

grown; but they do not bring silt of any value. Wells are not generally easy to make, especially in the clay, where they are most needed, and the supply in them is often very inadequate. The Bahgul is dammed in places, but sometimes disputes or other causes prevent the construction of the dams, and then there is apt to be considerable loss from want of water.

(5) The central bhur.—This is an extensive stretch of light soil lying roughly between the Bahgul and Ram Ganga on the south-west and the Garrai on the north-east. It com-

Pargana.	Circle.	Sub circle.	Number of	prises the sub-
Kant .	Kant	. All except	villages.	circles shown
Adding the state of	***	Garrai tarai	174	on the margin,
Jalalabad	Bhur }	Jalalabad town	14	and also, a
Khera Baihers		Rest	59	small portion
Tilbar	Bhur	AJ]	1 118	of Miranpur

Katra ; but the Chauki and Jalalabad town sub-circles differ from the rest of the tract. The soil is generally sandy, varying from light loam to *bhur* ; the surface is flat with undulations in the more sandy places, here and there a few sand hills. As regards irrigation the settlement officer, writing of pargana Kant, says : "The circle requires as much irrigation as it can get. The soil does not require much water, but almost every field requires some, or would be the better for some ; and every field cannot be irrigated. The irrigated area seems to vary with the temporary prosperity or poverty of the people : irrigation involves hired labour, and often more than the *asamis* are able to afford." Water is obtained chiefly from small temporary wells worked by lever, which yield slowly and are soon exhausted. The main crops are bajra and wheat, the latter being of medium quality.

The Chauki sub-circle is an inferior tract and suffers in many places from water-logging. The Jalalabad town subcircle consists of the highly-cultivated villages round the town, and may be classed as stable.



(6) The central clay.—This tract comprises (roughly speaking) the lower doab between the Garra and Garrai, and also a stretch of clay north of the former stream. The sub-

Fargana.		Circle.		Sub-circle.	Nup	ber of	circles	com	pos-
-	H AL	The second second			vill	lages.	ing	ît	are
Jamaur	***	Jamaar .	-	Pasgawan		83	shown	in	the
Kant		Kant		Garrai tarai		48	margi	a.	The
- Bour			i k	GARAGE AND			soil	in	this

tract lies low and consists chiefly of very stiff and hard clay, which cannot be worked when dry and which dries very quickly. It requires much heavier rainfall than the lighter soils of the district, and irrigation for the rabi is essential: any serious deficiency in the rains is therefore disastrons. Wells cannot as a rule be sunk in the clay, but they are possible where the soil is lighter. Though low-lying, the tract does not appear to suffer from excessive rain.

(7) The central loam.—This is a large tract, continuous except where it is pierced by the Khaimua circle of pargana Nigohi (mentioned above). It is composed of the sub-circles

Pargana.	Circle.	Sub-circle. Number of villages.	shown in the margin: those
Shahiahannur	Shakiahannur	Khanaut* 21 Simrai* 16	sub-circles
ShanJananbar	*** Ougujenanpar	C Sukbeta* 17 Rest 139	which require
Jamanr	Jamaur	Pasgawan 44	separate des
Tilhar	Garra tarai	/ 93	mintion
Jalalpur	Garra	82	cription are
Nigogi	non Dumat	1 101	marked with
Baragaon	Baragaon	125	HILVALLOCK HADL
CHARLES AND DE L) Gola*	62	an asterisk : a
Pawayan	Pawayan	56	C 35:
Carlo Carlo Carlo Carlo	Nahil	Central 41	part of Miran

pur Katra may also be classed with this tract. The main tract consists of fairly good loam, on the whole rather light. The cultivation is stable and not liable to any special calamity: temporary wells can be made nearly everywhere. The Garra does not do great harm and its silt is fertilising; the floods on the Khanaut are more violent and do considerable injury to a limited area. This tract



produces a great deal of sugareane as well as other high-class crops. There appears to be little danger of over-saturation apart from the sub-circles marked with an asterisk.

The characteristics of these special sub-circles are as follows :

- (a) The Khanaut valley.—The valley itself is subject to heavy floods in wet seasons, and the kharif is very precarious, while the rabi sowings may bé delayed or even prevented. If the rainfall is light, there is good sugarcane and excellent rabi. The slapes are poor sandy loam which gives indifferent crops.
- (b) The Sukheta valley.—The soil along this stream is heavy and bad, and liable to suffer from waterlogging in wet years. Drought has also serious results as the soil dries quickly. The climate is bad and tenants are hard to keep.
- (c) The Simrai .jhil.—This resembles on the whole Sukheta valley : it is a natural depression with heavy soil that goes out of cultivation in wet years.
- (d) The Gola circle.—This lies on the Khanaut stream, and consists mostly of rather poor loam: irrigation is not plentiful and temporary wells can only be made in the west of the loam (or roughly rather less than one half of the tract). The Khanaut does a good deal of injury to the villages adjoining it.

(8) The northern bhur.-This tract is made up of the

Pargana.	Circle.		Sub-circle.	Number of villages.	sub-circles
	Nahil	•**	{ Khanant Jungle	25 19	margin, but is
Pawayan	Samwat		Khanaut Bhainsi	33 56	not entirely
	Tareoua		Gumti Benda Gularia	25 45 26	homogeneous. The soil is
Khutar	Wiran		Jhukua	88	generally light



and sandy, with a good deal of inferior *bhur*. Population is scanty, and irrigation is greatly deficient, though wells can be made here and there except in the worst villages. The tract deteriorates towards the north where the climate is worse, the drinking water is bad and the people are very poor. The following is a brief description of the special features of the different sub-circles :--

Nahil-Khanaut.-There is very little good land and irrigation is not plentiful though some water can be had in most villages.

Nahil-Jungle.—This circle, which lies in two blocks, is somewhat superior to the average of the tract, but there is much jungle, and the crops suffer from wild animals, while there is waterlogging in parts.

Samwat-Khanaut .-- This is about the average of the tract.

Samwat-Bhainsı.—The soil is very inferior: wells are difficult to dig and yield badly. The drinking water is exceedingly bad and the people suffer from fever and other diseases: they are wretchedly poor.

Tareona-Gumti.—This resembles Bhainsi except that it is not specially unhealthy.

Tareona-Banda. This is somewhat above the average as cultivation is very stable and there is good irrigation.

Tareona-Gularia. This is fairly good country : wells are generally possible, and the cultivation is stable.

Wiran-Jhukua.—This is a wilderness of jungle and bhur lying on the left bank of the Gumti. The soil is wretched, irrigation is very scanty, wild animals do much harm, the drinking water is bad and the villages are liable to be almost depopulated by disease : consequently cultivation is fluctuating and precarious, carried on largely by tenants who live a long distance off.

(9) The northern loam.—This tract includes most of pargana Khutar, the most northerly in the district, and is composed of the sub-circles shown on the margin. The two portions of

Circle.	Sub-circla.	Number of villages.
Abad	Southern	 52 18
Wiran	(Chandpur	 87 62

the Abad circle (which are not contiguous) are on the whole generally similar: the soil is fairly good loam, and is well cultivated by a dense popula-

tion. Temporary wells are generally possible, the northern block being slightly inferior in this respect. The Chandpur sub-circle is an extension of the Northern Abad sub-circle into what was formerly forest, and resembles it generally.

Most of the forest sub-circle is uncultivated : the climate is unhealthy : the soil is uniform loam of fair quality, but its value depends on its distance from the forest and comparative immunity from wild animals. Drought is not a serious danger as the climate is so moist that irrigation is hardly needed.

Water-supply.

The conditions of the different tracts in regard to watersupply have been noted above. There is a considerable amount of irrigation from rivers and jhils, but the chief source is the temporary percolation-well. The villages where these can be readily made have been recorded in the well-survey : about 130 villages have been noted (mostly in pargana Nigohi, Tilhar, Jalalpur and Khera Bajhera) where masonry wells are believed to be possible and should be constructed; there are also numerous villages in the northern pargana, where masonry wells would be useful but cannot be made owing to the absence of foundation-clay. The number of masonry wells in the district is very small, and nearly half of them are in the single pargana of Shahjahanpur : the people are not interested in the matter, and local information as to the presence or absence of foundation-clay is probably much less trustworthy than in the doab or South Oudh.

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Cattle-supply.

In the three southern tahsils the stock of cows is proportionately very low and the quality poor. A few superior workingcattle are imported from the Punjab and Rajputana, but the bulk of the imports come from Pilibhit, Kheri and Sitapur. Tahsil Pawayan contains a considerable breeding industry. There are some large herds, the owners of which take much care in providing suitable bulls. The cows are mainly of the Ganjarhi type, which is closely allied to the Kheri breeds but somewhat inferior to them : the bulls are either of the same type, carefully chosen for quality, or else Khairigarh or Parehar. Most of the large herds graze either in Nepal or in the Pilibhit jungles for the greater part of the year, but use the local jungles during the rains. Apart from the large herds, the stock of cows in the north of the tahsil is very large : the quality is inferior to those of the large herds and the breed more mixed. Suitable bulls for breeding are very scarce, The cows are usually grazed in the local jungles : at present there is no complaint of scarcity of pasture, but cultivation is extending, and it is possible that the small owners may find it difficult to maintain their stock in the near future.

The district is liable to all the common forms of cattledisease. The attitude of the people towards the practice of inoculation is at present one of indifference.

Annals.

The district has a record of severe distress from drought in 1303, 1837 and 1877: the injurious effects of the last continued for several years. The first report received from the district relates to 1894-5, the last and wettest of the series of wet years. In that year the Ganges and Bankati tracts, and the Ram Ganga *tarai* suffered from excessive floods, the whole country being described as one expanse of water, and both kharif and rabi were very seriously injured. In 1895 the Bankati and the central clay suffered severely from deficient rain: and the two northern tracts were affected by the



same cause, as the kharif was only half a crop and the absence of winter rain caused the small rabi area of 1896 to be very poor. Test works were opened in Pawayan in May and attracted labour until August.

The rains of 1896 ceased prematurely in August and the kharif yielded less than half the normal outturn, while the ground was too dry for sowing until rain fell in November. The rabi of 1897 was poor, especially in tahsil Pawayan, the Bankati and the elay tracts. Distress was severe in these seasons: relief works attracted large numbers of labourers from October to March, but the numbers fell rapidly at harvest and did not increase seriously afterwards. Gratuitous relief continued until October.

In 1897 the Ram Ganga *tarai* suffered from exceptional floods. In the following year no injury was reported, but in 1899 the early cessation of the rains caused serious injury to the rice in the clay tracts, the outturn being only about five annas: the rabi area of 1900 also fell off, but the produce was good. The next year was prosperous; but in 1902 the yearly cessation of the rains again injured the kharif in the Bankati tract.

West of			Rabi.				Kharif.			
Yen		All orops.	Wheat.	Barley.	Gram.	All crops.	Rice.	Bajra.	Sugareane.	
1903		75	75	81	69	61	62	62	75	
1904		85	87	87	85	81	84	84	87	
1905		63	62	70	75	82	75	94	69	
1906	4++	80	81	81	75	110	119	116	100	
1907		67	56	87	81	34	25	48	45	
1908		81	87	.94	50	79	56	100	62	
1909	1000	47	44	62	37	85	75	100	81	
1910		95	94	94	100	94	100	87	94	
1911	ANOTA DA	113	106	122	125	Conserve a				

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

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The winter rains of 1903 were deficient and some injury was caused by strong winds : the area irrigated from wells in this year was remarkably high. The monsoon was a month late and the kharif area was seriously reduced while sugarcane suffered: heavy rain in October caused severe injury. A full rabi was sown for 1904, when the winter rains were light. The rains of this year were on the whole favourable, but were not sufficient in September, and the rabi of 1905 was somewhat reduced in area. The exceptional frosts in the spring caused serious injury, chiefly in the bhur tracts and river valleys. The rains of this year were delayed, and sugarcane suffered: there was some anxiety, which was relieved by rain at the end of September. The rabi area of 1906 was again contracted and the crops suffered from lack of moisture until good rain fell in February. The monsoon of this year was excellent, securing very fine kharif crops and a full rabi area for 1907 : this crop however suffered from drought in January and excessive rain in February and March, leading to severe rust on wheat.

The monsoon of 1907 lasted from 20th July to the end of August, in the interval there were heavy falls, unequally distributed. The clay and Bankati tracts suffered very severely: the central *bhur*, where the rain was heavy, gave fair crops and was fit to sow with rabi. The rabi area of 1908 was however seriously contracted in the greater part of the district, and the crops were weak owing to want of moisture in the early stages. Distress was not serious during these seasons, and it was noticed that the resisting-power of the people was very much greater than in the previous famine. gratuitous relief was given from January to June and a small amount of employment provided on aided works. Fodder was very scarce in the Bankati tract, where hay imported from the forests proved very valuable.

The rains of 1908 were favourable until the end of August, but deficient in September. Rice suffered severely



and also sugarcane which had already been affected by drought in spring. The ground was dry when seed-time came for the rabi of 1909, and the very severe outbreak of malaria hampered field-work so that the area sown was again very low. Winter rains were very deficient and the crops suffered throughout from lack of moisture, as well as from hail in February and heavy storms at harvest-time. The report for this year mentioned that new settlers were arriving along the Gumti.

The rains of 1909 were on the whole heavy and there were severe floods in the lowlands : but a break in August lasted long enough to injure the rice-crop. The rabi area of 1910 showed a substantial increase though it was not up to the standard : the season was favourable as was the following kharif, though in this case juar was injured by borers. The rabi of 1911 was sown on a very large area as the result of heavy rain in October and yielded excellently : wheat was inferior to other crops owing to a slight outbreak of rust.

Progress.

The cropped area shows some expansion in the last two decades, mainly in the northern tracts where new land has been cleared: the figures show an extension in the centre also but this is rather a recovery as cultivation had fallen off. The proportion of the area devoted to remunerative crops rose sharply during the period covered by the settlement proceedings, but has remained approximately constant for the last decade. The great increase was in wheat: sugarcane has fallen off substantially, and cotton (which is little grown) has not expanded. Poppy extended until 1907, but is now being reduced: potatoes have become of some importance.

The resources of the district in regard to irrigation have not increased materially. The number of masonry wells has increased by 64 per cent. since 1905, but is still almost negligible, there being only one such well to 666 acres of normal cultivation : and there are few signs of their construction



becoming popular. On the other hand there appears to have been a distinct advance in the recognition of the possibilities of temporary wells, and of the need for very liberal provision of capital for this purpose.

The population rose very slightly between 1891 and 1901 and more rapidly in the last decade ; in 1911 it stood at 946,000 as against 919,000 in 1891.

Rural wages have risen somewhat in the last five years; in 1911 the rates recorded lay between 2 and 21 annas.

As might be expected from the conditions of irrigation, loans for land-improvement were practically never taken until 1907-8. A large sum was given in that year, but the demand has not been maintained. Advances for temporary needs were also formerly little taken, but in the same year very large sums were given with advantage. There has as yet been no development of agricultural co-operation in the district.

The last two decades have seen the opening of the Pawayan steam tramway, the narrow gauge line from Shahjahanpur to Pilibhit, and the broad gauge line to Sitapur. When the sanctioned line from Tilhar to Budaun is opened the railway-system of the district will be practically complete. There has been no material extension of metalled roads in the same period: the chief need of the district appears to be for bridges.

The level of rents in the district is low. The rents of occupancy tenants recorded after the settlement in 1902 gave a rate of Rs. 3.5 per acre, and this has remained substantially unchanged. The average rate on other classes of land has risen in the same period from Rs. 3.5 to Rs. 4.0.

Local industries show a decline. Sugar-refining and weaving have been affected by competition, and the disappearance of indigo has involved the loss of some seasonal employment. Organised industry is represented only by the sugar factory and distillery at Rosa.



Judged by the statistics of money-orders paid, the district does not depend largely on external sources of income. The sums distributed about the year 1898 averaged about 6 lakhs annually: the present figure is about $8\frac{1}{2}$ lakhs.

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 reduced and rice will extend unless the rain is almost continuous; while bajra will be sown later on if the weather clears.

The area under late rice depends to some extent on the same factor: if early rice has been contracted late rice will extend provided the weather in the second month is suitable. Frequent falls of rain with little sunshine produce an extension: and a long break at this time will reduce the area materially.

The area planted with sugarcane is influenced by the weather in February and March, 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; another is the financial position of the cultivators, which depends mainly on the success or failure of the preceding harvests; while in those localities where manufacturers give advances the views of the manufacturers as to the future are the controlling factor.

The small 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 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 early rice requires more and later 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 rainsalmost to the end 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 late rice requires more rain in September than is suitable for the dry crops, and at least one fall in October is desirable for its complete success.

The district relies too much for its food-supply on the prolongation of the rains through September; the early dry crops are sown on a very small proportion of the area, and an extension of maize is desirable. The area under this crop fluctuates widely but is probably on the whole expanding.

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. Apart from variations in the rainfall, the kharif is exposed to the following dangers :---

(a) Floods.—These may cause serious injury in the Ganges, Bankati, Ram Ganga and Bahgul tracts

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as well as in certain areas of the central loam enumerated in the section dealing with topography.

(b) Insect pests.—Both sugarcane and juar are liable to injury by boring-insects (vide Provincial Note, section VI). Other pests have not been recorded, but they should be watched for.

4. The rabi area depends mainly on the rainfall of September and early October. Good rain in the latter period brings the area substantially above the normal, while drought in September involves a large reduction.

In the tracts liable to flooding, the rabi area may be largely reduced if the floods occur late and leave the ground too wet for sowing.

5. Winter rains are very important for the rabi yield. They are beneficial up to about the middle of February (or later in the north), provided the falls are moderate and of short duration: rain late in the season will probably do some harm, while prolonged periods of damp and cloudy weather between January and March must be expected to result in rust on wheat and linseed. The loss from this cause may be serious, and its extent may not be fully realised 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. Frost occurring early in January does little harm except to arhar and possibly potatoes. Late frosts may injure the staple crops very severely; probably the danger is greatest



in early February. Severe frosts may injure the vitality of the sugarcane reserved for seed.

Hailstorms early in the seasons are unimportant: the risk becomes serious when the crops are forming ears and 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.

The poppy crop may suffer serious injury from damp and cloudy weather late in the season.

The potato-crop may be infected with the potato moth, and vigorous action is desirable if this occurs (vide Provincial Note, section VI).

Whiteants occasionally do considerable harm to the young crops in the lighter soil when the seed-bed has been dry.

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

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 valleys of the larger rivers and in the lower parts of the central loam. The same process must be expected to lead to increased unhealthiness in the north of the district.

9. Distress requiring some measures of relief must be expected to occur in seasons when the rains have coased at the beginning of September : probably the central loam



and *bhur* will suffer least. The following measures were taken in 1907-8 when distress was slight.

Revenue suspended, kharif	-	***	2 lakhe.
n n rabi		ANT SAME ON STR	1 lakh.
" remitted, kharif	***	A State Salling	··· 8 - ···
", " rabi		*** -	nil.
Improvement loans			1
Advances for rabi			4 lakhs.
kharif	Sufficiency and the second	AND	1 Jakh.

Maximum proportion of population relieved 0.5 per cent. in February.

10. A serious shortage of fodder may occur in the Bankati and possibly in other parts of the south of the district in seasons when the rains have ceased so early that the crops wither altogether; in this case the only remedy that can be suggested is the importation of grass from the Pilibhit forests and its distribution on the takari-system. The demand will depend very largely on the winter rains : if there are none, it may become considerable, but even light falls bring up enough grass to keep large numbers of cattle going.

A fodder-famine does not necessarily occur when the large 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 enable cultivators to replace cattle that have died from this cause.

11. The improvement of the water-supply is not easy, and apparently no general measures are possible at present.

Loans for masonry wells should be given when required, and a boring-staff should be maintained to assist in locating sites. Should a practicable form of percolation-well be devised arrangements should be made for the construction of a sufficient number to serve as demonstrations.



There is probably scope for the introduction of powerpumps on the minor streams.

12. There is at present no demand for drainage works, but a series of wet seasons may result in complaints from the areas in the central loam and northern *bhur* enumerated in the section dealing with topography.

13. To maintain the breeding-industry, it is desirable that any action authorised by Government may be taken to preserve the existing grazing-grounds in the north of the district, and to improve the supply of bulls in the same region. Special care is also required to minimise losses from cattledisease in this tract: the system of reporting outbreaks prescribed in the Land Records Manual should be strictly enforced, and the veterinary staff should be sufficient to localise outbreaks where they occur.

14. The district is not rich in agricultural capital: the supply furnished by the sugar-manufacturers is important, but it costs too much: and in the north the people are often very poor. Pending the possible development of a co-operative organisation, there is a considerable field for the *takavi*-system. Improvement loans should be given when required for masonry wells, or other valuable works: agricultural loans may be required in the following cases:--

- (a) Early cessation of the rains—The demand for loans to sow the rabi may be very great, and special efforts will be required for rapid distribution; there may be a further demand for the following kharif, while money may be wanted about February to plant sugarcane, and possibly to sow zaid crops.
- (b) Floods.-Advances may be required in the flooded areas to enable cultivators to sow rabi.
- (c) Cattle-disease.-It is important that cultivators should be in a position to replace working-cattle by the beginning of the next tillage-season.



(d) Curtailment of the poppy area.—It may be desirable to offer advances in villages where the crop has been largely grown to enable cultivators to substitute some other remunerative crop.

15. There is at present no agency to carry out agriculaural improvements requiring associated action, nor can such an agency be suggested other than a co-operative organisation. The cropping of the district requires examination before definite suggestions can be made for its improvement; an extension of maize is desirable as a protection, and probably better varieties of sugarcane can be found for some localities. There is not much scope at present for expensive machinery other than pumping-plant, but improved tillage-implements should be gradually adopted, while special attention is required to the question of improving the efficiency of cane-mills.



DISTRICT NOTE.

PILIBHIT.

Topography.

The district is not homogeneous, and Puranpur has little in common with the other two tabsils. On the extreme north-east is the Sarda tract, a strip of lowland traversed by the Sarda and the Chauka. Much of the land is liable to injury by changes in the course of the rivers : it is very unhealthy and sparsely populated, while the soil is inferior, and most of the cultivation is carried on by non-resident tenants. This tract is separated from the rest of the tabsil by a belt of reserved forest, which runs along the high bank bordering the lowlands on the west, and at its northern end joins the Mala forest belt.

Between the two forests lies the upland tract of Puranpur. The portions adjoining the forests are mostly poor sandy soil with a somewhat unstable population, and the crops suffer greatly from wild animals. Southwards and away from the forests the soil is richer and cultivation is more stable.

The belt of forest along the Mala separates Puranpur from Pilibhit, and extends into the north-east of tahsil Bisalpur. The villages on its western side in Pilibhit resemble those on the east, with poor soil, bad climate, and much injury caused by animals.

The rest of the district shows the gradual transition from the *tarai* to the ordinary conditions of Rohilkhand. In the north of tahsil Pilibhit, there is much clay with numerous swamps, and wide stretches of grazing-land: going south the soil gets lighter, cultivation becomes more general, and



improves in quality, and the population gets denser. The upland is broken by numerous streams flowing south from the *tarai*. The Decha has a wide valley with lowlands of very uncertain value owing to the varying nature of the silt deposit: on the other streams the lowlands are of much less importance.

Water-supply.

In Puranpur there is very little irrigation from streams or *jhils*, and there are only sixty-two masonry wells available for irrigation in the whole tahsil. The only important source of irrigation is the temporary percolation-wells: these wells can be made in about two-thirds of the villages of the tahsil, but they are ordinarily impossible in the villages near the forests, which are practically unprotected.

The villages on the north and east of pargana Pilibhit are almost equally unprotected: but in the south of that pargana and in almost the whole of Bisalpur, temporary wells can be made, and much irrigation is done from rivers and *jhils*. Pargana Jahanabad, which lies west of the Deoha, depends on a system of canals which is supplemented by irrigation from the rivers: temporary wells are possible in most of the southern half of the pargana, but they are little needed even in seasons of drought.

In the well-survey 347 villages were enumerated in the district as being inadequately protected and requiring masonry wells if these can be made. Only two of these lie in Bisalpur: 133 are in Puranpur and 212 in Pilibhit. There are exceedingly few masonry wells in these tabsils and the number is increasing very slowly: there is thus no accurate local knowledge as to the presence of foundation-clay, and well-sinking cannot be recommended without a trial-boring to determine if it exists. Borings made recently at the request of landholders have disclosed its existence in about one trial out of two.

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Pilibhit.

Drainage.

The natural drainage of the upland is generally adequate, except in the swamps of the *tarai* and the Mala, and along the upper course of the Khanaut. The river lowlands, and especially the Sarda tract, are necessarily subject to injury from floods.

Cattle-supply.

Tahsil Bisalpur imports a proportion of its working cattle, but the other two tahsils are self-supporting, and Puranpur produces a large surplus for export. The cows are mostly either Panwar, or intermediate between Panwar and Parchar. There are many large herds, the owners of which take great care to provide suitable bulls : most of these herds graze in Nepal for the greater part of the year; the remainder graze in the local jungles. The stock owned in small herds in Puranpur is collectively very large : the cows are of the same type as in the large herds but generally of somewhat inferior quality. The small herds are usually united into larger herds and taken to one of the local forests for grazing from about October to June: they depend on wild bulls which join the herds in the forest. Cows kept in the villages have not as a rule suitable bulls : sacred bulls are very rare throughout the district. The surplus stock is sold to dealers and distributed mainly to Oudh and the eastern districts as far as Gorakhpur.

The district is liable to all the common forms of cattledisease, but there has been very little rinderpest in recent years. The attitude of the people towards the practice of inoculation is at the present time one of indifference: the practice would probably become popular in the first serious outbreak of rinderpest.

Annals.

The early economic history of the district is included in that of Bareilly of which it formed a part. Shortly after the



settlement of 1870 cultivation fell off in the precarious parts of Pilibhit and Puranpur, and the deterioration was increased by the drought of 1877. In that year the district (except part of Bisalpur) did not suffer severe distress, but the bad crops led to abandonment of holdings. Enquiries made about 1880 showed that large areas had gone out of cultivation in Puranpur and the north of Pilibhit, and also in the villages along the Mala in that tahsil. Revenue was in many cases reduced as the results of these enquiries, and in some villages a system of annual assessments was introduced.

Conditions improved until about 1892 when the cultivated area was substantially higher than at settlement. The rains of 1894 were excessive, and with heavy rain in the winter the following rabi was very poor. In 1895 the rains were deficient and ceased early, and the rice crop suffered severely, while a very small rabi area was sown for 1896. The produce was inferior especially in Puranpur, where large numbers of cattle died during the year. Relief was given during this season, but the distress was less severe than had been anticipated.

The rains of 1896 terminated in August, and the late dry crops were very poor while the yield of rice was bad. The rabi area of 1897 fell further owing to the drought, but it yielded well. Distress prevailed throughout the district during this year, especially in Puranpur, and relief was given until the rains of 1897. The following seasons were favourable and the cultivated area recovered steadily. In 1899 the early cessation of the rains involved serious injury to rice. In 1900 rice suffered from insufficient rain early in the season but other crops were fair: the following rabi suffered from rain and strong winds, but the rains of 1901 and 1902 were fairly satisfactory. The seasonal yields since 1903 are given in the following table :—

1



			Rabi.				Kharif.			
	Year.		All orops.	Wheat.	Barley.	Grøm.	All crops.	Rice.	Sugaroane.	
				1			Charles.	Line M	150.00	
1903				81	85	81	76	75	87	
1904			72	81	善75	56	94	87	100	
1905		49.8	74	75	80	81	79	75	87	
1906			88	87	95	87	98	100	87	
1907		194	77	75	85	87	31	20	50	
1908			72	81	94	37	90	81	87	
1909			88	87	94	87	95	97	1 97	
1910	10 1 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-	106	106	106	106	84	81	85	
1911		tax	92	81	106	100				

* Figures not available.

The winter rains were deficient in 1903, and the monsoon was late, while heavy falls in October injured all the late kharif crops. A large rabi was sown for 1904, but was not very successful: the germination of gram in particular was very defective owing apparently to excessive moisture. The following rains were good, and secured a full rabi area for 1905. The exceptional frost of this year did some damage, especially in the south of Bisalpur, and wheat was also affected by rust. Large numbers of cattle died from exposure to cold and wet.

The rains of 1905 were inadequate and there was some anxiety until good falls were received in the second half of September. The rabi area of 1906 was however somewhat curtailed, but the yield was on the whole satisfactory. The following rains were good : but the rabi of 1907 suffered from excess of rain, and locally from hailstorms, and wheat was somewhat seriously attacked by rust. The rains of this year lasted only for about five weeks, and the drought in September involved serious loss of crops and the reduction of the rabi area of 1908 by two-fifths : the rabi suffered throughout from

lack of moisture, and gram was very poor. The resistingpower of the people during these seasons caused some surprise: gratuitous relief was given from January to June, but no relief works of any kind were required; the collection of grass in the forests for export to other districts provided a large amount of employment.

The rains of 1908 were satisfactory up to the end of August, but insufficient in September, and the late kharif crops, especially rice, suffered some injury : sugarcane was very poor owing mainly to the dryness of the first half of the year. The drought of September, together with a very severe outbreak of malaria, reduced the rabi area of 1909 : the yield was satisfactory though somewhat reduced by high winds in March and heavy rain in April. The rains of this year were favourable, and the district benefited in particular by a good crop of sugarcane and by high prices for the produce. A full rabi area was sown for 1910 and with favourable winter rains vielded exceptionally well. The monsoon rains of this year were deficient in July and excessive at the end of the season, but the excess secured for 1911 the largest rabi area of tha last two decades. Excessive rain and damp induced rust on wheat and there was local damage from hail, but the yield on the whole was satisfactory.

Progress.

The last two decades have seen a fall and a recovery in the area cropped, which reached a maximum in 1906-7. The low rabi area of the two following years involved a temporary fall which was almost made good in 1910-11. For the whole period, Bisalpur and Puranpur show slight extensions, and Pilibhit a slight decline. The proportion of land devoted to remunerative crops has not extended materially : wheat has increased, but shere has been a substantial fall in sugarcane. Cotton is little grown and has not increased : hemp came into



some importance in the last decade and a considerable trade was developed with Bombay, but the area has not been maintained of late years.

There has been no improvement in the water-supply beyond the remodelling of some of the canals in pargana Jahanabad: very few masonry wells have been made, and in 1911 there was only one such well to 611 acres of normal cultivation. There has however been a distinct development of the practice of sinking temporary wells when needed: thus in the famine year 1896-7, the area irrigated from these sources was below 40,000 acres, but in 1905-6 there were over 62,000 acres, in 1907-8 nearly 69,000, and in 1908-9 over 72,000 acres.

The population decreased slightly between 1891 and 1901, but the loss has been made good in the last decade: in 1911 it stood at 488,000 as against 485,000 in 1891.

Bural wages have probably risen on the whole in the last five years owing to the establishment of higher rates in particular localities; in 1911 the rates recorded lay between 13 and 23 annas.

Loans are practically never taken for land-improvement: in 1909-10 over Rs. 3,600 were advanced in the hope of getting some masonry wells started, but nothing was advanced in the following year. Loans for temporary purposes are not taken in ordinary seasons, but in 1907-8 over two lakhs were distributed; and there can be no doubt that leans on at least this scale will be wanted in the next drought. There has been no marked development of agricultural co-operation in this district: in 1911 two rural credit societies were at work, and an early extension was contemplated.

The district is now well provided with railway facilities. The Lucknow-Bareilly line was completed through the district in 1891, and the Pilibhit-Shahjahanpur line in 1911, while the line north to Tanakpur is almost finished. Metalled

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roads and bridges are much needed, and in this respect little progress has been made though a programme has been drawn up.

The recent movement in rents has been very slight. When revised records were completed in 1903-4, the rents of recorded occupancy tenants gave a rate of Rs. 4.3, and this has not varied since. Other tenant's rent gave a rate as low as Rs. 3.3, and this has risen only to Rs. 3.5.

Among indigenous industries there has been a decline in sugar-manufacture, and in weaving, but carpentry and cartbuilding are carried on at Pilibhit on a considerable scale. The only development of large industries is the recent establishment of a factory for making sugar direct from cane. A rice-mill was started some years ago with promising prospects but has been closed down owing to quarrels among the shareholders.

The district derives only a small income from external sources: about 2½ lakhs annually is now distributed by moneyorder, which is more than double the amount 14 years ago.

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 reduced but rice will extend; while if it is too dry for rice the total area is likely to fall though there may be an extension of bajra.

The area under late rice varies very widely with the season. It requires frequent falls of rain with little sunshine during the second month, and a long break at this period reduces the area substantially.

Pilibhil.

The area planted with sugarcane is influenced by the weather in February and March, 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, another is the view of the season taken by manufacturers, who under the system of advances in vogue take an important part in deciding on the area to be sown.

2. The yield of the early dry crops which occupy only a small proportion of the area, 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 early rice, the chief staple, requires more and later 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.

The late rice requires more rain in September than is suitable for the dry crops, and at least one fall in October is desirable for its complete success.

The district at present relies too much on rice and bajra for its food-supplies, and an extension of the area under maize is much to be desired : apparently there is at present a tendency to extend this crop.

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.

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3. Apart from variations in the rainfall few dangers to the kharif crops have hitherto been reported. Injury may result from floods in the Sarda tract and the valley of the Deoha. Serious injury from insect-pests has not been reported, but should be watched for, especially in the case of sugarcane.

4. The area under rabi crops fluctuates widely with the amount of rain in September and early October. It may fall by almost one-half if this period is dry, and rises largely after good rain in early October.

5. Winter rains up to February are highly beneficial to the rabi in all seasons, provided the falls are moderate and of short duration. Rain late in the season will probably cause some injury, while prolonged periods of wet and cloudy weather between January and March must be expected to produce rust on wheat and linseed. The injury from this cause may be serious, and its extent may not be fully realised 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. Frost occurring early in January does little harm except to the arhar. Late frosts must be expected to cause serious injury especially to cereals; that which happened in the first days of February 1905 was injurious only in the extreme south, and probably a week or ten days later is the most dangerous period.

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Hailstorms early in the season are not important : the danger increases as the season advances.

The rapeseed crop must be expected to suffer seriously from the aphis if damp and cloudy weather occurs while the plants are in flower.

7. The area sown with *said* crops is unimportant in ordinary seasons, and does not extend considerably when food stocks have been 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.

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 Sarda tract and along the north and east of Pilibhit, where the rise in water-level will affect the climate injuriously, and land will probably go out of cultivation.

Another process which may have cumulative effects is an increase of predatory animals in the forests. Should complaints of injury increase, or should land along the forests - begin to go out of cultivation, the question of restoring the balance of life should be taken up in conjunction with the officers of the forest department.

9. Distress requiring some measures of relief must be expected to occur in seasons where the rains have ceased by the beginning of September. Its incidence will depend largely on the condition of the people as determined by previous harvests, but Puranpur and the north and east of Pilibhit are most likely to be affected. The following measures were taken in 1907-8, when distress was very slight.

August Collegie ren	hitted, khar	ie 👘		 ,, 8	12,000
10 10	,, rabi			 	4,000
mprovemen	t loans			 	1,000
Advances fo	r rabi	• • • •	408	 13	lakhs.
23 93	kharif	WITTER CONT		 4	lakh.

Maximum proportion of population relieved 0.1 per cent in March.

10. Experience does not indicate conditions in which the shortage of fodder may become so serious as to require Government action. The risk is probably present to some extent in tahsil Bisalpur: should action become necessary the transport of grass from the Government forests is apparently the most suitable measure.

11. It does not seem possible to suggest any large measures for improving the water-supply of the district. Loans for masonry wells should be given when asked for, and facilities provided for making trial-borings, but the construction of masonry wells should not be pressed on the people. If however a practicable form of percolation-well should be designed, arrangements should be made for the construction of a sufficient number to serve as demonstrations.

12. There is at present no demand for drainage works, and the appearance of a demand appears to be improbable.

13. To minimise losses from cattle-disease, it is of special importance in this district to secure early reports of outbreaks. This is provided for so far as the villages are conterned by the rules in the Land Records Manual, which require to be strictly enforced : but the patwaris are not likely to hear of outbreaks in the forests, and it seems desirable that to veterinary assistant should remain in close personal touch with the herdsmen during the grazing-season at periods when here is any reason to apprehend disease. So large a portion of the wealth of the district consists of cattle that the mainenance of an adequate veterinary staff is a matter of the atmost importance. The private grazing-grounds of the district require protection in any form that may be possible under the orders issued by Government.

The breeding villages require bulls, the supply of which should be organised on the lines laid down by Government.

14. Cultivators are as a whole poor in agricultural capital, especially in Puranpur; and the supply provided by sugar-manufacturers though of great importance is often too dearly bought. For the present there is considerable scope for agricultural leans, but little for improvement leans. Agricultural leans may be required in the following cases :--

- (a) Early cessation of the rains.—There should be a large demand for advances to sow rabi, and possibly for the ensuing kharif, while money for planting sugarcane may be wanted about February by cultivators who are not financed by manufacturers.
- (b) Floods.—Advances to sow the rabi may be required in the Sarda tract, and possibly also along the Deoha.
- (c) Cattle disease.—It is important that cultivators should be in a position to replace working-cattle by the beginning of the next tillage-season. It may also be desirable to offer advances to cowowners to enable them to replenish their herds when these have been reduced.

15. There is at present no agency which could introluce improvements requiring associated action; the co-operaive organization may develop so as to serve in this respect, while if the pioneer sugar-factory is successful and is followed by others the managers will naturally be in a position to introluce better varieties of sugarcane and better methods of cultivation. ofore definite suggestions can be made for its improvement, it it is believed that better varieties of sugarcane and wheat in be found. The scope for machinery is at present comaratively small, and the most urgent matter is to raise the bandard of sugarcane mills, which at present are very infficient.

DISTRICT NOTE.

FARRUKHABAD.

Topography.

THERE are extensive lowlands along the Ganges, while the main upland portion of the district is broken up by the valleys of the Kali Nadi and Isan Nadi. There are thus six principal tracts: (1) the lowlands, (2) the north-Kali uplands, (3) the Kali valley, (4) the Kali-Isan uplands, (5) [the Isan valley, and (6) the south-Isan uplands.

1. The lowlands .- This tract includes the whole of

Pargana.	Allu	vial.	Non- alluvial.	Mized.
Amritpur		76	67	W Dear
Khakatmau		14	81	
Paramnagar	-	21	12	
Total tahs	il	111	110	
Aligarh-			Summer State	States and
Kanauj		43	6	3
Talgram		1		
Bhojpur	nes	10		
Pahara		16	8	9
Kampil		43	57	38
Shamsabad V	Vest	26	22	21
Total	5	250	203	71

tahsil Aligarh, most of pargana Kampil, and parts of Shamsabad West, Pahara, Bhojpur, Kanauj and Talgram. The number of villages included in the tract is shown in the margin; those classed as "alluvial" are liable to the erosive action of the river : the "non-alluvial" villages

are not liable to erosion, but are subject to flooding, while the "mixed" villages are those which lie on the edge of the river valley and are composed partly of lowland and partly of upland.

Tahsil Aligarh is affected not only by the Ganges but by the Ramganga, and consists of two bands of alluvial villages divided by rather higher ground.

This tract is almost immune against drought; irrigation is not usually required, but when necessary temporary wells can be made in most places at a triffing expense. On the other hand, the kharif crops are exposed to injury from floods, while in wet seasons the land gets waterlogged, and is soon covered with coarse grasses, which harbour injurious animals. Thus determation once started tends to spread rapidly.

2. The north-Kali uplands .- This tract includes the

m.z.r	** *			
Kampil	Kaimganj		EO	
Bhamsabad	West	***	177	
Sadr tol	isit.	N JOSEPH		
Shamsabad	East		80	0
Annammad Shoinur	labad	-	43	
Pahara	ALC STRUCTURE	100	133	
		i and		
	Total		538	

upland of Kaimganj and of the Sadr tahsil, and comprises 538 villages as shown in the margin. It is traversed by the Bagar Nala. The land along each of the rivers is light, passing into bhur; away from the rivers

it is firm loam passing into clay with stretches of usar. Villages round the towns have such fine cultivation that for assessment they have been classed as separate "suburban" circles. The sandy areas are liable to be overrun by kans in unfavourable seasons.

3. The Kali valley .- This tract includes 134 villages,

	Total		134
aannj	344		30
hhibraman			23
algram			25
hojpur			27
hamsabad East		-	29

distributed as in this margin, which lie wholly or partly in the valley of the Kali Nadi. The valley is in some places separated from the uplands by a sharp rise, but more

loam or clay with considerable areas of usar, especially in

usually there is a long slope of poor sandy soil, broken by ravines. Except on the slope the land can be irrigated from temporary wells or from the river itself : the level ground is exposed to moving floods in the rains, and tends to become waterlogged after a run of wet seasons.

4. The Kali-Isan uplands .- This tract comprises 319villages, as shown, in the falgram 72 844 Thhibramau margin. The soil in 97 the *Canauj* 150 2.4.0 centre of the tract is firm Total ... 319

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a reached and there is bhur along the edge of both valleys. 5. The Isan valley.—This is a small tract containing

N'AUTINE	Total	alle.	91
Sakrawa Saurikh	199	***	17
Tirwa			23
Kananuj			20
Talgram	Production and		15
Chhibraman		No.	15

s is a small tract containing 91 villages along the river. There is on each side a belt of low land, then a band of uneven bhur, in many places broken up into ravines, and and then a more level stretch of culturable bhur. The low-

land is irrigable from the river, while the bhur is usually dry. The south Isan tract.—This tract includes all of tahsil

	Total		213
Saarikh	100	***	45 30
Sakatpur			52

Tirwa outside the Isan valley -213 villages in all. There is light soil along the edge of the Isan tract : away from the river the soil get stiffer and there is much clay, on

which rice is grown, and usar plains and dhak-jungle appear. Water-supply.

In the north-Kali uplands there is some irrigation from the Fatehgarh branch canal in the villages lying north of the Bagar, but the bulk of the tract depends on wells. Temporary wells lasting from one to three years are made very cheaply in all land except the *bhur*; masonry wells are possible throughout except in the *bhur*, and are apparently increasing in popularity.

In the Kali-Isan uplands, the Bewar branch canal supplies water to the west of Chhibramau; the rest of the tract depends mainly on wells, which can be made everywhere except in a few localities, specified in detail in the records of the well-survey. In this tract also masonry wells are increasing in popularity.

The south-Isan tract is watered chiefly by the Cawnpore branch canal, which passes through it, but temporary wells

Farrukkabad.

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are also largely employed. Masonry wells are not increasing at the same rate in this tract as in those previously mentioned.

Drainage.

The natural drainage of the district was very defective, but has been improved by correcting the channels of some of the rivers and by an extensive system of artificial channels. The work is believed to be practically complete, but a series of wet seasons may bring defects to light.

Cattle-supply.

The district as a whole has a very small supply of cows and is not self-supporting in the supply of working-cattle. There are however considerable number of cows in the lowlands in Kaimganj tahsil ; it is noteworthy that tahsil Aligarh, which is entirely lowland, keeps buffaloes rather than cows. In Kaimganj the herds graze in the *khadir*, where bulls are not found in adequate numbers. Working cattle are brought into the district for sale by local dealers, who purchase partly at the Punjab fair, partly at Kosi in Muttra, and partly from Batesar and other fairs in the provinces.

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 district, like others in the doab, was devastated by the famine of 1837-8, the after-effects of which necessitated a reduction of the revenue in 1845. The droughts of 1861 and 1868 appear to have had little effect, while in 1877 the kharif was generally better than in neighbouring districts. There was however some distress during the cold weather and relief works were necessary; the rabi brought relief.

Before this there has been complaints of the spread of kans in certain sandy villages along the Bagar and the Kali Nadi. At the same time the Kali Nadi khadir was found to be depressed, owing to causes that were disputed ; apparently more water came into the river than the lower part of

Farrukhabad.

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the channel could carry off, and the lowlands were consequently flooded.

From 1884 onwards a series of wet seasons led to serious deterioration, and eventually the revenue had to be reduced in over 300 villages throughout the district. The deterioration was due to over- saturation following a rise in the water-level, and appeared mainly in the lighter soils and in the lowlands along the rivers : the phenomenon is known locally as *gharki*. Considerable drainage works were undertaken by the Irrigation department but no very great improvement was noticeable until dry seasons recurred. Investigation made in the similar tract of Etah showed that the natural drainage is very defective, and that most of the rainfall is absobbed by the land; the result is that the water-level may rise vory rapidly to the point where cultivation becomes unprofitable, while it falls slowly in dry seasons.

When the first of the annual reports was submitted in 1895, the majority of the relieved villages showed some improvement, but some, especially the bhur in Talgram, were still depressed : heavy rainfall had continued, so that there was the less chance of recovery in these villages. The Ganges floods in 1894 prevented the sowing of kharif in the Aligarh tahsil. This year marked the end of the series of wet seasons. The rains ceased prematurely in 1896, and there was a serious loss of the kharif, but the rabi area of 1897 was on the whole fairly well maintained and the yield was good; the fall in area was greatest in Talgram, Bhojpur, Shamsabad East and Muhammadabad. Relief was necessary during these seasons, but distress was not severe, and the district recovered rapidly up to 1902; there were no years of heavy rainfall and no general calamities, though there were occasional floods on the rivers, and in 1901 wheat was seriously affected by rust. The cultivated area in 1903-4 when complete returns were received after the interruption caused by the settlement amounted. to 266,340 acres as compared with 565,102 acres in 1894-5, the last year of heavy rainfall. The seasonal yields since 1903 are given in the following table :---

			Rabi.		Kharif.						
Year.	All crops,	Wheat.	Barley.	Potato.	Poppy.	All crops.	Maize.	Juar.	Cotton.		
1903 1904 1905 1906 1907 1908 1909 1910 1911	88 94 66 80 83 84 88 99 90	94 94 62 81 69 87 87 100 87	94 100 62 87 94 94 94 94 100 94	94 87 87 94 100 94 100 100	100 81 87 81 87 62 75 75 50	71 87 70 88 61 92 84 90 	75 75 75 87 69 100 87 100	69 94 62 87 56 87 69 81 	62 75 94 113 62 87 81 100 		

In 1903 the rains were at first insufficient, while heavy falls in October damaged the cotton and millets. In 1904 the lowlands suffered from floods in August and maize was injured by heavy rain. In the rabi of 1905 the cereals as well as arhar and minor crops suffered severely from the exceptional frost of February, and this season marks the close of the period of prosperity which had lasted on the whole from 1897.

The rains of 1905 were insufficient throughout, but falls at the end of September removed the danger of actual distress and a fairly satisfactory rabi was sown for 1906. It suffered from hot winds in March, and locally from hail. The kharif of this year was not so good as had been hoped for owing to untimely falls of rain, while in the rabi of 1907 wheat suffered severely from rust.

The rains of 1907 were very late, and September was dry. The rabi area of 1908 was therefore contracted, and moisture insufficient to enable the crops to resist the hot winds of i. During these seasons advances were taken on a large and gratuitous relief was given from January to April : istress was at no time severe, and relief-works were not red. The rains of 1908 were at first good, but were somedeficient in September : and a very severe outbreak of ia hindered field-work so that a full rabi could not be for 1909. Floods did much injury in the lowlands dure rains of this year, and juar was injured by insects and ufficiency of rain in September. An extended rabi area own for 1910, and the crops except poppy were exceptiongood. The rains of 1910 were too scanty at first to a full kharif area; but the crops were good except juar suffered from excessive rain at the end of the season. abi area of 1911 was again large, and most crops did well: oppy suffered severely from blight, and wheat was affectrust. In this year attention was drawn to the spread baisurai weed in tahsils Tirwa and Aligarh.

Progress.

The fall in the cropped area which took place as the result er-saturation had been fully recovered by about 1901 and has been no expansion since, nor is there room for it. proportion of remunerative crops has apparently risen otibly in the last two decades. Indigo (which occupied 15,000 acres) has almost disappeared, and the sugarrea, which fluctuates widely in this district, cannot be o have increased, but cotton is more largely grown, and has increased very markedly. The specialities of the et, potatoes and tobacco, are both extending, and in 1911 ied as much as 13,000 acres of each. Poppy extended y during the period under review, but is now being ed. The late settlement officer recorded the opinion that uplands the loss of this crop would not be serious, but pecial attention should be given to the lowlands where no y remunerative crop can be grown.

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Farrukhabad.

There has been some development of the practice of sowing certain kharif crops with the aid of canal-irrigation. In 1910, when the rains were late, the proportion of maize, cotton and fodder (taken together), so sown amounted to 30 per cent., but in ordinary years the proportion is nearer 15 per cent.

There have been no material improvements in the canalsystem which protects about the same area in seasons of drought as it did 15 years ago. The drainage of the canal-tracts has however been improved in this interval. Construction of masonry wells received considerable impetus from the droughts of 1905 and 1907, but the impetus appears to be declining in force. There was in 1911 one such well to 64 acres] of normal cultivation as against 82 acres in 1905. Practically no hostility on the part of landholders towards well-sinking has been reported.

The population of the district, which had fallen somewhat seriously between 1881 and 1891, showed a marked rise in 1901, but has fallen by 25,000 in the last decade, and now stands slightly below that of 1881. Agricultural wages have risen in the last five years and in 1911 ranged from 21 to 3 annas, the latter rate being not uncommon.

Loans for land-improvement have for long been taken on a small scale in ordinary years, and they have apparently become more popular since 1905 : the issues for the last three years average about Rs. 6,000, as against Rs. 2,000 to Rs. 3,000 before that date. Loans for temporary purposes are also popular, averaging about Rs. 5,000 in ordinary years. These loans are particularly desirable in a district which depends so largely on temporary wells. There has so far been no development of co-operative credit.

The railway-system has been improved by the opening of the line to Shikohabad, and there is now one station to 140 square miles. The chief need of the road-system is a bridge n true is an river to give communication with the transn true : the project for this work has been sanctioned, but ide an not available.

Rental statistics are available since 1903-4 when settlent proceedings were completed. The rents of occupancy ants then gave an average rate of Rs. 4.4 per acre, which I not changed appreciably up to 1910-11. Competition ats gave a rate of Rs. 4.0 in 1903-4, which rose steadilty to 4.9 in 1910-11.

Weaving has declined under competition, but two special anches of the textile industry, cloth-printing and tenttking, have developed at the head quarters town, and the mufacture of perfumes at Kanauj is apparently holding its in. There has been some loss of rural employment owing thhe decline of indigo, but the extraction and refining of tpetre has developed, and affords a considerable amount of ployment, crude saltpetre being imported from the surroundtion development what is extracted locally. There is been no development of organised industries, and there is t as yet even a single ginning mill.

The sums distributed annually in the district by moneyler have risen in the last decade from about 10 to nearly lakhs; the rise has been most marked since 1906, but its use has not been ascertained.

Dangers and possible remedies or improvements.

1. The area sown with kharif crops depends mainly on e weather during the first month of the season counting from e first heavy fall of rain. An early beginning is an advange, but the most important point is that there should be ight whether with just sufficient rain to enable tillage and wing to preced, without interruption. If the first month wet, sowings of dry crops will be delayed and the area will 11, though the loss may be to some extent made good by larger early the end of August.

The area which is planted with late rice is small : its stant depends mainly on the weather of the second month, hich should be wet, and a long break at this period results in reduction.

The area planted with sugarcane is influenced by the eather in the early spring, at which time rain facilitates llage : but it is determined mainly by ecomomic causes. ne of these is the yields and prices obtained from the crop in cent seasons ; the other is the financial position of the cultitors, which depends mainly on the success or failure of the receding harvests.

The area sown with cotton is affected to some extent by e nature of the sowing season; an early start and a dry ason are favourable. The chief factors determining the ea are the profit obtained in recent seasons, and the relative ices of cotton and food-grains. Taking a longer view, the ea is affected largely by facilities for marketing and an tension would probably result from the opening of uning mills at the centres where the crop is largely rown.

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

The late dry crops require the prolongation of the rains the middle of September or later : they may be seriously jured by heavy falls in the end of September or the beginning October, while they will give very little grain if September altogether dry. The fate rice requires more rain in September than is le farche dry crops and where canal water cannot be ab least one fall in October is desirable for its complete ss.

The proportionately large area sown with maize goes far sure the food-supply of the district in years when Seper is dry.

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

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

3. Apart from variations in the rainfall, the chief ger to the kharif crops arises from floods in the lowlands in the valleys of the Kali Nadi and Isan. The loss is aporary only if the land is left in good condition for rabirings; but if these are prevented, some rolief in the matter revenue-collection may become necessary.

Juar is liable to considerable injury from boring-insects de Provincial Note, section VI). Other insect-pests have been reported, but they should be watched for especially the case of cotton and sugarcane.

4. The rabi area depends mainly on the rainfall of Sepaber and October, and may fall substantially when this riod is dry; the fall can however be mitigated if the people in a position to make full use of the facilities for paleo-

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irrigation, and advances should be given in such seasons on a large scale,

In the lowlands and the river valleys, the rabi area 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 bulk of the rabi can be matured without winter rains; these however are beneficial up to the early part of February, provided the falls are moderate and of short duration. Rain in March and April will probably cause some damage, 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 full extent may not be 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 early in January may injure arhar, potatoes and the early crop of the tobacco, but will not affect the staple crops seriously; frost at the end of the month or early in February may cause very serious injury.

Hailstorms early in the season will not do much harm except to the early tobacco; the danger to staple crops begins about the time the cereals are earing, and increases as the season advances.

The rapeseed crop may be seriously injured by the aphis if damp and cloudy weather occurs while the crop is in flower.



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The poppy crop may suffer severely from damp weather late in the season.

A careful watch should be kept for the potato-moth (Vide Provincial Note, section ∇I), the spread of which would involve very serious loss to the petato-growers.

7. The area sown with zaid crops is considerable. It consists mainly of tobacco planted after potatoes, and it does not extend largely in unfavourable seasons, though there may be some increase in the area under melons, &c.

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.

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 *tarai*, the river valleys, and the sandy areas of the North-Kali uplands. All these tracts should be watched very carefully in such seasons, and any decline in cultivation should be regarded as a serious symptom, necessitating close attention to the collection of the revenue, and probably a temporary reduction of its burthen.

9. Distress requiring some measures of relief must be expected to occur if the rains have ceased by the beginning of September. The following measures were taken in 1907-8, when the need for direct relief was very slight :--

Regenue suspended,	kharif		480	Rs. 46,000
Ditto	rabi			, 10,000
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Revenue re	mitted,	kharif	-	 Re.	8,000
Ditto		rabi		 46	12,000
Improvement	loans				1 lakb.
Advances for	rabi	Tere and	***		3 lakhs.
93 13	kharif				z lakh.

Maximum proportion of population relieved 0.3 per cent in February.

10 A general fodder-famine appears to be a very remote contingency. There will probably be local deficiencies in seasons when the rains cease so early that the late millets make little growth, and advances to buy fodder may be required : but the need for importation is not likely to be great unless the rains fail entirely.

In dry 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 recognized beforehand except by analytical methods : the only action possible is to provide advances to enable cultivators to replace cattle that have died from this cause.

11. No large improvements in the water-supply can be suggested, but all possible assistance should be given to cultivators who wish to sink wells; improvement loans should be readily available for this purpose, and a boring staff should be employed to assist in locating sites.

Should a practical form of percolation-well be devised, arrangements should be made for the construction of a sufficient number to serve as demonstrations in those areas where foundation-clay is not met with.

12. There is at present no demand for drainage-works, but the district should be watched carefully in wet seasons, special attention being given to the movement of the waterlevel in the North-Kali uplands. If the level begins to rise prompt steps should be taken to clear out any drainage lines that may be obstructed.

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13. To minimise losses from cattle-disease, attention should be given to securing prompt reports of outbreaks under the rules contained in the Land Records Manual, and a sufficient veterinary staff should be maintained to localise outbreaks where they occur.

Any action that may be authorised by Government should be taken (a) to preserve the grazing grounds in the Kaimganj lowlands, and (b) to improve the supply of bulls in the same area.

14. The district is not sufficiently provided with agricultural capital and for the present at least there is a wide field for the *takavi*-system. Improvement loans are required mainly for well-sinking. Agricultural loans may be wanted in the following circumstances :--

- (a) Early cessation of the rains.—There may be a very large demand for advances to sow rabi, and possibly again for the kharif, while on a smaller scale money may be wanted in the early spring to plant sugarcane and extend the *zaid* area. Advances to buy fodder may also be required.
- (b) Floods.---Advances may be required to enable the rabi to be sown in villages where the kharif has been injured.
- (c) Cattle disease.—It is important that cultivators should be in a position to replace working-cattle by the beginning of the next tillage-season.
- (d) Curtailment of the poppy area.—It may be desirable to offer advances in villages where the crop has been largely grown, in order to enable cultivators to substitute some other remunerative crop.

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

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As regards cropping there is room for a better cotton when available, and probably the varieties of sugarcane can be changed with advantage in some localities at least. The introduction of new strains of potatoes should be considered from time to time; and probably detailed examination of the cropping will disclose other possibilities.

The simpler forms of improved tillage implements should be found useful, particularly in the *tarai*, and their introduction would probably be effective in controlling the *baisurai* weed (vide Provincial Note, section VIII). The efficiency of the sugarcane mills in use is understood to be low and the type can probably be improved.

16. A special need of the district is the bridging of the Isan to give the Tirwa tahsil convenient access to the railway: there seems to be little prospect of this being done from local resources within a reasonable time as the funds are not available.

DISTRICT NOTE.

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Topography.

THE district is divided into four natural tracts, known locally as pachar, ghar, kurka, and Jumna-par.

The pack w includes all the country north of the Sengar, or slightly more than half the district: the whole of tahsil Bidhuna, half of Bharthana and portions of Etawah and Auraiya lie in this tract. It is mostly good, loamy soil interspersed with beds of elay, but contains large tracts of usar. The two streams which traverse it, the Pandu and Arind, are of little importance. The Sengar runs in a deep bed with ravines which become extensive east of Etawah.

The ghar extends southward from the Sengar to the edge of the high land above the Jumna, and includes the greater part of Auraiya and part of Etawah and Bharthana. It is a light, fertile loam with no usar; and very little clay: sandhills occur in parts of Bharthana.

The kurka is the land along the Jumna; and includes a band of high-lying cultivation along the north, then a large area of wild ravines, then a low-lying plain of rich soil (kachar) more or less exposed to the river floods, and finally the *tir* or alluvial soil on the border of the stream. In places however there is no kachar or *tir* as the river flows close to the bluffs. The silt of the Jumna is very fertile.

The Jumna-par tract extends from the river to the southern border of the district in the west of Auraiya and along the border of Bharthana and Etawah. Most of this tract is a



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network of ravines leading either to the Jumna or to the Chambal; there is practically no level upland except in the west of Etawab, but some of the villages on the Jumna contain excellent kachar land. The silt of the Chambal is here less fertile than that of the Jumna.

Mater supply and drainage.

The kachar is largely irrigated from the Etawah branch canal which travorses the centre, and from the Cawnpore branch which runs a short distance to the north of its limits. Both masonry and temporary wells can usually be made in this tract; foundation-clay is ordinarily present and the water-level is not deep. The east of Bidhuna gets less canal-water than the rest of the tract, and there are a few villages, noted in the detailed records of the well-survey, where more masonry wells are needed, and a larger number which require advances for temporary wells in a dry season. The natural drainage of the tract has been improved as necessity arose, and water-logging is not anticipated.

In the ghar, water lies as a rule so far below the surface that well-irrigation is very difficult though wells can be made in most places. Practically the whole of the tract has been supplied since 1880 by the Bhognipur branch canal. The small area in the extreme west lying between the Sengar and the Sarsa is without canal-water : it has recently been examined by the Irrigation department, who consider that the supply from temporary wells is sufficient and that the introduction of the canal would probably lead to deterioration of the soil : this area therefore needs special attention in a dry season to secure that any necessary wells are made in time. The introduction of the canal has not appreciably raised the waterlevel in the main tract and there appears to be now no risk of water-logging. Something of the kind occurred about 1890 close to the Sarsa west of Etawah town, but the drainage there was improved, and there have been no further complaints.

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In the kurka and Jumna-par tracts, the depth to water and the uneven surface of the soil almost put irrigation out of the question; but masonry wells can usually be made though at a great cost, in the small level portions. These tracts are over-drained and have suffered greatly by denudation.

Cattle supply.

The stock of cows in the pachar and ghar tracts is not large, and needs are met largely by importation; dealers come from the Punjab and the Batesar fair and sell in the district, while cattle are also brought in from Gwalior. In the kurka and Jumna-par tracts there was formerly a large number of cows, and some owners could be classed as professional breeders. There were, and are, very good bulls set apart for breeding in these tracts, but the number of cows has decreased very seriously owing to losses by drought, particularly in 1905-06.

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

Annals.

The whole district suffered very severely in the famine of 1838-39, but in 1861 and again in 1868 the effects of drought were severe only in Auriaya, which was then almost wholly unirrigated. During the settlement operations between 1869 and 1875 the only deterioration noticed was due to obstructions to drainage caused by the canals in certain places; it was not widespread and has been remedied. In the next famine year, 1877-78, there was no general distress; relief works were opened for a short time in the cold weather, but the distress practically came to an end when the rabi was harvested in April.

Between 1890 and 1895 various tracts where the drainage was found to be obstructed were gradually taken in hand and drains made. With the drought of 1896 all complaints on this

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score disappeared: in that season the kharif yield for the whole district was only about half the average, and the district was classed as a "famine district." The distress was severe only in the *Jumna-par* tract. The rabi area of 1897 was nearly full in the canal tracts, but fell seriously in the *kurka* and *Jumna-par* regions: the yield was however good, and the distress was not prolonged. Cultivation recovered at once in the following year.

Between 1898 and 1902 the only adverse event recorded was somewhat serious damage caused by rust to the wheat crop in the wet season of 1900-01. The seasonal yields since 1903 are given in the following table:--

Rabi.						Kha	rif.		
Year.		All crops.	Wheat.	Gram,	Poppy.	All crops.	Jaar.	Bajra.	Cotton.
1903 1964 1905 1906 1907 1908 1909 1910 1911		100 94 68 72 79 81 90 100 97	100 100 62 75 50 87 87 100 94	88 100 87 69 94 75 94 100 100	100 94 87 75 94 81 94 94 94 44	69 81 74 107 56 92 87 91 	69 94 69 125 37 100 81 62 	56 94 75 125 44 100 100 87	69 81 100 100 55 81 69 100

In 1903, the kharif crops suffered from heavy rain in October; and in 1904 the rain was too heavy in August and too light in September. The exceptional frost of February 1905 affected especially wheat and arhar: and in the same season linseed suffered from rust and rape from the aphis. The rains this year were late and were throughout inadequate: the crops were almost complete failures in the Jumna-par tract and along the Sengar. The rabi area of 1906 fell by 20 per cent., and the yield was very bad in the same tracts. In February the Jumna and Chambal rivers rose and destroyed the crops

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in their lowlands. Fodder was exceedingly scarce, and the mortality among cattle was heavy. The existence of famine conditions was recognised in March, and works were open till June while gratuitous relief continued through the rains.

The kharif of 1906 was sown on a very large area and gave an excellent yield, and the rabi of 1907 was also satisfactory except that wheat suffered somewhat severely from rust and rape from the aphis. The rains of 1907 were confined to five weeks, and September was entirely dry. Cotton suffered also from boll-worms. The rabi of 1908 was sown on a small area and moisture was insufficient for the unirrigated crops. The areas that suffered most in both seasons were the *Jumna-par* tract, the neighbourhood of the Sengar river, and the east of tahsil Bidhuna. Advances were largely given, and famine was declared in December, when gratuitous relief began. Works were required only from January to May: gratuitous relief was restricted in May and discontinued in August.

In this year the existence of the *baisuras* weed was first reported from tahsil Bidhuna, where it was found to be spreading.

The rains of 1908 secured good crops, but September was too dry for a large rabi area, and tillage was hindered by severe malaria in the autumn. The value of the rabi of 1909 was reduced by rain in April: while in the following kharif cotton was injured by boll-worms and juar by borers. The year 1910 was favourable, but juar was affected by heavy rain in September as well as by borers. The rabi of 1911 was marked by slight rust on wheat, and by very severe injury to the poppy caused by rain in March.

Progress.

The cropped area shows no advance during the last two decades nor does there seem to be any room for expansion. The proportion of remunerative crops is distinctly lower than tion is due to the almost complete disappearance of indigo (which occupied about 50,000 acres), and to a substantial rediction in wheat, which is probably connected with the loss of indigo. Sugarcane is still little sown, but appears to be expanding slightly, and cotton has extended considerably. There was a marked extension of poppy which five years ago covered nearly 20,000 acres, but this is now being reduced: Potatoes are becoming important in a few localities.

The practice of sowing certain kharif crops with the aid of canal-irrigation has extended considerably: in 1898 less than 4,000 acres, were so sown, but in 1910 the area exceeded 34,000 acres and in that year nearly one-third of the maize and cotton, and two-fifths of the fodder, were sown with irrigation.

There has been no important extension of canal-irrigation during the last twenty years, and the maximum area irrigated in years of drought shows no expansion. The number of masonry wells increased largely after the drought of 1905 and is still rising though more slowly: in 1911 there was one such well to 86 acres of normal cultivation as against 104 acres in 1906.

Population expanded between 1891 and 1901, but has fallen sharply in the last decade. Agricultural wages have risen slightly during the last five years, and in 1911 the rates ordinarily paid varied from $2\frac{1}{4}$ to $2\frac{3}{4}$ annas.

Loans for land improvement were almost unknown in the decade before 1906, but considerable sums were taken in the two famines, partly for wells and partly for embankments or similar works, and the practice appears to be becoming established on a moderate scale in ordinary years. Advances for other purposes are rarely taken except in adverse seasons when they are popular. There has hitherto been no development of agricultural co-operation.