels

Water from the augmentation tubewells installed along the canal is delivered directly into the canal. The tubewells along the cross lines have been connected through underground RCC Hume pipes. The total length of the underground pipe channel is about 20 kilometres.

Unit IV : Diversion of Existing Tubewells

Of the existing 301 Augmentation Tubewells along the Western Jumna (Yamuna) Canal, which lie in the reach of the Augmentation Canal, the tubewells on the left hand side of the Western Jumna (Yamuna) Canal, have been

diverted to the Augmentation Canal except the tubewells proposed to be utilized for feeding the existing offtaking channels of the Western Jumna (Yamuna) Canal. The tubewells along the right hand side of the Western Jumna (Yamuna) Canal are proposed to be diverted to the Augmentation Canal by taking the water supplies across the Western Jumna (Yamuna) Canal. Water from the tubewells in the lower reaches is proposed to be diverted into the Narwana Branch Karnal Link through the old Nardak Distributary and Jundla Minor so as to save the construction of a new channel passing through valuable agricultural land near Karnal.

This is the first project in India whereby conjunctive use of ground water and surface water has been attempted on a large scale. It would ben fit not only the entire area at present covered by the Western Jumna (Yamuna) Canal System, but also provides perennial irrigation to the Jui Canal in the Bhiwani district. It will also bring an additional area of 55,800 hectares under irrigation. It also improves the capacity factors and consequently the yield of the crops in the existing culturable commanded area of 10,16,000 hectares of the Western Jumna (Yamuna) Canal System. Finally, the project will help in reclaiming some 2,000 to 4,000 hectares of water-logged area along the existing Western Jumna (Yamuna) Canal providing additional area for food production.

The project was inaugurated on the 10th January, 1973 by Shri D.P. Dhar, Union Planning Minister. Ever since its commissioning, the Augmentation Canal has been running during *rabi*, as originally conceived. However, flood waters are additionally passed to meet the demand of irrigation downstream in the *kharif* season also.

Haryana Milk Foods, Pehowa

A public limited company with an authorised capital of Rs. 1 crore, it was incorporated in 1965-66 under the name and style of Kailash Chemicals and Textiles Mills Limited. Though registered as a public limited company, it functions more or less in a co-operative style. It has about 1,000 shareholders most of whom hail from the rural areas. It has been licensed by the Government of India, Ministry of Industrial Development, for the manufacture of 800 tons of whole/skim milk powder, 1,200 tons of milkfoods and 1,000 tons of condensed milk besides *desi* ghee, butter, etc.

The company set up its plant in the rural sector at Pehowa and started production in December 1970. The intake capacity of this plant is 50,000 litres of milk. The following figures show the procurement of milk and

turnover of finished products of the plant during 1971-72 to 1973-74 :—

(Figures in lakhs)

Year	Procurement of milk	Value of finished products
	(Litres)	(Rs.)
1971-72	73	92
1972-73	93	147
1973-74	106	248

The company employs about 200 skilled, semi-skilled and unskilled staff and provides indirect employment to about 10,000 rural families who supply milk to the plant. It arranges financial assistance for the dairymen and also provides veterinary facility to help them in the upkeep of their livestock.

Milk being a highly sensitive food item has to be processed within a given time to save it from getting soiled. Thus besides being a highly sophisticated plant, it is run without a break round the clock in three shifts.

Chapter V

INDUSTRIES

Old-time Industries

The main occupation of the people in the district has been agriculture. In the past only a few industries and that too on a cottage scale, engaged a minority of the population. Woollen blankets and brass and copper utensils were made at Panipat, lacquerware at Kaithal, shoe and leather goods at Karnal and pottery at Panipat and Karnal. A certain amount of glass blowing was done at Panipat and Karnal and saltpetre refining at Kaithal, Panipat and Thanesar.

Woollen blankets.—Wool spinning and wool weaving has been one of the major cottage industries of the district. From time immemorial, Panipat has been an important blanket weaving centre. The weavers used handspun yarn till 1942 when a power-operated woollen yarn spinning unit was established. The industry progressed as the defence requirement for barrack blankets increased. The wool was procured from the Punjab, Rajasthan and the South. Blankets of ordinary quality were exported to other districts in small quantities until the World War II raised the demand for barrack blankets to the extent of 10,000 per day. This industry was dislocated by the emigration of the Muslims at the time of the Partition, but was gradually revived by the displaced wool merchants from West Punjab (Pakistan) who settled at Panipat.

Brass and copper utensils.—Panipat had been for long famous for the manufacture of copper and brass utensils. These were largely exported to the Delhi market. Lockwood Kipling, Principal of Lahore School of Arts, described this industry as follows :—

> "Panipat has long been noted for small wares in metal of various kinds. A peculiar kind of bead-like ornament known as *motis* or pearls, skilfully made in thin silver is one of the specialities of the place. A necklace of six rows costs about Rs. 30, of three rows about Rs. 10. There is no chasing on ornament of any kind, but the silver is a good colour and the beads are

perfectly round. Captain Roberts reported in 1882 that this small industry was declining. Betel nut cutters (*sarotas*) are here made in fanciful forms, the handles being of brass with quaint projections, in which small mirrors and pieces of coloured glass are fixed. A good one costs two or three rupees. Scissors are similarly ornamented; the handles being made of brass with bits of coloured glass rudely simulating jewels set therein. A pair of scissors costs about 6 annas. These articles are made for export."

Lacquerware works.—Lacquerware toys, household utensils and the legs of *charpoys*, were manufactured at Kaithal and in the surrounding villages.

Glass-blowing.—Karnal district was well known for glass-blowing and the glass was used for mirror-worked walls and also sewn into *phulkaris*. Lockwood Kipling, wrote in 1892:

"Karnal itself has long had a name for glass blowing. The silvered globes of thin glass, which, when broken up are used for mirror-worked walls and also sewn into *phulkaris*, are invariably said to come from Karnal. In the descriptive catalogue of the Punjab contributions to the Calcutta Exhibition, 1883-84, Mr. Baden Powel wrote :—'In Karnal rude globes are made for ornaments, the inside being silvered with quicksilver and tin-foil; the large aperture necessary for the manipulation is awkwardly covered with ozidue. The Karnal glass-makers also prepare the large, thin, pearshaped glass retorts or carboys, in which the native manufacture of salammoniac (*naushadar*) is effected....'."

There were glass-blowing factories at Panipat and Karnal[1]. In 1944-45, another glass-blowing factory was set up at Shahabad (Shahbad). However, the shortage of skilled labour forced these factories to close down.

Shoes and leather goods.—Karnal was famous for its shoe-making. Thousands of boots were supplied to army regiments when Karnal was a cantonment station. Shoe-making is still carried on in various parts of the district as a cottage industry.

Pottery.—The village pottery is as old as the country itself and the

1. Glass was also made at Gumthala and a small village adjoining Gumthala is called Kheri Sheeshgaran (the village of glass blowers).

ordinary vessels for villagers' use, including the earthen buckets for Persian wheels and small bricks, were made by village potters. Special kinds of glazed-art pottery such as tea-pots, cups and other fancy articles were made at Panipat and found a ready market at fairs and festivals. Tiles and flower-pots were made in Sadar Bazar, Karnal.

Saltpetre.—Saltpetre was manufactured around Panipat, Kaithal and Thanesar by the indigenous process. After the Partition, a few factories for manufacturing and refining saltpetre on modern lines were set up at Kaithal, Thanesar and Shahabad (Shahbad).

Besides, the district was known for its distillery and the manufacture of salammoniac (*naushadar*).

Most of these industries except shoe-making and blanket manufacturing decayed after the Partition owing to the skilled Muslim artisans having migrated to Pakistan. In this way the Partition almost impaired the economy of the district. This loss was made good when people rehabilitated here from Pakistan began to set up factories. Factory accommodation was provided to them in the industrial area at Panipat and the industrial estate at Nilu Kheri (Nilo Kheri). Financial assistance was provided under the State Aid to Industries Act, 1935, and for the training of persons in technical and vocational trades.

Government Assistance to Industries

Financial assistance.—After Independence, the provisions of the State Aid to Industries Act, 1935, were liberalised. A provision to advance loans up to Rs. 1,000 against a certificate of credit-worthiness was introduced for the benefit of village artisans and craftsmen. The Haryana Financial Corporation provides financial assistance to large and medium-scale industries and the State Bank of India advances loans to small-scale industries against the security of raw material, finished goods, etc. Besides, the Khadi and Village Industries Board advances loans and grants for the promotion of village industries. The following amounts were disbursed during 1962-63 to 1969-70 :—

Year	Loans	Subsidies
	(Rs.)	(Rs.)
1962-63	1,31,000	3,520
1963-64	1,72,360	8,200

Year	Loans (Rs.)	Subsidies (Rs.)
1964-65	2,50,000	—
1965-66	1,96,000	—
1966-67	1,71,200	—
1967-68	1,63,500	—
1968-69	29,99,150	..
1969-70	32,99,017	..

Supply of machinery on hire-purchase basis.—The National Small Industries Corporation, an agency founded and controlled by Government of India, supplies machinery to small-scale units on hire-purchase basis on easy terms on the recommendations of the State Government. After the initial payment of twenty to forty per cent of the total cost of machinery and equipment by the loanee, the remaining amount is paid by him in easy annual instalments.

Supply of raw material.—The supply of raw material like iron, steel, steam coke, hard coke, copper, zinc, etc., is regularly made to quota-holders and deserving industrialists. The quota is fixed after proper assessment. The requirements of imported raw material and equipment are assessed by the State Government and necessary recommendations made to Government of India for import licences.

Quality marking.—Quality marking scheme was introduced by the Government with a view to promoting the sale of standard goods. A quality marking centre for furnishing fabrics was set up at Panipat in 1957. It extends technical assistance and guidance to the textile industries in the selection of raw material, manufacture of yarn and finished goods. An up-to-date laboratory has been installed at the centre where tests are conducted in respect of fibres, yarns and manufactured cloth. The quality marking centre maintains a show-room to display different types of finished fabrics produced by the mills registered under the quality marking scheme.

Industrial estates.—Three industrial estates were established by the Government: Industrial Estate at Nilu Kheri (Nilo Kheri) in 1962, Rural Industrial Estate at Kaithal in 1965 and Rural Industrial Estate at Kohand in 1967. In these estates, industrial sheds were constructed and were let out

to those intending to put up industrial units—14 at Nilu Kheri (Nilo Kheri), 12 at Rural Estate, Kaithal (7 to different industrialists on rental basis and the remaining 5 to Rural Industrial Development Centre and Rural Artisans Training Centre) and 8 at Kohand.

Industrial Training.—Government has established a number of institutes for industrial training and technical education in the district to provide training facilities in various crafts. The details of technical institutes and courses/crafts in which training is imparted, are given in Chapter on 'Education and Culture'.

Eight peripatetic demonstration parties (two for hosiery goods, three for leather shoe-making, and one each for soap making, carpentry and weaving) are working in various blocks to provide latest technical know-how to rural artisans. Training is imparted for a period varying from 3 months to one year depending on the trade.

There are 7 training centres: two for leather tanning; two for footwear making; two for soap making: and one for *durrie* and *khes* making located in various blocks. The trainees, after successful training, are encouraged to start their own work. A leather tanning-cum-common facility workshop functions at Pundri (Pundri Block). The workshop renders service in leather tanning to the local tanners. Besides, there are three rural industrial development centres: one for leather goods at Kaithal, one for light engineering goods at Samalkha and one for engineering works at Kohand.

SOURCE OF POWER

Since the beginning of the present century, power generated mostly from diesel oil was used in installations for flour grinding, oil seed crushing, *dal* grinding, rice husking, grain grinding and saw milling. In the thirties, electricity was made available through the establishment of some thermal and diesel generating stations. These were privately owned and Government gave them long term contracts for generation and supply of electricity to various towns. There were, on the eve of Independence, the following three electric supply companies in the district :—

The Kaithal Electric Supply Company Ltd., Kaithal.—Licensed in 1936, the company established a generating station in 1937. The power station had 4 sets of diesel engines with a capacity of 259 kw. The supply of hydro-electric power from Bhakra Nangal Project was given to the company in 1956 and thereafter the diesel stations were just kept as a stand-by. After the lapse of contract in 1966, the company was taken over by the Punjab State Electricity Board.

The Karnal Electric Supply Company Ltd., Karnal.—The company established a generating station in 1935 for the supply of electricity to the Karnal town. The power supply was, however, taken over by the P.W.D. Electricity Branch in March 1949. Between 1954 and 1956, the supply of electricity was obtained from the Panipat Station. The hydro-electric power from Bhakra Nangal Project was made available to the town in 1956.

The Panipat Electric Supply Company Ltd., Panipat.—The company, licensed in 1934, established a power generating station in 1936 and installed two diesel engine sets with a capacity of 310 kw. The generating station was taken over by the Government in 1954. It was energised with hydro-electric power in 1955.

In 1948, Nilu Kheri (Nilo Kheri) Administration established a generator with a capacity of 3 kw to provide electricity to the new township. Later, two generating sets with a capacity of 30 kw replaced the previous generator. The hydro-electric power was supplied to the township in 1955.

In 1968, the whole supply of electricity to the Karnal district was that of the hydro-electric power from Bhakra Nangal Project. It was controlled by six electricity divisions, two at Karnal, two at Panipat and one each at Kaithal and Kurukshetra. Besides, there is another divisional office (Shahbad Division) at Shahabad (Shahbad). The Panipat grid sub-station which was of 132 KV initially, was raised to 220 KV in 1962 in view of the growing industrial needs. In addition to this, there are four 66 KV grid sub-stations and fifteen 33 KV grid sub-stations in the district[1]. The power actually sold was 788.76 lakh units in 1967-68, 1,147.67 lakh units in 1968-69 and 1,608.92 lakh units in 1969-70.

NEW INDUSTRIES AND MANUFACTURES

Large and Medium-scale Industries

In 1969-70, the following factories were working in the district :—

The Panipat Co-operative Sugar Mills Ltd., Panipat.—It was established on co-operative basis in 1957 with an investment of Rs. 1.07 crores. The shares are held predominantly by the cane growers. The area around Panipat is rich in sugarcane and fully meets the demand of the factory. In 1969-70, the factory employed 1,000 workers on an average and its annual production was worth Rs. 2.38 crores. In order to utilise molasses, which is a

1. For details see Chapter on 'Other Departments'.

by-product, this concern set up a distillery in 1969 at a cost of Rs. 40 lakhs. It has an installed capacity of 3,300 gallons of rectified spirit per day.

M/s Shambhu Nath & Sons Ltd., (Manufacturers of Acids and Chemicals), Shahabad (Shahbad).—The unit was set up in 1958 with an investment of about Rs. 12 lakhs. It manufactures sulphuric acid and its by-products. In 1969-70, the unit gave employment to 55 persons and its production was worth Rs. 15 lakhs.

M/s Karnal Distillery Co. Ltd., Karnal.—The distillery was started in 1900 with a capital investment of Rs. 4 lakhs. The process of manufacture involves fermentation of molasses obtained from sugar mills. The yeast thus formed is distilled in patent stills and converted into alcohol. Some of it is sold as methylated spirit whereas a major part of it is converted into wine. In 1962-63, the distillery employed 90 persons and its annual production was worth Rs. 2.96 lakhs. However, in 1969-70, the employment increased to 104 while the production decreased to Rs. 2.49 lakhs. The fact that the distillery remained closed from 22nd January, 1969 to 24th May, 1969 and then again from 8th January, 1970 to 15th July, 1970 due to the non-availability of molasses, explains the decrease in the production. The sales of the distillery are regulated through the Excise Department.

Karnal Card Board Industries, Charao (Karnal).—This factory was established at Charao about 6 kilometres from Karnal in 1964 with a capital investment of Rs. 6.50 lakhs. It manufactures card board and mill board. In 1969-70, the factory employed 66 persons on the average and its annual production was worth Rs. 8.55 lakhs.

Solvex Oil and Fertilizers, Karnal.—This unit was commissioned in 1964 with a capital investment of Rs. 10 lakhs. It extracts oil from ground nut and rice bran with the help of solvent hexane. The oil is mainly marketed in Delhi and the de-oiled cakes are exported to foreign countries as poultry and cattle feed. In 1969-70, the factory employed 50 persons on an average and the annual production was worth Rs. 24.22 lakhs.

Small-scale Industries

Woollen goods.—The woollen industries are centralised at Panipat. In 1969-70, there were 50 wool spinning and weaving units working with a capital investment of more than one crore rupees. These manufacture a lot of barrack blankets and blanketing cloth for which there was a great demand from the defence services. To meet this demand the spindles increased

from 6,000 to 10,000 and handlooms to 500. The number of persons employed was 1,580 and the annual production was worth Rs. 1.25 crores. The woollen and finishing centre set up at Panipat by the State Government to improve the quality of woollen goods helped these units to produce attractive designs and offered finishing service.

There were two presses with a capacity of pressing eight thousand bales annually. These were originally started for pressing cotton bales but later switched over to the pressing of woollen bales.

Twenty other units were engaged in the manufacture of blankets, *loies* and *shawls* for civil requirements. These units did not have their own spinning plants and bought yarn from spinning mills. The annual production of these units was estimated at Rs. 20 lakhs and these employed 450 persons in 1969-70.

Agricultural implements.—This industry exists on small-scale as well as cottage basis. The small-scale units are located at Samalkha, Karnal, Panipat and Kaithal. These units manufacture harrows, chaff cutters, etc. The cottage units are located in villages all over the district and manufacture *kassies*, *khurpas* and sickles — articles of common use to the agriculturists.

In 1964-65, there were 289 units employing more than 1,000 persons and the annual production was worth Rs. 190 lakhs. The industrial recession thereafter affected these industries adversely. Production fell during 1966-67 and was worth Rs. 85 lakhs. Only 554 persons were employed. Fortunately the recession was short-lived. With agricultural break-through in 1969-70, the number of units increased to 275, the number of workers employed to 1,250 and the annual production to Rs. 380 lakhs.

Cycle parts.—The industry is of recent origin. The first bicycle assembling unit was established in 1954 at Panipat with an investment of Rs. 1.5 lakhs. Gradually, some more units were established at Panipat and Karnal which manufacture cycle parts such as pedals, cycle stands, chain covers and mud-guards.

This industry in the district faces acute competition from Jullundur and Ludhiana (Punjab) and Sonipat (Sonepat) in the Rohtak district. It is also handicapped by non-availability of proper categories of steel which has resulted in the closing down of some units.

During 1969-70, there were five units which employed 48 persons and produced goods worth Rs. 2.50 lakhs.

Sewing machines and sewing machine parts.—In 1969-70, there was only one unit at Kaithal engaged in the production of sewing machine parts and assembling of sewing machines. This unit employed 24 persons on an average and its annual production was worth Rs. 2.15 lakhs.

Steel re-rolling.—There is only one unit at Panipat, which is engaged in the re-rolling of steel. The unit was started in 1950 with a capital investment of Rs. 2.5 lakhs. In 1969-70, it gave employment to 33 persons and its total production was worth about Rs. 12 lakhs.[1]

Nuts, bolts and bifurcated rivets.—The industry is of recent origin and the first unit was established at Panipat in 1957 with a total investment of Rs. 1.5 lakhs. In 1969-70, there were four such units which employed 115 workers and produced goods worth Rs. 25 lakhs.

Electric cables.—The industry is of recent origin and the first unit was set up at Panipat in 1958. In 1969-70, there were four units and these manufactured rubber insulated and braided electric wires and cables. The production of these units was worth Rs. 2.37 lakhs and their employment was about 35 persons.

Scientific instruments.—There are only two units engaged in the production of scientific instruments. These are located at Panipat and Ladwa. These manufacture porcelain scientific goods and microscopes. In 1969-70, these units employed 15 persons and produced goods worth Rs. 50,000.

Rubber goods.—This industry was started in 1960-61. There were five units in 1964-65. The unit at Karnal had an investment of Rs. 1.5 lakhs and manufactured rubber soles and heels. The other units at Panipat were engaged in the manufacture of electric cables, *chappals* and rubber tubings.

In 1969-70, only one unit at Kaithal functioned and manufactured heels and soles, for footwear. The unit produced goods worth Rs. 3.80 lakhs and employed 55 persons.

Conduit pipes and industrial tubings.—Industrial development necessitated a demand for conduit pipes for electric wiring and industrial tubings.

1. Two more re-rolling mills were set up at Samalkha in 1969 with an investment of Rs. 5.84 lakhs and 9.15 lakhs respectively.

There are seven units engaged in the manufacture of these items and all of them are located at Panipat and Kurukshetra. The conduit pipes are marketed all over the country but the industrial tubings are supplied to iron and steel factories at Tatanagar, Durgapur, Bhilai and Rourkela. In 1969-70, 400 persons were employed in these units and the production was worth Rs. 1.05 crores.

Steel furniture.—The industry is concentrated at Panipat. It started in the district after the Partition when the industrialists who manufactured steel fabrications in Gujranwala (Pakistan) came here. The items manufactured include steel cabinets, piped chairs, safes, racks, almirahs, wheel barrows, post office letter boxes and trollies. In 1969-70, there were eleven units which employed 117 persons and the turn-over was worth Rs. 18.5 lakhs.

Radio.—Restrictions on the import of assembled radio sets gave an incentive to this industry in almost all the important towns of the State. Besides assembling radio sets, coils and wire resisters are manufactured. In 1969-70, there were eight units employing about 16 persons. Despite a cut-throat competition, the industry succeeded in manufacturing and selling goods worth Rs. 22,000.

A unit at Panipat has been experimenting with automatic remote (wireless) control system and has succeeded in making some novel devices such as automatic fire alarm, automatic water tap, burglar alarm, etc. The unit has also successfully manufactured a miniature tape-recorder.

Wood-wool.—There is only one unit at Panipat and it prepares wood-wool from timber logs for packing purposes. It employs 12 persons. In 1969-70, goods worth Rs. 2.40 lakhs were produced. Most of the production of the unit is consumed by the porcelain units at Sonipat (Sonepat) and Delhi.

Printing industry.—There are about 28 small-scale printing presses located at Karnal, Panipat, Thanesar and Kaithal. None of these has offset printing arrangements. These units are mostly engaged in the printing of account books, vouchers, letter heads and hand bills. They usually do job work. This industry provides employment to about 90 persons. Besides, there is a Government of India Press at Nilu Kheri (Nilo Kheri) engaged in Government jobs, which employed 290 persons during 1970-71.

COTTAGE AND VILLAGE INDUSTRIES

Handloom weaving (cotton).—Handloom weaving is done both on

cottage as well as small scale. There is a huge concentration of handlooms at Panipat where goods worth Rs. 2 crores annually are produced on some five thousand handlooms engaged in the manufacture of bed sheets, *kheses*, tapestry, curtain cloth and other furnishing fabrics. Some of the goods produced are extremely well designed and finished. With the rising popularity of handloom products, Panipat has become well known all over the country for its exquisite designs of tapestry, furnishing fabrics, etc. These are marketed all over the country and a good portion of its production is exported. Besides, some handlooms are functioning at Nilu Kheri (Nilo Kheri) and in villages. The goods in villages like *kheses* and plain sheets are produced on pit-looms. The handlooms at Panipat and Nilu Kheri (Nilo Kheri) are of fly shuttle type. The industry provides employment to 10,000 persons.

Shoe and leather goods.—Shoe-making is one of the oldest cottage industries carried on by Harijan workers. It exists in rural as well as urban areas. The urban units are engaged in the manufacture of shoes whereas the rural units manufacture *jootis*. The district is popular for fine shoes and a few units at Karnal sell these to neighbouring districts and States.

In the absence of a tannery in the State, chrome leather and lining of Kanpur and Madras tanneries are consumed by the shoe-makers. The sole leather is, however, obtained from local tanners. The *jootis* in rural areas are made out of the leather tanned locally.

In 1969-70, 1,150 units employing 1,500 persons were functioning in the district. The total production in 1969-70 was worth Rs. 35 lakhs.

Ban **and rope making.**—Ever increasing prices of these commodities are attracting more and more persons to this trade. In 1969-70, 95 units manufactured *ban* with hand-driven machines. About 95 workers were engaged in this industry and the total production was worth Rs. 0.56 lakh.

Leather tanning.—This old industry continues on cottage basis in villages and urban areas. Tanning is mostly in the hands of Khatiks and Rehgars. The main raw materials consumed are raw hides, *babul* bark, lime salt, etc. The tanning process in vogue is very crude and the product is thus generally rough and spongy and cannot fetch a good price. It is consumed mostly by local shoe-makers. During 1969-70, about 1,050 units were engaged in this industry and it gave employment to 1,385 persons. The total production was worth Rs. 11.08 lakhs.

Gur **and** *Khandsari* **making.**—*Gur* and *khandsari* making, a seasonal industry, is carried on in almost every village. The sugar mill at Panipat

has been drawing most of the sugarcane crop in the district. However about 325 units are engaged in the production of *gur* in rural areas. During 1969-70, 1,008 workers were engaged in this industry and they produced *gur* and *khandsari* worth Rs. 32.56 lakhs.

HANDICRAFTS

Woollen carpets.—In 1969-70, four units were engaged in the production of woollen carpets at Panipat. About 53 persons were employed and the goods produced were worth Rs. 3.50 lakhs. Due to the paucity of demand and acute competition from Mirzapur and other places in Uttar Pradesh, these units worked much below their capacity.

Ivory goods.—The craftsmen engaged in making ivory goods manufacture articles like buttons, bangles, flower vases, scent bottles and other artistic goods. In 1969-70, nine units were functioning in the district which employed 21 persons and produced goods worth Rs. 0.23 lakh.

AGRO-BASED INDUSTRIES

Rice milling.—The district abounds in paddy crop and therefore, rice milling is one of the important agro-based industries. In 1969-70, there were 94 rice shellers and 875 rice hollers working in the district. These units gave employment to 2,303 persons and their output was estimated at Rs. 92.71 lakhs per annum.

Cotton ginning.—Kaithal area being rich in cotton crop, three cotton ginning factories ginned and pressed 50,000 bales in 1969-70 and provided employment to 350 persons. The pressed cotton was sent to the textile mills at Bombay (Maharashtra) and Ahmedabad (Gujarat).

Oilseed crushing.—In 1969-70, the only two oil expelling units were located at Kaithal besides about 50 power driven *kohlus* scattered all over the district which usually did job work. These units procured edible oilseeds worth about Rs. 5.5 lakhs. The industry provided employment to 125 persons.

Flour milling.—Only one flour milling unit is located at Karnal. It was established in 1969 with an investment of Rs. 5 lakhs. Its output in terms of money is estimated at Rs. 1.8 lakhs. It provides employment to 18 persons.

There are many other industries in small-scale and cottage sector. Information about industry-wise number of units, average employment and

production during the years 1964-65 to 1969-70 is given in Table XIX of Appendix.

TOWN-WISE DISTRIBUTION OF INDUSTRIES

In 1971, the following important industries were located in various towns of the district :—

Tahsil	Town	Industries
Karnal	Karnal	**Large and Medium-scale:** Distillery, Card Board, Rice Bran, Oil Extraction, and Shoe-making.
		Small-scale: Handlooms, Harrow Discs, Sodium Silicate and Soap-making, Fire Extinguishers, Electrical Instruments, Barbed Wire, Rubber Goods, Shoe-making, Leather Goods, Motor Stamping, Transformer Stamping, Wire Netting, Flour Milling, Agricultural Implements, Cycle Parts, Rice Milling, Printing, and Saltpetre-making.
	Gharaunda	**Small-scale**: Rice Milling, Surgical Cotton-making, and Foundry.
	Nilu Kheri (Nilo Kheri)	**Small-scale**: Pints making, Agricultural Implements, P.V.C. Pipe, Rice Milling, and Handloom Weaving (Cotton).
Panipat	Panipat	**Large and Medium-scale:** Sugar, Distillery, Dehydrated Vegetables, Wool and Spinning, and Steel Tubes.
		Small-scale: Woollen Weaving and Furnishing Fabrics, Woollen Blankets, Handloom Weaving (Cotton), Agricultural Implements, Steel Furniture, Nuts and Bolts, Steel Pipes, Steel Re-rolling, Conduit Pipes, Cycle Parts, Electrical Cables, Radios, Scientific Instruments, Wood-wool, Water Pipe

Tahsil	Town	Industries
		Fittings, Plastic Goods, Rubber Goods, Copper Liners, Printing and Printing Press-making, Woollen Carpets, and Sports Goods.
	Samalkha	**Small-scale**: Chaff-cutter Machines, Steel Re-rolling, and Cycle Tyres and Tubes.
	Thanesar	**Large and Medium scale**: Solvent Oil Extraction.
		Small-scale: Conduit Pipes, Printing, and Rice Milling.
	Shahabad (Shahbad)	**Large and Medium-scale**: Vanaspati Ghee and Acids and Chemicals.
		Small-scale: Chemicals, Rice Milling, Agricultural Implements, and Saltpetre-making.
	Ladwa	**Small-scale**: Agricultural Implements, Scientific Instruments, and Rice Milling.
Kaithal	Kaithal	**Small-scale**: Agricultural Implements, Cycle Parts, Sewing Machines, Cotton Ginning and Pressing, Printing, Utensils, Radios and Radio-parts, Saltpetre-making, *Dal*-making, Handloom Weaving, Rubber Goods, Oilseed Crushing, Leather Tanning, Shoe-making, and Leather Goods.
	Pehowa	**Large and Medium-scale**: Milk Food Products.
		Small-scale: Diesel Engines and Rice Shellers.

INDUSTRIAL LABOUR

Industrial labour in the district is mostly drawn from displaced persons

from the Pakistan, neighbouring villages and Uttar Pradesh. Displaced persons either reside in Government-built hutments or newly set up colonies around the towns. Rural labourers from nearby villages, whether engaged on full time or part-time basis, normally return to their homes daily after work. The newly set up factories thus provide subsidiary occupation to partially employed agricultural labour. Poor labourers from Uttar Pradesh live in overcrowded rooms near their place of work, and remit a sizeable part of their earnings home.

Industrial training institutions and industrial schools opened by the Department of Industries now increasingly meet the demand for skilled labour. This is greatly helping the development of industries.

Industrial labour in the district has sometimes to go without work owing to the closing down of some factories due to the non-availability of raw material or lack of finances. Also, the seasonal character of some of the industries does not offer regular employment.

Strikes and lock-outs resulting from disputes between the employers and the employees are scarce although labour is reasonably well organized. In 1969-70, the following unions of the industrial workers were working in the district :—

Karnal Distillery Workers Union, Karnal
Karnal Press Workers Union, Karnal
Karnal Rice, Oil, Cotton and Flour Mills Workers Union, Karnal
Engineering and Foundry Workers Union, Panipat
Industrial Workers Union , Panipat
Sugar Mills Karamchari Union, Panipat
Sugar Mills Mazdoor Sangh, Panipat
The Panipat Sugar Mills Mazdoor Sabha, Panipat
Woollen Workers Union, Panipat
Woollen Mazdoor Sabha, Panipat
The Wool Khadi Workers Union, Panipat
Textile Mazdoor Sangh, Panipat
Weavers Union, Nilu Kheri (Nilo Kheri)

Rates of wages prevailing in the district vary according to supply and demand at the time of employment. The wages of skilled labour range between Rs. 5 and Rs. 7 per day whereas unskilled labourers get Rs. 3 to Rs. 4 per day.

INDUSTRIAL CO-OPERATIVES

The development of industrial co-operatives is looked after by the Industrial Assistant Registrar, Karnal, who is assisted by 5 Industrial Inspectors and 21 Sub-Inspectors. Industrial co-operatives have made considerable progress in the district. The following table indicates the number of industrial co-operative societies working in March 1970 :—

Serial Number	Name of industry		Number of societies (as on March 31, 1970)
1	Handloom Weaving		125
2	Small-scale Industries		158
	(a) Leather Goods	—	
	(b) Engineering Industries	33	
	(c) Wood Work	16	
	(d) Miscellaneous (brick kilns, hosiery, etc.)	109	
3	Khadi and Village Industries		239
	(a) Non-edible Oils and Soap Industries	20	
	(b) Pottery	6	
	(c) Bee Keeping	1	
	(d) *Gur* and *Khandsari*	43	
	(e) Palm *Gur*	2	
	(f) *Ghani* Oil	15	
	(g) Cobblers	105	
	(h) Leather Tanning and Flaying of Skins	24	
	(i) Hand Pounding of Rice	10	
	(j) Others	8	
	(k) Khadi Spinning	5	
4	Handicrafts and Women Handicrafts Societies		39
			561

The value of the goods produced by these societies during the years 1965-66, 1966-67, 1967-68 and 1969-70 amounted to Rs. 13.96 lakhs, Rs. 11.73 lakhs, Rs. 34.59 lakhs and Rs. 122 lakhs respectively.

The District Co-operative Industrial Union registered on August 18, 1950 assists in the marketing of the goods of the industrial co-operative societies. It has its sales depots at Karnal and Panipat.

Owing to the great concentration of handloom weaving co-operative societies at Panipat, the workers experienced much difficulty in securing living accommodation at reasonable rates. To overcome this difficulty two weavers colonies comprising 20 and 28 houses were built in 1960-61 by the Khadi Wool Weavers Co-operative Industrial Society, Panipat and Panipat Co-operative Industrial Union respectively. Government assisted these societies in their effort by advancing loans.

General

Judging from the progress in the field of industries, particularly large and medium-scale industries, it can be surmised that the outlook of future industrial development is quite bright.