Chapter IV

CROP PATTERNS

Motives of Crop Production

In the last chapter, it has been noted that in this district the land is used predominantly for crop production. In the western countries like Great Britain, although the crops cultivated on the arable land depend on climate, soil and farmer's needs, yet the over-riding considerations are always national and world prices*. But in the area under study, the main consideration is the subsistence, while some of the arable land is devoted to the cultivation of fodder crops needed for feeding the draught and dairy animals also. The small land-holders seldom have any surplus, though they sell some of their produce for the payment of the outstanding debts or land revenue or for meeting certain other expenses. The big land holders may have sufficient surplus for sale. But, sometimes, their extravagant habits force them to sell their produce. Actually, only a small part of the produce is meant for sale.

Main Crops

Taking an average of 1953-58**, the foodgrains and pulses annually occupy 79.6% and fodder crops 6.5% of the total cropped area in this district. Market garden

* Stamp, L. L., C. cit., p. 96.
** Based on Sadar Tanungo's Milan Khasras for these years.
produce such as vegetables, melons, condiments, tobacco, etc., cover 1.8%, sugarcane holds 9.2%, oilseeds 2.2% and fibre crops both alone and mixed with arhar 0.7%. Thus more than 86% of cropland is devoted to the production of foodgrains, pulses and fodders, while all other crops including sugarcane, oilseeds, fibres and market garden produce hold less than 14%.

**Trends of Crop Production**

A study of the crop areas since the last quarter of the nineteenth century* shows the following trends:

(a) Increase in the area under foodgrains and pulses.
(b) Increase in the area under fodder crops.
(c) Increase in the area under market garden produce, particularly potatoes.
(d) Larger increase in the area under sugarcane.
(e) Decrease in the area under fibre crops, particularly cotton.
(f) Decrease in the area under small oilseeds.
(g) Disappearance of opium and indigo.
(h) Introduction of jute.
(i) Great popularity of groundnuts.

(d) Sadar Janungo's Milan Asarapras for the years 1953-58.*
As compared to the average for the years 1878-81, there has been about 28.5% increase in the area under food-grains and pulses in the years 1953-58. But, the area under sugarcane has increased by 240%. The area under cotton has decreased by 84.6%.

The increase in the area under food-grains, pulses and other food-stuffs is caused mostly by the substantial increase in local population requiring more of these things. The great increase in the area under sugarcane is due to the increasing demand for gur and sugar both within the district and in other parts of the country where they find a market. The development of the facilities of irrigation and transport and the establishment of sugar mills have stimulated the cultivators to devote more land to the production of sugarcane. The decline in the area under cotton and small oilseeds owes partly to the unfavourable seasons for some years at a stretch and partly to the competition from the better cotton and oilseeds from Punjab due to the development of transport as already noted. The trends in the production of individual crops will be seen in the sequel.

Factors Influencing the Distribution of Crops

The distribution of crops varies considerably in different parts of the district depending mostly on the various physical factors, e.g., the amount of rainfall,
suitability of topography and soil, etc. The table below sums up the correlation of various crops and physical factors* in the district.

Table 22

<table>
<thead>
<tr>
<th>Crop</th>
<th>Rainfall</th>
<th>Soil</th>
<th>Physiographic unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>bajra alone &amp; mixed</td>
<td>Less than 35&quot;</td>
<td>dry bhur or light loam</td>
<td>inferior banhar</td>
</tr>
<tr>
<td>barley alone &amp; mixed with peas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>moong, moth pulses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>groundnuts</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>rapeseed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wheat mixed with barley</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>jowar alone, or mixed</td>
<td>35&quot;-40&quot;</td>
<td>moist, fine loams</td>
<td>superior bangar</td>
</tr>
<tr>
<td>with arhar</td>
<td></td>
<td>medium &amp; and open khadar</td>
<td></td>
</tr>
<tr>
<td>tobacco</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>wheat alone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sugarcane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cotton alone and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mixed with arhar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>market garden produce</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>including chillies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gram alone &amp; mixed</td>
<td>Above 40&quot;</td>
<td>wet clays</td>
<td>whadds depressions</td>
</tr>
<tr>
<td>rice</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Fig. 33 shows the crop pattern in village khaliqpur Kalan in the year 1955-56. In it crops are represented by different shades. Mixed shades indicate mixed cropping where the crops belong to the same harvest. They denote double cropping, where crops belong to different seasons. While studying Fig. 33, a reference should also be made to Fig. 43 which shows the topography and soils in khaliqpur Kalan. On comparing these two figures the physiographic control over the distribution of crops becomes clear.
But, locally and on a small scale the choice of crops may also depend on the demand from the nearby markets, the skill of the cultivator and his capacity for land management and investment. Thus, we find some specialised cultivation of the market-garden produce near the towns, where it is intended to meet the demand from the townsfolk for fresh vegetables. The specialisation in the cultivation of sugarcane for supply to sugar mills by some large land-owners, e.g., the Sheikhs of Lahadpur, owes to their better economic position, better understanding of the comparative advantage in the cultivation of various crops, better knowledge of the land management, scientific methods, etc. But, owing to the cultural influence of the establishment of sugar mills in their vicinity as well as in areas where roads and railways can provide an easy link with them and the farms, sugarcane is becoming more and more important.

Cultural Practices

Cultural practices vary with different crops owing to their requirements of growth. They also vary in various physiographic tracts owing to the control imposed upon the crop growth by the physiographic details.

(a) Single Cropping: Normally, a single harvest is raised each year on a piece of land. This practice may
be termed as 'single cropping.' In the drier tracts it is physically impossible to raise more than one harvest a year. By dry-farming practice people conserve the moisture received from the rains and generally grow rabi in one year to be followed by kharif in the next year. In places, where owing to their depressed nature leading to flooding during the rainy season, kharif is not possible so that mostly rabi is raised year after year. Where, however, the land is well-drained and irrigational facilities are available the influence of dry season can be overcome so that even more than one harvest can be produced each year. But, this would require a much greater care on the part of the farmer than a large land holder can devote.

In the single cropped rather single harvested areas, peasants, in some cases, practise mixed cropping to get more than one produce from the same piece of land and in the same season. This is quite clear from Fig. 33 where mixed shades generally denote mixed cropping.

(b) **Mixed Cropping:** In mixed cropping, different grains, capable of growing in one and the same season, are mixed together and sown as such. They are not sown in separate rows. Generally wheat is grown alone; but where

* In some villages, about half of the lands are devoted to kharif and half to the rabi in each year and a rotation of the two harvests is practised in the two halves locally known as the *kharif har* and the *rabi har*, respectively. This feature can be seen from Fig. 34, which shows the crop pattern in Lagarpur Chhoiya. The physiographic and soil conditions in this village may be seen from Fig. 46.
the soil is inferior owing to dryness or sandy character, 
wheat is mixed with barley, where, on the other hand, the 
soil is wetter, wheat is mixed with gram*. In both cases, 
lesser number of ploughings are necessary than for wheat 
alone so that a peasant who, owing to some drawback, cannot 
afford the tillage for single wheat may devote his land 
to mixed wheat. It is, however, a common practice to mix 
a small percentage of rapeseed or mustard with wheat. This 
owes to the common village belief that the mixture of oil-
seeds with wheat is helpful in maintaining the fertility 
of the soil.

Mixed cropping is common in the case of millets 
particularly in the Bhurlands. Jowar and bajra are usually 
mixed with other things such as guar, arhar, groundnuts, 
urad (black gram), moong (green gram), etc. Maize is also 
mixed with the kharif pulses. Whereas usually two things 
are mixed in the case of rabi cereals, in many cases, four 
to five things are mixed together in the kharif millets 
and pulses, particularly in the bhurlands of Hassanpur.

* Strange mixtures have been noticed by the writer. When he 
visited Khalilpur Bala in the October of 1956, after 
heavy showers of rain, he found on the way, a large field 
with a mixed crop of sugarcane and rice. Sugarcane was 
suffering from a very poor growth but rice had developed 
well. In some fields rice was mixed with jowar. There jowar 
had suffered but rice was growing well. The peasants in 
the neighbouring fields informed that earlier in that 
season the monsoon had failed and the normal growth of 
jowar and sugarcane had been affected. But, later on, 
there were heavy showers and some of the peasants, who 
could afford, sowed their flooded fields with rice which 
had grown well owing to the continuation of heavy rain-
fall, later on.
Rice, as a rule, is grown alone. Some inferior food-grains like sawan, kodon, etc., are mixed with millets and pulses in the kharif. In the kharif mixtures, there is a combination of high stalked and creaping crops. There is also some difference in time of maturity of these crops. So these crops can be easily separated from each other at the time of harvest. Maize, jowar, bajra, etc., are high stalked crops. Moong, urd, etc., creep on the ground. Above them an intermediate layer is provided by such small stalked crops as guar, sawan, kodon, etc. Til (sesamum), arhar and sanhemp where mixed have a slightly higher intermediate layer.

Arhar is commonly mixed with cotton. Both of them occupy land longer than the kharif millets and pulses. Arhar grows higher than cotton, but where arhar is mixed with jowar or bajra it has not acquired its full size when the latter are harvested. When they have been cleared it expands much, and quite rapidly too, and fills up the vacant space.

Mixing of sanhemp is not so common though the writer has seen it mixed in some fields. Generally, a row of sanhemp is grown around the fields growing other crops and it serves as a hedge.
Factors of Mixed Cropping

Perhaps, the smallness of holdings is a factor of mixed cropping practice, as the small peasants who work for subsistence, would try to produce all sorts of required crops from their small holdings and mixed cropping has the advantage of producing a number of crops from one and the same field in the same season.

Much of the mixed cropped produce, however, goes to feed the livestock. Along with the millets, guar, sawan, groundnuts, moong, urd, etc., are also fed green to the animals in the kharif season. In the rabi season, the mixed crops of gram, barley and peas are also, sometimes, fed green to the livestock. Looking at mixed cropping from this point of view, it seems to be useful in supplying various fodders in mixture to the livestock.

Mixed cropping seems to have a scientific basis in that the different products exploit the soil differently so that only one type of plant nutrients in the soil are not taxed. The mixture of pulses with foodgrains, moreover, provides a useful balance since the pulses fix atmospheric nitrogen at their roots and thus enrich the soil while the foodgrains exhaust it.

Theoretically speaking, mixed cropping ensures a better safeguard against a total crop failure due to
adverse weather conditions, pests and diseases, particularly where irrigation facilities are not provided. Distribution of labour and income is spread over a longer period, thus helping, to some extent, to fulfill the diverse needs of the holders of small holdings. It, thus, provides a more complete utilization of land.

For successful mixed cropping, however, the crops in mixture should not have identical demands for soil moisture or nutrients; their root systems should be feeders at different soil depths and their growth habits should be different. By arranging the mixtures in such a way that the crops can be harvested one after the other with a gap of a few days or weeks, the peasants not only spread their activity over a long period of time but also keep their fields covered and safe from the erosion by wind and water. On the other hand, they get a variety of produce for the subsistence of their families and livestock, getting it by and by, without the need of taking a large stock for the year as a whole. Let us take an example as under:

**Example: A Kharif Mixture**

**Sown in early July:** Sawan - Jowar - Urd - Sesamum - Groundnut - Arhar.

**Harvested in August (Sawan), Early October (Jowar), Late October (Urd, Sesamum & Groundnut), March (Arhar).**

In this example, Sawan gives an early millet, followed by jowar (Sorghum) about a month thereafter. Both these
provide foodgrains and fodder. Urd pulse and sesame and
groundnuts oilseeds, all easily marketable commodities, are
obtained in late October. Then the fields remain covered
by arhar pulse till March. In addition, to providing a pulse
for home consumption and for sale, arhar yields a good deal
of fuel in the form of its long and tough stalks.

Again, sawan is a medium sized (rather low) plant,
jowar is a tall plant, urd is a creeper on the floor, sesame
is a medium sized plant and groundnut lies on the ground.
Arhar is a tall plant. There is no difficulty in isolating any
of these from the mixed field. When the one matures and is
harvested, the remaining crops, in order of their maturing
period, flourish rapidly. When all others have been harvested
arhar is yet immature and finds the necessary space for its
expansion. In this way, no crop inhibits the growth of the
other. Rather they help each other, e.g., the pulses and
groundnuts fix nitrogen in the soil, while the foodgrains
exhaust it. The crops are so adjusted that each one takes a
different set of plant nutrients from the soil. The moisture
requirements are also well adjusted. It is a dry farming
mixture well suited to light soils which are much subject
to erosion if left fallow for a long period of time as may
be necessary in case the monoculture of wheat is practised.
The practice of double-cropping comprises the raising of more than one harvest on the same piece of land in the same agricultural year. It means that the same field is sown first with the kharif crops and then with the rabi crops, so that at least two crops are harvested in succession. In a few cases, even the zaid harvest is also raised from the same field, but that is an exception. This requires a very judicious selection of crops or the intensive use of manures and fertilizers to maintain the fertility of the soil.

The increasing pressure of population and livestock on the limited land suggests that the only way out of the difficult economic situation for the peasant is to be able to use his land more and more intensively and to grow more than one harvest on the same piece of land. Double-cropping is thus one solution of the difficulty, which is felt more particularly by the smaller land holders. They have very little sense of the labour values and returns.

Wheat, sugarcane, cotton and arhar do not permit a second harvest in the same year. For wheat the fields have to be kept fallow in the kharif. It requires a very well tilled land for its growth. Numerous ploughings are necessary for a field to be ready for wheat sowing and this work takes some months of the kharif period. Hence very few kharif crops
are possible in the fields designed to grow wheat in the rabi. On a small scale some early maturing staples such as maize, sathi rice, etc., or green fodder crops like jowar may be grown to bear a previous kharif crop (Fig. 35*). But, generally this is not the practice, perhaps owing to the reason that the time left for the preparation of the wheat fields on a large scale is insufficient for proper tillage and rest.

Cotton and arhar stand for about eight to ten months in the fields covering the whole of the kharif and a part of the rabi seasons, while sugarcane stands for more than a year so that double-cropping is out of question with them. The Katehr bangar of Bilari and Sambhal where wheat and sugarcane are the predominant crops, therefore, has very little double-cropping. In the year 1954-55, for example, Bilari tahsil had only 4.17% of its total cultivated area as double-cropped.

* Fig. 35 shows the crop pattern in Jaglia Kathair (in the southern Katehr upland). The inset maps show the distribution of soils and irrigation in this village. Thus this figure presents a comparative study of the geographical conditions and crop patterns in a relatively drier part of the superior upland. The graph of crop association in the inset shows the relative importance of various crops and their irrigated and unirrigated parts. This village is representative sample of the areas having stable cultivation since the last quarter of the 19th Century as shown by the graph of the trend of land use. The distribution of main crops, in 1873-74, has also been shown in one of the inset maps. In preparing all these maps actual field to field information has been plotted on the village map on the scale of 16 inches to the mile. Then, all adjacent fields having similar crops have been grouped together and shown thus.
Gram, peas and barley, however, do not require so much preparation for their land as does wheat, so they can be grown after early maturing kharif crops like rice, jowar, bajra, sawan, etc., which take about three months for their growth. They permit double-cropping on a large scale, provided the soil and climatic conditions are favourable. In this district, temperature is seldom harmful for the growth of crops but if sufficient moisture is not available, cultivation becomes fruitless. Thus where cultivation is 'dry' as in the bhurlands raising of a second crop may be an impossibility. But in the khadars, in the wetter north-east and in the irrigated parts elsewhere, drought has little influence in debarring double-cropping. Rather water-logging or over-saturation of the soil may become a drawback as in the case of the Udla and kanmar tracts. If the fields do not become sufficiently dry in time for rabi sowings double-cropping may become impracticable.

For gram only a little upturning of soil is necessary. It grows well on the heavy soil of the rice fields. It is sown in early October by which time water from the rice fields recedes. Hence rice-gram double-cropping is a normal feature of the rice growing tracts. Peas are sown in November and may be grown alone or mixed with barley. Even oats alone or mixed with peas for fodder may be grown as late as December, if the moisture is available in the soil by that time. Thus, the maximum of double-cropping is possible in the rice fields of the north-east where rice is
almost wholly unirrigated and dependent on monsoonal rainfall. Thakurdwara and Moradabad tahsilis, therefore, have the maximum of double-cropping in the district. In the year 1954-55 respectively 27.62% and 25.21% of their total cultivated areas were double-cropped. The adjoining tahsil Amroha with a large number of rice-growing depressions followed with 14.82% of its total cultivated area as double-cropped, in that year. Elsewhere the clayey depressions have the same result.

Jowar and bajra, single or combined, which predominate in the bhurlands and are usually grown for fodder elsewhere, occupy land for not more than three months and are harvested by the end of October. For the purpose of fodder they are cut successively from August to October so that some of their fields become available for the sowing of rabi crops. Drought is a drawback in the bhurlands. Therefore, only in suitable places barley and peas are grown as mixed crops after jowar, bajra, etc. Sambhal and Hasanpur with their extensive bhurlands, therefore, have a comparatively low double-cropping. In the year 1954-55, Sambhal had 11.66% and Hasanpur had 12.49% of their total cultivated areas as double-cropped.

Nearer the towns, where baghbans try to cater for the urban markets and produce green vegetable, potatoes,
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green maize and fodder crops etc., in quick succession by using manures and fertilizers, it is possible to raise more than one harvest year after year. Potatoes are grown both in the kharif and rabi. With early maturing varieties they can be easily double-cropped. To give a few examples, Daulat Bagh Mustehkam, a part of Moradabad Municipality and Hauz Iadesra a part of Sambhal town had 58.7% and 71.9% of their total cultivated land as double-cropped in 1954-55 respectively.

Places, which are easily accessible and can export green products to the nearby town markets, have a high percentage of double-cropping. Thus Machharya a railway station about four miles from Moradabad town had 36.3% of its total cultivated area as double-cropped in the year 1955-56.

Since the beginning of this century the double-cropped area has almost doubled. In the year 1899-1900, it amounted to 87,500 acres only. In the year 1954-55, it stood at 169,129 acres; let it, however, be pointed out here that in tahsil Bilar double-cropping has decreased from 12.84% of the total cultivated area, in 1303-05, to 4.17% of the total cultivated area, in 1954-55. This owes to the fact that whereas previously early maturing crops like maize and sathi rice were popular, now the crops like wheat and sugarcane are predominant.

** The figure for Hauz Iadesra is for the year 1955-56.
// Sadar Qamungo’s Milan Khasra for the year.
Crop rotation is one of the practices whereby peasants try to maintain a balance of plant nutrients in the soil. If one and the same crop is raised year after year, the soil may be exhausted of a particular set of elements. But if crops are changed at shorter or longer periods, this defect would not arise, since each crop varies in its requirements of plant-food. In addition, a good rotation reduces weeds, insects, pests and plant diseases. Leaving the land fallow for some time gives it rest wherein it recovers its lost fertility to some extent. Current fallow, therefore, usually forms a part of the crop rotation.

Wheat and sugarcane tax the soil too much. Where they are grown each year, a gap period of fallow remains in between. But, in places, sugarcane is allowed to continue for some seasons, yielding cuttings of ratoon cane till its quality has deteriorated much. Wheat follows sugarcane, sometimes, to make use of the accumulated effect of the fertilizers, which are commonly used in the cultivation of the latter.

In most places of the drier west where only single-cropping is the practice, wheat alone or mixed with barley and barley alone or mixed with peas is the common rotation after last year's jowar, bajra or their mixture.

But in the wetter tract of the north-east, where rice predominates, gram alone or mixed with wheat or barley
is grown in the rabi of the same year, where double-cropping is carried on. Otherwise, rice is followed by rice in the next kharif and this continues for many years, depending on the fertility of the rice fields. In the uplands rice is also rotated with jowar or maize. Only Matiyar I is suited to growing wheat after rice. Matiyar II allows gram alone or mixed with barley after rice.

There is no place for grass in the crop rotations in this area. Fodder crops play some role and foodgrains are usually rotated with them. The decision as to what should be grown in a particular season is, however, reached from year to year depending upon the conditions of weather and soil moisture. No set crop-rotations for any period of time are followed strictly in this district.

WHEAT

Importance of wheat

Moradabad district is predominantly a wheat growing area. Taking an average of five years 1953-58, wheat alone covers 58.2% of the total rabi harvest while wheat mixed with gram covers 8.7% and wheat mixed barley covers 6.2%. Thus the total wheat crop amounts to 73.1% of the total rabi harvest in a year. This is more than 7.6% above the total acreage of all the foodgrains and pulses grown alone or mixed during the kharif harvest. This feature, however, is very old
and even in the last century the average of the total wheat crop alone and mixed amounted to 70.1% of the total rabi harvest.

After the partition of country Uttar Pradesh became the most important wheat growing state in India. Within U.P., the most important wheat growing areas lie in the west; Rohilkhand Division leading all other divisions of the State, while within Rohilkhand, the Moradabad district is credited with about 30% of the total wheat area.

Varieties of Wheat

The bread wheat 'Triticum vulgare' is commonly grown in this district. Work on wheat breeding was started during the first decade of this century at the Agricultural Research Institute, Bass (Bihar) now at New Delhi, mainly with a view to improving the grains, quality and yield of wheat. A number of superior types have been developed by means of hybridisation both at the Centre and in the States. Out of these Panjab 591, Pb 409, C 13 and C 46 are popular in the district. Some of the indigenous varieties, however, are still preferred to improved varieties in certain areas, e.g., the Mundhia or Chandausi (semi-hard wheat) grown in the area round about Chandausi. But, they are susceptible to rust.

The duration of the growing season for wheat, in this area, is approximately 120 to 140 days. Pb 591 and
Fb409 are moderately late varieties. Another medium late variety, Fb 518 has been grown to some extent, but it is being given up because of its susceptibility to 'smut' and its rather low quality 'bhusa' as compared to that of Fb 591 or Fb 409. C 13, a bearded wheat, is an early variety and if sown at the proper time is capable of getting ready for harvest in about 4½ months. It has a high yielding capacity too, and is particularly suitable for the irrigated areas, but unfortunately, it has a lodging tendency. C46 resembles C13 very much. It is a good drought resistant variety and yields better than the latter under unirrigated conditions while the latter is a better yielder under irrigation. Fb 591 is about 10 to 20 days later than C 13. It grows and yields better under irrigation. But, Fb 409, also a late variety, gives a good performance under the unirrigated conditions.

Sowing season

For wheat sowing, the best season is the latter half of October. In order to ensure a proper development

Winter temperatures persist long enough for the cultivation of medium late varieties. After full flowering, the wheat crop needs about two months or a little more for getting fully matured and ready for harvest. These two months must have sufficiently cool and favourable temperature and weather, essential for the proper development and maturity of the grains. In order to ensure this, the wheat crop should come into full flowering preferably as near about the middle of January as possible. In the eastern district where the onset of summer temperatures is early, late varieties, which do not come into full flowering at this time, do not fare well. But, in Baradabad the cooler temperatures persist longer and thus allow of successful cultivation of moderately late varieties which are generally better yielders than early ones.
and maturity of the grain and to avoid a shrivelled undergrowth, it is very essential to sow the crop as early as possible during this optimum period. This is also necessary to save the crop from being severely damaged by rust.

In any case, it is absolutely essential for wheat sowings to be completed, definitely and at the latest, by the 31st October. Later sown wheats suffer much from the rust disease, susceptibility to which may be reduced by a light topdressing by phosphates and potash.

**Harvesting Season**

The harvesting period for early varieties is from mid-April to the end of April. For late varieties, it is up to mid-May. The wheat crop should be harvested only when it is dead ripe, i.e., when the ear stalks become thoroughly dry and brittle and snap easily on being bent sharply. It is necessary not only for easy threshing of grains, but also because good 'bhusa' can only be made if the wheat straw is dead ripe and breaks easily into bits during the threshing operations.

**Soil Requirements of wheat**

Although wheat can grow almost anywhere, the best yields and performance are obtained on medium and heavy loams. The fields should be well-drained and preferably near some source of irrigation, as irrigated wheat gives superior yields.
Fields green-manured during kharif are ideal but, those under summer fallow are often preferable on account of their better moisture reserves. Fields, which had a kharif legume, are also good, but fields, which were under jowar, bajra or maize, require adequate manuring if desired to be put under wheat. Fields, which are quite in the open and get the longest hours of sunshine, do better than those which suffer from shade effects and low lying situations. An exposed wheat crop suffers less from rust*.

* Hot weather ploughing has been found useful not only in improving the physical condition of the soil but also in eliminating weeds and harbouring pests and diseases through exposure to the hot wind and sun during the months of May and June. It is very essential that moisture is conserved in the unirrigated areas. After each rainfall, only the top layers should be stirred and the soil tightly packed by the 'nataila' in order to check evaporation. In case the rains have stopped early and there is shortage of soil moisture, a preliminary watering (palewa) is given to the field before taking up the preparatory ploughings. For a good preparation of the wheat field, often, as many as 14 ploughings are necessary but, generally, 7 to 8 ploughings, if efficiently done on suitable soil, may suffice. On irrigated lands, five to six ploughings are usually given, at least one of these being with the furrow-turning plough. Of course, the greater the number of ploughings, each followed by 'nataila', the better would be the field for wheat, for the wheat field, properly prepared and ready for receiving the seed, should have a fine mellow texture, free from weeds and stubbles and should have sufficient moisture to ensure uniform and good germination. Soon after the wheat is sown, the field is divided into small plots, known as 'alaries', in order to facilitate irrigation and to ensure economy in the use of water supplies. The first irrigation to the actual crop becomes necessary after a month of the sowing, when the wheat plants are about 4 to 6 inches high. In case, where at sowing time the moisture was slightly deficient, irrigation may be necessary a little earlier.
Irrigation of wheat

On an average (cf 1953-58) about 30% wheat alone, 13.6% wheat mixed with gram and 6.4% wheat mixed with barley is irrigated in this district. Whenever the monsoon remains weak and is followed by a complete drought in November and December, wheat needs more irrigation as happened in the years 1953-54 and 1954-55. When September and October are sufficiently rainy, the need for the irrigation of wheat is not felt so much in the months of November and December, since the October rains leave abundant soil-moisture for the wheat grain to germinate properly. But, when moderate rain in October is followed by light showers in December, the need for irrigation of wheat becomes still less. It is the least, however, when the rain is well distributed throughout the whole rabi season as well as throughout the preceding kharif season.

* Unless there has been sufficient rainfall at the sowing time the first, usually light, watering to the young crop is very essential to ensure proper tillering and vegetative development without which the yields are bound to be affected adversely. The second, medium, watering becomes necessary at the time when the crop is nearly in full ears in January, in order to ensure the proper setting and development of grains. These two irrigation are quite sufficient, provided the winter rains have been normal, but, when the winter rains are not adequate or fail completely, one or two extra irrigations will be necessary to make up for this deficiency. But irrigations are beneficial only up to the time when the grains are still in the milk or the soft dough stage (i.e., immature). Irrigations given after that serve no useful purpose. They are often responsible for the crop lodging badly, rust spreading in humid conditions and heavy loss in yields. The demand of the crop for water is at its highest at the tillering and at the full flowering stage.

** Cf. Tables III & XXIII in the appendix. Table III shows the actual monthly rainfall in the years 1953-58 while Table XXIII shows the areas under the rabi cereals and their irrigated and unirrigated parts during these years. Remarks regarding the season in each year are given at the base of the latter table.
Total wheat acreage may, however, decline when
(1) either the hot season has remained too dry to
permit the plough to work in all the fields
likely to be devoted to the next rabi, as it
happened in the year 1954-55,
(2) or the latter part of the rainy season is so
much rainy as to leave too much of moisture in
some of the fields to be suitable for wheat sow­
ings, as it happened in 1957-58.

Moreover, in the first case, more than normal area
is devoted to wheat mixed with barley or to barley alone,
though some of it may also require irrigation. In the second
case, comparatively more area is devoted to wheat mixed with
gram or barley mixed with gram and the requirements of irri­
gation are thus reduced.

**Mixed-Growing with Wheat**

The practice of growing wheat mixed with gram, barley
rapeseed, etc., is followed to an appreciable extent by the
cultivators in this district as has been noted already.
Usually, the mixture is with one or two of these but, some­
times, they are all mixed together. The more common mixtures
met with are wheat-gram (gaichani) in the humid tracts, and
wheat-barley (gujai) in the drier tracts. These mixed crops
are harvested, threshed and, usually, milled together into
flour for consumption. The annual average of wheat mixed with
gram amounts to 54,476 acres and that of wheat mixed with barley amounts to 38,945 acres. In other words, about 16% of the total wheat harvest is mixed with gram and about 11.4% is mixed with barley. Since these mixtures are grown where wheat alone cannot be, mixed cropping of wheat helps to some extent to fulfil the diverse needs of the small holders and, at the same time, contributes towards a more complete utilization of land.

A favourable season would always encourage the cultivation of wheat as a single crop, while the unfavourable weather conditions increase the area under mixed cropping of wheat depending on the local soil-moisture and weather conditions during the sowing period and during the preceding monsoon period, when the fields were prepared for rabi. So there must be a considerable shift, from year to year, between wheat alone and wheat mixed, but the extension of the means of irrigation has created conditions more favourable for the cultivation of wheat alone. Mixed cropping of wheat is now getting unpopular. The total acreage under wheat mixed is not less now than what it was in the last quarter of the 19th century, but its ratio to the total wheat crop has come down from 26.2% to 20.4%. The comparison is even more significant in relation to the mixtures severally. The wheat mixed with barley has shown a sharp decline from 77,260 acres to 38,945 acres. It amounted, on an average, to 22.9% of the total wheat crop in the years 1878-81 but now it amounts to only 8.5% of that in the years 1953-56.
This is perhaps due to an appreciable improvement in the western tracts having drier and lighter soils and this improvement can be easily correlated with the extension of tube-well irrigation. On the other hand, the wheat mixed with gram amounted, on an average, to 3.3% of the total wheat crop in the years 1878-81, but it amounts to 11.9% of that in the years 1953-58. This shows an appreciable extension of mixed wheat cultivation in the areas of wetter and heavier soils, e.g., Thakurdwara and Moradabad tahsils. The actual increase in this area is from 11,320 acres to 54,476 acres.

**Seed Rate**

Under very good conditions usually, 70 to 75 lbs. of seed per acre is required to produce a uniform and vigorous growth. But, under adverse conditions 90 to 100 lbs. per acre may be required for that*. For mixed cropping the proportion of wheat seed varies according to the liking of the peasant.

* Theoretically, a good crop of wheat has about 60,000 plants to the acre and as such about 60,000 seeds weighing about 6 lbs. should suffice provided each seed germinates and the plant from each seed establishes itself and survives till harvest. Actually, however, quite a large number of seeds and plants die depending upon the soil and weather conditions and the white ant activity. If the soil is heavy and moist, or the moisture content of the field is deficient or if the sowing is unavoidably delayed, it is safer to use a higher seed rate. Sowings done with a seed drill, which ensures uniform distribution, require a lower seed rate than when the sowing is done by hand behind the plough. Well-developed plump seed, from a well-fertilized vigorous crop, is undoubtedly the best seed material to use. Generally speaking, sowings 2½ to 3 inches deep are necessary in rough, dry and light soils, while shallower sowings about 1½ inches are desirable on moist or heavy soils. Generally, the crop is sown by hand behind the plough, usually a woman walking behind the plough dropping the seed in the furrows by her hand. This process gives a very uniform stand.
Crop Rotation with wheat

The more common rotations practised with wheat in this area are:

2. Jowar mixed with arhar-fallow-wheat.
3. Early paddy-peas-jowar mixed with arhar-fallow-wheat.
5. Green manure-wheat-fallow-sugarcane.
7. Early groundnut-wheat mixed with barley.
8. Early maize-wheat.

Where the rainfall is higher, a common rotation is to grow wheat alone in one year, gram, jowar or bajra and a non-cereal crop in the following years. But it will be seen from the above that the greater tendency is to take wheat preferably after a kharif fallow or, sometimes, after kharif green manure. This is due to the lack, so far, of any suitable kharif leguminous crop of sufficiently short duration to precede wheat. Early urd (Phaseolus radiatus) and early mungo (Phaseolus mungo) are being introduced. Both these (particularly Mung T-1) are of about 60 days' duration and thus not only fit in, very well, in the rotation, but also will give
an extra pulse crop (yielding one cutting, the rest of the crop being ploughed in), besides its beneficial effects on the following crop. Guar (Cyamopsis psoralioides) is also a good green manure crop. Around towns, where high intensities of cropping are practised, wheat is rotated with vegetables, potatoes, maize (tender), tuber crops etc. On irrigated lands, wheat is rotated with sugarcane as well.

Weeds in Wheat

Bathua (Chenopodium album) is a very persistent weed of the wheat fields. This is, however, used for human feed as a leafy vegetable and as such, most of it is usually picked away from the fields when the crop is still young. Plasl (Asphodelus tenuifolius), Motha (Cyperus rotundus) and birankhuri (Convolvaria arvensis) are very persistent weeds capable of doing extensive damage to the wheat crop. They should be removed with their underground parts and destroyed by burning before their flowering and fruiting period.

Diseases of Wheat

Among the diseases which affect the wheat crop, rust is the most damaging. The orange and yellow rusts are the first to appear in the season, often both at very nearly the same time. After the crop is about 4 to 6 inches high and has received its first irrigation, weeding and hoeing become necessary in order to avoid unnecessary competition for soil nutrients and soil moisture between the weeds and the young crop. This intercultivation practice also helps in soil aeration. In case this operation is attended to carefully and other conditions are favourable, the wheat crop grows vigorously and is soon dense enough to smother any further growth of weeds.
same period. The black rust is the last to appear and is the most damaging of the three. Other diseases include loose smut, stem smut or bunt and barley cockle or hal worm disease of wheat. White ants (Termites) do damage to the seedling wheat crop, particularly, under dry conditions. Under very dry conditions, when winter rains fail, wheat crop is often attacked by aphids as well. Irrigated crop is usually safe from these pests.

**Distribution of Wheat Cultivation**

Though wheat is grown all over the district, most of wheat alone is obtained in the Kastur Bangar, the Ganga Khadar and lowlands of the trans-Ganganga tract as shown by Fig. 36A*. The relative importance of wheat in various tracts varies owing to the soil, moisture and certain cultural factors. For example, in the year 1953-56, Anglia Kathair has 26.91% of its total cropped area under wheat alone, 11.99% under wheat mixed with gram and 0.82% under wheat mixed with barley. Of the total rabi acreage, wheat alone and mixed amounted to 75.5%. Semli has 33.76% of its total cropped area under wheat alone in this year and this amounted to 100% of the rabi harvest. Khabri Ghandu has 37.43% of its total cropped area under wheat alone and mixed in 1954-55 and this accounts for 85.2% of the total rabi harvest.

* These figures have been prepared by spreading the percentages of the total cropped areas under wheat, etc., in the sample villages over the tracts which they represent. Appendix table XXIV gives the relevant data.
PERCENTAGE OF TOTAL CROPPED AREA IN SAMPLE VILLAGES SPREAD OVER THE TRACTS REPRESENTED BY THEM

FIG. 36
In the Ganga khadar, Matena GLd has 50.76% of its total cropped area under wheat, in the year 1955-56, and this amounted to 88.6% of the total rabi acreage. Matena new has 62.51% of its total cropped area under wheat, in the same year, and that meant 86.1% of the total rabi harvest. Bhagwanpur khadar has 56.01% of its total cropped area under wheat in the year 1954-55, and this amounts for 87.7% of its total rabi harvest. There is no mixture with gram, while mixture with barley is also slight in the whole of this tract.

In the Ramganga khadar the conditions are not similar. Wheat mixed with gram becomes significant while there is a small area under wheat mixed with barley, too. Birpur Baryar had 21.94% of its total cropped area under wheat, alone while wheat mixed with gram amounted to 9.35%, in the year 1955-56. This reflects a higher moisture content of the soil in parts of this area. Ramnawala represents the Thakurdwara uplands where wheat alone becomes much less important than wheat mixed with gram. That there is no wheat mixture with barley owes to the fact that the soil is not dry. Kharif is an important crop there and double-cropping is extensively done. It has only 16.40% of its total cropped area under wheat alone (1955-56), but wheat mixed with gram amounts 27.42%. In Tikhunti, representing the trans-Ramganga lowlands, the four year (1954-58) average of wheat alone is 25.24% of the total cropped area.
Thus, wheat alone predominates in the Ganga khadar and Central Bangar tracts, in general (Fig. 36A), wheat mixed with gram predominates in the Thakurdwara uplands (Fig. 36C) and wheat mixed with barley predominates in the bhurlands (Fig. 36B). In the Ramganga valley, wheat alone and mixed with gram or barley have fair proportions, though the former leads.

The tahsil-wise data does not show these regional differentiations. Hasanpur, for example, is a tahsil which combines two large tracts, namely, the Ganga khadar and the Hasanpur bhur. These tracts have altogether contrasting features in respect of wheat cultivation, but when their data are combined the average of the two applies to none of them. Similarly, in Thakurdwara tahsil the uplands and the lowlands, in Moradabad tahsil, the Ramganga valley and the western upland section, in Amroha tahsil, the sandy ridges and the clayey depressions, and in Sambhal tahsil the western bhurlands and the eastern bangar tract differ mutually in this respect. Only tahsil Bilari is more or less uniform in character in being devoted to the cultivation of wheat alone, mostly.

The Central Bangar is pre-eminently a wheat growing tract where wheat alone is grown as the main crop. If grown as a mixed crop, it is usually mixed with gram. Mixture with barley is rare. This is mainly due to the prevailing dumat soils and the facilities for irrigation. In the Ganga khadar on the other hand, the importance of wheat owes to the fertile
silts and the high moisture content of the soil.

Conversely, the bhurlands grow less of wheat in general and most of the wheat grown there is mixed mostly with barley. Mixture with gram is rare, there. This owes to the aridity of the prevailing light and sandy soils and the dearth of irrigational facilities. Bagarhpur Chhoiya, for example, has only 3.22% of its total cropped area under all wheat alone and mixed in the year 1955-56. In Chaki Khera, wheat alone amounted to only 8.83% of the total cropped area while wheat mixed with barley was 16.31%.

Trend of Wheat Cultivation

During the last one hundred years or so the cultivation of wheat has increased substantially from an average of 337,762 acres (1878-81) to 458,506 acres (1953-58) showing an over all increase by 35.8% in the district. There has been a significant extension of wheat cultivation in Hasanpur, Moradabad and Thakurdwara tahsils, which now have, respectively 57.8%, 51.2% and 47.1% of their rabi in wheat alone. In the beginning of this century, these ratios were about 50.0%, 47.4% and 44.4% respectively. This increase is due to both economic and cultural factors, which have been noted previously. Pressure of population has led to the extension of cultivation in general and this naturally extended the area under wheat, which is the most suitable crop in this area. The prevailing

Further, the progress of the irrigational facilities has greatly enhanced the possibility of the extension of area under wheat. Thus, in the years 1878-81, the average annual acreage under irrigated wheat, both single and mixed crops, amounted to 14,309 acres only whereas, in the years 1953-58, it rose to 135,286 acres.

**BARLEY**

Barley constitutes the second important foodgrain among the rabi crops. On an average, barley alone occupied 43,954 acres and barley mixed with gram etc., 8,246 acres annually during the years 1953-58. The averages in the years 1878-81 were 31,371 and 11,366 acres respectively. This shows an increase in the area under barley alone. Since then, however, the ratio of barley single and mixed with gram etc., to the total rabi harvest is slightly lesser now (8.3%) than formerly (8.9%). This may be taken as a sign of comparative declining popularity of barley where wheat can be grown, though the general extension of cultivation towards the inferior lands has increased its acreage.

* As noted already, there was an average rise of 41.7% in the price of the principal foodgrains between 1861 and 1905, while in the case of wheat the rise was not less than 65%. The price of gur in the absence of sugar factories, then, rose relatively much less. Cheap sugar was imported from abroad and, conversely, wheat was exported to Europe. This in a large measure, accounts for the then reduction in the area under sugarcane and the substitution of other crops, particularly wheat, which increased more rapidly in value, vide Hevill. H.R., (p. cit. p. 46).
Hasanpur leads all other tahsils in the acreage of both barley single and that mixed with gram etc. In respect of barley alone, the order of the tahsils is Hasanpur, Sambhal, Amroha, Bilari, Moradabad and Thakurdwara. In respect of barley mixed, the order of the tahsils is Hasanpur, Thakurdwara, Moradabad, Amroha, Sambhal and Bilari. While the first order emphasises the influence of dry and light soils prevailing in large tracts of the western tahsils, the second order indicates that wherever the soil-moisture content is more, soils are better devoted to barley mixed with gram etc.

The relative importance of barley cultivation in the sample villages may be seen from Fig. 36D. It indicates that there is little cultivation of barley in the central bangar, the Hamganga valley and the trans-Hamganga tract. Barley cultivation becomes more significant where bhur or light loam soil is found as in Latiapur in the north centre of Amroha tahsil. It is also of some significance in the Ganga khadar where deposits of sandy silts are devoted to it. But, most of the barley grown there (Fig. 37B) is mixed with gram (bajhar) since the soil moisture content is also high. The same thing is to be noticed in the Hamganga valley. The unirrigated Hasanpur bhur, however, has the maximum of barley as we find in Bagarhpur Chhoiya which has 46.1% of its total cropped area under barley alone. This shows how the light sandy and dry soils are related to barley. Only 5.2% of the barley single

The relevant data is given in Appendix table XXIV.
and 9.2% of barley mixed with gram in the whole of the district/irrigated in the years 1953-58. Sambhal and Bilari tahsils lead in this respect owing to their facilities for irrigation.

**GRAM**

Gram is the most important of the rabi pulses. On an average, it occupied annually 62,857 acres or about 10% of the total rabi area in the years 1953-58, but only 5.4% was irrigated. Since the last quarter of the nineteenth century there is a considerable increase in the gram acreage, when it averaged about 30,823 acres per annum in the years 1878-81 and out of that only 1.5% was irrigated. Part of the increase in the gram acreage may be due partly to the extension of irrigation and partly to the general extension of cultivation in formerly uncultivated areas.

Gram is a common pulse used in various ways in human diet. The poor use its leaves as a vegetable also. It is also fed to the breeding cattle and working horses. It is grown both as single and mixed with wheat or barley. It is one of the early sown crops in the rabi harvest. It does not require much preparation for its fields and provides an easy double-cropping with kharif crops, particularly in the fields having a high moisture content and a heavy soil. It is, generally, sown broadcast in the rice fields after rice has been harvested. Amroha tahsil with a large number of clayey depressions
usually leads in its cultivation followed by Thakurdwara and Koradawad. Fourth position is occupied by Bilari which has a large gram acreage in the Ari depression and Gangan valley. Sambhal comes next with gram areas in its north eastern and eastern parts. Hasanpur has the least of gram area owing to its extensive bhurlands. A study of Fig. 37D shows that the maximum of gram cultivation is found in the uplands of Thakurdwara where it follows rice in most cases. Figs. 36C and 37D show the distribution of wheat gram and barley-gram mixtures, respectively.

**PEAS**

Peas (pisum sativum) comprise the second important pulse of rabi season. On an average they annually covered 36,435 acres or about 5.8% of the total rabi area in the years 1953-58 and nearly 23.4% of the peas area was irrigated. Since the last quarter of the nineteenth century there is a large increase in the acreage of peas. It was about 1,388 acres per annum in the years 1878-81 and only 4.2% was irrigated. Part of the increase in this area seems to be due to the extension of irrigation and part to the general extension of cultivation.

Peas form a common animal feed and a pulse and green bean used in human diet. It is grown both alone and in mixture...
Mostly with barley and gram. It is one of the late sown crops in the rabi harvest and the area which is found too wet for wheat sowing may be devoted to peas. It does not require much preparation for its fields, so it also provides an easy double cropping with the kharif crops particularly in the fields having a light soil and subject to udla.

Hasanpur, Amroha and Sambhal hold leading positions in order of merit in respect of the cultivation of peas. Moradabad comes next but Thakurdwara and Bilari have very little of it. Sambhal has nearly one-half of the irrigated peas and Amroha nearly one-third, the remaining of the irrigated peas being almost wholly in Hasanpur. Fig. 37C* shows the distribution of peas in the district. Too dry and too wet areas are avoided by peas.

**K A S U R**

Masur or lentil is another pulse of the rabi harvest. On an average, it annually occupied about 4,154 acres or 0.7% of the total rabi area in 1953-58. Only 3% of it was irrigated. In the years 1878-81, its acreage amounted 8,325 acres or 1.7% of the total rabi area, annually. Only 1.2% of it was irrigated. Thus the masur acreage shows a considerable decrease. It may be due to the competition with other crops like gram and wheat. In practice where wheat or gram sowings are delayed, masur is the other alternative crop. It does not require much preparation of the land and is sown late in November and harvested in March. It is a short seasoned crop and serves as a catch crop.

* The relevant data is given in table XXV of the appendix.
Masur pulse is, moreover, not popular among the Hindus and usually sells at cheaper rates. A high moisture content and a fine loamy soil suit it. Nearly three-fourths of it is grown in Moradabad and Thakurdwara tahsils. The remaining four tahsils are, however, significant in having almost the whole of the irrigated masur.

Table XXV shows masur as percentage of the total cropped area in the sample villages. It indicates that outside the wetter north-eastern region its cultivation is mainly practised in Rizam Nagla and Chaki Khera, where the seasonal streams leave much moisture in parts of the villages.

KHARIF PULSES

Arhar is the most important kharif pulse. But it is grown mostly mixed with bajra, jowar and cotton. Arhar single has covered annually 226 acres in 1953-58.

Urd (Phaseolus radiatus), on an average occupied 15,751 acres in the years 1953-58. In the years 1878-81, the average was 35,147 acres per annum. Amroha grows 51.6% of it, Hasanpur 29.1% and Thakurdwara 11.4%.

Koth (Phaseolus aconitifolius) covers 4,255 acres per annum (average for the years 1953-58). Sambhal leads with 68%, Amroha has 19% and Hasanpur 8.4%.

Moong (Phaseolus aureus) covers 2,829 acres per annum. Amroha has 35.2%, Hasanpur 34.1% and Sambhal 25.1% of it.
Other kharif pulses such as lobia (cow pea), etc., occupied 3,089 acres on an average (1953-58). Hasanpur held 51.5%, Amroha 24.2% and Sambhal 16%. Thus the kharif pulses are grown mostly in the dry and light soils of the western tahsils. Their mixture with bajra, jowar, maize, etc., is getting more popular. Urd, however, requires rather heavier and wetter soil and is grown mostly in the Udla tract. Table XXV shows these pulses as percentage of the total cropped areas in the sample villages. It bears out the truth of the above statement.

**R I C E**

The traditional use of rice in the Hindu rituals indicates its intimate association with the life of our people. It comes next to wheat as a food grain in this area.

**Varieties of Rice**

Rice is a semi-aquatic plant which thrives best under conditions of high temperature and humidity. Owing to the great diversity in soil and climatic conditions, season and methods of cultivation, the number of rice varieties is very large. They can, however, be put into two or three broad groups:

(a) The 'wet' or lowland rice,
(b) The 'semi-wet' rice, and
(c) The 'dry' or upland rice.

The 'wet' rice is of long duration of 140 to 170 days.
anci is grown where water stands long and deep throughout the rice season. The 'semi-wet' rice is sown dry but gets enough water from copious rainfall and is grown in areas of heavy rainfall. The 'dry' or upland rice is of shorter duration of 90 to 120 days and is usually rainfed.

There are two seasons for rice in this district:

(a) Early autumn (Bhadai) rice grown in May-June and harvested in September-October, and

(b) Late autumn (Aghan) rice grown in June-July and harvested in November.

Late autumn (Aghan) variety is of less significance, so that we have in this district mostly the 'Bhadai' variety. On an average, the rice crop has occupied 1,43,722 acres during the years 1953-58, but only 3.7% was late autumn rice; the remainder belonged to the early variety.

Factors controlling rice Cultivation

The consideration of water supply appears to be the most important factor for deciding the suitability of an area for growing rice so that, in this district, 40" isohyet seems to delimit the area of maximum rice cultivation. However, rice thrives well in heavy soils such as clays and clayey loams capable of holding water on the land. Although it is known that a transplanted rice crop gives a higher yield than a direct sown crop, yet most of it is sown broadcast in
this district* owing to the lack of irrigational water supply in the rice growing tracts.

In the year 1957-58**, only 10,388 acres or 6.7% rice belonged to the improved varieties and the remaining belonged to ordinary varieties. Only 1.44% rice is irrigated (1.3% early and 3.9% late). Thus most of the rice grown in this area is of ordinary early varieties and is unirrigated depending on rain water so that rice cultivation is limited to the areas where either rainfall is heavier as in the north-east or where soil moisture content is higher as in the depressions, elsewhere.

* Where irrigation facilities are available some transplanted rice is also grown for which seeds are sown in nurseries. The nursery area is frequently ploughed or hoed after the harvest of the previous crop and manured with bulky organic manures like farmyard manure or compost. After the commencement of the monsoon, the field embankments are strengthened to impound rain-water. The land is, then, ploughed in standing water to get a good puddle. Puddling breaks up soil particles to a fine condition and makes the field suitable for transplanting the seedlings. Then, 20 to 25 days old seedlings are transplanted in a well-puddled field according as the variety is early or late. Too close or too wide a spacing seems to affect the yield, adversely. For early varieties a spacing of 4 inches by 4 inches is quite sufficient in fields of average fertility. Planting early is conducive to better crop but to a large extent, the time of planting is determined by the outbreak of the monsoon, on which depends the preparation of fields in most cases.

** Figures for 1957-58 are based on Sadar Janungo's Khasra for the year.
A comparison of the table of actual monthly rainfall in the years 1953-58 (Table III) and the following figures of present rice cultivation provides an interesting study into their correlation:

Table 23

| Year   | Rice early | | Rice late | | |
|--------|------------|-------------------------------|
|        | Irrigated  | Unirrigated | Irrigated | Unirrigated |
| 1953-54| 1,630      | 143,444       | 226       | 5,790       |
| 1954-55| 3,884      | 141,311       | 394       | 4,758       |
| 1955-56| 2,792      | 127,549       | 119       | 5,810       |
| 1956-57| 1,893      | 123,026       | 99        | 3,262       |
| 1957-58| 1,102      | 147,509       | 196       | 5,903       |

The study shows that -

1. Whenever, there is heavy rain in July, rice requires little irrigation but a week monsoon in July enhances the need for irrigation as it happened in 1954-55.

2. Early rice cultivation decreases whenever the hot season is more suitable for the preparation of more fields for wheat (see wheat alone in Appendix table XXIII) as it happened in 1955-56 and 1956-57.

3. Rice cultivation, however, increases towards the climax of a wet cycle, since the conditions for wheat cultivation, then become unfavourable in some marginal land. In such years the cultivation of gram, peas and masur also increases and the need for irrigation is decreased in general.

*Figures based on Sadar Qanungo's Milan Ahasras for the respective years.
PERCENTAGE OF TOTAL CROPPED AREA IN SAMPLE VILLAGES SPREAD OVER THE TRACTS REPRESENTED BY THEM
as it happened in the year 1957-58.

**Distribution of Rice Cultivation**

Fig. 37A makes it sufficiently clear that rice predominates in the north-east. The lower Gangan valley also has sufficient of it as shown by Machharya (Fig. 36). In the west it is grown in khadars or in depressions having high soil-moisture, and a heavy soil. Thakurdwara tahsil has more than 30% of the total rice acreage. Moradabad follows with more than 25% and Amroha holds the third position with nearly 20%. The remaining three tahsils with relatively lesser rainfall or lighter soil have only 25% of the total rice area in all.

**Sowing and Harvesting Seasons**

Rice is sown or planted at the outbreak of monsoons. The right stage for harvesting paddy is just when the ear is nearly ripe and the straw is still slightly green. If it is delayed till the crop is dead ripe, grain is lost due to shedding and the milling quality of the grain is also impaired. Much human labour is required for the harvesting of rice.

**Seed Rate**

A high seed rate of 100 to 120 lbs. per acre is used generally, for broadcast sowing as soon as the early monsoon showers are received, the land being prepared earlier by repeated ploughings which, generally number 6 to 8.

* The relevant data is given in Appendix table XXVI.
Among the diseases which attack the rice crop and reduce its yield, are the 'blast', 'brown-eye', 'foot rot', 'Tem rot' and the 'smuts'. A number of disease resistant varieties have been evolved by the Agricultural Research Departments and they are being popularised, e.g., Ch. 10, T.136, T.43, N.22, T.3, and T.21. Besides, there are a number of insect pests, which cause losses to the crop. Among them are the stem borers, swarming caterpillar, gall fly, stink or bug, rice hispa, paddy grasshoppers, rice caseworm, rice leaf-hopper, rice thrips, etc.

**Double Cropping & Crop Rotation with Rice**

In low marshy areas it is not possible to grow any other crop except paddy year after year and the land is usually left fallow after paddy has been harvested. But, in other areas, after the harvest of paddy, a quick growing pulse like gram, peas or masur is grown in most localities. The practice of sowing quick-growing leguminous crops, in sequence with rice, improves soil fertility. The growing of berseem fodder after rice is also showing good results. The inclusion of a green manure crop or of groundnut in rotation with rice is also seen in some places. In areas, where supply of irrigation water is assured and close to the settlements, potatoes or winter vegetables are grown after the early rice harvest. In well drained fields, sometimes, wheat also follows rice. The double cropping becomes a feature of most of the upland rice areas.
Fig. 39 shows the crop pattern in Tikhunti (tahsil Thakurdwara) and bears out the above points, which are also clear from Fig. 38.

**Trend of Rice Cultivation**

The average of rice area in the years 1878-81 was 146,560 acres per annum, when 1.36% of it was irrigated. This shows a slight decline in the rice area now, though its irrigated part has slightly increased. But the difference is not much and the extension of maize or sugarcane in some of the lands, formerly devoted to rice, may be the cause. What surprises most is the almost static position of irrigated rice, which has not changed though there has been so much extension of irrigational facilities in the district as a whole. This seems to be related to the fact that the tracts which grow rice, e.g., the Ramganga Valley and the trans-Ramganga tract, have benefitted least by the extension of irrigation facilities, which have mostly developed in the areas where wheat has been the predominant produce since times immemorial.

**Bajra**

Bajra (*Pennisetum typhoides* or *Holcus spicatus* or *Penicillaria spicata*) is a tall, erect grass, growing from three to eight feet. The stems are solid and single, but
often primary, secondary and even tertiary branches arise. The plant tillers freely and puts on a profuse leafy growth. Thus, it yields grain, fodder and thatching material, all from the same plant.

Factors influencing the Cultivation of Bajra

The crop is very accommodating in nature and can grow in regions having an annual rainfall varying from about 10 to 40 inches. Heavy rains at the time of seed germination, flowering and harvesting are harmful to it. It is predominantly a crop suited to light soil and to the regions of low rainfall though on good, deep soils, the growth of the crop is vigorous. Its moisture requirements are much lesser than those of rice, wheat, gram, jowar, etc., and it is mostly grown as a rainfed kharif crop.

Mixed cropping with bajra

While its grain is richer in nutritive value, its fodder is inferior to that of jowar and is usually supplemented with the fodder of pulses which are commonly grown mixed with it. The commonly mixed crops are pigeon pea, horse gram, green gram, black gram, etc. Stalks of bajra fodder are often used for thatching, compost-making and fuel also.

Distribution of Bajra Cultivation

In the tahsils of Sambhal and Hilari, where agriculture
PERCENTAGE OF TOTAL CROPPED AREA IN SAMPLE VILLAGES SPREAD OVER THE TRACTS REPRESENTED BY THEM

FIG. 40
is better developed, bajra-arhar mixture predominates* over bajra alone (Fig. 35). Nearly 57.1% of the mixture, in the district, is found in Sambhal, 26.6% in Bilari, 7.6% in Hasanpur, 5.7% in Amroha and the rest is shared by Moradabad and Thakurdwara, the last having the minimum (0.13%).

In Hasanpur and Amroha, bajra alone or mixed with guar, moong, groundnut, etc., is more popular, Hasanpur having nearly 35%, Amroha 21.8%, Sambhal 19.1%, Bilari 11.5%, Moradabad 8.3% and Thakurdwara nearly 4% of it. Thus the distribution of bajra alone reflects the prevalence of dryness in bhur soil as is the case with Bagarhpur Chhaviya (Fig. 34); that of bajra mixed with arhar reflects an improvement in the cultural practice that has been adopted on the lighter soils of the bangar uplands. Fig. 40A shows the distribution of bajra in the district. Outside the bhurlands bajra alone is associated with only such places where soil is inferior or sandy as we find in Latifpur in the Ban-Gangan doab, in Pahladpur on the Sot Hadi and in Bhagwanpur in the Ganga Khadar. Bajra mixed with arhar, on the other hand, is associated with unirrigated light dumat areas in the Central Bangar tract as is shown by Fig. 40B.

Trends of Bajra Cultivation

During 1953-56, the average of total bajra alone and mixed has been 170,898 acres per annum out of which only 132

* Appendix table XXVI shows bajra alone and mixed with arhar as percentage of the total cropped area in the sample villages. Fig. 40A to D has also been prepared similarly as Figs. 36 and 37.
acres were irrigated. bajra mixed with pulse arhar (Cajanus flavus), a very popular mixture in this area, amounted to 91,568 acres or 53.6% of the total crop. The annual average of the total bajra crop in the years 1876-81 was 124,605 acres when the acreage of bajra mixed with arhar was 30,228 only. Irrigated bajra amounted to only 66 acres. This means that the area of bajra alone has decreased somewhat now, but the area of bajra mixed with arhar has increased to a very great extent. The popularity of bajra-arhar mixture seems to be due to the following reasons:

1. On the light and dry soils, this mixture makes it possible to get a grain, fodder and pulse from the same fields.

2. Since arhar stands longer in the fields and is harvested along with rabi crops, it provides a chance of the distribution of labour and income over a longer period, in the areas where double-cropping is not possible.

3. The bajra grain is quite exhausting for the soil but the arhar pulse replenishes its fertility loss.

4. Besides allowing a more complete utilization of land this mixed-cropping is a safeguard against soil erosion, for the longer stand of arhar saves the dry and light soil from the attacks of wind and rain both.

5. There is always a lesser chance of a total crop
failure and of loss of labour in the case of mixed-cropping than it would be if the bajra is grown alone.

**Seed Rate and Cultural Practices**

Land is generally, ploughed twice and planked after each ploughing. On sandy tracts, the land is ploughed only once. Seed is sown in July. Sometimes, it is sown through a tube behind the plough and with a seed-rate of four to eight pounds per acre. But, mostly it is sown broadcast. Where the crop is meant primarily for fodder it is sown thick with a higher seed rate and cut at the milk stage when about 70 days old. The crop ripens by the end of September or by middle of October and is harvested in October. Bajra crop has to be watched against birds during the grain ripening period. Generally, watching is done by women and children from high wooden platforms erected at suitable places in the fields.

**Diseases of Bajra**

A number of diseases, e.g., the green ear disease, rust, smut, the ergot disease, etc., are known to occur on the bajra crop. There are also a number of pests of bajra, e.g., the blister beetle, the wingless grasshopper, etc.
JOWAR

Jowar (Holcus sorghum) millet is also grown both as single and mixed with arhar. On an average the total of jowar alone and mixed with arhar amounts to 47,425 acres per annum during the years 1953-58. Out of that only 229 acres are irrigated. Jowar mixed with arhar amounts to 60.5% of the total jowar. During the years 1878-81, the total of jowar alone and jowar mixed with arhar averaged 48,796 acres per annum, out of which only 145 acres were irrigated. But, jowar mixed with arhar amounted to about 25% of the total crop. Thus the story of bajra is repeated, here. The popularity of jowar mixed with arhar is more recent and it indicates the progress of better cultural practices.

Jowar is also mixed with legumes, like guar, moong, moth, etc. This improves the fodder quality and also provides pulses for peasants' dish and for sale in the market. In the non-irrigated areas these mixtures are followed to a great extent, and sometimes, even bajra is mixed with jowar.

Factors influencing the cultivation of jowar

Jowar requires a richer soil and a higher soil moisture than bajra. It is best suited on the loamy soils. But, too much of precipitation is harmful for its grain. Hence, we find very little of this crop either in Hasanpur or in Thakurdwara.
Distribution of Jowar

The greater cultivation of jowar is found in Moradabad tahsil, where 37.3% of jowar mixed with arhar and 27.5% of jowar alone is grown. But, it is mostly grown in the Ramganga valley. Tahsil Bilar comes next with 29.6% of jowar mixed with arhar and 27.9% of jowar alone. There the Ari jhil area and the Ari valley has the greatest share of it. Sambhal occupies the third position with about 13% of jowar-arhar and 8.8% of jowar alone. There, the Udla tract has the greater part of it. Amroha holds the fourth position with about 11.5% of jowar-arhar and 22.2% of jowar alone. There also the Udla and Banmar tract holds the leading position in it.

Jowar alone is relatively more popular in the western parts of the district, where the soils are more sandy and dry. But, jowar-arhar mixture prevails in the parts, where, generally, the soils are better and have a greater moisture content. A reference to village maps (Figs. 33, 35 and 36) makes this fact quite clear.

Fodder Jowar

Jowar is more popular as a fodder crop than as a grain crop in this area. The great popularity of jowar fodder owes to its qualities. It is fed to the cattle both as green

* Table XXVI in the appendix shows the relative position of jowar in the sample villages.
and dry fodder. Throughout the kharif season, i.e., from June to October, it is used as a green fodder. Its outturn as compared with the other fodder crops grown in this season is the greatest. Moreover, it leaves the soil suitable for rabi cultivation. It does not require many ploughings. Only two or three ploughings are sufficient and, then, after the first heavy showers, the seed is either broadcast or drilled and is followed by a 'Katala'. But, irrigated crop is sown in April or May. For fodder a very high seed rate, 20 to 24 seers per acre is used to get thin and good quality plants. The fodder is ready for feeding, after two or three months of sowing. After meeting the green fodder requirements, the crop is left for ripening the grain, which matures early in the month of October. Then the farmer gets grains as well as dry fodder.

The annual average of jowar fodder in the years 1953-58 amounted to 68,152 acres, which was about 86.5% of the total of fodder crops raised in the kharif season. In the years 1878-81, the average was only 6,087 acres. This shows a substantial increase of jowar fodder and indicates its recent popularity. It is of interest to note here that even other kharif fodders amounted to only 109 acres, per annum, then. The small extent of the forage crops in the last century may be due to the fact that then there used to
be more spacious natural grasslands or banjar areas where sufficient fodder used to be available for feeding the animals.

Amroha tahsil leads in respect of jowar fodder having 22.5% of its total acreage in the district, while each of the other tahsils has about 14 to 16% only.

**Other Fodder Crops**

Bajra, maize, sawan, guar, groundnuts, sugarcane, etc., almost all the kharif crops, excepting rice, yield some green fodder for the animals. Dry stalks of jowar, bajra, paddy, etc., continue to be used for fodder in the winter season, when the sugarcane leaves provide the main green fodder, and a little short grass also is available in the wastes, fallows and khadars. Some green fodder crops like oats and herseem are grown in the rabi season but they amount to very little, seldom more than 7,500 acres in the whole district. Moradabad tahsil has the maximum followed by Thakurdwara. These two tahsils devote much of their land to rice in the kharif and less land to fodder, saving little of that for the winter season. Naturally, therefore, they must devote some land to rabi fodder to feed their animals. Besides, their rice fields, with their high moisture content are suitable for raising oats and peas in the rabi.

*Table XXVII shows the distribution of fodder jowar in the sample villages. It also shows the relative importance of other fodders there and thus it compares the same.*
Thus the fodder crops are more extensive in the kharif when some extra fodder is also available from the grass growing in the fallows and wastelands after the rains. This indicates the insufficiency of grasslands as well as the greater need of green feed for the animals during the hot period of the year.

MAIZE

Maize (Zea mays L.) has occupied 33,371 acres annually during the years 1953-58. Out of that nearly 6% was irrigated. In the years 1878-81, the average annual maize area was 15,630 acres only and out of that nearly 9 percent was irrigated. Evidently, there has been a substantial increase in the maize area since then and it indicates the growing popularity of this crop.

Uses of Maize

Maize provides food and fodder both. Its food is not rich enough to maintain proper health. So people cannot depend upon it alone. It can provide only a change. When green its stalks and leaves are relished by the cattle. Green maize is very nutritious and can be easily grown and obtained for feeding in a very short time, within two months, as the crop is a very quick growing one, and the average yield is about 200 maunds of green fodder per acre.
Varieties of Maize

Though maize breeding has been carried on by the Agriculture Department of U.P. since 1932-33, and a number of improved varieties have been developed and circulated, yet the local varieties yielding small cobs are, usually, more popular owing to the qualities noted below:

(a) They are so adapted to their localities that they give a fair yield of grain even when the organic matter in the soil is poor and the rainfall is deficient or erratic.

(b) Their flour is sweeter and contains more gluten, making it more suitable for bread making.

(c) They ripen in 65 to 75 days and can be followed by early potatoes in rotation, the potatoes being sown in the later half of September. The late varieties do not fit with the double cropping scheme of the farmer, hence, the importance of early varieties.

Growing Season

Maize is sown, as a rule, when the rains start but in localities where the green cobs are likely to command a sale as near large towns like Moradabad, sowing often begins in May, with the help of irrigation. If the cobs are to be sold as green, they are pulled and the stalks are used as cattle feed. Otherwise, the crop is not harvested till the leafy covers surrounding the cobs are dry and shrivelled, i.e., October.
Irrigation of Maize

If the crop has been sown early with irrigation, it requires regular waterings after every 8 to 10 days from the date of sowing till the regular break of the monsoon. Later on, whenever the rains are irregular and there are long breaks, the crop will have to be irrigated.

Seed Rate and Intercultivation Practices

The seed rate varies from 16 to 20 lbs. in the case of small grained varieties and 26 to 32 lbs. in the case of larger grained varieties. The seeds are sown either broadcast or behind the plough. Broadcasting the seed, however, does not ensure a regular spacing of plants, which is very important in increasing the yield.

Deep ploughing up to a depth of about 10 inches is very beneficial to the crop. After the seedlings are about 6 inches high they should be thinned so as to keep one healthy plant at a distance of one foot. Weeding and hoeing are necessary to keep the soil well pulverised. Earthing up the plants when they are 2 to 4 feet high according as the variety is short or tall, is necessary to facilitate the anchorage of the lower whorls of adventitious roots above the soil, which then begin to function as absorbing roots also. This additional anchorage of the plants greatly reduces the possibility of lodging of the crop in the stormy weather. Maize is
free from any serious disease, though some rust and smuts are liable to do some harm. Similarly, a few insects like the steam borer and solai do some damage to the crop but that is not much.

Double and Mixed Cropping with Maize

Even if sown when the rains commence, the ordinary varieties of maize are ready for cutting in early September. Therefore, they leave ample time for the preparation of the same fields for the rabi sowings. Hence, maize suits for double-cropping and is almost invariably followed by wheat, barley, potatoes or gram. As a rule, it is grown as a single crop, since few other crops would keep pace with it in maturing. Occasionally, however, cucumbers, lobia (cow pea) or moong may be mixed.

Distribution of Maize

A good, well-drained and open soil, rich in humus, is necessary in order to get a good yield of maize. But, since maize crop needs protection from birds, animals and human tresspassers, it is almost invariably grown close to the settlements as may be seen from Figs. 38, 39 and 35. There the soil is also enriched by the night-soil and farmyard manures.

Owing to the adaptability of the plant to the different climatic and soil conditions, it is grown in all parts
of the district. But, the greater area of it is found in Hasanpur (31.8%) and Sambhal (29.8%). Thakurdwara and Moradabad come next with 14.2% and 10.8% respectively. The remainder is shared almost equally by Bilar and Amroha tahsils. Table XXVI shows maize as percentage of the total cropped area in the sample villages. A reference to it shows that maize cultivation is localised in the suburban areas mostly. But, most of the maize grown in the vicinity of the towns is meant for selling green to the urban market. It forms a part of the multiple cropping followed by the baghbani cultivators in such situations. Elsewhere it is found mostly in the open khadars.

Minor Food Grains

Besides wheat and barley in the rabi and rice, bajra, jowar and maize in the kharif, there are a few minor food-grains of local value. On the average the total area of all of them in the kharif has been 7,729 acres and that in the rabi 25 acres only in the years 1953-56. The most important of them is 'sawan', a small millet which has averaged 7,246 acres in these years while kodon occupied 300 acres and mandua 148 acres. Their acreage has been declining gradually. In the beginning of this century, sawan used to cover more than 15000 acres, kodon more than 16000 acres and mandua nearly 200 acres per annum*.

SUGARCANE

Sugarcane holds 17.83% of the kharif area in this district. It comes next to foodgrains and pulses. But, it is the most important cash crop grown here. It has shown a considerable increase during this century and every year its area is increasing. During the years 1878-81, it averaged only 35,652 acres. Out of that 24,562 acres or 68.9% sugarcane was irrigated. Now its average is 121,061 acres. Out of that as much as 78,071 acres or 64.5% crop is irrigated. Evidently, there is an increase of both the irrigated and unirrigated sugarcane indicating great improvement in the cultural conditions in the district. The large increase in the sugarcane cultivation is in response to the enhanced demand for sugar owing partly to the increase in the local population. But mainly, it owes to the demand of the sugar mills established at Amroha and Baja-ka-Sahaspur in this district and at Seohara (Bijnor), Kashipur (Kainital) and Rampur in the adjoining districts. These mills draw upon the sugarcane grown in this district and manufacture refined crystal sugar for sale far and wide. Of course, it has been possible through the development of transport and irrigational facilities in this area.

Varieties of Sugarcane

At the beginning of this century, the most common variety of cane grown in this district was the hardy 'chin',
which thrives even under the most adverse conditions. The rich 'agraul', 'dhaul' and 'bori' canes were also grown, but on a lesser scale. Now, these varieties have yielded place to improved varieties such as Co.421, Co.453, etc., which yield more sugar for the sugar mills. These are mostly irrigated in the uplands but being grown in the khadars and depressions irrigation is not necessary for them. On an average (years 1953-58), the improved varieties hold more than 97% of the total sugarcane area in the district. The indigenous varieties are no longer grown in Bilari, Hasanpur and Thakurdwara tahsils.

Factors influencing the cultivation of Sugarcane

Sugarcane grows well on land of good tilth; the best crops being obtained on heavy loams. Light showers and irrigation in the period of germination, followed by a dry hot season up to June, sufficient rainfall in the period of growth, i.e., July and August, and a cool but frostless and bright winter season comprise the favourable weather conditions for sugarcane. Irrigation under bright skies improves its yields and quality. But yields depend more on the application of manures and fertilizers to this exhaustive crop.

Sugarcane occupies land longer than any other crop. It is planted in January, February, or March of the previous year and harvested up to May or June of the next year. The land to be planted with sugarcane needs much preparation and
is kept fallow throughout the kharif and rabi of the previous year. It means that one crop of sugarcane uses land for two kharif seasons and two rabi seasons. A little ratoon (‘pedi’) cane harvest is also obtained in many places. Thus the sugarcane crop has a distinct pattern of land use. The small subsistence farmers cannot devote much land to it. Larger land owners, who can afford to spend on fertilizers and irrigation and to devote their land to this long term cash crop, therefore, grow most of the better yielding sugarcane, cultivated in the Central uplands (Fig. 41). In the khadars and depressions, however, the conditions are different. The high moisture content of the soils may not be suitable for other crops, while the cane cultivation in such areas does not require much care after it has been planted. The yield may be less and the quality inferior but the labour involved is much less, too. Hence, even smaller landowners, in many cases non-residents, grow sugarcane along the sides of the streams.

Distribution of Sugarcane Cultivation

Figs. 40C & D show the distribution of sugarcane in the district. Appendix table XXVIII shows sugarcane acreage as percentage of the total cropped area in the sample villages. The relative importance of sugarcane in various situations is much dependent upon the accessibility of an area from the sugar mills. Thus sample villages bahadurpur, Fahladpur and Khabri Gandu supply cane to the sugar mills at Raja-kaśahaspur.
(Bilari), but bahadurpur adjoins the mill area and so has the maximum of irrigated cane. Sugarcane occupies a very important position in such situations and excepting it and wheat all other crops become insignificant (Fig. 42). The Amroha sugar mills are supplied by Chaki Khera and khidmatpur, which, too, have much irrigated sugarcane.

The table below shows the cultivation of sugarcane, tahsilwise, in the year 1957-58:

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Total sugarcane</th>
<th>Irrigated area</th>
<th>Unirrigated area</th>
<th>All sugarcane</th>
<th>% of Dist</th>
<th>% of the Dist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>acres</td>
<td>%</td>
<td>Acres</td>
<td>%</td>
<td>acres</td>
<td>total</td>
</tr>
<tr>
<td>Thakurdwara</td>
<td>418</td>
<td>4.1</td>
<td>9,694</td>
<td>95.9</td>
<td>10,112</td>
<td>7.5</td>
</tr>
<tr>
<td>Hasanpur</td>
<td>13,267</td>
<td>42.0</td>
<td>18,292</td>
<td>58.0</td>
<td>31,559</td>
<td>23.3</td>
</tr>
<tr>
<td>Amroha</td>
<td>24,738</td>
<td>76.1</td>
<td>7,787</td>
<td>23.9</td>
<td>32,525</td>
<td>24.0</td>
</tr>
<tr>
<td>Sambhal</td>
<td>21,088</td>
<td>82.2</td>
<td>4,565</td>
<td>17.8</td>
<td>25,653</td>
<td>19.0</td>
</tr>
<tr>
<td>Moradabad</td>
<td>3,934</td>
<td>23.0</td>
<td>10,119</td>
<td>77.0</td>
<td>13,153</td>
<td>9.7</td>
</tr>
<tr>
<td>Bilari</td>
<td>19,570</td>
<td>87.3</td>
<td>2,532</td>
<td>12.7</td>
<td>22,402</td>
<td>16.6</td>
</tr>
<tr>
<td>Total Dist</td>
<td>82,115</td>
<td>62.7</td>
<td>53,289</td>
<td>37.3</td>
<td>136,404</td>
<td>100.0</td>
</tr>
</tbody>
</table>

In the district, as a whole, 60.7% cane is irrigated, while only 39.3% is unirrigated as shown by the above figures. Most of the sugarcane is grown in the western parts where the four tahsils - Hasanpur, Amroha, Sambhal and Bilari - grow 82.8% of the total sugarcane in the district. Of the eastern tahsils Moradabad grows 9.7% and Thakurdwara 7.5% of the sugarcane in the district. Actually Amroha and Hasanpur lead other tahsils in this respect. But, in Amroha, the larger part of the crop (76.1%) is irrigated, while in

* Figures based on Sadar Qanungo's Milan ahsara for the year.
Hasanpur it is mostly (58%) unirrigated. This difference owes to the fact that in Amroha most of the cane is cultivated in the canal and tubewell irrigated areas. But, in Hasanpur, there is the vast Ganga khadar tract where no irrigation is required for cane cultivation. Other tahsils of the uplands, viz., Lilari (87.3%) and Sambhal (82.2%), too, have most of their cane as irrigated like Amroha. But the Sot valley, as represented by village Fahladpur, contains a good khadar tract, which is devoted to unirrigated sugarcane (Fig. 43). In the north-east, Thakurdwara tahsil has only 4.1% of its sugarcane as irrigated while Moradabad tahsil has 23% of its sugarcane in that category.

Evidently, as we go east, generally, the sugarcane cultivation becomes of lesser importance. That it is least important in Thakurdwara is significant enough, since that tahsil has no sugar mill, no irrigation facilities and, until 1956, had poor means of communication and transport. That most of sugarcane is grown under irrigation and on the Central uplands shows, on the other hand, that this crop requires a regular water supply, a fertile loamy soil, proximity to the sugar mills, and well-developed easy and cheap means of transport.

In the year 1957-58, as much as 67.9% sugarcane is new sown, 29.8% is ratoon crop or pedi of one year, whereas only 2.3% is pedi of more than one year. Thus long standing pedi is not popular in this district, since the yield and quality continues to degenerate as the pedi grows older.
Oilseeds are grown both in the kharif and rabi seasons, but the most important of all oilseeds is the groundnut, which has been introduced into the district, recently. Groundnuts made their appearance in the beginning of the second World War. Their average of 1946-51 was 21,402 acres. The present average area of groundnuts is 34,693 acres. While the area under groundnut is increasing rapidly year after year, that under other oilseeds is decreasing gradually. Only linseed shows a slight recovery. The following table gives the area under different oilseeds in the last three years and illustrates these facts:

Table 25

Cultivation of Oilseeds in 1955-58 (acres)*

<table>
<thead>
<tr>
<th>Oilseed</th>
<th>1955-56</th>
<th>1956-57</th>
<th>1957-58</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lahi</td>
<td>469</td>
<td>433</td>
<td>106</td>
</tr>
<tr>
<td>Mustard</td>
<td>44</td>
<td>58</td>
<td>26</td>
</tr>
<tr>
<td>Linseed</td>
<td>199</td>
<td>329</td>
<td>487</td>
</tr>
<tr>
<td>Tara</td>
<td>417</td>
<td>648</td>
<td>278</td>
</tr>
<tr>
<td>Other rabi oilseeds</td>
<td>40</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Til</td>
<td>15</td>
<td>24</td>
<td>17</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>18,351</td>
<td>33,535</td>
<td>52,194</td>
</tr>
<tr>
<td>Other kharif oilseeds</td>
<td>7</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>19,542</td>
<td>35,062</td>
<td>53,129</td>
</tr>
</tbody>
</table>

The annual average of the total area of rabi oilseeds during the years 1953-58, has been 990 acres, whereas their average was 6,038 acres per annum during the years

* Based on Sadar Qanungo's Milan Khasras for the years.
1901-1906*. This indicates a very sharp decrease in their acreage since then. These oilseeds include lahi (rapeseed), mustard, linseed, tara, etc., all of which are small ones. Examination of their individual areas shows that all of them have suffered a gradual decline. Rapeseed averaged annually 3,219 acres in the years 1901-06. But now both rapeseed and mustard combined average 378 acres per annum (average of 1955-58). Linseed area also has dropped from 2,366 acres to 342 acres in the same period.

**Distribution of Oilseeds**

Lahi, linseed and tara are grown mostly in the wetter north-east. Thakurdwara and Moradabad tahsils together have 50% of lahi. Thakurdwara alone has 80% of linseed and Moradabad has 18.5% of it. Amroha, has 52% of tara while Moradabad has about 20% and Thakurdwara 22% of it. Amroha and Sambhal each has about 42% mustard. But til and groundnut predominate in Hasanpur which has about 71% of the former and 66% of the latter. About 20% of groundnut is found in Amroha and 14% in Sambhal. Thus the areas of the rabi and kharif oilseeds are distinct. Groundnut is grown on poor oilseeds as and light soils. Appendix Table XXVIII shows the percentage of the total cropped area in the sample villages and makes it clear that the maximum of kharif oilseeds, mainly groundnuts, are grown in the Udla and Panmar tract represented by Mizam.

The growing popularity and the extension of the cultivation of groundnuts is due to its suitability for cultivation on the dry and sandy soils of the bhurlands, which are enriched by this nitrogenous leguminous crop. Generally it is grown mixed with bajra, jowar, arhar, etc., and is fed green to the livestock. Its seeds are relished both raw and roasted by the people during the winter season and are also used in mixing with many a sweet dish. Thus it has a variety of uses.

**Fibre Crops**

Fibre crops are of little general importance in this district. On an average the total area under them has been 7,726 acres during the years 1953-58.

**Cotton**

Cotton desi has the maximum share. This is a short staple cotton mostly of indigenous varieties. It is grown both as a single crop or mixed with arhar. The average area under cotton desi alone has been 1,476 acres and that under cotton desi mixed with arhar 4,304 acres. Long staple American cotton alone has averaged 412 acres and American cotton
mixed with arhar has held 190 acres. Cotton holds about 82.6% of the total area under fibre crops. The rest is shared by fibre hemp, jute, etc.

**Distribution of Cotton**

Tahsil Thakurdwara leads in the cultivation of cotton and contains 38.7% of the total cotton area in this district. Most of it is desi cotton mixed with arhar. Sambhal has 17.9%, Amroha 15.9%, Hasanpur 12.3%, Nilari 7.1% and Moradabad 6.8%. Cotton is predominantly an unirrigated crop in this district. Only 2.2% of it is irrigated. Irrigated cotton is found mostly in Hasanpur and Sambhal; the former has 46.4% of the total irrigated cotton in the district, the latter 31.7%. Amroha holds the third position with 12.8%.

**Trend of Cotton Cultivation**

Cotton was much more popular, formerly, when at the beginning of the present century, cotton single and mixed with arhar averaged 43,391 acres per annum*. All parts of the district had some area under cotton, which supplied local raw material for clothing. But, the Katehr tract was the foremost owing in the part to the development of the ginning and pressing industry at Chandausi. But, later on, competition from Panjab cotton gave it a great set-back while enhanced prices of sugarcane and wheat made them more popular, here.

The decreasing area under cotton and its replacement by other crops may be noted with reference to the old and new maps of the sample villages (Figs. 35 & 44).

**Hemp**

Hemp is the next fibre in order of acreage. The annual average for the total district is 936 acres in the years 1953-58. Nearly 80.5% of it is grown in Bilari, while Sambhal has 10.7% and Hasanpur 5.8% of it. A little hemp is also grown for green manure. It has averaged 888 acres per annum. It is found mostly in tahsils Bilari and Amroha.

**Jute**

Jute amounts to only 206 acres per annum on an average and almost the whole of it is grown in Bilari tahsil and mostly in the lower Gangan valley.

**Sann**

Sann is grown on a small scale in this district. The total area in the year 1957-58 was 187 acres. 65.3% of it is grown in Sambhal and 25.7% in Hasanpur.

Table XXVIII shows the fibre crops as percentage of the total cropped area in the sample villages and indicates their relative importance in various parts of the district.
Market gardening is a limited and specialized occupation found only in the suburbs of the large settlements, e.g., at hauz bedesra Fig. 45. It is the industry of small farmers, mostly baghbans, who take advantage of the demand for such articles from the townsfolk and carry on an intensive type of cultivation, raising two or more harvests a year from the same fields in the 'kachhiana' lands of the suburban areas. Having small holdings, they try to produce sufficient for earning their livelihood by putting in more labour. They are busy with their hoes at all seasons. Hence, we have the market garden produce in all three harvests, kharif, rabi and zaid.

The Market-garden Produce

The market-garden produce consists of the cultivation of potatoes, sweet potatoes, a large variety of vegetables, some spices and condiments. An exception is found in the cultivation of sweet melon, water melons and some vegetables in the khadar tracts of the Ramganga and Ganga rivers.

Besides the potatoes and sweet potatoes, which, owing to their preserving qualities, can command wider markets and so occupy larger areas, the market garden vegetables consist chiefly of radish, turnips, 'arwi' or 'ghuiyan', yams, endives, anise, parsley, fenugreek, coriander, senna,
pumpkins, gourds, cucumbers, egg-plants, cabbages, cauliflowers, spinach, beans and fennel. The condiments include garlic and onions, and the spices comprise the chillies, which are grown mostly in Hasanpur and Sambhal.

The annual average of this produce is given in the following table:

<table>
<thead>
<tr>
<th>Produce</th>
<th>Kharif</th>
<th>Nabi</th>
<th>Zaid</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potatoes</td>
<td>-</td>
<td>4,928</td>
<td>-</td>
<td>4,928</td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td>818</td>
<td>-</td>
<td>-</td>
<td>818</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1,981</td>
<td>1,134</td>
<td>1,034</td>
<td>4,149</td>
</tr>
<tr>
<td>Chillies</td>
<td>708</td>
<td>-</td>
<td>-</td>
<td>708</td>
</tr>
<tr>
<td>Condiments</td>
<td>36</td>
<td>245**</td>
<td>453</td>
<td>736</td>
</tr>
<tr>
<td>Melons</td>
<td>-</td>
<td>-</td>
<td>1,693</td>
<td>1,693</td>
</tr>
<tr>
<td>Tobacco</td>
<td>-</td>
<td>54**</td>
<td>1,415</td>
<td>1,469</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,545</td>
<td>6,361</td>
<td>4,595</td>
<td>14,501</td>
</tr>
</tbody>
</table>

Factors influencing the Distribution of Market Garden Produce

The water melons are easy to grow in the khadars of the Ramganga and Ganga rivers, where there is always a thin layer of fine silt underneath or above a layer of sand, both left by the previous floods, when the two layers are mixed together by the plough no more fertilization nor irrigation is required since the sub-soil is highly moist. Very large sized water melons, sometimes weighing a maund or so each, grow in these khadars and they are exported to other

* Average figures based on Sadar Qamungo's Milan Khasras.
** Average for the years, 1955-58.
parts of country. Some vegetables are also grown in such areas. But, they all need protection from wild animals and thieves so that the areas devoted to them are usually near the basti from where they can be looked after.

As regards vegetables, Sambhal and Moradabad each holds nearly 26%, followed by Bilari which holds 22% of their area in the kharif. In the rabi, Sambhal leads with nearly 34%, followed by Amroha 24%, Hasanpur 16% and Moradabad 15.4%. These positions owe more to the potatoes than to other vegetables which demand a near-at-hand market. Moradabad thus, holds nearly 60% of onions, 30% of turnips and carrots and 50% of other rabi vegetables grown in the district, whereas Sambhal has only 15%, Amroha 16% and Hasanpur 11.5% of such vegetables. This is due to the incomparable influence of the large population of the city of Moradabad in creating a demand for green vegetables in its neighbourhood. The population of Moradabad city and its Railway Colony is not only large but is also more educated as compared to the people of Sambhal and Amroha. The other three tahsils have minor towns and town areas which cannot exert that much of influence on the crop pattern of their neighbourhoods. Actually, Moradabad city draws its supplies of vegetables, potatoes and other market garden produce from a much wider area than mere local and even parts of Hasanpur, Sambhal, Bilari, Amroha and Thakurdwara tahsils contribute towards the supply of the more preservable items.
The cultivation of these crops is, however, everywhere localised near the bastis owing to the need of protection from thieves and animals for these crops, which need a lot of labour and manuring, etc. A reference to the village maps (cf. Figs. 33, 35, 36, 39 and 43) will be useful in this regard. Areas, away from basti, have little of such crops, indeed.

Tobacco is almost wholly grown as a zaid crop, and mostly in suburban Sambhal and Hasanpur, the other areas having but a small share in its cultivation. Suburban Sambhal alone holds nearly 80% of all tobacco cultivation in the district. This localization of tobacco seems to owe to the hereditary skill, which the baghbans of these places have acquired from their ancestors, to historical influences, which determined the introduction of this crop along the Delhi-Hasanpur-Sambhal road, during the Muslim period, when Sambhal was a provincial headquarter and also to the greater local demand from the Muslim population and the traditional tobacco trade of these localities. No special soil or moisture conditions can be attributed to the localization of tobacco cultivation here. Two-thirds of the tobacco grown is of improved Calcutti variety and only one-third is of desi variety.

Appendix table XXIX gives the market garden produce and table XXVIII shows tobacco, chillies and condiments in
the sample villages as percentage of their total cropped areas. They indicate the relative importance of these products in various parts of the district.

A special feature of this type of cultivation is that, on the whole, nearly 75% of all crops raised are irrigated. In the case of rabi produce, the irrigated portion is 94%, in that of the zaid harvest it is 83%. In that of kharif, it is 36%. The maximum irrigation in the kharif season is required in the case of chillies, 55% of which are irrigated. Tobacco is almost wholly irrigated, while in the case of condiments very little area remains unirrigated in all the seasons. Irrigation in the market gardens, is generally provided by kacha wells and ponds. Drains which carry foul water out of the towns also supply a part of it.

Trend of Market-gardening

Market gardening is a relatively new feature and is progressing along with the urbanisation*. Thus, potatoes which averaged only 552 acres, during the years 1878-81, now hold nearly 40% of the market garden acreage, and amount to about 5,000 acres in the rabi harvest. Zaid vegetables, which now hold more than 1,000 acres per annum hold only 155 acres, formerly. Details of other market garden produce being not available for the older period no comparison is possible at greater length. Melons, however, have held their position.

* Fig. 46 shows the old and new crop patterns at Daulat Bagh Mustekham in the suburbs of Ahmedabad and makes this fact quite clear. Whereas in 1871-72, much of the cultivation was devoted to wheat, cotton, rice, etc., now potatoes, vegetables & maize predominate overwhelmingly.
The orchards and groves comprise a separate main type of land use by themselves. But they occupy a very minor place in the land use of this district. They are, moreover, decreasing day by day. At the beginning of this century it amounted to 12,669 acres*. In the year 1953-54, all groves and orchards in this district occupied 13,892** acres or 1.05% of the total area of the district. Since then it has further decreased to 12,962 acres in the year 1958-59. This shows a considerable decrease of this type of land use in this district. The decrease owes to the extension of cultivation and settlement, in the site of former orchards and groves, which had, probably, proved to be unremunerative. The actual fruit orchards amount to less than ten thousand acres. A considerable extent of grove land, being partly cultivated is, however, included in the cultivated area and, in the year 1958-59, such land amounted to 10,632 acres*.

When the orchard is young, it is almost customary to have some cultivation in it, for, it provides the protective interest of the farmers, though scientifically the cultivation of the inter-space causes the undernourishment of plants. Actually, the land should be tilled and manured

* Hevill, H.L., op. cit., p.16.
** Based on Jadar Ranungo’s Milan hhasra for the year, 1953-54.
*** Ibid., for the year 1958-59.
but, not cropped in order to provide the orchard better conditions of growth. But, it is rarely the practice.

Generally these orchards form a part of the market gardens. In fact, very little of the fruit gardening in this district can be separated from market gardening. Since the former does not provide a whole time and all the year round job, the gardeners try to supplement their work and income by raising vegetables in part of their gardens and, sometimes, even between the rows of fruit plants. In some cases, where market gardening is more important, the plants have been reduced in number. Rows of fruit plants like the papaya are grown on the margins of the fields or along the footpaths made within the orchards. Pure and dense stands of fruit trees are found mostly in the case of mangoes and guava but even land under these is seldom spared.

The table below shows the tahsilwise distribution of the orchards:

<table>
<thead>
<tr>
<th>Tahsil</th>
<th>Area under Orchards (Acres)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fruit Orchards</td>
<td>Arable Orchards</td>
</tr>
<tr>
<td>Moradabad</td>
<td>1,621</td>
<td>1,395</td>
</tr>
<tr>
<td>Amroha</td>
<td>5,347</td>
<td>5,000</td>
</tr>
<tr>
<td>Thakurdwara</td>
<td>454</td>
<td>136</td>
</tr>
<tr>
<td>Hasanpur</td>
<td>531</td>
<td>1,682</td>
</tr>
<tr>
<td>Bilari</td>
<td>526</td>
<td>399</td>
</tr>
<tr>
<td>Sambhal</td>
<td>1,145</td>
<td>2,020</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9,624</strong></td>
<td><strong>10,632</strong></td>
</tr>
</tbody>
</table>

* Ibid.
A comparative study of these figures shows that in tahsil Thakurdwara both fruit gardening and cultivated orchards are insignificant. In tahsils Hasanpur and Sambhal, the cultivated orchards are, actually, much more important than the fruit gardens. In Amroha and Moradabad, the two are of almost equal importance. Most of the groves are maintained in uneconomic conditions. Only a few at Amroha seem to be carried on successfully and, there, market gardening is carried on side by side with fruit gardening. This mixed type of gardening is becoming more and more popular day by day*. Thus, the grove area included in the cultivated area has increased from 7,952 acres in 1955-56 to 10,632 acres in the year 1958-59.

**Variety of Fruit**

As a rule, the groves and orchards consist of mango, jaman and berry. But orchards of oranges, leeechee, apricots, pears, guava, louqat, papaya, etc., are also found. Nearly 65% of the fruit acreage in the district belongs to the mangoes. In the hot season, there is much more local fruit than in other seasons; winter has got the least of them. The following table gives the main types of fruit found here:

*These facts have made the writer consider the fruit gardening as a minor industry and to treat it here, instead of giving it a separate chapter.*
Table 28

Fruit Acreage in 1959-60

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Moradabad</th>
<th>Amroha</th>
<th>Chakurdwa</th>
<th>Hasanpur</th>
<th>Billa</th>
<th>Sambhal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aharif harvest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banana</td>
<td>7</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Other fruit</td>
<td>376</td>
<td>622</td>
<td>261</td>
<td>39</td>
<td>518</td>
<td>601</td>
</tr>
<tr>
<td>lemon &amp; oranges</td>
<td>8</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mangoes</td>
<td>599</td>
<td>4366</td>
<td>157</td>
<td>437</td>
<td>-</td>
<td>318</td>
</tr>
<tr>
<td>Other fruit</td>
<td>238</td>
<td>265</td>
<td>9</td>
<td>44</td>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>Zaid harvest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>393</td>
<td>71</td>
<td>4</td>
<td>11</td>
<td>8</td>
<td>190</td>
</tr>
<tr>
<td>Total</td>
<td>1621</td>
<td>5347</td>
<td>454</td>
<td>531</td>
<td>526</td>
<td>1145</td>
</tr>
</tbody>
</table>

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Distribution of Fruit Orchards

Most of the fruit orchards are found around the larger villages and towns (cf. Figs. 33, 42, 45 and 45). Amroha, in particular, has large orchards of mangoes to which partly the town owes its name. Hasanpur and Bachhraon also have large mango orchards. Sambhal, Chandausi and Moradabad have a variety of fruit. Their greatest extent is found in the suburban areas like Hauz Badesra, Daulat Bagh, etc. (Figs. 45 & 46). The khadars are conspicuous by an absence of grove land (cf. Fig. 47 which shows Katenas in the Ganga khadar). The bangar tracts are more suitable for fruit gardening. The consideration of safety and protection from wild animals and thieves, however, limits the situation.

* Based on Sadar Qanungo's Milan khasra for the year.
of gardens nearer the settlements.

Of the total of 9,624 acres of fruit yielding orchards in the district, in the year 1958-59, nearly 56% belonged to tahsil Amroha, where many places like Kanth, Joya, Haugawan Sadat, etc., have their groves, but none compares to Amroha town which has very vast orchards enclosing it on all sides. The settlement is almost completely hidden from the south by the mango groves, which are extending along the Amroha-Joya road link. Amroha specializes in mangoes both ordinary and grafted. New orchards of grafted mangoes have also been planted in the south. Louquat, papaya, guava, peaches, pears and plums are also grown to some extent. Most of the orchards occupy a fertile loam, though some have been established even on bhur ridges that surround the town. The Moradabad-Delhi railway line makes it easy for the fruit to be sold fresh in Delhi and Moradabad.

Near Moradabad town apricots, pears, guava and grafted mangoes are grown. These orchards are mostly mixed. Mangoes are less important for they can be had quite cheaply from the country-side groves. Orchards are grown on fine silts left by the river sometime ago. The upland slopes a little towards the river Ramganga and in places terraces have been cut to level the ground for orchards. A few orchards bordered the old town on the west. Some of them have now been cut down in favour of roads, railway lines and building construction.
But, some are seen between the metalled road and the railway lines leading towards Bareilly and Chandausi.

Owing to its historical background, Sambhal has many groves and orchards which fill up the gaps in between its various parts. Here, mangoes are found in the east and south of the town and berries, guava and other small fruits in the north and west. A few plants of lemon and oranges are also found here and there. The soils on which these orchards have been planted are of varying texture ranging from fine dumat to light dumat. Water for irrigation is available from the numerous tanks and wells. The baghbans of Sambhal are reputed for their traditional skill and industry.

A great concentration of orchards is also found around Chandausi, the largest town of Bilar taksil. Besides, the normal mango and guava, a variety of fruits including grafted mangoes, peaches, leeches, papaya, pears, plums, bananas, lemon, oranges, etc., are also grown there. Mango groves are found near all larger villages and small towns of the district. But, near Bilar taksil and Dankarki orchards of guava and other fruits are also found. The garden of the Raja of Sahaspur near Bilari is a large one.

Hasanpur, Gajrala, Bachhraon and Dhanaura all have extensive groves of mangoes and some orchards of fruits like guava and papaya, while the metalled roads are lined by mango trees. These towns, particularly Hasanpur, look like small
islands of groves in a sea of sand. These groves and orchards seem to have been established with much labour and industry on the part of the baghbans and the interest of the zamindars and jagirdars of old.

Factors Influencing Orchard Planting

The skill of the gardeners, choice of the owners and some historical or economic factors seem to make differences in the character of the orchards. But, usually near every large town almost all varieties of fruit are grown in mixed orchards showing a tendency towards local self-sufficiency and a desire to exploit the local demand for fresh fruit at all seasons. Away from the towns the groves are mainly of mangoes and guava which do not require much care and their fruit can be transported over longer distances. In the bhur-lands of hasanpur, where every large village or small town is sited at a place where soil and water conditions are better, the settlement sites are significantly surrounded by groves and orchards.

Recently, planting of new groves has been associated with the land acquisition, zamindari abolition and consolidation of holdings rules which have left the possession of groves to their original owners. Thus, some of the best land in their holdings was devoted by the zamindars to haphazard and uneconomic orchards with a view to saving it for their posterity.
The economic aspect of orchard planting is very serious, for the demand for fruit does not vary as much from year to year as does the yield. In a good year the market is glutted and prices are very low whereas in a bad season scarcity causes prohibitive prices. The local fruit is excessively deceiving in this matter so that the established fruit dealers, generally, rely more upon imported supplies, which are steady in supply as well as in prices. Most of the fruit grown in this area of low storage value and cannot be exported to distant markets, nor can jam factories or canneries be established for a few peak periods. Hence the local fruit gluts cannot be controlled.

Fruit gardening differs from crop raising in that while in the case of the latter the crops become established by the process of trial and error for a succession of two or three years, in the case of orchards, it takes many years. Normally, the orchards are auctioned to the highest bidders when the trees have borne fruit. These bidders have only a temporary interest in the orchards. Therefore, they care little for their proper maintenance. Little spraying or fertilization is done in them. Being the most convenient and easily accessible places of repose near the settlements they are, however, manured by the cattle, sheep, pig, poultry and night-soil.