

# THE FUTURE WHEAT SUPPLY OF THE UNITED STATES.

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Because of the scarcity of wheat and accompanying high prices in recent years, there has been considerable discussion of the question of future wheat production in this country. Doubts have even been expressed by some that we shall be able much longer to furnish our own people with sufficient wheat for bread. Others, on the contrary, contend that high prices will induce a revival of interest in wheat cultivation, and that a large acreage in the older States, devoted to other crops because of previous low prices of wheat, will be again planted with that cereal. This, together with the possible increase of acreage in the undeveloped lands of western States and the increase in acre yields likely to follow improvements in the crop and in methods of culture, will, it is claimed, enable us to maintain an abundant supply for an indefinite time.

In this article the attempt is made to reach as near as possible the proper viewpoint of the question, after an analysis of recent conditions as to production, export, home consumption, etc., and comparison of these with future probabilities in the same lines. Analogies are also drawn from conditions now existing in other countries.<sup>a</sup>

## RECENT CONDITIONS.

Evidently any calculation of future wheat production and its relation to consumption must be based chiefly upon inferences that may be drawn from present and past conditions, it being a generally accepted proposition that the average trend of things in future will be about the same over a considerable period of time as in the past.

The total land area of the United States is 1,900,947,200 acres. Ten years ago considerably less than half of this area was included in farms, a little more than one-fifth of the area was improved, and less than 3 per cent was devoted to wheat culture.

In the following table are given the total farm acreage, the improved farm acreage, and the wheat acreage of the United States for each census year that they were determined from 1850 to 1900, also the percentage that each of these comprises of the total land area. The facts are taken from the Statistical Abstract of the United States

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<sup>a</sup> The writer acknowledges great assistance rendered by officials of the Bureau of Statistics.

for 1908, pages 119-121, except wheat acreages, which are calculated as 10-year averages from regular reports of the Bureau of Statistics of this Department.

Year.	Farms.		Improved.		Wheat.	
	Acreage.	Percent- age.	Acreage.	Percent- age.	Acreage.	Percent- age.
1900.....	838,591,774	44.1	414,498,487	21.8	41,971,000	2.2
1890.....	623,218,619	32.8	357,616,755	18.8	37,275,000	2.0
1880.....	536,081,835	28.2	284,771,042	15.0	31,912,000	1.7
1870.....	407,735,041	21.4	188,921,099	9.9	18,386,000	1.0
1860.....	407,212,538	21.4	163,110,720	8.6	15,424,496	.8
1850.....	293,560,614	15.4	113,032,614	6.0	.....	.....

<sup>a</sup> This sum is the acreage for 1866.

The total farm acreage is the total area in farms, whether in actual cultivation or not, and includes often large stock ranges.

As the wheat acreage is obtained yearly and varies considerably, it is considered that 10-year averages show more accurately its relation to farm acreage than the wheat acreage of the census years themselves. Therefore, for the census years of 1880, 1890, and 1900, averages for the periods 1874-1883, 1884-1893, and 1894-1903, respectively, are employed, and for 1870 the average for the period of 1866-1871, as the figures for wheat acreage in this period do not go back farther than 1866.

The figures of the table show a remarkable expansion in both the improved farm area and the wheat acreage. The question now is, to what extent can we expect such increases to continue.

We have no definite statement of farm acreage since 1900. We have, however, a statement for the period 1900-1908 of the yearly "disposal of public lands for cash." These public lands include original homestead entries as much the larger portion, timber-culture claims, lands obtained with agricultural college and other scrip and under military bounty land warrants, and lands (a comparatively small amount) selected by States and railroads. We may therefore assume these lands to make up much the largest portion of the total additions to farm acreage. The total amount of these lands up to 1908 was 164,159,599 acres. These figures, of course, exclude public lands similarly disposed of in Texas, which, according to the reports of the commissioner of the Texas general land office, amounted to 22,470,856 acres from September 1, 1900, to August 31, 1908. If we then consider the further amounts of such lands added after 1908, and the enormous tracts of railroad lands sold to new settlers in recent years, particularly in Kansas, Nebraska, and Colorado, it appears that at least 200,000,000 acres must have been added to the

farm area from 1900 to the present time. This would bring the total farm area up almost to 1,050,000,000 acres, making the percentage of the total land area in farms in 1910 approximately 55 per cent.

The area in cultivated crops in 1909, as reported by the Bureau of Statistics of this Department, was about 10 per cent greater than ten years ago. It is therefore reasonable to believe that at the present time nearly 25 per cent of the total land area is improved. The present average wheat acreage is about 46,500,000 acres, or 2.4 per cent of the total land area.

Up to 1910 these different areas have, therefore, all increased greatly, and apparently at the same rate as in the preceding decade.

It is of interest to note also the percentage of the farm area employed for wheat in succeeding census years. In 1870 the average wheat acreage was 4.5 per cent of the farm area, in 1880 it was almost 6 per cent, in 1890 it was practically the same as in 1880, in 1900 it was 5 per cent, and at the present time approximately 4.4 per cent. The percentage remains almost the same as in 1870, but stood much higher from 1880 to 1890, during a period of unusual expansion in wheat acreage, and fell again in 1900 and later years, during a period of proportionally greater expansion in farm area. This percentage is likely to get larger soon, as the farm area, of course, can not increase indefinitely and is likely even, during the next decade, to increase less than heretofore. On the other hand, there has apparently already begun a considerable expansion in wheat area.

#### PROBABLE FUTURE WHEAT ACREAGE.

The trend of all these areas, it is seen, is constantly toward an increase, though, as stated, the rate of increase of farm area will hereafter become much less. The percentage of farm area improved and that devoted to wheat will become correspondingly greater, until the farm area finally reaches its limit. What is this limit likely to be? To be more definite, what will be the probable farm area in 1950?

According to the Report of the General Land Office for 1908 there remained at that time, exclusive of Alaska, 386,873,787 acres of government lands "unappropriated and unreserved." Probably 75,000,000 to 100,000,000 acres of these lands will be included in farms. There will be other additions from present Indian reservations,<sup>a</sup> from western Texas, from the reclamation of swamp lands, etc. Add to these the natural expansion of farm area in the older

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<sup>a</sup> At the close of the fiscal year 1908 there were 52,013,010 acres of Indian lands, "unallotted and unreserved." See Report of Commissioner of Indian Affairs, 1908, pp. 149-164. These are generally better than the usual run of western lands.

States, which amount will hereafter be proportionally greater than heretofore, and it seems reasonable to expect nearly 300,000,000 acres additional farm area in the next forty years, making a total amount of over 1,300,000,000 acres, or about 70 per cent of the total land area.

The improved farm area has heretofore been about half of the total farm area, but will hereafter increase more rapidly than the latter. It should therefore reach at least 40 per cent of the total land area, or about 760,000,000 acres.

As before stated, the present wheat acreage appears to be approximately 4.4 per cent of the farm area, a slightly less proportion than in 1870. By 1950 the proportion should easily reach 6 per cent, as that rate was attained before in 1880 to 1890, and the farm area will hereafter increase less rapidly. That percentage will allow a wheat acreage of about 80,000,000 acres. Figure 4 illustrates about the conditions that should exist by 1950, based upon conservative estimates.

#### ANALOGIES FROM FOREIGN COUNTRIES.

Some confirmation of the preceding estimates may be secured, reasoning by analogy from conditions now existing in other countries.

In the accompanying table are given the total land area, the wheat acreage, and the percentage of total land area in wheat in a number of other important countries. The wheat acreage in each case is an average for ten years, 1899-1908.

Country.	Total acres.	In wheat.	Percent- age in wheat.
Great Britain.....	<sup>a</sup> 56,787,082	1,745,000	3.1
Austria.....	74,102,001	2,742,000	3.7
Hungary.....	80,979,000	9,044,000	11.2
Belgium.....	7,277,000	<sup>b</sup> 390,000	5.1
Bulgaria.....	23,797,000	1,990,000	8.4
Denmark.....	<sup>c</sup> 9,500,000	90,000	1.0
France.....	130,374,000	16,100,000	12.3
Germany.....	133,585,000	4,610,000	3.5
Italy.....	<sup>a</sup> 70,787,000	11,660,000	16.5
Japan.....	94,499,000	1,100,000	1.2
Netherlands.....	8,038,000	140,000	1.8
Roumania.....	32,444,191	4,690,000	14.5
Russia in Europe (exclusive of Poland).....	1,244,367,000	48,550,000	3.9
Poland.....	31,451,000	1,240,000	3.9
Servia.....	11,931,000	895,000	7.5
Spain.....	124,616,000	9,100,000	7.3
United States (continental).....	1,900,947,200	46,500,000	2.4
Argentina.....	714,918,000	14,000,000	1.9
British India.....	556,599,000	27,000,000	4.9
Manitoba.....	41,169,000	<sup>d</sup> 2,700,000	6.6

<sup>a</sup> Area including water.

<sup>b</sup> 1904, 1905, 1906 averages.

<sup>c</sup> Area exclusive of lakes and rivers.

<sup>d</sup> Approximately.

It is seen that the percentage of the total land area in wheat runs from 1 per cent in case of Denmark to even 16.5 per cent in case of Italy. It would require only about 4.2 per cent of the total land area in the United States to give us 80,000,000 acres of wheat. Yet Spain, which is considerably mountainous, is now

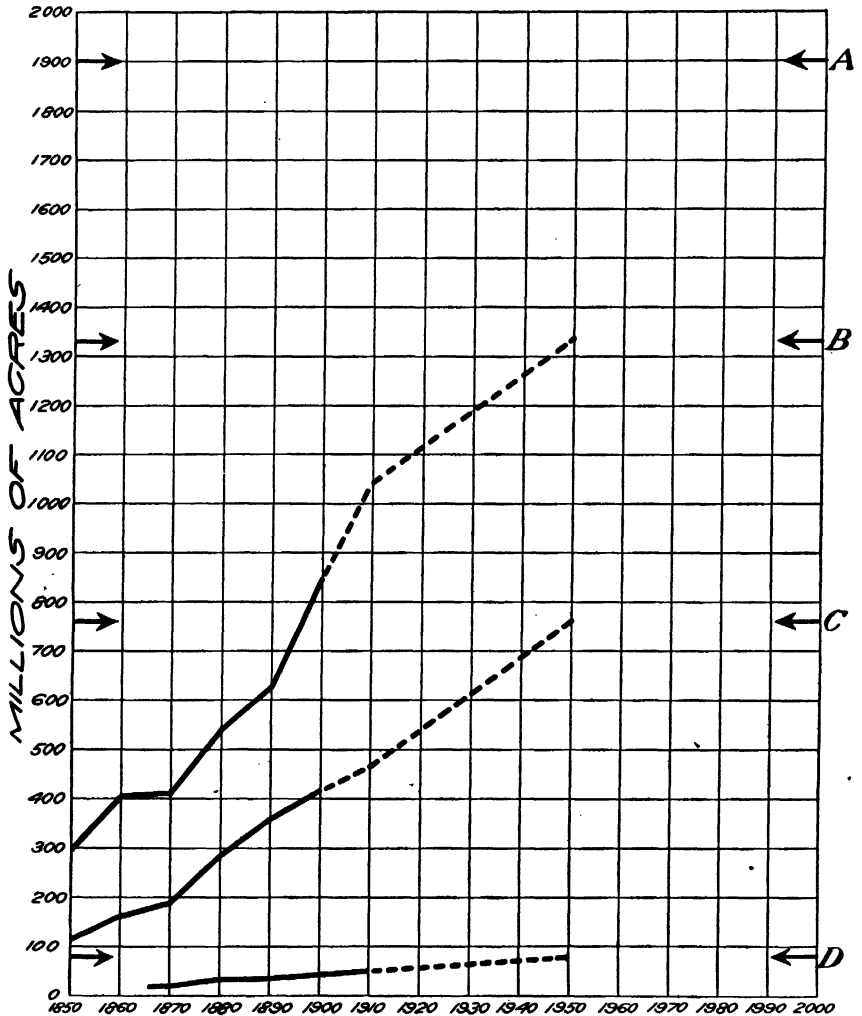


FIG. 4.—Diagram showing increases in farm area (upper line), in improved farm area (middle line), and in wheat acreage (lower line) that may occur by 1950, conservatively estimated. A=absolute limit of land area; B=probable farm area in 1950; C=probable improved farm area in 1950; D=probable wheat acreage in 1950.

employing 7.3 per cent, while even in Germany, where there is much waste land, the present proportion is 3.5 per cent, though rye is the really important crop, comprising 10 per cent of the total area. Some of the countries noted for wheat growing, such as Russia, Hungary, Roumania, Bulgaria, France, and Italy, employ from 3.9

to 16.5 per cent of their total area for wheat. Even in Great Britain, where there is the most intensive cultivation, wheat is grown on 3.1 per cent of the total area.

In England about 75 per cent of the land area is cultivated. In Germany 48.7 per cent is arable, while in France 85 per cent is productive. In face of these facts it certainly seems very conservative to estimate 70 per cent of our total area as the area in farms and 40 per cent as the improved farm area in 1950.<sup>a</sup>

It may be added that in Hungary, one of the important wheat countries, but much older than our own, the wheat acreage has increased even since 1884 from 6,797,800 acres to 9,474,415 acres in 1908. In Austria proper during the same period the increase was from 2,735,600 acres to 2,959,557 acres. In total European Russia the acreage has increased from 39,711,200 acres in 1894 to 62,766,700 acres in 1908. In three other smaller countries wheat acreage increases have been as follows: <sup>b</sup> Roumania, 2,903,700 acres (1886) to 4,452,000 acres (1908); Bulgaria, 2,167,200 acres (1897) to 2,422,700 acres (1908); Servia, 783,500 acres (1893) to 931,300 acres (1908).

#### SUPPLY AND DEMAND, OR THE FACTOR OF PROFIT.

In estimates of this kind, forecasting probable production, it is of course taken for granted that there will be sufficient incentive in the way of demand and therefore profit, to keep up the movement of progressive increases. The most decisive question, after all, is simply one of supply and demand. The farmer, like the man in any other business, will grow what pays best. In 1908 to some a wheat shortage seemed very near. But similar periods have occurred before and have been followed by periods of wheat expansion, the higher prices naturally inducing a larger acreage. Here, again, a review of past conditions will show what is probable in the future.

To present the subject clearly, figure 5 is exhibited, showing the course of wheat acreage and prices in the United States for thirty-nine years, from 1870 to 1908, inclusive.<sup>c</sup> The upper line illustrates the acreage, indicated in millions of acres, beginning at very nearly 19,000,000 acres for 1870 and ending at approximately 46,500,000 acres for 1908. The lower line shows the average farm price per bushel annually on December 1 in cents, beginning at approximately 94½ cents for 1870 and ending at very nearly 93 cents for 1908. From left to right each space represents one year in time.

<sup>a</sup> The above data were published in agricultural statistics, 1907, of the Board of Agriculture and Fisheries, vol. 42, pt. 4, Colonial and Foreign Statistics, London, 1908.

<sup>b</sup> These facts were taken from Bulletin 68, Bureau of Statistics, U. S. Dept. of Agriculture, entitled "Cereal Production of Europe," by Frank R. Rutter.

<sup>c</sup> The facts were obtained from the Yearbook, U. S. Dept. of Agriculture, 1908, p. 608.

Two things of importance may be noted in a general survey of this sheet: (1) That the line of acreages exhibits four rather clearly defined periods: (a) A rather rapid trend upward from 1870 to 1880; (b) a steady maintenance of high acreages from 1881 to 1892; (c) a shorter maintenance of low acreages from 1893 to 1896; and (d) a trend upward again from 1897 to 1908; (2) that the range of prices shows an interesting and rather close relation to the changes in acreage, both as to periods and even in the sharper variations in single years.

It is extremely interesting to note how the prices go down as the acreages go up, and vice versa, though this is the perfectly natural thing to expect. There are a few apparent exceptions, and, as usual, these exceptions are more interesting than the rule. In 1881, why should the price rise so high with only a very slight decrease in acreage? On the other hand, in 1898, 1901, and 1906 the increases in acreage are not at all sufficient to justify the great drop in prices, while in the period 1888-1892 the acreage variations are not in accord with the extreme price variations. The simple explanation is that while prices influence acreage, it is production rather than acreage that influences prices, and occasionally, as in these instances, production is not proportional to acreage. In each of these cases, by dividing the actual production by the average acre yield for five years, with the year in question as the middle year of the five, the normal acreage that should have been necessary for this production at the average acre yield is obtained, represented by the broken lines in figure 5. In 1881, for example, with an acreage almost the same as the preceding year, the production fell over 110,000,000 bushels—from 498,000,000 to 383,000,000—the acre yield dropping from 13.1 to 10.2 bushels. The broken lines extending upward indicate high acre yields—over 15 bushels in all cases except that of 1889. The highest total yield was in 1901; 748,460,218 bushels, this and the 1906 yield being the only yields going beyond 700,000,000 bushels. In 1906 we reached also our highest acre yield, 15.5 bushels.

Again, in some instances the acreage and price variations, though apparently interdependent, do not occur the same year. This fact may probably be explained as follows: Several good crops having occurred, the farmer holds his wheat in spite of fair prices, expecting still better, so that an unusual amount is delivered the following year, thus affecting prices of that year instead of the year the crop was grown.

A period of remarkable conditions is that of 1892-1896. For many years a steady high production had been maintained until, in 1892, accumulations beyond the needs of the people assumed tidal-wave proportions and inundated the country with a large surplus of wheat, followed by low prices. This is at least a partial explanation of the great depression in wheat during this period. However, good crops

in other countries permitted no relief through export, a matter perhaps of equal importance. Not only were low acreages not accompanied by high prices, but by extremely low prices, the lowest in our history, 49.1 cents being reached in 1894. In the light of recent wheat scarcity and high prices, it is of interest to look back at these conditions. Wheat became a drug on the market, and in Kansas it was estimated that 4,000,000 bushels of the 1893 crop, or almost one-sixth, were fed to farm animals. It was seriously considered whether "with corn and wheat approximating the same price per bushel it is unprofit-

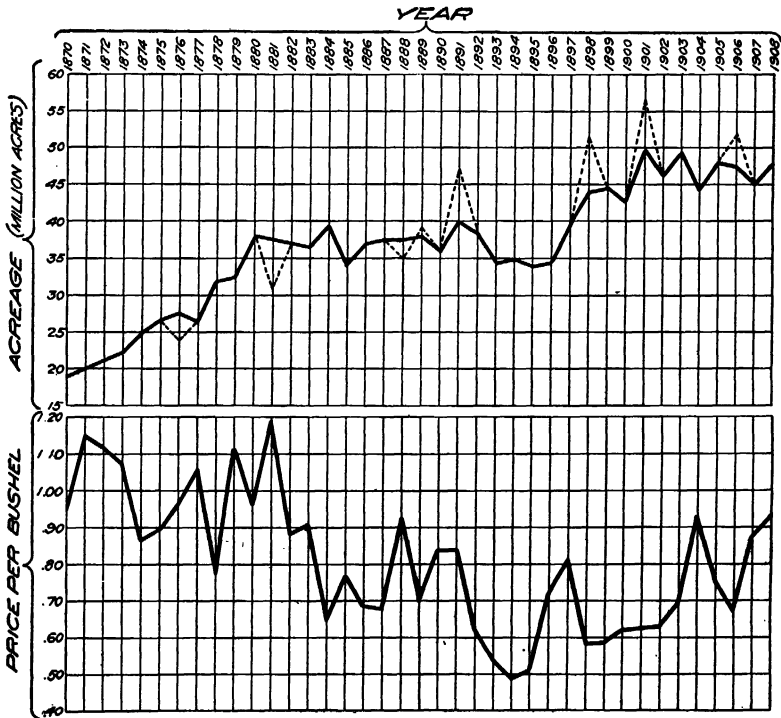


FIG. 5.—Diagram showing variations in wheat acreage and prices for 39 years, from 1870 to 1908. The upper line represents the trend of wheat acreage (in millions of acres) and the lower that of prices (in cents per bushel). From left to right are shown the different years.

able or wicked to feed the wheat." It was quite commonly believed in the Great Plains States, where acre yields are usually low, that wheat growing would never again be profitable.

This period closed only thirteen years ago, and during the preceding period the highest ratio of wheat acreage to farm acreage was attained. Now the trend in acreage is again upward and will continue, no doubt, through another period of wheat expansion. Recent high prices in



the face of big crops (in this country) have probably excited fully as much comment as the low prices in the face of low acreages in 1892 to 1896.<sup>a</sup>

INCREASE OF WHEAT ACREAGE IN OLDER STATES.

It is a natural inference from the preceding discussion that there must occasionally be a considerable increase in wheat acreage hereafter within the present farm area, and particularly in the older States, to allow sufficient production to satisfy unusual demands that will arise. Even since beginning the preparation of this article, a report from the Bureau of Statistics shows that just such an increase in acreage has occurred. This report states an increase in the winter-wheat acreage alone for the season of 1910 of almost 2,500,000 acres over that of last year, the increase being largely in the States east of the Mississippi River.

From further data, partly furnished by the Bureau of Statistics, it is found that in Maryland the proportion of total land area devoted to wheat has increased from 7.5 per cent for the period 1870-1879 to 12.3 per cent for the period 1900-1909. Here follows a tabulation of all States whose percentage of total area devoted to wheat has increased between the same periods above mentioned, with the percentages for each period:

State.	Proportion of total area in wheat.		State.	Proportion of total area in wheat.	
	1870-1879.	1900-1909.		1870-1879.	1900-1909.
	<i>Per cent.</i>	<i>Per cent.</i>		<i>Per cent.</i>	<i>Per cent.</i>
Maine.....	0.1	0.6	Minnesota.....	3.3	10.5
Pennsylvania.....	4.4	5.6	Missouri.....	2.7	4.5
Delaware.....	5.0	8.9	Nebraska.....	.9	5.1
Maryland.....	7.5	12.3	Kansas.....	1.5	10.5
West Virginia.....	1.9	2.5	Kentucky.....	2.7	3.1
North Carolina.....	1.4	1.9	Texas.....	.1	.6
South Carolina.....	.6	1.5	Arkansas.....	.4	.7
Ohio.....	6.4	7.2	Oregon.....	.4	1.3
Indiana.....	8.0	9.0	California.....	.2	1.7

While there are large increases in the newer States, as would be natural, it is of more interest to note the considerable increases in some of the older States. It is an indication of what may yet be expected.

<sup>a</sup> In this connection the writer does not overlook the fact that certain changes in the condition of our monetary system have been emphasized as causes affecting prices during periods such as those of 1892-1896 and 1873-1874. That monetary changes do affect prices is no doubt true. However, it should be readily determined with some certainty whether or not such causes do have effect in any instance, since all crops should be affected alike. In the period of 1892-1896, well known to the writer, wheat was depressed far more than other crops. Recently gold has been plentiful, dating back apparently to 1897, making, it is claimed, general high prices, but nevertheless no such scarcity of other important crops existed in 1908 as of wheat.

## YIELD PER ACRE.

We come now to another topic, concerning which an erroneous opinion has prevailed for some time. In recent literature repeated statements have been made leading one to infer that acre yields of wheat are decreasing in this country, and in farm journals even the causes of such a decrease have been discussed. As a matter of fact, acre yields, even in this country, are not decreasing, but, on the other hand, have considerably increased, showing that farmers are already giving some attention to better methods of cultivation and using better varieties.

As yields per acre often vary sharply in succeeding years, it is necessary to compare periods instead of single years to get satisfactory information. Ten-year averages of yield per acre in this country, from 1866 to 1905, are as follows: 1866-1875, 11.9 bushels; 1876-1885, 12.3 bushels; 1886-1895, 12.7 bushels; 1896-1905, 13.5 bushels. There is seen to be an increase in acre yields in the last period over the first period of 1.6 bushels. Arranging a different series of ten-year periods, from 1869 to 1908, results are as follows: 1869-1878, 12.31 bushels; 1879-1888, 12.13 bushels; 1889-1898, 13.21 bushels; 1898-1908, 13.75 bushels. Here also is shown an increase in acre yields of 1.4 bushels in the last period over that of the first period. The increase in the last period over that of the second period, however, is 1.6 bushels, practically the same as the total increase in the other calculation. In other words, since 1866, or about 1870, our wheat yield per acre has really increased  $1\frac{3}{4}$  bushels, and, on the basis of our present average of 46,400,000 acres, is already giving us an increase in production of 74,241,000 bushels above what it would be at the rate prevailing forty years ago.

## FUTURE WHEAT PRODUCTION.

At the same rate of increase the added yield per acre by 1950 would be  $4\frac{1}{2}$  bushels. This increase in acre yields, however, goes on much more rapidly each decade, as there is a more rapid diffusion of knowledge of improved methods of culture and seed selection, use of better varieties, etc. All farming will also become more intensive. Six bushels of actual increase in acre yields by 1950, or about 20 bushels per acre, is therefore surely a safe estimate. Twenty bushels per acre on a basis of 80,000,000 acres, before estimated for 1950, will furnish 1,600,000,000 bushels.

What may occur after 1950 will presumably concern ourselves or the coming generation some other time, but it is practically certain that acre yields will go on increasing, and probably also the acreage. In view of the preceding data showing percentages of total land area devoted to wheat in foreign countries 8 or even 10 per cent of the total

area does not seem an unreasonable limit for this country, and yet it would mean the planting of 150,000,000 to 190,000,000 acres in wheat at some future time. Also, 20 bushels per acre in yield is still much below what is actually being obtained even now in places in Europe. In Germany, where the yield has increased 6 bushels since 1897, it is now (1907) 28.4 bushels. In Great Britain it is 32.6, and even in that country of extremely intensive farming long practiced the increase has been 2.5 bushels (Winchester) since 1897. At least 25 bushels per acre should, therefore, be attained in this country, which, on a basis of 150,000,000 acres, would furnish 3,750,000,000 bushels, and on a basis of 190,000,000 acres, 4,750,000,000 bushels.

HOME CONSUMPTION.

To calculate probable future home consumption of wheat, it is requisite to determine the probable population, and, if possible, the trend of per capita consumption, whether upward or downward, and at what rate. The population of continental United States, the average home consumption of wheat, including seed, and wheat flour, and the per capita consumption for each census year from 1870 are given below. Wheat flour is reduced to wheat at the rate of 4½ bushels to the barrel. The home consumption is an average in each case for five years, of which the middle year is the year preceding that of the census, except in case of 1908, for which an average for the years 1905–1907 is employed.

Year.	Population.	Home consumption.	Per capita consumption.
		<i>Bushels.</i>	<i>Bushels.</i>
1870.....	38,558,371	193,698,324	5.02
1880.....	50,189,209	276,884,727	5.52
1890.....	62,979,766	345,602,279	5.49
1900.....	76,149,386	389,331,530	5.11
1906.....	ª 84,024,026	536,706,866	6.39
1908.....	ª 87,000,000	551,801,954	6.34

ª Estimated.

It is seen that the yearly consumption per capita increased from about 5 bushels in 1870 to approximately 5½ bushels in 1880, at which point it remained until 1890, through the period of high wheat acreages already discussed, and then fell again to a little over 5 bushels in 1900. This last five-year period, 1897–1901, follows close after the period of low wheat acreages, low prices, and general financial depression of 1892–1896. If the estimates of population for 1906 and 1908 come near the facts, there was a great increase in per capita consumption after 1900, amounting to about 1½ bushels. The high per capita

figures would indicate that if the population estimates are much in error they are underestimates rather than overestimates, though they can hardly be so much too small as to bring the per capita consumption much below 6 bushels. These per capita figures do, however, vary up and down, just as acreage figures, prices, etc., will do, and may settle at somewhere near 6 bushels for 1910. This is about 1 bushel increase since 1870, and it seems quite possible that there will be an increase of another bushel in the equal period ending with 1950. We will suppose the per capita consumption for 1950, therefore, to be 7 bushels, though it may be considerably less.

The census population figures show that, starting with an increase of nearly 12,000,000 from 1870 to 1880, the succeeding increase has been rather constantly about 1,000,000 more for each ten years than for the preceding ten years. At this rate of gain the population in 1910 should be about 90,000,000, in 1920 about 105,000,000, in 1930 about 121,000,000, in 1940 about 138,000,000, and in 1950 about 156,000,000. Allowing for a considerably higher rate of increase, however, for safer calculation, we may assume it to be 160,000,000 in 1950.

At the rate of 7 bushels per capita this population would require 1,120,000,000 bushels of wheat. This amount taken from the preceding estimate of production for that year would leave a surplus of 500,000,000 bushels. Some predictions of our future population have placed it much higher for 1950 than 160,000,000, one putting it as high as 200,000,000. Supposing this last to be correct, at 7 bushels per capita consumption this population would require 1,400,000,000 bushels, leaving still a 200,000,000 bushel surplus.

#### WORLD PRODUCTION, RESERVES, AND EXPORT.

With the menace of wheat famine at least far away, and with a large present average production, many will inquire why prices have been high. It is explained largely by low reserves and the amount of world production. The unusual reverse conditions of the period 1892-1896, already discussed, are explained chiefly in the same way. To make clear the further discussion of this topic, some tabulations may well be made. The following table shows the annual world production of wheat since 1890, the stock of wheat of each year on hand March 1 of the following year since 1890, or rather the percentage it is of the entire crop, and our wheat export since 1890. The export set down for each year really begins July 1 of that year and includes both wheat and wheat flour.

Crop year.	Percentage of crop on farms March 1 of following year.	United States export.	World production.	Crop year.	Percentage of crop on farms March 1 of following year.	United States export.	World production.
	<i>Per cent.</i>	<i>Bushels.</i>	<i>Bushels.</i>		<i>Per cent.</i>	<i>Bushels.</i>	<i>Bushels.</i>
1890....	28.2	106, 181, 316	.....	1900....	24.5	215, 990, 073	2, 640, 751, 000
1891....	27.9	225, 665, 811	2, 369, 746, 000	1901....	23.2	234, 772, 516	2, 945, 275, 000
1892....	26.3	191, 912, 635	2, 414, 414, 000	1902....	24.5	202, 905, 598	3, 148, 517, 000
1893....	29.6	164, 283, 129	2, 426, 731, 000	1903....	28.0	120, 727, 613	3, 230, 580, 000
1894....	16.3	144, 812, 718	2, 590, 121, 000	1904....	20.0	44, 112, 910	3, 163, 542, 000
1895....	29.0	126, 443, 968	2, 593, 312, 000	1905....	22.9	97, 609, 007	3, 330, 431, 000
1896....	20.6	145, 124, 972	2, 506, 320, 000	1906....	28.3	146, 700, 425	3, 432, 931, 000
1897....	22.9	217, 306, 005	2, 233, 637, 000	1907....	23.8	163, 043, 669	3, 145, 101, 000
1898....	29.3	222, 618, 420	2, 921, 045, 000	1908....	21.6	.....	3, 181, 115, 000
1899....	29.0	186, 096, 762	2, 725, 407, 000				

It is seen that there is a natural preparation for low prices and low acreages in 1892-1896. There is a considerable surplus of wheat all along, shown by the very large proportion of each crop yet on hand March 1 of the following year, the average percentage being about 28.5 per cent, or almost one-third, up to 1893. During the same time world production was good, allowing little relief through export, though the export was fairly good, particularly that of the large crop of 1891. The 1893 crop was unusually low, and by March 1, 1895, the reserve amounted to less than one-sixth. Probably through a reacting influence of the extremely low price of 1894 the reserve increased again temporarily for 1895, then from 1897 permanently decreased, with very few exceptions. The wheat overflow was checked by persistent low acreages, a very small world production occurred in 1897, prices went up, and acreage increased again. A temporary depression for two years followed the very large crop of 1898, the world crop that year also being large, reaching almost 3,000,000,000 bushels. The price fell from 81 cents to 58 cents and March 1 reserves increased. This depression continued to be felt until 1902, with the largest crop of our history occurring in 1901 and world crops increasing. Another temporary depression occurred in 1906, when we had our second largest crop and the largest world crop in history, the exports of the two preceding years having been very small. The price fell from 75 cents to 67 cents; then renewed activity began. The crops of 1907 and 1908 were only moderate, the export rose to 163,000,000 bushels in 1907, world crops of 1907 and 1908 fell considerably, and accordingly prices advanced again to 87 cents in 1907 and then to 93 cents in 1908.

## PRODUCTION IN OTHER COUNTRIES.

The necessity of considering world production in calculating the trend of acreage and prices has been shown. It acts as a balance in finally bringing local extreme conditions approximately to the same level. While it does not affect our potential wheat area, a large world production puts a check upon export, and a small world production stimulates an increase in our acreage through better prices. The possible future wheat acreage of the world, also, will indicate whether we may continue to expect very much longer an occasional surplus in the world's crop.

The three principal regions upon which the world depends at present to supply the needs of other countries are (1) the plains of North America; (2) the "Black Earth" of east and south Russia, Roumania, and Hungary, and including a large indefinite area in Siberia, and (3) Argentina.

Space does not permit a detailed discussion of the probable increase in production to be expected from the countries comprised in these regions. The two provinces of Canada of any considerable importance in producing a surplus are Saskatchewan and Alberta. From a rough calculation based upon the available farm area as reported by the provincial governments we may estimate the increase in wheat production of these provinces, together with Manitoba, to be at least 400,000,000 bushels by 1950.<sup>a</sup> Similar calculations will show that Russia (in Europe) should increase her production at least 600,000,000 bushels and Argentina at least 300,000,000 bushels. Outside the United States, therefore, the chief exporting countries of the world should furnish a total increase in production by 1950 of 1,300,000,000 bushels. Add to this the probable increase of about 900,000,000 bushels in our own production, and the total increase for the chief exporting countries becomes 2,200,000,000 bushels.

On the basis of increase of production heretofore compared with increase in population, and considering the increase in substitute foods that is sure to occur, the world is likely to require, we may suppose, about 5,500,000,000 bushels of wheat by 1950, an increase of 2,000,000,000 over present production. The above estimated total increase more than satisfies this requirement. This increase also leaves out the numerous smaller increases that will surely occur in other countries, such as Hungary, Austria, South Africa, etc., and the possible resources of the vast agriculturally unknown regions in Siberia, Brazil, and the central plateau of Africa.

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<sup>a</sup> Anyone who has been "on the ground," as the writer has, during the past summer and seen the tremendous recent development in these provinces can well believe that this production is not only possible but probable, with a sufficient incentive in wheat demand.