Chapter Three
AGRICULTURAL PRODUCTION WITH SPECIAL REFERENCE TO WHEAT CULTIVATION

During the early twentieth century the Punjab remained primarily an agricultural province. The agricultural production provided all the foodgrains that were consumed within the province and also yielded surplus grain and other cash crops for export. The limited factory industry that the region came to have was largely related to the processing of agricultural raw materials like cotton, sugarcane and oilseeds. The enhancement of the area and yield of the crops was made possible by the irrigation by canals, new implements and techniques. These new developments did significantly aid the alteration of the cropping pattern, and cultivation for the market gained an upper hand. Under British rule, the Punjab managed to hold a place of its own in the domestic as well as international market because of its surplus agricultural production, primarily wheat which was the principal crop of the province.

I
The province had two harvests. The first was the *rabi* or the spring harvest sown mainly in October-November and reaped in April-May. The major spring crops remained wheat, gram and barley in the early twentieth century. Wheat was grown extensively in the central Punjab plains and canal colonies. In the south-eastern and western districts it was grown to a lesser extent, but there was no tract in the Punjab where it was not sown at all
because it could be grown under varied circumstances. The most extensive wheat cultivation was done in irrigated tracts. At the turn of the century, in the Montgomery district, wheat was the chief crop on well-irrigated land. It was also the main crop on sailaab, do-fasli, and abi cultivated land. In the rain-cultivated tracts, wheat was often sown mixed with gram. Barley was sown on soils that were light, lacking in humus or moisture, or not so well cultivated. It was generally grown on sailaab and barani lands and was used extensively as a fodder. Sometimes, in addition to the grain crops, additional harvests of tobacco, melons, tea, indigo, turnips and carrots were obtained in different areas of the province.

The khari or the autumn crop was sown in June-August and harvested from early September to the end of December. The principal autumn crops were cotton, maize, sugarcane, great millet (jowar), spiked millet (bajra) and rice, with maize and rice being the principal kharif crops of the hill areas. Maize was also cultivated in the sub-

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2 SR Montgomery District, 1892-99, 17-19.

3 SR Gujrat District, 1912-16, 3.


5 Imperial Gazetteer Punjab, 60, 296-98; James Douie, The Punjab North West
montane areas which got the full force of the monsoon while rice was also grown in Hoshiarpur, Karnal and Ambala districts and throughout the Lahore and Multan divisions. Its cultivation was a difficult art as it was first sown in a nursery and then the seedlings were planted out. It was grown in all the low lands that were inundated naturally or by artificial means, when the temperature was at least 70°F and water supply abundant. Jowar was grown throughout the province and was called chari when sown as fodder. Jowar was grown throughout the province and was called chari when sown as fodder. Bajra was sown in the relatively barren areas of the south-east and north-east. Besides these, cotton and oilseeds were also widely grown. Sugarcane was an important crop in the sub-montane and central Punjab districts. It was laid from mid February to April and was cut in December, thus occupying the land for the whole year.

II

The techniques of cultivation used at the outset of British rule were traditional. The methods and implements used for ploughing were adapted to local conditions, particularly

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8 H.K. Trevaskis, Economic History (1890-1925), 331.

9 Imperial Gazetteer Punjab, 299; DG Rohtak 1910, 22; DG Jullundur 1916, 18.
the soil, capacity of the owner, overhead expenses, movability and reparability. The advantages of frequent ploughing were well understood; land was generally ploughed three or four times for the wheat crop.¹⁰

The traditional implements, usually made of wood by the local carpenters, varied for different operations. The *hal*, *munna*, *manjha* and *kur* were implements used in the first stage of ploughing. These made furrows and upturned the soil so that the lower earth could be aired. In the second stage the field was levelled. This levelling was generally done by the *karah* drawn by bullocks or *jandra* drawn by hands. After the field had been levelled and reduced to a fairly fine tilth, the *sohaga* was used so that the remaining clods could be crushed and the soil pulverized.¹¹ In 1914 an experiment on steam ploughing was conducted in the Montgomery district of the Lower Bari Doab Colony, but it did not

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¹¹ The *hal* was a beam made of wood tied to a ploughshare which was made of iron. The *munna* was heavier though similar to the *hal* and it had to be pulled. The *manjha* was a flat piece of wood with strings attached for making furrows on irrigated lands. The *kur* was a ploughshare made of a strong flat piece of wood, broad at the back and centre but gradually tapering to a point called *phala*. Into the middle of this fitted the shaft from which it took its name. The *karah* and *jandra* were large and flat earthen boards with teeth at the lower end. The *sohaga* was a heavy square log of wood with an iron pointed share and was drawn by a single yoke of oxen. Baden H. Powell, *Economic Products*, 213. See also DG Lahore 1916, 89.
prove to be successful as it needed larger holdings and was costly, besides frequent breakdowns.12

By the turn of the century the use of iron implements had become fairly widespread. An iron cap was affixed to the point of the spike of the harrow which dug the furrow.13 The Department of Agriculture, opened in 1906 at Lyallpur, had turned its attention to the improvement of implements. This work was done in two phases: namely the modification of foreign implements to suit Indian conditions, and the improvement of indigenous implements.14 In 1914-15 the Rajah Reaper was introduced and recommended for use in the canal colonies. In 1915 there were one hundred and twenty-five such reapers in use in the Chenab Colony and Lahore district. This reaper was recommended where fields were large and regular. It could cut 7.2 acres a day and the cost incurred was Re.1-8-0 per acre, whereas the cost of reaping by the traditional dantri was Rs. 7-8-0 per acre. The Rajah Reaper was sold by the Volkhart Brothers, a British firm, through their sale outlet at Lyallpur at a cost of Rs. 255 per piece.15 The Department of Agriculture set up agricultural machinery depots for distribution of implements. Approved societies also served as distribution centres for implements recommended by the Department. These

13 H.K. Trevaskis, Economic History (1890-1925), 319
15 Year Book of the Punjab Agricultural Department for the Year 1915, Lahore, 1915 (all subsequent references to Year Book of the Agricultural Department are as
societies were not to buy implements but act as agents. For example, Octavius Steel and Co. was to supply ploughs and implements up to the railway stations to be sold through the banks. Two rates generally prevailed, one for the societies and one for the individuals.\footnote{Punjab Manual of Co-operation, 2-3.} The use of more sophisticated and durable iron implements like sugarcane press, Persian wheel containers, fodder-cutter, harrow and iron plough became popular. In fact, the chaff-cutter was the first implement to be manufactured on the factory scale. The chaff-cutter was used to chop fodder crops: green wheat, \textit{senji}, and \textit{jowar}. One or two men could work it and do over six \textit{maunds} an hour as compared to 2.5 \textit{maunds} by the country chopper or \textit{toko}. This chaff-cutter was supplied by Volkhart Brothers.\footnote{Also see Gurcharan Singh Dhaliwal, \textit{Agricultural Implements Industry of the Punjab}, 1; Sukhwant Singh, ‘Agricultural Development in the Punjab(1849-1947)’, \textsl{JRH}, Volume I, GNDU, Amritsar, 1980, 91.} The number of new agricultural implements in use in the Punjab rose substantially. In 1914-15 among the implements sold in the province were 204 furrow turning ploughs, 664 meston ploughs, 186 reapers and sixty fodder-cutters. In 1922-23 portable self driven machines were brought from London for harvesting. These machines failed as they were not suited to the local conditions. In fact, the indigenous full size steam driven machines producing \textit{bhusa} remained ideal.\footnote{PAR 1922-23, 85.} Meston ploughs continued to be the most popular, though by 1922-23, only 841 pieces sold in the province were imported and 6,914 were
manufactured at Batala. These appear to have been more in use in the central Punjab with smaller holdings and greater dependence on well irrigation. In the canal colonies in the 1920s, the Chattanooga ploughs made by Chattanooga Harvest Co. of USA and stocked by Messrs, Spedding and Co. of Lahore were more popular. In 1927 Watkins Mayor and Company was established at Jullundur for the manufacture, among other things, of chaff-cutters and centrifugal pumps. According to the 1931 census, the output in the Punjab was nineteen thousand implements valued at 537 thousand rupees. By 1931 there were 6,658 meston ploughs, 4,496 cane-crushers, 12,211 chaff-cutters and 178 bar harrows. By 1946 the Punjab had more than one lakh fodder-cutters and the manufacture of these was no longer confined to Batala, but had spread to Phillaur, Goraya, Okara and Lyallpur.

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19 This could have been because the ploughs made at Batala were cheaper. For example in 1928, the English made meston plough cost Rs. 8-0-0 while the Batala made plough cost Rs. 5-8-0. By 1937 the cost of foreign ploughs rose to Rs. 8-8-0 while that of local ploughs was Rs. 6-0-0. Seasonal Notes, October 1929, Punjab Agricultural Department, 53; Ibid., 1937, 92-93.


21 M. S. Randhawa, A History of Agriculture in India, 257.

22 Census of India, 1931, Volume XVII, Delhi, 1933 (cited hereafter as Census of 1931 Punjab), 22, 35. For further detail see Appendix C.

23 M. S. Randhawa, A History of Agriculture in India, 257.
There was not much change in the pattern of use of agricultural implements. Although the fodder-cutters were the most widely used implements the ratio between the cultivators and the fodder-cutters remained the same. It was generally believed that old ploughs were better because apart from straining the oxen, the new ploughs were expensive, were not reparable locally, and were suitable for large fields only. Moreover, these exposed and dried the undersoil and were less effective in uprooting weeds. In 1940 the wooden ploughs outnumbered the iron ploughs by 3,097 per cent.

In 1914 the Department of Agriculture started manufacture of simple improved country implements at the Lyallpur Agricultural farm. Yet the 1921 census showed a noticeable absence of any local manufacture of agricultural implements, though as far back as 1904-05, Delhi, Lahore and Sialkot each had an iron foundary. By 1939, Batala emerged as the most important centre of iron implements. It was known for the manufacture of sugarcane presses, flour mills, lathes and various other articles. In 1921 it had one foundary, but by 1939 it had twenty-nine foundaries, whereas the number for the

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26 *Royal Commission on Agriculture Punjab 1927*, 191.

27 *PAR 1904-05*, 29.
entire Punjab was forty-six. These foundaries manufactured *belnas* or sugarcane presses with the aid of steam power. The localization at Batala was said to be because of the suitability of sand for making moulds for casts, availability of skilled labour, presence of subsidiary industries and, furthermore, it was a cane producing tract. After Independence, by 1949 the agricultural implements industries was localized at Batala, Tarn Taran, Goraya and Phillaur.

The tractors entered the Punjab for the first time in 1920 when the Agriculture Department purchased two tractors. The tractors run on gasoline, kerosene or diesel fuel were marketed in India during 1928-1932. In 1929 there were twenty-nine tractor owners in the Punjab, mostly in the canal colonies. These tractors were used mainly to break hard land, drive threshers, fodder-cutters and pumps. Since the Depression set in around the same period it resulted in a drastic fall in income and purchasing power of the cultivators. These conditions did not allow the use of tractors to become widespread even among the large farmers.

The sowing of the wheat crop was generally done by three methods: by scattering the seed broadcast on the surface, by dropping in the furrows by hands, or by the drill. The first method was used in thoroughly moist soils and the second in moderately moist soils.

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30 *Seasonal Notes April 1928*, Punjab Agricultural Department, 31.
The drill was employed when the surface was moderately dry. It was a hollow bamboo attached to the ploughshare by the handle and fitted with a wide wooden mouth which was kept supplied with the seed by the ploughman. The grain was put in the furrows through a tube attached to the plough handle. After sowing the field was levelled by a sohaga.

Manuring was commonly done because the Punjab soil was deficient in organic matter. Besides the sweepings of the villages, night soil and dung of sheep, goats and camels, the ashes of cowdung and nitrous earth were used for manure. Manuring was done according to the soil and crop. Sugarcane, maize and tobacco were always manured while bajra, gram, tara-mira and inferior grains were not manured. Cotton, barley and melons were manured only when manure was readily available. This applied to wheat also. For example, in the Lahore district, only twenty per cent of the whole wheat area was manured. Generally, the irrigated land was much more manured than the unirrigated land.

Weeding and hoeing were resorted to for the more valuable crops on irrigated land.

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32 The wheat seed drill was invented in mid 1920s and its sale price was fifty-five rupees per piece. PLCD 1929, 355.
33 See note 11 above.
34 Imperial Gazetteer Punjab, 58.
35 DG Lahore1916, 91.
36 H.K. Trevaskis, Economic History (1890-1925), 310.
lands. Weeds were classified according to the length of staying time as annual, biennial or perennial, or according to the season of their growth. Weeds reduced the yield of crops by robbing the plant of food and moisture.\textsuperscript{37} For example, in 1911-12 due to weeds the yield of wheat in the Punjab was 780 lbs. or 12.6 bushels per acre which was poor as compared to UK where it was thirty-three bushels.\textsuperscript{38} Common \textit{rabi} weeds were \textit{piazi}, \textit{bathu}, \textit{maina}, \textit{kangi richni}, \textit{kala-takla} and \textit{pohli}.\textsuperscript{39} To control weeds it was necessary to eradicate them. However, weeding was not done on a large scale during our period.

Experimental farms owned by the government were set up in the canal colonies to enhance wheat production. These farms were given to tenants under the half \textit{batai} system under the direct supervision of a manager assisted by skilled workers. The seeds, implements and methods of cultivation recommended by the Agricultural Department were used. At first a small farm of fifty-five acres was opened at Lyallpur in 1901, which was staffed by agricultural assistants trained at Kanpur.\textsuperscript{40} Later, in the same year, a seed

\begin{itemize}
\item \textsuperscript{37} \textit{Imperial Gazetteer Punjab}, 59. See also H.K. Trevaskis, \textit{Economic History (1890-1925)}, 312-13; Baden H. Powell, \textit{Economic Products}, 211.
\item \textsuperscript{38} \textit{Seasons and Crops Report} 1911-12, 5. One bushel was equal to 62 lbs.
\item \textsuperscript{39} \textit{Punjab Weeds and Their Control}, Punjab Agricultural College and Research Institute, Lyallpur, Lahore, 1938, 3.
\item \textsuperscript{40} In 1904 the first post of Deputy Director of Agriculture was sanctioned and an economic botanist for work in the Punjab and United Provinces was engaged and stationed at Saharanpur. \textit{Report of Royal Commission on Agriculture in India}, Central Press, Bombay, 1928, 27. Also, Kartar Singh, \textit{Studies in the Cost of Production of Crops in the Punjab}, BOEI, Publication No.33, 1934, 1.
\end{itemize}
farm of five hundred acres was opened in the Jhelum Colony. The task of this seed farm was to find suitable varieties of wheat and cotton seed.\textsuperscript{41} In 1904 the Imperial Institute of Agriculture was established at Pusa (Bihar) which was later transferred to Delhi in 1936.\textsuperscript{42}

In 1920 the Agricultural Department had seven experimental farms, fifteen district farms and nine seed farms. By 1946 the number changed to had twelve experimental farms, thirteen district farms and fourteen seed farms.\textsuperscript{43} As may be expected, these farms were canal irrigated and used techniques of intensive cultivation. In these farms the area under wheat varied from forty-five to forty-two per cent in 1931-32 and 1939-40, respectively.\textsuperscript{44} The Agricultural Department also advocated the use of chemical fertilizers but met with little success.\textsuperscript{45} Since it was not easy to convince the farmers to adopt the new methods, the Department had to take recourse to demonstrations, exhibitions, educative lectures, bulletins, besides lending the improved implements. At the initiative of the Department, the Agricultural Association and Village Farmers’ Association were organized in 1911-12 to propagate the ‘scientific agriculture’.\textsuperscript{46} In its efforts to educate the farmers the

\textsuperscript{41} PAR 1901-02, 103-4; \textit{Imperial Gazetteer Punjab}, 62.
\textsuperscript{42} PAR 1905-06, 26.
\textsuperscript{45} M.L. Darling, \textit{At Freedom’s Door}, Oxford, Bombay, 1949, 276.
\textsuperscript{46} The cultivators formed associations and agreed to follow the advice and recommendations of the Department in matters connected with agricultural improvement.
government opened the Punjab Agricultural College at Lyallpur in 1909.47

The rotation of crops was determined by irrigation, climatic conditions and system of cultivation. At the turn of the century, the system of double cropping was more prevalent in the well-irrigated areas and the canal colonies; in other parts the rotation meant that a spring crop was followed by an autumn crop and then the land lay fallow for a year.48 The most recognized rotations were maize, indigo or hemp followed by wheat; jowar followed by masur and gram; rice followed by barley, masur and peas; turnips or cotton followed by maize; maize or cotton followed by senji; senji followed by melons.49


47 To begin with, this College had diploma courses. In 1914-15 it started imparting B.Sc. course in agriculture, and later introduced M.Sc. It was equipped with chemical, botanical, entomological and other laboratories. PAR 1909-10, 45; Ibid., 1911-12,19. Also, Census of 1931 Punjab, 32.

48 From 1891-92 to 1918-19 the double cropping was 15.2 per cent, and in the period between 1919-20 and 1945-46 it was 16.3 per cent. The average proportion of fallow to generally cultivated land from 1891-92 to 1918-19 was 25.9 per cent, and from 1919-20 to 1945-46 it was 17.7 per cent. George Blyn, Agricultural Trends in India, 191-93.

The common practice in the barani tracts was wheat, gram or barley in the rabi followed in the succeeding kharif by chari, moth, mash, til or cotton with a year’s fallow. On the lands in the riverain tracts which were liable to an annual deposit of silt, the rotation was either sugarcane, a period of lying fallow and sugarcane, or sugarcane followed by wheat and again sugarcane. On well-irrigated lands the main rotation was wheat, maize, senji and sugarcane, or wheat, cotton, senji and sugarcane. Some areas of tobacco, potatoes, melons and other vegetables were also grown in the neighbourhood of the towns. In the canal colonies the chief rotation was wheat, toria, cotton or two crops of wheat in succession followed by toria and cotton. In the hills the system varied according to the nature of the soil, but the most common practice was to allow the land to lie fallow after three harvests.

Despite the new techniques of cultivation ‘scientific agriculture’ did not proceed to an appreciable extent. The traditional methods managed to hold their own even in canal colonies. This comes out rather clearly from a survey conducted in the Montgomery district in the 1930s to ascertain the success or failure of improved techniques. The villages surveyed were divided into three classes according to the

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50 DG Hisar and Loharu State 1915, 160.
52 Royal Commission on Agriculture Punjab 1927, 189.
53 B.S.Saini, Social and Economic History, 179.
54 The Tribune, Volume XLIII, 21st November, 1923, L
proportion of the following six stipulations that they fulfilled: i) use of only pure seeds; ii) conservation and use of manure; iii) sowing of crops in lines and not broadcast; iv) use of furrow turning ploughs to pulverize and aerate the soil; v) use of light harrows to keep the surface of the soil free from weeds after sowing; and vi) a carefully thought out rotation of crops. Significantly, out of the 386 villages, 303 adhered entirely to the traditional methods.\textsuperscript{55} 

III

Several modes of artificial irrigation were prevalent in the Punjab at the beginning of our period, through wells, inundation, embankments and canals. The Himalayan zone was dependent to a large extent on rain cultivation and cultivation by streams. Well-irrigation was fairly widespread in the sub-montane, central and northern districts of the Punjab during the British rule.\textsuperscript{56} The number of wells in the Punjab in 1900-01 it was 317 thousand and by 1939-40 the number had risen by six per cent. The peasant proprietors increasingly invested in wells. By 1939-40 the number of masonry wells alone in the Punjab was 335,748.\textsuperscript{57} The area under well-irrigation gradually rose from 3.7 million in 1901 to 5.3 million acres


\textsuperscript{56} \textit{Census of 1931 Punjab}, 38.

in 1940.\textsuperscript{58} With the development of irrigation by wells the trend shifted from extensive to intensive cultivation as it was not possible to irrigate large areas.

Initially, the water was lifted manually or by bullocks and camels. In the 1920s a new scheme of wells was evolved by the Agricultural College, Lyallpur, namely the lift irrigation. For this the tube-well, which was often 260 feet deep and capable of watering two to four hundred acres, was introduced. Water was raised to the surface by an engine. Use of pipes augmented water supply and increased it from hundred to three per cent. By 1931 the well boring section of the College annually bored about a thousand wells for cultivators all over the province. The limitation of this system of lift irrigation was that it could not be used extensively.\textsuperscript{59} Moreover, both tube-wells and lift systems could economically function only with electric power without which large quantities of water could not be raised. In 1902-03 hydroelectric power generated by the canal falls was used for lift irrigation in the Chenab Colony, and in 1917-18 it was used in the Bari Doab Colony.\textsuperscript{60} The electrical energy plant at Mandi in the hills was started in the 1920s.

\textsuperscript{58} Sukhwant Singh, ‘Agricultural Development in the Punjab’, 93.


\textsuperscript{60} The pioneering work in using canal falls for irrigation was done by Sir Ganga Ram. In 1902-03 he obtained 2,800 acres in the Chenab Colony on lease. Then in 1917-19 he obtained 48,650 acres on lease in the Lower Bari Doab Colony. He used pumping plants and steam power for irrigation. In 1923 he obtained a lease on 70,000 acres near Renala. It expired in 1930. Imran Ali, \textit{The Punjab Under Imperialism}, 218-20.
Lyallpur and Amritsar received electricity as late as 1926. In 1931 Sheikhupura district is reported to have thirteen electric tube-wells. On the whole, the electric tube-wells were more like 'localized experiments' that relied on small scale energy generation. By 1947, the Indian Punjab was left with only fifty-five tube-wells working with electric motors.

The construction of canals was a landmark in the economic history not only of the Punjab but also of British India. The canals made the arid lands of low yield into areas of rich harvests and the area under cultivation more than doubled (Table 3.1). The first four decades after annexation were devoted to the construction of canals in the eastern plains. The sub-montane and Salt-Range zone, with exceptions like parts of Gurdaspur

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61 PWD, Hydroelectric Branch, Administration Report for the Year, 1926-27, Lahore, 1928, 10.
62 PLCD 1932, Volume XXI, 591.
65 Table 3.1: Area under kharif and rabi from 1901 to 1944-45 in the Punjab.

<table>
<thead>
<tr>
<th>YEARS</th>
<th>Kharif (acres)</th>
<th>Rabi (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-01 to 1904-05</td>
<td>9,116,207</td>
<td>12,012,716</td>
</tr>
<tr>
<td>1905-06 to 1909-10</td>
<td>10,624,464</td>
<td>16,393,808</td>
</tr>
<tr>
<td>1910-11 to 1914-15</td>
<td>10,877,988</td>
<td>17,414,042</td>
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<tr>
<td>1915-16 to 1919-20</td>
<td>10,812,618</td>
<td>17,475,572</td>
</tr>
<tr>
<td>1920-21 to 1924-25</td>
<td>11,920,349</td>
<td>19,365,038</td>
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<tr>
<td>1925-26 to 1929-30</td>
<td>12,410,610</td>
<td>18,090,462</td>
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<td>1930-31 to 1934-35</td>
<td>13,146,940</td>
<td>18,184,356</td>
</tr>
<tr>
<td>1935-36 to 1939-40</td>
<td>13,314,930</td>
<td>17,660,382</td>
</tr>
<tr>
<td>1940-41 to 1944-45</td>
<td>13,125,663</td>
<td>17,214,922</td>
</tr>
</tbody>
</table>

Sources: Seasons and Crops Reports 1900-01 to 1944-45. For further detail see Appendix D.
and Amritsar districts, remained outside the influence of these canals. The first work in the eastern plains was the construction of the Upper Bari Doab canal from a branch of river Ravi at Madhopur. It was formally opened in 1859. The work of remodelling the Western Jumna Canal began in 1873. The construction of the Sidhnai Canal began in 1876 and it was opened in 1882, and by 1885, it was effectively being used for irrigation. The Sirhind canal was constructed in 1887. In the 1880s, the government turned its attention to the arable wastelands of the western plains and concentrated on their development in the Chaj, Rechna and Bari Doabs. The major canals in these regions were the Upper Bari Doab, Lower Bari Doab, Upper Chenab, Lower Chenab, Upper Jhelum, and Lower Jhelum. Besides these, there were over a dozen minor irrigation works, including inundation canals and embankments.\footnote{For details see, Paul W. Paustian, \textit{Canal Irrigation in the Punjab, An Economic Inquiry Relating to Certain Aspects of the Development of Canal Irrigation by the British in the Punjab}, Columbia University, New York, 1930,167;Imran Ali, \textit{The Punjab Under Imperialism}, 5.} An overview of the major canals of the Punjab from 1914-15 to 1942-43 is given (Table 3.2). The Lower Chenab canal had the largest area under irrigation, which could have been a reason for the greater immigration into this colony.

In 1887-88, the canals irrigated 2.3 million acres. With the opening of the Chenab canal in 1900-01, the area under canals rose from almost nil in 1858 to six million acres.\footnote{SR Lahore District, 1912-1916, 2; SR Gujranwala District, 1909-1913, 3.} By 1920, the canals of the North-West Frontier Province and the Punjab together irrigated 8.5 million acres. With the opening of the Triple Canal Project in 1920-21, the area rose to
ten million acres. By 1929-30, with the opening of the Sutlej Valley Project the area rose to 12.4 million acres.\textsuperscript{68} In 1939-40 the area irrigated by canals in the Punjab was 13.5 million acres.\textsuperscript{69} By 1944-45 the area under irrigation rose to 14.8 million acres which was an increase of 149 per cent (Table 3.3).\textsuperscript{70}

Settled along these canals were nine canal colonies namely Nili Bar, Sidhnai, Chunian, Upper Chenab, Upper Jhelum, Chenab and Lower Bari Doab besides the Sohag-para.\textsuperscript{71} Colonization included the selection of the suitable cultivators from numerous villages in different parts of the province and the dispatch of selected colonists to the colony. It also specified the allocation to these immigrants in villages and in holdings, with

\textsuperscript{68}Census of Punjab, 1931,38-39 ; James Douie, Punjab NWFP and Kashmir, 132.

\textsuperscript{69}Gulshan Rai, Agricultural and Trade Statistics of the British Punjab 1939-40, 4.

\textsuperscript{70}Table 3.3: Average area irrigated in the Punjab

<table>
<thead>
<tr>
<th>Years</th>
<th>Average Area (acres)</th>
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<tbody>
<tr>
<td>1900-01</td>
<td>6,000,551</td>
</tr>
<tr>
<td>1904-05</td>
<td>6,306,384</td>
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<tr>
<td>1910-11</td>
<td>7,227,042</td>
</tr>
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<td>1914-15</td>
<td>8,963,041</td>
</tr>
<tr>
<td>1920-21</td>
<td>10,273,690</td>
</tr>
<tr>
<td>1924-25</td>
<td>10,789,448</td>
</tr>
<tr>
<td>1930-31</td>
<td>12,984,260</td>
</tr>
<tr>
<td>1934-35</td>
<td>11,148,533</td>
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<tr>
<td>1940-41</td>
<td>13,587,701</td>
</tr>
<tr>
<td>1944-45</td>
<td>14,869,817</td>
</tr>
</tbody>
</table>

Sources: PWD,IBR,1900-01 to 1945-46.

\textsuperscript{71}Lower Sohag-para was constructed to bring under cultivation the extensive area of government watselands situated mainly in the eastern and central parts of Pakpattan tehsil. The Sandal Bar in the Rechna Doab was also irrigated by the Chenab canal and incorporated in the Lyallpur district. SR Montgomery District, 1892-1899, 1-4. 66
due regard to considerations of tribe, caste, religion and family relationships. There was a demarcation of villages, holdings and fields and of grazing areas. Apart from this village officers were appointed. The arrangements for securing the settlement of the village menials, whose skills and labour were indispensable to the agriculturist, and for other classes of non-agricultural population of the traders, shopkeepers, contractors and village bankers were also made. Besides these, mandi towns were founded at various centres of collection throughout the colony. Agricultrists in these colonies were from different parts of the province, but came mainly from the overcrowded central Punjab districts which had largely been the wheat producing areas. The total area colonized till 1936 was over five million acres which was more than one-sixth of the total area of the province. By 1940 it stood at ten million acres.

The expansion of canals shifted the focus from extensive to intensive cultivation of more remunerative crops. Towards the end of our period colonies in the north-west dry area became the 'granaries' of India. Between the years 1900-01 and 1944-45 the area under wheat increased by 4,771 thousand acres. During the same period the area under oilseeds, cotton, rice and sugarcane extended by 1,601, 1566, 586 and 245 thousand acres respectively. Thus, in absolute terms, even the kharif crops registered

72 PAR 1901-02, ix-x.
substantial increase. We may therefore briefly review their position before turning to the principal *rabi* crops.

IV

*Bajra*, a major *kharif* crop was the staple food of the rural Punjab and its acreage from 1901 to 1945 had increased by 167 per cent. This increased consumption of *bajra* could have resulted from the increased export and price of wheat, besides its rationing during the war years. The out-turn of *bajra* was from two to ten cwt. per acre on unirrigated and irrigated land respectively. *Maize* was grown more widely in the hill tracts and its acreage remained fairly constant over the period. It registered a marginal increase of 14.6 per cent from 1903-04 to 1944-45. Its yield varied from four to one cwt. on land dependent on rainfall and from seven to thirteen cwt. on irrigated land. *Jowar* was sown as a fodder crop. The area covered by *jowar* in the Punjab remained more or less constant and from 1901-02 to 1944-45 its acreage increased only by three per cent.see Appendix F.
The out-turn of this grain was from one to five cwt. per acre and it could be increased by one to two cwt. if irrigated. Rice was relatively unimportant throughout the period under review. Despite its short fall as compared to Indian acreage, rice cultivation in the Punjab registered an increase of eighty-seven per cent from 1901-02 to 1944-45, though it was only seven per cent of the total acreage under the kharif food grains (Graph 2).

Among the cash crops harvested in the winter, cotton was encouraged by the British and new varieties were introduced to enhance yields. The demand for cotton was great in Europe due to the textile industry. This demand was met with an increasing supply from the Punjab. There were considerable fluctuations in prices, when harvests were good in the Western countries. Despite the fluctuations, the acreage under cotton increased by 183 per cent from 1901-02 to 1944-45. During the Depression years, and subsequently when wheat was increasingly oriented towards the domestic market, regional and foreign demand for cotton was growing. At the same time, the area under indigo shrank by ninety per cent. The production of indigo lost its significance because the foreign and domestic markets were cut away by the use of synthetic indigo introduced in 1897. Another kharif cash crop, sugarcane, occupied a relatively constant area over the period under review. Its acreage registered an increase only of sixty-nine per cent from 1901-02 to

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80 Imperial Gazetteer Punjab, 60; Estimates of Area and Yield 1913-14, 16; Production of Major Foodgrains in the Punjab, 13-16.
81 For more detail see Appendix F.
1944-1945. Sugarcane cultivation needed manuring and an adequate water supply and it did best on humid soils. Its occupying the land for the whole year, could have been a disincentive for increasing its cultivation. Besides sugar imports, the absence of external market and marketing facilities for this crop also checked its growth. The internal demand increased after the tariff protection was granted in 1932. The number of sugar factories in the Punjab rose from seven in 1931 to thirty-three in 1933. This progress was arrested by the imposition of excise duty in 1934 and its subsequent enhancement in 1937. By 1939 the Punjab was left with only four sugar factories. The demand for refined sugar was never really generated as the people living in the rural areas largely consumed jaggery. This coupled with foreign competition lowered prices and consequently profits. These trends restricted the increase in acreage under sugarcane.

Several factors contributed to greater **rabi** cropping. Firstly, the **rabi** harvest had a greater degree of reliability because it was not dependent on rains. Secondly, the soil of the western Punjab was more favourable for the **rabi** crop. In fact, gradually it was

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83 For more detail see Appendix F.


noticed that the chief *kharif* crop, that is, cotton tended to exhaust the soil. The onslaught of hot weather also reduced the production of the *kharif* crop. But, the main reason for the greater acreage of the *rabi* crop was the greater demand for wheat which occupied thirty to fifty per cent of the total cropped area.\(^{86}\) Even when the area under the *kharif* during 1901-45 registered an increase of ninety per cent while the corresponding figure for the *rabi* crop was 120 per cent (Appendix D). The introduction of irrigation had a marked impact on the yield of wheat. The yield of wheat varied from two to three million tons in bad and good years, respectively. The yield on irrigated land exceeded that of the unirrigated land and showed lesser variations (Graph 3). In fact, yield on irrigated land was hundred per cent more as the unpredictability of rainfall was overcome by irrigation (Table 3.4).\(^{87}\)

Before the extension of irrigation, the sowing of large area under spring crops was


\(^{87}\) Table 3.4: Average yield of wheat in thousand tons.

<table>
<thead>
<tr>
<th>Years</th>
<th>Irrigated</th>
<th>Unirrigated</th>
<th>Total</th>
<th>Per cent of excess of irrigated over unirrigated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1906-07 to 1909-10</td>
<td>1,763</td>
<td>1,024</td>
<td>2,787</td>
<td>72</td>
</tr>
<tr>
<td>1910-11 to 1913-14</td>
<td>1,985</td>
<td>1,094</td>
<td>3,079</td>
<td>81</td>
</tr>
<tr>
<td>1915-16 to 1919-20</td>
<td>1,997</td>
<td>794</td>
<td>2,793</td>
<td>151</td>
</tr>
<tr>
<td>1922-23 to 1924-25</td>
<td>1,987</td>
<td>759</td>
<td>3,117</td>
<td>162</td>
</tr>
<tr>
<td>1925-26 to 1929-30</td>
<td>2,095</td>
<td>906</td>
<td>3,001</td>
<td>131</td>
</tr>
<tr>
<td>1930-31 to 1934-35</td>
<td>2,098</td>
<td>808</td>
<td>2,906</td>
<td>160</td>
</tr>
<tr>
<td>1935-36 to 1939-40</td>
<td>2,521</td>
<td>960</td>
<td>3,482</td>
<td>162</td>
</tr>
<tr>
<td>1940-41 to 1944-45</td>
<td>2,737</td>
<td>1,026</td>
<td>3,764</td>
<td>167</td>
</tr>
<tr>
<td>Average</td>
<td>2,148</td>
<td>921</td>
<td>3,116</td>
<td>136</td>
</tr>
</tbody>
</table>

Sources: *Seasons and Crops Reports 1907-08 to 1944-45*. (For greater detail see Appendix F).
not possible because bulk of the rain fell in the autumn season. In fact, prior to the introduction of canals the chief staple food of the rural people the Punjab was bajra. In the Gujrat district, for example, this grain covered 31.6 per cent while wheat occupied sixty per cent of the total cropped area of the district.\textsuperscript{88} The rabi crop was more widely sown than the kharif. On the irrigated land it always had a greater acreage. Substantial extension of irrigation neutralized the natural advantages of the kharif crops from the monsoon season. During the decade ending 1909-10, the irrigated area under the rabi was forty-two per cent more than the kharif. In the next decade, the rabi occupied fifty per cent more area. Even in 1930-31, when the cultivation of cotton had begun replacing wheat during the Depression, the rabi harvest still managed to hold thirty-two per cent more in terms of irrigated area (Table 3.5).\textsuperscript{89} This difference was more evident in the canal colonies. Many assessment circles even had a seventy-five to twenty-five ratio for the rabi and kharif crops. In the Chenab Colony this ratio was consistent from 1901 to 1933.

Wheat the main spring harvest of the Punjab, occupied sixty-two per cent of the total cropped rabi crop in 1901. A substantial increase in wheat acreage was recorded till the 1920s and after that the increase was at a declining rate. One reason for this could

\textsuperscript{88} SR Gujrat District, 1929, 13.

\textsuperscript{89} Table 3.5: Average irrigated area under kharif and rabi crops in the Punjab.

<table>
<thead>
<tr>
<th>Years</th>
<th>Kharif (a)</th>
<th>Rabi (b)</th>
<th>Per cent excess of (b) over (a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900-01 to 1909-10</td>
<td>2,287,846</td>
<td>3,245,123</td>
<td>42</td>
</tr>
<tr>
<td>1910-11 to 1919-20</td>
<td>3,153,676</td>
<td>4,721,960</td>
<td>50</td>
</tr>
<tr>
<td>1920-21 to 1929-30</td>
<td>4,656,317</td>
<td>6,133,636</td>
<td>32</td>
</tr>
<tr>
<td>1930-31 to 1937-38</td>
<td>5,424,198</td>
<td>6,157,517</td>
<td>14</td>
</tr>
</tbody>
</table>

Sources: PWD, IBR 1900-01 to 1937-38.
probably be that till the 1920s extensive cultivation dominated the scene and, once most of the available land was used up, a need arose for intensive cultivation of which we do not have much evidence in the pre-Independence Punjab. On the whole, between 1901-02 and 1944-45, the irrigated area under wheat registered an increase of fifty-seven per cent and the increase of unirrigated area was 139 per cent (Graph 4). This increase can be said to be relative to the international conditions and domestic market which induced the cultivator to either sow wheat or other crops as per the demand. As may be expected a priori, during periods of higher prices the area under wheat increased and vice versa. Despite the Depression and switch over to some other crops, the area under wheat constituted more than half the total agricultural area of the rabi crop throughout our period (Graph 5).

Of the remaining spring crops, the next in importance was gram. The area under gram rose almost constantly over the period which shows that gram was a fairly widely consumed grain. In fact, when wheat began commanding a place in the international market, it was sold to get cash and gram was eaten instead of wheat. Often wheat was sown mixed with gram. From 1903-04 to 1944-45 gram registered an increase of seventy-seven per cent in terms of acreage. This grain was also exported from the Punjab though in relatively much smaller quantities. Its yield varied from four to nine cwt. on unirrigated land which could go up to eleven cwt. on irrigated land.91

90 For greater detail see Appendix F.
91 Imperial Gazetteer Punjab, 60; Estimates of Area and Yield 1920-21, 24. For greater detail see Appendix F.
The area under oilseeds also increased during the early twentieth century. The principal oilseeds were linseed, rapeseed and mustard. The area under linseed registered an increase of thirty per cent from 1901-02 and 1944-45. During the same period the area under rapeseed and mustard registered an increase of eighty-five per cent. Cumulatively, oilseeds formed an important part of exports from the Punjab and this resulted in an increased acreage by fifty-six per cent from 1901-02 to 1944-45.92

In comparative terms, barley did not acquire much significance during the period under review, barring a few years. Its acreage more than doubled during the quinquennium ending 1911-12. This increase was generated by a demand in the international market when barley production in Europe failed on account of poor harvests.93 From 1901-02 to 1944-45 the area under barley gradually rose by forty-seven per cent.94 The yield of barley on irrigated land was eleven cwt. while on unirrigated land it varied from three to nine cwt.95

After partition in 1947, fifty-four and sixty-two per cent of the kharif and rabi area respectively went to Pakistan. Seventy per cent of the wheat growing area went to Pakistan which included seventy-two per cent of the irrigated and sixty-seven per cent of

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92 For more detail see Appendix F.
93 PAR 1912-13, 50.
94 For more detail see Appendix F.
95 Imperial Gazetteer Punjab, 60; Estimates of Area and Yield 1920-21, 15-16.

For more information see Appendix F.
The wheat traditionally grown in the Punjab belonged to three species namely, *Triticum Durum*, *Triticum Compactum* and *Triticum Vulgare*. It may also be mentioned that the pioneering work in the classification of wheat was done by the Imperial Economic Botanist at Pusa, by the name of Howard, who was invited in 1908 by the Punjab Agricultural Department to classify the wheat grown in the province. It was he who divided the Punjab wheat into the above three groups, to be further classified into twenty main varieties depending upon length of the stalk and the awns, and colour and shape of the seed. The *Durum* species had bearded ears and tall straw. It required fertile land and copious water supply and was grown mostly in well-irrigated or sub-montane districts. The grains were long and fetched a premium. The grains of the *Compactum* species were small, rounded and beardless and the straw was short and stiff. The *Vulgare* species grains were of medium size and white, amber or red in colour.

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The bulk of the Punjab wheat came under this last species and was widely used in flour mills. It was grown extensively on irrigated and *barani* lands. The second was grown in the south-western districts, but it did not enter export trade, and the area under it diminished gradually. The first variety was cultivated widely in Sialkot and Gujranwala districts, but was cultivated on a lesser scale in Gujrat, Shahpur and Gurdaspur districts. Bulk of the wheat produced in Sialkot was utilized for local consumption, whereas wheat from Gujranwala was exported, among other places, to Karachi and Bombay.

There also were some generally understood commercial descriptions of different types of wheat in the Punjab. *Sharbati* was semi-hard or hard white wheat produced from improved varieties; it denoted clear, brownish-yellow colour. *Dara* was the term used to denote a heap (presumably, a *dhara*). Its nearest equivalent was fair average quality; it had no fixed composition and its character depended on quality characteristics of wheat grown in a particular area. *Khara Dara* signified a preponderance of white grains, whereas *Lal Dara* denoted a preponderance of red grains. *Pissia* was the soft white wheat, while *Lal Kanak* was the red-hard wheat of the canal colonies.

As a result of the plant-breeding researches carried out at the government experimental farms at Hansi, Lyallpur, Gurdaspur and Sargodha, a number of new varieties of wheat, giving improved yields in quality and quantity, were evolved. First,  

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101 *PAR 1918-19*, 41.
the seeds were tried on experimental farms, and then on demonstration farms. If the seeds proved to be successful then they were tried on the farmers’ own land. The seeds which stood all the tests successfully were multiplied in the seed farms and then made available for market cultivation.\textsuperscript{102} In 1905, thirty-six \textit{maunds} of seeds from Lyallpur Agricultural College were distributed to farmers.\textsuperscript{103} The most popular varieties were Punjab-11 and 8-A. In 1912-13, 227 \textit{maunds} of Punjab-11 wheat from the College was given to the farmers.\textsuperscript{104} The Punjab-11 was officially given out by the Agricultural Department to the cultivators in 1913.\textsuperscript{105} In the years 1913-19 it fetched a premium of Rs. 0-2-0 per \textit{maund}.\textsuperscript{106} This variety was more popular in the irrigated areas and was being pushed in the canal colonies.\textsuperscript{107} In 1916-17 it covered an area of ninety-seven thousand acres and

\textsuperscript{102} \textit{Royal Commission on Agriculture Punjab 1927}, 177.

\textsuperscript{103} \textit{Report on the Operations of the Department of Agriculture 1905}, 19.

\textsuperscript{104} \textit{Royal Commission on Agriculture Punjab 1927}, 170.

\textsuperscript{105} Punjab-11 was a bearded wheat with amber coloured grains. No. 9-D was a bearded wheat with dark red grain strong straw and had a good yield on irrigated land. Punjab-13 was a bearded wheat with red grain and good yield in good seasons specially on \textit{barani} land. Punjab-14 was a bearded wheat with red grain and good yield on \textit{barani} land. Punjab-17 was a beardless white with amber coloured grains. \textit{YRPAD 1915}, 46; \textit{Report on the Operations of the Department of Agriculture 1924}, 23.

\textsuperscript{106} I.D. Mahendru, \textit{Some Factors Affecting the Price of Wheat in the Punjab}, 27.

by 1924-25 the area rose to one million acres. But by 1936-37 its acreage had fallen to twenty-one thousand acres having been completely superseded by the 8-A variety. This particular variety proved to be superior to Punjab-11 in out-turn, rust resistance, standing power and quality of grain. The tillering capacity of 8-A was higher. It was issued for general cultivation for the first time in 1919 and by 1925-26 it had established its superiority over Punjab-11.

As is evident from Table 3.6 the area under Punjab-11 increased rapidly during 1924-25 and then decreased just as fast whereas type 8-A did not find favour at its inception but the area under it increased steadily. In fact, the area under 8-A exceeded the area under Punjab-11 by 3,279 thousand acres by 1936-37. Taking up the other popular varieties, the 9-D evolved in 1932 occupied the third place. It was an early earing wheat and did well on light and poor soil and could be sown late. Its hard white grain was suited for sowing in harani areas. In 1934-35 the area under 9-D was 20,739 acres.


111 9-D was a full bearded type with awns, white felted chaff and amber plump
In 1934, two more hard varieties of wheat, Cross-518 and Cross-591, were evolved by hybridization. The 518 was sown on rich irrigated lands. It was a fully bearded but comparatively short-awned, amber grained wheat, with white densely felted chaff and greyish black awns. The straw was short and stiff. Its yield was five and a half maunds more than that of 8-A. It was officially released in August 1930 and in 1931-32 it fetched a premium of Re. 0-0-6 per maund over 8-A. It occupied an area of 4,078 acres in 1934-35. By 1940 Cross-518 covered more than one quarter of a million acres. These wheats were cultivated not only in the Punjab, North West Frontier Provinces and Sind but also crossed frontiers and reached as far as Canada and Mexico.

The Cross-591 could be sown under average conditions. It was a fully bearded, amber grained wheat with rather densely felted chaff and greyish grains. It was officially introduced in September 1934 but as early as 1931-32 it fetched a premium of Rs. 0-1-6 per maund. In 1934-35 it was grown on 1,787 acres, and by 1940, it covered three million acres. Later some other varieties were developed. On the whole, the demand for

grains. It was heavy strawed and unfit for lodging. It was liable to stem rust. I.D Mahendru, Some Factors Affecting Price of Wheat in the Punjab, 6-7.

113 I.D. Mahendru, Some Factors Affecting the Price of Wheat in the Punjab, 7.
114 Report on the Operations of the Department of Agriculture 1940, 82-83.
115 M.S. Randhawa, A History of Agriculture in India, 345.
117 For example, C-228, C-250 and C-217 were the new varieties developed.
improved seed increased eightfold with the passage of time (Table 3.7).  

The use of the improved varieties was greater in the canal colonies as compared to the old districts as much because of the investment and interest of the British as because in these colonies experiments and new varieties were adopted more willingly and extensively by the enterprising peasant proprietors. The area under improved varieties continued to increase in the Punjab as a whole. In 1923-24 the improved varieties covered ten per cent of the total area under wheat in the Punjab. In 1925 alone, the use of the improved varieties of wheat yielded an income of eighty-four lakh rupees. By 1940-41 it had risen to sixty-three per cent (Table 3.8). Amongst these 8-A remained the most popular even

Report on the Operations of the Department of Agriculture 1940, 82-83; M.S. Randhawa, A History of Agriculture in India, 345

Table 3.7: Demand for improved seeds in the Punjab

<table>
<thead>
<tr>
<th>Year</th>
<th>Seeds (Maunds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1932-33</td>
<td>25,375</td>
</tr>
<tr>
<td>1933-34</td>
<td>88,150</td>
</tr>
<tr>
<td>1934-35</td>
<td>101,200</td>
</tr>
<tr>
<td>1935-36</td>
<td>154,000</td>
</tr>
<tr>
<td>1936-37</td>
<td>220,500</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Seeds (Maunds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1937-38</td>
<td>278,000</td>
</tr>
<tr>
<td>1938-39</td>
<td>248,500</td>
</tr>
<tr>
<td>1939-40</td>
<td>216,600</td>
</tr>
<tr>
<td>1940-41</td>
<td>205,600</td>
</tr>
</tbody>
</table>


Table 3.8: Area under improved wheat and total area under wheat

<table>
<thead>
<tr>
<th>Year</th>
<th>Improved Wheat (a)</th>
<th>Total Area (b)</th>
<th>Percentage of(a) over (b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1923-24</td>
<td>1,001,865</td>
<td>9,671,513</td>
<td>10.3</td>
</tr>
<tr>
<td>1925-26</td>
<td>1,500,000</td>
<td>9,481,990</td>
<td>15.8</td>
</tr>
<tr>
<td>1928-29</td>
<td>2,100,000</td>
<td>9,968,964</td>
<td>21.0</td>
</tr>
<tr>
<td>1930-31</td>
<td>2,500,000</td>
<td>9,287,145</td>
<td>26.9</td>
</tr>
<tr>
<td>1933-34</td>
<td>4,168,000</td>
<td>9,772,860</td>
<td>42.6</td>
</tr>
<tr>
<td>1940-41</td>
<td>6,250,000</td>
<td>9,884,202</td>
<td>63.2</td>
</tr>
</tbody>
</table>

after Independence. Commercially too the 8-A was the most important as being a hard wheat variety, its demand in the international market was greater.\textsuperscript{121}

These high yielding varieties with controlled doses of fertilizers and irrigation -- more by the owner-cultivators in central Punjab and the peasant and safedposh grantees in the canal colonies -- enhanced yields to keep pace with the fast growing market in wheat.\textsuperscript{122} A well developed trading network stimulated largely by the emergence of rail-borne traffic, provided for the export of wheat to other parts of the country and overseas markets and made the Punjab one of the foremost region of market oriented agriculture in South Asia.

\textsuperscript{121} Wheat Studies of the Food Research Institute, Volume XIV, 1937-38, Stanford University, California, 43.

\textsuperscript{122} Imran Ali, The Punjab Under Imperialism, 19-21, 27. See also Tom G. Kessinger, Vilyatpur, 123.