Basti.

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6. Frost occurring early in February does little damage: it is probable that late frosts may cause very serious loss, but this has not occurred in recent years; the exceptional frosts of the first few days of February 1905 did little harm in this district.

Hailstorms early in the season are of little importance, but the danger increases as the season advances.

The rapeseed crop may be injured severely by the aphis if damp and cloudy weather occurs while the plants are in flower.

The poppy crop is liable to serious injury if damp and cloudy weather occurs late in the season.

7. The area sown with zaid crops in ordinary years is not large, nor does it extend greatly in unfavourable seasons.

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 percolationwells 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 probably be most noticeable in the lowland tracts.

9. Distress requiring some measures of relief must be expected to occur if the rains have ceased by the beginning of September. In the past the distress has been most marked in the Domariaganj tahsil. The following measures were taken in 1907-8:--

Revenue suspended, khari	if	and and	Rø.	61,000
n n rab	1		te	14,000
, remitted : kharif	C. C. C. C.	163	33	68,000
n rabi			52	45,000
Improvement loans			22	3 lakhs
Advances for rabi			20	32 15
n h kharif			Ci i	43 ,7

Maximum proportion of population relieved 2 per cent. in May,

10. There has been no experience of conditions producing such a shortage of fodder as to render government action necessary, and the contingency appears to be very remote.

11. The only measures that can be suggested for the improvement of the water-supply are (a) the continued grant of loans for the construction of masonry wells, and (b) possibly provision for embankments in some of the rice tracts (vide Provincial Note, section III).

12. There is at present no demand for drainage works: the loss by flooding in the lowlands is serious but no practicable remedy can be suggested.

The bed of the Rapti is gradually silting up, and there is a possibility of its shifting its course at some period in the future. A change would produce a calamity of such magnitude that it is desirable that the position should be examined by an expert in order to determine whether there is any danger in the near future.

13 In order to minimise loss from cattle disease, it is desirable to enforce strictly the system of reporting outbreaks prescribed in the Land Records Manual, and to maintain a veterinary staff sufficient to localise outbreaks when they occur. Efforts should also be made to educate the people, through their leaders, in the advantages of protective inoculation.

14. The district is not well supplied with agricultural capital. The supply will probably be increased gradually by the extension of the co-operative organisation, but for the present there is considerable scope for the *takavi*-system. Improvement loans may be wanted for masonry wells, and possibly for embankments in the rice country. Agricultural loans are likely to be required in the following circumstances—

(a) Early cessation of the rains.—Large sums will be wanted for the rabi and again for the following kharif, while there may be a demand about February for sowing sugarcane and zaid crops.



Basti.

- (b) Floods.-Advances may be required to enable the rabi to be sown.
- (c) Cattle disease.—It is important that cultivators should be able to replace their working-stock before the beginning of the next tillage-season.
- (d) Unrtailment of the poppy area.—Advances may be desirable in villages where the crop has been largely grown to enable cultivators to substitute some other remunerative crop.

15. There does not seem to be any possible agency other than the co-operative organisation for introducing agricultural improvements requiring associated action. The crops of the district require to be examined before suggestions are made for their improvement, but probably there is room for new varieties especially of wheat and sugarcane. There is not likely to be a large demand at present for expensive agricultural machinery, but the cheaper forms of improved implements should gradually come into favour, especially in the lowland tracts. Parts of the district appear to offer advantages for the establishment of a modern sugar-industry.



DISTRICT NOTE.

AZAMGARH.

COMPLETE agricultural statistics are not available for this district between the year 1897-8 and 1906-7, which were occupied by survey and settlement proceedings. The statistics for years previous to this interval cannot be compared directly for the district with those compiled after its close owing to the transfer of some villages from Gorakhpur which was effected in 1904. The former and present figures are comparable for all parganas except Muhammadabad, Sagri, Gopalpur and Ghosi.

Topography.

The district is divided into three main tracts, the southern (termed *khalar*), the central (*bangar*) and the river (*kachhar*).

The southern tract comprises the whole of tahsil Deogaon, parganas Kiriat Mittu and Chiriya Kot in Muhammadabad, and the south of parganas Mahul and Nizamabad. The soil is mostly clay: lakes and marshes abound and there are extensive usar plains. This tract is drained by several streams flowing generally south-eastwards: at first their beds are shallow, and they can be dammed for irrigation; but towards the east the beds get deeper, and lighter soil is found in their neighbourhood. The distinctive feature of the tract is that about half the cultivated area yields only late rice, which requires rain up to October for success.

The central tract includes parganas Atraulia and Kauria, the north of Mahul and Nizamabad, the south of tabsils Sagri and Ghosi, and the greater portion of parganas Muhammadabad and Mau. The soil is usually a good firm loam, with



lighter land near the rivers and clay in the depressions. The tract is adequately drained by the Tons and its affluents; the Tons however has a narrow bed, and in seasons of heavy rainfall it comes down in high flood, threatening considerable loss of property but affecting only a small area of cultivation. The proportion of land sown with late rice does not exceed one quarter.

The kachhar consists of a tract of varying width along the north of the Sagri and Ghosi parganas, together with the abandoned bed of the Ghagra, known as the Chhoti Sarju, which runs south-eastward between these tahsils and then between Ghosi and Muhammadabad. The width of the kachhar along the Ghagra is greatest in tahsil Sagri : in Ghosi it almost disappears at Dohri ghat, but it becomes extensive again in pargana Nathupur. The land close to the Ghagra is not of high value, consisting of sand with a deposit of soil of depth varying with the depression : the kharif is liable to floods, and the rabi may suffer from excessive moisture as well as from deposit of sand. Away from the river and along the Chhoti Sarju there is less danger from floods and sterile deposits, but the rabi does poorly in wet years, and the land tends to go out of cultivation owing to the discouragement of cultivators rather than any permanent deterioration.

Water-supply.

A very large area is irrigated in the southern tract from *jhils* and from the minor rivers. The supply cannot be made sufficient for the late rice in dry seasons, and there appears to be increasing difficulty in securing united action for the construction of the necessary dams. The rabi depends mainly on wells. Temporary percolation wells are not very popular and are inefficient in dry seasons, but cheap masonry wells exist in very large numbers, and their construction is proceeding rapidly. Foundation-clay is met with almost everywhere, except one tappa of Mahul and two of Nizamabad, and nohostility has been recorded : the completion of the equipment

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of the tract is a question of capital. The district officer in reviewing the results of the well-survey considered that more wells are needed throughout the tract: the need is greatest in pargana Deogaon and least in Kiriat Mittu.

In the *bangar*, temporary wells are used to a considerable extent in the east, but are not popular in the bulk of the tract, where the number of cheap masonry wells is very large. Foundation-clay is in some cases reported to be absent, but probaby exists at too low a level to be reached without boring. The Collector considers that more wells are needed throughout, and that the supply of capital is the most important point. Disunion in the large proprietary bodies was reported to be a serious obstacle to construction, but it was hoped that the offer of capital would produce harmony.

In the *kachhar*, irrigation is not required close to the river : in the more stable portions it is adequately supplied from the rivers and lakes and from temporary wells.

Cattle-supply.

The stock of cows is small in the *bangar* and the southern tract: they are kept for milk, and the young stock raised is inferior. In the *kachhar* along the Ghagra the stock is relatively large, but here milk and *ghi* are the chief objects, and the young stock is of poor quality. The supply of bulls set apart for breeding appears to be sufficient.

The district imports large numbers of working cattle : they are brought by dealers from Bahraich, Gonda and Basti, and from the Dadri fair in Ballia. It is noticeable that many cultivators in the southern tract do not keep a pair of bullocks, though each has a plough : in some cases a cultivator keeps a single bullock and clubs with another in the same position to make a pair; in others he works for another cultivator in return for the loan of his bullocks.

There has not been much rinderpest of late years, though severe outbreaks are known to have occurred in the past:



other forms of cattle disease are common. The people are still very suspicious of the practice of inoculation.

Annals.

The early annals of the district contain few outstanding features: the event most clearly remembered is probably the great frost of 1819. The droughts of the nineteenth century were as a rule little felt but in 1878 the provision of some relief was found to be necessary. In 1890 there was an exceptional flood on the Ghagra, and the succeeding seasons being wet cultivation decreased in the kachhar.

The first regular report was received in 1895. The district was then suffering from the recent wet seasons and from congestion of the population. The monsoon of this year was light and ceased early: the kharif was poor and the rabi area of 1896 was reduced. The following rains ceased in August: the late rice was lost, and the early rice yielded very little while the rabi area of 1897 fell further. The southern tract suffered most because of the small rabi area, and the existence of distress was recognised in tahsils Deogaon, Azamgarh and Muhammadabad. The demand for relief slackened when the rabi was gathered, but a certain amount was required until the following August.

The rains of 1897 were favourable, but there were floods on the Ghagra: in 1898 late rice suffered slightly for want of rain in October, while loss was caused by erosion of good land along the Ghagra. The rains of 1899 were at first abnormally heavy, but later they were deficient, and all crops suffered from one cause or the other. There was also some damage from insects, while the rabi of 1900 was seriously affected by rust.

The rains of 1900 though generally favourable were unsuited to the late rice crop, as there was a prolonged break that either prevented transplantation or injured the newly-planted fields; the rabi of 1901 again suffered from rust brought on by prolonged damp and cloudy weather. The following rains were deficient; transplantation of rice was prevented in



places, and late rice and sugarcane yielded poorly. Erosion continued on the Gogra. The rabi of 1902 yielded fairly well; the following monsoon was late and at first deficient, but subsequently favourable; sugarcane was found to have suffered severely from boring-insects.

The seasonal yields since 1903 are given in the following table; the system of estimating yields is not yet satisfactory in this district, and the figures given, though comparable among themselves, are substantially understated :---

Rabi.			Kharif,				
Year.		Barley.	Peas.	Rice.	Small milletts.	Sugarcane	
1903		115	75	69	. 56	/75	
1904		87	87	71	69	75	
1905		75	50	84	18	07	
1909	494	81	01	07	.01	50	
1907		78	70	20	10	75	
1908		100	10	60	10	01	
1909	all	81	75	78	24	OF	
1910		94	94	80	84	01	
1911		87	94				

The rains of 1903 began very late, and were at first light but afterwards heavy. There was a high flood on the Tons, but it caused little damage. Locusts appeared in July but did not settle. In 1904 the rains were heavy at first, but weak in September. The following rabi was injured first by damp, which brought on rust, and then by the exceptional frosts of February. The frosts injured peas soverely almost everywhere; other crops for the most part escaped except in welldefined tracts where they suffered greatly. The damage was greatest on the west of the district, and along the course of the Tons. The report for this year noticed that though no figures were available, cultivation was certainly recovering in the



kachhar and in a group of rice-growing villages in Muhammadabad which had suffered specially during and after the famine.

The rains of 1905 were on the whole favourable; but in this year the damage caused to sugarcane by the cane-hopper began to attract attention in tahsil Azamgarh. The rabi of 1906 was fairly good, but the rains were unsatisfactory: at first they were heavy, and there were floods in the kachhar; but the falls in September were light and the late rice was very poor. The rabi of 1907 suffered from rust brought on by cloudy weather in January and February. The rains ceased at the beginning of September, and all crops suffered, late rice being almost an entire failure. The cane-hopper was spreading and causing increased injury during this season. The people managed to sow a remarkably large area for the rabi of 1908: peas yielded only moderately, but the other crops were good. During these seasons the southern tract suffered most, but distress was at no time serious. Aided works were open, and a small amount of gratuitous relief was continued up to August.

The rains of 1908 were late in starting, and they were deficient in September, especially in the south where much late rice was lost. The cane-hopper continued to spread. With great exertions a normal rabi area was sown for 1909 : the winter rains were scanty and water for irrigation was very scarce in the southern tract. The monsoon of this year was at first heavy, but once again the late rice suffered at the end of the season. The floods in the *kachhar* were not serious; but the cane-hopper continued to extend. The winter rains of 1910 were satisfactory and the crops good; and the following monsoon, at first defective, lasted long enough to give a satisfactory crop of rice and to secure a very large rabi area for 1911. In this year there was less complaint of the canehopper than for several years past.

Asamgarh.

Progress.

The district has for long been very closely cultivated, and there has been no expansion in the last two decades. The *kachhar* tract has however recovered the area abandoned between 1890 and 1894. The class of crops is relatively poor and shows a marked deterioration in the same period. This is mainly due to the abandonment of indigo, which occupied about 30,000 acres; and sugarcane also shows a marked decline, though a tendency to partial recovery appears now to be at work. Wheat has extended somewhat, having replaced sugarcane, and hemp has become of some little importance. Among the food crops maize has extended considerably.

The great advance in regard to irrigation has been the increase in the number of masonry wells. Accurate statistics are not available for comparison, but it is known that, while the number increased steadily during the currency of last settlement, a marked impulse to construction was given by the dry seasons in the last decade. In 1911 the number of these wells was 33,330, giving 1 to 25 acres of normal cultivation.

The population of the district decreased largely between 1891 and 1901 and there has been a slight further fall in the last decade; in 1911 it stood at 1,498,000 as against 1,729,000 in 1891.

Wages show no marked movement during the last five years, and are perhaps slightly lower on balance.

Loans for land-improvement were practically unknown in the district until 1907-8, when nearly three-fourths of a lakh was distributed for masonry wells. Apparently such loans are becoming popular, as in the three years that have elapsed an aggregate of close on half a lakh has been taken. Loans for temporary purposes are not taken in ordinary years, but they can be employed most usefully in adverse seasons, and between 1907 and 1909 over five lakhs were distributed. In 1911

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Azamgarh.

there were only two rural credit societies in the district, but a development of the movement is anticipated.

There has been a very marked improvement in the system of communications. Twenty years ago railways were non-existent, though the Oudh and Rohilkhand line just touched the district on the extreme west. In the interval the Bengal and North-Western Railway has extended through the east, north and centre of the district, so that in 1911 there was one station to 138 square miles. The north-west is perhaps the only direction where railways are still required, but a project for a line in this direction has been abandoned.

The metalled-road system is extensive, and recent additions have consisted chiefly of small lengths to the railways; the metalling of the road to Fyzabad, which is in progress, will probably suffice to meet the needs of the north-west of the district. The great need of the district is for more bridges.

The movement of rents is very slow; the rate is kept down by the privileges accorded to high-caste tenants and by the large proportion of the area which is cultivated by landholders. Occupancy rents recorded during the settlement gave a rate of Rs. 5.3 per acre, and other rents worked out to exactly the same rate. It is possible that these may be rising, but the period since settlement is too short for any conclusion to be drawn.

There has been no development of industry on a large scale, and the indigenous industries have on the whole declined seriously. The abandonment of indigo has withdrawn seasonal employment from about 7,000 or 8,000 hands: sugarrefining has diminished appreciably; and weaving is much less important than it used to be, though it has somewhat revived in Mau since the opening of the railway. Saltpetre extraction is understood to be prosperous.

The district draws a large and increasing income from external sources, the people of both high and low castes being accustomed to seek employment in Calcutta, Bombay and



elsewhere. At present the post office distributes about 31 lakhs of rupees annually in money-orders as against 16 or 17 lakhs at the end of the nineteenth century.

Dangers, and possible remedies or improvements.

1. The area sown with kharif crops other than late rice and sugarcane 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 sowings to proceed without interruption. If the first month is wet, sowings of dry crops will be reduced while early rice may extend.

The area under late rice, which is the principal crop in the southern tract and is also important in the centre, depends on the second month: frequent falls of rain with little sunshine are required, and a long break at this period may reduce the area considerably; no other crop can be substituted in these conditions.

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; the other is the financial position of the cultivators, which depends mainly on the success or failure of the preceding harvests.

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

The late rice requires moderately heavy rain in September and at least one fall in October is desirable for its complete



success. Late dry crops are not grown on an appreciable scale.

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.

The early crops are fairly well balanced between rice and dry crops, and the central tract should not be seriously distressed if the rains last long enough to secure the early rice. The southern tract however depends so largely on late rice that an early cessation of the rains involves serious loss.

3. Apart from variations in the rainfall, the chief danger to the kharif crops arises from floods in the kachhar. The extent of loss depends on the period at which they occur, that is on the amount of kharif that has been safely harvested.

The floods of the Tons are of less importance as the area affected by them is small.

Sugarcane may suffer both from borers and from the cane-hoppers (vide Provincial Note, section VI).

4. The rabi area depends mainly on the amount of rain received in September and early October. Heavy rain in October leads to a large extension, while an early cessation of the rains involves a reduction, which however can be mitigated by the grant of advances.

The area in the *kachhar* is affected by the Gogra floods; a late flood occasionally leaves the lower land too wet to be sown, or covered with sterile deposit of sand.

5. When the ground has been sufficiently moist at seedtime, the rabi yield depends relatively little on winter rains as the bulk of the crops can be matured with irrigation. Falls are however beneficial up to about the middle of January, provided they are moderate in amount and of short duration.



Later falls will probably cause some injury, while prolonged periods of damp and cloudy weather must be expected to produce rust on wheat and linseed, and possibly also on barley. The loss from rust may be very 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 season 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. A late frost may however cause very serious injury: probably the third or fourth week in January is the most dangerous period.

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

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

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

7. The area sown with zaid crops in ordinary seasons is small and apparently it does not extend largely when stocks of food are low.

8. A series of abnormal seasons of one type may produce certain cumulative effects. After some seasons of deficient rainfall the water-level falls, and the efficiency of temporary wells decreases, while the cost and labour of irrigation are materially enhanced. It is possible that the lowering of the water-level may proceed so far as to render the masonry wells.



useless in some tracts, but this occurrence has not been reported.

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 *kachhar*; there the loss of fertility may become so great that the land goes tomporarily out of cultivation, and any decline in cultivation in this tract should be watched very carefully.

9. Distress requiring some measures of relief must be expected to occur after a premature cessation of the rains. The central tract should escape if the rains last long enough to mature the early rice, that is ordinarily into the first week of September, but the southern tract requires rain until nearly the end of that month. In 1907-8 distress was practically limited to this tract, and was slight: the following measures were taken :--

Revenue suspended, khari	£			3 lakhs.
remitted kharif		and march		1 lakh.
Improvement loans				§ lakh.
Advances for rabi	10.000		-	3 lakhs.
, kharif				1 lakb.

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

10. Experience does not indicate the conditions under which so great a deficiency of fodder may occur as to require intervention by Government. The late millets are so little grown that even their entire failure would make little difference.

11. As has been indicated in the section on watersupply, the great need of the district is for loans to make more masonry wells. A boring staff should also be maintained to locate sites in doubtful localities, and to pierce the foundationclay where it is too thick for country tools.

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The question of embankments in rice-land is of special importance in the southern tract (vide Provincial Note, section III).

12. There is no demand for drainage works at the present time; the natural drainage of the southern tract is not perfect, but the presence of water at the end of the season is so essential for the late rice that drains are not likely to be accepted by the people.

The channel of the Tons will naturally receive special attention in any investigation into the drainage of the Ganges-Gogra doab, in order to see if anything can be done to mitigate the periodical floods.

13. In order to mitigate losses from cattle disease, it is important to enforce strictly the system of reporting outbreaks laid down in the Land Records Manual, and to maintain a sufficient veterinary staff to localise outbreaks when they occur. Efforts are also desirable to popularise through the leaders of the people the practice of preventive inoculation.

14. The district is exceedingly poor in agricultural capital: the defect may be met gradually by the extension of the co-operative organisation, but for the present at least there is a wide scope for the *takavi*-system. Improvement loans are wanted specially for masonry wells, and may also be required for embankments in the rice tracts. Agricultural loans may be required in the following circumstances :---

- (a) Early cessation of the rains.—The demand for advances to sow the rabi is likely to be very large, and a further demand will arise for the kharif; while money may be wanted about February for sugarcane and possibly for zaid crops.
- (b) Floods.—Advances may be needed in the kachhar when the kharif has been lost; and there may



be a demand on the Tons if the floods have caused damage to homesteads or loss of cattle.

- (c) Cattle disease.—It is important that cultivators should be able to replace working-cattle before the beginning of the next tillage-season.
- (d) Curtailment of the poppy area.—Advances may be desirable 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 suitable for the introduction of agricultural improvements regarding associated action; the only possibility in this direction lies in the extension of the co-operative organisation. The cropping of the district requires examination before definite suggestions can be made for its improvement, but probably better varieties of sugarcane are needed at least in some localities. A new market-crop is also required to replace indigo, the loss of which has undoubtedly deteriorated the agriculture of the villages where it was grown: groundnuts appear to be the most suitable crop for this purpose. The demand for expensive machinery is likely to be small, but the cheaper forms of improved tillage-implements will probably become popular, especially in the kachhar.

DISTRICT NOTE.

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NAINI TAL.

Topography.

THE district consists of three well defined tracts, the hill-pattis, the bhabar and the tarai; of these complete agricultural statistics are prepared only for the tarai, but partial statistics for the bhabar are now available.

The hill-pattis include the parganas under the jurisdiction of the Naini Tal tahsil, and consist of ranges of steep hills separated by narrow valleys. Cultivation is practically limited to the level hill tops, the terraced slopes, and the alluvial land where the valleys widen out. About six per cent. of the measured area is irrigated by channels led from the streams; the chief crops are mandua and rice in the kharif and wheat and barley in the rabi, but potatoes are also important in some localities. The population is dense, but it is not entirely dependent on the land, as the people obtain a considerable income by supplying the needs of the European settlement at Naini Tal, while the bhabar is largely cultivated by tenants who migrate for the season from the hills.

The bhabar consists of a stony slope, covered by a thin layer of soil, which has been brought under cultivation to relieve the pressure on the hill pattis. Wells or tanks are impossible, and the rapidity of percolation makes irrigation indispensable to the growth of rabi crops. Cultivation depends on the canals supplied by the hill streams, and its extent is limited by the quantity of water available; the uncultivated land is mostly under forest. Rabi crops are more important than kharif, and most of the cultivation is done by tenants

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The tarai includes tahsil Kashipur as well as the Tarai tahsil. It consists for the most part of clay soil which is fairly fertile but there is much lighter soil towards the north which cannot bear continuous cropping. Irrigation is required both for the rabi, and for the important rice crop to meet deficiencies in the rainfall. Wells are practically not used for irrigation, but there is an extensive canal system supplied by the hill streams. The striking feature of this tract is the difficulty of keeping cultivators on the land, due to the unhealthiness and the unpleasant conditions of life. Fever is very prevalent, the drinking water is often bad, wild animals from the forests have to be reckoned with, markets are few, and social attractions scarcely exist. There is thus always land waiting for cultivators, and any aggravation of the ordinary discomforts sends the cultivators elsewhere, and the land vacated goes out of cultivation and soon returns to the jungle. The causes of the unhealthiness of this tract have not apparently been worked out in detail. The badness of the water has been traced to the fact that many of the wells draw their supply from a layer of soil heavily charged with organic matter, and efforts have been made, in many cases with success, to keep this water out of the wells and obtain a supply from a lower uncontaminated stratum.

The land in the south of Kashipur tahsil is intermediate in character between the *tarai* proper and the plains.

Cattle-supply.

The hill tract breeds its own cattle, while the *tarai* provides a substantial surplus for export, and affords a large amount



Nami Tal.

of grazing to the cattle of the districts lying to the south. Rinderpest and foot-and-mouth disease occur very commonly in the district, and haemorrhagic septicaemia appears from time to time. The practice of inoculation is now welcomed by the people.

Annals.

Information regarding the district is somewhat meagre until recent years, and the absence of agricultural statistics for the hills, and till recently for the bhabar, make it impossible to give a detailed description. No part of the district is known to have required extensive famine relief in any season of drought, and no serious injury to the prosperity of the hill tract or the bhabar was reported until 1907. The western tarai however entered on a prolonged period of depression in about 1894. The cause was probably the series of wet seasons, leading to unusual sickness, but in Kashipur where the depression progressed most rapidly stress was laid at the time on the harshness of the landholders at a time when the tenants were impoverished. Though no measures of relief were required in the drought of 1896, this part of the district was further impoverished, while further losses followed the early cessation of the rains in 1899, and the decline in cultivation became more rapid. No amelioration was noticeable until 1906: in that year cultivation was very much below the standard of 1892-94 in Kashipur, Bazpur and Gadarpur, and to a less extent in Rudarpur, while in the eastern parganas (Kilpuri, Nanak Mata and Bilheri) the fall was slight. About this time the settlement of Kashipur was revised and large reductions in revenue took effect, while the rent rates of the tarai estates were revised. Cultivators then began to come in, and the fall in cultivation was checked. The early cessation of the rains of 1907 was severely felt in those parts of the turai (chiefly the west of Kashipur), where canal irrigation is not available, and the rabi area of 1908 decreased largely : the



bhabar was apparently little affected but parts of the hill-tract suffered. The depression was however temporary, and cultivation in the *tarai* is now substantially above the lowest level reached though still below the standard of 1892-94.

Progress.

In the *tarai* the class of crops shows a substantial improvement during the last two decades though the cultivated area has decreased; wheat is now much more largely sown, and cotton has expanded very rapidly in Kashipur since the opening of the railway. The staple of this crop is better than that usually grown in the provinces, and the crop is popular because wild animals leave it alone. Sugarcane has somewhat declined. In the *bhabar* also wheat has extended. In the hill pattis potato cultivation became very popular, but much of the land on which this crop was grown has now become exhausted. Tea has not extended, and several of the tea-gardens have been converted into orchards producing large quantities of fruit for the plains as well as the hills. The absence of statistics prevents a more detailed comparison.

In regard to irrigation the progress of the last twenty years has lain in the remodelling or improvement of a large part of the system of canals: the improvement does not appear in the statistics owing to the decline in cultivation.

Population fell heavily between 1891 and 1901 owing to the deterioration of the *tarai*; there has been a partial recovery in the last decade but the numbers are still below those of 1891. Agricultural wages have risen during the last five years, and in 1911 the rates exceeded four annas in the hills and *bhabar* and fell little below this figure in the *tarai*.

Advances for land-improvement are almost unknown in the district: sums aggregating Rs. 2,000 were taken in the famine year, but nothing since. Advances for temporary purposes are taken in small amounts in most years: the

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highest aggregate in any year is below Rs. 6,000. There has so far been no general attempt to introduce agricultural cooperation in the district, but a large credit society has been established among the Tharus of the eastern *tarai*, which in 1911 had 470 members.

The railway system has been greatly extended since 1907 by the opening of the lines from Ramnagar to Moradabad and from Kashipur to Lalkua: the central and western portions of the *tarai* are thus adequately served, while the eastern portion is traversed by the line just completed from Pilibhit to Tanakpur. The road system in the hills has been much improved during the past twenty years: the *bhabar* and *tarai* still depend on unmetalled roads with the exception of the road from Kathgodam to Bareilly.

The chief industry of the district is hand-loom weaving, which is still carried on extensively in the Kashipur tahsil, though it has suffered from competition. On the other hand Kashipur has become a centre of some importance for the trade in cotton, and two ginning and pressing mills have been erected there recently.

The district draws a relatively large income from external sources: payments of money-orders have varied between five and eight lakhs annually and show no tendency to increase in the past 15 years; a large proportion of this business affects only the European community. On the other hand the hillstation of Naini Tal brings a very large amount of money into the hills, and affords employment on what is relatively to the population a very large scale.

Dangers and possible remedies or improvements. THE HILL TRACTS.

1. The sowing and harvesting seasons in the hills vary with the altitude to such an extent that it is not possible to indicate the conditions of success and failure with the same precision as in the plains.

In the lower hills the kharif depends on both the spring rains and the monsoon, and the rabi on the winter rains. Rain in March and April is of great importance for the sowing of the unirrigated rice crop, which takes place about April, and this crop requires occasional storms to keep it alive until the rains arrive. An early commencement of the regular rains is desirable, but their continuance to the latter part of September is of much greater importance; a cessation by the end of August leads to loss of a large proportion of the crops. Heavy rain does not appear to cause much direct injury to the crops, but its effects are serious when it causes landslips or destroys the terraced fields.

Landslips are frequently originated by unterraced cultivation on steep hill-sides, and such cultivation should be sternly discouraged.

3. The rabi requires several falls of rain during the winter: and it is important that the winter rains should continue at least into March in the lower valleys and into April in the higher.

There are very few records of injury from too much rain at this season; and no report of serious loss from rust on cereals has been received though the disease exists.

Serious injury from frost has not been reported.

4. Damage by ordinary insect-pests has not been reported in either season: but locusts enter the hills at long intervals and cause considerable injury where they settle.

Hailstorms in the spring may cause great local damage to cereals and also to garden-crops and orchards: they are of little importance in the winter.

5. So far as experience can be relied on, distress requiring measures of relief should not result from a single bad season, but it must be expected when the rabi crops fail after

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a bad kharif or vice versa. Conditions may vary greatly from valley to valley, and each valley must be dealt with on its merits.

When distress occurs; the most important measure is to ensure an adequate supply of food in the distressed areas, where even in good years the local produce is insufficient; the system of advances to merchants and of grain-credit orders introduced in 1908 will apparently serve this purpose effectively. Loans for subsistence, and gratuitous relief are also likely to be required: there is ordinarily comparatively little scope for relief works, but the opportunity should be taken of employing all surplus labour on improvements in communications.

6. There is no experience to show that a folder famine is possible in any part of the hills; but with the increase of population and cattle there are indications of possible scarcity in the future unless the grass supply can be improved by conservation.

7. No measures can be suggested for the direct improvement of the water-supply; and the question of drainage does not arise. The water supply will however probably be improved considerably by the contemplated reservation of large forest areas.

8. There is sufficient pasture land for the cattle in most places, but it is not inexhaustible and difficulty is already being felt in places where cultivation is extensive. The reservation of forests will, it is hoped, improve the supply. The most important measure for the protection of cattle is the mitigation of disease, which is much more fatal than in the plains. The organisation of a system by which reports of outbreaks shall be promptly made, and the maintenance of a veterinary staff sufficient to prevent outbreaks from spreading are the essentials of the problem : but great difficulties arise from the obstacles to rapid travelling.

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9. There is not much scope for the *takavi*-system in ordinary years. The chief agricultural improvement—the terracing of fields—must be carried out very gradually and cannot be done off-hand by the expenditure of capital; and improvement loans will probably be wanted only in exceptional cases for the construction or repair of water channels.

Agricultural loans may be required in times of scarcity as has been indicated above, and at other times to enable cultivators to replace cattle that have been lost by disease or accident : in ordinary seasons they are not likely to be required for other purposes.

10. There is probably not scope for large changes in methods of cultivation. The problem presented by the wornout potato lands deserves further study than it has received. In the remoter villages the most hopeful line of agricultural improvement is probably the introduction of more valuable drugs and spices, the produce of which can bear the very heavy cost of transport. Within reach of markets, the promotion of market-gardening and orcharding is the most hopeful form of improvement.

11. It appears to be probable that the future development of the hills will be mainly on non-agricultural lines—extension of the tourist and pilgrim industry and of health resorts, manufactures based on forest produce, and possibly some utilisation of minerals. The first condition for any such developments is the improvement of communications: a programme of works has recently been drawn up for the district, but it should not be regarded as exhaustive. The question of labour will however affect developments such as are indicated: the people are prosperous, and do not need to work steadily nor are they inclined to do so.

THE BHABAR.

1. According to statistics the area is much less extensive than the rabi, but the *lahi* crop, which is classed under the

latter head, is here sown as a late kharif. An early start of the rains is desirable, but it is much more important that the first month of the season should not be continuously wet: bright weather with just enough rain to keep the land fit for tillage is desirable.

2. The yield of the kharif depends mainly on the prolongation of the rains to the end of September. The crops may be seriously injured by either a prolonged break or by excessive and continuous rain.

3. The rabi area depends on the prolongation of the rains to the end of September, but in a moderately dry year the fall in area is not marked. The yield is almost independent of winter rains as the land is almost entirely protected by canals, and injury may be caused by falls late in the season. Prolonged periods of damp and cloudy weather may result in injury from rust to the wheat crop. Hailstorms may cause serious loss if they occur when the cereals have eared. The *lahi* crop may be seriously injured by the aphis if damp and cloudy weather occurs, while the plants are in flower.

4. Available supplies of canal water are fully utilized and the margin for extending cultivation is very small. In many villages at the tail of a canal cultivation is very precarious owing to the difficulty about water and the perpetual war with wild animals.

5. There is no record of conditions leading to distress in this tract, nor does a fodder famine appear to be possible. In the spring the cattle are taken either into the hills or to the north of the *tarai* where grazing and water are available.

6. No improvements in water-supply can be suggested heyond the policy already pursued of improving head-works and extending masonry channels. No drainage works are required.



7. The protection of the cattle from disease requires the organisation of a system by which outbreaks are promptly reported, and the maintenance of a sufficient veterinary staff to localise outbreaks when they occur.

8. The cultivators are expected to look to the *padhans* of the villages for the supply of necessary capital, so that the ordinary system of *takavi* is not required.

9. The system of cultivation requires to be examined before suggestions for its improvement can be offered.

THE TARAI AND KASHIPUR.

I. The area sown with kharif depends mainly on the weather during the first month of the season : rice being the staple crop this month should be fairly wet, but continuous rain is likely to reduce the area, and there should be bright weather with just enough rain to enable tillage operations to proceed without interruption.

The yield of rice depends on the prolongation of the rains till nearly the end of September: a long break or an early cessation of the rains will lead to substantial loss. Sugarcane requires much the same season as rice, but cotton, which is of growing importance in the west, requires much less rain, both in the sowing season and in September.

Serious damage to the kharif from insect-pests or other causes has not been reported, but should be watched for, particularly in the case of cotton which would be seriously threatened by the appearance of the bollworm (vide Provincial Note, section VI). Rice is believed to suffer seriously from some form of caterpillar, but the facts are not accurately known.

2. The rabi area depends mainly on the prolongation of the rains to the end of September or early October: a dry September leads to a very serious decrease. Winter rains are an advantage up to nearly the end of February, provided the

falls are moderate and of short duration; rain at the end of the season is injurious, and prolonged periods of wet and cloudy weather must be expected to produce rust on wheat and linseed. The loss may be very serious, and its extent may not be fully realized till the crops are harvested.

3. There is no record of extensive damage by frost, and apparently there need be no anxiety unless frost occurs as late as the middle of February.

Hailstorms early in the season are unimportant. They may cause serious loss if the cereals have eared, and the danger increases as the season advances.

There is no record of serious injury to the rabi from insect-pests.

4. Experience does not indicate conditions in which the *tarai* may be so affected as to require large direct measures of relief, though suspension of revenue (or rent) and the offer of advances may be required when the rains cease early. In 1907-8 rents were remitted to a considerable amount, and some work was provided on the roads by the government estate. There is no indication that a fodder famine is a possible occurrence.

5. The chief risk to the prosperity of the *tarai* is a rise in water-level following on seasons of excessive rainfall. When this occurs the unhealthiness of the tract increases and the productivity of the land declines : holdings are abandoned, and the coarse grass that springs up harbours predatory animals : the process of deterioration once started is thus cumulative. The process cannot apparently be counteracted by direct measures, but its effects can be minimised by careful management, raducing the pressure of the rent (or revenue) providing capital when required, and also medical relief, and thus enabling the cultivators to remain on the land until seasons



improve. It is possible too that the risk of such a calamity is diminishing owing to the gradual deepening of the channels cut by the streams.

6. No measure can be suggested for the improvement of the supply of water for irrigation, and the effective drainage of the tract must be regarded as impracticable. The supply of water for domestic use is in many places naturally very bad, and a continuance of the present policy of providing good water by sinking wells with pipes to deep springs is desirable.

7. There is ample grazing for cattle and it appears desirable that the land should be devoted to this purpose rather than brought under cultivation. In the *tarai* a line has been drawn, north of which cultivation may not be extended to the detriment of grazing. The question may however have to be considered in Kashipur, which provides grazing for the herds of the Moradabad district, should the development of the cotton crop assume large proportions.

In order to minimize the losses from cattle disease, it is important to insist on the prompt reporting of outbreaks, and to maintain a veterinary staff sufficient to cope with outbreaks as they occur.

The improvement of the local breed of cattle is probably feasible, and the experiments in progress in this direction should not be hastily discontinued for want of obvious results at an early stage.

8. Those parts of the *tarai* which are managed directly by Government do not depend on the general *takavi*-system as the Superintendent provides capital for cultivators as required.

In the *zamindari* tract there is apparently little scope for improvement loans, but agricultural loans may be required to secure rabi-sowings when the rains have ceased early, or to replace working cattle that have died of disease.



9. The agriculture of the tract requires to be examined before definite suggestions can be made for its improvement There is probably room for improved tillage implements, and even for more expensive machinery as wages are very high and labour is unprocurable at any price during certain seasons: and it is probable that better varieties of crops can in some cases be substituted. One question that might be studied is the possibility of reducing irrigation by adaptation of the methods of tillage so as to conserve more of the natural moisture.



DISTRICT NOTE.

ALMORA.

Topography.

AGRICULTURAL statistics are not prepared for this district, and materials for its description are scanty. It may be divided roughly into two tracts, the lower hills, and the high mountains; formerly it included also a *bhabar* tract lying below the hills, but in 1910 this was transferred to Naini Tal.

The lower hills are thickly populated, and contain a considerable area of cultivation, which, however, is scattered in small blocks either on the more level hill-tops, in terraces on the slopes, or in the wider parts of the river valleys. Cultivation is most successful at elevations of from 3,000 to 5,000 feet; mandwa, jhangora and rice are grown in the kharif, and wheat and barley in the rabi. The land is irrigated when possible by channels from the streams and rivers, but most of the cultivated area is dry. The cultivators in the south of this tract are not entirely dependent on the land of their own villages, as they migrate regularly to the *bhabar* for the rabi season.

The high mountains may be said to stretch northward from a line drawn across the district from Kapkot to Askot. This tract consists mainly of glaciers and high mountain ridges. There is little cultivation at the greater elevations; the people depend mainly on trade, and a single crop, usually wheat, barley or phapar, is obtained between June and November. The tract is, however, pierced by the deep valleys of the larger rivers; in these the system of cropping resembles that of the lower hills.

Cattle supply.

The district provides its own cattle, and there is ample grazing land. Rinderpest and foot-and-mouth disease are common, and the former is exceedingly dangerous : other forms of contagious disease have not been reported recently. The practice of inoculation is now welcomed by the people.

Annals.

The district appears usually to receive sufficient rain in both seasons. When distress has occurred it has been the result of a failure of the winter rains following on a poor kharif: these conditions were realised in 1890 and again in 1892, when owing to the non-existence of any regular trade in food grains it became necessary for Government to undertake importation. In both years the western tract Pali-Pachaun was most affected. In 1894 some damage was caused by excessive rain, leading to landslips.

The district received sufficient rain in the famine year 1896. In 1899-1900 both harvests were inferior owing to scanty rainfall, and for a time there was some local scarcity of grain in the western pargana, Pali-Pachaun: this was relieved effectively by advances, and disappeared with the excellent crops of the following year. In 1901 some injury was caused to the kharif by locusts, and scanty winter rains led to an inferior rabi outturn in parts of Almora tahsil. Succeeding seasons were prosperous until 1905. This winter was exceptionally severe and the crops in the lower hills suffered, but more from excessive moisture than from cold. In 1907 again excessive rains caused slight injury to the rabi crops.

The monsoon of this season lasted only a month in the lower hills where the crops were very poor, but the higher tract received satisfactory falls in September. The rabi area of 1908 was contracted, and the failure of the rains in March and April resulted in a very poor yield in the lower hills : little relief was needed during the winter, but when the defects of

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the rabi crops became apparent it became necessary to provide works and give gratuitons relief. On this occasion Government imports of grain were avoided: advances were given to merchants to finance trade, while credit orders were given to individuals enabling them to obtain grain from dépôts at the foot of the hills. The credit orders were most successful during the hot weather, and the carriage of grain gave employment to large numbers of the people, so that the need for other measures of relief was small. The parganas most affected during these seasons were Pali-Pachaun, Bara Mandal and Chawgarkha.

The rains of 1908 were generally favourable but Pali-Pachaun again suffered from deficiency, and the rabi harvest of 1909 was reduced by drought in the spring. Stocks of food were low but relief was not required. Subsequent seasons up to 1911 were favourable.

Progress.

Statistics of the various crops are wanting. It is understood that potato-cultivation has been checked by the exhaustion of land on which this crop was grown, and by restrictions on its cultivation in positions where the denudation of the surface is likely to result in landslips. Tea has also not extended as the crop is not particularly profitable. There has been an increase in fruit and vegetable growing in the vicinity of markets.

The population has increased rapidly in each of the last two decades. The lower rates of rural wages are tending to disappear and the higher rates are spreading: the rates returned in 1911 varied from $2\frac{1}{2}$ to 4 annas.

Loans for land improvement were practically unknown until the last famine when small sums were given, mainly for irrigation channels. The demand appears to have ceased. Advances for temporary purposes were given on a large scale in 1907-8 : the grant of advances to grain-merchants in order to facilitate trade has already been mentioned, and it appears





probable that the need for direct importation by Government will not recur. No attempt has been made as yet to introduce agricultural co-operation.

The trade of the west of the district has been considerably benefited by the extension of the railway to Ramnagar in Naini Tal, Ramnagar being the starting point of the system of cart roads. Similar advantages will accrue to the south-east of the district when the line to Tanakpur is completed. The road system has been considerably developed in recent years, but an extensive programme of work remains to be carried out.

The chief industry of the district is weaving woollen fabrics for local wear. An attempt is being made to develop this industry by means of weaving schools recently established at Almora. Organised industries are represented solely by the brewery at Ranikhet.

The south-west of the district derives a large income from the cantonments and health-resorts of Ranikhet and Almora, which provide considerable markets and employ large numbers of labourers. Other income derived from outside the district appears to be unimportant.

Dangers and possible remedies or improvements.

1. The sowing and harvesting seasons in the hills vary with the altitude to such an extent that it is not possible to indicate the conditions of success and failure with the same precision as in the plains.

2. At the higher altitudes, roughly above 7,000 feet, where only a single-crop season exists, the nature of the winter is unimportant; the crops depend on the rainfall of the monsoon. This is almost always sufficient or in excess, and excessive rain does considerable injury.

In the lower hills the kharif depends on both the spring rains and the monsoon, and the rabi on the winter rains. Rain in March and April is of great importance for the

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sowing of the unirrigated rice-crop, which takes place about April; and this crop requires occasional storms to keep it alive until the rains arrive. An early commencement of the regular rains is desirable, but their continuance to the latter part of September is of much greater importance; a cessation by the end of August leads to loss of a large proportion of the crops. Heavy rain does not appear to cause much direct injury to the crops, but its effects are serious when it causes landslips or destroys the terraced fields.

Landslips are frequently originated by unterraced cultivation on steep hill-sides, and such cultivation should be sternly discouraged.

3. The rabi requires several falls of rain during the winter: and it is important that the winter rains should continue at least into March in the lower villages and into April in the higher.

There are very few records of injury from too much rain at this season; and no report of serious loss from rust on cereals has been received though the disease exists.

Serious injury from frost has not been reported.

4. Damage by ordinary insect-pests has not been reported in either season : but locusts enter the hills at long intervals and cause considerable injury where they settle.

Hailstorms in the spring may cause great local damage to cereals and also to garden crops and orchards : they are of little importance in the winter.

5. So far as experience can be relied on, distress requiring measures of relief should not result from a single bad season, but it must be expected when the rabi crops fail after a bad kharif or vice versa. The danger is apparently greatest in Pali-Pachaun but conditions may vary greatly from valley to valley and each valley must be dealt with on its merits.

When distress occurs, the most important measure is to ensure an adequate supply of food in the distressed areas, where even in good years the local produce is insufficient;



the system of advances to merchants and of grain-credit orders introduced in 1908 will apparently serve this purpose effectively. Loans for subsistence, and gratuitous relief, are also likely to be required: there is ordinarily comparatively little scope for relief-works, but the opportunity should be taken of employing all surplus labour on improvements in communications.

6. There is no experience to show that a fodder-famine is possible in any part of the hills; but with the increase of population and cattle there are indications of possible scarcity in the future unless the grass supply can be improved by conservation.

7. No measures can be suggested for the direct improvement of the water-supply; and the question of drainage does not arise. The water-supply will however probably be improved considerably by the contemplated reservation of large forest areas.

8. There is sufficient pasture land for the cattle in most places, but it is not inexhaustible and difficulty is already being felt in places where cultivation is extensive. The reservation of forests will, it is hoped, improve the supply. The most important measure for the protection of cattle is the mitigation of the disease, which is much more fatal than in the plains. The organisation of a system by which reports of outbreaks shall be promptly made, and the maintenance of a veterinary staff sufficient to prevent outbreaks from spreading are the essentials of the problem : but great difficulties arise from the obstacles to rapid travelling.

9. There is not much scope for the *takavi*-system in ordinary years. The chief agricultural improvement—the terracing of fields—must be carried out very gradually and cannot be done off-hand by the expenditure of capital; and improvement loans will probably be wanted only in exceptional cases for the construction or repair of water channels.



Agricultural loans may be required in times of scarcity, as has been indicated above, and at other times to enable cultivators to replace cattle that have been lost by disease or accident: in ordinary seasons they are not likely to be required for other purposes.

10. There is probably not scope for large changes in methods of cultivation. The problem presented by the wornout potato lands deserves further study than it has received. In the remoter villages the most hopeful line of agricultural improvements is probably the introduction of more valuable drugs and spices, the produce of which can bear the very heavy cost of transport. Within reach of markets, the promotion of market-gardening and orcharding is the most hopeful form of improvement. The development of sheep-breeding for wool is at present the subject of study.

11. It appears to be probable that the future development of the hills will be mainly on non-agricultural linesextension of the tourist and pilgrim industry and of health resorts, manufactures based on forest produce, and possibly some utilisation of minerals. The first condition for any such developments is the improvement of communications: a programme of works has recently been drawn up for the district but it should not be regarded as exhaustive. The question of labour will however affect developments such as are indicated : the people are prosperous, and do not need to work steadily nor are they inclined to do so.

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DISTRICT NOTE.

GARHWAL.

Topography.

No agricultural statistics are prepared for this district, and the materials available for its description are therefore scanty. There is a narrow strip of *bhabar* lying below the hills, and some *Dun* country between the Himalayas proper and the outer Siwalik formation, but the bulk of the district is mountainous, consisting of a succession of deep gorges and steep hillsides, with small patches of cultivation, usually terraced, in places where the slopes are more gradual. The agricultural features vary widely with the position, soil, and altitude of each block; and the only general distinction that can be drawn is between the north and the south of the district.

The north which includes parganas Chandpur, Dewalgarh, Badhan, Nagpur, Dasauli and Painkhanda, is not entirely free from the danger of drought, but the crops are specially liable to injury from excessive rainfall. The south includes the parganas Barahsyun, Chandkot, Malla Salan, Talla Salan and Ganga Salan. This tract may suffer severely from defect in either the summer or the winter rainfall. The parganas of Chandkot and Barahsyun have a relatively dense population and high proportion of cultivation, and in places there is scarcely sufficient grazing for the cattle. Ganga Salan and Mala Salan on the other hand are unhealthy and sparsely populated. The foothills and *bhabar* compose the forest divisions known as Ganges and Garhwal: the forests in the rest of the district are managed by the Deputy Commissioner.

Water-supply.

The only sources of irrigation are the small channels (guls) led from the streams along the hillsides : they are made



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by the people interested, and from time to time require modification as the bed of the stream deepens. There is not enough cultivation in any place to give scope for extensive irrigation works.

Cattle-supply.

The district is fully self-supporting, and the cattle of pargana Chandkot have some reputation in the adjoining parts of the plains. Rinderpest and foot-and-mouth disease are common: other contagious diseases have not recently been reported. Rinderpest is exceedingly destructive, and in the last epidemic a strong demand arose for protective incenlation, much greater than could be met by the local staff owing to the difficulty of travelling.

Annals.

The first severe scarcity recorded was in 1877-78 when the southern tract suffered from the failure of the rains and distress was for a time acute. Scarcity was again prevalent both in 1890 and 1892, chiefly in the south of the district, being caused in each instance by failure of the winter rains : relief was given chiefly by the importation of grain by Government, the grain being either sold for cash or given out in advances. The northern parganas suffered from excessive monsoon rains in 1893 and again in 1894, and some advances for subsistence were necessary.

In 1896 deficient rain in both seasons produced more general distress and relief works were carried out while gratuitous relief was also given. The district was more fortunate in the following year and no distress was experienced then or in 1899, though the crops in the latter year were much injured by insufficient monsoon rainfall. In 1901 the mandua crop was injured considerably by locusts, and the following rabi was inferior in the south owing to deficient winter rains.

Favourable seasons followed : and though the winter of 1904-5 was extraordinarily severe the crops suffered little

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injury. The rams of 1905 were irregularly distributed and the rice crop was inferior. In 1906 the crops in both seasons were generally good, but locusts caused severe local damage, and much valuable land was washed away by the persistent rain of August. The rabi of 1907 was injured by excessive rain, and rinderpest increased, while foot-and-mouth disease caused serious losses. The rains were late and ceased early, and about half the kharif was lost, while want of winter rains destroyed most of the rabi of 1908 in the southern parganas. As the results of three bad harvests, food-supplies were seriously deticient, but on this occasion the necessity for importation by Government was avoided by the grant of advances to merchants who either imported grain or issued it at the foot of the hills on advance-orders given by the district staff. The system worked well, and grain to the value of about three lakhs was imported. Some relief works were also organised, and gratuitous relief was given more freely than hitherto.

The rains of 1908 were generally satisfactory, but they failed in September in the south-east pattis where the crops were very poor; and the rabi of 1909 suffered severely throughout the south from drought and dry winds. Some measures of relief were required from May to July. The following rains were much more favourable, though considerable loss was caused by landslips, while rinderpest reappeared. The rabi of 1910 again suffered in the south owing to want of rain between February and April. The monsoon was heavy and serious losses from landslips were again recorded, but the crops on the whole yielded well, while the rabi of 1911 was exceptionally good. Rinderpest however spread widely during the seasons, causing close on 4,000 deaths between April 1910 and March 1911.

Progress.

The absence of statistical data makes it impossible to say whether cultivation has expanded in recent years, or whether

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changes in the system of cropping have occurred, but apparently there has been some development in the production of spices which are grown for sale to a considerable extent.

Population increased substantially between 1891 and 1901 and more rapidly in the last decade. The lower rates of rural wages recorded in 1906 have apparently disappeared, and in 1911 the usual rate was 4 annas or more.

Advances for land improvement are not a normal feature of the district, but about Rs. 13,000 were taken in 1907-8 and smaller sums in the two following years. Advances for temporary purposes, mainly for the purchase of grain, are popular in unfavourable seasons, and in 1907-8 their aggregate was close on $3\frac{1}{2}$ lakhs. No attempt has yet been made to organise agricultural co-operation in the district.

There has been a considerable advance in recent years towards making the district accessible: the railway was extended in 1897 to Kotdwara at the foot of the hills and a cart road has been constructed gradually to Lansdowne, while the improvements effected on the paths in the interior have made pack-traffic possible in several directions. The recent opening of the line to Ramnagar in Naini Tal is affecting the traffic in the south-east. There is still room for very great improvement of the road system, and in particular for a continuation of the cart road to Pauri.

The manufactures of the district are of local importance only, and no industry on a large scale exists. The district has however considerable resources other than its agriculture (which barely suffices to feed the inhabitants) and some of these have been developed materially. Large sums of money are spent by pilgrims, who have increased in number since the roads were improved: the development of the Lansdowne cantonment and the operations of the Public Works department have given increased employment; while increasing numbers of the people obtain seasonal work in Mussoorea

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and Naini Tal, as well as in the plains. The employment outside the district has increased rapidly as is indicated by the returns of money-orders : about 1900 the sums distributed in the district aggregated about two lakhs annually, and about 1907 this had risen to four lakhs : but for the last three financial years the figures have been six lakhs, $5\frac{2}{4}$ lakhs and $6\frac{1}{4}$ lakhs respectively.

Dangers and possible remedies or improvements. THE HILL TRACTS.

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In the lower hills the kharif depends on both the spring rains and the monsoon, and the rabi on the winter rains. Rain in March and April is of great importance for the sowing of the unirrigated rice-crops, which takes place about April; and this crop requires occasional storms to keep it alive until the rains arrive. An early commencement of the regular rains is desirable, but their continuance to the latter part of September is of much greater importance; a cessation by the end of August leads to loss of a large proportion of the crops. Heavy rain does not appear to cause much direct injury to the crops, but its effects are serious when it causes landslips or destroys the terraced fields.

Landslips are frequently originated by unterraced cultivation on steep hill-sides, and such cultivation should be sternly discouraged.



Garheval.

9. The rabi requires several falls of rain during the winter and it is important that the winter rains should continue at least into March in the lower villages and into April into higher.

There are very few records of injury from too much rain at this season; and no report of serious loss from rust on cereals has been received though the disease exists.

Serious injury from frost has not been reported.

4. Damage by ordinary insect-pasts has not been reported in either season : but locusts enter the hills at long intervals and cause considerable injury where they settle.

Hailstorms in the spring may cause great local damage to cereals and also to garden-crops and orchards: they are of little importance in the winter.

5. So far as experience can be relied on, distress requiring measures of relief should not result from a single bad season, but it must be expected when the rabi crops fail after a bad kharif or vice versa. The danger is apparently greatest in the southern parganas but conditions may vary greatly from valley to valley, and each valley must be dealt with on its merits.

When distress occurs, the most important measure is to ensure an adequate supply of food in the distressed areas: where even in good years the local produce is insufficient; the system of advances to merchants and of grain-credit-orders introduced in 1903 will apparently serve this purpose effectively. Loans for subsistence and gratuitous relief are also likely to be required: there is ordinarily comparatively little scope for relief-works, but the opportunity should be taken of employing all surplus labour on improvements in communications.

6. There is no experience to show that a folder famine is possible in any part of the hills ; but with the increase of population and cattle there are indications of possible scarcity



Garhmat.

in the future unless the grass supply can be improved by conservation.

7. No measures can be suggested for the direct improvement of the water-supply; and the question of drainage does not arise. The water-supply will however probably he improved considerably by the contemplated resorvation of large forest areas.

8. There is sufficient pasture land for the cattle in most places, but it is not inexhanstible and difficulty is already being felt in places where cultivation is extensive. The reservation of forests will, it is hoped, improve the supply. The most important measure for the protection of cattle is the mitigation of disease, which is much more fatal than in the plans. The organisation of a system by which reports of outbreaks shall be promptly made, and the maintenance of a veterinary staff sufficient to prevent outbreaks from spreading are the essentials of the problem : but great difficulties arise from the obstacles to rapid travelling.

9. There is not much scope for the takavi-system in ordinary years. The chief agricultural improvement – the terracing of fields—must be carried out very gradually and cannot be done off-hand by the expenditure of capital; and improvement loans will probably be wanted only in exceptional cases for the construction or repair of water-channels.

Agricultural loans may be required in times of scarcity, as has been indicated above, and at other times to enable cultivators to replace cattle that have been lost by disease or accident: in ordinary seasons they are not likely to be required for other purposes.

10. There is probably not scope for large changes in methods of cultivation. The problem presented by the wornout potato lands deserve further study than it has received. In the remoter villages the most hopeful line of agricultural improvement is probably the introduction of more valuable drugs and spices, the produce of which can bear the very heavy



Garhroal.

cost of transport. Within reach of markets, the promotion of market gardening and orcharding is the most hopeful form of improvement. The development of sheep-breeding for wool is at present the subject of study.

11. It appears to be probable that the future development of the hills will be mainly on non-agricultural lines extension of the tourist and pilgrim industry and of health resorts, manufactures based on forest produce, and possibly some utilisation of minerals. The first condition of any such developments is the improvement of communications : a programme of works has recently been drawn up for the district, but it should not be regarded as exhaustive. The question of labour will however affect developments such as are indicated : the people are prosperous, and do not need to work steadily nor are they inclined to do so.

THE BHABAR,

Conditions in the small *bhabar* tract are similar to those which prevail in Naini Tal. The prolongation of the rains through September is the most important point as drought at this time injures the kharif and restricts the rabi area.

DISTRICT NOTE.

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LUCKNOW.

Topography.

THE topography of the district can best be described with reference to the rivers. The Gumti flows between Malihabad and Mahoua, then through the centre of Lucknow and then along the northern boundary of Mohanlalganj. The villages along its banks and for a varying distance on either side are more or less sandy, except in the neighbourhood of the city, where market gardens extend in places up to the river. Beyond the *bhur* on each side there is a stretch of *dumat* and then a larger stretch of *bhur* along the Sai. The assessment circles show clearly the topographical features of the district, and the statistics for each circle will be found in the pargana handbooks.

Water-supply.

There are no irrigation canals. The well-survey showed that ordinary spring wells can be made in nearly all parts of the district, foundation-clay being met with at a reasonable depth. There are however 170 villages (out of 966 in the district) where these conditions do not prevail: practically all of these villages lie along the Gumti or the Sai, and most of them are situated in parganas Mohanlalganj (76), Bijnaur (28), Lucknow (25) and Nigehan (18). Temporary wells can be made in most parts of the district: the villages where their construction is most important in years of drought have been recorded in the survey. Irrigation from *jhils* is widely practised when water is available; temporary wells can be substituted in most places when the rains fail.

Lucknow.

Cattle-supply.

There is no organised industry of cattle-breeding, the absence of any extensive pasture lands preventing its establishment. The number of cows kept in the district is small and the quality poor, while there are relatively very few sacred bulls, and practically no other bulls reserved specially for breeding. The district depends therefore mainly on imports for its working stock. The best cattle are imported from the Punjab and from Pilibhit or Kheri, while the bulk of the ordinary animals come from Bundelkhand or the central doab.

There has been little rinderpest of late years. Foot-andmouth disease is common in the district, and haemorrhagic septicaemia also occurs. Hitherto there have been few opportunities of practising preventive inoculation, but it is probable that it would be accepted in a severe outbreak.

Annals.

Records of the earlier economic annals of the district are meagre. In 1877 the rains failed and there was next to no kharif; there was great distress and heavy mortality throughout the district. In 1880 again the rains failed; rice was almost a total failure, and as the *jhils* were dry much of the rabi could not be irrigated. After this the next record is of the great flood on the Gumti in 1894, when the whole of the lowlands suffered severely, the kharif being totally destroyed and many homesteads wreeked. In the following cold weather continuous rain did much injury to the rabi in the heavier soils. The series of wet seasons of which 1894 was the last did more damage than was recorded at the time; crop after crop was inferior in varying degrees and the people were gradually impoverished.

In 1896 the rains failed and the loss of kharif crops was severe and general, while rabi sowings for 1897 were restricted; distress was very severe throughout the district. A rapid

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Incknow.

recovery followed; for two years there were good seasons, and though there was some anxiety in parts of the district in 1899, when the rains ceased prematurely and much of the rice was lost, the later dry kharif crops gave an excellent yield, and there was no distress. From 1900 to 1902 the seasons were favourable, and cultivation recovered rapidly.

		Babi.			Kharif.				
Yes	ır.	All crops.	Wheat.	Gram.	Poppy.	All crops.	Rice.	Bajra.	Pulses.
1908		100	100	88	94	68	75	60	56
1904		94	87	56	100	100	94	94	94
1905		27	19	81	56	66	87	85	75
1906		96	100	92	113	87	90	105	100
1907		86	69	100	100	81	12	20	25
1908	The second	87	87	75	75	89	87	95	87
1909		87	87	75	100	90	90	100	98
1910		104	106	106	81	89	97	90	81
1911	And States	87	81	94	81	No.	BET-SUPE	8.4.6	

The yields for the years from 1903 onwards are given in the following table :---

In 1903 the rains began late, and excessive falls in October caused serious injury to the kharif. The year 1904 was prosperous, but in 1905 the great frosts which occurred at the end of January and beginning of February almost destroyed the cereals and pulses, wheat suffering most. The following kharif suffered from deficiency of rain in the latter part of the season, and the same cause reduced the area sown in the succeeding rabi, which however yielded well. The kharif season of 1906 was favourable and the following rabi yielded well except in the case of wheat, which was affected by rust. The kharif area sown in 1907 was large, but the failure of the rains in September led to the loss of most of the crop, and to a large reduction in the rabi area of 1908.

Lucknow.

Revenue was freely suspended and *takavi* liberally given, and at no time was distress serious. Recovery was somewhat delayed by the very severe outbreak of malaria in the autumn of 1908, which made it impossible to sow a full rabi area; but during 1909 and 1910 the district was prosperous. The rabi area of 1911 was almost up to the normal: wheat suffered from rust and poppy from blight owing to continued damp weather, but the other crops were good.

Prograss.

The district was fully developed at the opening of the period under review, and the extension of cropping has not been marked. The cropped area is subject to fluctuations, the chief source of which is the varying extent to which a rabi crop can be sown after rice.

The class of crops shows a slight tendency to improve. The area under wheat has risen substantially; and cotton has become of some little importance. Sugarcane has never been sown on a large scale : the area at one time tended to expand, but has fallen again in the last few years. Market gardening has extended, and a regular export trade has sprung up in some classes of vegetables. Cultivation of groundnuts has begun in the last two years and promises to extand. On the other hand the area under poppy is being reduced.

Construction of masonry wells has been rapid in recent years, the number having risen from 6,667 in 1904-5 to 9,386 in 1910-11. The rate of construction was maintained steadily until the famine of 1907 when it increased rapidly, but since then a decline has apparently set in. In 1911 there was one masonry well to 29 acres of normal cultivation as against 39 acres in 1906. The area irrigated from wells in the famine of 1907-8 amounted to 116,000 acres as against 95,000 in 1896-7: the expansion was due partly to the increase in masonry wells and partly to the large advances given for constructing temporary wells. At the time of the well-survey



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(1907) it was reported that tenants were usually willing to take advances but that many landholders objected to the practice. During the last few years the landholders' views have changed to a considerable extent, and hostility is now very much less common: it has almost disappeared among ordinary landholders, but a few talukdars. still, withhold facilities.

The population of the district rose between 1891 and 1901 but has fallen during the last decade; in 1911 it stood at 764,000 as against 774,000 in 1891.

Rural wages do not appear to have risen during the last five years : the rates ordinarily paid in 1911 ranged from 2 to $2\frac{1}{4}$ or $2\frac{1}{2}$ annas.

Advances for land improvement—chiefly masonry wells were taken steadily on a moderate scale between 1897 and 1905: the amount taken has increased considerably since then, varying from Rs. 8,000 to Rs. 24,000 in different years, while in the famine year 1907-8 advances aggregated several lakhs. Loans for temporary purposes have always been taken, but the amount has increased largely in recent years; some lakhs were given in 1907-8 and since then issues have varied from Rs. 20,000 to Rs. 76,000. The scope for such advances in years of drought is very great as it then becomes necessary to provide for the irrigation that in wet years would be afforded by the *jhils*.

A beginning has been made in agricultural co-operation. In 1911 there were 18 rural credit societies with 400 members, as well as a district bank at Mohanlalganj, and an early expansion of operations is expected.

The railway system has been extended during the last twenty years by the opening of the chord line to Benares, while additional stations have been provided on existing lines, and the district is now exceptionally well equipped.

Lucknow.



The length of metalled roads has been increased by nearly one-half in the same period, and not much remains to be done.

Rents have shown a steady upward movement during the last decade: the recorded rents for 1895-6, the first year after settlement, gave a rate of Re. 6.6 per acre which was maintained practically unchanged until 1900-01. By 1910-11 the rate had risen to Rs. 8.0 per acre; the rise during the last seven years has been at the rate of Re. 1.8 per cent. annually or double the maximum rate authorized by the Rant Act.

The old hand-industries of the city have for the most part declined, but are being replaced as sources of employment by industries organised on more modern lines. The chief developments during this direction in the last twenty years have been the opening of oil and flour mills and an iron works, the large extension of the railway workshops (employing 5,000 hands in 1910), and the development of the printing industry. A cotton-spinning mill is in existence but has not recently worked. Outside the city, handloom-weaving has declined where it existed, and there have been no new developments. Very large sums of money are distributed in the district by money-order, but the statistics available do not show how far this income affects the rural population and how far it is earned by the trade of the city.

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 occasional falls of rain. If the first month is wet sowing of dry crops will be delayed and the area will fall, though the loss may be to some extent made good by large sowings of rice, and also of bajra and the late pulses which can be sown until nearly the end of August.

Lucknow.

The area under late rice is small: it varies with the weather during the second month of the season, when frequent falls of rain at short intervals are required.

The small area planted with surgarcane 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; the other is the financial position of the cultivators, which depends mainly on the success or failure of the preceding harvests.

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

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

The late dry crops, which are the most important source of food, require the prolongation of the rains almost 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 small area under 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.

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

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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 crops may be exposed to the following dangers :

- (a) Floods on the Gumti and Szi.—The area affected by floods is not extensive, but particular villages may require postponement of revenue and advances to secure the rabi; the need for advances should be considered particularly when homesteads have been injured or cattle lost.
- (b) The juar crop may suffer from attacks of boring insects (see Provincial Note, section VI.)
- (e) There are probably other insect-pests, and also fungoid diseases which have not yet been reported.

4. The rabi area depends mainly on the rainfall of September and early October. It may fall seriously if this season is dry, but the loss can be mitigated if financial assistance is given in time to enable the land to be tilled with irrigation.

5. The rabi yield depends to some extent on winter rains though in ordinary seasons these are not required for the large irrigated area. Falls in December and January are beneficial provided they are moderate in amount and of short duration: falls after the middle of February are likely to cause some injury: prolonged damp and cloudy weather in January and February is almost certain to produce rust on wheat and linseed, and very serious loss may result, the full