The proportion of money-bringing crops is very high, and is if anything increasing. Indigo (which at one time occupied about 13,000 to 15,000 acres) has disappeared, and the wheat area is not expanding, but cotton has increased largely, and sugarcane substantially. On a smaller scale potatoes show a tendency to expand, and oats and lucerne have been introduced in comparatively recent times, while safflower has disappeared.

The practice of sowing certain kharif crops early with canal irrigation has developed considerably in the last decade, especially in the case of cotton and fodder; the development is less in the case of maize. Taking the three crops together, about 16 per cent. of the area was so sown in the 1910, against about 8 per cent. in the earlier period.

There have been numerous minor improvements in the canal-system, but no large supply-channels have been constructed: on the other hand, very great improvement has resulted from the extensive drainage operations which have been carried out. Masonry wells have increased substantially since 1905, under the stimulus of two seasons of drought: there is now one such well to 73 acres of normal cultivation, against 88 acres in 1905.

The population of the district expanded remarkably between 1891 and 1901, but has fallen very slightly in the last decade. Rural wages have risen distinctly in the last five years: in 1911 the rates commonly paid varied from 2¼ to 4 annas, the latter rate being by no means exceptional, while higher rates were found in some villages.

Advances for land improvement were formerly exceptional, but the droughts of 1905 and 1907 have brought a large number of applications for the purpose of well-sinking: in addition to the large sums advanced in 1907-8, advances have since been made to an aggregate of 1¼ lakh. Agricultural loans are taken to a very small extent in normal

seasons, but a dry year leads to a considerable demand both for cattle and for temporary wells. Agricultural co-operation has made little progress so far: in 1911 there were five rural credit societies with 93 members and about Rs. 4,000 working capital.

Railway facilities have been very greatly increased in the last decade by the construction of (1) the Moradabad Ghaziabad line across the south of the district, with branches from Hapur to Meerut on the north and to Khurja on the south: and (2) the Shahdara-Saharanpur light railway passing through the west of the district. There is now one station to 94 square miles, as against one to 339 square miles in 1891. The district was opened out by metalled roads at an early date, and recent extensions have been limited to completing the roads to Baghpat and Mawana: some feeder roads are still required to serve the recently constructed railway.

The rents recorded for occupancy tenants in 1900-1, the first year of the settlement, gave an average rate of Rs. 5·3 per acre: enhancements just after settlement brought the rate to Rs. 5·5 in 1904-5, and there has been no further rise. Competition rents on the other hand have moved rapidly during the decade: the average rate was Rs. 8·3 in 1900-01, Rs. 9·3 in 1905-6, and Rs. 10·4 in 1910-11.

Local textile industries have declined under competition, and a substantial amount of seasonal employment has been lost by the decline in indigo: the indigenous leather-industry has however expanded rapidly. Organised industries are represented by the soapworks at Meerut and by the ginning and pressing mills recently established at Hapur.

The amount distributed in the district by money-order is at the present time about 20 lakhs annually, having risen from 14 lakhs in the last decade. The sources of this income are not clear, but apparently a large proportion is paid in the cities and towns and comparatively little in the villages.

Dangers and possible remedies or improvements.

1. The area sown with kharif crops depends mainly on the weather during the first month of the season counting from the first heavy fall of rain. An early beginning is an advantage, though less so than in most districts owing to the extensive facilities for *palæo*-irrigation: but the most important point is that there should be bright weather with just sufficient rain to enable tillage and sowing to proceed without interruption. If the first month is wet, sowings of dry crops will be delayed and the area will fall, though the loss may be to some extent made good by larger sowings of *bajra*, which can be sown until nearly the end of August. The area under rice is very small, and its extension in wet seasons will not materially compensate for the reduction in dry crops.

The area planted with sugarcane is slightly influenced by the weather in the early spring, at which time rain facilitates tillage: but it is determined mainly by economic causes. One of these is the yields and prices obtained from the crop in recent seasons; the other is the financial position of the cultivator, which depends mainly on the success or failure of the preceding harvests.

The area sown with cotton is affected to some extent by the nature of the sowing season; an early start and a dry season are favourable. The chief factors determining the area are the profit obtained in recent seasons, and the relative prices of cotton and food-grains.

2. The yield of the early dry crops, of which maize is much the most important, depends mainly on the weather during the first two months of the season: alternations of rain and bright weather are desirable, and the yield may be much reduced by excessive rain in the second month. The small area under early rice requires more rain, and is not likely to give a full yield when the dry crops do best.

The late dry crops require the prolongation of the rains to about the middle of September; they may be seriously

injured by heavy falls in the end of September or the beginning of October, while they will give very little grain if September is altogether dry.

A sufficient food-supply is assured in all but the worst seasons, as maize and the late millets ordinarily compensate for each others' losses.

Sugarcane is apt to suffer seriously at two periods. The first is the end of the hot weather : the crop benefits from an early commencement of the rains and suffers from delay. The second is the end of the rains : a premature cessation is injurious, and rain in October is beneficial. The crop can stand a considerable excess of rain, but prolonged breaks are likely to cause injury.

Cotton is liable to considerable injury from excessive rain : the most dangerous times are probably just after sowing, and again at the end of the season. It can withstand fairly long breaks when once it has made a fair start, and suffers from a dry September less than any other crop.

3. Apart from variations in the rainfall, the chief danger to the kharif comes from floods in the various *khadirs*. No serious injury from insect-pest has been reported, but it should be watched for, especially in the case of sugarcane, cotton and *juar*.

4. The rabi area depends largely on the rainfall of September and early October : late rain leads to a large extension beyond the normal ; moderate drought is little felt in the canal-irrigated tracts, but when September is entirely dry a substantial falling off must be anticipated.

In the *khadirs* the area sown depends to some extent on the period and intensity of the floods : heavy floods late in the season may leave the ground unfit for sowing rabi.

5. In ordinary seasons, when the seed-bed has been sufficiently moist, the rabi crops do not depend largely on winter rains except in the unirrigated areas. Rain is however beneficial up to February provided the falls are moderate in

amount and of short duration. Rain in the latter part of March or early in April is likely to do some harm, while prolonged periods of damp and cloudy weather between January and March must be expected to bring on rust on the wheat; the injury from this cause may be serious, and its extent may not be fully realised till the crop is harvested.

When the ground has been dry at sowing time, and sowings have been largely made with irrigation, an early fall of winter rain is of great importance. When there is little winter rain or when falls are delayed, the crops fall off in condition as they ripen, and tend to wither under the strong dry winds which in such seasons must be expected in the spring. It is noteworthy that gram as a rule suffers most in this case: a seed-bed prepared with irrigation is less suitable for it than for the cereals or peas.

6. Frost occurring in January will cause little or no injury to the staple crops, though it is possible that harm may be done just at the end of the month if the crops are forward. There is danger that the seed-canes may be injured at this time, which would mean reduction in area and inferiority of yield of the next sugarcane crop. A frost towards the middle of February might do very serious harm, but the contingency is unlikely.

Hailstorms are not of much importance until the cereals are earing, but the danger from them increases as the season advances.

The rapeseed crop may suffer serious injury from the aphis if damp cloudy weather occurs while the plants are in flower.

Where potatoes are grown a watch should be kept for the potato-moth, which may cause very serious loss (vide provincial note, section VI).

7. The area sown with *zaid* crops in ordinary seasons is not important. It extends, but not largely, when stocks of food are reduced.

8. A series of abnormal seasons of one type may produce certain cumulative effects. After some seasons of deficient rainfall the water-level falls, and the efficiency of temporary wells decreases, while the cost and labour of irrigation are materially enhanced. It is possible that the lowering of the water-level may proceed so far as to render the masonry wells useless in some tracts, but this is not known to have occurred in the past.

On the other hand a series of wet years may raise the water-level to a point where the productivity of the land declines. This may happen throughout the district, but its effects will be most noticeable in the *khadirs* of the Ganges, Hindan and Jumna: land will probably go out of cultivation in these tracts, and the collection of the revenue will need careful attention. The central depression will also require watching, in case the drainage should prove inadequate.

9. The district has not recently experienced such distress as to require measures of direct relief, and the contingency appears to be remote. Indirect relief however will probably be needed in seasons when the rains have ceased at the beginning of September. The following action was taken in 1907-8:

Revenue suspended,	kharif	2 lakhs.
,, ,,	rabi	1¼ lakh.
Revenue remitted,	kharif	¾ ,,
,, ,,	rabi	½ ,,
Improvement loans	... ...	3½ lakhs.
Advances for rabi	... ...	3½ ,,
Advances for kharif	... ...	½ lakh.

Small sums were also lent for the purchase of fodder.

10. A general fodder-famine appears to be most unlikely as the water-supply enables fodder-crops to be grown in most unfavourable seasons, but local deficiencies may be felt in non-irrigated tracts when the rains have ceased so early that the millets yield little fodder: these deficiencies can be dealt with by the grant of loans, and it is not likely that importation of grass on a large scale will be required.

In seasons when the growth of the late crops is stunted *juar* occasionally becomes poisonous and the loss of cattle due to this cause may be considerable. The poison is formed under the abnormal conditions of growth, and its presence cannot be recognised beforehand except by analytical methods: the only action possible is to provide advances if required to enable cultivators to replace cattle that have died from this cause.

11. Not much remains to be done for the improvement of the water-supply: but loans should be readily given when required for sinking masonry wells, and a boring staff should be maintained to assist in locating sites.

12. There is at present no demand for drainage works, and it is unlikely that even in wet seasons the need for more works (other than very small extensions) will be felt.

13. In order to minimise losses from cattle-disease, attention should be steadily given to ensuring the prompt reporting of outbreaks under the rules laid down in the Land Records Manual; and the local veterinary staff should be sufficient to localise outbreaks when they occur.

Any action that may be authorised by Government should be taken (*a*) for the preservation of the grazing-grounds in the Ganges *khadir*, and (*b*) for the supply of suitable bulls in the same area.

14. The supply of agricultural capital is almost sufficient for the ordinary needs of ordinary seasons, but improvement-loans can still be given with great advantage to secure the construction of masonry-wells. Agricultural loans can advantageously be given on a large scale when the rains have ceased prematurely: the demand will be chiefly for sowing rabi, but some money may be wanted for the following kharif, and there may be a demand in the early spring to enable cultivators to plant sugarcane. Loans may also be desirable in localities that have been affected by cattle-disease, to enable cultivators to replace working-cattle in time for the next tillage-season.

15. There is at present no effective agency for the introduction of agricultural improvements requiring associated action. It is possible that a co-operative organisation may develop with some primary object other than the supply of credit, which would furnish the agency required.

The cropping of the district requires to be examined before definite suggestions can be made for its improvement; there is however a wide field for a superior cotton when available; while the varieties of sugarcane which are specially suited for making *gur* would have to be changed to make sugar manufacture possible. Improved tillage implements—not of the cheapest type—should come gradually into use, especially in the *khadirs*, and there is probably room for a good deal of labour-saving machinery.

DISTRICT NOTE.

BULANDSHAHR.

Topography.

THE district is roughly quadrilateral, and lies between the Jumna and the Ganges.

The Ganges *khadir* is as a rule narrow and contains little cultivation except at two points, in parganas Ahar and Dibai. The cultivation is fairly stable, that in Dibai being protected by the head works of the Lower Ganges Canal.

The Jumna *khadir* is much more extensive. The chief area is the west of parganas Dankaur and Dadri, with a maximum width of nearly ten miles: but there is also a substantial area in pargana Jewar. Immediately along the river the cultivation is very unstable, while under the high bank of the upland the land is very bad, being clay or swamp and in many places highly alkaline. Between these the land is better, and contains much stable cultivation: it is enriched periodically by the silt of the Hindan river, and depends mainly on the rabi crops. Its quality tends to deteriorate greatly in a series of wet seasons when swamps extend and alkaline efflorescence appears.

Between the two *khadirs* lies the main upland tract, traversed successively by the Patwaha, the Karwan, the Kali nadi and the Nim and Chhoiya streams. The soil is usually light and inferior near the rivers, there is a well-marked sand ridge east of the Patwaha, and a narrow *khadir* along the Kali nadi, while the level loam is (specially in the south) broken by extensive *usar*-plains, usually alkaline; with these exceptions the plain is substantially uniform, and differences in agricultural value depend mainly on the character of the water-

supply. The channels of the various rivers, including the Kali nadi, have been improved so that they can carry off the large volume of water brought to them by artificial drainage-cuts, which have been constructed in large numbers.

Water-supply.

The *khadirs* are not as a rule irrigated, but temporary wells are usually possible in them. The land between the Patwaha and Karwan is irrigated by the Mat branch and that between the Karwan and Kali nadi by the main Ganges canal, while the tract between the Chhoiya and the Ganges is served by the Anupshahr branch. The land between the Kali nadi and the Chhoiya is without canal irrigation. This tract includes the greater part of Bulandshahr tahsil, the west of Anupshahr and a small portion of Khurja.

Masonry wells are numerous and are very popular with the cultivators, but in a few villages in almost all parganas the landholders are hostile to their construction; this hostility is most common in parganas Jewar and Dibai. In most parts of the uplands there is little difficulty in making wells as foundation-clay is general and has a good supply below it. The Bulandshahr tahsil is in this respect inferior: foundation-clay is missing in several villages of Agauta and Baran, and in nearly half the villages of Shikarpur, and experience has shown that in seasons of drought the last-named pargana is unable to sow the same proportion of rabi as the parganas which have canal-irrigation. Temporary wells are used to some extent in the southern parganas, especially Dibai, but they are not generally popular, and in many places they are impracticable. There are practically no other sources of irrigation than canals and wells.

Cattle-supply.

The number of cows in the district is small, buffaloes being preferred for dairy-purposes, and there are few breeding bulls. Cultivators in the uplands usually buy their cattle when ready for work and prefer animals brought by dealers

from the Punjab, while the local young stock are sold to Rohilkhand. The uplands have exceptionally little grazing land, and the Jumna *khadir*, where a breeding-industry might be possible, is devoted mainly to buffaloes. Villages along the Ganges, especially in Ahar and Dibai, have a moderate supply of cows, and the young stock is taken into work locally; these villages have at present an inadequate supply of bulls.

The district is liable to all the common forms of cattle-disease. The practice of preventive inoculation is now welcomed by the people.

Annals.

The earlier reports do not contain much information of importance. Up to 1894 complaints were numerous of defects in the drainage of the uplands, but the drainage system was steadily improved, and in later years the subject became much less prominent. By 1895 the Jumna *khadir* was found to be seriously deteriorated by the extension of swamps and alkali, and the revenue was temporarily reduced. The district did not suffer from the drought of 1896, when practically a full rabi area was sown. In 1899, on the other hand, the early cessation of the rains led to a substantial fall in the rabi area, especially in the tract between the Kali and the Chhoiya. About this time the question was examined of introducing canal-irrigation into Shikarpur, the worst pargana; but the scheme was abandoned as the Irrigation department considered the formation of subsoil and position of water-level to be such that an extensive spread of alkali would probably result.

In 1902 the rabi crops suffered from drought, rain having ceased at the end of the previous August, and there were complaints of inadquate supplies in the canal. In this year the rains were excessive in the early part of the season, and maize and cotton were affected injuriously. The seasonal yields from 1903 are given in the following table :—

Bulandshahr.

Year.	Rabi.				Kharif.				
	All crops.	Wheat.	Barley.	Gram	All crops.	Maize.	Juar.	Cotton.	Sugarcane.
1903 ...	84	88	88	81	84	81	87	81	94
1904 ...	86	87	87	81	87	81	94	87	87
1905 ...	77	75	87	94	77	87	62	87	85
1906 ...	77	81	87	56	85	94	75	100	100
1907 ...	89	81	94	100	50	62	44	50	75
1908 ...	69	75	75	50	92	100	100	75	87
1909 ...	83	75	87	87	93	87	100	87	100
1910 ...	102	100	106	100	85	97	72	72	106
1911 ...	106	94	119	113	...	...	...	...	...

The rabi of 1903 suffered somewhat from want of winter rains, and the following kharif from excessive moisture. In 1904 the winter rains were too late, while the monsoon rains were irregularly distributed and were unfavourable to maize. About this time the north-east of the district was greatly benefited by improved communications; the Moradabad-Ghaziabad railway had been opened along the northern border of the district, and the railway from Khurja to Hapur was now constructed, while the road from Bulandshahr to Siyana was being metalled gradually.

The district escaped the full effects of the frost of 1905, but wheat was injured somewhat seriously. The rains began late and were exceedingly scanty, and the unirrigated crops were very poor. There was also severe scarcity of fodder in the Jumna *khadir*, and though advances for its purchase were given, large numbers of animals died. The winter rains of 1906 were inadequate for the crops sown on a minimum of moisture, but the monsoon rains of this year were copious; the Jumna *khadir* suffered from floods, and heavy rain with high winds in September was injurious to the millets. In 1907 the winter rains were sufficient and the crops were satisfactory with the exception of wheat, which was affected by rust.

Bulandshahr.

The rains of 1907 began late, were scanty throughout, and ceased early, so that about half the kharif was lost. The following rabi, the area of which was greatly contracted, suffered from the dryness of the land and the strong westerly winds of March, gram being the crop most affected. During the period of drought, advances were given and revenue was suspended, but no direct relief measures were required. The rains of 1908 were practically confined to July and August: they were at times heavy and the Jumna *khadir* suffered from floods; and their distribution was unfavourable to cotton, but other crops were successful. The dry September, followed by a very severe outbreak of malaria, prevented a full rabi area being sown for 1909; tillage was inferior, and mixed crops were sown in place of wheat. The crops were affected, first by insufficient rain, and then by unseasonable falls at harvest-time.

The rains of 1909 were on the whole favourable, though somewhat too heavy for maize and cotton, and they enabled a full rabi to be sown for 1910. This crop was successful, and the following kharif would have been equally good but for excessive rain in September and October, which injured the cotton and millets. The rabi of 1911 was sown on a very large area, and would have been exceptionally good but for slight injury caused to wheat by rust.

Progress.

Twenty years ago portions of the district were suffering from over-saturation: the progressive improvement of the drainage-system of the uplands has almost entirely removed this defect, and there has been a slight expansion in the area under crops. This movement appears to have reached its limit.

The percentage of remunerative crops has remained constant, but there have been considerable changes in the crops grown. The chief changes have resulted from the disappearance of indigo, which twenty years ago occupied 42,000 acres and had previously been sown even more widely. Its

disappearance has checked the expansion of wheat owing to the resulting changes in rotation; it has been largely replaced by cotton, the area under which has nearly doubled. Among other crops, sugarcane, which is grown for *gur*, has extended substantially, and on a smaller scale potato-cultivation is advancing. Safflower, which at one time was locally important, is now little grown.

The most important change in agricultural practice is the development of early kharif sowings with canal-irrigation: more than one-quarter of the area occupied by maize, cotton and fodder crops is now sown in this way.

The sources of irrigation are practically limited to canals and wells. There has been no important development of the canal-system during the last two decades though there have been numerous improvements in detail. The construction of masonry wells has proceeded steadily in recent years, and there is now one well to 57 acres of normal cultivation as against 65 acres in 1905. There appears to be scope for more of these wells in most if not all parts of the upland; but they are most extensively required in parganas Ahar, Agauta, Baran and Shikarpur. The rate of construction is relatively lowest in Shikarpur, where foundation-clay is not uniformly found.

Population increased very rapidly between 1891 and 1901, owing mainly to the improved conditions brought about by the extensive drainage works carried out early in the decade. The increase has not been maintained and the population in 1911 is very slightly less than in 1901: the prevalence of plague is probably the chief factor in this change. Rural wages are rising, though the highest rates are less commonly found than in Meerut.

Of late years the district has taken government loans to a considerable amount for the construction of masonry wells: Rs. 65,000 were advanced in 1907-8 and over Rs. 30,000 in the two following years. Temporary agricultural loans are as a rule taken only in unfavourable seasons. The organisation

of co-operative credit has made some progress; in 1911 there were 65 rural societies with 3,058 members and 2¼ lakhs of working capital.

Twenty years ago the communications on the western side of the upland tract were adequately developed, and there were some metalled roads in the south-east, but the north-east was inadequately served. The new railway lines and road already mentioned have materially improved this part of the district, while further south the road has been metalled from Khurja to Chhitari. There is now one railway station to 119 square miles, as against 239 square miles in 1891.

Comparative rental statistics are available since 1904-5. In that year the rents of recorded occupancy tenants gave an average rate of Rs. 4·6 per acre; there has since been a certain amount of enhancement, and by 1910-11 the rate had risen to Rs. 5·1. The competition rent rate in 1894-5 was Rs. 6·6; by 1904-5 this had risen to Rs. 8·1, and by 1910-11 to Rs. 9·1.

The ordinary textile industries have as elsewhere suffered from competition, but the production of goods such as prints and muslins has extended. There is little sugar-refining, as nearly all the produce is sold for consumption as *gur*; while in recent years there has been a large reduction of seasonal employment consequent on the loss of indigo. Organised industries are represented by the numerous ginning and pressing mills which have been established, chiefly in Khurja and Dibai.

The sums distributed in the district by money-order have risen during the last decade from about eight to eleven lakhs; the sources of this income are not clear, but apparently a comparatively small amount comes to agriculturists from outside the district.

Dangers and possible remedies or improvements.

1. The area sown with kharif crops depends mainly on the weather during the first month of the season counting

from the first heavy fall of rain. An early beginning is an advantage, but the most important point is that there should be bright weather with just sufficient rain to enable tillage and sowing to proceed without interruption. If the first month is wet, sowing of dry crops will be delayed and the area will fall, though the loss may be to some extent made good by larger sowings of *bajra*, which can be sown until nearly the end of August. The area under rice is quite unimportant.

The area planted with sugarcane is slightly influenced by the weather in the early spring, at which time rain facilitates tillage: but it is determined mainly by economic causes. One of these is the yields and prices obtained from the crop in recent seasons; the other is the financial position of the cultivators which depends mainly on the success or failure of the preceding harvest.

The area sown with cotton is affected to some extent by the nature of the sowing season; an early start and a dry season are favourable. But sowings are now largely made before the rains, and the chief factors determining the area are the profit obtained in recent seasons, and the relative prices of cotton and food-grains.

2. The yield of maize, the only early dry crop that is grown, depends mainly on the weather during the first two months of the season: alternations of rain and bright weather are desirable, and the yield may be much reduced by excessive rain in the second month.

The late dry crops require the prolongation of the rains to about the middle of September; they may be seriously injured by heavy falls in the end of September or the beginning of October, while they will give very little grain if September is altogether dry.

A supply of food is assured in all but the worst seasons since maize and the late millets ordinarily compensate each other's losses.

Sugarcane is apt to suffer seriously at two periods. The first is the end of the hot weather: the crop benefits from an early commencement of the rains and suffers from delay, the second is the end of the rains: a premature cessation is injurious, and rain in October is beneficial. The crop can stand a considerable excess of rain, but prolonged breaks are likely to cause injury.

Cotton is liable to considerable injury from excessive rain: the most dangerous times are probably just after sowing, and again at the end of the season. It can withstand fairly long breaks when once it has made a fair start and suffers from a dry September less than any other crop.

3. Apart from variations in the rainfall, the kharif crops are not known to have suffered serious losses from any cause. Floods occur in the Jumna *khadir*, but it does not depend largely on the kharif. A watch should be kept for the appearance of insect-pests on *juar*, cotton and sugarcane (vide Provincial Note, section VI).

4. The rabi area depends on the rainfall in September and early October, but the facilities for irrigation are so great that even in dry years the fall is serious only in particular areas, notably pargana Shikarpur.

In the Jumna *khadir* the area may fall substantially if late floods should leave the land unfit for tillage.

5. In ordinary seasons, when the seed-bed has been sufficiently moist, the bulk of the rabi crops can be matured without winter rains. These are however beneficial up to February, provided the falls are moderate in amount and of short duration: rain after the beginning of March may do some harm, while prolonged periods of damp and cloudy weather between January and March must be expected to produce rust on wheat. The loss from this cause may be serious, and its extent may not be fully recognised till the crop is harvested.

When the ground has been dry at sowing time, and sowings have been largely made with irrigation, an early fall of

winter rain is of great importance. When there is little winter rain or when falls are delayed, the crops fall off in condition as they ripen, and tend to wither under the strong dry winds which in such seasons must be expected in the spring. It is noteworthy that gram as a rule suffers most in this case: a seed-bed prepared with irrigation is less suitable for it than for the cereals or peas.

6. Frost before the end of January does little harm except to the *arhar*. The wheat may suffer if it occurs at the end of the month, while a frost towards the middle of February might be a very serious calamity. A severe frost at any time may injure the seed-canes, and thus affect both the area and the yield of the next sugarcane crop.

Hailstorms are unimportant up to the time when the cereals are coming into ear: the danger of injury increases as the season advances.

The rapeseed crop is liable to severe injury from the aphis if damp and cloudy weather occurs while the plants are in flower.

7. The area sown with *zaid* crops is not large in ordinary seasons, and it does not extend greatly when stocks of food are low.

8. A series of abnormal seasons of one type may produce certain cumulative effects. After some seasons of deficient rainfall the water-level falls, and the efficiency of temporary wells decreases, while the cost and labour of irrigation are materially enhanced. It is possible that the lowering of the water-level may proceed so far as to render the masonry wells useless in some tracts, but such an occurrence has not been reported in this district.

On the other hand a series of wet years may raise the water-level to a point where the productivity of the land declines. This may happen throughout the district, but its effects will be most noticeable in the Jumna *khadir*, where

cultivation will probably decline and the collection of the revenue will require special attention.

9. There is no recent experience of such distress as to require measures of direct relief, and the contingency appears to be very unlikely. Indirect relief is however likely to be wanted when the rains have ceased by the beginning of September: the following measures were taken in 1907-8:—

	Rs.
Revenue suspended, kharif	31,000
„ „ rabi	46,000
Revenue remitted, kharif	4,000
„ „ rabi	48,000
Improvement loans	¾ lakh.
Advances for rabi	½ „
„ „ kharif	⅛ „

A small sum was also advanced to the co-operative organisation.

There are indications in the class of cropping in this and the following season that advances could have been given with advantage on a larger scale.

10. Irrigation facilities are so great that a general fodder-famine appears to be a most unlikely contingency, but the scarcity may be severe in particular areas (of which the Jumna *khadir* is one) in years of exceptionally light rainfall, or of a cessation so early that the millets give little fodder. Advances to buy fodder will be required in such seasons, and the necessity may possibly arise for importing grass from the submontane forests.

In seasons when fodder is scarce owing to drought *juar* occasionally becomes poisonous and the loss of cattle due to this cause may be considerable. The poison is formed under the abnormal conditions of growth, and its presence cannot be recognised beforehand except by analytical methods: the only action possible is to provide advances if required to enable cultivators to replace cattle that have died from this cause.

11. The chief measure for the improvement of the water-supply is the promotion of well-sinking in the villages where wells are still required. Loans for this object should be readily given, and a boring staff should be maintained. Any steps that are possible should also be taken to remove the opposition of landholders where it exists: but it is probably only one side of the agrarian question which was formerly so acute in this district, and the most that can be hoped for is that its gradual disappearance may be hastened by influence exerted on individual landholders.

The needs of the country east of the Kali nadi, and especially Shikarpur, should not be lost sight of. It is probable that much fresh light will be thrown on the alkali problem by researches now in progress in the Agricultural department; and the question of giving canal-water to Shikarpur should shortly be re-examined in the light of those researches by the two departments concerned.

12. No further action appears to be required for the improvement of the drainage of the district.

13. To minimise losses from cattle-disease, attention should be given to secure the prompt reporting of outbreaks under the lines laid down in the Land Records Manual, and the veterinary staff should be sufficient to localise outbreaks when they occur.

Any action that may be authorised by Government should be taken to increase the supply of suitable bulls along the Ganges.

14. The district is fairly well provided with agricultural capital for the ordinary needs of ordinary years. There is probably not enough available for well-sinking or other special improvements, and loans for such purposes should be readily given. Agricultural loans can probably be given with advantage in the following cases:—

(*a*) *Early cessation of the rains.*—There appears to be room (as has been indicated above) for advances

on a larger scale than was followed in 1907, especially for sowing the rabi and possibly also for planting sugarcane.

(*b*) *Cattle-disease.*—It is desirable to place cultivators in a position to replace working stock without delay.

15. The nucleus of an agency for introducing agricultural improvements requiring associated action exists in the co-operative organisation, the influence of which will probably expand.

As regards improvements in cropping, there is a very wide field for a better cotton when one is available: the varieties of sugarcane will have to be changed if the market should become more favourable for sugar than for *gur*; and a distinct pressing need is for a leguminous crop sufficiently remunerative to take its place in rotation on the richer land. Groundnuts would apparently serve the purpose if the cost of harvesting is not found to be too great.

The demand for improved tillage-implements should gradually expand, especially in the Jumna *khadir*; and there is probably room for the cheaper forms of labour-saving machinery.

DISTRICT NOTE.

ALIGARH.

Topography.

THE district lies between the Ganges and the Jumna but its river-frontage is small owing to the intervention of Etah on the east and Muttra on the west. The trend of its natural divisions is south-eastwards.

On the north-east tahsil Atrauli covers the area between the Ganges and the Kali nadi. The Ganges *khadir* is not extensive: it is fertile and productive, and has benefited greatly by the head-works of the Lower Ganges Canal which keep the river floods under control. Above the *khadir* the land is light and sandy as far as the Nim nadi, westward of which a tract of good loam extends nearly to the Kali nadi with the Chhoya depression in its centre. The land along the Kali nadi is again sandy.

The centre of the district is occupied by tahsils Aligarh, Sikandra Rao and part of Hathras. After leaving the sand of the Kali nadi, there is a belt of highly productive loam down the east of the two first-named tahsils. This merges in the wide central depression, marked by heavier soil with extensive stretches of barren land, largely alkaline. West of this there is again good loam passing gradually into lighter soil.

On the west lie tahsils Khair and Iglas, with pargana Mursan of the Hathras tahsil. The surface of this tract consists of level stretches of loam broken by irregular ridges of sand, with no large depressions. The tract extends to the borders of the Muttra district, but the north-western pargana of Tappal projects westwards as far as the Jumna: it comprises

first a stretch of hard loam, then a narrow belt of sand and then the Jumna *khadir*. The *khadir* is mainly a hard and unproductive clay.

A special feature of the district is the presence over large areas of the deep-rooted weed called *baisurai (Pluchea lanceolata)*. It is found mainly in tahsils Iglas and Hathras, and also in scattered villages of Khair and Sikandra Rao. This weed does not as a rule throw the land out of cultivation but it increases largely the labour and cost of tillage, and its presence is inconsistent with high cultivation.

Water-supply.

In tahsil Atrauli the uplands as far as the Nim nadi depend for irrigation mainly on the Anupshahr branch of the Ganges canal, while west of the Nim wells are the only source. The well-capacity is usually good, foundation-clay being almost general and the supply under it copious. The sandy villages on the river banks are, as is usual, short of water.

The eastern side of the central tract (about half of Aligarh and the whole of Sikandra Rao), has excellent supplies from the Ganges canal, while wells can be made in most places. The west side of this tract has hitherto depended on wells. In the west of Aligarh these are still satisfactory: foundation-clay is usually found and the water-level has not fallen greatly. In the west of pargana Hathras however the water-level fell to an extent that rendered irrigation difficult, and the Hathras branch of the canal has just been constructed to meet this difficulty.

On the west, tahsil Khair has recently received increased supplies from the Mat branch of the canal, and the well-capacity is in most places adequate. The water-level has fallen in the southern portion of the tahsil where the new branch runs. Tahsil Iglas and pargana Mursan suffered most by the fall in the water-level: wells are in them still the main sources of irrigation, but the Mat branch now serves portions of the country west of the Karwan nadi, while the Hathras branch

will serve part of the land on the east. Formerly the water-level in this tract was well above the first layer of foundation-clay, and both masonry and temporary wells could be sunk to it with ease. The fall in level has rendered this layer useless, and wells have now to be carried down to the second layer which is below about 20 feet of sand. The sinking of temporary wells is thus rendered difficult and all forms of wells are much more costly. The new branches of the canal are not designed to replace wells but to supplement them: and it is possible that in time their effect may be to raise the water-level to its former position.

Drainage.

Various portions of the district have suffered in the past from defective drainage, but large sums have been spent in improving the natural channels of the minor streams and in cutting artificial drains, so that there appears to be no longer any risk of widespread injury from over-saturation, and no serious loss has been reported from this cause during the last ten years. The Jumna *khadir* is however liable to recurrent losses by floods on the river.

Cattle-supply.

There are no large grazing areas and consequently no regular cattle-breeding. The number of cows in the district is exceptionally low; the people are inclined to prefer buffaloes for milk-supply. There are few bulls and the local young stock is of poor quality, and is frequently sold to Rohilkhand dealers while immature. The working cattle are largely imported: they are brought by dealers of the district who visit the large fairs in the Punjab and the Batesar fair, and then travel through the district disposing of their stock.

The district is liable to all the common forms of cattle-disease. The practice of preventive inoculation is now welcomed by the people.

Aligarh.

Annals.

The earlier reports from the district contain little information of permanent value. The west of the district suffered somewhat during the drought of 1896, but not so much as to require measures of relief. It was about this time that the fall in the water-level began to attract serious attention, leading to the projects for constructing the Mat and Hathras branches of the Ganges canal. In 1901 wheat suffered from rust, and the early cessation of the rains resulted in poor yields of all staples except cotton. In 1902 the *rabi* was poor owing to continued drought but the following kharif was good. In this year the presence of *baisurai* was reported for the first time, but it is understood that the weed had been present for many years previously.

The yields of the harvest from 1903 onwards were as follows :—

Years.	Rabi.				Kharif.			
	All crops.	Wheat.	Barley.	Gram.	All crops.	*Jwar.*	Maize.	Cotton.
1903 ...	84	88	94	81	78	75	87	75
1904 ...	94	94	94	94	100	94	87	100
1905 ...	71	62	81	94	82	75	75	94
1906 ...	87	87	94	81	87	62	87	125
1907 ...	92	75	106	106	54	44	50	62
1908 ...	87	87	94	75	92	100	87	81
1909 ...	84	87	81	87	84	81	87	75
1910 ...	106	106	106	106	83	81	87	81
1911 ...	90	87	94	94	...	...	...	...

In 1903 abnormal rain in October caused considerable injury to millets and cotton, but enabled a very large *rabi* area to be sown for 1904. In this year all crops were good, the only drawback being slight injury to maize from excessive rain in August. In 1905 the frost did serious damage to wheat and *arhar* and also affected other crops; its effects were

most serious in the west of the district. The rains began late and were scanty: August was almost rainless, but light falls in September sufficed to save most of the crops and the damage was serious only in the extreme west, the Jumna *khadir* suffering most of all. The rabi area of 1906 was somewhat reduced and the crops suffered from drought in the west of the district but were good elsewhere. There was great scarcity of fodder in the winter of 1905-6, as the growth of grass was unsatisfactory and the usual fodder crops were stunted. The *baisurai* weed was extensively used as fodder, though in ordinary times cattle will not eat it.

The rains of 1906 were heavy and the Jumna *khadir* suffered seriously, but was recompensed by a deposit of fertile silt which ensured a good rabi. In the uplands the crops were good except *juar* which was damaged by strong winds. The winter rains were also above normal and there was severe local damage from hail, while wheat was affected by rust, but the remaining rabi crops of 1907 were good. The rains began only on 25th July and ceased at the end of August, so that the kharif crops suffered severely, and it was noticed that *baisurai* was extending. Rabi sowings for 1908 were made with great difficulty, but rain in January secured good yields except in the case of gram. Extensive suspensions and remissions of revenue were made and advances were given liberally during this season, but no direct measures of relief were found to be necessary.

The rains of 1908 were heavy in August and insufficient in September, but the crops were on the whole good, except in the Jumna *khadir* which was flooded. The ground was too dry for sowing rabi, and a very severe epidemic of malaria which followed the rains interfered seriously with tillage. The rabi area of 1909 was consequently again restricted. The season was favourable until strong winds set in during March, and subsequently the crops on the threshing-floors were damaged by rain in April. The rains of 1909 were heavy in

July when the Jumna *khadir* was again flooded, while they were insufficient in September. The rabi of 1910 was excellent; but the kharif after promising well was injured by excessive rain in September and October which affected the millets and cotton. The Jumna *khadir* again suffered from floods. A large rabi area was sown for 1911, and gave a fair return though injured by excessive rain in March.

Progress.

There has been no material extension of cropping in recent years, and there appears to be little or no room for expansion. The class of cropping has on the whole distinctly deteriorated owing to the decline of indigo: the area under this crop has fallen from over 40,000 to about 2,000 acres, and this has involved a substantial reduction in the wheat area. The place of indigo has ordinarily been taken by cotton, the area under which has risen substantially, and this crop does not serve for the wheat-rotation in the way that indigo served. The area under sugarcane is now extending as is the case throughout the upper doab. The position of other crops shows little change. The practice of sowing certain kharif crops early with canal-irrigation has made a very great advance in the last two decades; about two-fifths of the maize and cotton, and one-sixth of the fodder crops are now sown in this way.

The water-supply of the western side of the district has been injuriously affected by the fall in water-level already mentioned, but against this must be set the construction of the Mat and Hathras branches of the Ganges canal. The number of masonry wells has risen in seven years from 13,730 to 15,591 (one well to 58 acres of cultivation); according to the well-survey there is still room for many more wells, particularly in the western tract and in tahsil Atrauli.

Masonry wells are popular and opposition to their construction was reported from only a few villages (nearly all in

tahsil Khair): but in pargana Mursan there was at the time of the well-survey a deadlock between landholders and cultivators which prevented any extension. The view now taken by the local authorities is that temporary wells are more economical in this area, and this is borne out by the fact that the efforts made to distribute advances have had little result. Engineering difficulties were reported to exist in only about 100 villages of the district (which are specified in the records of the well-survey): elsewhere construction is mainly a question of capital.

The drainage of the district has been very greatly improved and apparently little remains to be done in this direction.

The population of the district rose substantially between 1891 and 1901, but the last decade has seen a slight falling off. The population per square mile of normal cultivated area was 734 in 1891, 844 in 1901, and 820 in 1911. Agricultural wages have shown a slight tendency to rise during the last five years, but in 1911 the rates were distinctly below those prevailing in Bulandshahr.

There has so far been no development of agricultural co-operation in the district, though a few societies exist. The facilities for obtaining government loans appears to be appreciated, as in recent ordinary years sums varying from Rs. 12,000 to Rs. 22,000 have been taken for improvements (almost exclusively masonry wells), and smaller sums for temporary requirements.

The only extension of railways in the last twenty years has been the short broad gauge branch from Hathras junction to Hathras city. About 40 miles of road have been metalled during the same period, and the system of main roads is now exceptionally well developed, but some feeder-roads and some bridges are still required.

Statistics of rents are available since 1903-4, when the revision of settlement closed. Occupancy rents then gave an

average rate of Rs. 5·8 per acre, which rose to Rs. 6 when enhancements were completed, and this rate had not changed up to 1910-11. Competition rents have risen steadily: the average rate was Rs. 7·8 in 1903-4 and Rs. 9·1 in 1910-11.

Seasonal employment has been much reduced by the loss of indigo: sugar-refining is little practised, and indigenous textile industries, though not seriously depressed, have suffered from competition. Among organised industries, ginning and pressing mills have increased largely in numbers, and there are now 23 concerns in the district: cotton-spinning and weaving has been introduced at Hathras, and there has been a considerable development of metal-working, specially lock-making, in Aligarh, where the postal workshops have served as the nucleus of this industry. The government dairy is now a large concern in private hands, and is also finding imitators.

The sums distributed annually by money-order have risen during the last decade from about twelve to about eighteen lakhs. It is understood that a large portion of this income belongs to the city and towns and comparatively little reaches the country.

Dangers and possible remedies or improvements.

1. The area sown with kharif crops depends mainly on the weather during the first month of the season counting from the first heavy fall of rain. An early beginning is an advantage, but large areas are now sown before the rains break, and the most important point is that there should be bright weather with just sufficient rain to enable tillage and sowing to proceed without interruption. If the first month is wet, sowings of dry crops will be delayed and the area will fall, though the loss may be to some extent made good by larger sowings of *bajra*, which can be sown until nearly the end of August. The area under rice is quite unimportant.

The area planted with sugarcane, which is small but increasing, is influenced by the weather in early spring, at

which time rain facilitates tillage: but it is determined mainly by economic causes. One of these is the yields and prices obtained from the crop in recent seasons; the other is the financial position of the cultivators, which depends mainly on the success or failure of the preceding harvests.

The area sown with cotton is affected to some extent by the nature of the sowing season; an early start and a dry season are favourable. The chief factors determining the area are the profit obtained in recent seasons, and the relative prices of cotton and food grains.

2. The yield of maize, the only early dry crop that is grown, depends mainly on the weather during the first two months of the season: alternations of rain and bright weather are desirable, and the yield may be much reduced by excessive rain in the second month.

The late dry crops require the prolongation of the rains to about the middle of September: they may be seriously injured by heavy falls in the end of September or the beginning of October, while they will give very little grain if September is altogether dry.

The district depends too much for its food on the late dry crops, and a substantial extension of maize is desirable.

Sugarcane is apt to suffer seriously at two periods. The first is the end of the hot weather: the crop benefits from an early commencement of the rains and suffers from delay. The second is the end of the rains: a premature cessation is most injurious, and rain in October is beneficial. The crop can stand a considerable excess of rain, but prolonged breaks are likely to cause injury.

Cotton is liable to considerable injury from excessive rain: the most dangerous times are probably just after sowing and again at the end of the season. It can withstand fairly long breaks when once it has made a fair start, and suffers from a dry September less than any other crop.

3. The kharif crops in the Jumna *khadir* suffer from floods during the rains, but there are not grounds for anticipating floods in other parts of the district unless possibly in very exceptional seasons. Serious damage from insect-pests has not been recorded, but should be watched for, particularly in the case of cotton and *juar*. The bollworm (vide Provincial Note, section VI) is believed to exist in the district.

4. The rabi area depends mainly on the rainfall of September and October. It will be reduced when this part of the season is dry, but the fall will not be serious in those parts of the district where canal-water is available for *paleo*-irrigation. The area in the Jumna *khadir* may be reduced if late floods leave the land unfit for sowing.

5. In ordinary seasons, when the seed-bed has been sufficiently moist, the rabi yield does not depend largely on winter rains as the bulk of the crops can be matured with irrigation. Winter rains are however beneficial up to about the middle of February provided the falls are moderate in amount and of short duration. Rain in March or early April may cause some injury, while prolonged periods of damp and cloudy weather between January and March must be expected to produce rust on wheat. The loss may be serious, and its extent may not be fully realised till the crops have been harvested.

When the ground has been dry at sowing time, and sowings have been largely made with irrigation, an early fall of winter rain is of great importance. When there is little winter rain or when falls are delayed, the crops fall off in condition as they ripen, and tend to wither under the strong dry winds which in such seasons must be expected in the spring. It is noteworthy that gram as a rule suffers most in this case: a seed-bed prepared with irrigation is less suitable for it than for the cereals or peas.

6. Frost occurring in the early part of January will do little harm except to the *arhar*. Late frosts may cause

serious injury from about the last week of January onwards.

Hailstorms do not become important until the cereals are earing: the danger from them increases as the season advances.

The rapeseed crop may suffer severely from the aphis if damp and cloudy weather occurs while the plants are in flower.

7. The area sown with *zaid* crops in ordinary years is not large, but it may be trebled or more when unfavourable seasons have reduced the stocks of food. No particular dangers are known to threaten this crop.

8. A series of abnormal seasons of one type may produce certain cumulative effects. After some seasons of deficient rainfall the water-level falls, and the efficiency of temporary wells decreases, while the cost and labour of irrigation are materially enhanced. The lowering of the water-level in the south-west of the district has produced serious results as has been noted above, and the effect of canal-extensions in this area should be watched.

On the other hand a series of wet years may raise the water-level to a point where the productivity of the land declines. This may happen throughout the district but its effects will be most noticeable in the Jumna *khadir* where land will probably go out of cultivation, and where the collection of the revenue will need special attention. The central depression will also require watching in such seasons.

9. Measures of direct relief have not been required in the district in recent droughts, and the conditions in which they may be needed cannot be specified; but the contingency is probably remote. Indirect relief will however probably be required in seasons when the rains have ceased at the beginning of September. The following action was taken in 1907-8:—

Revenue suspended, kharif	...	...	...	1½ lakh.
,, ,, rabi	...	...	...	½ ,,
Improvement loans ...	...	...	...	¾ ,,
Advances for rabi ...	...	...	...	2 lakhs.
,, ,, kharif ...	...	...	...	½ lakh.

Small sums of revenue were also remitted, and about Rs. 5,000 advanced for purchase of fodder.

10. A serious shortage of fodder may occur in seasons when the rains have ceased so early that the large millets wither altogether or are seriously stunted in growth: in this case the only remedy that can be suggested is the importation of grass from the forests and its distribution on the *takavi* system. The demand will depend very largely on the winter rains: if there are none, it may become great outside the canal area, but even light falls bring up enough grass to keep large numbers of cattle going, and the canals enable fodder crops to be raised on a large scale.

A scarcity of fodder does not necessarily occur when the millets yield no grain, as the plants may have grown to a sufficient size to yield fodder; but in such seasons *juar* occasionally becomes poisonous and the loss of cattle due to this cause may be considerable. The poison is formed under the abnormal conditions of growth, and its presence cannot be recognised beforehand except by analytical methods: the only action possible is to provide advances if required to enable cultivators to replace cattle that have died from this cause.

11. The recent extensions of canal-irrigation leave little that can be done, and the further improvement of the water-supply is mainly a question of the construction of wells. Loans should be readily given for this purpose and a boring staff should be maintained to assist in locating sites and also in sinking pipes where the foundation-clay lies deep; it does not appear desirable to press for further well-sinking in pargana Mursan though facilities should be given.

12. There appears to be no need for further drainage works, but possibly some minor improvements will be found necessary when wet seasons recur.

13. To minimise losses from cattle-disease, attention should be given to ensuring the prompt reporting of outbreaks,

and sufficient veterinary staff should be maintained to localise outbreaks when they occur.

14. The supply of agricultural capital appears to be insufficient and for the present at least there is a considerable field for the *takavi*-system. Improvement loans are wanted mainly for masonry wells. Agricultural loans may be required in the following circumstances :—

(*a*) *Early cessation of the rains.*—Considerable sums may be wanted for sowing the rabi, and possibly also for the following kharif ; while if food-stocks are low it may be desirable to offer advances in the spring for sowing *zaid* crops, as well as for planting sugarcane. Advances may also be required to buy fodder.

(*b*) *Floods.*—It may be desirable to give advances to ensure the rabi being sown in areas where the kharif has suffered from floods.

(*c*) *Cattle-disease.*—It is important that cultivators should be in a position to replace working-cattle in time for the next sowing-season.

15. There is at present no effective agency for the introduction of agricultural improvements requiring associated action. It is not likely that the large estates will furnish such an agency in present conditions ; the need may possibly be met by the growth of a co-operative organisation, or of associations for improvement.

There is considerable scope for improving the cropping of the district ; better varieties of cotton, sugarcane and (possibly) wheat are wanted, and in particular there is need of a leguminous crop sufficiently remunerative to take a place in rotation on the better soils ; this need may possibly be met by the groundnut crop. There is undoubtedly room for improved tillage implements in the general agriculture of the district : and probably the control of the *baisurai* weed is largely a question of their use (vide provincial notes, section VIII).

DISTRICT NOTE.

MUTTRA.

Topography.

THE district is divided by the Jumna into two main tracts: the eastern or trans-Jumna tract includes tahsils Mat, Mahaban and Sadabad, and the western or cis-Jumna includes tahsils Kosi and Chhata. Neither tract is altogether homogeneous, but their sub-divisions have not yet been worked out in detail.

In the eastern tract the land along the Jumna consists mainly of ravines with a small area of *tarai* soil below them; but in places there are sandy slopes, and in tahsil Mat some considerable areas of lowland representing abandoned river-beds; the largest of these is known as No-jhil. Beyond the ravines or sandy slopes there are usually irregular sand-ridges passing into the light loam of the uplands; there are also stretches of sand along the Patwaha nala in the north of Mat and the Karwan or Jhirna nala in Sadabad. Heavy soils are very rare in the uplands, and *jhils* or swamps are practically unknown. The *baisurai* weed is well-established in Mahaban and the west of Sadabad.

In the western tract the land along the Jumna is generally similar to that on the left bank, but there is only one large area of lowland. Away from the river the soil is usually a light loam with very little clay. An ill-defined depression runs through the west of the tract past Gobardhan; it is mainly cultivated and does not serve as a drain. In the extreme west there are a few scattered sandstone hills and the land below them is almost pure sand. Heavy soils, marshes, *jhils* and streams are practically unknown. Most of the tract is distinguished by the absence of valuable trees: the mango is very rare, and the *mahua* unknown. The population is concentrated in a small

number of large village sites: the formation of hamlets has been checked partly by historical causes, and partly by the difficulty of finding good drinking-water.

Water-supply.

Until recently the eastern tract depended almost entirely on wells, mainly temporary. About the year 1899 it was found that a serious general fall in the water-level was in progress here as in the adjoining tracts of Aligarh: many wells had been left dry and new construction was in abeyance. The water in many parts, especially of Mahaban and west Sadabad is brackish and unfit for use in tillage, though much of it is suitable for application to growing crops; and the diminished supply of water naturally increased the concentration of salts. The project for the Mat branch of the Ganges canal (which had been commenced as a famine work in 1878 but was subsequently abandoned), was therefore revived; this branch was completed in 1906 and supplies most of Mat and Mahaban, and the west of Sadabad. The portion of this tahsil east of the Karwan river will be served by the Hathras branch, now under construction. The effect of the canal on the supply of water in wells has not yet been ascertained.

Masonry wells have been rarely made of late years. The presence of foundation-clay cannot be relied on, and it is absent in many localities; while it is impossible to say beforehand whether the water obtained will be sweet or brackish. No hostility to well-sinking has been recorded, but in the large communities of landholders it is very difficult for an individual to undertake a well. Temporary wells usually require a somewhat expensive lining and if well made last for considerable periods.

The bulk of the western tract has been supplied with water from the Agra canal sine 1875. The distribution has been greatly improved of late, and additional distributaries are under construction to supply the north-east of Chhata and the west of Muttra. The supply of water is however not always

adequate to meet the demand in seasons of severe drought. Masonry wells are not being made on a large scale: there is no certainty of finding either foundation-clay or water sufficiently sweet to be of service. The distribution of brackish water is very irregular: it is most common in north-west Muttra and south-west Chhata, but brackish wells are found quite close to sweet wells. Experiments have been made in carrying brackish wells down to the next lower spring; in a few cases the quality of the water improved, but in most cases it got worse. Cheap temporary wells are rarely possible, as an expensive lining is usually required.

Drainage.

There appear to be no records of defective drainage in the uplands of the eastern tract, and no complaints have yet been made of obstruction caused by the new canal; but this point should be kept in view if series of wet seasons recur. Difficulties have been experienced in maintaining works constructed by the landholders to keep the flood-water of the Jumna out of the low area known as No-jhil, and a project for complete reclamation is now under discussion.

The drainage of the western tract has presented a very difficult problem. There is naturally very little run-off and when the canal superseded well-irrigation the water-level gradually rose and flood-water collected on the lower ground. A proposal to open an arterial drainage line through the western depression was abandoned on the ground that it must fail in heavy rain, and drains have gradually been cut to the Jumna as the need was experienced. The drains cannot carry off the whole of a heavy flood at once, but they have secured a very great improvement in the tracts which had suffered most from over-saturation: probably more drains are still needed to complete the system.

Cattle-supply.

The district has very little waste land, and the Jumna ravines are used to graze buffaloes rather than cows. In the

western tract some villages have regular grazing-grounds (termed *rakhiya*), which are preserved from cultivation by religious sentiment. The stock of cows is not great, but there is a certain amount of concentration along the Jumna: the quality is good, and suitable bulls are available, but the number of cows appears to have fallen seriously during the recent droughts. Cattle are imported mainly from the west; the great distributing centre is the Kosi market, where the local dealers obtain their supplies, but sales are also made by Punjab dealers passing through the district. The proportion of working-cattle to cultivation is much lower than in any doab district.

The district is liable to outbreaks of rinderpest, foot-and-mouth disease and haemorrhagic septicaemia: there is no active hostility to inoculation for cattle-disease, but the practice is not yet welcomed by the people.

Annals.

The district has a long history of distress in times of drought. Its modern annals may be said to begin with the settlement concluded in 1876, which was made at the close of a prolonged period of prosperity. In 1877 the rains failed almost completely and they were again defective in 1878, so that measures of relief were required until the rains of 1879. There was very heavy mortality from fever, and a large amount of emigration took place, especially from villages along the Jumna, when land went out of cultivation. During the eighties the over-saturation of the western tract developed gradually: while cultivation in the south-west of Muttra retreated before the wild cattle of the Bharatpur State. Revenue was reduced where necessary; the drainage of the western tract was begun, and the Muttra boundary was successfully fenced to keep out the wild cattle.

In the nineties the district was fairly prosperous, except for the famine year 1896-7 when relief measures were required

from December to July; but the drought of 1899 led to the reduction of the rabi area by almost one-half, and it was then that the fall in the water-level of the eastern tract drew serious attention. In 1901 the rains were again deficient, and the kharif was seriously injured in the extreme west of the district, the south of Mat and the north of Mahaban. The year 1902 was favourable: and in this year the Nandgaon distributary, serving the extreme west of the district, was reported to be complete, while the Mat Branch Canal and the Kosi arterial drain were under construction.

The seasonal yields since 1903 are given in the following table:—

Year.	Rabi.				Kharif.		
	All crops.	Wheat.	Barley.	Gram.	All crops.	Juar.	Cotton.
1903	85	100	75	70	80	75	81
1904	94	94	94	87	94	94	94
1905	62	50	50	100	48	25	50
1906	63	75	69	50	94	75	113
1907	89	81	94	94	38	18	50
1908	72	69	81	56	67	62	62
1909	83	81	87	81	76	69	78
1910	83	87	86	80	70	62	69
1911	90	94	94	87	...	...	...

The rabi of 1903 suffered from the want of winter rains, and the kharif was affected first by drought and then by a heavy storm in October. The storm enabled a full rabi area to be sown for 1904 which was a prosperous year. The number of pig were reported to be increasing about this time. In 1905 the exceptional frost of February caused serious injury to the cereals and to minor crops, and plague was exceedingly severe. The rains began late and kharif sowings were restricted, while the falls were quite inadequate throughout the season. The rabi area of 1906 was consequently short, and

much of the unirrigated crop had failed before rain came in February. During these seasons there was distress necessitating measures of relief from January to October. Fodder was exceedingly scarce, so much so that cattle were found to eat the *baisurai* weed; the mortality among cattle was heavy.

The rains of 1906 were more favourable, though the lowlands on the Jumna were flooded, and *juar* was injured by heavy rain at flowering time. The rabi season of 1907 was wet, and wheat suffered from rust and rape from the aphis. The rains of 1907 only lasted five weeks and September was entirely dry. With the aid of very large advances, about two-thirds of the normal rabi area was sown; the yield in many places was poor as there was not enough moisture to withstand the hot winds of March, and there were complaints of inadequate supplies in the canals. Relief works were found necessary in the spring, and relief measures lasted from January to July.

The rains of 1908 were excessive in August and deficient in September. The failure of a dam in Bharatpur during this season led to flooding in the south-west of Muttra. A large rabi area was sown for 1909: it suffered from insects after sowing, and rain in April damaged the crops on the threshing floors. The rains were favourable up to the end of August but deficient in September when hot winds prevailed. The rabi area of 1910 fell off, while the following kharif was short owing to inadequate falls in July, and was seriously injured by heavy rain in October. The Jumna lowlands were flooded.

A review of the recent history of the district made in 1911 indicated that its productivity was declining particularly in the western tract, and that probably inadequate tillage was the cause. This view was supported by the results of the census: the population of the eastern tract had fallen by eight per cent, but that of the western tract was reduced by as much as 19 per cent. in the decade. Orders were then issued for a summary revision of the revenue-assessment.

Progress.

The last two decades have been eventful : on the one side there has been extension of canals, drainage works, railways and roads : on the other the fall of water-level and the serious loss of population and of cattle. With favourable seasons, the loss should gradually be made good and the full value of the gains should then be realised : but at the time of writing it cannot be said that the district has progressed.

The cropped area has for the time fallen off in the western tract, and particularly in Muttra ; it is fairly maintained in the eastern tract, but the variations from year to year are large. The proportion of remunerative crops was rising until 1906 but has fallen since. Indigo, which was at one time important has disappeared and wheat has declined : cotton shows an expansion ; and there is apparently a tendency to cultivate sugarcane following on the construction of the Mat branch canal.

As regards kharif food-supplies, the district still depends almost entirely on the two large millets which require late rains. Maize appears to be extending slowly in the eastern tract, and should develop under the influence of the canal : attempts made to popularise it in the western tract have not as yet met with success.

The last decade has seen a remarkable extension of the practice of sowing certain kharif crops early with the aid of the canal-irrigation. Nearly half of the large area under cotton and one-third of the maize is now sown this way, as well as a substantial portion of fodder-crops.

The condition of the eastern tract in regard to irrigation has been entirely changed in the last few years by the construction of the Mat branch canal : while in the western tract water has been, or is being, carried to areas that were hitherto unsupplied, and extensive improvements have been made in the drainage. The construction of masonry wells is practically at a standstill.

As has already been indicated there has been a fall in population during the last decade, serious in the east and very serious in the west. The population in 1911 was substantially less than in 1881 when the district was seriously depressed, and was 16 per cent below the population returned in 1872. Agricultural wages are rising and in 1911 varied from 2½ to 3 annas daily.

Advances for land-improvement are taken with comparative freedom in ordinary seasons and readily absorbed in times of pressure. Advances for temporary purposes are also popular and large sums are required in seasons of drought. There has so far been no development of co-operation in agriculture.

Communications by rail have greatly improved with the opening of the Agra-Delhi line in 1904 and of the Nagda Muttra line in 1909; there was in 1911 one railway station to 90 square miles as against 240 square miles in 1891.

The metalling of the road from Mat to No-jhil practically completes the requirements of the district in regard to metalled roads, but several of the existing roads need costly improvements.

Occupancy rents have not moved appreciably during the last two decades, the average rate having risen only from Rs. 4-2-0 to Rs. 4-3-0 per acre; a large proportion of the occupancy land in the western tract does not pay rent in the ordinary sense, but only the proportionate amount of the revenue and cesses due on the mahal. Competition rents have risen slowly in recent years; the average rate was Rs. 5-6-0 in 1904-5 and Rs. 6 in 1910-11.

Local industries, principally weaving and paper-making, have declined considerably, and the loss of indigo has involved a reduction in seasonal employment. On the other hand the establishment of ginning and pressing mills has proceeded, especially at Kosi, and these afford a substantial amount of employment.

The sums distributed annually in money-orders have risen in the last decade from about ten to over fourteen lakhs: the sources from which this income is derived have not been ascertained in detail, but some portion represents earnings of employment in Delhi and in Rajputana.

Dangers and possible remedies or improvements.

1. The area sown with kharif crops depends mainly on the weather during the first month of the season counting from the first heavy fall of rain. An early beginning is an advantage, but the most important point is that there should be bright weather with just sufficient rain to enable tillage and sowing to proceed without interruption. If the first month is wet, sowings of dry crops will be delayed and the area will fall, though the loss may be to some extent made good by larger sowings of *bajra*, which can be sown until nearly the end of August. The rice crop is practically unknown.

The area planted with sugarcane which is at present small but tending to expand, is influenced by the weather in early spring, at which time rain facilitates tillage: but it is determined mainly by economic causes. One of these is the yields and prices obtained from the crop in recent seasons; the other is the financial position of the cultivators, which depends mainly on the success or failure of the preceding harvests.

The area sown with cotton is affected to some extent by the nature of the sowing season; an early start and a dry season are favourable. But a large proportion of the area is or can be sown before the rains break, and the chief factors determining the area are the profit obtained in recent seasons, and the relative prices of cotton and food-grains.

2. The yield of the small area under maize, the only early crop, depends mainly on the weather during the first two months of the season: alternations of rain and bright weather are desirable, and the yield may be much reduced by excessive rain in the second month.

The late dry crops which yield almost the whole of the food-supply, require the prolongation of the rains to about the middle of September: they may be seriously injured by heavy falls in the end of September or the beginning of October, while they will give very little grain if September is altogether dry.

Sugarcane is apt to suffer seriously at two periods. The first is the end of the hot weather: the crop benefits from an early commencement of the rains and suffers from delay. The second is the end of the rains: a premature cessation is most injurious, and rain in October is beneficial. The crop can stand a considerable excess of rain but prolonged breaks are likely to cause injury.

Cotton is liable to considerable injury from excessive rain: the most danagerous times are probably just after sowing, and again at the end of the season. It can withstand fairly long breaks when once it has made a fair start, and suffers from a dry September less than any other crop.

3. The kharif crops in the small areas of lowland may be injured by floods in the Jumna, and floods coming from Bharatpur have also been experienced in the south-west of Muttra tahsil.

Serious injury from insect-pests has not been reported but should be watched for, particularly in the case of cotton and juar. The cotton bollworm (vide Provincial Note, section VI) is believed to be present in the district.

4. In spite of the facilities for irrigation, the rabi area fluctuates greatly: a fall of rain early in October leads to a large extension, while the reduction is very marked when September has been dry. The extent of the reduction is explained in part by the fact that large numbers of wells cannot be used for *paleo*-irrigation though their water can be applied to growing crops.

5. In ordinary seasons, when the seed-bed has been sufficiently moist, the yield of the rabi does not depend entirely on winter rains: these are however very beneficial up to the

middle of February (or possibly later), provided the falls are moderate and of short duration. Rain in March or early April will probably do some harm while prolonged periods of damp and cloudy weather between January and March must be expected to produce rust on wheat. The loss from this cause may be very serious and its extent may not be fully recognised till the crops are harvested.

When the ground has been dry at sowing time, and sowings have been largely made with irrigation, an early fall of winter rain is of great importance. When there is little winter rain or when falls are delayed, the crops fall off in condition as they ripen, and tend to wither under the strong dry winds which in such seasons must be expected in the spring. It is noteworthy that gram as a rule suffers most in this case; a seed-bed prepared with irrigation is less suitable for it than for the cereals or peas.

6. Frosts occurring early in January will do little harm except to *arhar*: but at the end of January or early in February the loss may be very great. Frost may also injure the vitality of the seed-canes, and thus affect both the area and the yield of the next sugarcane crop.

Hailstorms do not become important till the cereals are begining to ear: the danger from them increases as the season advances.

The rapeseed crop may suffer severely from the aphis if damp and cloudy weather occurs while the plants are in flower.

7. The area sown with *zaid* crops in ordinary years is very small: it increases when food-stocks are low but has not been an important resource in recent years.

8. A series of abormal seasons of one type may produce certain cumulative effects. After some seasons of deficient rainfall the water-level falls, and the efficiency of temporary wells decreases, while the cost and labour of irrigation are materially enhanced. As has been recorded above the lowering of the water-level may proceed so far as to render the

masonry wells useless in some tracts and it involves an increase of salts in the water, which may make some wells unfit for use.

On the other hand a series of wet years may raise the water-level to a point where the productivity of the land declines. This may happen almost throughout the district, but its effects will be most noticeable in the low-lying portions of the western tract, where the collection of the revenue will require special attention.

9. Distress requiring some measures of direct relief must be anticipated when the rains have ceased by the beginning of September: its severity will be determined largely by the economic position of the people resulting from previous harvests, but the pressure is likely to be greatest in the villages lying along both banks of the Jumna. The following measures were taken in 1907-8:—

Revenue suspended	kharif	...	...	... Rs. 89,000
,, ,,	rabi	...	...	... ,, 87,000
Revenue remitted	kharif	...	...	... 1¾ lakhs
,, ,,	rabi	...	...	... 2¾ ,,
Improvement loans		...	...	... 1 lakh
Advances for	rabi ...	...	...	... ¼ lakhs
,, ,,	fodder	...	...	... ½ lakh
,, ,,	kharif	...	...	... Rs. 15,000

Maximum proportion of population relieved 2·9 per. cent. in February.

10. A serious shortage of fodder may occur in the unirrigated areas in seasons when the rains have ceased so early that the large millets wither altogether or are seriously stunted in growth: in this case advances for the purchase of fodder will be required: ordinarily this can be procured from the irrigated tracts, but in exceptional seasons importation of grass from the forests may become necessary.

A fodder famine does not necessarily occur when the millets yield no grain, as the plants may have grown to a sufficient size to yield fodder; but in such seasons *juar* occasionally becomes poisonous and the loss of cattle due to this cause may

be considerable. The poison is formed under the abnormal conditions of growth, and its presence cannot be recognised beforehand except by analytical methods: the only action possible is to provide advances if required to enable cultivators to replace cattle that have died from this cause.

11. No large measures can be suggested for the improvement of the water-supply, which has received the special attention of the Irrigation department in recent years. Loans should be readily granted for well-sinking, but the conditions are such that pressure to construct wells would not be justified.

12. The western tract should be watched very carefully in wet seasons with a view to detecting any need for additional drains. The areas in the eastern tract which have recently received canal-water also require watching with the same object.

13. To minimise losses from cattle-disease, attention should be paid to ensuring the prompt reporting of outbreaks under the rules laid down in the Land Records Manual, and sufficient veterinary staff should be maintained to localise outbreaks when they occur. Any action that may be possible should also be taken to educate the people through their leaders in the advantages of protective inoculation.

14. The district is not sufficiently provided with agricultural capital, and in the absence of any alternative source of supply there is a wide field for the *takavi*-system. Improvement loans should be readily given for well-sinking or other useful purposes. Agricultural loans will probably be required in the following circumstances:—

(a) *Early cessation of the rains.*—Advances may be required on a very large scale to sow the rabi; and probably further large advances should be offered for the following kharif. Smaller sums may be advantageously given in the spring in villages where sugarcane is grown or where the people wish to sow *zaid* crops.

(*b*) *Floods.*—Advances may be required in the flooded areas to enable the cultivators to sow rabi.

(*c*) *Cattle-disease.*—Advances may be required to enable cultivators to replace their working cattle by the beginning of the next tillage season.

At the present time the district is undoubtedly short of its requirements both in labour and in cattle-power, and loans may be given freely both for cattle and for labour-saving implements and machinery.

15. There is at present no effective agency for the introduction of agricultural improvements requiring associated action.

As regards cropping, there is very wide scope for a better cotton, and improved varieties of sugarcane are probably needed. There is also need for a leguminous crop sufficiently remunerative to find a place in rotation on the better land; and a greater diversity is desirable in the kharif food-crops.

Special attention should be given to introducing machinery and better tillage-implements in the district so as to make the best use of the cattle-power that is available: better tillage implements will probably aid materially in keeping the *baisurai* weed under control.

DISTRICT NOTE.

AGRA.

Topography and Water-supply.

THE district contains four distinct tracts, (1) trans-Jumna, (2) Jumna-Utangan, (3) South Khairagarh, and (4) pargana Bah-Pinahat.

The trans-Jumna tract includes parganas Itmadpur and Firozabad. The course of the Jumna is fairly constant and there is little lowland, but the ravines are extensive. Beyond them there is a stretch of sandy soil, and the rest of the tract is level loam, rather light but usually of great natural fertility.

There is a little canal irrigation in the north of Firozabad: the rest of the tract depends on wells, which however cannot be made in the neighbourhood of the ravines. The wells are rarely of masonry, but are usually protected by a wooden cylinder, and last for several years. The water-level at settlement (about 1877) was in Firozabad usually from 30 to 40 feet: in Itmadpur it was usually 50 to 60 and occasionally as much as 80 feet. The supply in the wells was described as somewhat inadequate and the quality as inferior, though usually good enough for agriculture. Foundation-clay is ordinarily present. The water-level has fallen distinctly during the past 15 years. The rabi area has hitherto fallen after an early cessation of the rains, indicating that difficulty is found in preparing land with irrigation: the area sown is however adequately protected. There is practically no *jhil* or tank-irrigation. This tract will benefit very greatly when the distributaries from the new Hathras branch canal are in working order.

No defects in the drainage of this tract have been reported.

The Jumna-Utangan tract includes the country between these rivers, namely parganas Fatehabad, Agra, and Fatehpur-Sikri, with the north of Khairagarh. There are extensive ravines along the Jumna, and also on the eastern part of the course of the Utangan, but away from these the tract is a level stretch of loam, broken by a shallow depression, known as *dahar*, which serves as a drainage channel for parts of Agra and Fatehabad, and by the Khari nadi, which drains part of the south of the tract.

The water-level in this tract falls steadily from west to east. The tract depends very largely on wells. In Fatehpur-Sikri water is found 20 to 40 feet down, but the subsoil is often such as to make temporary wells impossible, and in many places the water is brackish; it can be used for growing crops, but not in preparing land for sowing as its use at that time prevents the seed from germinating. In Agra water lies at 30 to 40 feet, and temporary wells are usual: here too the water is in some places too salty to be used before sowing. In Fatehabad water is much more distant (from 40 to 60 feet down), but most wells are temporary and the quality of the water is not bad; the supply is, however, inadequate. In the north of Khairagarh the depth to water is from 20 to 40 feet and temporary wells are used. Foundation-clay is ordinarily present. Formerly irrigation from the Agra canal was confined to Agra, Fatehabad and the north of Fatehpur-Sikri; but recent extensions have brought water to the south of of Fatehpur-Sikri and to the north of Khairagarh.

Little damage has been reported from lack of drainage within the tahsil itself, and the affected villages have been drained. There have been occasional floods in the south of Fatehpur-Sikri resulting from vagaries in the upper course of the Utangan, and from the breach of the Ajan embankment in the Bharatpur State. This embankment is several miles

long, and holds up a great quantity of water: a breach therefore causes moving floods, which destroy the kharif. There has been much difference of opinion as to the effect of these floods: they destroy the kharif, but sometimes they enable a large area to be sown with rabi. When not very severe they are probably beneficial on the whole, though not to individuals; but a flood late in the season has been known to delay or even prevent rabi sowings, and in this case its effect is decidedly evil. In 1891 it appeared probable that the water of the Utangan would gradually transfer itself to the Khari nadi and the question was examined by the Irrigation department. Numerous works were carried out in Bharatpur territory with the object of retaining as much of the flood water as possible and the result was to lessen the frequency and diminish the volume of the floods in this tahsil. Further works have been carried out in the last few years.

South Khairagarh.—There is a range of hills along the north of this tract and numerous hills are scattered through it. The soil varies from loam to sand with occasional patches of clay. Water is near the surface, averaging 10 to 20 feet, but the subsoil frequently prevents the making of temporary wells, and wells of stone or brick predominate. Foundation-clay is not usually present: while in 25 villages the wells are sunk into rock, and are shallow with a supply that is often inadequate.

In a few places embankments have been constructed to hold up water for irrigation; in 1883 it was reported that practically all the small works possible had been constructed by landholders with the aid of advances, but a later report indicated that possibly more could be done, and a large number of projects were examined out of which six have been completed.

There appear to be no defects in drainage.

Bah-Pinahat.—This is a long narrow stretch of land between the Chambal on the south and the Utangan and Jumna

on the north. About half the land is occupied by ravines, and the lowland (*kachhar*) is of great importance, especially on the Chambal, the silt of which is very fertile. Between the ravine systems there is a stretch of level upland consisting partly of loam and partly of black soil, similar to the *mar* of Bundelkhand.

Foundation-clay is usually present; temporary wells can be made, and are much more numerous than masonry wells, but irrigation is restricted by the cost of raising water from the great depths at which it is found (60 to 80 feet in the west and 80 to 100 feet in the east of the pargana). There are practically no other sources of irrigation, and the rabi area and yield both fluctuate widely according to the nature of the season; during the last two decades the area has varied from over 55,000 to less than 21,000 acres.

No defects in drainage have been reported; the tract is in fact over-drained, and suffers from denudation.

Cattle-supply.

The number of cows kept in the district is relatively low and their quality inferior: such grazing areas as exist are used mainly by buffaloes. Bulls set aside for breeding are sufficient in number but poor in quality. The working-cattle are largely imported from Gwalior and Rajputana, while much of the inferior young stock produced locally is sold to dealers who take it to the east.

The district is liable to all the common forms of cattle-disease: the practice of preventive inoculation is now welcomed by the people.

Annals.

The current settlement was made at the close of a period of prosperity and was followed by the drought of 1877, and by a disastrous epidemic of fever. The whole district was more or less depressed, but matters were at the time regarded as serious only in Fatehpur-Sikri: here a few villages

were affected by saturation from the canal, while the whole of the country adjoining the Bharatpur territory was ravaged by wild animals, particularly cattle, which fed regularly off the young crops. Emigration took place on a large scale, and land went out of cultivation and became covered with high grass which afforded fresh cover for the animals. The revenue was reduced in 1886, and further reductions were made in 1890; about the same time the saturated villages were drained, and between 1890 and 1892 the whole of the Bharatpur border from the Utangan northwards was protected from wild animals by a wire fence constructed by Government. The remedy was complete, the land came rapidly under cultivation and the revenue has been enhanced, though not to its original figure. The fence has recently been removed as no longer required.

When the first district report was received in 1895 there was no special cause of depression in any part of the district. The seasons about this time were, however, unfavourable here as elsewhere, and the drought of 1896 found the people already impoverished; the kharif in that year yielded less than half of the normal, and distress was sufficiently severe for the district to be classed as a famine district for purpose of relief; the rabi area of 1897 was greatly contracted. The loss was greatest in South Khairagarh, where the rain was particularly short, and temporary wells could not be made; Bah-Pinahat received more rain, but the rabi was very poor. In Fatehpur-Sikri the kharif was fair, but very little rabi could be sown where the water is brackish.

In 1897 the rains were favourable and distress disappeared. In 1899 the rains were excessive first and very deficient later, and the rabi area of 1900 fell considerably below that of 1897; the fall was greatest in Bah, Khairagarh and Fatehpur-Sikri. From 1900 to 1902 the seasons were on the whole favourable, and the kharif area was large, though the early cessation of the rains kept down the rabi area.