CHAPTER VII

AGRICULTURE AND ALLIED PROBLEMS

It is beyond all doubts that, in the Panjab, agriculture was the oldest and by far the largest and most important industry. It provided not only the food that was absolutely necessary for the lives of the people, but the raw produce by which alone imports were paid for, the commodities on which the commerce of the province, was based, and the material for such industries as the province possessed. It is necessary, therefore, to give here a short account of the agricultural methods of the Panjab peasant and the developments in this respect.

(1)

CULTIVATION

HARVESTS. — The Panjab had two harvests: rabi (hari) or spring, sown mostly in October-November and mostly reaped in April-May; and the kharif (sawari) or autumn, sown in June-August and reaped from early September to the end of December. Both sugar-cane and cotton, though sown earlier, were autumn crops. The spring sowing followed quickly on the autumn harvesting. To the spring succeeded the extra (zaid) harvest, chiefly

1. Calvert—W.W.P., p.4. *For different diseases and blights incident to crops, see Appendix A
tobacco, melons, and similar crops, harvested late in June. Speaking generally, the tendency, as irrigation developed, was for intensive cultivation in the rabi to replace the extensive cultivation of the kharif.

**PLOUGHING**— The advantages of frequent ploughing were thoroughly recognized, especially for wheat and sugar-canes, for which a fine seed-bed was essential. The following proverbs on the subject are interesting:

Je hal di bahi awe ras  
Chare Bed karakkan pas  
(If you know how to plough properly you have obtained the four Vedas i.e. you have everything.)

Hul dewa char,  
To fasal howe maromar.  
(If you give four ploughings, then the crop will be abundant.)

Jitana hul,  
Utna hi phal.  
(The more the ploughing the better the crop.)

But the plough used remained an implement of simple construction, made of wood with an iron or iron-pointed share and drawn by a single yoke of oxen. Although according to the opinion of Lieutenant-Colonel G.B. Trenenheere, the Superintending Engineer, Panjab, in 1853, under the peculiar circumstances of climate and soil, the Panjabi plough in its

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2. R.M.S., 80-84.
simplicity and lightness was the best, certain efforts were made to introduce generally a better plough in the Panjab, which hardly bore any fruit.

In the hill the plough could only be used where there was a tolerably large area for each field; but it often happened that the fields arising in terraces one above the other were only a few feet in breadth. In such localities the plough gave way to hand hoeing and digging. The plough when used was just like that of the plains. Some of the tools were especially adopted for strong soil and for breaking up stones too large to move without assistance. But they were all simple in construction.

3. He held that in England, the object was to break up hard masses of mould or stiff clay and to get rid of superfluous moisture, while in the Panjab, in light and tractable soil, scarcely a clod could be seen, and to preserve, in the sub-soil, the rain and moisture it imbibed at certain periods, was the cultivator's greatest care. It was evident, therefore, that deep ploughing would be unsuited to such conditions. If the surface was loosened so as to allow the delicate fibres of the roots to penetrate and to secure the free access of air, it would be sufficient; to turn up the moist soil from below, and expose it to a hot sun and drying wind, would be most injurious. Selection from Correspondence, vol.1, 1893, p.195.


SOWING.— The peasant in the Panjab was not ignorant of the value of the better methods of sowing and of the selection of better seeds as the proverbs say:

Bi Chunne,
Pasal Sunde.
(Select your seed and you will reap a golden crop.)

Ik pai muthi,
Te char pai nali.

-(Sowing) broadcast give one pai (a measure), (sowing by) nali gives four-

There were three methods of sowing: by scattering the seed broadcast on the surface, by dropping it into the furrow by hand, or by drilling through a tube attached to the plough handle. The last method if skilfully used, deposited the seed in the bottom of the furrow, and was employed when the surface was dry. The second was employed in moderately moist, and the first in thoroughly moist soils.

ROTATION.— The same crops succeeded each other, year after year, on the same ground. There was no regular system of changes for the renovation of the soil. The Rabi was no sooner removed than the Kharif was sown; one or the other was occasionally omitted, and the ground left fallow for half, sometimes for all the year, but if no manure had been used, the same crops were annually grown. But although a regular rotation was almost unknown, there was a succession of crops

7. Powell, i, 212–213.
8. see Select papers of the Agri.Horti. Society, Panjab, 1868, p.68.
9. Selection from Correspondence, i, 1853, p.196.
practiced. It was chiefly observed in lands that had been manured, where, in order to make the most of the fertilization effects, the next sowing consisted of crops which required rich soil, and the next of those requiring less richness, and so on. The succession shown below were generally recognized, but all depended on climatic conditions, soils, the means of irrigation, and the system of agriculture followed in any given tract: great millet, followed by masur and gram; rice, followed by barley, masur, and peas; turnips or cotton, followed by maize; cotton or maize, followed by senji; senji followed by melons. They were followed because having been once or twice found to answer—thus had passed into a custom, but the farmers had generally no knowledge of the reason of rotation, or how to improve the system they followed, even during the later years of the century.

After annexation, the potato, tea, and English fruits and vegetables were introduced. The first named was so important that the people called it the hill man's sugar-cane. Attempts made to acclimatize American maize had succeeded only in the hills, and even there the stock had deteriorated. It required nearly five months to mature, and the heat of the plains ripened it too rapidly. In 1901 an experimental farm of 55 acres was started at Lyallpur in the Chenab Colony.

10. Fowell, i, 204.
MANURING.- The Panjab peasant would often say—

\[
\text{Dalen raja,} \\
\text{Male n kheti.}
\]

(The manure is to the field, what the army is to the Raja-king.)

and

\[
\text{Khat kare,} \\
\text{Ya Kartar kare.}
\]

(Manure does the work, or the God does.)

Land near a town or village was heavily manured, as also land near a well, since it could be easily irrigated and valuable crops grown on it. Sugar-cane, maize, tobacco, and vegetables were always manured; wheat, cotton, barley, and melons were manured only when manure was available. Spiked millet, grain, tara mira, and other inferior crops were never manured. Irrigated land was manured much more generally than unirrigated.

Cultivators did collect as much manure as they could, so far as their imperfect system of farming permitted, and their knowledge of other sources from which it might be derived.

Substances used were the animal manure, vegetable refuse, sweepings of the town, of dwellings, and drains; ashes and rubbish of all sorts; earth from old mounds and dykes; the urine of camels was prized in the Leia district. The heaps collected were sometimes distributed among the village community, according to custom. From some towns moist soil was carried to the land.

In Kangra, the dung of all domestic animals and the leaves of certain trees were used as manure. The dropping of the flocks of the hill shepherds who brought both sheep and goats

12. see R.M.S.
to feed in the low lands during the winter in Kangra, were much sought after. Ashes and lime were also occasionally applied, but rather to destroy insects than as manure; and that only on which were strictly speaking "garden crops". In the cis-Sutlej States, the earth, which crumbled from old mud walls besides the foregoing substances, was used as

All the substances collected, like cow-dung and other excrements, litter, vegetable refuse, ashes, rubbish, sweepings of houses and of yards, were kept in heaps outside the villages, and exposed to the weather for a considerable time, before being applied as manure to the land. After one or two years, but without any definite rule, it was spread on the field at the time of ploughing. It was not thought fit for use, till it had been allowed to ferment for a year, but on the other hand it was often carried out before the straw and other substances have had time to decay. In either case it was unfit for the land, and an examination of them reported in 1853, had shown that only 40 per cent of its bulk was calculated to afford any nourishment to the growing crop. After a twelve months' exposure to a tropical sun and rains, there remained little of its fertilizing properties; the nitrogen and ammonia from animal substances, most essential to vegetation, must have been long before expelled.

Many substances, as bone-dust and lime were available, and within the cultivator's means and reach, to add to the exuberance of his crops, but they were little cared for. The cattle were left most carelessly and without any economy of the manure they yielded. They stood for the most part, under trees which surrounded the wells at which they worked, instead being kept under sheds where litter could be usefully mixed with their dung and nothing lost. The practice of using cow-dung for fuel seriously diminished the natural supply of manure.

There could be no doubt that manure under the British rule began to be more valued than it formerly was. The collection from the large towns of night-soil and other refuse, which at one time were absolutely neglected or resolutely rejected, were now much sought after and were a source of considerable income to several Municipalities. Efforts were also being made in various directions to provide a larger and cheaper supply of wood as fuel so as to set free more cow dung if possible, to be used as manure. Yet too much of the manure was still allowed to be useless and much was used as fuel.

Weeding and hoeing were resorted to only for the more valuable crops, the crops were cut entirely by hand, and harvesting employed all the menials of a village. Sometimes the people showed a remarkable spirit of co-operation at the

14. Selection from Correspondence, vol. 1, 1853, pp. 197-198; see also D.G. Lahore, 1893-94, p. 132.
time of harvesting, when the neighbours were all summoned and cheerfully came to render the annual service of mutual assistance, for which no pay was taken, though the owner provided them with their homely meals. Musicians were got together, and laughing girls with kilted skirts were standing up to their knees in mud and water, planting the bright green shoots in the soft ground at their feet. It must be a hard labour, this stooping all day long, but the work went on merrily to the weird sound of music and drum. The singers chanted of love, always however in the minor key, to the running commentary of the light-hearted girls, who emphasized each point with many a joke upon their comely neighbours, while the bystanders last no opportunity of throwing in a rought jest to raise the colour in the cheeks of the girls before them. Grain was mostly trodden out by cattle. The implements in use, of a primitive type, and simple in construction, were well adapted to the cultivator's needs, but were all capable of improvement.

(2)

IRRIGATION

"As the extension of railways tends to lessen the acuteness of a famine, so the extension of works of irrigation tends to prevent it."

17. see 1.G.I.P., 1, 59.5
Irrigation in the Panjab was firstly effected by natural causes—rain, rivers, and inundation, etc. In almost every district there were portions which were out of the reach of artificial irrigation, and so were dependent on rain, and whole crops were often lost for want of it; but there were only a few kinds of crops (e.g., gram) that were as a universal rule, left to the care of rain.

The two main types of artificial irrigation in the Panjab were (1) wells and (2) river channels and canals.

The number of wells in use in the Panjab at annexation was 1,36,638. These wells were of two kinds—"katcha" and "pucka". Kutch wells were merely dug in the earth without masonry walls or casing. In some kinds of soil they did very well, where the clay was strong and tenacious; but in other places, especially in the low khadir lands, they soon fell in. In some districts, they were worked by a rude kind of Persian wheel, just as a pucka well was. In others, especially in the cis-Sutlej districts, the water was raised by means of a lever of balanced pole erected over the well; one arm of the lever carried a large earthen "ghara", or vessel holding about six gallons, which was let down into the well and raised again by a person pulling down the other arm of the lever; this apparatus was called a "dhenki". It was the most laborious and least productive of all methods of cultivation. The man's hands often got out by lowering and raising the "ghara".

2. Powell, i, 205-206.
4. Khadir or low lying land near river—see S.M.
In Khadir lands the depth before water was reached varied from 6 to 20 feet, but in high banjar lands it was much more, varying from 20 to 60: the water was abundant, but was procured with great labour; the "dhenki" was not employed for a very deep well. An apparatus called the "lao charsa", or "rope and bucket" was also in vogue in raising water; but though it was everywhere to be seen (worked by hand) at wells whence water was obtained for domestic purpose, it was little, if at all used in the trans-Sutlej Panjab for irrigation. The "lao charsa" in the cis-Sutlej was worked by bullocks.

Pucka wells were those which had an internal wall of masonry and a pucka coping; sometimes this was expanded into chabutra or flat terrace, on which the villagers sat, when they gathered together for a sale or any discussion, or to rest after the day's labour and smoke their "huqas". Pucka wells were usually worked by the "harth", or Persian wheel. Sometimes, over large wells there were two sets of wheels bearing the belt and pots, and placed parallel to each other - "domalah", or in Panjabi "dohartha", or "do-chuthi". The single wheel was called "ek-hartha".

These wells were often the joint property of several owners, who took it in turns to work them.

In the Jhelum district however the well was something quite unlike the deep well of other districts with its Persian wheel. It consisted merely of a small pit in the low land by the side of a ravine. Each had only 2 or 3 acres attached.

5. upland tract - see ibid.
6. Powell, i, 207.
8. Powell, i, 208.
to it but the ground was kept highly manured, and tilled like a
9
garden, and all sorts of vegetables were raised. The cost of
10
sinking a well in 1868, ranged between 50 and 300 rupees.
In 1902, the average cost of a masonary well was found to be
11
atleast 300 rupees.

The amount of land irrigated by a well depended on the
nature of the soil, depth of water from the surface, and
condition of the well; but most of all on the number of yokes
it was worked by. In bar land, one yoke was equal to irrigating
5 acres in the year, whilst in the banjar lands and khadir it
reached 7 or 8 acres. The soil of the khadir and banjar tracts
however absorbed more water than that of the bar. Buffaloes
were mostly used in the "bar". They were also coming into use
in the banjar lands, but in the khadir inferior bullocks could
do the work. Buffaloes were superior in strength to bullocks;
but could not work in the sun so well. The expenses of
irrigation were least in the khadir, and greatest in the bar;
in the latter the water was often so far from the surface, that
it was by no means uncommon to see two yokes of buffaloes
working together at one well.

Another kind of irrigation was by jhalar (or chalar).
It was used only in such localities as exhibited the peculiarities
to which this method was adopted. A 'chalar', was merely the
Persian wheel of a common well transferred to the bank of a
canal, the margin of a jheel, or the high bank of a river. A

10. Powell, i, 209.
small pool was excavated immediately below the 'chalar' to collect the water, and afforded the wheels a sufficient surface to work upon. As almost the whole expense consisted in the wood work, 'chalars' were constructed in great number, and abandoned again without materially affecting the prosperity of the peasants.

In some places there was a modification of this called a 'raota' or 'phiraoti', when there was only a wheel fitted with the belt and jars, and a man located on the bank turned the wheel with his foot, treadmill fashion, and aided with his hands also.

The construction and maintenance of wells had been mainly the result of private enterprise. British Government after annexation, however, encouraged the sinking of wells by granting takavi loans on easy terms for such purposes; by liberal assessment for land revenue of land watered by wells, and by securing the tenant against an increase of rent or of land revenue on account of such improvement.

Immediately after annexation, numerous sums were advanced, and during one year of threatened draught, the readiness of the state to give assistance was notified by a proclamation, setting forth that any proprietor, who might accept a loan, and therewith construct a well or other work of irrigation would, at the coming settlement, be taxed only for unirrigated land. In some of the arid districts adjoining the central wastes, the people gladly availed themselves of this

12. Powell, 1, 209.
proffered succour. But on the whole, the fifty years history of these and other such advances to the agriculturists in the Panjáb, is only a history of carelessness on the part of the agriculturists to apply for and accept them. Since these advances always play an important part in the development of agriculture, a brief account of the developments in this connection may here be traced.

THE ADVANCES.- The takavi advances which equalled Rs. 26,504 in 1858-59, were Rs.57,670 in 1867-68. In the eight years from 1867-68 to 1874-75 inclusive, the advances were on an average Rs.1,22,988 a year. This period included two years of famine and distress, 1868-69 and 1869-1870. Excluding these two years the average was Rs.86,747 per annum only. This was too discouraging a response. The zamindars were more in the habit of resorting to the village bankers than to the Government for loans. The Land Improvement Act (XXXVI of 1871) under which new rules were issued to simplify the procedure of advances and to extend the period of repayment was a step to relieve the zamindars of the necessity of resorting to the village bankers for loans. Yet it failed in its purpose and the very next year (1872-73) of the enactment the Government of Panjáb seemed to have been confused as to decide whether the diminished resort to loans was result of increase in private capital or of defects in the

working of the existing rules.

A large decrease was rather noticed in 1873-74 in the amount of Takavi Advances since the introduction of the rules under the Land Improvement Act (XXVI of 1871). The Financial Commissioner attributed the decrease to (1) the novelty of system, (2) the seasonable rainfall, and consequent prosperity; but the Lieutenant Governor was not convinced of this explanation and suggested that the working of the rules had to be carefully observed.

During 1875-76 further improvement was made in the system of advances, in order to encourage the response of the zamindars towards them. Yet the amount of advances during 1876-77 equalled only to Rs.97,097. In a province of small proprietors, where there was so much waste land available for cultivation, a system of Government loans for wells and water courses ought to have been more successful than it actually was. Replying to a question in the inquiries issued by the Famine Commission in 1878-79, said Colonel W.G. Davies, C.S.I., Commissioner of Delhi. In the case of proprietors there could be no doubt that the fear of having to pay an enhanced assessment in consequence of an improvement operated in checking improvements towards the close of the period for which a settlement had been made. But this could not be said to have any permanent affect in restraining the investment of capital in improvements. The case of tenants was different; besides ignorance of their rights, there was always before them the knowledge that they might have to pay a higher

rent if they sank a well or otherwise increased the productive capacity of their land, and this knowledge essentially had the effect of permanently checking any disposition on their part to lay out money in improvement.

In 1880-81, orders were passed that, the applications "for loans should be taken up and disposed off by officers while on tour in the cold weather". The terms of repayment and security were made yet more easy, and the Lieutenant Governor hoped that these directions would have a good affect in inducing the people to apply for advances. During 1881-82, the Panjab Government were actually encouraged when in the year not only had the sum of Rs. 1,50,000 assigned for advances in the Panjab been completely taken up, but it had also been found necessary to apply to the Government of India for further sanction to a similar account.

Under the Land Improvement Loans Act No. XIX of 1883 further improvements were made in the system of advances. Loans were made at 6½ per cent per annum interest, and on the security of the borrower's holding. The Agriculturists Loan Act XII of 1884, laid down the system under which advances were made on the personal security of the cultivator, and practically only in or after draught, to enable him to replace cattle that had died and to purchase seed. On the Agriculturists Loans Bill in 1883, there were frequent discussions among the papers in the Panjab.

24. for details see Rev. & Agri., 1885, Rev., June, 9 to 11.
26. see Home 1884, Public, B. Feb., 172-73.
The Koh-i-Nur in its issue dated 27th December, 1883, thus, reported that although the Agriculturists Loans Bill was without doubt a great improvement on the existing law, the difficulty was that cultivators were already generally deep in the books of Mahajan (money-lenders) and had nothing to offer as security for new loans they might desire to obtain from Government. Moreover, there were other reasons which led to imagine that the measure would not be successful to any large extent:

1. Applications for loans would have to be submitted on stamped paper, and evidently a poor man could ill afford to incur any such expense.
2. Applicants would necessarily have to dance attendance at revenue courts for some days, and to submit to the tyranny of officials before they succeeded in obtaining money.
3. Although the rate of interest fixed was moderate, the period within which loans would have to be repaid was extremely short and must deter cultivators from taking loans.
4. Above all, cultivators must naturally prefer to deal with the Mahajan than with the Government, because the latter lent them money only for improvements, while the former made advances for all purposes.

The government seems to have given a special consideration to these difficulties of the agriculturists when they laid down that for loans for the improvement of land, applications could be made orally or in writing to Naib Tahsildars or officers superior to them; that Tahsildars and Naib Tahsildars were to be constantly on tour in their circles so that the zamindars could have every facility for bringing their wants.

to the knowledge of officials and that Stamp and Registration
dues were to be remitted on documents connected with these
loans.

The amount of advances under Agriculturists Loans Act of
1884 varied greatly from year to year. In 1886-87, they only
slightly exceeded the fixed allotment for the province, viz.,
Rs. 25,000. In the same year the allotment was raised to
Rs. 1,05,000, to meet the special and emergent circumstances.
In 1887-88, in its Review of the Revenue Report for 1887-88,
the Local Government laid down the principle that advances
for purchase of bullocks should be made only where there had
been unusual loss of cattle by disease or famine.

The system of advances, inspite of the earnest efforts
of the Government, could not be made popular with the
agriculturists. The Government of India, in its Review of the
Panjab Land Revenue Administration Report for 1889-90 remarked;
"The falling off in the amount of advances (after a small rise)
under the two Loans Acts was noticed with regret. The subject
appears to meet with very unequal attention from District
officers."

During 1895-96, the amount of advances under the two
Acts was Rs. 4 lakhs and in 1899-1900 they reached the figure
12,50,000. This increase was, however, due to agricultural
distress in the Panjab, towards the close of the century and the

28. for details see Indian Irrigation Commission-Panjab Evidence,
1902, p.144.
amount of advances under the Land Improvement Act separately, did not show any big increase.

The total number of wells in use in the province had increased from 1,461 in 1849 to 317 thousands in 1900-1901. Of 9,375,983, the total area of crops irrigated during the year ending 30th September, 1900, 4,154,598 were irrigated by wells. Wells thus remained one of the most important means of irrigation. Yet on the whole the progress made towards the extension of irrigation by wells in the Panjab which was one of the purposes of the Government advances, was during these years, was not such as to be taken pride of.

The process of granting advances under the Land Improvement Loans Act was considerably simplified about the year 1901, but the accounts were still very complicated. Interest was charged at 6½ per cent, and it was thought necessary to keep an elaborate account of repayment of principal and interest separately for each instalment which confused the borrower and caused extra labour to the officials concerned. This was one cause of the unpopularity of Land Improvement Loans; other causes were the difficulty in getting a loan which was sometimes caused by the smallness of the grant made available year by year for the province, and the levy of 6½ per cent interest, which, though low as compared with the rates actually charged

32. A.R., 1899-1900, pp. 45-46.
33. R.A.R. 1900-1901; also see Indian Irrigation Commission—Panjab evidence-1902, pp. 299-300.
34. A.R. 1900-1901.
by private money-lenders, sounded high to the borrower when he was told he would have to repay double the amount borrowed if the instalments were spread over 20 years.

Mr. F. J. Fagan, Revenue Secretary, Panjab Government, held in 1901 that if takavi were allowed without interest, it would add much to the extension of wells. But the Assistant Secretary to the Panjab Government in the Financial Department reasoned that during the 11 years ending 1901, about Rs.1,500 a year had to be written off on account of irrecoverable loans, that was to say unrealizable principal; how much, if any unrealizable interest was also written off, the account did not show. Moreover the Land Improvement Loans were made from the "Provincial Loan Account", over which the province paid interest to the Imperial Government and was charged with all that became irrecoverable. Accepting, he added, the principal that there must be at least no loss on money put out to loans by the State, the Government could not under the conditions stated above, safely undertake to surrender the present surplus of interest in such loans by the grant of interest-free loans on a larger scale than was already provided for (for special cases) by existing arrangement.

37. Indian Irrigation Commission-Panjab Evidence, 1902, pp.119-139.
The capabilities of the Panjab for canal irrigation" reported the first Administration Report, "are notorious". Intersected by great rivers, it was bounded on two sides by hills, whence poured down countless rivulets; the general surface of the land sloped southward, with a considerable gradient. These facts at once proclaimed it to be a country eminently adapted for canals. Nearly all the dynasties, which had ruled over the five rivers, had done something for irrigation; nearly every district possessed flowing canals, or else the ruins of ancient water-courses; many of the valleys and plains at the base of the Himalayan ranges, were moistened by water-cuts conducted from the mountain torrents. The people, deeply sensible of the values of these works, mutually combined with an unusual degree of harmony and public spirit, not only for the construction of the reservoirs, but also for distribution of the water, and the regulation of the water supply. Yet, although the Panjabis were not blind to the possibilities of irrigation in the Panjab; at annexation, the only canals open in the province, as it stood before the addition of the Delhi territory after the Mutiny, were the nasli (later on merged into the Bari Doab) and a good many inundation canals in the south-western districts.

The canals constructed during the British rule fell into two classes; the perennial canals, with permanent head-works; and the inundation canals which ran only in flood season, and

1. A.R. 1849-50 to 1850-51, p.133.
irrigated the lowlands along the rivers. By 1900-1901 the major irrigation works constructed were: the Western Jumna Canal, Bari Doab Canal, Sirhind Canal, Chenab Canal, Lower Sohag and Para (Inundation), Sidhnai Canal and the Swat River Canal. The minor irrigation works were the Upper Sutlej Inundation canals, Lower Sutlej Inundation canals, Chenab Inundation canals, Indus Inundation canals, Shahpur Inundation canals, Muzaffargarh Inundation canals and Ghaggar Inundation canals.

**WESTERN JUMNA CANAL**—The Western Jumna canal was an important perennial irrigation work in the Panjab, taking off from the west bank of the river Jumna and irrigating Ambala, Karnal, Hissar, Rohtak, and Delhi districts, and parts of the Indian States of Patiala and Jind. It was by far the oldest of the great canals in the province, and irrigated in 1356 under Firoz Shah III. Later on it was neglected but in 1568 the emperor Akbar got it re-excavated; in 1626, Ali Murdan Khan, the engineer of the emperor Shah Jahan developed it into a more ambitious scheme. With the decay of the Delhi empire the up-keep of the canal was no longer attended to. Its Delhi branch was re-opened in 1819, and the Hansi branch in 1835. The alignment of the canal was, however, by no means satisfactory; and as early as 1846 it was noticed that the concentrated irrigation, the defective drainage, and the high banks which cut off the flow of the natural drainage of the country, all contributed to rapid deterioration of the health of the people. Saline efflorescence was rapidly

spreading and the inhabitants of the water logged area were affected with chronic disorders of the liver and spleen. Between 1870 and 1882 various remodelling schemes were sanctioned, with the object of securing increased control over the supply and its distribution, greater facilities for navigation, and improved drainage; and this resulted in the complete disappearance of the swamps and accumulation of water, and a most marked improvement in the health of the people. The Sirsa branch was sanctioned in 1883, and this and subsequent minor extensions largely increased the irrigating capacity of the canal.

**BARI DOAB CANAL.** It was another perennial irrigation canal in the Panjab, taking off from the left bank of the Ravi, and watering the districts of Gurdaspur, Amritsar, and Lahore in the Bari Doab or tract of country between the Beas and Ravi. The undertaking originated in a project for the improvement of an older work, the Hasli canal. The Emperor Shah Jahan had begun to turn to account one of the neglected great rivers of his northern province, his inspiration being love for beauty, not pity for his sometimes starving people. That fountains might play in Shalimar, the royal gardens at Lahore,

3. see Water Logging Chapter XXI, p.382—Brij Narain, 'Indian Economic Life'.
4. Selections New Series, No. VI. see for further details. It discusses how the existence of spleen, and secondarily the prevalence of malarious type of fever, showed so marked a connection between these inter se, and with the proximity of water to the surface. Dr. Taylor studied the subject and recommended measures for adoption by Canal Department in order to remedy the evil.
he cut a canal, the Hasli, from a point on the Ravi 110 miles north of his Panjab capital in 1633, and more than a century later Ranjit Singh and his Sikhs extended it to Amritsar, there to fill the sacred tank about the Golden Temple.

After the occupation of Lahore in 1846, Major Napier (afterwards Lord Napier of Magdala) turned his attention at once to this project, and set on foot the necessary surveys. The progress of the work was interrupted by the outbreak of war. After annexation the work was pressed on, because the immediate construction of the canal was regarded as almost a matter of political necessity to provide employment for the disbanded Sikh soldiers, who, having their homes in the centre of the tract, would otherwise have had little encouragement to turn to agriculture. The allignment of the Hasli canal proved on examination to be so defective that the officers in charge decided upon the adoption of an entirely independent line, parts only of the original channel being utilized as distributaries. Irrigation began in 1860-61, but the permanent weir and other regulating head-works were not completed till after 1875. The head-works were constructed at the village Madhopur in Gurdaspur district.

SIRhind CANAIS.— During the Famine period of 1860-61, the Western Jumna Canal, in watering very nearly half a million acres, and supplying food grains, moderately estimated at five millions of maunds, had doubtless done noble work. And Col. R. Baird Smith who reported on the Famine was thoroughly

convince, that no money could be better invested than in extending the capabilities of the irrigation works in the Panjab. The effect of canals in preventing famine was so obvious a subject that, the Lieutenant Governor said in 1867, it could not be too often, or too urgently pointed out. There was, therefore, a lot of inspiration in the Panjab, for the further extension of the irrigational facilities.

Sirmind Canal (perennial) which took off from the Sutlej, and irrigated the high land between the Sutlej on the north-west and Patiala and Chaggar streams on the south-east, and extending as far south as the border of Rajputana, Bahawalpur, and the Bikaner State, was constructed by Government, in association with the Indian States of Patiala, Nabha and Jind. The land over which the canal was excavated was before it, black, wretched, and without water, a vast sterile land. The wells were so deep that artificial irrigation from them was impossible, the water was so brackish and impure, that no sane inhabitant of the tract could drink it without impunity; rains were scanty and precarious; vegetation was represented by a temporary crop of grass, scattered over the great parched plains. Under circumstances so ungenial, the population was necessarily scanty and lawless, deriving their subsistence from herds of cattle, and addicted to the marauding habits common to pastoral tribes.

12. I.G.I.P:1, 205.
The part which canals play in civilizing such a population and developing their resources is too well known to be discussed here. Under such conditions was the preliminary survey work begun in 1867, and the canal was formerly opened in 1882, though irrigation did not commence till 1883.

Apart from money considerations the Sirhind Canal gave comparative affluence to a large population previously leading hand-to-mouth existence, and in famine years fed multitudes of starving refugees from Bikaner and Sirsa. Even so, wrote S. S. Thorburn in 1904, it was questionable whether the canalisation of the Sutlej should not have been postponed until one of the easier and more remunerative, and for the always disconsidered Mahomedan population of the Western Punjab, more necessary, Chenab and Jhelum projects had been carried through. Surveys, plans, and estimates for canals from those rivers as well as for the Indus were completed early in the 'seventies, and none of them presented the same class of engineering problems as had been encountered in the Ravi, Jamna and Sutlej.

The Sirhind Canal, no doubt, converted potentially troublesome Sikhs and Jats into well-fed, and therefore contented farmers; but at the same time, coupled with the Bari Doab and Western Jamna canals, gave the Hindu section of the community a great advantage over the Western Mahomedans who were already, owing to their scantier rainfall and less-helpful habits, the chief sufferers from the fixity of demand and the unsympathetic

inflexibility of British rule. By canalising the eastern rivers before breaking ground westwards the Government laid itself open to various charges - the continued neglect of Mahomedan for Hindu interests, the prior protection against famine of the less insecure half of the Panjab, the watering of submontane tracts already supplied with numerous wells, and blessed a considerable and fairly certain rainfall, and the sinking of a larger capital on construction than would have been necessary for any of the western rivers.

17. The tract between the two rivers.

THE LOWER CHENAB CANAL.- It was another perennial canal in the Panjab, taking off from the bank of the Chenab river and entering the tract between it and the Ravi. It was early in the 'eighties that after having canalised the three eastern rivers, the Government turned their eyes westwards to the Mahomedan districts of the province and resolved to successively divert the waters of the Chenab, Jhelum and Indus over their respective Doabs.

The Chenab canal as an original work, was designed only as a small inundation canal and opened as such in 1887, but in 1889, it was decided to convert it into a perennial canal of the first magnitude. The estimate for the complete project for the Chenab Canal, including a weir and permanent head-works, was submitted to the Government of India for sanction on the 18th July, 1889. Sanction to commence preliminary operations was accorded by the Government of India at the end of October 1889, and the actual commencement of work in a telegram dated...
January 7th, 1890. The Secretary of State's formal sanction to the scheme was conveyed in a despatch No.2 P.W., dated 9th January, 1890.

The head-works of the canal were constructed at Khanki, a village in the Gujranwala district, 8 miles below Wazirabad. Here a weir across the river was commenced in 1890 and completed in 1892, by which year the supply to the canal was regulated and controlled.

Opening ceremony of the Lower Chenab Canal, in 1892, was the turning point in the economic history of the Panjab. The part which the colonisation of the Rechna Doab contributed towards the development of the general prosperity of the province, can hardly be over estimated. A short account of it may therefore be given here separately.

COLONISATION OF THE RECHNA DOAB — The greater part of the Rechna Doab was, before the introduction of irrigation, a desolate region, unpeopled except for a race of pastoral nomads. In giving priority to the Chenab over the Jhelum the Government acted upon business principles. As the Rechna Doab was more extensive than the Chaj Doab, and most of its waste—the loose inheritance of Mahommadan tribes — had already been appropriated as state property its colonisation by peasant settlers from the congested central districts of the province would be more rapid and profitable than that of the less extensive Doab to its west.

The colonisation carried on the land, was actually on a scale hitherto untried in the history of India, if not of the world. The total area of Government waste in the Doab, to be colonised was about 3,817 square miles. In the first selection of colonists the Government had two main objects in view. Primarily, it was desired to relieve pressure of population in the highly congested districts of the central Panjab, where conditions in the 'nineties were worse. Secondly it was designed to create villages of a type superior in comfort and civilization to any thing which had previously existed in the Panjab. Upon this two-fold basis arose the Lyallpur colony. Subsequently in the 20th century, however, other objects appeared.

The grantees of the land were divided into three classes—capitalists, yeomen, and peasants; the greater part of the land had been distributed to peasants, who were by far the most satisfactory tenants. For the purpose of allotment the whole of the Government waste had been divided into squares, the side of each square being 1,100 feet and the area about 28 acres. A peasant's grant consisted of from one-half to three quarters, a yeoman's of four or five, and capitalist's of any number from five to twenty or more. The Government retained the proprietary rights in the land, and the colonists were its tenants, the peasants for a term of years, the yeomen with right of continued occupancy so long as they paid their

assessment, while the capitalists had also the right to purchase proprietary rights in their tenancy after the lapse of a certain period of time. In the later stages of colonisation, there also arose tenures which carried the liability to provide a certain number of camels for military service.

EALY DIFFICULTIES OF THE COLONISTS. Early difficulties for the colonists; who were for the most part taken from the central Panjab, and only from the best agricultural tribes, were overwhelming. The country was wide, empty and desolate, the population hostile, and the climate in summer of the fiercest. The tract could only be reached by bullock cart, camel or horse, and even when the first harvest was won, there was no railway to take it to market. Nor was the first harvest by any means an easy affair. Methods of irrigation were in their infancy; levels were not always rightly calculated, and colonists were allowed to arrive before all the main channels were ready. The land had to be cleared of bush and scrub, fields to be levelled and embanked, and water courses to be made. Sometimes the water refused to run, and nothing could be sown. The indigenous nomads, resenting the alien intrusion into their solitude gave the settlers no peace, stealing their cattle and preying upon them in every possible way. A severe epidemic of cholera made things worst, and it was not till an abundant harvest appeared, that the excellence of the soil was revealed. Even then difficulties were not at an end. Labour was scarce and large quantities of cotton remained

unpicked. When harvested, too, the produce had to be conveyed to market by the same perilous ways by which the settlers came. No wonder that many returned in disgust to their homes, little realizing the Eldorado that the wilderness was to come.

By the middle of 1893 the competition for land amongst capitalists and officials, not only throughout the Panjab but beyond its limits, had become very keen, a proof that, in the opinion of intelligent men, the margin for profit, after payment of the expenses of production including the Government demand would be large. The full awakening of the home-tied peasantry to the certain competence awaiting settlers came a little later, and was at first confined to the central and most congested districts, particularly Sialkot, Amritsar, and Hoshiarpur. Even in them there had been hesitation at first, for the conditions on which allotments were offered were strange and forbidding—alienation, non-residence, and failure to cultivate, one and all entailing summary forfeiture of holding; and, further restrictions being placed against partitions by inheritance. Such unprecedented innovation filled the ignorant peasantry with vague apprehensions. To many the freedom to ruin themselves and their children - exercised for generations in their old homes - appeared preferable to the shackled abundance now promised. Happily, the Government knew its own mind, and was determined that, in spite of "system", with its laws, lawyers, and enforcement of the letter of so-called contracts, colonists should be at the start, and always continue to be, prosperous.

and unindebted. Reflection soon convinced the more industrious and thrifty that the Government was acting as their best friend in protecting them and their heirs from prospective declension and poverty. When, thus, the struggle for allotment began in earnest, the Government was in a position to select tenants on its own terms, and in doing so took only substantial men from the most industrious castes and tribes in the congested districts of the Panjab. All settlers thrived amazingly, and many were in a short time able to redeem mortgaged fields in their home villages. By 1901, the population of the colony had reached the figure 782,690.

The Lower Chenab thus enormously relieved the pressure of population in the congested districts of the Panjab and to add yet more to its benefits, it proved a most remunerative investment, besides adding largely to the general wealth of the country.

But though the scheme as devised and executed had proved grandly successful, an unfortunate aspect of the history of colonisation is that, the Government sacrificed, or at least postponed, local Mahomedan interests for large and quick returns. As the canal penetrated southwards, converting waste into corn-fields, the Muslim tribes on either bank in its vicinities the hereditary possessors of the country - were not only denied participation in the abundance flowing by their doors, but were required to stay at home, cultivate their now profitless wells and rainlands, and pay their fixed revenue assessments. The

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28. see Panjab Colonies Report 1901-02.
instinct of self-preservation, however, proved stronger than
the fiat of the Government, and soon, for a depth of thirty
miles on either side of the canal-irrigated country, wells were
abandoned by the hundred, and a large part of the rural
population migrated to the canal villages, working there as
farm-labourers, artisans, and menials. In this way the fabric
of estimates and measurements, on which the assessments of
considerable tracts in the districts of Gujranwala, Montgomery
and Jhang were based, was destroyed, and members of previous
well-to-do peasant and yeomen families were rendered to waste.
The peasantry of these three districts were thus at first
treated as pariahs and outsiders - in their own country too-
and a great wedge of industrious foreigners was established
in their midst.

OTHER WORKS.- Of the other canals executed during this
period, only a short account will suffice. In 1873-74, a project
for the irrigation of a portion of the Usafzai parganna of the
Peshawar district by a canal from the Swat river was submitted
to the Government of India. The commencement of the works of
the Swat Canal was made in 1877-78, the purpose of the cutting
of canal obviously being mainly political. The canal was opened
on the 11th February 1885. The canal cleared its interest
debt, and for the first time showed accumulated profits amounting
to Rs.1,42,919 against an interest balance of Rs.1,28,169 in
1899-1900.

31. A.R. 1877-78.
34. A.R. 1900-1901.
The Upper Sutlej Canals, was a system of four inundation canals in the Panjab, known as the Katora, Khanwah, Upper Sohag, and Lower Sohag (or Lower Sohag and Para) canals. They took off from the right bank of the river. Katora Canal was made in 1870-71. The date of first opening of the Khanwah is not known; it is, however, recorded that the canal was improved by Mirza Khan, a minister of the Emperor Akbar; but was neglected by his successors, and silted up. In the time of Ranjit Singh, Diwan Radha Ram repaired the head and cleared the channel, and the canal flowed from 1807 to 1823. It was again neglected till 1841, when Fakir Chiraghudin, under the order of Maharaja Sher Singh, had the canal repaired, and it was in flow when taken over by the Irrigation department on the annexation of Panjab. The Upper Sohag appears to have been made in 1827, and worked till 1840, when it was neglected; and nothing further was done to it till 1855, when, the canal having been taken over by the Irrigation department, the channel was again put into working order. The Lower Sohag Canal dated from 1816, when the first attempt to irrigate was made by means of a dam across the Sohag nullah, which caused it to overflow its banks. In 1831 another dam was made. The dam, after some fighting, was demolished in 1835; and from that date the canal existed only in name. It was in 1885-86 that the improved and remodelled canal under its above name was opened.

The Lower Sutlej Inundation Canals, were an Imperial system of inundation canals in the Panjab, taking off from the right bank of the Sutlej and irrigating part of Multan district. They were for the most part constructed in the middle of the eighteenth century by the Daudputras, a powerful tribe who were then in possession of this part of the country; but one of the largest, the Diwarwah, was excavated in 1831 by Diwan Sawan Mal. Excluding the Hajiwah canal, whose territory was separate from that of the rest, there were in 1850 nineteen of these canals; which however, were gradually amalgamated during the later years, and in 1903 there were only three, the Mailsi, Muhammadwah-Sardarwah, and Bahawalwah-Lodhran canals.

Sidhuai canal, which took off from the left bank of the Ravi and watering part of Multan district, derived its name, meaning 'straight', from a remarkable reach of Ravi, which extended in a perfectly straight cutting for 10 or 12 miles from Tulamba to Sarai Sidhu. The water was admitted into the canal in May 1886. In 1887-88, it was reported to have proved most successful undertaking among the Inundation Canals.

CHENAB INUNDATION CANALS, was a system of canals which took off from the left bank of the Chenab below its confluence with the Ravi and irrigated part of the Multan and Shujabad tahsils of Multan district. They were for the most part constructed by the Pathan rulers of Multan and Shujabad, and were once thirteen in number, but by amalgamation the heads

37. Ibid, 216.
in the river were reduced to four, the Muttithal, Mal 40
Muhammad, Sikandarabad, and Sikandarwah.  

**Indus Inundation Canals** was an imperial system of
inundation canals, taking off from the west bank of the Indus,
and irrigating part of Dera Ghazi Khan district. They were
fourteen in number and were constructed mostly by the Mirani
chiefs and other native rulers, and were greatly improved
by Sawan Mal, governor under Ranjit Singh. Five, however,
were constructed by Baloch chiefs in 1862-63 for the use of
their tribal lands, but proving a financial failure, were
brought up by Government.

**Shahpur Inundation Canals** system was fed from the Jhelum
mainly situated in Shahpur district. About sixteen of
them were owned by private persons and six by Government,
of the latter three were classed as Imperial and two as
Provincial, while one, the Pind Dadan Khan canal in Jhelum
district, was early in the 20th century, made over to the
Municipality of Pind Dadan Khan for management. The three
imperial canals lay in the Shahpur tahsil, and were
developments of a canal dug in 1864 by Colonel Sir William
Davies, to supply water to the civil station of Shahpur.
In 1870, Government acquired this canal and added two new
canals. Of the two Provincial canals the largest was the
Ranidh, an old native canal which had fallen into disuse
and was re-opened in 1870-71. Corbynwah was constructed in
1879. Pind Dadan Khan Canal did not pay expenses, but it
supplied the town with sweet water. Most of these inundation

40. I.G.I.P., i, 217.
41. ibid, 218.
canals were expected to cease to exist as such when Shahpur branch of the Lower Jhelum Canal would be constructed.

**Muzaffargarh Canals** was an Imperial system of inundation canals in the Panjab, taking off from the left bank of the Indus and the right bank of the Chenab, and irrigated portions of Muzaffargarh district. They were for the most part constructed by the Indian rulers of the district, improved by Swaran Mal. After annexation the canals remained for many years under the management of the Deputy Commissioner, and were transferred to the Canal Department as a 'minor' work in 1880.

**The Ghaggar Canal** were an Imperial system of minor canals, taking off from the Ghaggar. Owing to the waste of water in the lakes and swamps of that river, and the insanitary condition to which the low-lying lands in the Valley below Sirsa were reduced, it was agreed between the British Government and the State of Bikaner that the Dhamir Lake about 3 miles from Sirsa, should be converted into a reservoir by the construction of masonry weir at Ctu, and that irrigation should be effected by two canals, the northern and southern, taking off from each end of the weir. The Bikaner State was to share the canal supplies and meet a proportionate part of the cost. The canals were constructed with famine labour in 1896-97, and began to irrigate in the monsoon of 1897.

**SOME GENERAL REMARKS.**—Some of the general benefits of irrigation in the Panjab have already been discussed above.

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42. ibid, 212.
43. ibid, 213.
44. ibid, 215.
There are some more points which deserve a separate note. Average outturn per acre of wheat grown on irrigated lands in the province in the year 1391 was known to be 808 lbs, or 13 bushels; and without irrigation it was 544 lbs, or 9 bushels. Judged from this test, it may be said that the extension of irrigation to 100 acres of land increased the production of the province by an amount equal to that resulting from an extension of cultivation to 48.5 acres, or nearly 50 per cent.

But the real benefit of the extension of irrigation was greater even than this. In addition to securing crops secure from the greatest danger to which they were subject in this country—drought—and thus going far to obviate the possibility of the terrible calamity of famine, it enabled the cultivator to substitute more valuable crops for those which could be grown on unirrigated lands.

Still more, the profit and loss calculation based on the total income, direct and indirect, of the year, as compared with the total capital invested up to the end of 1899-1900, in the case of major works, should a net profit of Rs.67,93,613 after paying interest.

Yet the irrigational facilities did not develop to an extent it was desired. The total area irrigated by canals in 1868-69 was 1.37 million acres; that irrigated by wells etc. was 4.61 and total unirrigated cultivated area 14.18 million acres. The figures reported in 1900-1901 were respectively; 46 5.06, 4.20 and 15. And commenting on these irrigational

45. Provincial Material Condition Report, 1894, p.3.
46. Of this 4.24 was irrigated by Government and .82 by private canals.
47. A.R., 1900-1901. See also Appendix B.
facilities in 1902, remarked Mr. J. Wilson, the Settlement Commissioner, Panjab, the irrigation in the Panjab was yet, but in its infancy. The Government were only beginning to tap the sources of water supply, above and below ground. The great perennial canals, though they absorbed almost the whole of the winter supply in some of the rivers, utilised only a portion of the monsoon supply, and the summer floods passed on to the sea in practically undiminished volume.

Meanwhile there was any amount of land available for irrigation. The area of unirrigated cultivated land in the Panjab was some 15 millions of acres, and the total culturable uncultivated area was over 21 millions of acres, making a total of 36 millions of acres. Of that area at least 20 millions of acres were commanded by the rivers as they issued from the hills and it was quite possible to add that to the 9 millions of acres already irrigated by canals and wells. Moreover, there were further untold millions of acres in the Rajputana desert which it was quite possible to irrigate from the Panjab rivers.

The Government, perhaps, could have done better in their efforts to develop the irrigational facilities of the Panjab, had they given some more attention to the inundation canals in the Panjab. But the unfortunate fact is that while lakhs of rupees were found for the extension of a perennial canal, the case of inundation canals suffered. When first, the British Government took over the country in 1849, it failed to realise the need of aiding the people to maintain

the existing inundation canals, which began to fall into disrepair and it was only after irrigation and cultivation had fallen off considerably that the necessity of Government interference was realised, and the management of these canals was taken over, first by the Deputy Commissioners and afterwards by the Irrigation Department. The clearance continued to be done by the irrigators and not at the direct expense of the State; they were looked upon not as State canals, from which the State could draw any direct profit, but as in a sense owned by the people themselves. No charge was made by Government for the use of the water, and as no direct income was received by the State from these canals, Government was very reluctant to expend any money on their extension or improvement. Their management was greatly improved in the last 30 years of the century under the control of the officers of the Irrigation Department, but it was always difficult to obtain money to spend on them, and many obviously desirable improvements thus remained in abeyance. Apparently the reason was that no Capital Account was kept for these inundation canals, and this prevented the Government of India from seeing that it was as much a profitable expenditure of capital in one case as in the other.

49. P.W.D., 1885, Civil Works, Irrigation, 34/42, B. - Col. Grey's Manual on construction & management of District Canals. Also see P.W.D., 1883, Civil Works, Irrigation, Sept., 48/50, B. These papers show how people were encouraged to develop these canals.

50. see Indian Irrigation Commission, 1902; Wilson, J, 62-65.
As for the great and constantly flowing canals, whose shaded banks were the pleasantest refuge the plains could offer one in the hot weather, the achievements of the Government were not small. Of their financial success, they were by far the best investment that the Government of India had ever made. They had largely extended the cultivation of new crops such as rice and sugar, they had given India a permanent granary, and they had opened up huge tracts of desert country to cultivation, relieving the congested districts in the process. The Chenab Canal, the latest big scheme which the Government of India had carried through, was indeed, an achievement of which the proudest Government could afford to be proud and in the opinion of a high official of the Government, "The Chenab had largely saved the Panjab". In face of all this, the excessive deliberations, with which the Government set about realising the rest of the approved canal schemes was scarcely edifying. The Jhelum project, for instance, was fully authorized in 1888, but no body seemed to know even at the close of the century, when it would be ready to hold water.

PROTECTION OF FORESTS

The part played by the forests in the economic condition of the people can hardly be exaggerated. Among the peasant's greatest needs which are fulfilled by the forests are firewood to replace manure; small timber for house and wood for implements, as well as grazing and fodder for his cattle. Forests have a marked affect on climate and on the maintenance of the water-supply. They hold together the fertile surface soil; they store water and dole it out gradually, thus preventing disastrous floods and the formation of ravines. By checking erosion they prevent good soil from being washed into the rivers and carried away to waste. Forests also directly increase the fertility of the land, being capable of forming rich vegetable mould even from mineral soil. They also provide edible fruits and roots of which the poor readily avail themselves in India, especially in the time of famine. An account must therefore be given, of what the government did to protect the forests in the Panjab.

On the annexation of the Sikh kingdom the curious dislike felt by the early administration of Northern India to State property in the soil and their short-sighted indifference to forest conservancy were already giving way to sounder views. In accordance with the instructions of Dalhousie, the Board of Administration made arrangements for

2. see also Chapter I.
the preservation and economising of the tracts of forest
and brushwood already existing. Further developments of
forests was also encouraged through various means. The
Board trusted that if due arrangements were carried out for
the cheap felling and transit of the prolific forests in
the hilly regions, and for the preservation of the brushwood
in the central plains, the country would not feel the want
of either timber or firewood. The possibility of the
exploitation of the forests as a source of State revenue was
not then considered. At different times, rules and executive
orders had been passed in order to protect the forests, but
it was only in 1865 that the first Government Forest Act
put them on the legal basis which was considered necessary
by the developed legal conscience of the period. But the
Act had certain defects the worst of which was that it drew
no distinction between the forests which required to be
closely reserved, even at the cost of more or less interference
with private rights, and those which merely needed general
control to prevent improvident working. It was only in
1878 that a workable Forest Act was produced under which
forests were broadly divided into two classes, "reserved" and
"protected". In the Panjab, "reserved" forests included the
great Himalayan tracts whence the supply of the more valuable
timbers was obtained. Another class of reserved forests
arose from the rapid denudation of the slopes of the Siwaliks.

3. Both of which abounded in the Panjab; see Chapter I.
4. L.A.M., 703 etc.
Under the Sikhs the Siwaliks had been covered with a low stunted brushwood and scattered trees which covered the sandy soil by the roots and by the grass which grew in their shade. The cool air from the shaded hillside arrested the passing clouds and produced a constant and almost regular rainfall, which, checked by the leaves of the brushwood and grass, poured down the hillside at a gentle pace, and, bringing with it all the soluble products of the decayed leaves and grass, spread its wealth-laden waters over the plains below, which thus became so renowned for their fertility as to be known as the garden of the Panjab. But when the hillsides were divided among the villages located on the hills, all this brushwood became common property open to everyone. Increasing wish for comfort and the demand for employment by the labours freed from the forced labour, increased the demand for firewood of all sorts with the result that the hillsides were in a few years stripped of everything that could by any possibility be used for that purpose. The new proprietors did little to protect their quasi-forests and the result was that, the heated air of the dry sandy soil drove off the rain clouds which passed into the upper ranges. When owing to the increasing pressure of the clouds, rain at last fell, the condensation produced by its fall on the heated soil produced a great downward rush of the heavily laden upper air, and the rain then came in torrents. No longer arrested by leaves and brushwood and grass the increasing torrent poured rapidly down the sandy slopes, bearing with it thousands of tons of sand instead of the fertilizing deposits of former days. For the first few years the effects were not apparent but gradually reports of deteriorated crops and distressed villages
and tenants unable to pay their revenue replaced the uniformly prosperous reports of the former days. The deterioration spread and the injury was not confined to the agricultural peasantry alone. The increased volume of waters thus suddenly brought down soon carried away the bridges sufficient for former times, and necessitated the construction of further expensive bridges both on the Grand Trunk Road and the Railway and even those proved insufficient when the waters submerged the country far and wide. It was to prevent these evils that the submontane areas were declared "reserved" forests. In the case of "protected" forests the Government control was exercised more particularly in the interest of the rightholders than for the general interests of the province as a whole. Under the Forest Act of 1878 a forest settlement was carried out in 1888-89 as a result of which "reserved" and "protected" forests were demarcated.

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THE AGRICULTURAL PROBLEMS

An account has been given above of the defective agricultural methods in the Panjab; of the part played by the Government, to improve them, to develop the irrigational facilities and to protect and develop the forests in the province. It is hardly necessary to say here after giving the above account, that the agriculture in the Panjab was still in a backward state. The agricultural problems were many sided and while not much could

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6. see L.A.M., 722 to 749; also Fowell,i; see also Chapter I.
be done to solve them, some more were added to their list. Only a short reference to some more important of them will here be given.

In Panjab, as in the rest of India, the agricultural population had for many centuries carried on cultivation according to traditional methods which were intimately bound up with the stereotyped social organization. There was little or no room for increased agricultural production along traditional lines, and it was extraordinarily difficult to introduce improved methods from the west to the typical small holding, which latter (the small holdings) was the problem created under British rule. The Government had been able to do little to check the evil of sub-division and fragmentation.

Agriculture was the biggest, the oldest and the most important industry in the Panjab and yet, it is unfortunate to note that, with a few honourable exceptions, it received little attention from the educated people, and the most important industry was thus only left at the mercy of the least intelligent and the uneducated.

The most discouraging thing in the history of agricultural improvements in the Panjab, however, is that although the population of the agriculturists always exceeded one half of the total population of the province, agriculture was the profession which was always degrading for a man of high caste to follow. The most industrious classes among the agriculturists

1. see Chapter XI.
were the Rainis, Sainis, Luhanas and Jats. And next to them, ranked those of Saiyads, Pathans, Banjars, Brahmans, Gujars and Raugars, placed in the order of increasing slothfulness, while last and worst was the Rajput. The latter considered ploughing an occupation beneath his dignity, and it was only necessity that made him cultivate at all: he would never plough his land himself as long as he could get any Chamar, or a low caste man to do it for him. In border districts of the North West frontier where hill tribes prevailed agriculture was generally at a discount. The Billochi tribes were indolent; they sowed the seed and took little or no care after it, leaving it to the course of nature, to produce somehow or other their yearly crop. It is obvious therefore that the production of a given area of land, not only depended upon the quality of the soil, the methods of sowing and other such things, but it also very much varied according to the class of people who cultivated it. In fact there were the problems arising out of a whole series of interconnected social institutions such as, caste, the joint Hindi Family, and the purdah system, which tended to perpetuate the existing lack of the "economic motive", and in many ways prevented the best use from being made of the adoption of scientific methods of cultivation.

Increase and concentration of an excessive population upon the soil, resulted in sub-division, indebtedness, and under-

3. see Chapters on the Social Life of the People.
4. see Indebtedness, etc., Chapter XI.
employment. It had indeed been alleged that there had been actual exhaustion of the soil, although it was established that, on the whole a balance had been established, and that deterioration was not taking place.

Still more, there was the difficulty of providing the cultivator with the capital necessary for the adoption of improved methods of cultivation. There were other difficulties which included, the difficulties experienced by a country largely dependant upon the monsoon, and hence subject to extreme seasonal fluctuations and uncertainty. The extension of the artificial irrigational facilities was rather a step towards the solution of this problem, but these facilities were yet too small. The difficulties of spreading scientific knowledge (when it had been gained) amongst lakhs of illiterate cultivators who were deservedly renowned for their love of tradition was not small. And an average cultivator being poor at arithmetic, he hardly considered the interest factor. So much so that the actual net earnings from some plats of land might easily be less than the fair interest realizable upon the sale price, so that the labour expended received no remuneration. The Panjab Press had many suggestions to make in this respect and the one that was often forwarded was that the Panjab Government should send the educated Indians to England to study the subject, so that after getting the necessary knowledge they should come back and work among the peasants. But to work among the peasants was again a task too difficult for the modern educated man to face, and this was again a problem.

5. see Chapter I.
6. see Land Improvement loans-above.
7. see Irrigation-above.
A discouraging feature in the history of agriculture under British rule was the increasing number of tenants in the Panjab which was acting adversely over it (the agriculture). The tenants generally took less care in preparing the land for crops, ploughed it less often, manured it less and used fewer implements upon it than the owners. They grew less valuable crops, especially avoiding those requiring the sinking of capital in the land; they made little or no effort at improving their fields; they kept lower type of cattle; they avoided perennials and bestowed no care on trees. They showed a stronger disinclination than even small owners to do have their children educated, and had not yet grasped the importance of organizing themselves for the more profitable conduct of their industry. The system of playing a proportion of the crop as rent (batai) accentuated most of these tendencies and militated against a proper rotation of crops, yet this system was steadily supplanting cash rents.

All these were the problems which needed solution.

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10. see Chapter XI.
11. The batai system favoured extensive cultivation, i.e. the highest gross return. It discouraged intensive cultivation owing to the law of diminishing return.