than hardships, and their religious ideas rarely cause them to inflict much discomfort on themselves or their neighbours. They have a vague idea that it is well to be good and wrong to do evil, and this is enough to keep their lives as a rule fairly free from vice and wrong-doing. They are on the whole a wonderfully peaceable, contented and law-abiding people, very easy to manage. There is nothing to dislike in the Bágrís, but they are so dull and coarse and wanting in spirit that one cannot admire them much; the Musalmáns are likeable for their frankness and spirit, but their comparative laziness and extravagance are objectionable; and it would be hard to find anywhere a better body of peasantry than the Sikh Jats, who are frank, spirited and independent without turbulence or arrogance, thrifty and industrious but not miserly, temperate in their habits and not wanting in intelligence, so that there is much in their character to admire, respect and like, and little to despise or disapprove.

CHAPTER IV.—The Produce of the District.

Total areas.

146. The following statement shows for each assessment circle and for each tahsíl the total area in acres as returned by (1) the patwáris' measurements of last Settlement made between 1853 and 1864; (2) the Revenue Survey made between 1876 and 1879; and (3) the present Settlement Survey made by the patwáris in 1880-81, with the percentage of difference.

Assessment circle and tahsíl.	Total area in acres by measurements of			Percentage of difference from Revenue Survey area.	
	Last Settlement, 1853—64.	Revenue Survey, 1876—79.	Present Settlement, 1880-81.	Of area by last Settlement.	Of area by present Settlement.
Bágar	1,80,258	1,74,351	1,73,809	+3·4	— ·3
Nálí	3,52,379	3,40,640	3,41,689	+3·5	+ ·3
Rohi	12,74,413	12,30,494	12,31,900	+3·6	+ ·1
Utár	1,19,749	1,15,440	1,15,668	+3·8	+ ·2
Hitár	66,109	61,436	60,372	+7·6	—1·7
Total of district ...	19,92,908	19,22,361	19,23,438	+3·7	+ ·1
Tahsíl Sirsá ...	6,58,184	6,35,819	6,35,158	+3·5	— ·1
„ Dabwálí ...	5,85,618	5,21,211	5,22,765	+2·7	+ ·3
„ Fázilká ...	7,99,106	7,65,331	7,65,515	+4·4	...

The difference of 1·7 per cent. in Chak Hitár between the measurements of the Revenue Survey and the present Settlement is due chiefly

to the action of the river Satlaj, which annually causes changes in the area of the villages bordering on it. The above statement gives the figures of the patwáris' measurements after the first check in 1881. After the final fairing and check and the incorporation of the alluvion and diluvion changes of 1881-82, the total areas as given by the faired Settlement record are as follows :—

Tahsil.	Area according to faired Settlement records.		Percentage of difference from Revenue Survey.
	In acres.	In square miles.	
Sirsá ...	6,35,181	993	— ·1
Dabwálí ...	5,22,993	817	+ ·3
Fázilká ...	7,68,851	1,201	+ ·5
Total of district ...	19,27,025	3,010	+ ·2

It will be observed that the areas of the previous Settlement Survey are everywhere from 3 to 4 per cent. in excess of the true area. This seems to be chiefly owing to the rough method then employed of calculating areas of triangular fields.

Cultivated areas.

147. The following statement shows the cultivated area in acres for each assessment circle as returned by the Revenue Survey of 1876-79 and by the Settlement Survey of 1880-81 with the difference per cent. :—

Assessment Circles and Tahsil.	Area in acres by Revenue Survey, 1876-79.			Area in acres by Settlement Survey, 1880-81.			Difference per cent.
	Cultivated.	Lately abandoned.	Total.	Cultivated.	Lately abandoned.	Total.	
Bágar ...	1,31,795	3,596	1,35,391	1,25,607	7,596	1,33,203	— 2
Náli ...	1,81,656	18,263	1,99,924	1,85,813	9,704	1,95,517	— 2
Rohi ...	6,12,696	5,687	6,18,383	6,51,348	2,912	6,54,260	+ 6
Utár ...	49,305	935	50,240	53,816	663	54,481	+ 8
Hitár ...	23,300	4,025	27,325	25,147	4,208	29,355	+ 7
Total of district...	9,98,752	32,511	10,31,263	10,41,733	25,083	10,66,816	+ 3
Tahsil Sirsá ...	3,88,038	22,478	4,10,516	3,96,193	18,096	4,04,289	— 2
Tahsil Dabwá'i ...	2,98,081	2.756	3,00,837	3,17,821	961	3.18.782	+ 6
Tahsil Fázilká ...	3,12 633	7,277	3,19,910	3,37,719	6,026	3,43,745	+ 7

The definitions adopted by the Revenue Survey of "Cultivation" and "Lately thrown out of Cultivation" agree with those adopted in the Settlement, and include in the first term all land that had borne a crop during the two years preceding the survey, and in the second, all land not coming under the definition of "Cultivation," which had borne a

crop during the four years preceding the survey. Although a strict adherence to these definitions must to a great extent eliminate differences in the cultivated area due to differences of season, yet where the cultivated area fluctuates from year to year so greatly as it does in this district, and where on the one hand the sandy soil thrown out of cultivation loses in two years all signs of having been cultivated, and on the other, the hard soil once cultivated shows marks of cultivation ten years after it has been abandoned, measurements made in different seasons by different sets of officers must necessarily give somewhat different results. The patwáris' Annual Returns show that the area cultivated is on the whole increasing from year to year at the rate of something like 1 per cent. per annum, and this rate of increase was in some parts of the district greatly accelerated by the favourable seed-time, both of the rabi and kharif harvests of 1880, which encouraged the cultivators to break up much new land, and still more by the eagerness shown by many to bring new land under the plough before the Settlement measurements, in order to get it entered in the Settlement Record as held by them. The differences in the cultivated areas returned by the two surveys are therefore not greater than might have been expected, and the area under cultivation in 1881 may be taken as 10,66,816 acres or 1,667 square miles, *i.e.*, 55½ per cent. of the total area of the district.

Increase of cultivation.

148. The following statement shows the increase of cultivation since last Settlement in each tahsil and assessment circle :—

Assessment Circle and Tahsil.	Area at last Settlement (1853-54.)			Area by present Settlement (1880-81.)			Increase or decrease of cultivated area.	
	Total area.	Cultivated area.		Total area.	Cultivated area			
		Acres.	Per cent. on total area.		Acres.	Per cent. on total area.	Acres.	Per cent.
Bagar	1,80,258	1,40,617	78	1,73,909	1,25,607	72	−15,010	−11
Nali	3,52,379	1,47,486	42	3,41,689	1,85,813	54	+38,327	+26
Rohi	12,74,413	3,47,945	27	12,31,900	6,51,348	53	+3,03,403	+87
Utar	1,19,749	12,943	11	1,15,663	53,818	47	+40,875	+317
Hitar	66,109	22,299	34	60,372	25,147	41	+2,848	+13
Total of district ...	19,93,908	6,71,290	34	19,23,433	10,41,733	54	+3 70,443	+55
Tahsil Sirsa... ...	6,58,184	3,29,524	50	6,35,158	3,86,193	61	+56,669	+17
Tahsil Dabwali ...	5,35,618	2,07,866	39	5,22,765	3,17,821	61	+1,09,955	+53
Tahsil Fazilka ...	7,99,106	1,33,900	17	7,65,515	3,37,719	44	+2,03,819	+152

There has thus been a large increase of cultivation everywhere except in Chak Bágar, where there has been a decrease of 11 per cent., and in Chak Hitár, where the increase has been only 13 per cent. The greatest increase is in the Utár, where cultivation is more than four times its former area, and the increase of cultivation for the district as a whole is 55 per cent.

According to the Annual Reports the total area cultivated for each harvest during each year since 1871 has been as follows :—

Agricultural Year.	Area Cultivated (in acres)			Percentage on total of	
	Kharif.	Rabi.	Total.	Kharif.	Rabi.
1871-72	7,70,699	1,37,296	9,07,995	85	15
1872-73	7,82,051	1,58,530	9,40,581	83	17
1873-74	7,93,415	1,51,267	9,44,682	84	16
1874-75	7,79,535	2,09,136	9,88,671	79	21
1875-76	7,40,517	2,19,319	9,59,836	77	23
1876-77	7,45,436	2,21,142	9,66,578	77	23
1877-78	3,91,956	2,24,349	6,16,305	64	36
1878-79	7,26,097	2,59,579	9,85,676	74	26
1879-80	7,00,000	2,76,303	9,76,303	72	28
1880-81	7,37,300	1,52,446	8,79,646	83	17
1881-82	7,72,858	2,50,129	10,22,987	76	24
1882-83	7,15,186	3,23,146	10,38,332	69	31
Average ...	7,20,413	2,15,220	9,35,633	77	23

It appears then that while the area cultivated for each harvest fluctuates greatly with the nature of the seasons, the total area under cultivation is on the whole increasing steadily at the rate of something like one per cent. per annum, and that the proportion cultivated for the rabí crop is rapidly increasing and is now about one-fourth of the total cultivated area. I have often been told, especially in Bágrí villages, that they had just begun to cultivate rabí crops, and have seen many evidences that rabí cultivation is fast extending. The Bágrís when they first immigrated from the Bíkáner prairies knew nothing of rabí cultivation and are only now learning it by degrees from their Sikh and Musalmán neighbours, and even the latter now find they can get more out of the soil, though with greater labour, by growing a larger proportion of rabí crops than before. This gradual progress is an improvement in the condition of the district, for the rabí crop, though very precarious, seems less so than the kharíf, and a village which cultivates a large proportion of rabí is more sure of getting some produce in one or other of the harvests of the year.

149. At the previous Settlement the cultivated land had been classified according to its quality into (1) *dákar* or clay loam, (2) *rausli* or loam, and (3) *bhúr* or sandy soil; but these are Hindustání terms and, except the last, are hardly known to the people, who practically make little distinction between the soils except distinctions relating to the source from which they get the supply of moisture necessary for cultivation. Generally for wide stretches of country the soil varies little, and even where the proportion of sand varies considerably, no difference is made in the rate of rent, the fact being that the amount of produce depends much more on the supply of moisture than on the quality of the soil. No doubt when the rainfall is good, a field of hardish loam (*rausli* or *karrí zamín*) will produce more than a field whose soil is sandy (*bhúr*); but on the other hand, when the rain fall is light, a fair crop may be got on the sandy soil, and none on the hard loam. Again while low-lying ground (*niwán*) benefits in a season of scanty rainfall from the drainage of the neighbouring higher ground (*mair*) and produces a better crop, it is found that in seasons of heavy rainfall the crop on such land is poor owing to the fact that the kankar (*ror*), which in many places in such hollows forms a layer a short distance below the surface, prevents the water from soaking through. This is especially the case in parts of the depressions made by former streams or drainages. In short, in the Rohi tract the produce of a field depends so very much on the rainfall, and the rainfall is so uncertain, that a considerable difference in the quality of the soil makes little difference in the actual value of the field, and the people themselves have hitherto made so little distinction between soils in distributing the revenue or in fixing the rents of their tenants that it was thought unnecessary to make any such distinction in the Settlement measurements; more especially as any increase in the classes of soils to be distinguished greatly increases the work of a Settlement, and this branch of the work, which must necessarily be left much to the munsarims and patwáris, is generally more or less untrustworthy. Accordingly in this Settlement the old distinctions of *dákar*, *rauslí* and *bhúr* have been abandoned, and the only classes of soil are those determined by the nature of the irrigation from which they ordinarily benefit. Only it has been found necessary to distinguish the hard clay soil of the Sotar or Ghaggar valley from the lighter sandy loam of the uplands. Thus the classes into which the cultivated land has been distinguished in the present Settlement are as follows :—

Classes of soil.

(1.) *Cháhí*, or land ordinarily cultivated with the help of irrigation from wells, *jhaláre* or *túyas*.

(2.) *Rez*, or land ordinarily cultivated with the help of flood-irrigation from the Satlaj or Ghaggar, whether naturally or by means of water-cuts.

(3.) *Sotar bárání*, the hard clay alluvial soil of the Sotar or Ghaggar valley, ordinarily cultivated with the aid of the local rainfall only.

(4.) *Rohi bárání*, the lighter loam or sandy soil of the uplands, ordinarily cultivated with the aid of the local rainfall only.

The following statement shows the areas of these different classes of soil according to the present Settlement measurements.

Assessment Circle and Tahsil	Total area cultivated (in acres.)	Detail of cultivated area.			
		Irrigated from wells (cháhi).	Flooded (rez).	Unirrigated hard clay (sotar bárani).	Unirrigated light loam (rohi bárani.)
Bágar	1,25,607	.....	.....	335	1,25,272
Náli	1,85,818	892	89,915	8,051	1,86,955
Rohi	6,51,348	.....	.....	.....	6,51,348
Utár	53,818	167	.....	855	52,796
Hitár	25,147	9,389	13,868	.....	1,890
Total of district ...	10,41,733	10,448	53,783	9,241	9,68,261
Tahsil Sirsá ...	3,86,193	817	39,280	8,331	3,37,715
Tahsil Dabwáli ...	3,17,891	75	635	5	3,17,106
Tahsil Fázilká ...	3,37,719	9,556	13,868	855	3,13,440

Thus of the total cultivated area of the district only 1 per cent. is within reach of irrigation from wells, 5 per cent. is irrigated by floods from the rivers, less than 1 per cent. is unirrigated hard clay in the Sotar valley, and 93 per cent. is the unirrigated light loam of the prairie uplands.

Irrigation from Wells in the Náli and Utár Chaks.

150. Owing to the depth of water below the surface there is no irrigation from wells in the Bágar and Rohi Chaks. In 44 villages of the Náli Chak 82 *pakka* and 27 *kachcha* wells are used for purposes of irrigation, while at last Settlement only 48 *pakka* and 6 *kachcha* wells were so used. and only 260 acres were returned as irrigated from wells. In the present Settlement 892 acres are returned as ordinarily cultivated with the help of irrigation from wells, but this area is not irrigated every year. The actual irrigation for each of the seven harvests observed during Settlement was as follows in the Náli Chak :—

Agricultural Year.	Area actually irrigated from wells in		
	Kharif.	Rabi.	Total of year.
1879-80	not observed.	480	...
1880-81	184	626	810
1881-82	119	353	472
1882-83	120	296	416

The area so irrigated varies very much from year to year according to the rainfall. Thus in 1880-81 when the rainfall was scanty the area irrigated from wells was nearly double the area irrigated in the following year when the rainfall was favourable. According to the patwáris' annual papers for the years 1874 to 1879 the average area irrigated from wells during those five years was 473 acres, and the present average area actually irrigated may be estimated at 500 acres; but 892 acres are returned as within reach of irrigation from wells and nearly the whole of this area is actually irrigated when the failure of rain renders it desirable. It gives an average of about eight acres per well, which is very small for a tract where water is ordinarily sweet and within 40 feet of the surface. Although there has been an increase both of wells and of actual irrigation from wells since last Settlement, the villagers of the Ghaggar valley have not developed irrigation from wells to such an extent as they might. They say that the sandy subsoil in many places does not allow them to use *kachcha* wells, and that *pakka* wells are too expensive for them (say Rs. 500), and this would account to some extent for the fewness of the wells. But besides this they do not fully use the wells they have; and the unthrifty Musalmáns who cultivate most of the land on the Ghaggar are content to take their chance of a good flood and do not care to bestir themselves to provide by a development of well-irrigation for the failures of floods. The wells in the Ghaggar valley are almost all worked with the rope and leather bag (*ldo* and *charas*), but one or two are worked with the Persian wheel (*harat*). Sometimes a rope-and-bag apparatus is erected on the high bank of the Ghaggar and used for irrigating kharif crops; this is called a *túya*. But the Persian wheel is more commonly used in this way both for kharíf and rabí crops, a channel being dug from the stream or lake to bring the water under the wheel which is then called a *jhalár*. The best irrigation from *jhaláts* is in Chak Ráiyán and Dhanúr on the Dhanúr lake, and the best irrigation from wells is perhaps in Farwáía and the other villages on the Ghaggar before it enters the Sotar valley. In 1880-81 the crops irrigated from wells were

Kharíf 1880.		Rabí 1881.	
Crop.	Area in acres.	Crop.	Area in acres.
Jawár	96	Wheat	194
Maize	2	Barley	138
Vegetables &c.	84	Vegetables	81
Gwár	2	Tobacco	190
		Miscellaneous	23
Total ...	184	Total ...	626

In the Utár Chak, although water is generally within 60 feet of the surface, and in some places sweet, irrigation from wells is practised only in 9 villages of the 58 in the Chak, and only 167 acres have been returned as so cultivated. The area actually irrigated from wells in this circle was 122 acres in 1880-81, and 120 acres in 1881-82. At last Settlement 12 *pakka* wells were

used for irrigation; now 14 are so used. But owing to the river's having moved farther west fewer *jhaláṛs* are now worked on the high bank overlooking its eastern branch, and irrigation in this tract has slightly fallen off since last Settlement when it was returned at 206 acres. In some villages irrigation is practised both with the Persian wheel and with the rope and leather bag; and on one occasion I saw both kinds of apparatus at work on the same well.

Irrigation from wells in the Hitár.

151. The only part of the district in which irrigation from wells is of any importance is Chak Hitár on the Satlaj. Here water is everywhere sweet and within 40 feet of the surface—indeed near the river it is within 20 feet and *kachcha* wells can easily be made and worked—and irrigation from wells is practised in 56 out of the 62 villages of the tract. At last Settlement 122 *pakka* and 156 *kachcha* wells were used for irrigation; now 217 *pakka* and 69 *kachcha* wells are so used—an increase on *pakka* wells of 78 per cent. Many of these so-called *pakka* wells are lined with burnt bricks without mortar and cost from Rs. 200 to Rs. 250 to make; some of them are liable to be covered by the river-floods, but when the floods subside they can be cleaned out and set to work again. *Kachcha* wells are used near the river where water is within 10 or 15 feet of the surface, and cost almost nothing to make, as they are lined only with the stalk of the *sarr* grass (*kána*) or with brush-wood (*pilchi*) and are intended to last for one harvest only, a new one being made next harvest. At last Settlement the area returned as ordinarily irrigated from wells in Chak Hitár was 4,845 acres; the area returned at this Settlement is 9,389 acres or nearly double the former area, being an average of 33 acres per well. But the full area is hardly ever irrigated in any one year; this is rather the area which could be irrigated if the wells were all kept at full work, or the area which has been actually irrigated during the last two or three years. According to the patwáris' annual papers the average area irrigated from wells during the five years 1874-79 was 6,133 acres and the area so irrigated during the Settlement operations was as follows:—

Agricultural year.	Area actually irrigated from wells in		
	Kharif.	Rabi.	Total of year.
1879-80	not observed	4,766	...
1880-81	1,954	5,162	7,116
1881-82	3,207	4,559	7,766
1882-83(approximately)	2,000	4,779	6,779

The area irrigated from wells varies greatly from year to year. When the floods fail the people devote all their energies to their wells, but again when the floods are favourable they sow a great deal of land with the help of the floods and then irrigate a large proportion of it from their wells; and the best crops are most easily got on land which has been

thoroughly moistened and rendered fit for sowing by the river-floods and has afterwards had its supply of moisture kept up by irrigation from a well. Thus in the good year 1875-76, the area irrigated from wells was only 4,450 acres; and in the fair year 1877-78, it was 7,635 acres. The crops irrigated in 1881-82 were as follows :—

Kharíf 1881.

Crop.	Area in acres.
Jawár ...	... 2,530
Bájra ...	... 120
Moth and Múng	... 17
Til ...	... 210
Cotton ...	... 240
Pepper ...	... 37
Sugarcane ...	... 24
Gwár, &c. ...	... 29
Total ...	... 3,207

Rabí 1882.

Crop.	Area in acres.
Wheat ...	... 3,764
Barley and Gram	... 59
Sarson and Tara	... 69
Vegetables ...	... 401
Tobacco ...	... 93
Miscellaneous ...	... 173
Total	... 4,559

Ordinarily the area under jawár is a good deal less than it was in that year and the area under wheat somewhat larger. All the wells in the Hitár are worked with the Persian wheel (*harat*), and *jhaldrs* are often worked on the high bank of the river or one of its branches so long as there is water left within reach ; and when the channel dries up the wheel is removed and set up in a more favourable place or laid by to wait for the floods of next year. Sometimes two wheels work on one well, which is than called *wán*. A Persian wheel is said to require eight men and eight pairs of oxen to keep it going night and day, as the small oxen used for this purpose cannot keep up the monotonous round for more than a few hours at a time ; and the average area which can be irrigated by a well in a year is stated at 25 acres, but this depends chiefly on the supply of water. In rabí 1882 a number of wells irrigated from twenty to twenty-five acres in the one harvest, and the area irrigated in kharíf and rabí of that year averaged in some villages from 30 to 35 acres per well. The supply of water seems to vary partly with the distance from the river and partly with the nature of the strata through which the well is dug. Near the river there is always plenty of water and the supply in a *pakka* well never fails, and if a *kachcha* well falls in owing to the dripping of the water on its sides, another can be made close by with little trouble or delay. But farther off it is found in many parts of the tract that to reach an unfailing supply of water it is necessary to pierce an impermeable stratum of hard white clay (*baggí mittí*) called the *hán*, sometimes 18 feet thick, and wells which only go down to this stratum are dependent on percolation only and soon run dry. Where the *hán* has been pierced even by a hole a few inches across, a constant stream of water comes up from below ; but it is often too hard and thick to be pierced by the simple boring-rod (*larí* or *súá*) used by the peasants. This is merely a long bamboo shod with iron, which is raised by several men, struck into the clay and shaken about. A number of wells in the south of the chak have been abandoned as useless because the change in the course of the river has caused the water-level to sink below the *hán*, and complaints of the *hán* are common about Salemsháh near the centre

of the tract. The best wells, those which irrigate the largest area of good crops, are about Jamálke and Ládhoke in the north of the chak. Probably the Fázilwáh Canal just opened will help to raise the water-level again in the south of the tract and enable the wells there to irrigate a larger area of land.

The floods of the Ghaggar.

152. In a country with so little rainfall the variable floods of the Ghaggar are very valuable and great efforts are made to take full advantage of them. When the land naturally flooded (*rez* or *saildb*) by the stream in the rainy season is left sufficiently dry, it is ploughed and sown with jawár or moth for the kharíf crop or with wheat or gram for the rabí. An insignificant area of land which lies too high to be naturally flooded by the stream is irrigated by *jhaldrs* or *túyas* erected on the bank, and when the height to which the water must be raised is not great, the peasants employ the *chambar*, an apparatus on the principle of the lever or *dhenkli* consisting of a strong beam with a leather bag fastened below one end and a weight of stones placed on the other; this beam is rested on a fulcrum so that the bag can be alternately dipped into the water and raised so as to discharge it at a higher level, the operation being assisted by a man walking alternately up and down the beam. This mode of irrigation is common on the Annakai lake. For rice-cultivation banked enclosures (*kund*) are made on the lowlying ground most subject to inundation by surrounding fifty or sixty acres of land with a bank of earth high enough to keep out ordinary floods. When the Ghaggar comes down in flood, so much water is let into the enclosure (*kund*) as will suffice to moisten the soil thoroughly, and then the entrance is closed and the ground inside allowed to dry sufficiently to allow of sowing the rice. So long as the flood outside stands higher than the level of the land inside, the cultivator can, by knocking a hole in his bank, let in as much water as the crop wants from time to time and then fill up the entrance again. Sometimes the level of the flood outside is artificially raised by a water-cut from higher up the stream, or an embankment lower down, or water is brought directly by a water-cut from one of the lakes or depressions into the *kund*; at the present Settlement measurements 146 such *kunds* were enumerated, enclosing altogether 8,957 acres, so that the average size of a *kund* is 61 acres. There are a number of *kunds* in Mangála, Rániá and other villages dependent on the Dhanúr jhíl for their supply of water, but they are most numerous about Nakaura and lower down the Sotar valley below the Annakai Chhamb, from which many of them draw their water-supply. In order to increase the area irrigated, *nálas* or water-cuts are dug from the channel of the stream or from the depressions in its bed to conduct its water through intervening high ground to flood land lying at a lower level than the stream at the point whence the water is brought. If allowed, the peasants would often artificially raise the level of the stream at the point of exit of the *nála* by erecting an earthen embankment (*band*) across the channel below that point. These *nálas* (water-cuts) and still more the *bands* (embankments) have proved a fruitful source of dispute.

Since first the country came under British rule disputes regarding the disposal of the water of the Ghaggar have been of constant occurrence, and schemes for turning it to better advantage have been over and over again put forward. The old valley of the Ghaggar, now known as the Sotar or Choya valley, which enters this district from Fathábád, no longer brings any water from the Ghaggar, which now leaves it at Phúlad some 60 miles higher up for a narrow drainage-channel joining the broad Sotar valley again at Dhanúr. After 40 years of complaining on the part of the peasants on the Choya in the Sirsá district, who ascribed the stoppage of the former water-supply to the embankments thrown across the channel by the peasants in Hissár, the Panjáb Government, in 1873, accepted the following conclusions—(1) that the bed of the Choya has silted, not only close to the head, but for some distance along its course; (2) that only a general clearance of the bed would be of any material use, and that the benefit would not last long without the aid of a dam across the main Ghaggar. The question of constructing such a dam was left undecided, but the consent of the Pattiála authorities was obtained to the construction of a permanent masonry level across the bed of the main Ghaggar at the point of bifurcation to prevent future disputes as to the silting of the Choya; and as regards the embankments on the Choya in the Hissár district the Panjáb Government, in 1874, ordered (1) that the erection of new *bands* should be strictly prohibited, (2) that several recently erected *bands* should be demolished, and (3) that the Deputy Commissioner of Hissár should be invited to get the people to agree to a code of rules regulating the time each *band* should be kept closed, to be enforced by a *panchâyat*. There seems, however, to have been no flood of any importance from the direction of Fathábád down the Choya (Sotar) valley for nearly 30 years. The people say that in 1909 and 1910 Sambat (A. D. 1852 and 1853), or just before last Settlement, an unusually good flood reached this district down this valley, and that a large area of land in the villages east of Sirsá town, hardly ever again flooded, was in consequence measured and assessed as irrigated by the Choya floods. A considerable body of water came from the Fathábád direction in the rains of 1880, and covered the Sotar valley about Narel, but it appears to have been due to the heavy local rainfall only, and not to any flood from the Ghaggar, and it seems certain that unless operations of some magnitude be undertaken no floods of any importance will come down the Choya (Sotar) valley, and the villages to the east of Sirsá, if flooded at all, will be flooded only by the local rainfall. The soil of the valley is a rich hard clay, and heavy rain does not readily soak into it, but runs off into hollows, some of which are cultivated with jawár, wheat, or barley, or even rice. There are several such depressions in the Ráin villages of Kanganpur, Khairpur, Baidwála and Sikandarpur, where rice is sometimes grown, but it is not often that they are sufficiently flooded to make it worth while to sow rice, and still more seldom do they produce anything of a crop. Some of the *Sotar* land in these depressions has been returned by the patwáris as *rez* or flooded land, but the area so returned is small, and practically

the whole of the *rez* land in the Nálí circle is irrigated by the water of the Ghaggar itself.

Irrigation-works on the Ghaggar.

153. The chief irrigation-work on the Ghaggar in the Sirsá district is the Sikandarpur Nála, intended to bring water from the present channel of the Ghaggar (Nálí), where it runs uselessly along in a deep and narrow bed, back to its old Sotar valley by cutting through the intervening high ground. It takes off from the left bank of the Ghaggar near Musáhibwála in the Dabwálí tahsíl, comes out into the Sotar valley at Darbi, and runs along it past the south of Sirsá town to rejoin the Ghaggar opposite Jhorar, its total length being about 17 miles. It was first taken up in 1861 as a famine-work, but was left unfinished and silted up. Again in 1871 and 1873 much money was wasted by the people in endeavouring to construct it; and it was not until 1875, when Mr. Wakefield, then Deputy Commissioner, took the work into his own hands, that a canal from six to eight feet wide was opened for a distance of 13 miles. In 1876 it was continued for four miles, and tailed off into the Ghaggar, and in 1877 a branch cut was brought into the station of Sirsá, from a point on the main canal about three miles distant, and a number of small branch cuts were also made to the villages which had subscribed towards its construction. More than Rs. 20,000 were spent on this work, of which Rs. 16,000 were taken as a *takkávi* advance by 16 villages from Darbi to Mangála in the Sotar valley, whose lands were supposed to be likely to benefit from the canal. It was partially successful one year, and a considerable area of land was irrigated from it in some of the villages which had spent money on it; but it seems that except in high floods the canal cannot flow unless a dam is placed across the bed of the Ghaggar at the point where it takes off, and as the hard soil at this point is gradually being cut away by the action of the water the bed of the main stream will soon be lowered still further. Such dams have been forbidden, and since 1876 practically no water has come down the canal which has now silted up. In 1881 the project was admitted to have failed and Government remitted the balance of *takkávi* Rs. 6,790 due from the villages, on the ground that they had been misled by the Deputy Commissioner into spending the money on an unworkable canal.

The next system of *nálas* is between the Dhanúr lake and Fírozábád some three miles lower down. Regarding its origin the people say that some 40 years ago, and indeed at the time of last Settlement, the stream here had no well-defined channel, but flowed in a wide and shallow depression along the valley, and the position of the masonry pillars which Mr. Oliver in 1859 erected along the centre of the bed corroborates this account. But since last Settlement the stream has gradually worn a deep channel for itself, and unless artificially distributed would pass right on into the Annakai Chhamb. Accordingly between the Dhanúr lake and Fírozábád some 18 *nálas* have been dug to conduct the water to the low lands of 12 villages to the right and left of the channel; and that the water might be kept at a level high enough to make it flow down these *nálas*, a *jhám* or *chháp* was

made at a point lower down, where the channel is about 56 yards wide and eight feet deep, by driving in five rows of stakes, and interweaving them with branches. In 1877 the Bíkáner authorities complained against this obstruction, and after some correspondence and a joint report by the Deputy Commissioner and the Assistant Political Agent of Bíkáner it was ordered by the Panjáb Government that this obstruction as a new dam arresting the course of the stream must be demolished, and the site levelled to the river bed. This was accordingly done, and the stream now passes along its deep channel without obstruction, and only in high floods does any considerable part of it find its way down those *nálas*. The irrigation of Mangála, Mádho Singhána, and the other villages which were dependent upon this system of *nálas* is therefore likely to be much poorer than formerly, and had their new assessment been fixed it would have been Rs. 1,347 less than the former assessment. After the demolition of this *jhám* it was pointed out that sufficient consideration had not been given to the chief reason urged by the people for its erection, namely that at the spot where the *jhám* was made the stream had within a comparatively short time cut a deeper channel for itself than before, and if left to itself would irrigate much less land than it used to, and that the effect of the *jhám* was only to make the water spread over those lands which it used to flood naturally. The fact seems to be that the Ghaggar, which still deserves the name of Sarasvatí or "river of pools," consists of a succession of lakes like the Chánmal, Dhanúr and Annakai Chhambs connected by broad high-level channels. The stream in flowing from one of these depressions into another tends to cut away the obstruction, and the silt gradually fills up the depressions, so that the bed of the stream tends to adopt the same general slope throughout. In time the depressions will be filled up by the deposits of silt, and the higher ground between will be cut away. This process seems to be going on at the point where the Sikandarpur Nála takes off from the Ghaggar; the people say that two generations ago the bed of the Ghaggar was quite flat at that point, and now a well-defined channel has been cut by the stream. And there can be little doubt that the spill of the Dhanúr Chhamb in passing on over the intervening higher ground into the Annakai is gradually cutting a deeper channel for itself so that the level of the Dhanúr lake, on which really all these *nálas* and *kunds* about Fírozábád depend for their supply of water, is gradually getting lower. Indeed, from measurements made the bed seems, in the floods of 1880, to have cut deeper than before at the point where the Fírozábád *jhám* formerly existed. A proposal was made to erect a masonry bar at this point to prevent further erosion and maintain the bed at its present level, but after some discussion the Panjáb Government decided in 1881 that no remedial works were possible except at a prohibitive cost, and that no attempt of the kind should be made.

The road from Ellenábád to Dabwálí was constructed in 1869 under Mr. Oliver as a famine-work and carried across the Ghaggar valley on a high embankment, part of which, as lying in the bed of the stream, was destroyed by order of the Deputy Commissioner in 1874.

The Bíkáner authorities in 1877 complained of this embankment as still impeding the course of the stream, and in 1879 the Panjáb Government ordered that what was left of it should be demolished and the site levelled to the river-bed. This was accordingly done. In 1877 Mr. Wakefield, Deputy Commissioner, submitted a proposal for a masonry dam and sluice at the point where a branch of the Ghaggar turns off towards Ellenábád, to prevent more than is required from flowing in that direction, as the floods having no exit stand round Ellenábád and make it unhealthy. This scheme is objected to by the Ellenábád peasants who want as much irrigation as they can get, but as it would send down more water in the direction of Bíkáner, it was supported by the Bíkáner authorities who even agreed to defray all expenses if necessary, although the estimate was for Rs. 12,000; but no decision has yet been come to on this point.

Future prospects of irrigation on the Ghaggar.

154. The orders passed by the Panjáb Government at various times to regulate the action of the district officers and people as regards the bed of the Ghaggar, come to this, that while no objection to *kunds* or embankments of rice-fields can be admitted, the erection of new dams (*bands*) which arrest the flow of the stream, divert it entirely from its ordinary channel, and prevent floods from passing onwards, is strictly prohibited. It is obvious that without to some extent damming the stream any important extension of irrigation is impossible, and there is reason to fear that the present area of irrigation will not be kept up, as the stream is annually filling up the depressions in its bed and cutting deeper the channels joining those depressions. Thus these orders, if maintained, put an end to the hopes of improving irrigation from the Ghaggar which have been indulged in by almost every officer who has held charge of the district since the commencement of British rule, and nullify the repeated injunctions of higher authority to utilise the waters of the Ghaggar more fully. This general prohibition of dams is due to the remonstrances of the Bíkáner Darbár against the smallest obstruction to the onflow of the stream towards their boundary; and it is but natural that they should regret every drop of water that is used up before it reaches them and but just that attention should be given to their complaints against new obstructions. But if the question be considered, not as one of British villages against Bíkáner villages, but as that of the greatest good to the people generally under whatever rule, it will be seen that the present state of the case causes a serious waste of the precious means of irrigation ready to hand. The prohibition of dams entails great loss on the Sirsá villages and brings little gain to Bíkáner, for the stream, even when wholly unobstructed, seldom reaches the Bíkáner border in any volume, and it is only a very small area in Bíkáner territory that is at long intervals cultivated with the help of its floods, the greater part of its valley being left uncultivated for grazing purposes. It is for such an insignificant advantage that the Sirsá villages are prevented from extending their rice and wheat cultivation, and even perhaps from keeping up the present area so

cultivated. A large volume of water evaporates uselessly in the depressions of the Ghaggar bed, which might be employed in irrigating rich land lying uncultivated for want of moisture. But nothing can be done without damming the main stream of the Ghaggar at some point, and as the Panjáb Government has admitted the right of the Bíkáner authorities to object to the construction of new dams, the only solution of the difficulty is to purchase from Bíkáner the right to dispose of the water of the Ghaggar as seems best for the country in general, whether under British or Bíkáner rule; and however extravagant the estimate of the value of the chance of floods to Bíkáner, it would be more than counterbalanced by the increased facilities for high-class cultivation in Sirsá, and probably the increase of revenue under the system of fluctuating assessment would alone repay Government for the outlay. Levels are now (1883) being taken and plans made for diverting the stream of the Ghaggar (Nálí) back into the Sotar valley. A dam across the main Ghaggar at the head of the Sikandarpur Nála would probably suffice, if the Nála were cleared out and slightly deepened, to send down enough water to irrigate much land in the Sotar valley about Sirsá town, but a larger scheme is to bring back as nearly as possible the whole of the Ghaggar into the Sotar or Choya valley by a strong masonry dam at or near Phúlad, some 80 miles above Sirsá, where the Ghaggar leaves the Sotar. Many thousand acres of rich clay soil capable of producing rice and wheat lie untilled for want of water, and there can be little doubt that some such scheme would be possible and remunerative to Government, while it would greatly increase the prosperity of the people and the produce of the tract. A long low dam across the lower end of the Dhanúr lake would also be a great improvement, for it would make that depression into a large reservoir from which water could be drawn off when wanted for the rice cultivation lower down. On the other hand, if the present order forbidding dams be maintained, not only must all hope of any great future increase of irrigation be abandoned, but there is reason to apprehend a contraction of the present irrigated area, and the Sikandarpur Nála which cost Government and the villages Rs. 20,000 must be considered a failure. If even the right to construct *jháms*, which are allowed almost everywhere else in the Panjáb, were conceded to the Sirsá peasants, it would be a great boon to them, and indeed would be no more than they can in justice claim, and would help greatly to maintain the present irrigation.

Area flooded by the Ghaggar and nature of the annual floods.

155. At last Settlement the area of land recorded as irrigated by the floods of the Ghaggar in the villages now in Chak Nálí was 36,735 acres or 25 per cent. of the then total cultivated area. There seems reason to believe that this area is in excess of the area at that time ordinarily flooded. In 1852, 1853 and 1856 the floods were unusually good, and Mr. Oliver, in submitting the report on the Settlement of the Rániá pargana, writes as follows:—"The year of 1856, during which Captain Robertson effected the assessment, happening to be one of

plentiful rain and high floods, this tract was more extensively cultivated than is the case in ordinary seasons. This circumstance of infrequent occurrence, it strikes me, was not taken into sufficient consideration at the time of revision of Settlement by Captain Robertson. It is however certain that since that period some estates set down in the statement as having irrigated cultivation have not had any crops so raised, and the proprietors have been paying for lands from which they have actually derived little or no return." The area returned at the present Settlement measurements as ordinarily cultivated with the help of the floods is 39,915 acres, an increase of 9 per cent. on the area returned at last Settlement, but the area actually flooded varies greatly from year to year with the extent of the annual floods, and according to the patwáris' papers the average area flooded during the five years ending 1879 was only 31,355 acres; in 1878-79 however it was 34,906 acres. The area cultivated with the help of floods has been as follows for the last seven harvests:—

Agricultural year.	Area flooded in		
	Kharif.	Rabi.	Total year.
1879-80	Not observed	10,827	.....
1880-81	10,041	17,673	27,714
1881-82	11,053	15,129	26,182
1882-83	10,245	14,181	24,426

The area actually flooded has been unusually constant for the last three years, but the extremely uncertain nature of the Ghaggar floods is well illustrated by a comparison of the areas of 1875-76 and 1877-78. In the former year the area cultivated with the help of the floods was 44,694 acres, and in the latter year only 3,042 or less than a fourteenth of the area flooded two years before. The hard Sotar soil cannot be cultivated at all unless thoroughly saturated; nor is it enough that the land should have been well flooded to begin with and the seed-time favourable. For the cultivation of rice a continuous supply of water is necessary for a hundred days, and unless successive floods come down the Ghaggar at seasonable times, or a store of water can be drawn on when wanted, the rice crop fails; and it is for this reason that most of the rice-*kunds* are situated below the Dhanúr and Annakai Chhambs from which water can be drawn by water-cuts (*nálas*) when required. The wheat and gram crops also require seasonable showers of rain, or the outturn is poor. Excessive floods in the rainy season sometimes overtop the embankments round the *kunds* and drown the rice-crop as in 1880, and often a freshet in the cold weather destroys a large area of the gram crop in the lowlying parts of the bed. The following

statement shows how the Ghaggar floods have varied from year to year :--

Year		Nature of flood.	Remarks.
Sambat.	A. D.		
1907	1850-51	Poor ...	Heavy floods in February drowned the rabi crop.
1908	1851-52	Poor ...	Rice-crop poor for want of floods in autumn. Rabi poor and drowned by floods in February.
1909	1852-53	Excellent ...	Some rice drowned.
1910	1853-54	Fair.	
1911	1854-55	Fair ...	Some rabi crops drowned.
1912	1855-56	Fair ...	Some rabi crops drowned.
1913	1856-57	Good ...	Plentiful rain and high floods.
1914	1857-58	Fair ...	Little land cultivated owing to the Mutiny.
1915	1858-59	Fair ...	Some rabi crops drowned.
1916	1859-60	Poor ...	Rabi crops drowned.
1917	1860-61	Almost none.	
1918	1861-62	Good.	
1919	1862-63	Good ...	Rice and wheat particularly good.
1920	1863-64	Excellent ...	Some rice and some rabi crops drowned.
1921	1864-65	Poor ...	Some rabi crops drowned.
1922	1865-66	Fair.	
1923	1866-67	Poor ...	Rabi crops drowned.
1924	1867-68	Good ...	Little rice, but good rabi. Some rabi drowned.
1925	1868-69	Total failure.	
1926	1869-70	Very good.	
1927	1870-71	Fair ...	Some rabi crops drowned.
1928	1871 72	Fair ...	Some rice and some rabi crops drowned.
1929	1872-73	Poor ...	Floods high, drowned rice and rabi crops and prevented sowings.
1930	1873-74	Good.	
1931	1874-75	Fair ...	Some rabi crops drowned.
1932	1875-76	Good ...	Some rabi crops drowned.
1933	1876-77	Poor ...	Autumn floods lower than for many years. Rabi crops drowned.
1934	1877-78	Total failure.	
1935	1878-79	Good.	
1936	1879-80	Poor ...	Rabi crops drowned.
1937	1880-81	Very poor ...	Rice-crop drowned. Floods ceased too soon for rabi crop.
1938	1881-82	Good ...	Rice and wheat both good.
1939	1882-83	Good ...	Rice good.

Thus it appears that in the last 33 years the floods have been in

3 years	...	...	...	Very good.
9 ,,	...	...	...	Good.
9 ,,	...	...	...	Fair.
9 ,,	...	...	...	Poor.
3 ,,	...	...	...	A total failure.

In five years excessive floods in the kharíf drowned part of the rice-crop and in seventeen years floods in the cold weather drowned some of the rabí crop. The floods are dependent more on the rain-fall on the Sub-Himálaya below Simla than on the local rain-fall. A heavy fall of rain north of Ambála brings down a sudden freshet which fills all the depressions in the bed and in some places runs ten feet deep; but usually the flood abates in a few days and either runs very low or dries up altogether until another fall of rain brings down another

freshet. Sometimes a heavy fall of rain nearer than Ambála sends the drainage of the plain country down the Ghaggar, but such floods are rare and insignificant compared with those that come down from the hills.

Crops grown on the lands flooded by the Ghaggar.

156. The crops grown on the lands flooded by the Ghaggar in 1881-82 were as follows:—

KHARIF, 1881.

Crop.	*Area in acres.*
Rice ...	6,740
Jawár ...	652
Bájra ...	3,466
Til ...	40
Gwár ...	118
Moth, Múng, &c. ...	37
Total ...	11,053

RABI, 1882.

Crop.	*Area in acres.*
Wheat ...	9,234
Gram ...	4,704
Barley and Gram ...	878
Sarson and Tara ...	63
Vegetables ...	42
Miscellaneous ...	208
Total ...	15,129

There is ordinarily a smaller area than this under bájrá and a larger area under jawár and wheat, but the staple crops are rice in the kharíf and wheat and gram in the rabí.

The 39,915 acres returned as ordinarily cultivated with the aid of the Ghaggar floods (*rez*) and the 3,316 acres of such land returned as lately thrown out of cultivation have been classified as follows according to the crop ordinarily sown:—

Class of land.	*Under cultivation.*		*Lately thrown out of cultivation.*		*Total.*
Rice-lands	8,581	...	346	...	8,927
Wheat-lands	20,255	...	2,784	...	23,039
Gram and other lands	11,079	...	186	...	11,265
Total rez ...	39,915	...	3,316	...	43,231

In the Sirsá district rice (*dhán*) is only cultivated on the rich clay soil of the Sotar valley and more than half the cultivation is in the hands of the industrious Ráins, many of whom, especially from the villages about Sirsá, where they can seldom cultivate rice in their own lands, cultivate as tenants in the villages on and below the Annakai Chhamb belonging to other proprietors. Rice requires a liberal supply of moisture, and in this district can only be cultivated in *kunds* so embanked as to retain enough and not too much water for the crop. The 146 *kunds* are situated in 26 villages chiefly below the Dhanúr and Annakai Chhambs, and some idea of the capital spent in making lands fit for rice-cultivation may be gathered from the fact that in the 20 years from 1861 to 1881, 21 of these villages took *takkávi* advances from Government amounting to Rs. 22,536 to be spent on making and repairing the embankments (*ber*) of their *kunds*. The village of Rániá alone took for this purpose Rs. 5,071 and several other villages took more than Rs. 1,000 each. Besides this *takkávi*, the rice-cultivators spend large sums of money of their own in employing labourers to make embankments and clear out water-cuts, and themselves devote much labour to such work. A *kund* of 140 acres in Amritsar

is said to have cost Rs. 1,000 to make and Rs. 400 to repair. In Mangála owing to the fall in the level of the Dhanúr Chhamb caused by the erosion of the Ghaggar bed, a whole *kund* had to be lowered a foot and a half, an operation which must have cost in digging alone at least Rs. 100 per acre. The labour of cultivating the crop is great and two or three acres are said to employ a plough fully. The ground is manured before the rains, goats' dung being especially preferred as manure for rice, and on the first flood in Asárh (June-July) enough water is admitted into the *kund* to moisten the soil thoroughly. The land is then ploughed once or twice and levelled with the *sohága*, and the rice is sown broadcast and after eight days or so appears above the ground. It is then carefully weeded, and after about 21 days bare patches are filled by transplanting from where the sprouts are too close. After about 40 days it is again weeded. But the greatest difficulty is to give the crop the proper amount of moisture. It must be kept moist until it ripens about 100 days after sowing, and if at any time it is allowed to get dry, no grain forms in the ear and the crop produces nothing but straw (*maráyan*) ; but it must not be allowed to get too wet, for if water is allowed to stand long in the field, the action of the sun ruins the crop. The Ghaggar floods are too uncertain for the rice-irrigation to depend on them directly, and rice is only grown below the Dhanúr and Annakai lakes which act as reservoirs from which water can be drawn off to the rice *kunds* when wanted. The best kind of rice (*múnji*) must be sown before the middle of Bhádua (end of August), but an inferior kind of red rice (*kharsu* or *seora*) can be sown a little later on and ripens in 60 days, but gives only about half the produce of *múnji*. The rice crop is very precarious, for not only does a failure of the Ghaggar floods make it impossible to sow or ruin the crop after it is sown, but an excessive flood overtops the embankment of the *kund* and drowns the crop. In 1880 many *kunds* were drowned and those of Mangála, it is said, were only saved by 200 men being told off to watch the embankment and keep the high flood from coming over it. Of the 8,927 acres of rice-land the area sown and the nature of the produce have been as follows during the last three years :—

Year	Area sown	Nature of produce.		
		No crop	A poor crop.	A fair crop.
1880	1,028	.....	.....	1,028
1881	6,748	1,146	954	4,648
1882	6,206	386	876	4,944

The smallness of area sown in 1880 was due to the excessively high floods in July which drowned many of the *kunds*, and the largeness of the area producing no crop or only a poor crop in 1881 was due to the

premature cessation of the floods which caused the rice in many *kunds* to dry up. As a rule land within *kunds* cannot well be cultivated with other crops, but sometimes wheat or gram is grown in an old *kund* which has not been sown with rice for some years.

The best land on the Ghaggar, if not prepared for rice-cultivation, is usually sown with wheat, after having been ploughed several times and levelled with the *sohága*. Three or four acres are said to give full employment to a plough. No trouble is taken to free it of weeds and the crop is sometimes almost choked by the camel-thorn (*jawása*). Unless the land has been thoroughly moistened it cannot be sown, and unless the winter rainfall is favourable the crop does not come to much. A good deal of wheat-land about Jagmalera is irrigated by water-cuts (*nalás*) from the Annakai Chhamb; but precautions are seldom taken to protect the wheat-crop from floods as the winter-freshets are not often so heavy as to injure it seriously. Of the 23,039 acres of wheat-land flooded by the Ghaggar the following areas have been sown with wheat in the last four harvests:—

Rabí of year.	Area sown with wheat.	Nature of produce. (Approximately.)		
		No crop.	Poor crop.	Fair crop.
1880	6,360	...	Not observed.	...
1881	10,771	...	Not observed.	...
1882	9,234	400	1,000	7,800
1883	7,571	600	1,500	5,500

But in 1878-79, 22,000 acres flooded by the Ghaggar were sown with wheat, and the area sown during the last few years seems exceptionally small. Wheat is not nearly so precarious as rice, and once sown is pretty certain to produce something of a crop.

Land flooded by the Ghaggar which is too poor to produce good wheat or which is not left dry by the floods in time is ordinarily sown with gram after one ploughing, so that a plough can sow six or seven acres of gram. The gram crop in the lower parts of the channel and round the edges of the Chhamb is especially subject to be destroyed by the winter freshets, and often a most promising crop is ruined by a flood in February. No care is taken to preserve the crop from this danger, though something might perhaps be done by a system of long low *bands* parallel to the course of the stream with short *bands* at right angles to them to keep the flood from drowning part of the crop; and now that there is a telegraph to Sirsá, two or three days' notice of the approach of a flood might be obtained from Ambála. Of the 11,265 acres of gram-land ordinarily flooded by the Ghaggar the following areas have during the last four years been sown with gram or with

barley, which is however rarely sown on these flooded lands either alone or mixed with gram :—

Rabí of year.	Area sown with gram or barley.	Nature of produce. (Approximately.)		
		No crop.	Poor crop.	Fair crop.
1880	3,923	...	Not observed.	...
1881	6,440	..	Not observed.	...
1882	5,582	500	1,000	4,000
1883	6,074	679	803	4,602

The other crops sown on lands flooded by the Ghaggar are comparatively insignificant. When land not prepared for rice-cultivation is flooded at a time favourable for kharíf sowings it is, if strong Sotar clay, sown with jawár, and if light sandy soil, like that on the Ellenábád branch, with *moth* or *bájra*. The areas flooded by the Ghaggar and sown with these crops have been as follows :—

Kharíf of year.	Area sown with		
	Jawár.	Moth.	Bájra.
1880	3,936	1,958 13	2,317
1881	652	108	3,466
1882	350		3,528

The unirrigated Sotar lands.

157. The cultivation on the Sotar lands which are out of reach of the Ghaggar floods is very similar to that on flooded lands, for the hard clay soil cannot be cultivated unless thoroughly moistened, and when it can be sown jawár and wheat are the crops commonly grown. In the Sotar villages east of Dhanúr only low-lying patches of land are cultivated, the drainage of the uncultivated land being conducted into those patches, and where necessary retained or distributed by embankments. Where there is a large depression with a considerable supply of drainage water, rice-cultivation is sometimes tried ; but the rainfall is rarely sufficient to give anything of a crop. When the rainfall is heavy, as in 1881, the low-lying fields produce very good crops of jawár and wheat, but the soil is so hard and requires so much moisture that it is seldom that the rain is sufficient to bring the crops to maturity ; and much of the land under cultivation is rarely sown, or when sown produces very little except in an unusually favourable year. Thus in 1880, these Sotar villages had hardly a grain of produce either in the kharíf or in the rabí.

The total area of the Sotar east of Dhanúr is approximately 40,000 acres, but in the whole Nálí Chak only 8,051 acres of Sotar bárání are returned as cultivated and 2,142 acres as lately thrown out of cultivation.

The Satlaj floods and irrigation-works.

158. The Satlaj appears at one time to have flowed farther to the east under the well-defined bank known as the *Danda*, but the annual inundations now extend only to about five miles east of the main stream. The soil of this narrow tract along the river (Chak Hitár) is ordinarily, except where affected by deposits of pure river sand, a rich alluvial loam, fertile when water is plentiful, but hard and unculturable when dry. Near the main stream the usual phenomena of alluvion and diluvion recur year after year. The river recedes to the west and new soil is left bare; the pure sand produces nothing, but on the alluvial soil little shoots of *pilchí* or *jhár* (Tamarix dioica) spring up in great numbers. Next year the river again rises, but its force is still diverted towards the other bank, and on this side more alluvial soil is deposited, and the *pilchí* attains a respectable height. It is cut down and the ground is scratched with the plough and a little pulse (*masúr*) thrown in; the crop is of little value, but it well repays the minimum of labour spent in sowing it. Next year the ground is firmer and when drying after the river-floods is easily ploughed up, and produces capital wheat crops. It is thus cultivated year after year with little trouble, being annually irrigated by the floods passing over it which deposit fresh soil rendering manure unnecessary, gradually raising the land higher and higher and leaving it firmer. This process may go on until the land is so high as to be beyond the reach of any but extraordinary floods, or the current of the river may again set towards this side, and either carry off the land altogether or cover it with barren sand. The general tendency of the river for the last few centuries has probably been to move towards the west like other Panjáb rivers, and those village-areas of Chak Hitár which are now out of immediate danger of losing land have all been formed in the way above described. Within the twenty years ending 1880 the changes of area in the 17 villages on or close to the river were approximately that altogether 5,323 acres were carried away, and 6,700 added to this bank, making a net increase of 1,377 acres along a bank of about 25 miles; four new villages were formed and none wholly carried away. The river seems to have perceptibly moved westward within the last thirty years, and the villages in the south-west of the Hitár Chak on the Bháwalpur border have suffered in consequence; less land has been flooded, the water-level in the wells has fallen, cultivation has decreased and a number of cultivators have migrated. The alluvial soil of the valley when irrigated either by the river-floods or by means of wells produces good crops of wheat, barley, vegetables, tobacco and sugarcane. A high flood irrigates a large area of this land sufficiently to enable the cultivators to plough and sow it for the rabí when the river falls. The tract is intersected by channels which were at various times branches of the river, and appear to have been formed in the following way. The river-flood

sets in a new direction and hollows out a new channel for itself in the soft soil, perhaps cutting off a corner round which it used to wind, and silt is deposited at the mouth of its former channel, which dries up or nearly dries up when the flood subsides, and the river when at its lowest in the cold weather flows only in the new channel, making it gradually deeper. When the flood comes down next year the great body of water flows in the new channel, and only a sluggish stream flows down the old one, depositing more silt both at the entrance to the old channel (which has now become merely a branch (*phát*) of the river), where its rapid flow is first checked, and also at the other end of it where the more rapid flow of the main stream, when the branch again rejoins it, makes a sort of still back-water. The sluggish water in spilling over both sides of the branch also deposits silt immediately on its banks, and when this process has gone on for some years the banks of such a branch become higher than the ground on both sides, and both ends silt up to such an extent that only a high flood can get into it. Thus the whole of the Hitár tract is intersected by old river-beds, each running in a sort of arc or horse-shoe with its concave side towards the river, having both ends higher than the middle (which is then called *dhan*), and its banks higher than the country farther off on both sides. So when the river rises high enough to overtop the high land at the entrance of one of these old channels, its water often finds its way far inland, and as the general slope of the country is considerable such a flood often irrigates a considerable area of land which, though higher than the river directly opposite to it, is lower than the river where the old channel leaves it. An ordinary flood however, if left to itself, usually only fills the old channel and leaves the land on either side high and dry. At different times attempts have been made by clearing away the silt from the inlet to one of these *pháts* to introduce a larger supply of water than would naturally enter it, and by damming it (*band*) farther down to stop the water from going on down the channel back into the river and to raise the level of the water in the *phát* and make it flow over the neighbouring country, or into another old channel (*phát*) which will take it farther inland to irrigate villages farther from the river. Where there is danger of the water's flowing over low ground back towards the river a long low embankment (*pasel*) is erected to keep it in. The chief work of this description is the Pádí Nála, a rude inundation canal made by joining together several of these old channels by a system of cuts and embankments. It has now been superseded by the new Fázilwáh Canal made this year, which follows the old Pádí for a great part of its course. The Pádí left the main stream at Chak Jíwa just within the border of the Fírozpur district some twelve miles above Fázilká and wound its course through the greater part of Chak Hitár, rejoining the river below Dárá. At different times operations have been undertaken by the district authorities to open and improve its head, to straighten and deepen its course, to raise dams and embankments preventing its water from getting back to the river, and to conduct it by means of

water-cuts to the land of different villages. At one place near Mahtamnagar a large embankment with a masonry sluice has been erected to control the division of its water. Here and there along both sides of the Pádí about twenty small irrigation-cuts (*chhár*) had been dug, and twenty-six villages might be said to depend for the extent of their annual floods on the water brought down by the Pádí. Hitherto the district officers have been able to attempt the improvement of this canal only in a spasmodic and haphazard way. A good deal had been done to it in Mr. Oliver's time, but it had been allowed to silt up, until in 1875 under Mr. Wakefield operations were undertaken on an extensive scale to improve its head, deepen its course and strengthen its dams, and at first proved very successful, as the villages dependent on the Pádí which, owing to the silting up of the head, had enjoyed no good floods for nine years, had their lands thoroughly well inundated in the season of 1875. In 1876 the dams were strengthened and the Pádí cleared out for thirteen miles to the benefit of many villages. But the head was again allowed to silt up, and although the villagers, aided by the tahsíldár, endeavoured to do something to open it up again, their efforts were not well directed, and for some years very little land was irrigated by the Pádí. This year (1883) under the direction of the Commissioner, Colonel Grey, to whom the great success of the Fírozpur Inundation Canals is chiefly due, the Pádí has been realigned and widened, a new head has been made for it farther up the river in the Fírozpur district, its embankments have been strengthened, and it is now a regular Inundation Canal constructed on scientific principles, and to be known henceforth as the Fázilwáh. It has been made part of the Fírozpur Canal-system and placed under the establishment specially employed in keeping up the Fírozpur Inundation Canals, so that now there is every hope that it will be kept constantly running in the inundation season and that the irrigation of the Hitár will be much more certain than heretofore. The Fázilwáh has at present a trunk-length of twenty-six miles and a mean discharge of 350 cubic feet per second. It has this year irrigated some 8,000 acres in a number of villages all down the tract to the west of Fázilká, and will when properly developed irrigate 15,000 acres by carefully aligned distributaries. Hitherto the system of clearing out these canals in the Sirsá district has been very uncertain and unsatisfactory. The clearances were effected more by rule of thumb than on any scientific principle. Sometimes a small grant was given by the District Committee, but ordinarily the villagers were left to take *takkávi* advances which they had some difficulty in repaying, or compelled to effect the clearances themselves by a sort of system of forced labour (*chher*). This system was not well regulated, and complaints were common on the part of the officials that the villagers would not turn out to work, and on the part of the villagers that harsh means were employed to compel them to work against their will. Now under the Fírozpur system, an experienced establishment will annually superintend the clearances

which will be done with ease by the villagers themselves and the cost of the establishment will, as in Firozpur, be paid by a small rate per acre on the land actually irrigated each year; only, in the Sirsá district, Government will pay half the cost of establishment up to a limit of 1½ anna per acre on all land irrigated which is under fluctuating assessment.

The annual floods of the Satlaj bring down a large quantity of sand and mud which alter considerably the quality of the land on which they are deposited, the sand sometimes converting fertile fields into a barren waste, and the mud often acting as a manure to the land which it annually fertilises. In his Settlement Report Mr. Oliver said that the fertility of the soil of the riverain was impaired by a description of soda deposited by the floods, so that land inundated by the river often produced only half the crop given by land irrigated from wells. This seems to refer to the white salt efflorescence known as *shor* or *reh*, but although *kallar* soil impregnated with this salt is to be found in Chak Hitár as well as elsewhere in the district, there seems no reason to charge the river with increasing the evil; nor do the people accuse it of this. The constant supply of water given to crops irrigated from wells is enough to account for a crop more plentiful than on land only flooded once by the river and then left to dry up gradually as the crop approaches maturity.

Area flooded by the Satlaj and nature of the annual floods.

159. At last Settlement (1858-60) the area of land recorded as irrigated by the floods of the Satlaj in the villages of Chak Hitár was 15,450 acres or 69 per cent. of the then total cultivated area. The area now returned as ordinarily cultivated with the aid of the floods is 13,868 acres, a decrease of 10 per cent. This decrease is partly owing to the fact that some of the land formerly cultivated by the aid of floods alone is now irrigated by wells, and partly to the change in the course of the river and the silting up of the old channels which have caused a decrease in the actual extent of the floods, especially in the south-west of the tract. The area actually irrigated varies greatly in different years, and according to the patwáris' annual returns, averaged 14,100 acres for the five years ending 1879 ; but in 1874-75 it was 9,891 acres, and in the next year after the clearing out of the Pádí it was 20,880 acres, and again in 1877-78 it was only 7,667 acres or little more than a third of the area flooded two years before. During the last seven harvests the area actually cultivated with the aid of the Satlaj floods has been as follows:—

Agricultural year.	Area irrigated by Satlaj floods in		
	Kharif.	Rabí.	Whole year.
1879-80	not observed	4,398	.....
1880-81	757	5,421	6,178
1881-82	1,731	4,684	6,415
1882-83 (approximately)	200	3,753	3,953

This very serious decrease of the area flooded during the last few years is owing chiefly to the neglect of the inundation canals, and now that they have again been taken in hand, no doubt a great increase in irrigation will follow. The area irrigated perhaps depends more on the arrangements made to secure the advantage of the floods than on the floods themselves, but the height to which the river rises varies greatly from year to year and depends chiefly on the melting of the snows on the far Himálaya and on the rainfall on the nearer ranges. The river ordinarily begins to rise, owing to the melting of the snows, in the beginning of May and continues in flood until September; a heavy fall of rain on the lower ranges sometimes brings down a heavier flood in July or August, lasting for a few days, after which the river again subsides, though still much above its winter-level. The difference between its flood-level in July and its cold-weather level in February is generally about eight feet. The following statement shows the nature of the floods during past years in the Sirsá Hitár:—

Year.		Floods of the Satlaj.	Remarks.
Sambat.	A. D.	Nature of Flood.	
1906	1849-50	Fair.	
1907	1850-51	Very good.	
1908	1851-52	Good.	In some villages poor.
1909	1852-53	Fair.	
1910	1853-54	Poor.	
1911	1854-55	Poor.	
1912	1855-56	Poor.	Good everywhere.
1913	1856-57	Excellent.	In some villages good, in some bad.
1914	1857-58	Fair.	
1915	1858-59	Very poor.	
1916	1859-60	Excellent.	
1917	1860-61	Fair.	
1918	1861-62	Very poor.	
1919	1862-63	Poor.	
1920	1863-64	Fair.	In many villages good, in many bad.
1921	1864-65	Fair.	
1922	1865-66	Poor.	In many villages good in many bad.
1923	1866-67	Very poor.	
1924	1867-68	Poor.	
1925	1868-69	Fair.	
1926	1869-70	Fair.	
1927	1870-71	Fair.	Since 1870 the floods have generally failed in a number of villages they used to irrigate.
1928	1871-72	Good.	
1929	1872-73	Very good.	
1930	1873-74	Fair.	
1931	1874-75	Fair.	
1932	1875-76	Good.	
1933	1876-77	Fair.	
1934	1877-78	Fair.	
1935	1878-79	Very poor.	
1936	1879-80	Very poor.	
1937	1880-81	Poor.	
1938	1881-82	Poor.	
1939	1882-83	Poor.	

Thus in the last 34 years the floods have been in

4	...	...	Very good.
8	...	...	Good.
13	...	...	Fair.
9	...	...	Poor.
5	...	...	Very poor.

Mr. Oliver writes that during nineteen years of residence he observed five years of extensive floods sending the water to upwards of five miles inland and in other years floods so low as hardly to fill the old channels; in the former case the entire riverain tract became one sheet of cultivation, whereas in low floods nearly half the lands remained fallow. The same may still be said of the Satlaj floods.

Crops grown on lands flooded by the Satlaj.

160. The crops cultivated on flooded land in 1880-81 were as follows:—

Kharif.		Rabi.	
Crop.	*Area in acres.*	*Crop.*	*Area in acres.*
Rice	33	Wheat ...	... 3,716
Jawár	197	Wheat and Gram	... 239
Bájra	197	Gram and Barley	... 434
Moth	48	Pulses ...	... 790
Másh	147	Vegetables ...	... 220
Til	24	Miscellaneous ...	... 22
Maize	99		
Miscellaneous	12	Total	... 5,421
Total ...	757		

The floods rarely subside in time to allow of much land being sown for the kharíf, and the staple crop on flooded lands is wheat. When the floods have subsided the land is ploughed up several times and levelled with the *sohága*, and then sown. Little trouble is taken to clear it of weeds which often are so thick as to greatly reduce the outturn of the crop. New land thrown up by the river is sometimes simply scratched with the plough and some pulse (*masúr* or *churál*) thrown broadcast and left to grow or die. The crop even after sowing often comes to nothing, and of the 4,684 acres of flooded land sown in rabí 1882, 572 acres produced nothing; in kharíf 1882, of 150 acres sown, 73 acres produced nothing; and in rabí 1883, of 3,821 acres sown, 498 acres gave no crop.

The hard soil of most of the Hitár cannot be cultivated unless thoroughly moistened, and the local rainfall is rarely sufficient to admit of cultivation without irrigation either from floods or wells, so that the area cultivated in this Chak by the aid of rain alone is small, and is chiefly confined to the light high lands which lie above the reach of the floods and resemble the sandy soil of the adjoining Utár tract or to the lower parts of the old river channels where the drainage of the neighbouring high lands collects. The area returned as ordinarily cultivated by the aid of rain alone is only 1,890 acres,

and the area actually cultivated without irrigation has been as follows:—

Agricultural year.	AREA CULTIVATED IN		
	Kharif.	Rabi.	Whole year.
1879-80	not observed	...	...
1880-81	990	190	1,180
1881-82	2,078	1,235	3,313
1882-83	1,928	2,575	4,503

The large areas of the last two years are partly owing to favourable rainfall, but chiefly to the failure of floods which led to the cultivation by rain alone of a considerable area of land returned at Settlement as ordinarily inundated.

Prospects of irrigation in the Dry Tracts.

161. There is now some prospect of an extension of irrigation in the Utár Chak between the present bank of the Satlaj valley and the Danda or old bank. In 1852 Mr. Thomason, the Lieutenant-Governor of the North-West Provinces, pointed out that the whole of this tract could be irrigated by cuts from the Satlaj, if taken off high enough up in the Firozpur district, and calculated that the increase of revenue would warrant an expenditure by the State to the amount of four lakhs in the construction of inundation canals from the river. In the two years 1879 and 1880 some 500 acres in three villages on the Firozpur border were irrigated from the tail of the Nizámwáh Canal in Mamdot and paid water-rate of 8 annas per acre. This irrigation was then stopped, but now it is proposed to extend the Mamdot Baggewáh Canal into the Sirsá Utár so as to irrigate a number of villages east and south of Fázilká, and this canal, which is to be called the Mubárikwáh, is now being excavated (1883). Another canal to be called the Shaukatwah is to be made by the Nawáb of Mamdot, and will irrigate a number of villages in the Utár still farther east close under the Danda. These canals are being started by Colonel Grey and will be under the Firozpur Canal establishment and will irrigate annually a considerable area in this tract, in which hitherto the only irrigation has been less than 200 acres irrigated from wells and jhalárs. In the Fázilká Rohi the Abohar branch of the Sirhind Canal, which commenced to run this year (1883), but has not yet begun to irrigate regularly, will no doubt irrigate a large area of land hitherto wholly dependent on the local rainfall, and it is possible that one or two other branches of the Sirhind Canal may in time be extended into the Sirsá Rohi farther east. In 1832 a small branch of the Western Jamna Canal was brought into a

village of the Bágar south-east of Sirsá, but it was found impossible to supply it with water for irrigation purposes. A proposal to bring a kharíf-irrigation branch from the main line of the Western Jamna Canal through the Hissár district into the south-east end of the Sirsá district was referred to the Secretary of State in 1871, but was set aside on account of want of funds. It is now again being discussed and may some day be realised.

Area dependent on the local rainfall.

162. It is not however probable that these canals will for some time to come irrigate any large portion of the Sirsá district, and at present only 6 per cent. of the total cultivated area of the district is ordinarily irrigated either from wells or by the floods of the Satlaj and Ghaggar, which depend on the melting of the snows on the distant Himálaya or the rainfall on the lower ranges; and 94 per cent of the cultivation depends on the scanty and uncertain local rainfall. The area returned at the present Settlement measurements as ordinarily cultivated wtih the aid of the rainfall alone (*bárání* is 9,77,502 acres, but the rainfall is rarely so general and so favourable as to allow of nearly the whole of this area being actually cultivated. The areas actually cultivated with rain alone during the past seven harvests have been as follows :—

Agricultural year.	Area cultivated by rain alone in.		
	Kharíf.	Rabí.	Whole year.
1879-80	Not observed.	256,267	.....
1880-81	713,967	123,481	837,448
1881-82	756,552	225,346	981,898
1882-83	702,523	300,118	1,002,641

But the last two years have been exceptionally favourable years, and even in 1880 the seed-time of the kharíf was unusually promising, and the statistics of these three years do not adequately show the fluctuations to which the rain-cultivation is liable. In 1877-78 the area returned as cultivated was less than 600,000 acres, and there is reason to believe that even this was an exaggeration, and that the area actually sown in that year was very much less than six lakhs. So uncertain is the rainfall and so much is the cultivation dependent on it that it would be nothing extraordinary in a bad year for half the cultivated land in the district to lie unsown. Moreover, unless the subsequent rains are favourable, a large area sown produces no crop at all, and a still larger area produces no grain, only straw. For instance, in the kharíf of 1880 although 713,967 acres were actually sown, only 351,513 acres produced a grain crop, so that more than half the area sown produced nothing but straw, and the greater part of the remainder produced very little grain; and again in the kharíf of 1882, half the

area sown in tahsíl Dabwálí was returned as having produced no grain.

Uncertainty of the rainfall.

163. The statement of annual rainfall shows how variable is the quantity of rain which annually falls at each of the recording stations, and it is to be remembered that the showers are very partial, and that often one village gets rain when its neighbour gets none. But it is not so much upon the quantity of rain that falls as on its seasonableness that the success or failure of the crops depends. The rains usually set in about the end of June, and for a favourable kharíf seed-time a heavy downpour is wanted then or in the beginning of July. If the rain be then good and general a large area is sown with kharíf crops, and to bring them to maturity showers of rain are wanted at intervals up to September. If during this period no rain falls for a month or so, the crops dry up and produce no grain, and sometimes not even straw. If the early rains are scanty, only a small area is sown, and unless the seed is in the ground before the middle of August, it comes to nothing. It may then be said that the area of land sown for the kharíf varies with the amount of rain that falls in June and July, and that the outturn per acre varies according to the seasonableness of the showers that fall in the following months. For the rabí crops there should be good rain in August or September to moisten the land thoroughly for the sowing, and one or two showers are necessary in December, January or February, to save the crop from drying up. The people estimate the amount of rain that falls by the number of finger-breadths (*ungal*) it has sunk into the ground—a down-pour that penetrates into the ground 100 *ungal* being considered perfection. If there be already moisture in the ground, it is sufficient that the rain from above should sink to the moisture below (*vattar se vattar milgaí*, or *dl se dl milgaí*). The peasants say that if it rains for 24 hours incessantly, it is a sure sign that there has been rain for a distance of 100 *kos* (150 miles). Even if there be good rain in June and July, the rainfall of August and September is very important, for on it depend both the ripening of the kharíf crop and the sowing of the rabí. Sometimes, even in this district, there is too much rain. Heavy rain sometimes washes the seed out of the sandy soil, or drowns it on harder ground; and an inopportune shower when the *bájra* is blossoming prevents the ear from being fertilised. The rice-crop also is injured by heavy rain. More than once the fever that follows heavy rains has so much weakened the scanty population of the district, as appreciably to lessen the area cultivated. Inopportune rains in October may injure the ripening kharíf crops, or interfere with the rabí sowings, and in some soils where there is *kankar* not far below the surface, heavy showers in the cold weather kill the sprouting rabí.

Account of some good and bad years.

164. These remarks will be best illustrated by an analysis of the phenomena of some of the good and bad years through which the district has passed. In the good year 1872-73, the monthly rainfall at the three tahsíls was as follows:—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	·2	·3	·1
May	·9	·3	1·1
June	2·2	·6	·1
July	7·2	2.	6.
August	4·6	5·5	·3
September	1·6	1·2	4·3
October	.....	.....	.....
November	.....	.....	.....
December	1·6	·6	·5
January	.....	.....	.....
February	.....	.....	.....
March	.....	·3	.....
TOTAL ...	18·3	10·8	12·5

The heavy rainfall in June, July and August gave a good seed-time for the kharif, and the rains in September brought it to maturity. The harvest was an exceptionally good one, though in places it suffered from the depredations of locusts from Bíkáner. The fair rains of August and September moistened the ground thoroughly for the rabí sowings, the rain in December fell just when it was wanted, and the rabí was a good crop. It may be noted that except at Sirsá the rainfall was actually below the average, but it was so seasonable (especially the comparatively slight fall in December) that the harvests were good. Although the district had suffered from bad seasons for four years, since the famine of 1868-69, these good crops enabled the people to pay in this year (including balances of former years) more than one and a half times the annual revenue demand.

In the good year 1875-76 the rainfall was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	.....	·1	.....
May	·4	·3	·2
June	·3	1·	·4
July	4·9	4·6	3·4
August	3·	1·3	16·6
September	9·5	8·1	7·1
October	·6	·1	.....
November	.....	.....	.....
December	.....	.....	.....
January	.....	.....	.....
February	.....	·2	·3
March	·7	1·1	·1
TOTAL ...	19·4	16·8	28·1

The total rainfall for the year was above the average everywhere. The good rain in July and August enabled the peasants to sow a large extent of land for the kharíf, and the heavy fall in September suited both seasons, and encouraged them to sow an unusually large area for the rabí also. Although little rain fell in October and none in November, December or January, the subsoil which had been well soaked in September remained moist and the rabí outturn was good. The balances which still hung over the district were nearly all cleared off.

In the good year 1878-79 the rainfall was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	3·4	1·3	0·9
May	3·4	2·2	1·2
June	1·7	0·5	0·6
July	3·5	4·3	6 9
August	9·7	7·3	7·7
September	0·1	0·8	.....
October	.....	.....	.....
November	.....	.....	.....
December	1·0	.....	.....
January	.....	.....	.....
February	.....	0·3	.....
March	0·6	0·7	0·6
TOTAL ...	23·4	17·4	17·8

The total rainfall was everywhere much above the average. The rainfall in April and May was very exceptional, as usually in those months hardly any rain falls. In consequence of this early heavy rain there was a great deal of fever in the district, but these early rains and the good fall in July and August gave an excellent kharíf; and the ground was so thoroughly soaked in August that the rabí sowings were very extensive, and although after September no rain fell at Dabwálí until February and at Fázilká till March, the rabí harvest was a bumper everywhere and almost all the balances which had accrued in the previous bad year 1877-78 were paid up.

In the famine year 1860-61 the rainfall was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
May	1·1	0·6	0·1
June	1·4	0·8	0·4
July	2·7	2·5	2·2
August	1·6	0·6	8·3
September	.....	.....	.....
October	.....	.....	.....
November	.....	.....	.....
December	.....	.....	.....
January	1·1	0·9	2·6
February	.....	.....	.....
March	.....	0·2	.....
April	0·6	.....	0·1
TOTAL ...	8·5	5·6	13·7

The total rainfall, except at Fázilká, was much below the average. The comparatively scanty rains of June and July did not sufficiently moisten the ground, and there being little rain in August at Sirsá and Dabwálí and none at all throughout the district in the following four months, the kharíf crops dried up and the rabí could not be sown, for the rain in January was too late to help the rabí sowings. Here then, owing to the failure of rain in August and September, both kharíf and rabí crops were lost. The harvests of the previous three years had been poor, and the distress in the district was very severe until the good rains of 1861 came to relieve it. The revenue fell into arrears which were not paid up for several years.

In the famine year 1868-69 the rainfall was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	0·1	0·3	0·5
May	0·4	0·3	0·6
June	4·0	0·8	0·4
July	1·3	2·8	5·6
August	0·3	0·3	0·1
September	0·5	2·3	.....
October	.....	0·2	.....
November	.....	.....	.....
December	.....	.....	0·2
January	1·0	1·3	0·8
February	0·4	0·4	0·1
March	1·8	2·2	2·7
TOTAL ...	9·8	10·7	11·0

The total rainfall was below the average everywhere. The rains in June and July were exceptionally light, and there was very little in August, so that what kharíf crops were sown dried up, and the September rain was too light to restore them : so that the kharíf was a failure. Owing to the absence of good rain in August, September and October the ground was not in a fit state for the rabí sowings, and there being as usual no rain in November and but little in December there was no rabí crop to benefit from the rain of January and February. Here again the want of rain in August and September ruined both the kharíf and the rabí. The previous year's harvests had failed in part of the district and the distress was great. Balances were incurred which were not finally paid off for several years. The importance of the later autumn rains was shown next year (1869) when again the kharíf crop seemed to be gone, but good rain in the beginning of September thoroughly revived it.

In the scarcity year 1877-78 the rainfall was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	0·8	3·4	0·9
May	0·6	1·1	1·5
June	2·2	2·0	0·9
July	2·2	2·4	3·3
August	0·1	0·2	0·9
September	2·1	2·7	3·5
October	0·1	0·1	0·6
November	0·7	1·2	0·8
December	3·2	0·6	0·9
January	0·1	0·1	.....
February	0·5	0·4	0·6
March	.....	0·5	0·4
TOTAL ...	12·6	14·7	14·3

Although, except at Sirsá, the total rainfall was actually above the average, it was too much spread over the year. The failure of rain in August caused the kharíf crop to dry up, and the rain in September was neither sufficient to restore it nor to enable the people to sow the rabí well. Both harvests were much below the average, but the previous two years had been good ; consequently there was comparatively little distress felt and the balances were small.

Nature of the rainfall in past years.

135. The following statement shows how, according to the accounts given by the peasants and the reports of District Officers, the seasons have varied from year to year, chiefly as regards the crops dependent on the local rainfall :—

Year.		Character of Season.	Remarks.
Sambat.	A. D.		
1904	1847-48	Fair.	
1905	1848-49	Famine.	
1906	1849-50	Fair.	
1907	1850-51	Good ...	Kharíf failed in part of the district.
1908	1851-52	Poor ...	Kharíf a failure. Rabí very scanty.
1909	1852-53	Good ...	Heavy rain in early part of year. Fever prevalent.
1910	1853-54	Poor.	
1911	1854-55	Poor.	
1912	1855-56	Fair.	
1913	1856-57	Excellent.	
1914	1857-58	Fair ...	Small area sown because of the mutiny.
1915	1858-59	Poor.	
1916	1859-60	Poor ...	Kharíf failed. Rabí below average.
1917	1860-61	Famine ...	Both harvests entirely failed.
1918	1861-62	Fair.	
1919	1862-63	Good ...	Both harvests good.
1920	1863-64	Fair.	
1921	1864-65	Poor ...	Much land unploughed.
1922	1865-66	Good ...	Towards Fázilká excellent.
1923	1866-67	Poor ...	Harvest less than half the average.
1924	1867-68	Poor ...	Fair along north-east ; a failure to south-west.
1925	1868-69	Famine ...	Both harvests failed.
1926	1869-70	Excellent.	
1927	1870-71	Poor.	
1928	1871-72	Poor.	
1929	1872-73	Good ...	Injury done by locusts.
1930	1873-74	Poor ...	Rain failed towards end of season.
1931	1874-75	Poor ...	Winter rains failed.
1932	1875-76	Excellent ...	Both harvests good.
1933	1876-77	Fair ..	Kharíf suffered from hot wind.
1934	1877-78	Scarcity ...	Kharíf dried up. Rabí poor.
1935	1878-79	Excellent ...	Rabí especially good.
1936	1879-80	Fair ...	Kharíf poor. Rabí good.
1937	1880-81	Poor ...	Kharíf dried up. Rabí little sown.
1938	1881-82	Excellent ...	Kharíf and rabí both good.
1939	1882-83	Fair ...	Kharíf poor. Rabí good.

It appears that in the last 36 years the seasons have been in—

5 years	...	... Excellent.
5 years	...	... Good.
9 years	...	... Fair.
13 years	...	... Poor.
4 years	...	... Scarcity and Famine.

In this statement I have given a general estimate of the nature of each season for the district as a whole. The enquiries were made in more than a hundred villages throughout the different assessment circles, and in each year there were many exceptions to the general rule. In the very best years some villages got little produce and in the very worst year some had good rain. There are always patches of country which fare better or worse than the tract generally.

Crops grown on unirrigated lands.

166. The crops cultivated by rain alone in 1881-82 were as follows:—

Kharif.		Rabi.	
Crop.	Area in Acres.	Crop.	Area in Acres.
Jawár (alone and with pulses) ...	135,513	Wheat ..	11,010
Bájra (alone and with pulses) ...	528,715	Wheat and Gram ...	1,329
Moth ...	36,847	Gram ..	22,349
Múng ...	3,292	Barley and Gram ...	109,177
Til ...	23,549	Barley ...	77,517
Gwár ...	28,574	Sarson and Tara .	2,048
Miscellaneous ...	62	Miscellaneous ...	1,916
Total ...	756,552	Total ...	225,346

The staple crops are *bájra* mixed with pulses in the kharíf, and barley and gram in the rabí.

System of cultivation.

167. The cultivation of the kharíf crops on the ordinary rain-land is a very simple affair. When a sufficient and opportune shower of rain falls, each man goes out to the fields with his plough and his camels, bullocks or donkeys, and ploughs and sows as much land as he can before the moisture leaves the ground. It is not necessary to give the land a preliminary ploughing; indeed sometimes prairie-land previously uncultivated is sown at the first ploughing. A drill of bamboo is attached to the plough and sowing begun at once, the ploughman feeding the drill with the hand with which he holds the plough, from a bag of seed slung at his back. The plough, drill and harness cost altogether little more than one rupee. With an eighty-rupee camel a man can plough and sow two or even three acres in a day; with a pair of twenty-five rupee bullocks an acre or more; with one bullock three-fourths of an acre; with a pair of donkeys still less. Camels are used chiefly by the Bágrís along the south-west of the district, and in hot weather plough only by night; bullocks by the Sikh Jats along the north-east, and by the Musalmáns along the centre of the district and in the Ghaggar and Satlaj valleys; donkeys by their Kumhár (potter) owners. When bullocks are scarce

after a drought, the women sometimes draw the plough. About three ser of *bájra* is sown per acre generally mixed with *moth*, *múng*, pumpkin (*kakri*) and water-melon (*matíra*); *jawár* takes from 8 to 18 sers per acre and generally has *moth* or *múng* mixed with it. Gwár is sown both with these crops and separately, about seven ser of seed to the acre. Til is sown broadcast one to three sers per acre. The hard clay soil of the Sotar valley requires to be ploughed once before sowing; a pair of bullocks in the first ploughing get over half an acre a day and then sow about an acre a day. The seed can be sown only while the moisture remains in the ground, and there is at such times a great demand for ploughs, a man with his camel and plough sometimes getting Re. 1-4 or Re. 1-8 for a day's work. Such favourable times are so few that in one season one plough can sow only about 20 acres for the kharíf. Often in light sandy soils the seed gets washed or blown out of the ground or covered with light sand, and the sowing has to be done over again; or the first sowing dries up, and a shower of rain encourages the peasant to sow again. Otherwise he has simply to wait until the sun and rain give him a crop or none. When the first ears begin to ripen, sometimes before the end of September, the women pluck enough to give fresh grain for the day's meal, and when harvesting begins in earnest the whole family often camp out in the fields for the time, living on the fresh grain and the juicy water-melons. If there is much grain to reap, the peasant cuts off the ears first and threshes them with the help of his oxen, and afterwards cuts down the straw at his leisure. Sometimes February comes in before all the *bájra* is threshed, and the straw cut and stacked.

More pains are taken with the cultivation of the rabí crop. Sometimes the land is turned over in the early part of the rainy season and exposed to sun and rain. It generally gets at least two ploughings, sometimes as many as four, before it is sown; and where necessary the soil is pulverised and levelled by the *sohága* or clod-crusher, a plank or log on which the ploughman stands while his oxen draw it over the field. Then the ground is ploughed again, and the seed drilled in at the same time through a drill attached to the plough, the furrows being made much closer than for the kharíf. About 25 sers of wheat are sown to the acre, and about 22 of barley, gram and oilseeds, the barley and gram being sown either separately or mixed, and the oilseed (*sarson* or *tara*) being generally sown in lines among the other crops. The cultivator must make the most of the favourable seed-time in October and November, and usually a plough can sow only eight or ten acres for the rabí. If the kharíf has failed, or the first rabí sowing has dried up, a good shower in December encourages the peasant to sow again in hopes of a crop; but such late sowings (*pichhetí* or *kanaujai*) seldom produce anything but a little straw. The busiest times of the year are in October and November when the kharíf is being cut and the rabí sown, and in March and April when the rabí is being reaped, as all the rabí crops ripen much about the same time, and if the ripe crop is allowed to stand long uncut it is apt to be shaken

by the wind or injured by hail or animals. The easiest times of the year are the hottest months (May and June) and the coldest months (December to February). The Sikhs with their fine bullocks devote most of their attention to the rabí (*Hárí*); the Bágrís with their camels have hitherto cultivated little but the kharíf (*Sáwaní*), the only crop known on the Bíkáner prairies; it is only of late years that, copying their neighbours the Sikhs, they have begun to cultivate the rabí, and they do not yet make a thoroughly good job of it. But the cultivation of the rabí is rapidly extending among them, and in the last few years some villages have begun to sow a rabí crop which had never sown it before.

In the case of land dependent on rain only, it is usual to sow one crop each year, thus allowing the land to lie fallow half the year; for instance, a field sown with *bájra* in the kharíf will lie fallow in the following rabí and be again cultivated in the next kharíf. No such land bears two crops in one agricultural year, that is, land sown with a kharíf crop is invariably left fallow in the following rabí, unless the kharíf crop has totally failed. Some of the Sikh peasants, when they wish to change the crop, allow the land to lie fallow for a whole year instead of for six months only, that is, land which has borne a kharíf crop is allowed to lie fallow for the following rabí and kharíf and then sown with a rabí crop, to be followed immediately by a kharíf. But this course is not often kept up, and generally speaking land best suited for a kharíf crop is always sown with kharíf, and land best suited for a rabí crop is always sown for the rabí. The trouble and expense required in growing a kharíf crop are much less than for the rabí; a preliminary ploughing is hardly necessary, the seed costs much less and the produce is less valuable and requires less care and watching; moreover, at the time when the kharíf operations are in progress, there is generally plenty of water in the hollows, and grass everywhere available for the plough-bullocks. It is therefore common to sow a kharíf crop first in land newly-broken up, and to sow only kharíf crops in land situated far from the village. On the other hand, light loam does not produce a good kharíf crop after it has been under cultivation for some years, but when well worked up produces a fair rabí crop with little rain, the seed is more valuable and the produce requires more care and protection, and at the season of rabí operations the outlying ponds are often dry and grass is scarce. It is therefore usual to find that the land nearer the village, which is generally the land that has been longest cultivated, is always sown with rabí; and in some of the older Sikh villages a circle of land close to the village rarely produces anything but rabí, the land farthest away from the village usually produces kharíf crops only, and the belt between these produces sometimes kharíf and sometimes rabí. This is however only a tendency and is often overruled by other considerations. Some sandy fields, especially the land in the drainage-channels which cross the district, rarely produce anything but rabí; and sometimes the question whether a peasant will sow kharíf or rabí in a particular field is determined by his personal conveni-

ence at the time rather than by the nature of the soil or regard for any particular course of cropping. As already noted, the Bágrís often sow no rabí at all in any circumstances, while the Sikh, whatever be the nature of the soil, sows as much rabí as will keep him and his cattle fully employed. But most of all, these arrangements are subject to be modified by the distribution of the rainfall. If the rain fails altogether, nothing at all is sown, and the land gets a whole year's rest. If the rain is favourable for the kharíf sowings, as much land is sown for the kharíf as there is time and means to sow. If the kharíf fails and the rains promise well for the rabí, as much land as possible is sown with a rabí crop, and sometimes the stunted kharíf crop is ploughed up to make way for a rabí. Thus the area sown, and still more the area harvested, for each crop varies very much with the rainfall: for instance, in 1877-8, 36 per cent. of the whole cultivation was rabí, and 1880-81 only 17 per cent. It is not common to give fallow land many ploughings, as the rests it gets owing to failure of rain seem sufficient to keep up its crop-bearing powers. Rotation of crops is almost unknown, and the same crop is sown year after year in the same land. Much land produces *bájra* year after year, and much produces barley and gram without any change. The only crop not usually repeated on rain-land is jawár which is considered to exhaust the land; and if a kharíf crop is taken after jawár it is generally bájra, moth or til; but sometimes land which has borne a jawár crop gets a rest for a year and is then sown with rabí. When light land is cultivated for the first time, it is sometimes sown with barley alone to begin with, and afterwards barley and gram. In the rice-*kunds* on the Ghaggar a crop of rice is taken every year in which the floods are sufficient to allow of its being sown; it is only rarely that wheat or gram is sown in rice-land, and the only rest the land gets is when the floods fail. The wheat and gram lands also, both on the Ghaggar and Satlaj, bear the same crop year after year when there is a sufficient flood. Lands irrigated from wells when manured sometimes give two crops in the same agricultural year. On such lands after sugarcane a fallow of six months is given, and then a crop of wheat is taken. Maize also is followed by wheat. After vegetables the land lies fallow for a year, and then wheat is sown. After tobacco comes a six months' fallow, and then wheat. Onions are sometimes followed by turnips; and after wheat jawár is sometimes sown for fodder. But most of the land on the wells produces wheat year after year, and in the whole district the area which produces a kharíf and rabí crop in the same agricultural year (*dofasli*) is quite insignificant.

Agricultural implements and operations.

168. The plough (*hal*) is of different shapes and sizes according to the kind of soil to be ploughed and the kind of animal that is to draw it, from the large plough drawn by oxen to break up hard land for the rabí crops to the small plough (*haleri*) drawn by donkeys or women in the sandy soil of the uplands; but the plough generally consists of a wooden boot (*kur* or *chau*) in front of which the iron

plough-share (*phálá*) is fastened, while to an upright shaft let into the boot a small peg is attached as a handle; another shaft attached to the boot stretches forward between the bullocks and is tied to the yoke (*panjálí*) resting on their necks. The donkey-plough is yoked in the same way, but is much smaller than that drawn by bullocks and is only rarely used by the Kumhárs. Sometimes the light sandy soil of the Rohí is ploughed by a small plough drawn by a single bullock which pulls it by two poles attached to the plough as shafts, and passing one on each side of the bullock to a collar on its neck. The camel-plough, which is very commonly used by the Bágrís in sowing kharíf crops in light soil, is smaller than the ordinary bullock-plough and is drawn by one camel by means of a rope attached to the shafts of the plough and to a cross-beam from which a rope passes along each side of the camel to a small saddle fastened round his hump. The ploughman directs the camel by a pair of very long reins fastened to the rings in the camel's nose. The ploughing in the Hitár is all done with bullocks, a pair of which can plough about a third of an acre of the hard soil in a day, the plough usually penetrating about six inches into the ground. An ordinary two-bullock plough can turn up in a day about three-fourths of an acre of the loam of the uplands when penetrating six inches into the ground in preparing it for rabí cultivation, and 1¼ acre when penetrating only three inches to prepare it for the kharíf. A camel can plough in a day about two acres for the kharíf, the plough penetrating only three inches into the ground; and the light plough drawn by donkeys simply scratches the ground. In sowing with the drill, a hollow bamboo (*nálí* or *por*) is attached to the upright shaft of the plough with its lower end in the ground just behind the boot, and with its wide mouth at the plough-handle so that the ploughman can feed it with the hand with which he holds the plough. That hand he keeps supplied with seed from a bag slung behind him, so that he is kept fully occupied holding the plough, guiding the bullocks, giving their tails a twist or their backs a stroke now and then, and at the same time keeping the drill regularly supplied with seed. As the soil has generally been prepared beforehand unless it is sandy and light, a plough can sow more land than it can break up in preparation for sowing. Thus in the Hitár a pair of bullocks can sow about half an acre for the rabí in a day; and in the Rohí about two acres for the kharíf or one acre for the rabí, the furrows being much closer in sowing rabí than for kharíf crops. A camel can sow about two acres in a day, and a single bullock about three-fourths of an acre.

The *sohágá* or clod-crusher is simply a log or beam which is drawn over the field by bullocks while the driver stands on it to increase its weight. It pulverises the clods, levels the ground and gathers together some of the weeds. It is not ordinarily used in kharíf cultivation in the uplands, but is employed in preparing the land for a rabí crop and in levelling the ground after the seed has been sown. The *karáhí* is a board with a handle attached to it at right angles, held by one man while another holds two ropes attached to its ends; it is used for making the boundaries of fields or of plots for irrigation

(*kyárá*) one man standing on one side and pushing up the earth while the other man on the opposite side helps him by pulling the ropes. The *dandráli* is a sort of wooden rake used chiefly for raking manure together. In reaping (*wadhan*) the *dátri* or *datti* is used, a sickle with a curved blade like the hook sometimes used by reapers in Scotland, but with a saw-edge. The reaper squats on the ground and cuts the crop in handfuls at a time, tying it in sheaves as he moves along. This is the usual way of cutting the rabí crops, but in reaping *jawár* and *bájra* it is usual to cut off the ears only (*dunggan*) leaving the stalks standing to be cut afterwards. A man can reap about a fourth of an acre of rabí crop in a day, and sometimes when there is a great demand for labour, wandering reapers get as much as 3 annas each and their food for a day's work. The sheaves or ears seldom require to be dried, but are carried at once to the threshing-floor (*pir*) which is simply a piece of bare hard ground swept clean for the purpose. Here they are heaped round an upright stake round which bullocks are driven so as to tread out the grain and separate it from the straw; while a man with a pitch-fork (*tringal* or *tangli*) heaps it up under their feet. Sometimes as many as 15 bullocks are driven round the stake together. When the grain and straw have been separated, the straw is removed with the pitch-fork and the grain drawn together with the *sabarkatta* or wooden scraper, and if necessary again trodden out. The grain and chaff are separated by winnowing with the *chhajj*, a sort of tray made of the thin part of the stalk of *sarr* grass. One man fills the *chhajj* from the heap and hands it to another who stands up over a bare spot of the threshing-floor and shakes out the stuff gradually so that, as it falls to the ground, the wind may blow the chaff some distance while the heavier grain falls straight down. The chaff and stalks are then swept to one side and the grain to another. For winnowing a dry day and a fairly strong wind are required, and these are rarely wanting in Sirsá at harvest-time; too strong a wind blows part of the chaff beyond the threshing-floor so that it is lost. Winnowing is the special duty of the Chúhra, where he helps in harvest operations, and the *chhajj* is generally made by him. When the grain is winnowed it is put up into a heap, which is sometimes protected from evil spirits by having a circle of ashes traced round it, or by having a slit stick stuck into it with a piece of paper put in the slit on which a verse of the Qurán has been written as a charm. If the owner takes rent in kind and is not ready to divide it, little bits of wet mud are stuck all over the heap and a Chúhra (the *thápí*) stamps them with a small wooden stamp (*thappa*) that no one may take away the grain before it is divided. When all are ready, the division is made in presence of the parties interested, and each takes away his share. In some villages it is the duty of the Kumhár to bring the grain in from the field to the village, but often it is brought in by the peasant himself in his cart or on his camel. It is then stored in the earthen receptacles (*bharola* or *palla*) until wanted for consumption or to be taken to market. Barley and bájra keep longest, sometimes as long as 15 years, but have to be protected from the attacks of white ants by being kept above the ground in a raised bin (*bharola*) or granary (*bukhárí*

or *burj*). Barley is also liable to be attacked by weevil (*súrí*). Jawár only keeps for two years or at the most four, and is also attacked by the *súrí*. Gram keeps for four or five years and is attacked by a different weevil called *dhorá*.

The straw of jawár and bájra is put up in large stacks, sometimes near the homestead, but generally in the field. The chaff and broken straw of wheat and barley, and the leaves of gram, moth, mung and pála are generally brought to be stored in the homestead, but often left in a heap on the field with a covering of thorns and surrounded by a ditch to protect them from the cattle, or put up in a stack thatched with bájra straw to keep out the rain. Jawár and bájra straw are chopped into little pieces for fodder with the chopper (*tokí*).

Other implements are the *kulhárí* or hatchet used for cutting wood; the *phárá* or wooden scraper used for scraping up manure, &c.; the *gandása* which consists of a thin broad blade fastened at an oblique angle to a long handle, and is used for cutting thorns and low brush-wood by a sidelong blow with the right hand while the left hand catches and tosses them up with a pitch-fork; the *khurpa*, a small trowel used for digging up grass and weeds; the *kahí* or *kassi*, a shovel-mattock, the broad blade of which is placed at an acute angle to the short handle; this does the work of a spade, but instead of being pushed outwards and upwards like a spade, it is struck downwards and pulled inwards like a hoe. Carts are little used in the district except by the Sikhs and the Ráins, who have fine large four-bullock carts and sometimes go long distances with them for hire. According to the enumeration made in 1880 there were then 2,013 carts in the district, of which 1,172 were for two bullocks and 841 for four bullocks.

Use of manure and deterioration of soil.

169. The use of manure is almost unknown in the Sirsá district; indeed, the report furnished in 1878 to the Famine Commission gave the percentage of area annually manured as only ·014 of the irrigated area, which is itself only 6 per cent. of the cultivated area; and this is much less than the proportion in any other district of the Province. Manure is not used at all in the Dry Tracts, Chaks Bágar, Rohi and Utár. It is only rarely applied to lands irrigated from wells and to rice-lands. The best rice-cultivators think it enough to give their lands a cart-load of manure per bígha before the rains every second year, *i.e.*, about two tons to the acre, and they double this quantity if a layer of soil has been taken off the field to make it low enough for irrigation. For rice the best manure is the dung of sheep and goats scraped up at long intervals from the folds where they are shut in at night. In the Ghaggar valley land irrigated from wells often gets manure every year, one or two cart-loads per bígha of rubbish taken from the general heap of ashes, sweepings and waste outside the village exposed to sun and rain. In the Satlaj valley some lands irrigated from wells get manure once in two years, and especially when sown with tobacco or sugarcane. Maize, turnips and wheat are said to get 50 tons of manure per acre; pepper, tobacco and onions twice as much; and sugarcane thrice as much; but probably the land is excep-

tionally lucky that gets this quantity of manure. On the lands flooded by the Ghaggar and Satlaj the silt annually deposited by the river-floods to some extent refreshes the soil and renders manure less necessary, but a considerable area of land on the Ghaggar which formerly produced a wheat crop annually will now produce nothing better than gram. In the Dry Tract so much of the cultivated land has been only lately brought under the plough that of a great portion it may be said, in the words of a former Deputy Commissioner, that it is a virgin soil requiring only to be tickled to make it smile with blooming harvests. The people however with some show of reason say that after five years or so of cultivation the land deteriorates and requires more labour to make it produce crops like what it did at first, and that after twenty years' cropping the kharíf produce is so poor that it becomes necessary to cultivate the land more carefully and grow rabí crops. The often-recurring enforced fallows due to the failures of rain must help to restore the fertility of such land. In 1838, Major Thoresby estimated the average produce of the Dry Tract at from 3½ to 5½ maunds per acre, which is not far from the present average; and there cannot have been any very great deterioration in the productive power of the soil, though no doubt there has been some, the effect of which has been to make the better soils first brought under the plough more nearly equal to the soils which being somewhat inferior were broken up at a later date. In the Dry Tract the fields are comparatively free from weeds, which there cause no trouble; but in the irrigated lands of the Ghaggar and Satlaj the camel-thorn (*jawása*), the wild onion (*piyázi*), the thistle-like *katelí* and *leh*, and other weeds, are very common and often do great harm by exhausting the soil and choking the crops; indeed many fields seem to produce more weeds than grain. Yet, except in the rice-fields, the people seldom make any attempt to eradicate them, and as weeding hardly finds a place in the agricultural operations of the Sirsá peasant, it is probably true that weeds are annually becoming more numerous and troublesome.

Causes reducing the outturn of crops.

170. When a crop has been sown, the outturn depends chiefly on the quantity and seasonableness of the rainfall it gets when growing and ripening, but there are other things which affect the result. The rabí crops, and especially gram and sarson, are apt to suffer severely from late frosts which prevent the fruit from forming and sometimes kill the whole plant. In 1868 Mr. Oliver estimated that severe frosts had reduced the outturn of the rabí by one-third, and a severe frost in February 1882 greatly reduced the outturn of the rabí harvest of that year. Late *jawár* and *moth* are also sometimes injured by early frosts. Both kharíf and rabí crops often suffer from dry hot west winds blowing while the grain is forming, and shrivelling up the grain so as to make the outturn much lighter. For instance, in 1876 a hot wind in September reduced the produce of the kharíf, and in 1880 a hot west wind in March reduced the rabí outturn throughout the district, the loss being in some places estimated at one-fourth. Sometimes, but rarely,

a hail-storm in March or April passes over a tract of country, laying low the ripening grain and quite destroying the crop. For instance, in 1876 remissions were granted to five villages on account of damage done by hail. Such storms, however, affect only a few villages at a time, and they seem to be very rare in this district, not visiting any village oftener on the average than once in 20 years. The crops are also very liable to attacks of animals. Antelope, which are very common in some parts of the district, do great damage to the crops and much trouble is taken to preserve the growing grain from their ravages, especially in and near the Bishnoí villages and along the Bíkáner border. Field-rats are always numerous enough to do some damage to the crops, but sometimes they suddenly multiply enormously, and devour almost the whole produce of the fields; for instance, in 1876 they swarmed in several parts of the district and even filled the houses. On such occasions the villagers are practically helpless and do little more than look on and wait until the rats disappear, which they do as suddenly and as inexplicably as they increased. The kharíf crop especially is liable to the attacks of birds of many sorts, parrots, crows, doves, starlings, sparrows, *goliyas*, *sarágás* and other small birds in flocks. To protect the crops, the peasants erect platforms from which a watchman with his sling or rattle or rope to be cracked like a whip and his shouts and cries frightens off the depredators. Flights of locusts (*tídí*) often come up from the west in the rainy season and disappear towards the east where they are supposed to die from eating saline earth (*reh*). Such swarms do great harm to the crops where they settle for the night by devouring everything eatable; and even if the crop recovers somewhat and grows again, both grain and straw are bad and useless. The greatest damage is done where they lay their eggs, for after 21 days the young locust (*phakka*) appears above ground and prepares for his devastating career. It is while his wings are gathering strength that he does so much damage to the neighbouring crops, but at this stage he is easily killed. A shallow trench is dug and the young locusts driven into it, beaten down and buried alive with earth. If he escapes this treatment, he flies about a month after appearing above ground. The villagers near the Bíkáner frontier complain that they suffer from the carelessness and want of system of the Bíkáner people in killing the young locusts; but if the crawling army sometimes extends, as it is said to do, 20 or 30 miles without a break, the people are to be excused for letting some of them escape. The worst flight of locusts in late years was in 1872, but there is hardly a year in which they do not visit the district, and on the average each village endures a flight of locusts about once in 20 years. In dry weather the roots of all crops are liable to be attacked by the white ant (*syonk* or *dímak*), especially wheat and gram in hard dry ground. A kind of grasshopper (*tokáí*) eats sprouting bájra and jawár, and sometimes wheat and barley. A small insect (*teliya*) attacks the leaves of autumn crops which are also sometimes eaten by a caterpillar (*kútra*) and other insects, most of which are said to be produced by excessive rain and east wind and to be killed

by a dry west wind. One of them, the *karwa*, a flying insect which injures the bájra blossom, is got rid of by a man taking his sister's son on his shoulder and feeding him with rice-and-milk while he repeats the following charm:—"*Máme charhke bhánjá áyá—nikal karwa khet paráyá*," *i.e.*, "The nephew has got on his uncle's shoulder—go away *karwa* to somebody else's field." A white maggot (*gindár* or *baggá kíra*) eats the heart of the *jawár* stem where it joins the roots and injures the plant so that it produces no grain. Rice is injured by a bluish insect (*kara*) which sucks the juice of the plant. Other insects also attack the crops and they are liable to diseases, such as rust (*kúngí*) which destroys or diminishes the produce of wheat and barley; it is caused by continuous damp weather and is cured by sunshine or strong wind.

Mode of observation of harvests.

171. Since the commencement of Settlement operations in 1879 a careful field-to-field inspection has been made of each harvest, and an estimate framed of the outturn and its value at the prices of the day. The areas returned by the patwáris as cultivated with each crop were carefully checked by the supervising staff, and I believe them to be very approximately correct. In order to estimate the average outturn, a number of fields were selected by the Superintendent or tahsíldár such as he considered to represent the average outturn of the assessment circle for that harvest, and their actual produce was weighed and reported; and after comparison of the averages given by the different fields so chosen and enquiry from the Superintendents and the peasants checked by my own observation of the crops, I formed a rough estimate of the average outturn of that harvest for each crop in each assessment circle. In a tract where the produce of the fields varies so immensely as it does in Sirsá, it would be very difficult even for a skilled farmer after an inspection of the whole tract to say what fields represented the average of the harvest, and although the fields were of considerable size (often more than 10 acres in area) and were chosen with care after a good deal of inspection and enquiry, the estimate of average outturn so framed must be only a very rough one, and I took care always to err on the safe side by assuming the average outturn as something less than the observations would seem to warrant. Having ascertained the gross produce of the harvest by multiplying the area sown with each crop by the estimated average outturn of the crop, I made an estimate of its gross value by ascertaining the prevailing prices of the time in the several towns and large villages, and after making full allowance for cost of carriage, applying those prices to the estimated gross produce. I submitted for each harvest a detailed report giving these calculations and discussing the condition and prospects of the district, the export of grain, the state of the cattle, and the realisation of the land-revenue of the year; and as these are the most trustworthy statistics available for an estimate of the average produce of the district, I give below a short account of each of those harvests.

Rabí harvest 1880.

172. The monthly rainfall of the year 1879-80 was as follows (in inches):—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	.....	.....	.....
May	.....	.....	.....
June	1·2	2·9	2·5
July	1·7	2·	1·1
August	5·9	4·4	3·6
September	2·	1·0	·8
October	.....	·1	.....
November	.....	.....	.....
December	·2	1·4	·4
January	.....	.....	.....
February	·5	·7	·9
March	.....	.....	.....
Total ...	11·5	12·5	9·3

This is below the average everywhere. The rainfall in June and July was much lighter than usual, and the kharíf crops did not get a good start. Very little rain fell until near the end of August and by that time the kharíf crop had almost wholly dried up. Except in a few villages in the south of Fázilká tahsíl, which had a fair crop, the kharíf was everywhere very poor, and in most villages a total failure. The Ghaggar did not come down in good flood and the rice-crop was poor. But in the end of August and in September there came good rain, which moistened the soil well for the rabí sowings, and a larger area was sown for the rabí than had ever been sown before. Some villages sowed rabí for the first time, and much land on which the kharíf had failed was ploughed up and sown for the rabí. The crop sprouted well, and a most opportune fall of rain in the end of December and again in February brought it near maturity with great promise. Unfortunately in March and April, just as the crop was ripening, a strong hot west wind blew for several days and dried up the grain, which thus lost much of its weight; and the crop which had promised to be a bumper everywhere in the Dry Tracts was brought down nearly to the average. It suffered from no other evil however—no trouble of hail or blight or insects—and in the three Dry Chaks both the area and the outturn were above the average and the crop was an unusually good one, especially

about Dabwálí where the rain in December was heavier than elsewhere. As always happens, however, a dozen or twenty villages, this time to the west of Rori were an exception to the general good fortune and had a poor rabí. The Ghaggar floods irrigated much less than usual, and the area of flooded lands under crop for the rabí was much below the average, but the outturn of wheat was fair and of gram good. The area irrigated by the Satlaj floods was also much below the average and the outturn too was poor, so that the rabí crop in the Hitár was a very poor one. But the gross produce of the rabí for the district as a whole was decidedly above the average.

The areas returned were as follows (in acres) :—

Areas sown for Rabí 1880.

Assessment Circle.	Soil.	Wheat.	Barley, gram, oil-seeds, &c.	Total.	Total of Assessment Circle.
Bágar ..	Bárání ...	...	12,432	12,432	12,432
Náli ..	Cháhi ...	206	274	460	...
	Rez ...	6,360	3,967	10,357	...
	Bárání ...	1,057	19,114	20,171	30,978
Rohí ...	Bárání ...	4,993	2,07,611	2,12,604	2,12,604
Utár ...	Cháhi ...	56	9	65	...
	Bárání ...	880	10,180	11,060	11,125
Hitár ...	Cháhi ...	4,136	630	4,766	...
	Rez ...	2,793	1,605	4,398	9,164
Total of district ...	Cháhi ...	4,398	913	5,311	...
	Rez ...	9,153	5,572	14,725	...
	Bárání ...	6,930	2,49,337	2,56,267	...
Grand total ...	Grand total ...	20,481	2,55,822	2,76,303	2,76,303

The actual produce of 44 fields chosen by the Superintendents was observed, and after comparison of all available *data* and enquiry from the people, I estimated the average outturn of the different crops for that harvest as follows (in maunds per acre) :—

Assessment Circle.	Soil.	Grain.		Straw.	
		Wheat.	Barley, Gram and Oilseeds.	Wheat.	Barley, Gram and Oilseeds.
Bágar ...	Bárání ...	...	4	...	4
Náli	Cháhi ...	7	10	6	10
	Rez ...	6	8	5	6
	Bárání ...	3	5	5	5
Rohí ...	Bárání ...	3	5	5	5
Utár ...	Bárání ...	3	4	5	4
Hitár	Cháhi ...	9	10	9	10
	Rez ...	6	8	6	8

This gives the gross grain produce of rabí 1880 approximately as follows :—

Assessment Circle.	Gross produce of Grain in Maunds.		
	Wheat.	Barley, Gram and Oilseeds.	Total.
Bágar	...	48,000	48,000
Náli	40,000	1,22,000	1,62,000
Rohí	14,000	10,00,000	10,14,000
Utár	3,000	38,000	41,000
Hitár	51,000	14,000	65,000
Total ...	1,08,000	12,22,000	13,30,000

In order to estimate the value of this grain the actual market prices of the 1st June 1880 of the eight chief towns and villages throughout the district were ascertained, and the lowest prices on that date were 20 sers per rupee for wheat and 40 sers per rupee for barley and gram. Allowing for the cost of carriage I estimated the average harvest prices as follows :—

Assessment Circle.	Average Price in Rabi 1880 (sers per Rupee.)	
	Wheat.	Barley, Gram and Oilseeds.
Bágar	...	42
Náli	20	40
Rohí	20	40
Utár	20	36
Hitár	22	32

These rates applied to the estimated gross produce gave the following as the approximate money value of the grain produce of the rabí crop of 1880. I add an estimate of the value of the straw similarly calculated, the rates taken being from five to seven maunds per Rupee for wheat straw, and from four to six maunds per rupee for barley straw.

Assessment Circle.	Value of Grain.	Value of Straw.	Total.
	Rs.	Rs.	Rs.
Bágar	46,000	12,000	58,000
Náli	2,02,000	38,000	2,40,000
Rohí	10,38,000	1,70,000	12,08,000
Utár	48,000	10,000	58,000
Hitár	1,10,000	11,000	1,21,000
Total Rs. ...	14,44,000	2,41,000	16,85,000

This estimate gives the value of the total produce of the cultivated land in rabí 1880 at the market prices of the day as Rs. 16,85,000, which is about nine times the former assessment of the whole year, and six times the new assessment of the whole year. There was little difficulty in realising the revenue, and on 31st October 1880 the balances of land-revenue were only Rs. 730 and of *Takkávi* Rs. 122.

Kharif harvest 1880.

173. The rain-fall of the year 1880-81 was as follows:—

Month.	Sirsá.	Dabwáli.	Fázilká.
April	...	...	...
May	·1	...	·5
June	3·9	4·1	4·3
July	·7	1·6	2·
August	...	2·6	·3
September ...	·6	·6	...
October	...	...	...
November ...	...	...	...
December ...	·7	·9	·5
January... ...	·1	·1	·1
February ...	...	1·	·8
March	2·8	1·	·7
Total ...	8·9	11·9	9·2

In the end of June and the beginning of July there was an excellent fall of rain over the whole district. Every plough was set to work and as much land as possible was sown while the soil remained moist. The total area sown was, notwithstanding the large area sown for the previous rabí, somewhat above the average, especially in the Rohí and Utár circles; but in the Náli circle owing to excessive floods of the Ghaggar in July many of the rice-*kunds* were overtopped and drowned and the area sown with rice was very small; on the other hand an unusually good flood from Fathábad irrigated a large area of Sotar land east of Sirsá in the Choya valley, and enabled it to produce good jawár crops. In July the prospects of the kharíf harvest were excellent everywhere in the Dry Tracts, but with the exception of slight and partial showers no rain fell in August, September or October, and the promising crops dried up. In many villages the failure was complete and not a straw grew worth the gathering; in many there was some straw but little grain; and in only a few did the partial rain-showers bring the crop to maturity, and produce a fair harvest of grain. According to the patwáris' inspection, which was checked on the field by the supervising establishment, of the 7,27,200 acres sown for the kharíf only 3,64,746, or about half, produced any grain, and in Chak Náli less than a fourth of the area sown produced a crop; indeed, in great part of that Chak every blade of crop sown on unirrigated land dried up, and came to nothing. In more than a third of the villages in the district less than a fourth

of the area sown produced a crop, and in 140 villages the failure was so complete that nine-tenths of the area sown produced no grain. The Bágar Chak suffered least, as its sandy soil produces a crop with very little rain, and a few opportune showers in September were enough to save something of the harvest. In the Rohi Chak some villages south-east of Chautála had a fair crop, but elsewhere, with the exception of a few fields here and there, very little grain was produced. Even where the crop came to something the outturn was as a rule very poor. Sixty-two fields averaging 12 acres each were selected by the Superintendents as representing the average outturn of the harvest, their actual produce was weighed, and from the results of these experiments and my own observations and enquiries, I framed a rough estimate of the average outturn. The statistics and estimates are as follows :—

Assessment Circle.	Total area sown for Kharif 1880.	Area Reported as having Produced a Crop (in Acres.)							
		Total area producing a Crop.	Soil.	Jawar (alone and with pulses.)	Bajra (alone and with pulses.)	Moth, Mung, Mash, and Gwar	Til	Rice.	Miscellaneous.
Bagar ...	1,18,954	80,911	Barani ...	2,493	76,643	1,774	...	...	1
Nali ..	1,29,420	29,611	Chahi ...	96	.....	2	...	...	96
			Res ...	8,936	2,517	2,518	275	994	1
			Barani ...	2,052	15,580	1,609	110	34	1
Rohi ...	4,35,607	2,26,383	Barani ...	30,846	1,61,988	27,156	6,328	...	45
Utar ...	37,898	24,160	Barani ..	2,473	19,906	1,342	430	...	9
Hitar ...	5,321	3,71	Chahi ...	1,361	36	15	98	...	444
			Res ...	197	197	205	24	33	101
			Barani ..	133	759	57	36	...	..
Total of district	7,27,200	3,64,746	...	48,582	2,77,426	34,688	7,301	1,061	688

My estimate of the average outturn and the resulting approximate gross produce were as follows :—

Assessment Circle.	Estimated Average Outturn in Maunds per Acre.			Estimated Gross Produce in Maunds.			
	Soil.	Jawar, &c	Bajra, &c.	Jawar, &c.	Bajra &c., including pulses.	Miscellaneous.	Total.
Bagar... ...	Barani ...	½	½	1,000	39,000	.....	40,000
Nali	Res ...	2½	2½	11,000	17,000	12,000	40,000
	Barani ...	¼	¼				
Rohi	Barani ...	1¼	1¼	48,000	2,53,000	10,000	3,09,000
Utar	Barani ...	1½	1½	4,000	31,000	1,000	36,000
Hitar ...	Chahi ...	5	...	3,000	1,000	4,000	13,000
	Barani ...	1	1				
Total of the district				70,000	3,41,000	27,000	4,38,000

The prices of the chief grains were comparatively low until June and then, owing to the failure of rain, rapidly rose until August, and stood high for some months. At the end of December the lowest prices quoted in the market-towns were 28 sers per rupee for jawár and 21 for bájra. The prices I adopted for valuing the grain produce of the kharíf and the resulting money value are given below. I also give the estimated value of the straw, which was taken at about 5 maunds per acre for jawár, 3 maunds for bájra, moth and gwár, and half a maund for *pála*. Owing to the scarcity of grass the prices of fodder were very high and those I adopted, at half the bazar prices, were 3½ maunds per rupee for jawár, 6 for bájra, 2½ for moth, and 3 for *pála* :—

Assessment circle.	Harvest-Prices (sers per Rupee.)			Value of Grain.	Value of Straw.	Total.
	Jawár.	Bájra.	Moth.	Rs.	Rs.	Rs.
Bágar	30	24	26	67,000	39,000	1,06,000
Náli	30	24	26	65,000	30,000	95,000
Rohi	26	24	22	5,20,000	1,75,000	6,95,000
Utár	24	21	22	68,000	16,000	84,000
Hitár	24	21	22	24,000	8,000	32,000
Total of district ...				7,44,000	2,68,000	10,12,000

This makes the value of the total produce of the cultivated land in kharíf 1880 as Rs. 10,12,000 or about 5 times the former total land-revenue of the whole year, or 3½ times the new total assessment. Notwithstanding the failure of the kharíf harvest, the lightness of the demand and the savings of the previous rabí enabled the people to pay the land-revenue without much difficulty, except in 19 villages chiefly in the Náli Chak, in which suspensions to the amount of Rs. 5,342 were granted; and, including these suspensions the balance of revenue unrealised on 31st March 1881 was only Rs. 5,690 or less than 3 per cent. of the annual demand.

Rabí harvest 1881.

174. The failure of the rainfall in September and October 1880 made it impossible to sow much for the rabí. Wherever the partial showers of September left some moisture in the soil, the fullest advantage was taken of it, and the slight fall in the middle of December kept alive the crops that had sprouted and made it possible to sow a large area with late barley (*kanaujai*) in hopes of getting at least some fodder. The area sown for the rabí, however, was very much below the average, being only 1,52,448 acres or little more than half the area sown for the previous rabí. From 15th December to 21st February hardly any rain fell, and though the fall of rain in the end of February and March saved the crop from being a total failure, the dry seed-time and the two months

drought made the outturn much below the average on lands dependent on the local rainfall, especially towards Sirsá, about Rorí, and on the Bíkáner border south-west of Abohar. The unusually high floods of the Ghaggar in July inundated more land than usual, and some land produced good crops which is not ordinarily flooded, but on the other hand the premature drying up of the floods, and the failure of the stream in September when its floods are most favourable for the rabí crop, prevented much land ordinarily cultivated from being sown. On the Satlaj also the floods subsided too early for the rabí sowings, and as the inundation canals were not properly cleared out, the area flooded was small; well-irrigation was considerably extended, but owing to the failure of rain, and the scanty supply of water in many of the wells, the ears were short and thin. The areas sown were as follows (in acres) :—

Assessment Circle.	Soil.	Wheat.	Barley, gram, oilseeds, &c.	Total.	Total of assessment circle.
Bágar ...	Bárání	.....	380	380	380
Náli ...	Cháhi	194	432	626	.....
	Rez	10,771	6,882	17,653	.....
	Bárání	39	2,737	2,776	21,055
Rohi ...	Bárání	698	1,15,166	1,15,864	1,15,864
Utár ...	Cháhi	75	30	105	.....
	Bárání	120	4,151	4,271	4,376
Hitár ...	Cháhi	3,844	1,318	5,162	.....
	Rez	3,955	1,466	5,421	.....
	Bárání	43	147	190	10,773
Total of district ...	Cháhi	4,113	1,780	5,893	.....
	Rez	14,726	8,348	23,074	.....
	Bárání	900	1,22,581	1,23,481	.....
Grand Total. ...		19,739	1,32,709	1,52,448	1,52,448

The estimated outturn per acre and the resulting estimate of gross produce were as follows :—

Assessment Circle.	Soil.	Estimated average outturn (maunds per acre.)		Estimate of gross outturn (in maunds.)		
		Wheat.	Barley &c.	Wheat.	Barley &c.	Total.
Bágar ...	Bárání ...	...	½	...	...	...
Náli ...	Cháhi ...	...	5	56,000	25,000	81,000
	Rez ...	5	5			
	Bárání ...	1	1			
Rohí ..	Bárání ...	1½	3	1,000	3,46,000	3,47,000
Utár ...	Bárání ...	1½	3	...	13,000	13,000
Hitár ...	Cháhi ...	7	10	51,000	21,000	72,000
	Rez ...	6	6			
Total of the district ...				1,08,000	4,05,000	5,13,000

The war in Afghánistán had created a brisk demand on the frontier, and over six lakhs of maunds, chiefly the produce of the previous good rabí harvest, had been exported through Fázilká during the previous year; but although owing to the two bad harvests the stocks of the agriculturists had become low, there was still a considerable quantity of grain in store in the towns. Prices remained at a high figure from August 1880 to June 1881, when the lowest market-prices quoted were for wheat 20 sers and for barley 29 sers per rupee. The prices adopted and the resulting estimate of the value of the produce of rabí 1881 are given below together with an estimate of the value of the straw. The produce of straw on unirrigated land I estimated at two maunds per acre for wheat and 2½ for barley, &c., and on irrigated land about six maunds per acre for wheat and ten maunds for barley. Owing to the failure of the previous kharíf there was a fodder famine in the district, and fodder was selling in the towns at prices at which a few years before grain itself could be got; barley and gram straw sold in Sirsá and Fázilká at a maund and a half per rupee. The prices I adopted for valuation were three maunds per rupee for wheat straw, and two maunds per rupee for barley straw. The resulting values are as follows:—

Assessment Circle.	Harvest Prices (sers per Rupee.)		Value of Grain produce.	Value of Straw.	Total.
	Wheat.	Barley &.			
			Rs.	Rs.	Rs.
Bázar	20	30	...	...	...
Náli	20	30	1,45,000	21,000	1,66,000
Rohí	18	28	4,96,000	1,44,000	6,40,000
Utár	20	25	21,000	5,000	26,000
Hitár	20	25	1,32,000	20,000	1,52,000
Total of district ...	.....	.....	7,94,000	1,90,000	9,84,000

This estimate makes the value of the rabí produce of 1881 Rs. 9,84,000, which is five times the former total land-revenue of the year, and more than three times the new total assessment. As two successive harvests had been more or less failures, I considered separately the condition of each village in the district with regard to its ability to pay the rabí instalment, but only eleven villages seemed to require a suspension of the instalment; and on 30th November 1881 the total balances were Rs. 5,001 suspended from kharíf 1880 and Rs. 1,782 suspended from rabí 1881—total Rs. 6,783. Thus notwithstanding the failure of three harvests out of four, the lightness of the demand made it possible to realise almost the whole of the revenue without hardship to the people.

In June 1881 the district was in a somewhat critical condition, for the kharíf and rabí harvests had both been poor and the stocks of

grain and fodder were low; and had the rains again failed there might have been a scarcity and a serious loss of cattle. There would probably not have been a famine, for the area which had suffered was small and scarcity prices would have caused a large importation. The people as a body were still well enough off to purchase grain from without, and the poorer classes are so ready to migrate that so long as work and food are within easy reach they readily go to it, and in June 1881 half the population of many villages in the Fázilká Rohí had wandered westwards; but such migrations are not necessarily a sign of distress. When the rains fail the cultivator has nothing to do at home, so he takes his wife and children and drives off his cattle and sheep towards the river where at the time of the rabí harvest he and his family find plenty of work and live in luxury on wheaten bread, while his cattle are allowed to graze free of charge. Many such families crossed the Satlaj into Montgomery to help in reaping the unusually good harvest there and returned to their homes as soon as rain fell. The cattle held out wonderfully notwithstanding the drought. In August 1880 they had been at their best with plenty of water and grass everywhere; but after that time for want of rain the grass gradually dried up and the cattle grew thinner and thinner. There was no grass within reach in Bíkáner, and though some cattle were driven to the banks of the Ghaggar and Satlaj, few left the district. Partial showers here and there produced a little grass, and the rain of March and April was a great boon to man and beast by filling the village-ponds and giving them a supply of water, which is generally got with great difficulty in the hot weather. In many villages there were stacks of *bájra* straw of several years back, and these were the means of saving many cattle. However, few cattle died though they were getting much reduced and the stocks of fodder were almost exhausted, and had the rains of 1881 held off much longer, many thousands of cattle must have died as in former seasons of drought.

Kharif harvest 1881.

175. The rain-fall of 1881-82 was as follows:—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	·7	1·	·6
May	·3	·3	·3
June	·3	...	1·4
July	12·8	9·6	9·6
August	9·4	7·	5·
September.	...	...	·2
October	...	...	...
November	...	...	...
December	...	...	...
January	2·5	2·1	2·3
February	·3	·5	·5
March	...	...	...
Total	26·8	20·5	20·6

This was an exceptionally heavy rainfall, almost as much as in the previous two years put together. No such heavy rainfall has been recorded at Sirsá since the mutiny, and only once during that period has there been so heavy a fall at Dabwálí or Fázilká. Some little rain fell in April, May and June, but up to the 9th of July there had been no fall of rain sufficient for the kharíf sowings, and things were getting very critical. During the following two months, however, there was such a heavy and continuous fall of rain as has not been seen in this district for many years and the general complaint was that there was too much instead of too little. In the lighter sandy soil of the Bágar and Rohí the seed was washed out of the ground by the violence of the downpour and in many fields had to be resown twice or even thrice before the young plants developed sufficiently to retain their hold on the soil; and in the stronger soils a heavy shower of rain falling within two or three days after sowing made the soil cake so firmly that the young shoots could not force their way through. The people did not fail to make the most of their opportunities to sow as large an area as possible, and the area sown (7,72,858 acres) was larger than had been cultivated for the kharíf during the previous six years. Besides the large area which suffered from too much rain at seed-time, a considerable area of crop which started well suffered from want of rain later on to bring it to maturity, as practically no rain at all fell after the end of August. The moisture which the soil had retained sufficed to develope the straw to an unusual degree, and a little rain towards the end of September would have enabled the ear to form well, and we should have had such a bumper crop as Sirsá never saw before; but the premature cessation of the rainfall made the outturn of grain much lighter than might have been expected from the favourable rain at seed-time, except in a few favoured tracts which got some partial showers. In those villages the harvest was really a bumper, even as compared with those of districts generally much more fertile than Sirsá; but as a rule throughout the district, while the outturn of fodder and straw was far above the average, the grain produce was not so very much better than in an ordinary kharíf harvest. Still the contrast between this kharíf and that of the previous year was a great one. In 1880 the rains had been almost equally favourable for sowing, but they commenced about a fortnight earlier than in 1881, and ceased about a month earlier, so that throughout the greater part of the district the crops dried up entirely and produced neither grain nor straw; while in 1881 hardly an acre sown failed to produce some little grain and a fair amount of straw. Even in this year of general prosperity, however, some tracts were denied the good rainfall granted to their neighbours, and 42 villages were returned as having had a poor crop, chiefly in two small tracts, one in the north corner of the Dabwálí tahsíl and the other in the west of Fázilká tahsíl. The floods of the Ghaggar were on the whole favourable for the kharíf, and as the rice-cultivators had taken care to repair the embankments of their *kunds* which had been breached by the heavy floods of the previous year, they were able to sow a large

area of rice most of which produced a crop. In the Hitár also the area sown was unusually large; the jawár crop was at first very promising, but the failure of the latter rains prevented the ear from forming, and although there was plenty of straw everywhere, there was comparatively little grain.

The area cultivated for the kharíf of 1881 was as follows :—

Assessment Circle.	Soil.	Area Cultivated (in Acres.)							
		Jawar (alone and with pulses.)	Bajra (alone and with pulses.)	Moth, Mung, Math and Gwar.	Til.	Rice.	Miscellaneous.	Total.	Total of Assessment Circle.
Bagar ...	Barani ...	10,018	1,07,698	4,023	2	.....	... ..	1,21,738	1,21,738
Nali ...	Chahi ...	74	7	7	.....	.....	31	119	.....
	Rez ...	653	3,466	152	40	6,740	3	11,053	.....
	Barani ...	14,996	1,06,735	5,581	900	8	8	1,28,248	1,39,420
Rohi ...	Barani ...	1,03,418	3,84,357	55,286	20,503	.....	38	4,63,601	4,63,601
Utar ...	Barani ...	7,148	28,230	3,652	1,918	.....	11	41,949	41,949
Hitar ...	Chahi ...	2,653	121	88	216	.....	313	3,341	.....
	Rez ...	895	396	46	320	.....	84	1,731	.....
	Barani ...	962	70	178	237	.....	1	2,078	7,150
Total of the district ...		1,39,811	5,32,717	69,963	24,130	6,748	489	7,72,858	7,72,858

My estimate of the average outturn and resulting average gross produce were as follows :—

Assessment Circle.	Estimated Average Outturn (in Maunds per Acre.)			Estimated Gross produce (in Maunds.)			
	Soil.	Jawár, &c.	Bájra, &c	Jawar (alone and with pulses.)	Bájra and pulses.	Miscellaneous.	Total.
Bagar ...	Barani ...	1	1	10,000	1,12,000	...	1,22,000
Nali ...	Rez ...	4	4	63.000	2,98,000	71,000	4,32,000
	Barani ...	4	2½				
Rohi ...	Barani ...	4	4	4,10,000	12,48:000	51,000	17,09,000
Utar ...	Barani ...	4	4	29,000	1,36,000	6,000	1,63,000
Hitar ...	Chahi ...	3	...	20,000	3,000	3,000	26,000
	Rez ...	3	2				
Total of the district				5,32.000	17,89,000	1,30,000	24,51,000

The high prices which had ruled from August 1880 when the failure of the rains showed that the kharíf of 1880 would be a poor harvest continued pretty steady until the end of May when they rose still higher; and in June and July when the rain seemed to hold off prices rose rapidly until on 31st July, in Sirsá market, barley was selling at only 23 sers per rupee, jawár at 22, bájra at 20, and gram, the cheapest grain, at 25 ; these were, for Sirsá, scarcity prices. The rains of August caused a rapid fall of prices, and they continued to fall as the harvest became assured, and more especially after it became

certain that the rabi would be a good crop, and in six months the prices of barley and jawár fell by half, *i.e.*, barley, which in July sold at 23 sers per rupee, sold in January 1882 at 50 sers, and the price of bájra fell from 22 sers per rupee to 46. On the 1st December 1881 the lowest prices quoted in the chief villages were for jawár 53 sers per rupee, for bájra 40 and for moth 49. I estimated the average outturn of jawár straw at about 8 maunds per acre, bájra and gwár 3 and moth 2 maunds per acre, and the average prices at about 12 maunds per rupee for jawár straw, 20 for bájra straw and 5 per moth and *pála*. These give the following as the approximate value of the kharif crops of 1881 ;—

Assessment Circle.	Harvest prices (sers per Rupee)			Value of grain.	Value of straw.	Total.
	Jawar.	Bajra.	Moth.	Rs.	Rs.	Rs.
Sagar	40	36	40	1,34,000	21,000	1,55,000
Nali	40	36	40	5,50,000	41,000	5,91,000
Rohi	50	40	45	16,63,000	1,35,000	17,98,000
Utar	45	35	35	1,83,000	18,000	2,01,000
Hitar	45	35	25	26,000	10,000	36,000
Total of the district ...				25,56,000	2.25.000	27,81,000

The value of the total produce of kharíf 1881 is thus estimated at Rs. 27,81,000, or enough to pay the new assessment of the whole year nine times over. The new assessment came into force in the three Dry circles with effect from this harvest, and although the enhancements were 31, 81 and 47 per cent. respectively, the land revenue in those tracts was fully realised without difficulty.

Rabi harvest 1882.

176. Although almost no rain fell for four months after the end of August, the rainfall of July and August had been so heavy that the moisture remained in the soil and enabled the people to sow a large area for the rabí. The crop was beginning to dry up when an exceptionally heavy fall of over two inches in January almost all over the district refreshed it and gave promise of a bumper harvest. Towards the end of February, however, a severe frost injured the crop in many parts of the district and greatly reduced the outturn. Had it not been for that frost, the rabí harvest would have given an amount of produce larger than was ever before given by a rabí harvest in this district, and even as it was, the outturn was excellent and much above the average. Almost every acre sown produced something, and no village which depends much on the rabí crop failed to reap some produce, though in a few scattered villages the harvest was much inferior to what it was elsewhere. In the Sotar valley east of Sirsá the wheat crop was exceptionally good both in area and in outturn, as the unusually heavy rain had thoroughly soaked the hard soil and made it possible to sow an exceptionally large area of wheat. There were good floods on the Ghaggar in

August, but the late floods failed, and the villages below the Annakai Chhamb were unable to sow much land for the rabí; the Dhanúr and Annakai Chhambs, however, and the low land towards Ellenábád dried up early and left an unusually large area of moist land fit for the rabí sowings. This was benefited like the Sotar crop by the heavy rain of January, while it escaped being drowned by winter floods of the Ghaggar. The Satlaj, chiefly owing to the neglect of the inundation canals, did not flood much land, and the area irrigated on wells showed a slight falling off, but the heavy rainfall permitted the sowing of a large area without irrigation, and the outturn of many fields was very good. The areas sown were as follows (in acres):—

Assessment Circle.	Soil.	Wheat.	Barley, Gram, Oilseeds, &c	Total.	Total of Assessment Circle.
Bagar	Barani ...	8	2,041	2,049	2,049
Nali	Chahi ...	68	285	353	
	Rez ...	9,234	5,895	15,129	
	Barani ...	4,780	10,143	14,923	30,405
Rohi	Barani ...	5,683	189,453	195,136	195,136
Utar	Barani ...	1,270	10,791	12,061	12,061
Hitar	Chahi ...	3,764	795	4,559	
	Rez ...	3,807	877	4 684	
	Barani ...	641	594	1,235	10,478
Total of the district.	...	29.255	220,874	250,129	250,129

In order to ascertain the average outturn, 62 fields aggregating 558 acres were selected by the Superintendents as representing the average of the harvest and their produce weighed. The estimated average outturn and the resulting estimate of the gross outturn are as follows:—

Assessment Circle.	Soil.	Estimated average outturn (maunds per acre).		Estimate of gross outturn (in maunds).		
		Wheat.	Barley, &c.	Wheat.	Barley, &c.	Total.
Bagar ...	Barani	...	4	...	8,000	8,000
Nali ...	Chahi	8	5	103,000	102,000	205,000
	Rez	7	5			
	Barani	8	7			
Rohi ...	Barani	6	7	34,000	1,326.000	1,360,000
Utar ...	Barani	6	7	8,000	75,000	83,000
Hitar ...	Chahi	7½	10	55,000	13,000	68,000
	Rez	6	4			
	Barani	6	6			
Total of the district.	...	...	...	200,000	1,524,000	1,724,000

Owing to the failure of the kharíf crop of 1880 and the rabí crop of 1881 and to the cessation of the war in Afghánistán export

had greatly fallen off, but the good kharíf crop of 1881 replenished the stocks of the peasants and left them free to sell a large portion of their excellent rabí crop in 1882. The imports into the towns for storage or export greatly increased, and an especially large quantity of grain found its way into Sirsá town. There was a large demand to the east, where the rabí crop had not been so good, and many traders from Bhiwání or Dehli bought largely; and it was estimated that two lakhs of maunds of grain were in a few months stored in Sirsá town alone. At the beginning of March prices were low, and barley and jawár were selling in Sirsá market at 47 sers per rupee, but the demand from the east then sent prices steadily but slowly up, and at the end of July the cheapest grain at Sirsá was jawár at a maund the rupee. At the beginning of June the lowest market prices were, for wheat 27 sers per rupee, barley 50, gram 45. The prices adopted and the resulting estimate of values are given below. The weight of the straw was taken, according to the roughly correct estimate of the peasants, as about equal to that of the grain, and the prices at about eight maunds per rupee for wheat straw and six maunds per rupee for barley straw. The resulting values are as follows :—

Assessment Circle.	Harvest Prices (Sers per Rupee.)		Value of Grain Produce.	Value of Straw.	Total Value.
	Wheat.	Barley, &c.	Rs.	Rs.	Rs.
Bágar	24	40	8,000	1,000	9,000
Náli	24	40	274,000	30,000	304,000
Rohi	28	50	1,110,000	225,000	1,335,000
Utar	25	45	79,000	16,000	95,000
Hisár	25	45	1,00,000	11,000	111,000
Total of the district ...	...	...	1,571,000	283,000	1,854,000

This estimate makes the value of the produce of rabí 1882 Rs. 18, 54,000, or nearly seven times the total assessment of the year. The enhanced assessment was realised without any difficulty. In July 1882 after the first rains of 1882 had fallen, the district was perhaps in as prosperous a condition as it had ever before experienced. The cattle had had a year of plenty and were in excellent condition, and there was plenty of grass and water everywhere. Large stores both of grain and fodder had been laid by from the last two harvests, and many of the peasants had a considerable amount of cash in hand after their recent large sales of grain and cattle. The contrast between the state of things then and that of only a year before was marvellous.

Kharif Harvest 1882.

177. The rainfall of 1882-83 was as follows :—

Month.	Sirsá.	Dabwálí.	Fázilká.
April	.....	.....	·2
May	.....	.....	·7
June	1·2	·6	·2
July	5·4	6·1	1·8
August	·2	1·	2·7
September	3·8	2·9	7·6
October	.....	.....	.....
November	.....	.....	.....
December	.....	.....	.....
January	1·5	2·3	1·9
Feburary	.....	·4	.....
March	1·4	·5	·5
Total ...	13·5	13·8	15·6

The total rainfall was not far from the average, being slightly below it at Sirsá and slightly above it at Fázilká. Almost no rain fell until the 10th of July, and very little land had up to that date been sown for the kharíf. During the next fortnight there was very little rain, and it was not until the last week in July that really good rain fell. In that week almost the whole of the district, with the exception of a small tract below the Danda near Fázilká, had two or three inches of rain. It was not too late to sow for the kharíf, and the area cultivated, though considerably less than the area sown in the previous year, was not much below the average kharíf area. Indeed nearly 50,000 acres of new prairie-land were for the first time brought under the plough. During August very little rain fell, except a partial shower in Fázilká and its immediate neighbourhood, and for more than a month no rain fell in the greater part of the district, and in many places the crops dried up irretrievably. Had the rain held off a fortnight longer, very little grain would have been produced except in a few villages which had been fortunate enough to get partial showers; but in the second week of September abundant rain fell most opportunely over almost the whole of the district and saved the greater part of the kharíf crop. The village ponds were filled and the grass revived, and the supply of fodder was assured. A considerable area had dried up so badly that this rain was too late to revive it and it produced no grain, and in a large area the outturn was poor, but most fields produced something, and the harvest was about three-fourths of the average. The floods of the Ghaggar came down at a good time for the rice sowings, and again in the beginning of September in good time to save it from drying up, and the rice-crop was unusually good, especially below the Annakai Chhamb; the villages dependent on the Dhanúr Jhíl however did not get good rice owing to the erosion of the Ghaggar channel which has lowered the level of that lake. The Satlaj floods were low, and owing to this and the almost total failure of the early rains in the Hitár, very little land was there sown for the kharíf. The areas cultivated and the reported quality of the produce were as follows:—

Assessment Circle.	Soil.	Area Sown for Kharif 1893 (in Acres).								Quality of Produce.		
		Jawar. (alone and with pulses.)	Bajra (alone and with pulses.)	Moth, Mung, Mash and Gwar.	Til.	Rice.	Miscellaneous.	Total.	Total of Assessment Circle.	None.	Very poor	Fair.
Bagar	Barani ...	8,134	105,216	2,393	5	...	1	115,749	115,749	955	13,861	101,433
Nali	Chahi ...	69	3	...	...	12	36	120	...	14	19	87
	Res ...	350	3,528	204	...	6,163	...	10,245	...	458	1,321	8,466
	Barani ...	16,641	101,801	3,233	412	31	6	122,124	132,489	13,083	57,353	51,688
Rohi	Barani ...	87,581	307,038	16,812	14,668	...	15	426,114	426,114	136,023	223,542	66,549
Utar	Barani ..	5,642	28,457	1,810	695	...	4	36,608	36,608	3,880	8,605	24,123
Hitar	Chahi ...	2,000	...	...	...	....	98	2,098	...	279	886	933
	Res ...	200	...	...	...	...	...	200	...	200	...	...
	Barani ...	155	871	148	311	...	443	1,928	4,226	276	682	970
Total of the district		120,772	546,914	24,600	16,091	6,206	603	715,186	715,186	155,168	305,769	254,249

Thus, according to the patwáris' returns as checked by the supervising staff, of the 715,186 acres sown for the kharíf only 254,249 acres produced a fair crop, and 155,168 acres produced no grain at all. In order to estimate the average outturn of the harvest the tahsíldars selected representative fields and had their produce weighed and also consulted the Zaildars. The average outturn and the resulting estimate of gross produce are approximately as follows :—

Assessment Circle.	Estimated Average outturn (in Maunds per Acre.)			Estimated Gross Produce in Maunds.			Total.
	Soil.	Jawár, &c.	Bájra, &c.	Jawár, &c.	Bájra &c.	Miscellaneous.	
Bágar ...	Bárani	1	2	8,000	210,000	...	218,000
Náli	Res Bárani	2	1½	30,000	142,000	100,000	272,000
Rohi	Bárani	1½	1½	130,000	330,000	16,000	476,000
Utár	Barani	3	2	16,000	55,000	2,000	73,000
Hitár ...	Chahi Barani	4 ...	... 1	7,000	1,000	8,000	16,000
Total of the district				191,000	738,000	126,000	1,055,000

The very low prices of June 1882 gave way to the failure of rain, but did not rise very rapidly as the stocks of grain in the district were large and there was no great demand for export; and in the beginning of September barley, gram, jawár and moth were selling at 35 sers per rupee in Sirsá market. The favourable rainfall and the prospect of fair kharíf and rabi harvests sent prices down again, and on 1st January 1883, the lowest prices quoted at the large villages throughout the district were 70 sers per rupee for jawár and 50 for bájra. The average outturn of straw may be taken as six maunds per acre for jawár, and three maunds for the other crops, and the average selling prices of straw at ten maunds per rupee for jawár, 20 for bájra, and five for moth and pála. These estimates give the value of the kharif produce of 1882 approximately as follows :—

Assessment Circle.	Harvest Prices (Sers per Rupee).			Value of Grain Produce.	Value of Straw.	Total.
	Jawár.	Bájra.	Moth.			
				Rs.	Rs.	Rs.
Bágar ...	50	40	50	2,20,000	30,000	2,50,000
Náli ...	50	40	50	3,00,000	40,000	3,40,000
Rohí ...	70	50	60	3,75,000	1,50,000	5,25,000
Utár ...	60	45	50	70,000	30,000	1,00,000
Hitár ...	60	45	50	15,000	5,000	20,000
Total of the district	..	...	...	9,80,000	2,55,000	12,35,000

This estimate makes the value of the produce of kharíf 1882 Rs. 12,35, 000 or about 4½ times the new assessment of the whole year. Notwithstanding the partial failure of the kharíf in some parts of the district, the previous harvests had been so good that the enhanced land revenue was realised with ease, and on 31st March 1883 the arrears amounted only to Rs. 159.

Rabi Harvest, 1883.

178. The general and abundant rain of September 1882 was very opportune for the rabí sowings, and a much larger area was sown for the rabí than had ever been before. The rain in January came in good time to save the crop from drying up, and the result was a bumper rabí crop throughout the whole of the Dry Tracts. The Ghaggar floods were not very favourable, and a smaller area than usual was sown with wheat; the gram crop in the low-lying parts of the channel was drowned by a flood in March. The Satlaj floods were low and the inundation canals had not been put in order, and the area flooded in the Hitár was small; but the abundant rain in September allowed of the sowing of a larger area of unirrigated land than usual in the Hitár also. The area sown on wells was about up to the average and the crop good. Throughout the district little of the land sown failed to produce a crop and on a large proportion of the area the outturn, both of grain and straw, was unusually good. The areas cultivated were as follows:—

Assessment Circle.	Soil.	Area sown for Rabi, 1883.				Quality of Produce.		
		Wheat.	Barley, Gram & Oilseeds.	Total.	Total of Assessment Circle.	None.	Very poor.	Fair.
Bágar ...	Báráni ...	3	4,676	4,679	4,679	988	1,112	2,579
Náli ...	Chábi ...	23	273	296	30,545	3	10	283
	Res ...	7,571	6,610	14,181		1,594	2,337	10,250
	Sotar ...	1,206	1,454	2,660		583	625	1,452
	Báráni ...	223	13,185	13,408		849	1,238	11,321
Rohí ...	Báráni ...	15,970	241,745	257,715	257,715	3,150	38,831	215,734
Útár ...	Báráni ...	3,550	15,550	19,100	19,100	57	4,484	14,559
Hitár ...	Chábi ...	4,000	779	4,779	11,107	200	100	4,479
	Res ...	3,000	753	3,753		400	100	3,253
	Báráni ...	1,429	1,146	2,575		321	277	1,977
Total of the district ...		36,975	286,171	323,146	323,146	6,145	49,114	265,887

According to the results of observations made by the tahsíldars on representative fields and enquiries made from the Zaildars, the average outturn and the gross produce may be estimated as follows:—

Assessment Circle.	Soil.	Estimated Average Outturn. (Maunds per acre.)		Estimate of Gross Outturn. (In Maunds.)		
		Wheat.	Barley, &c.	Wheat.	Barley, &c.	Total.
Bágar ...	Bárani ...	.....	3	.....	12,000	12,000
Náli ...	Chálu ...	6½	7½	80,000	120,000	150,000
	Res ...	4	6			
	Bárani ...	4½	5			
Rohi ...	Bárani ...	5	7	80,000	1,600,000	1,680,000
Utár ...	Barani ...	5	7	17,000	100,000	117,000
Hitár ...	Chahi ...	8	8	50,000	20,000	70,000
	Res ...	6	4			
	Barani ...	5	3			
Total of the district ...		.....	.....	177,000	1,852,000	2,029,000

There was a considerable export trade, and a large quantity of grain was purchased and stored in Sirsá, but there was no unusual demand in any direction, and a large quantity of grain remained in the hands of the peasants, whose stocks were fully replenished by two such good rabí harvests. Prices continued very low, and in Malaut in June 1883 wheat was said to be selling at 30 sers per rupee, and barley at 70 sers. The produce of straw was estimated as usual as about equal in weight to that of grain, and the average selling price of straw may be taken at ten maunds per rupee for wheat straw, and six maunds per rupee for barley straw. The resulting values are as follows :—

Assessment Circle.	Harvest Prices, (Sers per rupee.)		Value of Grain Produce.	Value of Straw.	Total Value.
	Wheat.	Barley, &c.			
			Rs.	Rs.	Rs.
Bagar ...	... ..	50	10,000	2,000	12,000
Nali ...	25	50	1,50,000	23,000	1,73,000
Rohi ...	30	60	12,00,000	2,75,000	14,75,000
Utar ...	28	55	1,00,000	18,000	1,18,000
Hitar ...	28	55	1,00,000	10,000	1,10,000
Total of the district	.....	.....	15,60,000	3,28,000	18,88,000

According to this estimate, the value of the gross produce of the cultivated land in rabí 1883 was Rs. 18,88,000, or nearly seven times the total assessment of the year. The rabí instalment was realised with ease, and at the end of September 1883 the arrears of land revenue, including suspensions, were only Rs. 243. In July 1883 the district was in an unusually prosperous condition. The cattle had not suffered from scarcity of fodder for two years, and there was plenty of water and grass everywhere, with considerable stores of fodder from the past good harvests. The peasants had had two good rabí harvests,

and their private stocks of grain had been replenished; there were no arrears of revenue against them, and most of them had considerable savings in hand. In short the district, as a whole, was in a more prosperous condition than probably it ever was in before, and the accumulated capital was larger than at any previous period in its history.

Summary of observations of seven harvests.

179. The above estimates are brought together in the following statement, a rough estimate of the kharíf harvest of 1879, which was not actually observed, being added to complete the four years. The statistics are given in even thousands, the last three figures being omitted:—

Agricultural Year.	Area actually sown. (In acres.)			Area which produced a crop. (In acres.)			Total produce of grain. (In maunds.)			Value of Grain and Straw.		
	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.
										Rs.	Rs.	Rs.
1879-80	7,00	2,76	9,76	5,50	2,65	8,15	6,00	13,30	19,30	10,00	16,85	26,85
1880-81	7,27	1,53	8,80	3,65	1,50	5,15	4,38	5,13	9,51	10,12	9,84	19,96
1881-82	7,73	2 50	10,23	7,50	2,40	9,90	24,51	17,24	41,75	27,81	18,54	46,35
1882-83	7,15	3,23	10,38	5,60	3,15	8,75	10,55	20,29	30,84	13,35	18,88	31,23
Average...	7,29	2,50	9,79	5,56	2,43	7,99	11,36	13,99	25,35	15,07	16,03	31,10

Thus, according to the average of the last four years, 9¾ lakhs of acres were sown, but only eight lakhs produced a crop of grain; the gross annual produce of grain was 25 lakhs of maunds, or rather more than three maunds per acre; and the value of the grain and straw was 31 lakhs of rupees, or about Rs. 4 per acre producing a crop, a sum equivalent to eleven times the total new assessment. And although the area sown for the rabí has been little more than a fourth of the whole, the grain produce of the rabí, and the money value of its crops, have exceeded those of the kharíf. The total grain produce of the year has varied from 9½ lakhs of maunds to 42 lakhs, or more than four times as much.

Estimate of area sown and area producing a crop on an average of years.

180. Where however the areas sown, the outturn per acre and the harvest prices vary so much as they do in the Siraá district, a true average could only be obtained by comparing the statistics of more than four years, especially where the crops observed have been so exceptional as in the past four years. The last two rabí crops have been exceptionally good in the Dry Tracts, and three of the four kharíf harvests have been poor, yet there has been no such very poor year as in 1877-78 or in any of the years of real scarcity, and some allowance must be made for them. The floods of

the Ghaggar have not been favourable, and the area irrigated by the Satlaj floods has been much less than it used to be and than it might fairly be estimated at. I propose then to correct the estimate of the average by making allowance for these considerations, and to state my estimates of what may be considered an avérage harvest in the Sirsá district as it was in 1882, without allowing for further extensions of cultivation or irrigation or development of new canals not already in existence. They are estimates only, founded upon the observations of the past four years and the available statistics. It does not seem necessary to give in detail in every case the grounds on which the estimate is framed, especially as the detailed calculations have in many cases been already reported in submitting proposals for assessment and reports on the different harvests. The best way of checking and correcting the estimates will be by comparing them with the actual results of future harvests.

The area actually sown on an average of years and the area which produces a grain crop I estimate as follows (in acres) :—

Assessment Circle.	Soil.	Total Cultivated area returned at Settlement.	Estimated Average Area Actually Sown			Estimated Average Area Producing a Crop.		
			Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.
Bagar ...	Barani ...	125,607	124,000	120,000	4,000	103,000	100,000	3,000
Nali ...	Chahi ...	893	...	...	...	...	...	...
	Rez ...	39,913	25,000	10,000	15,000	22,000	9,000	13,000
	Barani ...	145,016	127,000	115,000	12,000	101,000	91,000	10,000
	Total ...	185,813	152,000	125,000	27,000	123,000	100,000	23,000
Rohi ...	Barani ...	651,348	600,000	425,0 0	175,000	480,000	320,000	160,000
Utar ...	Bárání ...	53,818	45,000	35,000	10,000	38,000	30,000	8,000
Hitar ...	Chahi ...	9,389	6,500	2,000	4,500	6,0·0	2,000	4,0·0
	Rez ...	13,966	9,000	1,000	8,000	7,5·0	500	7,0·0
	Bárání ...	1,890	3,500	2,000	1,500	2,500	1,500	1,000
	Total ...	25,147	19,000	5,000	14,000	16,000	4,000	12,000
Total of the district	...	1,041,733	940,000	710,000	230,000	760,000	554,000	206,000

That is, of the total area under the plough, which may be stated roughly as 10½ lakhs of acres, on an average only 940,000 are cultivated, and of this only 760,000 acres produce a grain crop, the remaining 180,000 acres sown being estimated as producing practically no grain at all.

The 760,000 estimated as producing a crop on an average of years may be taken as sown with the following crops:—It will be seen that about a lakh of acres are estimated as producing jawár, 4 lakhs bájra, half a lakh autumn pulses and *til*, and nearly two lakhs barley, gram and oilseeds, while wheat is produced in only 26,000 acres and rice in 5,000.

Assessment Circle.	Soil.	Total area producing a Crop.	Kharif Crop.						Rabi Crop.		
			Total Kharif.	Jawar (alone and with pulses)	Bajra (alone and with pulses.)	Moth Mung, Mash Gwar	Til.	Rice,	Total Rabi.	Wheat	Barley, Gram, Oilseeds, &c.
Bágár	Bárani	103,000	100,000	6,000	92,000	2,000	...	...	3,000	...	3,000
Náli	Rez	22,000	9,000	1,000	2,000	1,000	...	5,000	13,000	9,000	4,000
	Báráni	101,000	91,000	12,000	75,000	3,500	500	...	10,000	1,000	9,000
	Total ...	123,000	100,000	13,000	77,000	4,500	500	5,000	23,000	10,000	13,000
Rohi	Báráni	480,000	320,000	70,000	2,10,000	30,000	10,000	...	160,000	5,000	155,000
Utár	Báráni	38,000	30,000	4,000	23,000	2,000	1,000	...	8,000	1,000	7,000
Hitár	Cháhi	6,000	2,000	2,000	...	...	...	...	4,000	3,500	500
	Rez	7,500	500	...	500	...	...	...	7,000	6,000	1,000
	Báráni	2,500	1,500	500	1,000	...	...	...	1,000	500	500
	Total ...	16,000	4,000	2,500	1,500	...	...	...	12,000	10,000	2,000
Total of district ...	... ..	760,000	554,000	95,500	403,500	38,500	11,500	5,000	206,000	26,000	180,000

Estimate of average outturn and average gross produce of grain and straw.

181. The average outturn of grain on the area producing a crop I estimate as follows (in maunds per acre.)

Assessment Circle.	Soil.	Jawar and pulses	Bajra and pulses.	Moth, Mung, Mash, Gwar.	Til.	Rice.	Wheat.	Barley, Gram, Oil-seed, &c.
Bagar ...	Barani ...	1½	1½	1½	...	...	...	2
Nali ...	Rez ...	4	3	4	...	12	6	6
	Barani ...	3	2	2	2	...	5	4
Rohi ...	Barani ...	2½	3	2	2	...	4	5
Utar ...	Barani ...	2½	2	2	2	...	3	4
Hitar ...	Chahi ...	4	...	...	...	...	8	9
	Rez ...	...	2	...	...	...	6	5
	Barani ...	2	2	...	...	...	5	4

These estimates of average outturn applied to the areas producing a crop give the following as the estimate of average gross produce of grain (in thousands of maunds) :—

Assessment Circle.	Jawar and pulses.	Bajra and pulses.	Moth, Mung, Mash and Gwar.	Til.	Rice.	Total Kharif Produce.	Wheat.	Barley, Gram and Oilseed.	Total Rabi Produce.	Total produce of the year.
Bagar ...	9	138	3	...	...	150	...	6	6	156
Nali ...	40	156	11	1	60	268	59	60	119	387
Rohi ...	175	630	60	20	...	885	20	775	795	1,680
Utar ...	10	46	4	2	...	62	3	28	31	93
Hitar ..	9	3	.....	...	...	12	67	11	78	90
Total of the District ...	243	973	78	23	60	1,377	149	880	1,029	24,06

According to this estimate the average gross grain produce of the district is 24 lakhs of maunds. The average of the last four years only would have given over 25 lakhs of maunds, bnt instead of 11 lakhs in the kharíf and 14 in the rabí as the four years' average gives, I estimate that on the average of a longer series of years 14 lakhs are produced in the kharíf and 10 in the rabí. Taking all crops together the average outturn per acre is 2¼ maunds in the kharíf and 5 maunds in the rabí, or 3¼ maunds per acre for both harvests taken together.

The average outturn of straw available as fodder for cattle may be estimated as follows in maunds per acre :—

Assessment Circle.	Soil.	Jawár.	Bájra.	Moth, &c.	Rice.	Wheat.	Barley, Gram, &c.
Bágar ...	Bárání ...	2	2	2	...	..	2
Nali ...	Res ...	10	4	3	8	6	6
	Bárani ...	5	3	2	...	5	4
Rohi ...	Bárani ...	6	3	3	...	4	5
Utár ...	Bárani ...	5	3	2	..	3	4
Hitár ...	Chahi ...	15	...	...	...	8	9
	Res ...	10	3	...	...	6	5
	Barani .	5	3	2	...	5	4

This gives only the weight of that part of the straw which cattle will eat, apart from the hard woody stalk which is hardly eatable. Our observations tend to corroborate the assertions of the peasants that in the rabí harvest the weight of straw is approximately the same as that of the grain. Ordinarily a much larger area produces straw than the area producing grain, for the rainfall is often sufficient to develope the stalk and leaves to some extent although not sufficient to develope the ear and grain. Allowing for this and for the leaves of the *jhárberí* (*pála*) which are a valuable fodder and in many fields, especially in the south-east of the district, average a maund per acre, the following estimate of the average amount of fodder produced by the cultivated land may be framed :—

Assessment Circle.	Average Produce of Fodder (in thousands of maunds.)									
	Jawar, &c.	Bajra, &c.	Moth.	Rice.	Pala.	Total Kharif.	Wheat.	Barley, &c.	Total Rabi.	Total of year.
Bagar ...	12	184	4	...	50	250	...	6	6	256
Nali ...	70	233	10	40	20	373	59	60	119	492
Rohi ...	420	630	90	...	50	1,190	20	775	795	1,985
Utar ...	20	69	4	...	5	98	3	28	31	129
Hitar ...	83	4	...	...	...	87	66	12	78	115
Total of District ...	555	1,120	108	40	125	1,918	148	881	1,029	2,977

According to this estimate the cultivated land produces 20 lakhs of maunds of fodder in the kharíf and 10 lakhs of maunds in the rabí.

Account of the different kharif crops.

182. It is common in this district to sow several different kinds of seed together, partly because different crops take up different constituents of the soil, and it is found that the produce of the two when sown together is often somewhat larger than if they were sown separately in the same area, and partly in order that the cultivator may have something of each kind of produce or that, should the season prove unfavourable to one kind, there may be a chance of getting something of the other kinds of produce. Sometimes they are reaped separately, as in the case of *jawár* and *moth* when sown together, but sometimes the produce re-

mains mixed, as in the case of barley and gram, which, once sown together, are rarely afterwards separated. This makes it difficult to frame an estimate of the produce of each kind of grain separately.

Rice (*dhán*) is always sown by itself in the *kunds* specially prepared for its cultivation, which have been already described. Mr. Oliver is said to have distributed some rice seed got from the Peshawar valley, but it was not very successful, and only a very few fields are now sown with it; it is recognised as a finer and more delicate rice than the ordinary variety, but the produce is not so great, and it is not found remunerative. Several varieties are grown in small areas as luxuries, such as the *rám-jawáyan*, *sunkharcha*, and *bánsmatti* varieties, but practically the only two kinds of rice cultivated here are the *munjí* and the *kharsu* varieties. The latter, which is also called *seora*, is much coarser and less valuable than the *munjí* and of a darker reddish colour but can be sown later, and is ordinarily only sown when the *kunds* have been unfit for rice-sowing until September, when it is too late to sow *munjí*, but not too late for *kharsu*. Ordinarily very little *kharsu* is grown (in 1882 only 117 acres), and it may be said that practically the only variety sown is the *munjí*, which is sown broadcast, about 25 sers or 30 sers of seed going to the acre. The mode of cultivation of rice has already been described. The sowing commences as soon as possible after the end of June and continues until September; and the reaping commences in the end of November and continues until the end of December. The ground is ordinarily quite dry by that time, and the rice is bound in sheaves and stacked to be threshed in the field by bullocks. The unhusked rice (*dhán*) is sometimes sold just as it comes from the threshing-floor, but before using it has to be husked in a mortar, and many of the grains are broken in the process, which reduces greatly the value of the cleaned rice (*chánwal*) unless it is sifted and only the full grains sold. Husking (*kutái*) costs about four annas a maund. Of the 8,927 acres of land set aside for rice-cultivation about 6,000 acres are sown on the average, and of this 5,000 acres are estimated as producing a crop averaging 12 maunds per acre. When rice dries up, no grain is formed in the ear, and it is then called *maráyan*. Such dried up rice is good fodder, but the ordinary rice-straw (*puráli*) is not of much use as fodder.

Jawár or great millet is sown about July and reaped about November or December, and is said to require at least 90 days to ripen. It is not often sown for fodder only (*chari*), even on the wells of the Hitár. In that tract it is usually sown alone broadcast, about 10 sers to the acre, the land being watered, ploughed and levelled first. If kept well irrigated it produces a good crop, but if irrigation and rains fail little grain is produced, especially if the white maggot (*gindár*) attacks it. The average area sown on the wells of the Hitár is about 2,000 acres, and the average produce may be taken as 4 maunds per acre. On the sotar lands of the Ghaggar valley also jawár is sown unmixed with other crops; the land is rich, and if the rainfall is good it sometimes produces excellent crops as in 1881, but more often the crop is very poor for want of sufficient moisture. In the Dry Tracts jawár is

sown in good soil, sometimes alone, but more often mixed with moth, múng, gwár and other seeds in varying proportions, and it is difficult to estimate how much of each kind of grain is produced. In these Dry Tracts the amount of jawár seed is about 8 or 10 sers per acre, and the average outturn of the mixed crop is estimated at about 1½ maunds per acre in the Bágar and 2½ maunds elsewhere. In 1881, however, some exceptionally favoured fields in the Rohi produced more than 12 maunds of jawár per acre. Jawár grain is not thought so nutritious as bájra, and always sells much cheaper, but the straw makes good fodder and in times of scarcity commands a good price.

Bájra is the staple kharif crop of the Dry Tracts, and is sown in about 5 lakhs of acres annually, but on the average only some 4 lakhs of acres produce a crop. It grows on the lightest soil and is almost always sown mixed with moth, múng, gwár and other crops in different proportions. Whenever favourable rain falls, at any time from April to August, the mixed seed, about 2 to 4 sers per acre, is drilled into the ground often without any preliminary ploughing. The crop often produces no grain, only stunted straw (*bukwána*), but if it comes to anything it is reaped in October and November, the ears being generally cut off first and thrown in a heap on the threshing-floor to be trodden out by bullocks, while the stalks are left to be cut and stacked at leisure. Sometimes the ears do not all come to maturity at once, as the stalks go on earing until the frost kills them. Bájra straw is very poor fodder and used to be left to rot on the ground, but recent fodder famines have taught the people its value, and it is now generally carefully cut and stacked against a drought, and stacks of several years back may sometimes be seen standing about the fields. Bájra grain is the staple food of the inhabitants of the Dry Tracts for half the year, and of most of the Bágri population all the year round; it is considered good and nourishing and generally commands a high price as compared with jawár, barley and gram. The outturn varies very much, but may be estimated as averaging 1½ maunds per acre in the Bágar and 3 maunds in the Rohi.

Moth is sometimes sown alone, but much more commonly with bájra or jawár. It is almost always grown on light upland soil dependent on the local rainfall, and when sown alone takes from two to four sers per acre of seed and produces on the average about 2 maunds per acre. The area returned as under moth alone was 24,000 acres in 1880 and 37,000 acres in 1881, but a large proportion of the area returned as under bájra and pulses also produces moth. The whole plant is collected, separately from the bájra, and its leaves are preserved as carefully as the grain, for they form a much-prized fodder which always commands a good price, as it is very nourishing and greedily eaten by cattle. The grain is sometimes given to cattle, but more commonly ground up into flour with bájra, or split and eaten as pulse (*dál*).

Múng is not nearly so much grown as moth, and the area under múng alone was only 424 acres in 1880 and 3,306 acres in 1881, but like moth, it is often sown with bájra and jawár and its leaves and pulse are similarly used. Másh, another pulse similar to moth and múng, is still less common and is grown chiefly on the flooded lands

of the Hitár; but only 242 acres were returned as under másh in 1880 and 101 acres in 1882.

Gwár is more common, and though sometimes sown with bájra and other crops on the dry uplands, is often sown alone from 3 to 10 sers to the acre, and produces about two maunds per acre. The areas under gwár alone in the last three years have been 10, 29 and 17 thousand acres respectively. It is sown and reaped at the same seasons as the other kharíf crops, and as the grain is coarse and inferior it is ordinarily given to cattle as well as the fodder.

Til is a crop of some importance in the Dry Tracts, where it is ordinarily sown in July and reaped in November. It is sometimes sown with other crops, but more often sown alone broadcast, about three ser to the acre, and the average produce is about two maunds per acre. The seed is pressed in the oil-mill (*kolhú*), by a Telí or oil-maker, and the resulting sweet oil (*míthá tel*) is used with food instead of ghí, or for anointing the body, and more rarely for burning in lamps. The number of oil-mills in the district is returned as 229.

Water-melons (*matíra*) are grown largely, where one would hardly expect to find them, in the fields of the dry uplands. A little seed is mixed with the bájra sown, and in September the creeping stems of the plant produce melons larger than a man's head containing a large quantity of pure cool juice, which is much prized in that dry country where the drinking water is often so hot and filthy. These melons are very common in the season all over the Dry Tract, but they do not keep long unless very carefully packed so as not to touch each other and covered up from the action of the air. They are sometimes cut up, dried in the sun and preserved for use in the cold weather. Another kind of small melon grown in the uplands is the *kakri*, which is similarly preserved; so is a sort of cucumber called *kachri*. A few sweet melons (*kharbúza*) are grown in the low lands near Sirsá flooded by the Ghaggar.

Cotton is grown only on a few wells on the Satlaj, and the area sown is insignificant, being only 148 acres in 1880 and 257 in 1881. About 300 acres of maize and less than a hundred acres each of sugarcane (*paunda*), red pepper (*mirch*) and hemp (*san*) and a few acres of *chína* are also grown in the Satlaj Hitár. Sugarcane is said to have been introduced only a few years ago. No sugar is extracted from it; the cane (*paunda*) is sold in the Fázilká market at a *paisa* per stalk and cut into pieces which are chewed and sucked raw. The produce of a kanál of land sells for about Rs. 6 or Rs. 8, say Rs. 60 per acre.

Account of the different rabi crops.

183. Wheat is the staple crop on the irrigated lands of the Ghaggar and Satlaj, and the average area sown has been estimated as 9,000 acres on the flooded lands of the Ghaggar and 9,500 on the Cháhí and flooded lands of the Satlaj Hitár, but in a good year nearly 20,000 acres of wheat may be sown on either river. In the Hitár about 3,500 acres are sown on the lands irrigated from wells, and 6,000 acres on the flooded lands. The average outturn may be taken as 8

maunds per acre on the land irrigated from wells and 6 maunds per acre on the flooded lands of both rivers. (In England the average outturn of wheat is 25 bushels or about 18 maunds per acre.) In favourable years the hard clay of the Sotar where thoroughly moistened is sown with wheat and sometimes produces excellent crops, as in 1882; and on the Satlaj, when the floods fail, patches of low-lying land where the rainwater has collected are often sown with wheat. In both cases the average outturn may be estimated at 6 maunds per acre. The estimated average area under wheat in the Dry Tracts is only 7,000 acres, but its cultivation seems to be spreading. It requires more careful cultivation than barley, and the seed is more expensive, but the produce is much more valuable, though the average outturn is rather less, being about four maunds per acre. Wheat is much preferred for food to any other grain except rice; it is the ordinary food of the Musalmáns of the Satlaj Hitár, but is a luxury to the inhabitants of the rest of the district. The straw (*túri*) of wheat is used for fodder, but is not nearly so nutritious as that of barley and commands a lower price. For wheat cultivation the ground is prepared during the rains by ploughing and pulverising it twice or thrice, and the seed is sown in October or November, about 20 sers to the acre on unirrigated land, 30 sers on flooded land, and 40 sers on land irrigated from wells. (In England the ordinary quantity of seed is 2½ bushels or about 65 sers per acre.) On flooded and unirrigated lands the crop is left to itself and not even weeded, but on wells, especially in dry seasons, it is irrigated as often as the capacity of the well allows. Some of the wheat-crops on wells and even on flooded lands in the Hitár are excellent, almost as good as can be seen anywhere in India, but these are the exceptions, and often the straw is stunted and the outturn very poor. The grain produced in the Hitár is often large and of excellent quality, but that of the uplands is generally small, dry and shrunken. The crop is reaped in April and threshed by means of bullocks treading it out on the bare ground. Considerable care is taken to clean the wheat and to keep the seed free from other grain, especially from barley. Sometimes wheat is sown mixed with barley and gram (*gojiyá* or *berra*): if mixed with barley alone it is called *jawáli* wheat, and if there is no barley in the mixture it is called *najawí*; but the area sown with these mixtures is small (only 500 acres being so returned in 1881 and 1,700 acres in 1882) and wheat is ordinarily sown alone. In the Hitár three varieties of wheat are grown. (1) The ordinary red wheat (*ratti* or *lál kanak*), also called *kálchingárí* because the beard (*chingár*) gets of a dark colour when ripe. This is the wheat ordinarily grown in the uplands also. Its ears (*sitta*) are about three inches long and the grains run in two lines, which make the ear look two-sided; the grain itself is short and thick. (2) *Pamman*, with a dark-green beard and a general dark colour in the sheaf, has distinctly two-sided and heavy ears, from 2½ to 3 inches long, and a long thick and soft grain. (3) *Dáúdí*, which again is divided into three subvarieties (*a*)

goní or beardless (literally "hornless") with short light-coloured ears from two to three inches long but sometimes (*chaughundí*) having as many as four lines of flowers (*ghúndí*); its grain (*dána*) is white, thick and soft and makes very white bread (*b*) *nárí dáúdí* or bearded (literally "horned") having whitish ears from 3 to 4 inches long, and a white beard; its grain also is white, thick and soft (*c*) *paháran*,—so called because its seed (*bíh=bíj*) was brought from the hills (*pahár*) some ten years ago by the Banya who owns part of Rána—with long pointed beardless ears from 4 to 5 inches long, and a reddish appearance; the grain is thin and reddish, and although the ear is longer than that of *goní dáúdí* it is thinner and has only three lines of flowers (*trighund*) and so produces less than the indigenous *goní*. Except the *paháran* variety these are all said to be old wheats well-known in this part of the country; and it says much for the care with which the seed is grown that they should be so well distinguished. They seem to be sown on all kinds of irrigated soil, but *pamman* and *ratti kanak* are said to require more moisture (*taráwat*) than *goní* wheat. *Goní dáúdí* is considered the best variety because of its whiteness, and if ordinary red wheat is selling at Rs. 2 per maund, *paháran* will fetch about Rs. 2-1 and *goní*, *nári* and *pamman* about Rs. 2-4 per maund. (These prices may be compared with the average price of wheat in England, say 40*s*. a quarter, or about Rs. 4 per maund.) Sometimes a grain or two of oats finds its way into a wheat field, but the people do not know it as a separate crop, and say that it is wheat which has deteriorated or become diseased (*dhanak*).

Barley (*jau*) and gram (*chholá* or *channa*) are the staple rabí crops in the uplands. They are often sown separately but very often together (*bejhar*), when they are reaped, threshed and sometimes even made into flour together. The areas sown were returned as follows for the last four years:—

Year	Barley alone.	Gram alone.	Barley and gram mixed.
	(acres)	(acres)	(acres)
1880	1,12,000	41,000	88,000
1881	55,000	33,000	40,000
1882	78,000	27,000	1,10,000
1883	88,000	40,000	1,45,000

Barley is not sown much on irrigated land, and when sown separately it is generally grown on the light sandy soil of the uplands. It is sown in October, about 20 sers to the acre. Sometimes if the early seed-time has not been favourable, it is sown as late as December, but such late crops (*kanauji*) seldom produce much grain. The average outturn of barley on the uplands is about 5 maunds per acre. It is reaped in March or April and trodden out by bullocks. The straw (*turi*)

is considered good fodder and commands a fair price. The husks are separated from the grain by pounding it in a mortar, and the flour of barley and gram is made into scones or porridge, which form the ordinary food of great part of the population of the uplands for half the year.

When gram is sown alone on the unirrigated uplands it is ordinarily sown on the stronger soils about 20 sers to the acre. It is sown in the early part of October and reaped in April, the average produce being from 4 to 6 maunds per acre. A good deal of gram is sown unmixed with other seed on the low lands irrigated by the Ghaggar, about 25 sers to the acre, and the average outturn is about 6 maunds per acre; but the crop is specially liable to be drowned by the winter floods of the Ghaggar. The young leaves of gram are plucked and used as greens (*ság*) with scones and porridge, and the flour of gram mixed with that of barley is much used as food. The dry leaves are used as fodder but are not very nutritious.

Sarhon or sarson is rarely sown by itself, and the area sown with sarson alone was less than two thousand acres in 1881 and less than a thousand in 1882. When sown alone in the uplands it is sown in October and reaped in April, the seed is from 3 to 6 sers per acre and the average outturn about 3 maunds per acre. But it is very common in the uplands to sow sarhon in lines in the barley and gram fields, and a large quantity of sarhon is grown in this way; it is reaped and threshed separately from the other crops. The young leaves of sarhon are largely used as greens (*ság*) and from its seed bitter oil (*karwa tel*) is expressed in the oil-press (*kolhú*) a maund of seed being pressed in a day and giving about 12 sers of oil, which is used for burning, &c., and more rarely consumed with food. The refuse or oil-cake (*khal*) is given to cattle. A considerable quantity of sarson seed is exported, chiefly towards Bombay. The similar plant, tara or tára míra, is grown in the same way, but is not quite so largely grown as sarson, because although less liable to suffer from frost, it is coarser and its products are less palatable.

Churál, masar and methra are low plants of the pea-kind which are sown in the Satlaj Hitár, chiefly on new land recently thrown up by the river, but the area sown is seldom so much as a thousand acres. They are generally sown broadcast with one ploughing, and the crop is very precarious. The produce is generally used for fodder, but the peas are sometimes used for human food. The people say that a constant diet of churál is apt to cause a sort of paralysis, and point to several invalids as instances of its evil effects. There are several other plants of the pea-kind which grow half-wild on the cultivated lands of the Hitár and are used as fodder.

Turnips (*ghonglu*), both white and red, carrots (*gájar*), radishes (*múlí*) and other vegetables are grown chiefly on lands irrigated from wells or by the floods of the Ghaggar and Satlaj, but the areas returned as under these crops in 1881 and 1882 were only 734 and 1,467 acres respectively. They are grown partly for human food

and partly for cattle. Tobacco is grown on well-lands in the rabí, but the areas sown in 1881 and 1882 respectively were on the Ghaggar only 149 and 191 acres, and on the Satlaj 93 and 60 acres only: the flower-buds (*kaliyán*) of tobacco are broken off in order to make the leaves ripen with a bitter (*karwa*) flavour, and the leaves are buried in the ground for some time with the same object. A few acres of other fancy crops, such as dhaniya, haliya, and kasumbh are also sown on irrigated lands.

Estimated average gross produce of each crop.

184. Owing to the prevalent custom of sowing the commoner crops together there is no means of making an exact estimate of the proportion borne to each other by the various grains whose seed and produce are thus mixed. It is possible however to make a rough estimate approximating to the truth, and my estimate of the average gross annual produce of the district is as follows (in thousands of maunds) :—

Kharíf Produce.		Rabi Produce.	
Crop.	Average Gross Produce.	Crop.	Average Gross Produce.
Jawár ...	2,00	Wheat ...	1,49
Bájra	8,00	Barley ...	5.00
Moth	1,80	Gram ...	3,00
Múng ...	47	Sarson ...	40
Gwár	60	Tara... ...	20
		Churál, Masar.	
Til	30	Methra ...	4
Rice	60	Vegetables ...	16
Total kharíf ...	13,77	Total rabí ...	10,29

According to this estimate, of the 24 lákhs of maunds annually produced in the district, about 22 lakhs are grain ordinarily used for human food, one lákh is oilseed (til, sarson and tara) and one lákh vegetables and grains sometimes used for human food, but ordinarily given to cattle.

According to the estimate furnished to the Famine Commissioners, a typical family of five persons, on an average for the whole Province, consumes 3·2 sers of grain per day. The Sirsá population is almost wholly agricultural and is unusually well-to-do, so that most of them have large appetites and the means to satisfy them, and the average consumption of a typical Sirsá family of five may be taken as 4 sers of grain (8lbs.) per day or say 36 maunds per annum, which gives for the whole population of 2,53,275 persons an average annual consumption of grain alone of about 18¼ lákhs of maunds, besides vegetables, greens, berries, spices, oil, milk, butter and the butcher-meat

consumed by the Musalmáns. This leaves available for export an average surplus produce of 3½ lákhs of maunds of edible grain and nearly a lákh of maunds of oilseed. According to the Municipal returns the average imports of grain during the last eight years into Sirsá and Fázilka have been about seven lákhs of maunds annually. Allowing a lákh and a half of maunds for the consumption of their population of 19,143, there remain 5½ lákhs to be re-exported out of the towns. Some of this is consumed in the district and some comes from Pattiála, Bikáner and other places, and there is nothing inconsistent between this estimate and the estimate of 3½ lákhs of maunds of grain as the average surplus produce of the district.

History of prices.

185. In order to ascertain the average prices at which the harvest produce should be valued, enquiry was made in three different ways. (1) The prices reported every fortnight by the Deputy Commissioner as those prevailing in the Sirsá market were extracted from the *Panjáb Gazette* and an average struck for each year since the Mutiny, and a separate statement was drawn up showing for each year the prices reported as prevailing about harvest-time. (2) The books of the chief traders of Sirsá and Fázilká towns were examined and the prices of wholesale transactions extracted, and an average of these taken for each year since the Mutiny as representing the average trade prices of these two principal markets. (3) The books of the grain-dealers of all the principal towns and villages in the district, *viz.*, Sirsá, Ránia, Ellenábád, Rori, Guda, Sohuwála Chautála, Dabwálí, Abulkharána, Malaut, Abohar and Fázilká, were examined and the harvest rates for each village were obtained by comparing a number of transactions about harvest-time between Banyas and peasants, and taking the average of the rates given by them. It is these last prices that concern us, for they show at what price the peasant could at harvest-time convert his grain into cash in the nearest market. The Gazette prices and the trade prices are chiefly important as corroborating the harvest prices obtained by the peasants, and as the general results of the very numerous independent enquiries on the whole corroborate each other, they may be considered quite trustworthy. In order to obtain an average for each assessment circle the average of the prices prevailing at each harvest in the different villages in or near the circle was taken, and in order to get an idea of the general changes in prices, an average of the harvest-prices was calculated for five-year periods. This is of course a rough method of ascertaining average prices, for it leaves out of account the quantity of grain which changed hands at each particular price; but it is the only method practicable and gives a fair idea of the rise and fall of prices. We were not able to get much evidence as to the prices prevailing before 1850, and the prices of the earlier years were calculated on fewer transactions and are therefore less trustworthy than those of later date. The following statements give the average prices so calculated for quinquennial periods from 1850 to 1883 (the last period however comprises only four years' rabí prices and three years' kharíf prices.) The prices are everywhere stated in standard sers per rupee.

Chaks Nálí and Bágar.

(Average prices of Sirsá, Rániá and Ellenábád.)

Five-year period.	Rabi Produce (about 1st June.)					Kharif Produce (about the end of December.)						
	Wheat.	Barley.	Gram.	Barley and Gram.	Sarson.	Jawár.	Bájra.	Moth.	Múng.	Til.	Rice (unhusked.)	Gwár.
1850 to 1854	41	...	49	...	...	..	80	...	...	...	38	...
1855 to 1859	45	...	75	...	...	...	54	105	...	...	38	120
1860 to 1864	24	...	37	...	...	...	37	42	...	22	29	57
1865 to 1869	20	33	33	27	17	44	26	33	27	16	23	46
1870 to 1874	22	36	34	32	23	48	30	33	...	13	27	41
1875 to 1879	21	44	39	35	20	56	31	39	25	18	28	43
1880 to 1883	20	39	34	33	18	38	30	36	28	17	27	42

Chaks Hitár and Utár.

(Average prices of Fázilká.)

1850 to 1854	44	...	...	...	40	...	...	...	...	...	...	...
1855 to 1859	48	...	...	...	36	78	52	...	...	34	...	...
1860 to 1864	29	24	51	...	23	33	35	24	19	16	...	...
1865 to 1869	23	38	33	...	20	26	22	20	16	13	...	...
1870 to 1874	24	35	29	...	16	37	29	31	26	14	...	55
1875 to 1879	24	40	36	...	17	30	30	35	18	11	...	38
1880 to 1883	22	38	31	38	16	38	31	33	25	13	...	52

Chak Rohí.

(Average of eight villages.)

1850 to 1854	36	68	48	79	48	73	65	72	36	30	...	...
1855 to 1859	39	114	93	...	51	102	71	107	93	33	...	...
1860 to 1864	24	71	48	68	30	67	50	55	37	19	...	53
1865 to 1869	21	52	42	46	36	34	27	27	25	15	...	37
1870 to 1874	22	43	33	41	24	43	32	35	28	14	...	64
1875 to 1879	21	45	40	41	21	43	33	34	24	13	...	46
1880 to 1883	21	43	35	39	19	43	35	40	29	15	...	50

The available information may be summed up as follows. Upon the whole the prices of the different food-grains of both harvests have gone up or down together according to the nature of the harvest of the year and latterly with some reference to the demand for export. Barley has almost always been somewhat cheaper than gram, both being much cheaper than wheat. Similarly, jawár has always been somewhat cheaper than bájra, both being much cheaper than rice. Upon the whole the cheapest grains have been jawár and barley, sometimes the one being cheaper and sometimes the other; then gram, then bájra and lastly wheat. In years of scarcity the difference of price between the different grains becomes very small. In 1838, just after the famine of 1837, when grain was probably dearer than usual,

Captain Thoresby valued the ordinary produce at more than two maunds per rupee. In 1844-45 gram and barley sold at 4¼ maunds and bájra at 3 maunds per rupee. From 1850 to 1855 the cheaper grains sold at about 1¾ maunds per rupee; and during the next five years prices were very low, the average rate of barley and jawár in the Rohí being over 2½ maunds per rupee, the cheapest grain sometimes selling at over 3 maunds. But the great era in the history of prices in the Sirsá district was the famine of 1860-61; in that year, owing to the widespread scarcity, prices rose higher than they had ever been before and trade was greatly stimulated. The peasants and grain-dealers of the district learned how profitable it was to watch the market and carry grain from where it was cheap to where it was dear; and they never forgot the lesson. Prices never again fell so low as they had been before the famine, and they did not again fluctuate nearly so much from year to year and from village to village. The high prices of the famine year 1861 did not hold and prices were pretty low in 1862 and 1863, were high from 1864 to 1867, but suddenly rose still higher in the famine year 1868-69, when they were higher than they have ever been before or since. They then fell gradually until the beginning of 1877, when they were lower than they had been for eleven years and than they have since been. The failure of the rains of 1877 and the demand caused by the famine in the South then sent them suddenly up, and notwithstanding the good harvests of 1878-79, the demand on the frontier caused by the Afghán war and the scanty rainfall of 1880 kept them at a high figure until the good rains of 1881 brought them down, and owing to the good rabí harvests of 1882 and 1883 prices continued to fall and in 1882-83 were lower than they had been since 1877. The periods of low and high prices since 1861 have been (1) 1862 to 1867, six years of low prices; (2) 1868 to 1871, four years of high prices: (3) 1872 to 1876, five years of low prices; (4) 1877 to 1880, four years of high prices; and (5) 1881 to 1883, three years of low prices. Prices have however on the whole been much higher since 1860 than they were before, and the five-year periods, which contain both good and bad years, give approximately the same average prices since 1860. There is little reason to expect that the average prices will fall lower than these, for communications have improved and are continuing to improve, and no doubt the opening of the Rewárí-Fírozpur Railway will cause prices to rise greatly throughout the tract and will keep them steadily high. The peasants even of out-of-the-way villages keep themselves informed of the state of the market and bring their grain long distances to sell for cash at the market rates in Sirsá and Fázilká. The ordinary rate of carriage is one anna per maund per stage of 10 or 12 miles, and the differences in price in different villages are never for any length of time greater than are to be accounted for by the expense of carriage. When there is a demand towards Sind the peasants within reach take their grain to sell at Fázilká; and if the demand is towards Delhi, grain goes to Sirsá. Yet the distances are so great and the produce of the district so varying in quantity and so uncertain from harvest to harvest,

that the prices of grain still fluctuate greatly, though not so much as before 1860. Thus in 1868-69 prices were double what they were the year before, and in 1877-78 nearly treble those of the previous year; and in the Sirsá market the harvest price of barley has fluctuated between 66 and 12 sers per rupee, and that of bájra between 50 and 10. Where the fluctuations are so great averages are apt to be misleading; but if the average prices of the five years ending 1879 be compared with the average of the six years ending 1854 as given for the Sirsá market in the annual Revenue Report as follows :—

Average of years.	Wheat.	Barley.	Gram.	Jawár.	Bájra.
1848 to 1854 (sers per rupee) ...	32	50	44	51	43
1874 to 1879 (sers per rupee) ...	20	37	35	36	32
Rise per cent.	60	35	26	42	34

and if the prices prevailing in the villages of the Rohí from 1850 to 1860, which may be taken as those of last Settlement, be compared with those of the years since 1870, it may safely be asserted that the prices at which the peasants of the district as a whole can dispose of their harvest produce are more than 50 per cent. higher now than they were at last Settlement.

Estimated average prices of grain and fodder.

186. After making every allowance for the fluctuations of prices and the cost of carriage from the field to the market and paying special regard to the prices of the last few harvests which have been carefully observed, but without taking into account the Rewári-Firozpur Railway and future developments of communications, I estimate the average prices for the different assessment circles as follows (in sers per rupee) :—

Assessment Circles.	Rabi Produce.				Kharif Produce.						
	Wheat.	Barley.	Gram.	Sarson.	Jawár.	Bájra.	Moth.	Mung.	Til.	Kiee unhusked.	Gwar.
Bagar and Nali	24	48	42	24	45	35	45	30	20	30	50
Rohi ...	25	55	50	24	50	40	50	30	18	...	60
Uttar and Hitar	25	50	45	20	40	35	40	25	15	...	50

It is more difficult to estimate the average prices of fodder, for owing to its bulk the cost of carriage is greater than that of grain, and owing to its being less carefully preserved and to the precariousness of the annual growth of grass on which the need of artificial fodder greatly depends, the variations in its price are even greater than in

that of grain. For instance, in the Sirsá market in June 1881 barley straw was selling at 1½ maunds per rupee, and wheat straw at 1¾ maunds, and in June 1882 their prices were 3 maunds per rupee for barley straw and 4 maunds for wheat straw, and in the villages the differences were even greater. Bájra straw sometimes fetches almost nothing in the market, but in February 1881 it was selling in the Sirsá market at 3 maunds per rupee. I estimate the average prices of straw as follows (in maunds per rupee.)

Assessment Circle.	Kharif Straw.						Rabi Straw.		
	Jawar.	Bajra.	Moth and Mung.	Rice.	Gwar.	Pala.	Wheat.	Barley.	Gram
Bagar and Nali	8	15	4	12	10	6	6	4	4
Rohi ...	10	20	5	...	12	6	10	7	8
Utar and Hitar	6	12	4	...	10	6	7	5	4

187. These estimates, combined with the estimate of gross produce, give the following as the estimate of the average value of the gross produce of the cultivated land (in thousands of rupees):—

Estimated average value of gross produce.

Assessment Circle.	Value of Kharif Produce.			Value of Rabi Produce.			Total of Year.		
	Grain.	Straw.	Total.	Grain.	Straw.	Total.	Grain.	Straw.	Total
Bagar ...	1,60	23	1,83	6	2	7	1,65	25	1,90
Nali ...	3.00	35	3,35	1,60	25	1,85	4,60	60	5,20
Rohi ...	8,20	1.00	9,20	1,50	1,20	7.70	14,70	220	16,90
Utar ...	70	11	81	30	6	36	1,00	17	1,17
Hitar ...	15	5	20	1,20	12	1,32	1,35	17	1,52
Total of district.	13,65	174	15,39	965	165	11,30	23,30	339	26,69

The average of the observations of the last four years gives a gross value of 31 lákhs of rupees, of which 15 lákhs worth are produced in the kharíf and 16 lákhs in the rabí, but according to my estimate the average annual value is 26⅔ lákhs of rupees, of which 15⅓ lákhs worth are produced in the kharíf and 11⅓ lákhs worth in the rabi. This estimate is certainly a low one, especially in the Rohí and Utár circles, but according to it the average annual value of the produce of the cultivated land alone equals nine times the total new assessment of the district.

188. At last Settlement the area of land still uncultivated was returned as 13,21,618 acres or 66 per cent. of the total area, and now according to the measurements of the present Settlement the uncultivated area is only 8,56,622 acres or 45 per cent. of the total area. Of this only 71,657 acres, or less than 4 per cent. of the total area, is returned as occupied by villages, roads or ponds, or otherwise incapable of cultivation. There are no hills or stony places in the district and the only classes of soil which are not fit for the plough are the hillocks of pure sand, which are of no great extent, the beds of pure river-sand on the Satlaj, and the *kallar* soil rendered barren by salts (*reh* or *shor*). Such soil is found in patches here and there all over the district and is easily distinguished by its being totally devoid of vegetation. Besides the patches so impregnated with salts as to produce nothing, there are many fields which owing to the presence of salts produce very little in places. Some soil also owes its barrenness to the presence of a bed of *kankar* too near the surface. The culturable area not yet brought under the plough is as follows :—

The uncultivated area.

Assessment Circle.	Culturable waste (in acres.)	Per cent. on Total Area.
Bágar	38,302	22
Nálí	1,31,661	39
Rohí	5,33,095	43
Utár	58,716	51
Hitár	23,191	38
Total of district ...	7,84,965	41

Some of this land is set apart round the village-ponds to collect rainwater, and no one is allowed to cultivate such reserved portions; and in many villages in the Rohí, and still more in the Sotar valley where the soil is hard and requires to be well soaked before being ploughed, large areas of land are kept uncultivated, and the rain which falls on them is guided by shallow surface drains (*súá* or *ágam*), sometimes as much as half a mile long, on to the adjacent cultivated fields. Practically the whole of this area, say eight lákhs of acres, is available for cultivation and little inferior in productive capacity to much of the land already cultivated. Meanwhile it annually produces abundance of grasses of all kinds in the rains and affords food to great numbers of cattle.

189. In former times the wealth of the inhabitants consisted chiefly in their large herds of cattle, which they drove about from place to place for grass and water; but as cultivation spread and the produce of the cultivated land increased in value, they became less dependent on the produce of their herds and accumulated other forms of capital.

The cattle of the district.

There seem to be some signs that the rapid change from the pastoral to the agricultural mode of life which this district has witnessed, and the breaking up of the prairie, may have caused a diminution in the numbers and perhaps a deterioration in the quality of the cattle of the tract, but their food-supply must be less precarious now than it was formerly when they were entirely dependent on the grass produced annually in the rainy season, which was rarely cut and stored, and must have died in immense numbers in seasons of drought. Yet even now, notwithstanding the care with which straw and even grass are preserved, and the high prices which they sometimes command, a serious drought deprives the cattle of their usual supply of food and the stocks soon becoming exhausted vast numbers of them die of simple starvation, especially when, in an emaciated condition, they are exposed to severe cold such as often follows rain in the cold weather. Mr. Oliver reported in 1863-64 and 1864-65 that the cattle were fast diminishing in numbers and deteriorating in value, a large number had died of murrain and starvation, herds driven towards Karnál in search of pasture had returned diminished by two-thirds of their number, and a great many cattle had been sold and taken down country. The breed had greatly deteriorated within Mr. Oliver's experience of 21 years, and none of those fine bullocks for which the country was once famous were to be met with. This deterioration he ascribed to three causes;—(1) the diminution of good pasture, as all the best of the land was brought under the plough; (2) the frequency of murrain; and (3) breeding-in, due to the smaller herds and their more limited range. In 1866-67 the cattle were still suffering from want of pasture, and in 1867-68 it was reported that more than half the cattle in the district had perished within the preceding two years from scarcity of fodder and the severe frost of March 1868, and the survivors were so tottering and emaciated that they could hardly be driven out to graze. Cattle in such a condition were ill-prepared to meet the drought of 1868-69, and it was estimated that in that year of 2,02,327 horned cattle 1,48,590 died and little more than a fourth were left. The Bágrís turned their cattle loose, and the Musalmáns killed and ate theirs, but the Sikhs spared no trouble and expense to obtain fodder for their bullocks. So few were left that in the following March women were to be seen drawing the plough. In 1874-75 cattle-disease was prevalent and was ascribed to the drought; of 13,000 cattle affected 7,000 died. Again in 1877 the rains failed, and 53,532 head of cattle or nearly half the entire number in the district were estimated to have died during the year. According to the enumeration made in 1879 there were then about 80,000 horned cattle in the district, only two-thirds of the number estimated in 1875-76, and only two-fifths of the number said to have existed before the famine of 1868-69. That this estimate was very inaccurate, however, was shown by the more complete enumeration made in the following year.

Enumeration of livestock in 1880.

190. In August and September 1880 we made an enumeration of the cattle of all sorts in the district. The opportunity was a good one, for the abundant and general fall of rain in the end of June and

beginning of July had given a plentiful supply of grass and water everywhere, and for the time each village had enough for its own cattle, so that few herds had either entered or left the district and at the time of the enumeration almost all the cattle were in their own villages. As it is usual for all the cattle to be driven inside the village enclosure every evening, all the patwárí had to do was to take the village headman with him in the morning, shut all the gates of the village but one, count all the cattle that went out to work or graze, and then go from house to house and count those left in the village. I believe that the enumeration was fairly accurate and complete and that its results approximately represent the actual number of cattle owned by the residents of the district in the rainy season of 1880, being however probably somewhat under the truth. The following statement gives the number of live-stock, carts, &c., as then enumerated, with the number returned in 1875-76 (in which year the number given is the largest since the drought of 1868-69) and the number returned in 1882-83.

Year.	Horned cattle.	Horses.	Ponies.	Mules and donkeys.	Sheep and goats.	Camels.	Carts.	Ploughs	Boats.
1875-76 ...	1,18,030	1,009	881	12,735	1,28,88(	12,413	425	33,01(	30
1880 ...	1,77,152	1,930	910	8,564	1,44,435	17,16-	2,013	34,286	28
1882-83 ...	1,80,472	1,706	2,174	1,621	1,89,788	16,983	1,86(	34,672	31

It is evident that the previous enumerations were incomplete and that the effects of the drought of 1877-78 had been exaggerated. I am inclined to believe that the losses of previous bad years were also exaggerated, but there can be no doubt that in 1868-69 a very large proportion of the cattle in the district died. At all events the number of horned cattle now in the district is nearly up to the two lákhs estimated as the number existing previous to the drought of that year. After August 1880 the rainfall was very scanty, the grass dried up, and little fodder was produced, and in June 1881 the cattle were in a most critical condition. The grass had all been completely burnt up, the fodder of the two previous harvests and the stacks of bájra straw preserved from former seasons had been almost entirely consumed, and fodder was hardly to be got at the ordinary price of grain. Had rain held off much longer many thousands of cattle must have died of starvation, but the plentiful rains of 1881 came just in time and very few cattle were actually lost. Three of the four following harvests gave a plentiful supply of fodder, and there was little cattle-disease, and in 1883 the cattle were perhaps more numerous and in better condition than they had been since 1868.

Bullocks and cows.

191. According to the enumeration of 1880, the number of ordinary cattle in each assessment circle was as follows:—

Assessment Circle.	Bullocks.	Cows.	Bull-calves.	Cow-calves.	Total.
Bágar	1,964	4,439	2,355	2,835	11,593
Nálí	8,819	7,360	3,553	3,442	23,174
Rohí	38,240	38,383	13,314	15,317	1,05,254
Utár	2,615	2,778	1,176	1,381	7,950
Hitár	3,741	3,153	1,097	1,290	9,281
Total of the district ...	55,379	56,113	21,495	24,265	1,57,252

The number of bullocks and cows is about the same except in the Bágar Chak where the Bágrí peasants do much of their ploughing by camels and sell their bull-calves, keeping the cow-calves, to supply them with milk. In the Nálí and Hitár the smaller number of cows than of bullocks is probably due to the large number of milch-buffaloes kept in those tracts. Far more bullocks than cows are sold out of the district, but on the other hand cows are not so carefully tended as the more valuable bullocks and their death-rate must be higher, so that the numbers of cows and of bullocks in the district probably remain about equal.

Sirsá bullock fair.

192. A great cattle fair is held annually at Sirsá during the month of Bhádún (August-September), and at this fair a large number of cattle bred in the district are sold for export. A number of cows, buffaloes, camels, &c. are sometimes sold, but it is essentially a bullock fair; for instance in 1880 of the 19,149 animals sold, 18,541 were bullocks. The number of bullocks brought to the fair every year with the number sold and the average price have been as follows:—

Year.	Number of Bullocks.		Total Price.	Average Price.
	Brought to the Fair.	Sold.	Rs.	Rs.
1863	...	11,971	2,07,647	17
1864	...	26,188	4,83,459	18
1865	...	10,066	2,13,174	21
1866	24,953	21,953	5,22,403	24
1867	13,000	10,769	3,06,419	28
1868	15,275	11,775	2,80,758	24
1869	7,600	5,576	1,58,054	28
1870	17 000	13,854	3,90,362	28
1871	7,430	5,426	...	...
1872	6,400	4,885	...	...
1873	12,436	11,051	...	...
1874	23,408	10,787	2,09,807	19
1875	14,222	5,869	1,61,708	28
1876	22,970	8,093	1,95,482	24
1877	27,625	14,031	2,89,474	21
1878	22,095	11,398	2,98,371	26
1879	28,028	22,839	6,29,522	28
1880	53,031	18,541	4,97,027	27
1881	17,491	8,901	2,64,593	30
1882	31,246	19,210	4,41,717	23
Average ...	19,071	12,659	3,26,468	25

The animals are counted as they are brought into the enclosure where the fair is held, and it is possible that some are omitted or counted twice over, but the number of animals sold is trustworthy, for each purchaser is careful to have the sale recorded by the clerks employed for the purpose, to state the price paid and to get a certificate of the sale, for which he pays a fee of ¼ anna per rupee on the price. The fair is now held under direct management and the income from fees was Rs. 4,213 in 1881 and Rs. 7,114 in 1882. Notwithstanding the large concourse of men and cattle and the rude arrangements made to prevent confusion, there is wonderfully little disorder, no one attempts to evade the regulations, and although many of the dealers carry large sums in cash there are seldom any offences committed—so quiet and law-abiding are the people.

The bullocks sold at the fair are almost all young animals bred in the neighbourhood, many of them untrained, and they are bought principally by dealers who take them away to the Upper Panjáb and across the Jamna, sometimes as far as Cawnpore. The animals sold during the last seven years came from the following districts and States :—

Year.	Sirsa.	Other British districts, chiefly Hissar and Rohtak.	Bikaner.	Pattiala.	Other States.	Total.
1876	3,615	4,028	1,080	...	1	8,724
1877	5,324	5,909	3,099	417	9	14,758
1878	6,096	2,954	1,666	658	263	11,627
1879	11,174	6,258	2,213	1,255	294	23,193
1880	8,372	7,842	1,194	1,543	198	19,149
1881	4,395	2,371	1,215	1,135	74	9,190
1882	6,851	5,852	3,414	2,455	1,731	20,303
Average ...	6,547	5,316	1,983	1,066	366	15,278
Per cent....	43	34	14	7	2	100

The number of cattle brought to the fair and sold and the average price depend chiefly on the nature of the seasons. The prospect of a drought and a scarcity of fodder in the neighbourhood bring a large number of cattle to the fair, as their owners having difficulty in providing for them are anxious to sell; thus in the years 1877 and 1880 the number of cattle brought to the fair was large. On the other hand, when the supply of fodder is abundant and the prospects of rabí cultivation good, owners are not anxious to sell and few cattle are brought to the fair, as in 1875 and 1881. Again, a drought in the east reduces the demand from that quarter and few cattle are sold, as in 1877 and 1880 when few buyers came from the North-West Provinces. The prices of course depend on the relation of supply and demand and vary accordingly, being ordinarily lowest in years of drought such as 1877, when many are anxious to sell and few to buy, and highest in years of plenty such as 1881, when their owners can

easily keep them at home and when many have means to buy and fodder to support more cattle. The effect of the bad years culminating in 1868-69 in diminishing the number of cattle in the district may be seen in the rapid rise of price and the smaller number of cattle sold for years afterwards; but now, although the price has not again fallen so low, the numbers have recovered. On an average, of about 20,000 bullocks brought to the fair, nearly 13,000 have been sold for 3½ lákhs of rupees at an average price of Rs. 25 per bullock. During the last seven years nearly half the animals sold at the fair have come from the Sirsá district, and almost all of these are sold out of the district; so that on an average the Sirsá cattle-breeders sell at Sirsá fair alone a surplus stock of 6,000 young bullocks for about a lákh and a half of rupees in hard cash, or more than half the total new assessment of the district, and in some years their realisations at this fair amount to two lákhs of rupees. There is no other cattle-fair of any importance in the district, but many cattle are taken from the district to other fairs in the neighbourhood, such as those at Hissár, at Gúga in Bíkáner and at Jalálábád in Firozpur, and many cattle are sold to dealers in the villages, so that it may safely be estimated that on an average of years the Sirsá peasants sell out of the district a surplus of 10,000 bullocks for more than two lákhs of rupees.

Bullocks.

193. Few bull-calves are allowed to grow up as bulls. The lucky animal selected to succeed his sire as the lord of the village-herd has an easy time of it. He is given no work to do and is often allowed to help himself to whatever takes his fancy in the fields. The peasants are careless about the quality of the bull, though they do try to select a promising animal and appreciate the value of the bulls which have been obtained in recent years from the Hissár Cattle Farm and distributed among the villages with the view of improving the breed. A bullock is expected to do full work from the age of four to nine, and sometimes survives work and droughts to the age of 15. His work is constant but seldom very severe, and he is carefully tended by his master, especially if he is a valuable animal and his master a Sikh. A young bullock grazing in the prairie is sometimes given 8 sers of chopped straw in the house daily, and a bullock in full work may get 2½ sers of grain and 15 sers of fodder every day. In the Dry Tract the bullocks are brought home to the village in the evening and tied in the owner's courtyard or sometimes in a covered shed, and are there fed in the evening and again in the morning before they go out to work. They are given a rest and a feed in the course of the day and if there is grass within reach are allowed to graze for an hour. When not at work they are often, if not very valuable, driven out to graze with the cows of the village. In the Hitár the bullocks are often kept in temporary shelters at the well both night and day and fed there in troughs with chopped straw and green fodder. The bullocks used on wells by the Musalmáns of the Hitár are small and feeble as compared with those in the dry uplands, where the Sikhs especially have excellent bullocks. The Aráins on the Ghaggar also usually have very fine animals. The average price of a

young bullock at the Sirsá fair has varied from Rs. 17 to 30, and may be taken as Rs. 25. An ordinary bullock in the Hitár costs from Rs. 20 to 30, but an ordinary animal of the kind used by the Sikhs costs from Rs. 40 to 50, and a good bullock fetches Rs. 60 or more. In 1876, a hundred standard artillery bullocks were bought at the Sirsá fair at an average of Rs. 50 each.

Cows.

194. Few cows are sold out of the district; they are kept for breeding purposes and for milk. At the Sirsá fair only about 100 cows are sold annually and their average price there is from Rs. 8 to Rs. 9; but these are poor specimens. The price of a fair cow in the Hitár may be taken at from Rs. 15 to Rs. 25, and in the Rohí from Rs. 25 to Rs. 35, but sometimes as much as Rs. 45 orRs. 50 is paid for a good cow giving 8 sers of milk daily. A cow calves after nine months of pregnancy, generally between January and June. She drops her first calf when four years old, and often gives six calves or even seven before she ceases bearing. A cow's life is stated as about 12 years. Cows are milked twice a day, morning and evening; for the first fortnight the calf is allowed to take all the milk, and for three months it gets half the milk and then a quarter of it. A Sirsá cow will not allow herself to be milked unless her calf is present, and the milker ties the calf to her leg before commencing operations. She can hardly believe that it is the calf that is milking her, but this is a form with which she will not dispense. An ordinary cow gives about 4 sers of milk a day from which 2 or 3 chhatánks of ghí can be extracted. Milk sells in Sirsá at about 16 sers per rupee, but in the villages it is much cheaper. The cows of the village are ordinarily driven out every day to graze in the common, and if a cow is in milk she sometimes get 2 sers of grain and 10 sers of fodder daily; but ordinarily she has to be content with some chopped straw.

Buffaloes.

195. The number of buffaloes in the district in 1880 was as follows:—

Assessment Circle.	Male Buffaloes.	Female Buffaloes.	Total.
Bágar ...	361	1,076	1,437
Náli ...	2,120	3,621	5,741
Rohí ..	1,819	8,187	10,006
Utár ...	101	517	618
Hitár ...	237	1 861	2,098
Total of district ...	4,638	15,262	19,900

Buffaloes cannot stand heat well and are seldom made to work in this district, but sometimes a buffalo may be seen in a cart or plough or working at a well, yoked along with a bullock. Male buffaloes are ordinarily sold to dealers from the districts farther north where they are used in cultivation, while buffalo-cows are kept for milk and breeding purposes. Thus three-fourths of the buffaloes in the district are cows, and almost all the buffaloes sold at the Sirsá fair, where

sometimes nearly a thousand change hands, are males (*jhotá*). The average price of a male buffalo at Sirsá fair is about Rs. 12, but sometimes Rs. 15 or Rs. 20 can be got. Buffalo-cows are highly valued for their milk. A buffalo calves when five years of age, in the eleventh month of pregnancy, usually about July; she ordinarily gives six or seven calves at intervals of two years. The calf is allowed to take all the milk for the first month, and then half the milk for three months and a quarter of it for three months more. A buffalo gives milk for about a year. She is milked only once a day in the evening, and an ordinary buffalo gives about 6 sers of milk a day, from which sometimes as much as half a ser of ghí can be extracted. The buffaloes of the Ghaggar and Satlaj river-sides are much superior to those of the dry uplands. On the Satlaj a good buffalo-cow giving 10 sers of milk a day fetches as much as Rs. 100, and the ordinary price may be taken as about Rs. 60 or Rs. 70 in the Hitár, and Rs. 40 to Rs. 50 in the Rohí. A buffalo is generally considered to consume nearly twice as much as an ordinary cow, and the grazing and watering fees for buffaloes are usually double those for cows. A good buffalo-cow is well looked after and when giving milk sometimes gets 3½ sers of grain and 15 sers of fodder daily; but an ordinary buffalo-cow is driven out with the village cattle to graze in the common, and gets a little chopped straw at home, and perhaps a feed of grain.

Produce and Price of Ghí.

196. The Sirsá district has for many years produced a large quantity of *ghí* over and above its own requirements for export northwards to Fírozpur and eastwards towards Delhi. With the improvement of communications and the increase of population the price of *ghí* has gradually risen, and as it is valuable in comparison with its bulk its price has not been subject to such violent fluctuations as that of the heavier food-grains, although it has varied considerably with the number of cattle and the supply of fodder. Like the other produce of the district, *ghí* made its first decided start upward in price after the drought of 1860. From 1850 to 1859 its price remained pretty steady between Rs. 10 and Rs. 15 per maund; in 1860, when a large number of cattle died in the scarcity, it rose to Rs. 18; and remained between Rs. 15 and Rs. 18 until 1864. In that year a large number of cattle died from disease and starvation, and it was probably in consequence of this that in 1865 the price rose to over Rs. 20 per maund. The next three years were bad for the cattle and the price went on steadily rising until, after the drought of 1868 which killed a large proportion of the cattle, the price of ghí was from Rs. 30 to Rs. 34 per maund. It fell during the next two years to about Rs. 20, and remained thereabouts until the drought of 1877 which again carried off a large number of the cattle. It then steadily rose to Rs. 25 or Rs. 30 per maund, or about double the price of thirty years ago. Ghí is not much consumed by the poorer peasants except on festive occasions, when the consumption is sometimes enormous. It is sold to the richer classes, or stored for sale and export. The average imports of ghí into the municipalities during the last eight years have been as follows:—

Sirsá ...	...	...	...	2,300 maunds.
Fázilká	...	...	...	2,600 „
Ellenábád	...	...	...	300 „
Rániá	...	...	...	125 „
Rori	...	...	...	100 „
		Total	...	5,425 maunds.

A good deal of this comes from Bíkáner, but on the other hand a good deal of *ghí* is exported from the district without passing through the towns, and it will be safe to estimate the average annual surplus produce of *ghí* in the district at 4,000 maunds, which at Rs. 20 per maund represents an income of Rs. 80,000 to the cattle-owners of Sirsá from this source alone.

Diseases of cattle.

197. Cattle-disease of some kind is always present in the district, but is rarely very wide-spread or fatal. According to the reports annually made by the patwáris, about 4,500 cattle are attacked on an average every year, and of these about 2,000 die. The worst year of late was 1874-75 when 7,000 cattle died. The most fatal disease is *sítlá* or cow-pox which occurs at all seasons of the year, and from which the animal attacked seldom recovers. The sick animal is put in a closed stable and protected from the cold, and is sometimes given balls of pounded *bhang*. Foot-and-mouth disease (*munh-khur*) is common but seldom fatal. Sores form in the bullock's mouth and on its feet and it loses its appetite and gets very thin and miserable. By way of remedy a pound of molasses (*gur*) is put in its mouth, which is tied for some hours so as to keep it shut. *Vilúya* or *vil* seems to be a kind of rheumatism and is rarely fatal; the animal affected gets stiff and unable to walk. It is said to be caused by eating a small black insect covered with a spittle-like secretion which appears in the rains, and the treatment is to give the bullock half a pound of onions and to tie a wisp of dry grass in its mouth. *Golí ki sat* is fatal and there is no remedy for it; it seems to be anthrax fever, and the swellings which appear on the animal's body are ascribed to coagulation of the blood. When *júán* or maggots appear in the skin, the part affected is rubbed with a solution of tobacco. Buffaloes are subject to *dhá* or *tákú* which seems to be rheumatism, as the legs stiffen and the animal is unable to walk and loses its appetite. It is ascribed to wallowing in water heated too much by the sun, and is treated by shutting the sick buffalo in a warm stable, bleeding it at the ear and giving it dried dates as medicine. *Galghúta* or malignant sorethroat is often fatal; the neck swells and the animal has difficulty in breathing. One remedy is to scorch the neck by applying burning grass to it, and another is to get a holy man to exorcise the disease by making mesmeric passes (*jhárná*) over the part affected. Little care is taken to guard against contagion by segregating diseased animals, and the wonder is that cattle-disease does not spread more rapidly than it does. It is generally thought sufficient to tie a charm over the village gate-

way so that the cattle may pass under it on their way to and from the pasture-ground.

Cattle-breeding in Sirsa.

198. Almost every village in the district has still a considerable area of pasture-land, and it is usual to send out all the unemployed cattle of the village daily under the charge of a cowherd to graze in the village common, and when there is no crop on the ground, in the cultivated fields also. The bullocks and more valuable milch-animals are sometimes, but rarely, kept by their owners apart from the rest of the herd, but usually all the cows and buffaloes and all the calves with the village bull are driven out into the common in the morning after milking-time, and brought back again in the evening. There is sometimes great difficulty in supplying them with water. So long as there is water in the village-pond they are allowed to drink and wade in it, but when the pond dries up, water has to be drawn for them from the well every morning and evening with great trouble ; and if, as is the case in many villages, the water of the well is too salt to drink, the cattle have to be driven daily sometimes as much as five miles to some neighbouring village to drink from the pond or well there ; and a considerable sum has often to be paid for this privilage *(pilú)*. In many villages a customary grazing-fee (*bhúnga*) is paid by the cattle of the village, and usually a higher fee is charged on any cattle belonging to other villages which may come to graze on the village pasture-land. There are still vast tracts of unenclosed prairie in Bíkáner, and there the same custom still prevails that was prevalent in Sirsá before the spread of cultivation. In the rainy season, after the annual growth of grass has sprung up, large herds of cattle are driven south into the prairie from Sirsá, Pattiála and even from as far north as Ludhiána, and are kept grazing there until the grass dries up, when they are driven northwards home again. Considerable fees are paid to the Bíkáner State and local authorities for permission to pasture and water these herds of cattle (*gol*) : sometimes as much as Rs. 2 per bullock for grazing and Re. 1 for watering ; but commoner rates are 8 annas for grazing and 4 annas for watering. The growth of grass on the Bíkáner prairies, like that on the Sirsá uplands, is wholly dependent on the local rainfall, and when, as in 1880, rain fails generally in that neighbourhood, no grass is produced and no cattle are driven southwards. In such years of drought little or no grass grows on the village commons and the cattle are left in dependence on the produce of the cultivated land. Mr. Oliver was of opinion that the prairie was being brought under cultivation too rapidly, and urged that in the interests of the cattle steps should be taken to check the spread of cultivation in the more advanced parts of the district, and to reserve a large area in each village as a grazing-ground for the cattle, and similar proposals have recently again been made. But however desirable such arrangements may be to keep up a supply of fresh green fodder in ordinary times, they would have little effect in protecting the cattle from starvation in years of drought ; for in such years the uncultivated land produces almost nothing, and

indeed up to a certain limit not yet nearly reached in Sirsá, cultivation actually increases the produce of fodder, and especially of storeable fodder, and thus renders the district better able to support its cattle in years of drought. The average produce of straw even on unirrigated fields may be estimated at four maunds per acre, which is much more than the storeable produce of grass on the same land when uncultivated; and even in a year of drought like 1880, when the grass-wastes produced almost nothing, the cultivated land was estimated to have produced from two to three maunds of fodder per acre. *Pála* too, which is considered one of the best fodders, grows more plentifully on cultivated than on uncultivated land. Considerable efforts are made by the people to store up fodder for their cattle. Some crops, such as turnips, gwár and moth, are cultivated chiefly for the fodder they give, and care is taken to gather and store not only the produce of these crops, but the straw of barley, wheat, jawár and even bájra, stacks of which may be seen in the fields and about the homestead of almost every village. *Pála* and some of the better grasses are also cut and stored. It seems that greater care is now taken than formerly to store fodder in these ways and preserve it for seasons of drought, and that the experience of the last two or three scarcities has taught the people to use every available means of storing fodder against such seasons. But as a rule all that they can do is to store up a quantity sufficient to support their cattle during the dry months of the hot weather, when there is no green food available and the cattle have to be supported wholly on the stored fodder. This gets exhausted towards the end of June, and if the rains then fail and no grass springs up, the cattle are left without food, and numbers of them die. Yet, except perhaps for a short time after one of these recurring scarcities, the district has always more cattle than it requires for agriculture, and can afford to export a large number of young bullocks. If the peasants of the district were to reduce their stock of cattle and breed fewer, the supply of fodder would be sufficient to support a larger proportion of them through a drought, and the loss of cattle from starvation in a season of scarcity would be smaller, but then their surplus stock and their profits from the sale of young cattle in ordinary seasons would be less. Cattle-breeding in such a country is a very speculative business, and the peasants seem to find it more profitable in the long-run to allow their cattle to multiply up to the limit of subsistence, that is, up to the number which can be supported by the year's fodder until the usual season for a new growth of grass, and to take their chance of the rains failing. If the rains come as usual, the speculation is a success, and the cattle are safe for another year; if they fail, the speculator loses his profits and some portion of his capital, but one or two good seasons soon make it up to him again. It is not improbable that improvements in the methods of storing fodder would be utilised by the Sirsá peasant not so much in guarding against the consequences of drought as in multiplying his stock still further, and taking his chance of the rains as before; and this is perhaps in the circumstances the most profitable way of conducting his trade as a cattle-breeder.

It is probable that, whatever improvements in the way of storing fodder and increasing its supply be made available in Sirsá, there will always be great mortality of cattle in seasons of drought. Still every increase in the supply and improvement in the method of storing must tend to some extent to render the food-supply of the cattle less precarious and to diminish the mortality in droughts, while the increase in the value of cattle makes it better worth the owner's while to take precautions to protect them from starvation. There cannot be a doubt that the district is much better off in this respect than it was. The annual produce of fodder is increasing, instead of diminishing, with the spread of cultivation, and if the number of cattle in the district is now fewer than it used to be (which I doubt), the mortality in a season of drought is much less, as they are less dependent on the precarious produce of the prairie and have larger stores of fodder to supplement it. It is probable that the drought of 1880 which caused hardly any deaths among the cattle would twenty years ago have killed a considerable proportion of the total number.

I am also inclined to doubt whether, as Mr. Oliver reported, the breed has really deteriorated in quality. At the time he wrote the cattle seem to have been suffering from a series of bad years and to have been greatly subject to starvation and disease. For a number of years now disease has not been seriously prevalent and the fodder-supply has not been so precarious as it was. The herds are certainly not yet so small as to lead to any deterioration from breeding-in. It is possible that the natural grasses developed a better breed than the straw and leaves of cultivated crops, but nearly half the area of the district is still virgin prairie, and there are boundless stretches of grassland within easy reach in Bíkáner. Perhaps the good quality of the breed of this tract is partly due to the frequent droughts which killed off the weaker animals and thus exercised a sort of natural selection leading to the survival of the fittest; and this principle is still at work. It is true that the Musalmáns of the Satlaj have an inferior breed of cattle and that those owned by the Bágris and Musalmáns of the uplands are only of fair quality, but the breeds owned by the Sikhs and the Aráíns are excellent, and finer bullocks than they have are seldom to be seen anywhere. The demand for Sirsá bullocks and the prices they fetch show no signs of falling off, but the contrary, and this would seem to show that the breed is at least as good as it used to be. Some attempt has been made to encourage artificial selection for breeding purposes by offering prizes at the Sirsá Cattle Fair for the best animals and by introducing good bulls from the Hissár Cattle Farm, and although the progress made in this direction has as yet been little, there are signs that the peasants are learning to appreciate the advantages of artificial selection sufficiently at least to prevent the breed from deteriorating.

Camels.

199. The number of camels in the district in 1880 was as follows :—

Assessment Circle	Adult Camels.		Young Camels.		Total.
	Male.	Female.	Male.	Female.	
Bágar ...	823	1,208	486	342	2,859
Nálí ...	712	993	455	281	2,441
Rohí ...	2,242	4,931	1,998	1,201	10,422
Utár ...	234	705	184	135	1,358
Hitár ...	24	38	10	10	82
Total of district	4,135	7,925	3,133	1,969	17,162

This is a much larger number than had ever been returned before. Camels are kept chiefly in the Dry Tract by the Bágrís who use them not only as beasts of burden, but do their ploughing with them also. Taking young and old together, there are 7,268 male camels to 9,894 female, the reason for the difference being that male camels are more readily sold than the females which are kept for breeding purposes. In 1878-79, during the Afghan War, orders were issued to impress camels and send them to the front, and camel-owners to escape impressment promptly sent their camels into Bíkáner, so that the number returned as in the district was only 1,099. The number required was therefore distributed over the villages of the district in proportion to their assessment, and each was required to produce so many whether it had them or not. The peasants of most of the villages had to buy the camels, which they took to the tahsíl and made over to the tahsíldár. Few of them ever returned and most of those that disappeared were never paid for. If the 2,792 camels thus impressed be taken at Rs. 70 each, it seems that the first Kábul campaign cost the Sirsá peasants in camels alone nearly two lákhs of rupees—a large contribution to the expenses of the war. For the second campaign 915 camels were bought by Government in 1879, and 975 in 1880, making a total drain of 4,682 in three years. These camels were all supplied through the Deputy Commissioner of Sirsá, and though many of them came from Bíkáner, the number of camels in the district must have been much reduced. Yet it was after this drain that we enumerated 17,162 in the district. The average price paid by Government was Rs. 77 in 1879 and Rs. 97 in 1880, and the total price paid from the Sirsá Treasury for camels during the two years 1879 and 1880 was Rs. 1,65,000. The circumstances were exceptional, and ordinarily the number sold out of the district and the price paid are much less. Very few camels are sold at the Sirsá Fair, and the average price is only from Rs. 50 to Rs. 60. But it may be estimated that on an average of years about 1,000 camels are annually sold out of the district at an average price of Rs. 60, giving a total value of surplus camels of Rs. 60,000 per annum. The Bágrís have often very good riding

camels which can go eight miles an hour for several hours at a time, or travel 70 miles at a stretch. Such a camel fetches Rs. 150 or more, but an ordinary male camel fetches from Rs. 70 to Rs. 90, and an ordinary female from Rs. 50 to Rs. 80. A camel begins to work at four years of age, and a female gives her first young in her fifth year, after thirteen months of gestation, and bears five or six times at intervals of two years. A camel's lifetime is considered to be 15 or 20 years. An ordinary camel-load is 6 maunds. Camel's milk is often consumed as food, and the hair (*jat*) is shorn and made into ropes and sacks. When a camel is in full work, he sometimes gets 2 sers of grain and 15 sers of *moth* or *pála* leaves daily, but ordinarily he is turned out into the prairie to pick up what he can find. Although camels are subject to many diseases, they eat almost any kind of plant and can live on food that does not support horned cattle, and are not like them liable to die off in great numbers in times of scarcity, so that in this district they are not so precarious a property.

Among the numerous ailments to which camels are subject the following may be noticed:—In *báo-bája* the eyes water badly and sometimes the animal cannot raise his head or move his legs. The part affected is branded, or he is given 4 sers of sugar in 4 sers of sweet oil, or is bled below the eyes. In *hubbí* the neck swells and the mouth waters and the animal ceases to wag his tail. The diagnosis is made by applying fire to the animal's tail; if that does not cause him pain he has certainly got *hubbi*. The proper medicine is hedgehog soup, made by boiling a hedgehog in water with a pound of red pepper; another medicine is a solution of roasted salt. *Kupálí* is supposed to be due to a growth on the brain which causes the camel to keep his head constantly raised in the air. The cure is branding the head, which causes the growth to burst and the matter to come out through the ears. In *ras* the camel's hindlegs get quite stiff and he becomes lame; the legs are poulticed and oil is given as a medicine. In *pátlí* the camel's nose gets filled with blood so that he cannot breathe properly: it is cured by clearing out the nostril with the fingers or by drawing two lines over the nose with a heated iron.

Horses and donkeys.

200. The number of horses and donkeys was returned in 1880 as follows:—

Assessment Circle.	Horses.	Mares.	Ponies.	Mules & Donkeys.	Total.
Bágar ...	52	166	52	425	695
Náli	146	285	621	4,687	5,739
Rohí ...	428	468	135	2,527	3,558
Utár	61	11	14	92	178
Hitár	60	253	88	833	1,234
Total of district...	747	1,183	910	8,564	11,404

The distinction between horses and ponies is not trustworthy. The horseflesh of the district generally consists of wretched little ponies, some of

which, especially near Fázilká, are used for carrying burdens; but some of the Sikhs and Musalmáns of the Rohí have fairly good mares, and the breed kept by the Bodlas in the Satlaj Hitár, especially those of Bahak, is famous in the neighbourhood for its excellence. Some 50 ponies are annually sold in the Sirsá Cattle Fair at an average price of from Rs. 15 to Rs. 20, and this may be considered the average price of the smaller ponies. An ordinary Sirsá mare fetches about Rs. 100, and one of the Bodla breed will sometimes fetch as much as Rs. 200. A mare is said to give her first foal at four years of age, after eleven months' pregnancy and to give 8 or 9 foals at intervals of two years, and a horse's lifetime is considered to be 18 or 20 years. A good horse gets 3 sers of gram and 12 sers of fodder daily, and a pony half as much.

The following diseases are described by the peasants as those to which horses are liable. *Sul* is due to excessive heat or cold, and its chief symptom is a severe pain in the stomach; it is often fatal; the remedies are a solution of molasses and *bhang*, or a mash made of *bájra* and *moth*. In *símak* the horse suddenly falls down and becomes senseless; the cure is to kill a fowl or a goat and let its warm blood flow into the horse's mouth; but if this cannot be done quickly, it is sometimes sufficient for a man to take off all his clothes and strike the horse on the forehead seven times with his shoe. In *khub* the horse's throat swells and gets sore; the cures are to poultice the throat with a mixture of *jawár* flour and sweet oil, or to steep a little raw cotton in the milky juice of the *ák* plant and trace a line with it from the right side of the horse's neck to his hind quarter, and then say "come out here"; but the disease is often proof against this charm, and the horse dies. *Khárish* or itch is said to be caused by eating wet *moth* or gram leaves. It is cured by administering balls made of barley flour mixed with the flesh and soup of a crow boiled with all his feathers on; or with the moisture got from the fresh dung of a buffalo that has never calved by squeezing the dung in a blanket; or with the remains of a few pounds of young locusts which have been kept shut up in a jar for some days. *Kanár* or cough is cured by causing the horse to inhale the fumes of blue cloth burned in a nose-bag or by blowing a mixture of ground ginger and sugar into the horse's nostril through a tube. *Sard garam* is brought on by allowing a horse to cool too quickly when he is hot, and is shown by his legs getting stiff and swollen so that he is unable to walk properly. One cure is to bleed his palate and rub salt into it and another is to shut him up in a warm stable, rub him well with a mixture of ginger, pepper, sweet oil, &c., and cover him with blankets to induce perspiration.

There are very few mules in the district. The donkeys are owned chiefly by the Kumhárs who use them for carrying burdens pannier-fashion; but many of the wandering tribes, such as the Ods, keep donkeys to carry about their camp equipage. The Bodlas of Hasta have a good breed of donkeys which sometimes fetch a high price, but the ordinary animal sells at from Rs. 10 to Rs. 15. A burden-carrying donkey sometimes gets 5 sers of chopped straw daily, but often he has to feed himself on the common.

Sheep and goats.

201. The number of sheep and goats was returned as follows in 1880 :—

Assessment Circle.	Sheep.	Goats.	Total.
Bágar	3,931	4,549	8,480
Náli	25,587	17,038	42,625
Rohí	53,307	22,084	75,391
Utár	7,990	2,890	10,880
Hitár	5,846	1,213	7,059
Total of district ...	96,661	47,774	144,435

Sheep are chiefly valued for their wool, and goats for their milk. There are two breeds of sheep: (1) the short-ear (*nikkekannâle*), kept chiefly by the Bágrís of the Bágar or Thalí, which has a fine white fleece but gives little milk; and (2) the long-ear (*lambe kannâle*), kept chiefly by the Musalmáns and near the rivers, which has a coarse fleece but gives a large quantity of milk. It is said that if the ram (*chatrá*) is allowed to mix with the flock (*ayyar*) the ewes lamb twice a year in April and November, but the owners generally tie up the rams so that the ewes may not lamb in November just before the cold weather. Sheep are said to give lambs in the second year after six months' gestation, and to give a lamb every year for seven or eight years. The lamb is allowed most of the milk for the first two months, and for the remaining four months that the ewe gives milk the owner takes most of it for his own consumption. The Musalmáns sometimes eat mutton, and a large number of sheep are annually sold to dealers (*bepárí*) who take them away to Firozpur, Ludhiána and other places to the north. The usual price of a sheep is from Re. 1 to Rs. 3. Sheep are clipped with shears (*kâî* or *katári*) twice a year in March and October and give about half a ser of wool each time. The Bágrís, especially the Bishnois, often wear woollen clothing and generally have good warm blankets made from the wool of their own sheep; but a large quantity of wool is annually exported from Fázilká to Karáchí. In 1846 wool sold at Rs. 5 per maund; now long-ear wool sells at Rs. 16 or 18 per maund, and short-ear wool at Rs. 25 or 26, and the finer qualities sometimes fetch as much as Rs. 36. Say that a fourth of the wool produced, or about 500 maunds, is annually sold out of the district at an average price of Rs. 20, this gives Rs. 10,000 as the annual income from the sale of surplus wool; and say that 8,000 sheep are annually sold out of the district at an average price of Rs. 1-4, this gives another Rs. 10,000 as the income from the annual surplus of sheep.

Goats are said to give a kid in the second year after six months' gestation, and to continue bearing at intervals of a year for six or seven years. A goat gives milk for six months, and after the first two months most of the milk is taken for household consumption. Goats are often killed for food by the Musalmáns, and large

numbers are annually sold out of the district to dealers from the north at prices ranging from Re. 1 to Rs. 3. They are shorn once a year in April, and the hair (*jat*) is made into ropes and sacks (*bora* or *chhati*). The quantity yielded by one goat is about a quarter of a ser. Say that 4,000 goats are annually sold out of the district at an average price of Re. 1-8, this gives Rs. 6,000 as the annual income from surplus goats.

Other domestic animals. Ploughs.

202. There is not a pig, wild or tame, in the whole district. Fowls are kept by the Chúhras, but they are considered unclean animals, and the ordinary Hindu peasant will have nothing to do with them. Dogs are common about all the villages and often attach themselves to a particular master whose house they watch and whose scraps they get, but more often they have no one master and keep to a particular village or quarter of a village, and fiercely resent the intrusion of a stranger of their own species; so that in a Sirsá village the very dogs are hereditary. Domestic cats are rare and so are pets of all kinds, though sometimes a small monkey may be seen chained in his master's courtyard or a tame antelope going out to graze with the village herd.

The number of ploughs is returned as 34,286. If a plough were allowed to each adult camel and to each pair of bullocks, the number would be 39,749, and as there are many extra camels and bullocks the two sets of numbers are not inconsistent. According to the enumeration there is a plough to every 30 acres of cultivated area.

Value of the live-stock and moveables.

203. The value of the live-stock in the district may be estimated as follows:—

	Number.	Average price.	Total price.
		Rs.	Rs.
Bullocks	55,379	30	1,661,370
Cows	56,113	20	1,122,260
Calves	45,760	10	457,600
Male Buffaloes	4,638	15	69,570
Milch Buffaloes	15,262	40	610,480
Adult Camels	12,060	60	723,600
Young Camels	5,102	30	153,060
Horses, Mares and Ponies ...	2,840	50	142,000
Mules and Donkeys ...	8,564	12	102,768
Sheep and Goats	144,435	1½	216,653
Total value ...	...	...	5,259,361

This gives the value of the live-stock of the district as more than half a crore of rupees, that is about Rs. 20 per soul or Rs. 100 per family. It is difficult to estimate the value of the houses, furniture, implements, utensils, clothes, ornaments and hoards of cash of the people, but an unusually large proportion of them have better clothes and utensils than an Indian peasant ordinarily possesses, and as for years the value of the exports has far exceeded that of

the imports, and the difference has been paid in precious metals which must still be in the district in the shape of ornaments or hoards of cash, it seems safe to estimate that the moveable property of all sorts of the inhabitants of the Sirsá district, if converted into money would fetch over a crore of rupees or say a million sterling, almost the whole of which has been produced within the last 50 years. This would give Rs. 200 as the average value of the moveable property of a Sirsá peasant family.

Miscellaneous produce.

204. Besides the grass which feeds their cattle the peasants derive but little income from the waste. Near the larger towns and villages some little profit is got by the sale of wood for fuel, and sometimes when badly off a proprietor will sell a tree for a few rupees, but the total income from this source is small. The fruit of the *kair* and *van* is largely eaten by the poorer classes, but is hardly saleable. On the Ghaggar the *khas* or roots of the *panni* grass are dug up to be made into tatties and its stems are used for thatching; and on the Satlaj the *sarr* grass is used for a great variety of purposes. The owners of the land sometimes sell the contract for the *sarr* for Rs. 50 or Rs 100, or charge a small fee for the right to dig up the *khas*, but the total income from this source is small. In a few villages some little income is derived from the *sajji* (barilla) grown in the waste, but on the whole not more than Rs. 1,500 per annum. A few villages derive a small income from a charge on the right to dig *kankar*, and some others from the sale of the right to manufacture saltpetre, but the amount so realised is small, and rights to such mineral products are not taken into account in assessing.

Total annual produce.

205. The annual gross produce of the district may then be estimated as follows :—

	Rs.
Value of grain	23,30,000
Value of straw	3,39,000
Surplus cattle	2,00,000
Surplus ghí	80,000
Surplus camels	60,000
Surplus sheep	10,000
Surplus wool	10,000
Surplus goats	6,000
Miscellaneous	5,000
Total Rs. ...	30,40,000

Thus the average value of the annual gross produce of the district may be estimated at over thirty lákhs of rupees, or nearly eleven times the total new assessment. The estimate might be swelled by taking into account the milk, ghi, wool, &c., consumed within the district, but enough has been said to give an idea of the total annual produce of all kinds.