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W H E A T S T U D I E S

of the FOOD RESEARCH INSTITUTE

VOL. XVI, NO. 3

(Price \$1.00)

NOVEMBER 1939

WHEAT AND WAR, 1914-18 AND NOW

M. K. Bennett

During the World War, difficulties in maintaining wheat supplies in Europe culminated in acute shortage in 1917-18. Small crops in the unblockaded part of Europe created enormous import requirements, even with utilization defined in terms of wartime levels much below those customary in peacetime. Russia could not ship wheat to the deficiency area. The full burden therefore fell upon the distant overseas exporting countries.

These overseas countries secured only moderate crops in 1917, in spite of expanded acreage, and their total supplies were too small to yield exportable surpluses adequate to cover the heavy world import requirements of 1917-18. In addition, shortage of shipping prevented Southern Hemisphere surpluses from passing fully into export. Heavy drafts upon stocks in North America, economies in American consumption, and stretching of wheat supplies in Europe so ameliorated the European position that mass starvation or hunger was generally averted outside of the Central Powers. Yet there was profound disturbance of consumption habits, even privation, and wheat prices rose exceedingly high.

At the outset of the present war, European countries are in a far better position than in 1914 to hold down their essential requirements for overseas wheat. This difference is likely to persist even if the war should last for four or five years. The overseas exporting countries, with normal yields on present acreage, could probably supply maximum import requirements with ease. Recurrence of a world wheat stringency like that of 1917-18 seems improbable for at least two years and possibly three, and would probably not occur later except in the event of abnormally low yields per acre in the overseas exporting countries.

STANFORD UNIVERSITY, CALIFORNIA

WHEAT STUDIES
OF THE
FOOD RESEARCH INSTITUTE

Entered as second-class matter February 11, 1925, at the Post Office at Palo Alto, Stanford University Branch, California, under the Act of August 24, 1912.

Published eight times a year by Stanford University for the Food Research Institute.

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WHEAT AND WAR, 1914-18 AND NOW

M. K. Bennett

History is said to repeat itself, and men are prone to appraise the present and future in the light of analogous circumstances of the past. With the outbreak of war in Europe on September 1, 1939, interest revives in the World War of 1914-18 and the events that preceded it.

In the later stages of the World War, the question of food supplies, and of wheat supplies in particular, occupied the center of the stage. Wheat at Chicago sold for more than \$2.00 a bushel from April 1917 to October 1920, whereas it had usually brought less than \$1.00 in the five years preceding July 1914. "Today," said Herbert Hoover, writing in 1917, "the war has

entered a phase in which food dominates the economics, strategy and statesmanship, not only of the countries at war but of neutrals as well." "The loudest call of the people," wrote Kellogg and Taylor with reference to Belgian relief, "their principal anxiety, and our first care, all converged on wheat." The slogan, "Wheat will win the war," was widely voiced in the United States. Starling, referring to Britain and to bread customarily made wholly from wheat, observed that ". . . any shortage of bread must cause widespread hardship as well as industrial inefficiency and unrest. On the other hand, provided bread can be kept free and available for all classes, any other foods can be rationed or limited in quantity without giving rise to actual hunger in any class of the population. . . . The keynote of the policy of the United Kingdom . . . was that at all costs bread must remain unrationed."

The possibilities or probabilities that history will repeat itself in the world wheat situation warrant discussion even in the stage of a European war barely three months old. We present here a condensed study of (a) the history of the world wheat situation during

the World War; (b) contrasts in the world wheat situation as it was in years immediately preceding 1914 and 1939; and (c) prospective developments in years to follow 1939, so far as the history and the contrasts seem to illumine these prospects, and so far as the prospects can be appraised on the basis of insecure assumptions concerning participants in and duration of the present war. Emphasis falls on the history and the contrasts, not upon the prospects.

We undertake here, not to present an exhaustive record of developments during the World War, but merely to sketch the broad picture. Developments in particular countries have been recorded at length in

many and valuable books. It is the world situation which seems difficult to perceive from the histories that have already been written. Consequently it is sought here to present "world" statistics, using estimates freely and without detailed explanation of methods; and relatively little attention is given to data pertaining to single countries.

The discussion runs in terms of developments in what we here call the "wheat world ex-Russia." This specially limited "world" includes on the one hand Europe west of Russia and four neighboring countries of northern Africa (Egypt, Tunis, Algeria, Morocco), and on the other hand five overseas exporting countries—the United States, Canada, Argentina, Australia, and India. This area contains the world wheat market. The great bulk of the wheat moving in international trade nowadays passes from the five overseas exporting countries to the European and north African part of the "wheat world." To this "wheat world," Russia was and is important mainly for what she ships into it; and the rest of the geographical world is important more for what it receives from the "wheat world" than for what it contributes.

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The definition of the "wheat world ex-Russia" used here is statistically convenient because data—often incomplete or uncertain—for a great many unimportant countries can properly be ignored. The definition is significant because it focuses attention upon facts

important in wartime—the need of the importing part of the wheat world for wheat that must come mainly from the overseas exporters, under the conditions of war that existed in 1914-18 and have begun to emerge in 1939.¹

I. SUPPLIES AND UTILIZATION

Outstanding facts in the wheat situation during the World War² were (a) that world wheat supplies were insufficient to provide the population of the "wheat world ex-Rus-

sia" with enough wheat to cover customary levels of per capita wheat use; and (b) that this general stringency, through effects exerted by interferences with interregional and international trade, was much more severe in some parts of the world than in other parts. It seems appropriate, therefore, to begin a statistical review of the world wheat situation during the World War with data bearing on wheat supplies and utilization.

¹ Sources of the quotations in the second paragraph on page 67 are: Vernon Kellogg and A. E. Taylor, *The Food Problem*: with a Preface by Herbert Hoover (New York, 1917), pp. v, 5; and E. H. Starling, *The Feeding of Nations: A Study in Applied Physiology* (London, 1919), pp. 128-29.

Among books mentioned in the fourth paragraph as recording in detail the wartime wheat developments in particular countries, especially valuable ones are those in the series "Economic and Social History of the World War," sponsored by the Carnegie Endowment for International Peace. Several of these—all written some years after the war—are cited below. A few significant publications on national food supplies published during or very shortly after the World War are as follows: Commission Scientifique Interalliée du Ravitaillement, *Rapport général sur les ressources et les besoins alimentaires des pays alliés* (3 reports, Paris and Rome, 1918); T. B. Wood, *The National Food Supply in Peace and War* (Cambridge [England], 1917); Royal Society , *The Food Supply in the United Kingdom. A Report* (Great Britain, Cmd. 8421, 1917); E. H. Starling, A. P. McDougall, and C. W. Guillebaud, *Report on Food Conditions in Germany With Memoranda on Agricultural Conditions in Germany And on Agricultural Statistics* (Great Britain, Cmd. 280, 1919); Paul Eltzbacher, ed., *Die deutsche Volksernährung und der englische Aushungerungsplan* (Braunschweig, 1915), an English translation of which appeared as *Germany's Food: Can It Last?* (London, 1915), edited by S. R. Wells; Raymond Pearl, *The Nation's Food* (Philadelphia, 1920).

² The World War may be said to have begun with the German declaration of war on Russia on August 1, 1914, and to have ended with the Armistice of November 11, 1918. Statistical data used in this study usually cover the five "crop" or "cereal" years from August 1, 1914, to July 31, 1919; and for convenience we call this the "war period" even though it extends beyond the cessation of hostilities between the major powers of Western Europe.

³ Contributions to the supplies of the wheat world ex-Russia, negligible for purposes of this study, come from Chile, Uruguay, and some countries in or near Asia Minor. Russian exports, unlike those of the overseas exporting countries, go with trifling exceptions to non-Russian Europe.

"WORLD" SUPPLIES AND UTILIZATION

Each year the total supplies of wheat in the wheat world ex-Russia consist mainly of initial carryovers of old-crop wheat, plus new crops, plus imports from Russia.³ Total supplies in each crop year from 1909-10 to 1918-19 and 1933-34 to 1938-39 are shown by the full length of the bars in Chart 1, and the three components are differentiated.

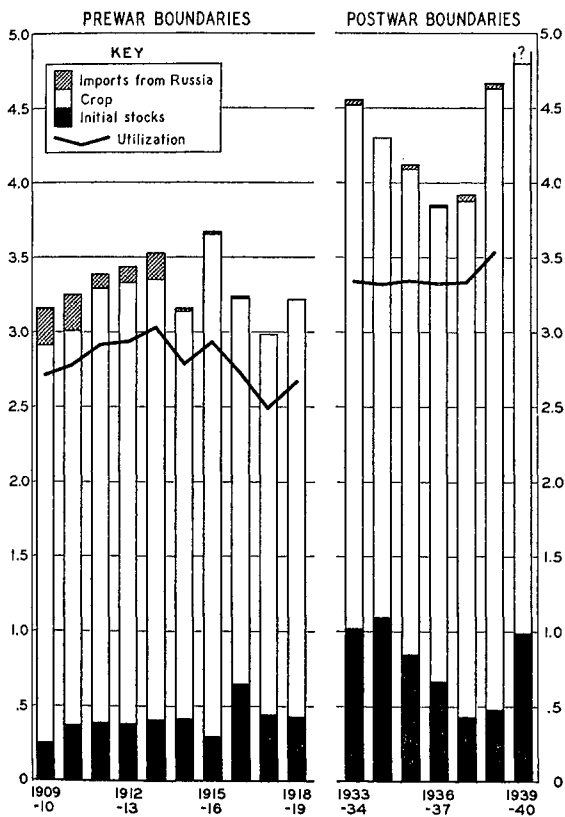
Total supplies averaged about 3 per cent smaller in the five war years than in the five years preceding 1914. In 1915-16, however, supplies were larger than ever before. The relatively low average wartime level of supplies arose partly from the disappearance of Russia as a source of supply for the wheat world ex-Russia, and partly from a slightly lower average outturn of crops. Initial stocks, on the other hand, averaged larger during the war years than earlier. This was a development due to interference with international trade and shipping. As will appear later, year-end stocks during the war averaged below the prewar level in Europe and North America, but far above the prewar level in Argentina and Australia. Under shortage of shipping, surplus wheat could not be moved in normal degree from the more distant shippers.

Annual supplies of the wheat world ex-Russia are never utilized in full within the year as food, seed, and animal feed and waste;

working stocks must be carried from one year to the next. The approximate volume of annual utilization may be calculated by subtracting from total supplies (*a*) the year-end stocks, and (*b*) the quantities of wheat shipped from the wheat world ex-Russia to countries lying outside its boundaries. In Chart 1, utilization so calculated is shown by the line running across the bars that measure total supplies.

CHART 1.—WHEAT SUPPLIES AND UTILIZATION OF WHEAT WORLD EX-RUSSIA, 1909-19 AND FROM 1933-34*

(Billion bushels)



* Data in Tables I-III, V. Production in overseas exporting countries in 1939 is now appraised somewhat larger than indicated here; see note to Chart 7.

During the five war years, utilization of wheat in the wheat world ex-Russia averaged nearly 5 per cent lower than in the five prewar years. In the last three years of the war, utilization fell about 8 per cent below the prewar average, and 13 per cent below the peak prewar year, 1913-14. In the worst year, 1917-18, utilization fell 13 per cent below the prewar average, and 18 per cent below the prewar

peak. All of these percentages would be higher if it were possible to take account of wheat sunk during the war on passage from exporting to importing countries.

Even these substantial contrasts, however, fail to reflect in full the shortage of wheat during the World War. In prewar years the trend of world utilization had been upward, reflecting both increase of population and rising per capita consumption (on the average though not in all regions). If this trend could have continued, utilization in 1917-18 might well have run to 3,200 million bushels. Actual utilization in 1917-18, only about 2,500 million bushels, thus fell more than 20 per cent below what it might have been in the absence of war. The population of the wheat world ex-Russia in 1917-18 may be said to have fallen short one loaf of bread in every five of what would probably have been eaten with peace continuing. Wheat was the most important single foodstuff of the wheat world ex-Russia, and in 1917-18 many other foodstuffs, notably animal products and sugar, probably showed even greater discrepancies than did wheat between actual consumption and the levels of consumption that continued peace would have permitted.

UTILIZATION IN MAJOR REGIONS

The incidence of wartime world wheat shortage, however, differed from country to country and region to region.

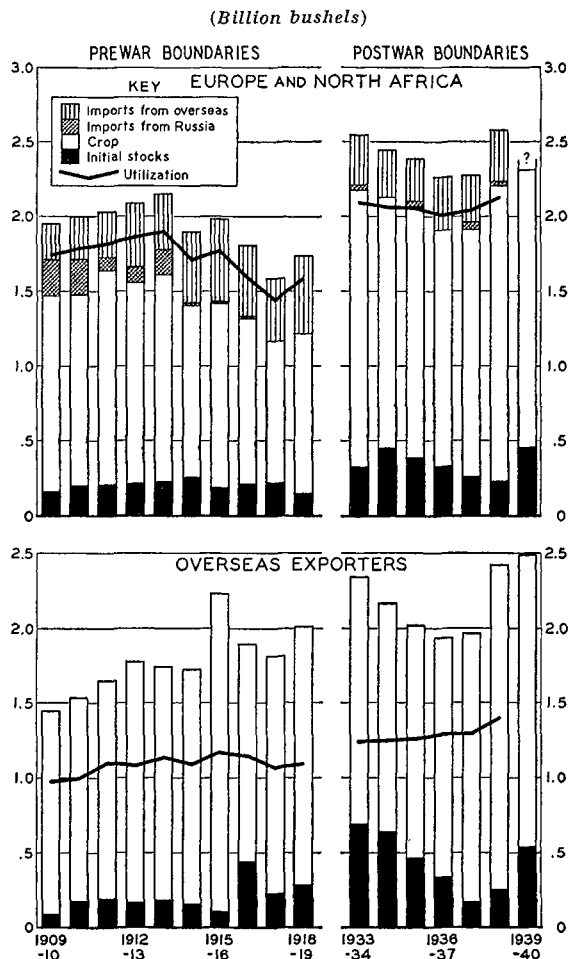
Chart 2 (p. 70) shows total wheat supplies and approximate total utilization within two main divisions of the wheat world ex-Russia: non-Russian Europe and northern Africa on the one hand, and the five overseas wheat exporters on the other.

The wheat supplies of Europe and northern Africa consist each year of (*a*) initial stocks; (*b*) new crops; (*c*) imports from Russia; and (*d*) imports from the five overseas exporters.¹ These components of supplies are differentiated in the bars of the chart. Utilization in this area consists of total supplies minus year-end stocks, and is indicated by the line passing through the bars. In the overseas exporters, wheat supplies consist of initial stocks

¹ Ignoring the minor contributions from such small exporters as Uruguay, Chile, Turkey, etc.

plus new crops. Their utilization may be calculated by subtracting from total supplies the sum of total net exports (regardless of destination) and year-end stocks. In each of these large regions, supplies always exceed utilization; but the excess of supplies is necessarily larger in the exporting region than in the importing region.

CHART 2.—WHEAT SUPPLIES AND UTILIZATION IN IMPORTING AND EXPORTING PARTS OF WHEAT WORLD EX-RUSSIA, 1909-19 AND FROM 1933-34*



* Data in Tables I-III, V. See also notes to Charts 1 and 7.

The war obviously had relatively little effect upon total wheat utilization in the overseas exporting countries as a group. Not even in 1917-18 did utilization fall below the prewar average, and in 1915-16 and 1916-17 it was larger than in any prewar year. The major

effect of the war was a check to the upward trend of utilization, apparent especially in 1917-18 and 1918-19. Certain aspects of the situation are discussed below (p. 75).

In the importing region, utilization declined promptly with onset of war, and failed to reach the prewar average level in any war year. In 1917-18 it was 21 per cent below the prewar average, 25 per cent below the peak prewar year 1913-14, and probably almost 30 per cent below the quantity that might have been utilized had war been averted. The percentages would be higher if quantities lost at sea could be allowed for in the calculations. The population of this large importing region in 1917-18 may be said to have fallen short of its "customary utilization" of wheat by almost one loaf of bread in three.

Nor does this comparison suggest the full extent of wheat stringency. When a nation makes the transition from peacetime to wartime economy, physiological requirements of the population for food calories increase. Soldiers in service require more food energy than they did as civilians, and the remaining civilian population tends to require more food energy than it did in peacetime because its wartime occupations tend to involve greater physical activity. The amount of increase in food-energy requirements is perhaps conjectural; it has been appraised roughly as possibly 10 per cent.¹ Furthermore, at least in countries where wheat is the principal breadstuff, transition to a wartime economy enlarges the nation's wheat requirement proportionally more than it enlarges the nation's food-energy requirement. The circumstances of modern war as exemplified in European food- or feed-importing countries tend to entrain economies in direct imports of more expensive foods and of feedstuffs, so that available supplies of animal products are reduced. To the extent that this occurs, an additional need for wheat emerges. One may conjecture that in 1917-18, in the wheat-importing section of the wheat world ex-Russia, actual wheat utilization fell short of "desired" utili-

¹ A. E. Taylor, *The Status of Agriculture Today and Its Role in a War Emergency* (Address before the National Industrial Conference Board, May 24, 1939, mimeographed), p. 7.

zation by something like two loaves of bread in five.

It early becomes obvious, however, that neither "desired" nor "customary" levels of wheat utilization can be maintained in a country heavily engaged in war and accustomed to use much wheat per capita. If the country is self-sufficient in wheat, there may nevertheless be difficulties in maintaining domestic output if only because of unavoidable drain on man-power and draft-power in agriculture. If the country usually imports much wheat, problems of maintaining customary or desired levels of per capita wheat utilization may arise merely because modern warfare involving the major nations of Western Europe itself puts a strain upon the world's shipping facilities. Such strain arises in reflection of necessity to enlarge imports of essential war materials, and is intensified if naval blockade on the one hand bottles up part of the world's merchant shipping, while on the other hand opposing naval action destroys another part and forces the use of merchant ships in convoy. Belligerent (and sometimes neutral) governments therefore tend, sooner or later, to adopt measures designed to mitigate existing or prospective stringency of wheat supplies, though in general without expectation of maintaining customary types of wheat utilization at customary per capita levels.

Strong efforts may be made to maintain or enlarge the flow of imports. Domestic wheat production may be encouraged, by exhortation and appeal or by fixed minimum prices or bounties to domestic producers. Problems of appropriate *differential* prices and *differential* bounties to producers arise in this connection. Efforts may be made, by exhortation or proscription, to curtail what are regarded in wartime as non-essential uses of wheat, such as the feeding of wheat, flour, or bread to animals, or the use of flour in industry, or kitchen and table wastage of flour or bread.

If in spite of such steps a stringency still threatens, the wheat supply may be "stretched." Extraction rates which customarily recover 70 pounds of flour from every 100 pounds of wheat may be "lengthened" to 75, 80, even 90 per cent or more. A change from 70 to 77 per cent in the extraction rate

means an increase of 10 per cent in the supply of wheat flour, though palatability of flour must deteriorate. If such stretching fails to avert bread shortage, resort may be taken to admixture of other products with wheaten flour—products such as potato starch, or rye, barley, or corn flour or meal. Neither the lengthening of extraction rates nor admixture is feasible without reduction in customary supplies of livestock feeds.

Sometimes flour and bread are rationed to consumers. Here the objectives are to reduce human consumption, not to provide for it; and to spread available supplies equably among rich and poor. But rationing of bread and flour would hardly be undertaken in the absence of or prior to rationing of many other foodstuffs, particularly the more expensive sorts. Efforts to discourage human consumption of bread may also involve prohibition of sale of the freshly-baked and therefore relatively well-liked product.

It is unnecessary here to attempt to recount the devices actually employed by governments to conserve and stretch wheat supplies during the World War. These varied from country to country, as did achievements. In the United Kingdom, where the published records seem best kept and most readily comprehensible,¹ rationing was not attempted; and in the year of greatest wheat stringency, 1917-18, it is estimated that about 4 per cent more flour was consumed than on the average in prewar years. Lengthened extraction rates and admixture, together with other but minor measures, thus sufficed not only to maintain but even to enlarge the flour supply.² But the

¹ In addition to the document cited below, see Sir William H. Beveridge, *British Food Control* (London, 1928); Arthur L. Bowley, *Prices and Wages in the United Kingdom, 1914-1920* (Oxford, 1921); E. M. H. Lloyd, *Experiments in State Control at the War Office and the Ministry of Food* (Oxford, 1924); T. H. Middleton, *Food Production in War* (Oxford, 1923); and Sir R. Henry Rew, *Food Supplies in Peace and War* (London, 1920).

² Great Britain, Royal Commission on Wheat Supplies, *First Report . . .* (Cmd. 1544, London, 1921), p. 42. In 1917-18, non-wheat grains mixed with wheat grain constituted 26 per cent of all grain milled into so-called flour; and non-wheaten diluents constituted a slightly larger percentage of imported materials used to make so-called flour. Extraction rates of wheat, varying from type to type, grade to grade, and time

flour was far different from and inferior to the prewar product. Hunger and starvation were avoided; but discomfort and dissatisfaction, more or less acute, were not. In France, where even rationing was resorted to, it could be said in retrospect that "Privations were experienced; absolute want was unknown."¹

On the basis of British experience, it is possible to conclude that a deficiency in the wheat supply as such amounting to some 12 per cent (as in 1917-18) need not result in absolute deficiency of the national flour supply; per capita consumption of bread may even be increased when wheat supplies fall 12 per cent below normal. But the impact of such a deficiency on the national diet must depend upon

to time, averaged no less than 79 per cent on home-grown wheat, and were at times as high as 91 per cent on such imported wheats as Choice Bombay, Australian, Milling Blue Stem, No. 1 Hard Winter, and No. 1 Montana Winter (*op. cit.*, pp. 42, 45).

¹ Michel Augé-Laribé and Pierre Pinot, *Agriculture and Food Supply in France during the War* (New Haven, 1927), p. 69.

² The extent of national dependence upon wheat as a source of food calories is suggested by the following tabulation, which shows for four European countries the percentages of total calorie consumption estimated to have been furnished respectively by wheat, other cereals, and all cereals on the average in years preceding 1914:

Items	United Kingdom ^a	France ^a	Italy ^a	Germany ^b
Wheat	33.4	50.2	46.5	15.7
Other cereals ^c	4.3	5.1	17.2	23.1
All cereals	37.7	55.3	63.7	38.8

^a Data for 1909-13, computed from Commission Scientifique Interalliée du Ravitaillement, *Premier rapport* *Annexes*, pp. 11, 19, 30.

^b Data for 1912 and 1913, computed from Paul Eltzbacher, ed., *Die deutsche Volksernährung* pp. 36, 62.

^c In the United Kingdom, oatmeal was the largest component of "other cereals"; in France, rye; in Italy, corn. In Germany, rye provided 18.6 per cent of the total calorie consumption and was more important than wheat; among cereals other than wheat and rye, barley was most important.

³ The technical difficulties are greater in measuring annual changes in wheat utilization in separate parts of Europe and northern Africa than in the region as a whole. This is largely because resort must be had to national import and export statistics which were incompletely reported during the war and in any event, for some countries, seem not to record with much precision the net intake or net outgo of wheat within specified crop years. There are also technical problems in appraising annual changes in wheat carry-overs; errors may loom larger in particular countries than in groups of countries.

many factors, such as availability of other foodstuffs and the customary importance of wheat in the national dietaries. A deficiency of 12 per cent in wheat supply obviously involves far less threat of either hunger or discomfort to a nation that customarily derives 10 per cent of its food calories from wheat than to nations that customarily derive 60 per cent of their food calories from wheat. Of two nations each deriving 60 per cent of their food calories from wheat, a 12 per cent deficiency in wheat supply would carry more threat to the one wherein the customary extraction rate was 75 to 80 per cent than to the one wherein the customary extraction rate was 70 to 75 per cent. In these relationships Germany and Austria-Hungary in the World War were less vulnerable to a given percentage deficiency in wheat supply than was Britain because of the lesser importance of wheat in the national diets of the Central Powers;² Britain was less vulnerable than France or Italy for the same reason; and France, though depending somewhat more than Italy on wheat, may have been less vulnerable because the customary milling extraction rate was lower in France.

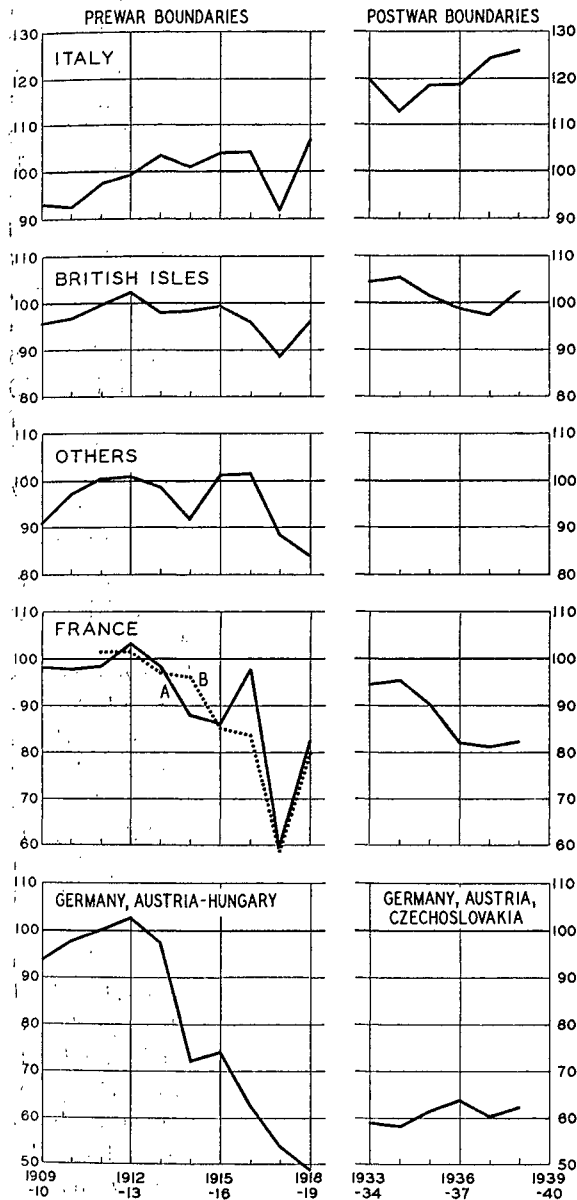
UTILIZATION WITHIN EUROPE

Within Europe, wartime total utilization of wheat declined unequally from country to country or region to region. Chart 3 shows index numbers of approximate total wheat utilization³ in the five countries or groups of countries in Europe west of Russia.

As measured in this way, wartime wheat stringency was least marked in Italy and not much more so in the British Isles, where utilization in the worst year, 1917-18, fell respectively about 8 and 12 per cent below the three-year average of 1911-12 to 1913-14. In a heterogeneous group of "other countries," which includes Rumania, Bulgaria, and Serbia in the southeast, Greece, Spain, and Portugal on the Mediterranean, and Switzerland, Belgium, Holland, and the four Scandinavian countries in the northwest, the worst year was 1918-19. In that year wheat utilization fell perhaps 16 per cent below the late prewar average. Particularly for the southeastern countries in this heterogeneous group the data

are faulty. They may present the wartime situation in too favorable a light, because wartime statistics of exports are not complete and

CHART 3.—INDEX NUMBERS OF WHEAT UTILIZATION IN SPECIFIED REGIONS OF EUROPE AND NORTHERN AFRICA, 1909-19 AND FROM 1933-34*
(Average 1911-12 to 1913-14 = 100)



* Data in Table V. "Others" from 1933-34 omitted because of changed boundaries.

our calculations do not allow here for shipments actually made to the Central Powers; this tends to exaggerate levels of wartime util-

ization in the southeastern countries. In general, the northwestern countries in the large group (occupied Belgium, Switzerland, Holland, and the four Scandinavian countries) suffered much greater shortages of wheat in 1917-18 than did the southeastern or Mediterranean countries. In that year, domestic crops plus net imports (in the case of Belgium, in-shipments through the relief organizations) approximated only 36 per cent of crops plus net imports in the three years 1911-12 to 1913-14.¹ This calculation disregards the possibility that reduction of stocks in 1917-18 might have raised the level of utilization. But even with allowance for this, the 1917-18 shortage of wheat in these northwestern countries was exceedingly acute—more so, however, in the non-Scandinavian ones. Furthermore, the importance of reduced wheat supplies was relatively less in the Scandinavian group because in these countries rye was an important component of the diet and wheat use per capita was ordinarily low.

The impact of war was apparently considerably more severe on wheat utilization in France. Divergent sets of net-import statistics confuse the picture of developments in the first three years of war; but the data agree in indicating that French utilization in the worst year, again 1917-18, fell about 40 per cent below the prewar average, and some 20 per cent below in 1918-19. These figures, however, tend to exaggerate the degree of wheat shortage, for the basic data on wartime production and trade apply to the portions of France free from military occupation.

The average population of all France in the period 1911-12 to 1913-14 was 39.74 million persons, while that of the unoccupied territory on January 1, 1918, was about 32.54

¹ The low figure for Belgium, however, requires qualification because the population of the occupied territory was substantially less than the population of the whole country in prewar years. On the food supply of Belgium and occupied France during the World War, see Albert Henry, *Le ravitaillement de la Belgique pendant l'occupation allemande* (Paris, 1924); Paul Collinet and Paul Stahl, *Le ravitaillement de la France occupée* (Paris, 1930 [?]); Vernon Kellogg, *Fighting Starvation in Belgium* (New York, 1918); and G. I. Gay, [The Commission for Relief in Belgium] *Statistical Review of Relief Operations* (Stanford University, California, 1925).

million.¹ On the basis of these population estimates and utilization reflected in the index numbers in Chart 3 (Series B), it would appear that per capita utilization in the France

¹ Michel Huber, *La population de la France pendant la guerre* (Paris, 1932), p. 220. Data for 77 uninvaded departments.

² As to German takings from the west, we find very little evidence. As to the east, August Skalweit (*Die Deutsche Kriegsernährungswirtschaft*, Stuttgart, 1927, p. 22) states that, after the conquest of Serbia in October 1915 and until Rumania joined the allies in August 1916, the Central Powers obtained about 2½ million tons of grain from the southeast, mainly Rumania. Hans Loewenfeld-Russ (*Die Regelung der Volksernährung im Kriege*, Vienna, 1926, pp. 392-93) speaks of "total grain import of 233,313 carloads from the Balkans," of which 120,010 went to Germany and the rest to Austria-Hungary. He further indicates that about 81,450 carloads, about a third of the total, consisted of wheat grain, rye grain, or "flour." A carload of grain is about 10 metric tons; so that the round data of Skalweit and Loewenfeld-Russ on grain are in broad agreement. Thus the equivalent of some 30 to 35 million 60-pound bushels of wheat grain, rye grain, and "flour" entered the Central Powers from the Balkans mostly in the crop year 1915-16. How much of this was wheat or flour is not clear; but on the basis of customary Rumanian exports of these two grains, wheat would greatly have predominated. It would seem clear from this evidence that practically all of the officially reported Rumanian net exports of wheat and flour in 1915-16, 23 million bushels, went to the Central Powers, although, according to Loewenfeld-Russ, England ". . . succeeded in concluding a contract with the Rumanian central commission covering 8 million quintals [about 30 million bushels] of wheat [and made] overpayments up to 1,000 lei per carload beyond the maximum price . . ." (p. 388).

³ Loewenfeld-Russ (pp. 394-95) states that Austria received 5 million quintals of grain in 1916-17 after the conquest of Rumania in October 1916, and that "bread grain now showed a considerable prevalence"; and 3 million quintals in 1917-18. As for Germany, Skalweit (p. 235) gives tables showing that German net imports of bread grains in 1916-17 could not have exceeded 600,000 quintals, while there were net exports of 539,000 quintals of flour. Both the net imports of bread grain and the net exports of flour from Germany were smaller in 1917-18. These quantities would only moderately affect the wheat-utilization statistics of Germany and Austria-Hungary in 1916-17, still less in 1917-18.

Some wheat was also obtained from Ukrainia in the period March-November 1918, but the amount probably did not exceed 4 million bushels—the equivalent in terms of wheat of 11,340 carloads of produce actually consisting of grain, milled products, pulses, and fodder given by Loewenfeld-Russ (p. 402) as the total shipped. Much larger quantities had been contemplated in a treaty between Ukrainia and the Central Powers signed in the spring of 1918. The Central Powers were more successful in obtaining such Ukrainian products as sugar, fats, and livestock.

of 1911-14 and the unoccupied France of 1917-18 declined from 9.44 to 6.75 bushels. This is a decline of 29 per cent, considerably smaller than that suggested by the utilization data in Chart 3.

Wheat utilization in Germany and Austria-Hungary combined is indicated by the chart to have fallen sharply in the first year of the war, by approximately a fourth. This presumably overstates the degree of immediate decline. Net-import statistics were not reported for war years, and exact quantitative estimates are not available to measure requisitions from conquered territories. It seems probable, however, that some wheat filtered into Germany from the west, and certain that at least in 1915-16 supplies also entered from Rumanian on the east.² Wheat utilization in the Central Powers in 1914-15 and 1915-16 thus may not have fallen more than 15 to 20 per cent below the prewar average, instead of the 25 to 30 per cent suggested by Chart 3. But by 1917-18 the data in the chart presumably do not so much overstate the extent of decline in wheat utilization; it may conceivably have fallen to 55 to 60 per cent of the prewar average, even with allowances for requisitionings in conquered eastern territory.³

All told, wartime wheat shortage *per se* was probably most marked in the Central Powers aside from occupied Belgium and northern France, Switzerland, and Holland. It was more marked in unoccupied France than in Italy and the British Isles. The relative severity of its impact upon total food supplies of the several countries, however, is a subject too complex for consideration here.

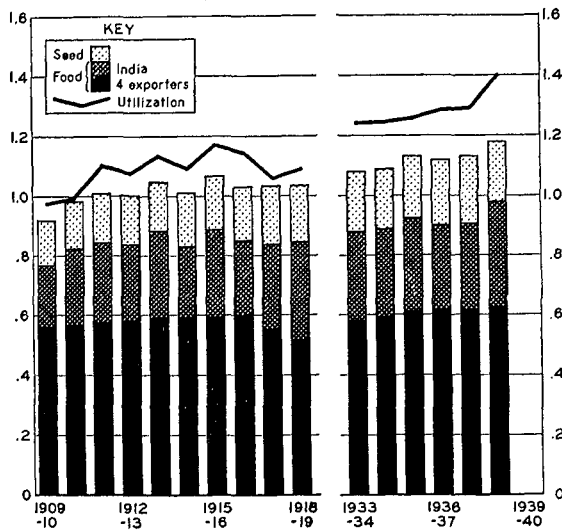
Since some European and north African countries both produce and export wheat while others both produce and import, explanations of wartime reduction of wheat utilization in the world's wheat-importing regions are conveniently to be sought both on the side of domestic production and on the side of imports—which in turn may involve production in overseas exporting countries and Russia, and also shipping facilities. But before we turn to questions of production and international trade, it seems advisable to refer briefly to utilization in the overseas exporting countries.

UTILIZATION IN OVERSEAS EXPORTING COUNTRIES

As Chart 2 (p. 70) indicated, wartime wheat utilization was about as large as prewar utilization in the five overseas exporting countries; the war apparently affected it but slightly, and certainly affected it less than was true in Europe west of Russia and northern Africa. Utilization, however, may be calculated either from estimated stocks and crops and reported net exports (as in Chart 2); or some elements of it may be appraised more directly from milling statistics, flour exports, and acreage estimates together with approximate quantities used per acre for seed.

Chart 4 shows these more direct estimates of utilization in relation to the indirect estimates in Chart 2. The lower parts of the bars

CHART 4.—COMPONENTS OF WHEAT UTILIZATION IN FIVE OVERSEAS EXPORTING COUNTRIES, 1909-19 AND FROM 1933-34* (Billion bushels)



* Data in Tables V, VI.

measure quantities of wheat used for food in the United States, Canada, Argentina, and Australia—all based on milling statistics (except for Canada). The middle portions of the bars represent Indian wheat crops minus exports minus estimated seed use—quantities representing food use of wheat in India on the assumptions that year-end stocks vary little and that only negligible quantities of wheat are used for feed and in industry or are wasted.

These seem to be tenable assumptions.¹ The upper portions of the bars represent estimated use of wheat for seed, in which errors cannot be large. The line which passes above the bars represents total utilization as calculated in Chart 2; and the gaps between the tops of the bars and points on the line would represent use of wheat for other purposes than food and seed—assuming both the direct estimates of food and seed use and the indirect estimates of total utilization to be correct.²

This chart suggests, as would be expected, that variations in total utilization in the overseas exporting countries arise mainly from variations (a) in miscellaneous uses in other countries than India, and (b) in food use of wheat in India. Seed use in all five countries together varies somewhat with change in acreage, but not greatly. Food use outside of India varies little under normal circumstances. Yet a wartime effect on food use is clearly apparent in the chart in the decline shown from 1916-17 to 1917-18 and again, less markedly, to 1918-19. This came wholly in the United States. It was directly attributable to effective appeal to consumers, reinforced by relatively mild governmental controls, particularly of milling extraction rates.³ Modification of con-

¹ For special reasons, however, we assume that stocks were built up 30 million bushels in India during 1915-16, and reduced in the next crop year. Such an accumulation may be regarded as abnormal and due to shortage of shipping together with abundance of wheat in North America in 1915-16.

² Incorrectness is of course indicated by the very narrow gap in 1910-11, for some wheat is always used for feed and other non-food and non-seed purposes. Perhaps the crop of the overseas exporting countries was underestimated in that year. But for Canada, our prewar estimates of food use and seed use, together with reported net exports, fall about 24 per cent short of the official crop estimates on the average for the period. Since changes in stocks over this five-year period can hardly have been significant, it seems probable that some Canadian prewar crops were overestimated. The quantity calculated as available for uses other than food, seed, and exports is far too large (nearly a fourth of the average prewar crop) to be credible as representing these miscellaneous uses.

³ On the operations of the United States Food Administration, see Wilfred Eldred, "The Wheat and Flour Trade under Food Administration Control: 1917-18," *Quarterly Journal of Economics*, November 1918, XXXIII, 1-70; *Grain and Flour Statistics during the War* (U.S. Grain Corporation, A. L. Russell, Statistician, 1919), and *Supplement* (1920); F. M. Surface, *The Grain Trade during the World War . . .* (New

sumption habits caused only minor inconvenience because of pre-existing tendencies toward declining use of flour per capita.¹ The reduction of food use of wheat in the United States in 1917-18 was important because, in the year of great wheat stringency, it released a substantial quantity of wheat for export from a country able, in view of the shipping position, to export it. The fact that total utilization in the five exporting countries failed in 1918-19 to reflect the substantial economy in food use in the United States is explained by the position of India. Here food use of wheat was very heavy, and wheat export negligible, because of small crops of millets following the wheat harvest of 1918.

The data seem too insecurely based to war-

York, 1928); F. M. Surface and R. L. Bland, *American Food in the World War and Reconstruction Period* . . . (Stanford University, California, 1931).

¹ Holbrook Working, "The Decline in Per Capita Consumption of Flour in the United States," *WHEAT STUDIES*, July 1926, II, 265.

² See H. C. Farnsworth, "'World' Wheat Stocks, 1890-1914 and 1922-39," *WHEAT STUDIES*, October 1939, XVI, 39-66, esp. p. 47.

³ The 1937 area of non-Russian Europe was larger than the 1913 area by all of Estonia, Latvia, and Lithuania; most of Poland; and the Bessarabian part of Rumania. This added territory contained in 1912 a population of about 20 million persons; its wheat production in 1909-13 averaged some 55 million bushels, and its rye production some 170 million.

⁴ Population estimates as of January 1, based on official statistics, are as follows in million persons for various countries within their 1937 boundaries:

Country	1912	1937
United States	94.5	128.9
Canada	7.3	11.1
Argentina	6.9	12.6
Australia	4.6	6.8
India	315.8	374.2
Total	429.1	533.6
British Isles	45.4	50.1
France	41.5	41.9
Italy	35.3	42.7
Greater Germany ^a	79.6	89.5
Poland	25.0	34.2
Southeastern Europe ^b	39.3	49.8
Other Europe ^c	69.3	82.9
Northern Africa ^d	24.2	32.3
Total	359.6	423.4
Grand total	788.7	957.0

^a Germany, Austria, Czechoslovakia.

^b Hungary, Yugoslavia, Rumania, Bulgaria.

^c West of USSR, including Finland.

^d Egypt, Tunis, Algeria, Morocco.

rant inferences concerning economies in feed and other miscellaneous uses of wheat during the war. No strong suggestion of it is given in Chart 4 except perhaps in 1917-18.

CONTRASTS OF PREWAR POSITIONS

Charts 1 to 4 provide certain significant contrasts of supplies and utilization of wheat in the wheat world ex-Russia as it was before 1914 and before the outbreak of war in 1939. These contrasts may be listed categorically.

1. Average annual supplies of the wheat world ex-Russia (Chart 1) exceeded average annual utilization by a larger margin in 1933-39 than in 1909-14. This is both because the normal level of year-end stocks has risen in the interval, notably in exporting countries² (Chart 2), and because several of the years in the recent period were distinctly wheat-surplus years while those preceding 1914 were not.

2. Total supplies have recently included considerably less wheat from Russia than was true before 1914 (Chart 1). Since Russian wheat goes almost entirely to Europe west of Russia, that area (with northern Africa) has recently depended much less upon Russia for wheat supplies than was true before 1914 (Chart 2). This region has also derived supplies more from domestic crops and less from imports from all sources than was true before 1914.

3. Average annual world utilization has recently run higher (Chart 1) than it did before 1914. The increase as between territories shown in the chart is 17 per cent, and would be somewhat less if comparable territories were covered.³ The population within 1937 boundaries of the wheat world ex-Russia has increased by about 21 per cent, from 789 million persons in 1912 to 957 million in 1937 as closely as we can judge.⁴ Hence use of wheat per capita in the wheat world ex-Russia has recently run lower than it did before 1914.

4. Total wheat utilization within the importing region of the world has recently run only 13 per cent above the pre-1914 level within a smaller territory, and this increase was less than the increase in population. Hence per capita utilization has declined. It has risen in eastern and northern parts of non-Russian Europe, but fallen in most other

parts and in northern Africa. Where decline in per capita use has occurred, it has been greater in food use than in feed use of wheat. Decline in per capita food use of wheat has been particularly conspicuous in France, Belgium, and the British Isles.¹

5. Total utilization of wheat in the five overseas exporting countries has recently run about 22 per cent above the pre-1914 level, food use about 10 per cent above, seed use about 29 per cent, and other use (mainly for feed) perhaps well over 100 per cent even with allowance for imperfections in the data given in Chart 4. Meanwhile population has increased by about 24 per cent. Hence there has been large increase in per capita use of wheat for feed, but substantial decline in per capita use for food, with little change in per capita seed use or in total utilization per capita.

6. The trend of wheat utilization was upward before 1914 in the wheat world ex-Russia

as a whole (Chart 1) and especially in the importing section (Chart 2). Since 1933 there is little evidence of trend-increase, particularly in the importing section taken as a whole.

7. The wheat world ex-Russia entered the war of 1939 with a far larger excess of supplies over probable requirements for utilization than was true at outbreak of war in 1914 (Chart 1). Supplies for 1939-40, not counting possible imports from Russia, are about 4,850 million bushels; one cannot expect utilization appreciably to exceed 3,400 million, or shipments outside to exceed 100 million. In 1914-15, total supplies of less than 3,200 million bushels were not sufficiently large to provide for internal utilization equal to that in the preceding crop year (some 3,035 million bushels) together with a normal or a meager outward carryover and moderate or small shipments outside. Supplies from carryover and new crop were strikingly large in 1939 both in the importing and in the exporting regions.

II. PRODUCTION

Wheat production in the wheat world ex-Russia averaged only about 25 million bushels smaller in the five war years than in the five years preceding 1914. Yet one may say that there was a large deficiency of production during the war, considering the upward pre-war trend of utilization, the shutting off of Russian exports, and the impossibility of sustaining utilization either by drafts upon initial stocks that were only moderate in size, or by curtailing outshipments that also were customarily only relatively small. Certain European countries in particular would have been much more fortunate with respect to wheat utilization if their wartime domestic crops had been larger.

"WORLD" AND MAJOR REGIONS

Chart 5 (p. 78) shows wheat production, acreage, and yield per acre in the wheat world ex-Russia and its two principal components, 1909-18 and 1933-39.

Four years of the World War, 1914, 1916,

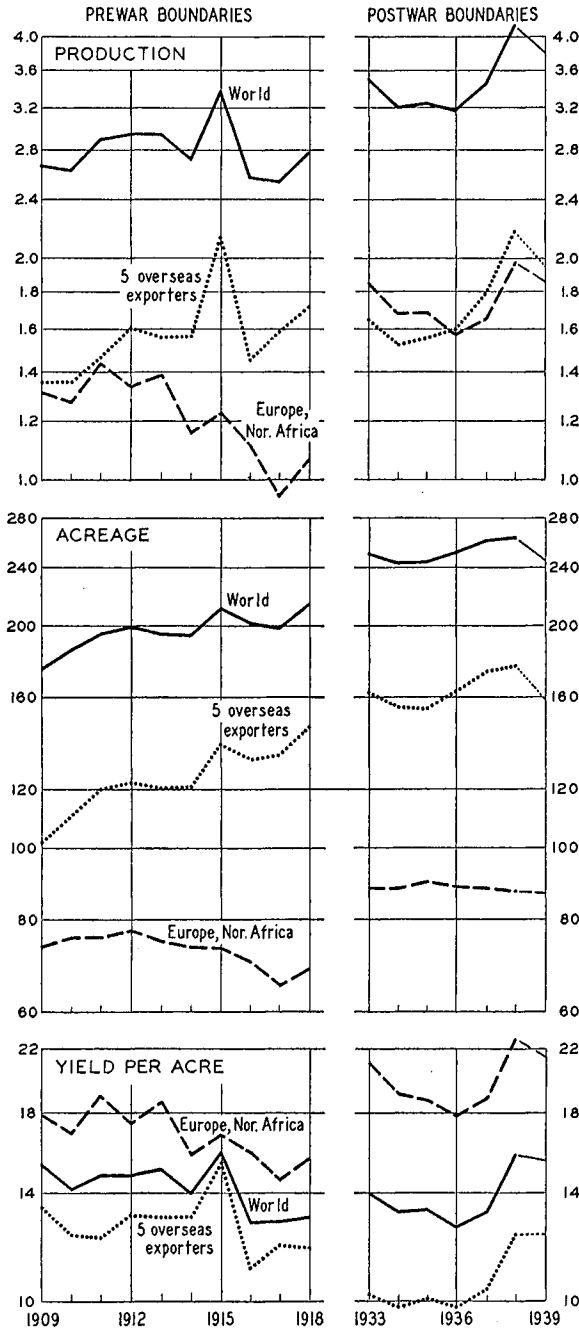
1917, and 1918, were years of relatively small wheat production as compared with the immediate prewar level. In 1914, the relatively low outturn reflected circumstances in Europe and northern Africa, not in the overseas exporting countries; and it reflected low yield per acre due to adverse weather more than large loss of acreage due to military operations. The wheat world ex-Russia entered the World War with an unusually small crop, and with the crop shortage more striking in the importing than in the exporting regions.

The relatively short world crops of 1916, 1917, and 1918 reflected exceptionally low world yields per acre, and the yields were exceptionally low not only in war-torn Europe but also in the overseas exporting countries as a group. Since the yields per acre were so low in the overseas exporting countries where wheat cultivation was extensive in type, depending relatively little on thoroughness of cultivation or on application of fertilizer, one must attribute the low world yields in appreciable part to adverse weather. The world wheat acreage in these years was as large as or larger than it had been in any of the five years pre-

¹ See chart in M. K. Bennett, "World Wheat Utilization since 1885-86," *WHEAT STUDIES*, June 1936, XII, 384.

CHART 5.—WHEAT PRODUCTION, ACREAGE, AND YIELD PER ACRE IN WHEAT WORLD EX-RUSSIA AND ITS PRINCIPAL COMPONENTS, 1909-18 AND FROM 1933*

(Billion bushels, million acres, bushels per acre; logarithmic vertical scale)



* Data in Table I. See also notes to Charts 1 and 7.

overseas exporting countries more than offset decline of acreage in non-Russian Europe and northern Africa.

One of the wartime crops, that of 1915, was exceptionally large. Its huge size, however, reflected developments only in the overseas exporting countries, where a record sown acreage gave a record yield per acre. This yield was a phenomenon of weather, not of cultivation. The enormous crop of 1915 greatly eased the wartime wheat-supply position in the countries of Europe open to receive shipments from overseas, as compared with 1914-15. But it was not large enough to preclude the emergence of difficulties in the three years beginning with 1916-17, particularly in view of shortage of shipping. The exceptional character of the 1915 crop in the overseas exporting countries is suggested by the facts that only two crops equal to it in size, those of 1928 and 1938, have since been secured; and these were harvested from much larger acreages. The 1915 yield per acre in overseas exporting countries has never been equaled.

THE IMPORTING REGION

The available data on wheat production in the whole territory of Europe west of Russia plus northern Africa measure the decline in output as about 250 million bushels or 18 per cent between 1909-13 and 1914-18. If the decline is measured between 1911-13 and the worst war years, 1917 and 1918 averaged, it approximates 28 per cent. The decline reflected reduction both of acreage and of yield per acre. Between the two shorter periods just specified, acreage declined 12 per cent. Decline of yield per acre, about 18 per cent, was proportionally larger.

As would be expected, however, decline of wheat production was not general; it was relatively most marked in countries long and deeply involved in hostilities and accustomed to produce much wheat. Chart 6 shows these facts crudely. The solid lines show production, acreage, and yield per acre in a group of deeply involved contiguous countries—France, Belgium, Germany, and Austria-Hungary. The dotted lines show the same series for all the rest of non-Russian Europe and northern Africa. In the first group, to con-

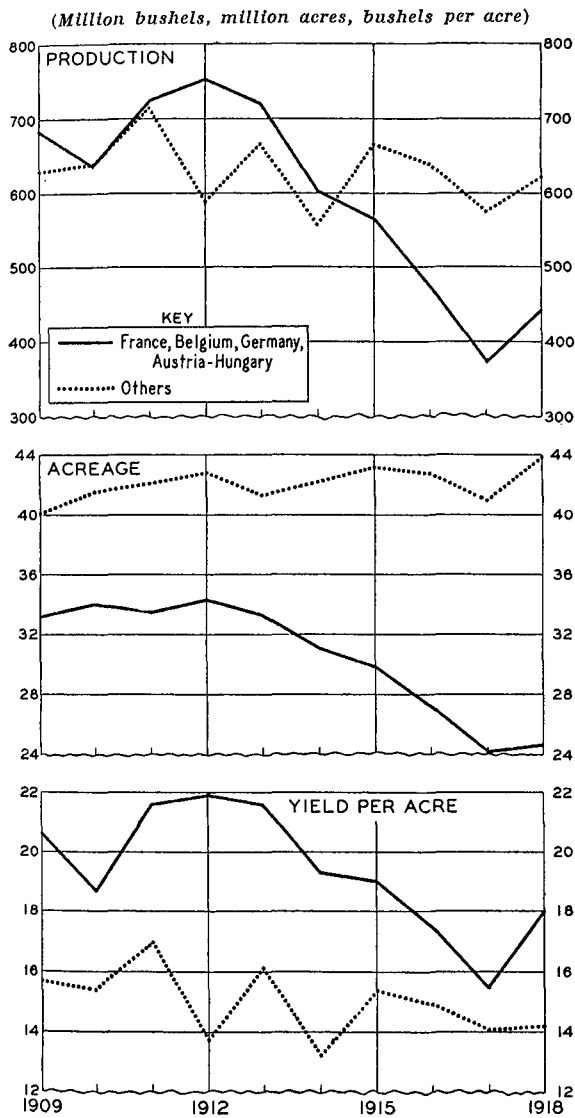
ceding 1914. As the second tier of the chart shows, wartime expansion of acreage in the

trast the periods 1911-13 and 1917-18, production declined 44 per cent, acreage 28 per cent, and yield per acre 23 per cent. In the second group, production declined only 9 per cent, acreage increased slightly, and yield per acre declined 10 per cent.

probably a little less, some 39 per cent, in Germany.¹

In the second group of countries, more peripheral to land warfare, changes in average production between 1911-13 and 1917-18 were as follows, in million bushels and percentages :

CHART 6.—WHEAT PRODUCTION, ACREAGE, AND YIELD PER ACRE IN TWO REGIONS OF EUROPE AND NORTHERN AFRICA, 1909-18*



Countries	1911-13	1917-18	Percentage change
Northern Africa ^a	90	90	0
Italy	191	162	-15
Other Mediterranean ^b	143	160	+12
Southeast ^c	146	81	-44
Northwest ^d	85	105	+24
Total	655	598	-9

^a Egypt, Tunis, Algeria, Morocco.
^b Spain, Portugal, Greece.
^c Rumania, Bulgaria, Serbia.
^d British Isles, Netherlands, Switzerland, Denmark, Norway, Sweden, Finland.

The changes were diverse. Neither acreage, yield per acre, nor production changed appreciably in northern Africa. The moderate decline of production in Italy, some 15 per cent, represented a decline of area by 9 per cent and a smaller decline in yield—the latter probably attributable mainly to weather unfavorable for the crop of 1917. This crop gave the lowest yield since 1910, while the 1918 crop, sown under worse conditions than that of 1917, gave the second highest yield per acre in than 20 years. The large decline of production in the southeastern countries rested solely on decline of yield, for acreage increased. This decline may have been due partly to ineffective cultivation, itself a reflection of warfare, in which these countries also were deeply involved. But weather conditions were presumably equally important, or more so. This region occasionally suffers disastrous years for wheat, as in Rumania (the most important producer) in 1897, 1899, 1907, and 1914, and on her larger postwar territory in 1924 and 1932. One is therefore inclined to attribute the extremely low yield per acre of 1918 (1917 was a fair year) in these southeastern countries largely to unfavorable weather, though without excluding the probability of significant war influences.

¹ If one accepts the official German prewar statistics (here reduced by 10 per cent) the indicated reduction of wheat output in Germany would be 45 per cent.

In the group of countries deeply involved in warfare, the decline of production was in much the same proportion, about 45 per cent, in France and Austria-Hungary; but it was

* Data in Table I.

In Spain, Portugal, and Greece combined, there was moderate increase of acreage (not in Portugal) and also in average yield. A larger increase of production in the north-western countries was due entirely to increase of acreage, which rose by about 28 per cent. Wheat was not a major crop in these countries, and a large percentage increase in acreage presented less difficulty than would occur in countries where the wheat acreage was larger and a more important fraction of the arable area. The yield per acre declined in this group of countries, but at least in England the decline was attributed partly to unfavorable weather for the crop of 1917.¹

The decline of production (9 per cent) in Europe and northern Africa outside of the central and deeply involved countries of Belgium, France, Germany, and Austria-Hungary, must on the whole be attributed to decline of yield per acre and not of acreage. And in the main, decline of yield per acre seems to have reflected accident of weather more than effects of the war. In this connection it is pertinent to observe (Chart 6) that the regional average yield per acre in 1914—a crop sown and in substantial degree harvested before wartime effects could be felt—was lower than the yields of either 1917 or 1918, the two lowest of four crops sown during the war period.

CAUSES OF EXTREME DECLINE

The causes of wartime reduction of wheat output in the European area most strongly affected may include (a) weather conditions, which may tend either to curtail sowings, to cause loss of acreage by winterkilling, or to damage the plant and lower the yields per acre; (b) man-power, which may become deficient and thus reduce both the sowings and the thoroughness of tillage; (c) draft-power, which if deficient may have similar effects to shortage of man-power; (d) fertilizer supplies, which may lower yields if they become short through reduction of herds (or fodder for animals), curtailment of imports of commercial

fertilizers, diversion of commercial fertilizers to non-agricultural uses, or defective internal transport; and (e) military operations and occupations, which may prevent acreage from being sown (or harvested) at points where activities are intense. Shortage of supplies of farm machinery and spare parts, due to military demands upon industry, may also affect both acreage and yield adversely.

There seems little reason to suppose that wartime disturbances of normal crop rotations are of large significance, or that harvesting operations can be much disturbed except where military operations interfere. Under European conditions, the wheat fields can probably be fully harvested by women and children in the absence of normal man-power or draft-power. Shortage of man-power, and to a lesser extent of draft-power, must be regarded not merely as sheer lack, but also as absence from the fields at the specific time when specific operations give the best result. Man-power may be short also with reference to planning and management of farm operations, that move best under the regular attention of the farm operator.

Mistakes of governments may be mentioned also as an influence capable of affecting wheat production adversely. Thus in France early in the World War, the wheat acreage is said to have suffered because wheat prices to producers were officially set at relatively too low a level, inducing farmers to shift land from wheat to other crops.² This, however, was probably a minor factor in the broad wartime decline of French wheat acreage.

The relative importance of these adverse influences on wheat production during the World War in the area covered by Belgium, France, Germany, and Austria-Hungary cannot be appraised with much precision.

Perhaps French and Belgian wheat acreages declined to the extent of one or two million acres on account of military activities on the western front. The French zone that suffered prolonged occupation contained about 6.3 million acres of cultivated land,³ of which probably around a fifth was in wheat. Some of this wheat acreage, not reported in the French statistics, was no doubt cultivated by the civilian population remaining in occupied territory

¹ See Middleton, *Food Production in War*, pp. 188-90.

² Alfred Beaucourt, *La politique du pain pendant la guerre (1914-1919)* (Paris, 1919), p. 65.

³ Augé-Laribé and Pinot, *Agriculture and Food Supply in France during the War*, p. 55.

and by the Germans; but this is not recorded in German statistics either. In addition, military activities on the allied side of the front must have curtailed wheat sowings in the part of France reported in the wheat statistics. We cannot undertake to appraise the wartime losses of wheat acreage of Germany and Austria-Hungary on the eastern front. But in the autumn of 1916, when the wheat crop of 1917 was sown, the boundaries of these countries lay inside the battle lines of the eastern front; and so also in the autumn of 1917, when the crop of 1918 was sown. Hence it seems safe to say that German and Austro-Hungarian wheat acreage probably suffered relatively little from military activities when one compares the wheat areas of 1917 and 1918 with the prewar level.¹ Military activities may have accounted for a fifth to a third of the French and Belgian loss of acreage between 1911-13 and 1917-18. It cannot have been the dominant cause of loss.

Shortage of man-power in agriculture was perhaps the most powerful influence on decline both of acreage and of yield per acre throughout the territory. This cannot be demonstrated. But the ultimate effects of withdrawing from agriculture some 3.7 million farmers out of 5.2 million, as occurred in France,² must have been great. The position in Austria-Hungary was probably similar to that in France, but in Germany it seems likely that the drain on agricultural man-power was smaller. There a smaller fraction of the population was engaged in agriculture, the problem of maintaining domestic crop production was probably more carefully considered, and prisoners of war usable in agricultural operations

were relatively numerous.³ This may help to explain why wheat production in Germany declined somewhat less than in France and Austria-Hungary (see p. 79).

With regard to the principal commercial fertilizers (nitrogen, phosphate, potash), it would appear that German farmers suffered less severe shortage than the French. Germany held practically a world monopoly of potash, and between 1913-14 and 1917-18 nearly doubled the use of it in agriculture, while available supplies of phosphate fertilizers were cut in half and those of nitrogen by a little more than half.⁴ In France, however, potash fertilizers practically disappeared, nitrates declined heavily despite large imports from Chile which were used mainly in manufacturing explosives, and phosphate fertilizers—in tonnage nearly two-thirds of all fertilizer used in prewar years—fell in 1917 to about a fifth of their tonnage in 1913.⁵ Difficulties in internal transport hampered movement of fertilizers in France, for three other main classes of goods received preference over the fourth and last class in which fertilizers fell. In Austria-Hungary, shortage of fertilizer presumably had relatively smaller effects on wheat yields, for the bulk of the wheat was grown in the Hungarian portion of the Empire, where fertilizer was not much used. England felt shortage of potash particularly.⁶

Our impression is that shortage of draft-power was relatively less important than shortages of man-power and fertilizers, but the point need not be pressed here.

The importance of weather is conjectural. The three seasons 1911-13, however, may be taken as averaging rather more favorable than normal practically throughout this deeply involved section of Europe, whereas the weather for the crop of 1917 (a very cold winter of 1916-17) was uncommonly unfavorable while that for the crop of 1918 was distinctly better than normal.⁷ In some degree, therefore, the decline of wheat yield per acre from 1911-13 to 1917-18 in the wide territory of France, Belgium, Germany, and Austria-Hungary was probably due to the less favorable weather in the later years.

Many of the adverse wartime influences bore not only upon wheat production, but also

¹ Some adverse effects may have held over from the Russian invasion of Galicia in 1914-15.

² Augé-Laribé and Pinot, *op. cit.*, p. 39. The figures apply to agriculturists in 1911 and to those in the military services in 1918.

³ The numbers involved ran to 700,000 to 900,000 in 1916-18. Friedrich Aereboe, *Der Einfluss des Krieges auf die Landwirtschaftliche Produktion in Deutschland* (Stuttgart, 1927), p. 33.

⁴ *Ibid.*, pp. 41-43.

⁵ Augé-Laribé and Pinot, *op. cit.*, pp. 66-67.

⁶ Middleton, *op. cit.*, pp. 110-11, 144, 186, 228.

⁷ See M. K. Bennett, "Trends of Yield in Major Wheat Regions since 1885. Part I," *WHEAT STUDIES*, November 1937, XIV, 69-102, esp. p. 92.

upon other crops. But upon rye, at least, the effects were less striking than upon wheat. The rye production of non-Russian Europe declined from 760 to 510 million bushels (some 33 per cent) between 1911-13 and 1917-18, the yield per acre declining somewhat more strikingly (22 per cent) than the acreage (15 per cent). Within the territory covered by Belgium, France, Germany, and Austria-Hungary, reductions of wheat and rye compare as follows, in percentages, with rye in parentheses: production, 44 (36); acreage, 28 (17); yield per acre, 23 (22). The two crops were similarly affected with regard to yield per acre, but rye acreage (and therefore production) declined less than wheat acreage. This may have reflected the different geographical distribution of the two crops; rye was grown in much smaller proportion than wheat along the battle lines, and in much larger proportion within Germany and western Austria-Hungary, where labor supplies seem to have been relatively more satisfactory. Rye might also have been given some preference by German producers because it would be expected to withstand shortage of fertilizers and inadequate cultivation better than wheat.

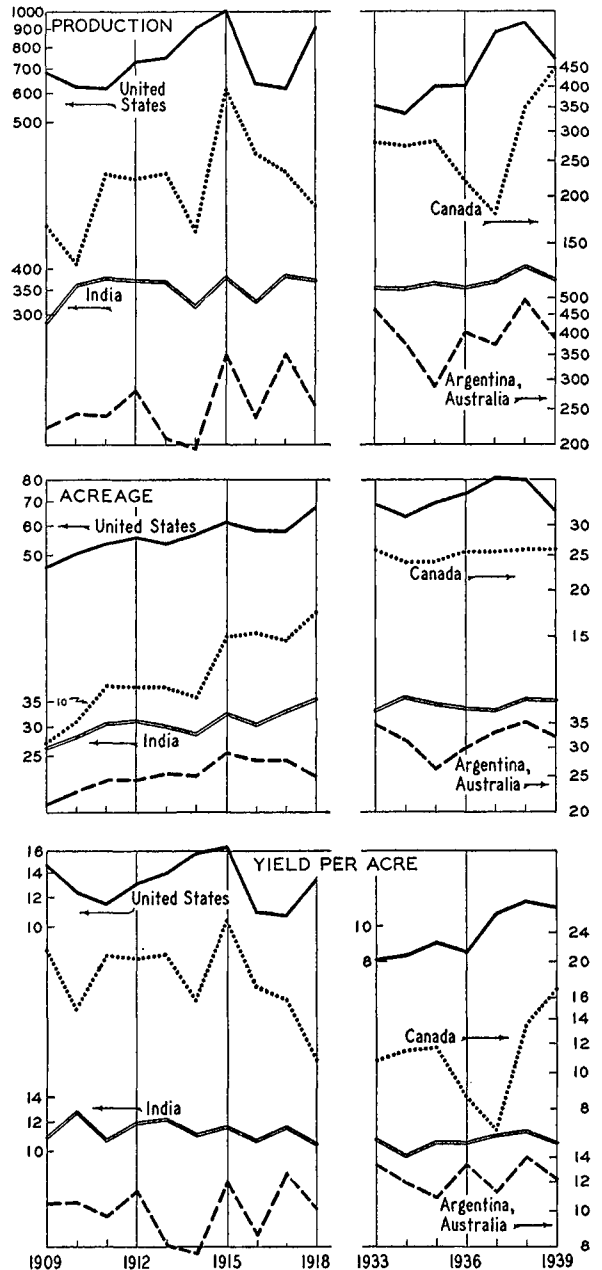
THE OVERSEAS EXPORTERS

Aggregate output of wheat in the five overseas exporters during the World War (Chart 5, p. 78) averaged larger, as we have seen, than in prewar years. But this reflected mainly the huge crop of 1915. The three crops of 1916-18 averaged barely 3 per cent above the three crops of 1911-13, despite an increase of 13 per cent in acreage sown. Yields per acre in 1916-18 averaged 9 per cent below the 1911-13 level.

Chart 7 gives further details. The crop of 1914 was a good one only in the United States. That in the Southern Hemisphere was the smallest in twelve years—reflecting mainly drought in Australia, where production was below domestic requirements. That in India was the second smallest in six years. So was the Canadian crop, which suffered from drought. It was the winter-wheat crop in the United States which was large; the spring-wheat crop suffered much as did the Canadian.

CHART 7.—WHEAT PRODUCTION, ACREAGE, AND YIELD PER ACRE IN EXPORTING COUNTRIES, 1909-18 AND FROM 1933*

(Million bushels, million acres, bushels per acre; logarithmic vertical scale)



* Data in Table I. The Canadian crop of 1939 is now officially estimated some 30 million bushels larger than indicated here. Recent advices also point toward a larger outturn in Australia, perhaps more than offsetting a prospective smaller outturn in Argentina.

The crop of 1915 was enormous—a record for the decade ending in 1918 in North Amer-

ica, and in India and the Southern Hemisphere barely smaller than the crops of 1917. War-stimulated acreages were important factors everywhere except in Argentina, but equally important was favorable weather for spring wheat in North America.

Only four really large crops were obtained in any of the exporting countries in 1916-18: the Australian in 1916, the Indian and Argentine in 1917, and the United States in 1918. Yields per acre rather than acreages were low in these years. Weather must have been the dominant factor in the low average yields of 1916-18—first because variations of yields in peacetime seem clearly to be due mainly to weather conditions, and this because the dry climates in which the wheat is mostly grown are naturally subject to wide variations in rainfall and at the same time do not prompt cultivators to use much labor or fertilizer per acre. Furthermore, both India and Argentina were not closely touched at any time by war effects on man-power and fertilizer; and the United States can hardly have been appreciably affected until the crop of 1918 was sown—and it was a good one. There is a possibility that yields per acre in Canada and Australia by 1916-18 were somewhat adversely affected by hurried or inadequate cultivation due to shortage of man-power the more marked in view of expanded acreages. But on the whole the low average yield per acre in the overseas exporting countries in 1916-18 seems explicable mainly in terms of weather; and weather thus chiefly explains shortage of overseas wheat production in relation to the requirements of European importers.

The response of producers in the overseas exporting countries to wartime stimulus may be measured in terms of percentage change of acreage between the average for 1911-13 and the highest level of acreage attained during any of the four years 1915-18. A tabulation follows, in million acres:

Country	Average 1911-13	Wartime peak		Percentage change
		Acreage	Year	
United States	54.3	67.3	1918	+24
Canada	11.0	17.5	1918	+59
India	30.6	35.5	1918	+16
Argentina	16.8	17.9	1917	+ 7
Australia	8.0	12.5	1915	+56

The smallest response was in Argentina. Here no patriotic efforts were involved; wheat cultivation was perhaps less open to pioneer development than in Canada, Australia, or the Great Plains of the United States; and the shortage of shipping tended to pile up the exportable surpluses and keep domestic wheat prices from responding to world shortage (pp. 90, 95). In Australia, promptly affected by the war as a participant, and with wheat acreage in an expanding pioneer phase, the response was large. But it came early, and the acreage declined after 1915, falling below its 1913 level in 1918. The piling up of exportable surpluses and resulting effects on prices are pertinent here. The response of India seems surprisingly large in view of the settled condition of agriculture. It seems possible—since the bulge of acreage in 1918 was confined almost entirely to the south,¹ where the extent of acreage seems to depend heavily upon soil-moisture conditions at time of sowing—that this was a response to weather more than to world shortage, price, or patriotism.

The response was naturally relatively strong and enduring in North America, where the full exportable surpluses could pass to export. It was natural also that in Canada, where vast areas of the Prairie Provinces lay open to agricultural settlement and settlement was in an expanding phase, the response should have been proportionally larger than in the United States. The increase in Canada was largely achieved by 1915, before the slackened rate of wartime immigration began to affect the growth of agricultural area.

CONTRASTS OF PREWAR POSITIONS

The world enters the war of 1939 with conditions of wheat production substantially different from those prevailing before 1914. Charts 5 and 7 (pp. 78, 82) give various contrasts; and these may be supplemented by Table 1. Here, using data applying rather closely to national boundaries as they were in 1937, further information is summarized on average production, acreage, and yield per

¹ See chart in M. K. Bennett, "Trends of Yield in Major Wheat Regions since 1885. Part II," WHEAT STUDIES, March 1938, p. 236.

acre in the prewar periods 1909-13 and 1934-38. Many of the changes are mainly of historical interest and need not be discussed. With reference to the bearing of these data on the prospects for developments after 1939, the following points seem pertinent.

1. The present war began just after the harvest of the second largest crop in seven years both in the importing and in the exporting regions of the wheat world ex-Russia. In 1914, the importing region had a very small crop (not fully harvested before war began), and the exporters only a moderately good one. These facts largely but not fully explain the contrasting situations with reference to total supplies of wheat (see p. 77).

yield perhaps means that this region, or parts of it, is now more vulnerable to wartime shortages of labor and fertilizer than was true in 1914.

3. The 1934-38 level of yield in overseas exporting countries is probably below the present "normal" level. Probably the 1934-38 levels of yield in Argentina, Australia, and India were close to what would be expected in a five-year period characterized by an ordinary alternation of good and bad weather conditions for wheat. But in North America, the Great Plains particularly, the period 1934-38 seems reasonably to be described as one that witnessed an extraordinary amount of crop calamity, mainly from drought and rust. We

TABLE 1.—WHEAT PRODUCTION, ACREAGE, AND YIELD PER ACRE IN 5-YEAR PERIODS PRECEDING WARS OF 1914 AND 1939*

Region	Production (Million bushels)			Acreage (Million acres)			Yield per acre (Bushels)		
	1909-13	1934-38	Per cent change	1909-13	1934-38	Per cent change	1909-13	1934-38	Per cent change
France	326	302	- 7.4	16.5	12.9	- 21.8	19.8	23.4	+18.2
Italy	184	267	+45.1	11.8	12.5	+ 5.9	15.6	21.4	+37.2
Greater Germany ^a	182	246	+35.2	6.4	8.0	+ 25.0	28.4	30.8	+ 8.4
Eastern Europe ^b	396	446	+12.6	23.2	26.2	+ 12.9	17.1	17.0	- .6
Other Mediterranean ^c	159	180	+13.2	11.9	13.7	+ 15.1	13.4	13.1	- 2.2
Northwest ^d	99	158	+59.6	3.0	4.4	+ 46.7	33.0	35.9	+ 8.8
Northern Africa ^e	92	116	+26.1	7.8	10.7	+ 37.2	11.8	10.8	- 8.5
Total	1,438	1,715	+19.3	80.6	88.4	+ 9.7	17.8	19.4	+ 9.0
United States	682	717	+ 5.1	52.0	73.5	+ 41.3	13.1	9.8	-25.2
Canada	197	261	+32.5	9.9	25.0	+152.5	19.9	10.4	-47.7
Argentina	147	231	+57.1	16.1	18.1	+ 12.4	9.1	12.8	+40.7
Australia	91	154	+69.2	7.6	13.0	+ 71.1	12.0	11.8	- 1.7
India	352	366	+ 4.0	29.2	34.6	+ 18.5	12.1	10.6	-12.4
Five exporters	1,469	1,729	+17.7	114.8	164.2	+ 43.0	12.8	10.5	-18.0
Grand total	2,907	3,444	+18.5	195.4	252.6	+ 29.3	14.9	13.6	- 8.7

* Mainly official data, including estimates of the U.S. Department of Agriculture for production and acreage of 1909-13 within 1937 boundaries of European countries whose boundaries were changed after 1918.

^a Germany, Austria, and Czechoslovakia as of 1937 boundaries.

^b Poland, Lithuania, Latvia, Estonia, Hungary, Yugoslavia, Rumania, Bulgaria.

^c Spain, Portugal, Greece.

^d British Isles, Belgium, Netherlands, Switzerland, Denmark, Norway, Sweden, Finland.

^e Egypt, Tunis, Algeria, Morocco.

2. The higher average level of yield per acre in the importing region in 1934-38 as compared with 1909-13 probably represents a change in "normal" level of yield, and the change is probably due proximately and largely to heavier use per acre of labor and fertilizer. The higher present level of normal

believe that the "normal" yields in the United States and Canada are described better in terms of averages for the two years 1938 and 1939 than for the five years 1934-38. Average yields per sown acre in the two latest years were 11.5 bushels in the United States, 15.7 bushels in Canada. In so far as "normal"

yields need be considered in discussion of prospects, it seems more realistic to use these averages than those for 1934-38, respectively 9.8 and 10.4 bushels. The 1938-39 averages regarded as normal, however, are properly lower than the 1909-13 averages. In the interval of years the normal level has declined, in large part because of shift of acreage to dry and naturally low-yield areas.¹

4. The recent level of wheat acreage in the

overseas exporting countries probably would not permit as large a *percentage* increase in acreage as occurred between 1914 and 1918 (Chart 5). There is not so much wheat land open to exploitation. But our impression, based on the record of fluctuations of acreage in the past 15 years, is that very substantial increase of acreage in absolute terms would be possible, and distinctly probable under stimulus of high prices.

III. REQUIREMENTS, SURPLUSES, AND TRADE

During the World War, as we have seen, wheat utilization in the wheat world ex-Russia could not be maintained at "customary" or "desired" levels, particularly in the importing region. Production, trade, prices, and governmental policies all contributed to and were in turn affected by this situation. Wartime developments can conveniently be considered in further detail with reference to import requirements for wheat, and the way they were satisfied or left unfilled by export

surpluses part of which proved unavailable because of stringency in shipping.

EUROPEAN IMPORT REQUIREMENTS

The world's wheat-import requirements may here be divided into two parts—those of non-Russian Europe and northern Africa ("European requirements"); and those of all other countries ("non-European requirements"). The European requirements in this sense are filled, with trifling exceptions, from two sources: Russia, and the five overseas exporters. The non-European requirements in this sense are filled almost wholly by the five overseas exporters, since Russia ships almost nothing to non-Europe. Thus world import requirements may also be said to consist of three parts: European requirements for Russian wheat, European requirements for overseas wheat, and non-European requirements for overseas wheat.²

In time of peace, the European import requirements of annual averages for five-year periods beginning respectively in 1909-10 and 1914-15, together with reported data for 1917-18, the year of smallest trade:

Aug.-July	Rumania	Bulgaria	Serbia	Algeria	Morocco	Tunis
1909-10.....	33.8	6.6	4.5	4.6	0.2 ^a	(0.5) ^b
1910-11.....	74.8	14.2	3.4	8.9	0.3 ^a	(0.9) ^b
1911-12.....	61.1	17.9	3.8	7.2	0.9 ^a	1.2
1912-13.....	48.2	4.2	... ^c	1.0	0.5 ^a	(2.4) ^b
1913-14.....	51.7	13.4	... ^c	5.2	(0.3) ^{a,b}	(1.6) ^b
1914-15.....	3.8	5.6 ^a	... ^c	3.8	(0.1) ^{a,b}	(1.6) ^b
1915-16.....	22.9	0.0 ^a	... ^c	5.4	0.4 ^a	0.4
1916-17.....	... ^c	0.0 ^a	... ^c	4.0	0.6 ^a	0.3
1917-18.....	... ^c	(0.1) ^{a,b}	... ^c	2.1	0.4 ^a	0.3
1918-19.....	... ^c	(0.7) ^{a,b}	... ^c	8.0	0.4 ^a	3.6

^a Estimated from calendar-year data. ^b Net imports.
^c Data not available.

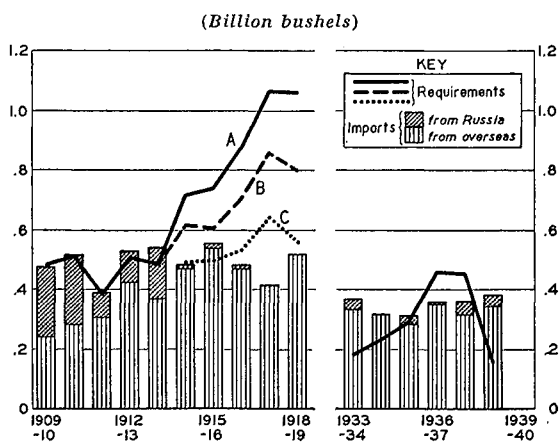
The second, also in million bushels and from similar sources, shows August-July net imports into the principal net-importing countries of Europe, in terms

Country or group	1909-14	1914-19	Change	1917-18
United Kingdom	218	194	-24	155
France	49	81	+32	73
Italy	53	74	+21	67
Scandinavia ^a	23	18	- 5	6
Belgium	49	21 ^b	-28	17
Netherlands	23	18	- 5	1
Switzerland	19	15	- 4	7
Other Mediterranean ^c	16	21	+ 5	10
Germany	68	.. ^d	.. ^d	.. ^d
Austria-Hungary	11	.. ^d	.. ^d	.. ^d

^a Norway, Sweden, Denmark, Finland.
^b November-October shipments of wheat and of flour through Commission for Relief in Belgium.
^c Spain, Portugal, Greece.
^d Data not available; but see tabulation below, p. 87.

quirements may reasonably be defined as the imports necessary to maintain European utilization of wheat at its customary level, trend considered. The solid line (A) in Chart 8 shows European import requirements calculated on this basis.¹ The bars represent actual "imports"² into this area. It is not surprising that actual imports sometimes exceed, sometimes fall below, import requirements. A part of the import demand is elastic, making for

CHART 8.—IMPORT REQUIREMENTS AND REPORTED "IMPORTS" OF NON-RUSSIAN EUROPE AND NORTHERN AFRICA, 1909-19 AND FROM 1933-34*



* Calculations of import requirements explained in accompanying text. Trade statistics in Table III.

imports in excess of requirements when prices are low, and imports short of requirements when prices are high. Such other factors as crop quality, location of exceptionally large or small crops in the importing area, and governmental decisions to build up stocks (as in 1938-39) or reduce them, may also cause ac-

¹ In this calculation, we reckon European import requirements of each war year as trend-point of extrapolated prewar total utilization plus "normal" outward carryover, minus domestic crop plus actual inward carryover.

² That is, the net exports of the five overseas exporters (lower portions of bars) and of Russia (upper portions of bars) that went to the European and northern African importing region as a whole.

³ In this calculation, we assume that "normal wartime utilization" in the Central Powers in 1914-15 and 1915-16 can be approximated by applying to projected trend-points of "customary utilization" in the Central Powers the ratio of actual utilization in other parts of Europe and northern Africa in those years to trend-points of "customary utilization" in those parts.

tual imports to differ from calculated import requirements.

In no year of the World War were actual imports even close to the import requirements based on the assumption of maintenance of "customary" levels of total wheat utilization in Europe. This is shown by the gaps between the solid line and the tops of the bars. In 1917-18, this gap was some 650 million bushels—over 50 per cent larger than actual imports.

But the concept of "customary" utilization is unrealistic in wartime. The circumstances of war tend on the one hand to raise total requirements for wheat utilization above the customary level, and on the other hand to reduce them below the customary level (p. 70). The circumstances making for reduction are the stronger; within nations deeply involved in war, wheat simply cannot be expected to be utilized in the ways of peacetime. The population must bear this sacrifice among others.

Such a concept as "normal wartime utilization" is pertinent here. It would represent utilization of wheat to such extent and in such forms as would not cause either hunger, acute discomfort, or great disturbance of normal consumption habits among the population. We take it that this was actually the general situation in Europe outside the Central Powers in the first two years of the World War, until about the summer of 1916. In order to make calculations, we assume that per capita utilization of wheat on the average in these two years represented "normal wartime utilization." With annual population statistics, it is thus possible to calculate³ what "normal wartime utilization" would have been in the three succeeding years, and these data may be used further to calculate what imports would have been required to attain levels of normal wartime utilization.

The dash line (B) in Chart 8 indicates the volume of wheat imports needed to attain to normal wartime utilization in the importing area as a whole. Here again actual imports failed to equal import requirements in any war year. The gap between these requirements and actual imports in the worst year, 1917-18, was some 440 million bushels. But in 1914-15 largely and in 1915-16 wholly,

the gap represents shortage in the Central Powers and not in the rest of the importing region; and in 1917-18 nearly half of it represents shortage in the Central Powers alone.

Data for the Central Powers on import requirements respectively for so-called "customary utilization" and "normal wartime utilization," together with actual imports, are as follows in million bushels:

Aug.-July	Germany and Austria-Hungary Requirements		Actual imports
	Customary	Wartime	
1909-10	115	...	110
1910-11	64	...	72
1911-12	51	...	60
1912-13	44	...	67
1913-14	59	...	82
1914-15	147	124	20 ^a
1915-16	145	110	25 ^a
1916-17	221	174	10 ^a
1917-18	275	214	6 ^a
1918-19	313	239	10 ^a
	Greater Germany ^b		
1933-34	0	...	6
1934-35	3	...	21
1935-36	0	...	9
1936-37	24	...	32
1937-38	61	...	47
1938-39	0	...	42

^a Not officially reported; inferred from scattered evidence; see p. 74.

^b Approximate only. Basic utilization, crop, and stocks statistics refer to Germany, Austria, Czechoslovakia, and half of Polish data as of 1937 boundaries. Net import statistics are combined net imports of Germany, Austria, and Czechoslovakia.

Only about a fifth of the import requirements necessary to attain normal wartime utilization (as defined above) could be brought into the Central Powers in 1914-15 and 1915-16. In later years the situation was far worse. Such imports as were possible during the war came mainly from southeastern Europe (p. 74).

From the point of view of overseas exporting countries, the import requirements of the Central Powers were of little interest in the commodity sense, for exports from overseas could not pass to the Central Powers while allied fleets controlled the seas. Accordingly, we show in the dotted line (C) of Chart 8 the import requirements necessary to maintain normal wartime utilization of that part of the importing area open to receive overseas ship-

ments. The gaps between this line and the tops of the bars were the gaps that concerned both the allies and the European neutrals, and overseas exporting countries whether neutral or belligerent.

In 1914-15 and 1915-16, actual imports into the importing region sufficed to satisfy normal wartime utilization of the open countries. A small shortage appeared in 1916-17. In 1917-18 the shortage was large, exceeding 225 million bushels. In 1918-19 the shortage was again small. In all five war years, imports had to be supplied almost entirely by the overseas exporters, for Russian exports practically disappeared when the Dardanelles were closed by Turkey in the autumn of 1914.¹ The wheat shortage of some 225 million bushels in 1917-18 in the importing region excluding the Central Powers was not, of course, spread evenly among the different countries (see p. 72). The importers rather than the exporters of non-Russian Europe and northern Africa felt it; and among the importers, it was naturally felt most by those which (a) depended most heavily on imported wheat supplies for total utilization, (b) depended most heavily on wheat as a component of the national diet, and (c) lacked control of shipping or cogent arguments for obtaining the ships.² Switzerland perhaps exemplified the most unfavorable situation.

The severe shortage of 1917-18 in the "open" countries generally would have been mitigated either if domestic crops had been larger, if Russian exports could have continued, if the overseas exporters had harvested larger crops, if shipping conditions had permitted exportations of existing surpluses in the overseas exporting countries, or if more wheat could have been diverted from non-European destinations.

¹ According to a chronicle of World War events summarized from Broomhall's *Corn Trade News* and presented in his *Corn Trade Year Book* for 1921, the Dardanelles were first closed on August 5, 1914; opened to British ships on August 19; closed again on September 28. Russia, France, and England declared war on Turkey on November 3-5; Turkey proclaimed a state of war on November 15. See C. J. H. Hayes, *A Brief History of the Great War* (New York, 1925), pp. 70-71.

² Italy succeeded in inducing Britain to provide shipping and credits with relative liberality, and this helped to maintain Italian wheat utilization in 1917-18 (see p. 72).

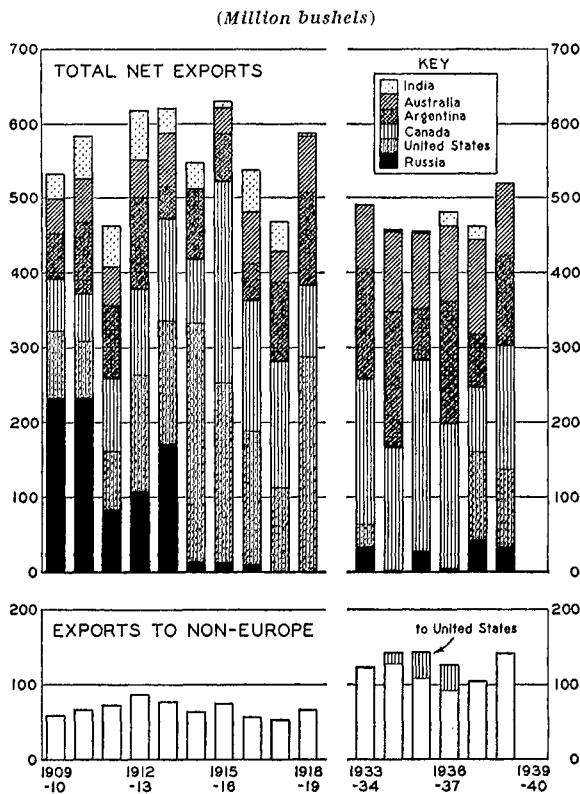
The position of domestic crops and of Russian exports hardly requires further discussion. But some comments seem warranted on overseas export surpluses, non-European requirements and trade, and accumulation of stocks in overseas exporting countries.

SURPLUSES AND TRADE

Chart 9 provides, in the upper section, a record of total net exports of the six exporters of the world which furnish the great bulk of

greatly reduced during the World War.¹ The contrary might have been expected in view of the considerable degree of response of non-European demand to changes in price. But short-haul shipments from Australia and Argentina to non-European markets remained feasible in spite of general shortage of shipping, given the wartime accumulation of stocks in those countries and resulting moderate elevation of prices there (see pp. 90, 95). The wartime exports to non-Europe, however, fell about 12 per cent below their average pre-war level, while exports to Europe did not decline at all.

CHART 9.—NET EXPORTS OF WHEAT AND FLOUR AS WHEAT FROM MAJOR EXPORTING COUNTRIES, TOTAL AND TO NON-EUROPE, 1909-19 AND FROM 1933-34*



* Data in Table III.

the wheat that goes to fill both European requirements and non-European requirements. The lower tier shows quantities sent to other destinations than those within non-Russian Europe and northern Africa; they originate almost entirely in the overseas exporting countries, mainly the United States, Argentina, and Australia. Exports to non-Europe were not

The upper portion of Chart 9 shows how Russian exports disappeared and the burden of supplying world import demand fell upon the five overseas exporters. It also shows the respective contributions of each of these and suggests, though not clearly, the extent to which the burden had to be borne by the North American exporters, from which shipments to Europe could be made most promptly, most safely (at least after the convoy system was inaugurated in May 1917), and most cheaply. The North American route across the Atlantic was the shortest one from the five overseas exporters during the World War.²

Not all of the wheat exported during the war years reached final destinations. The quantities lost are not recorded in sources available to us,³ and are not allowed for in our calculations of imports, since we treat exports from the major exporters to non-Russian Europe and northern Africa as precisely equiva-

¹ The shipments to non-Europe reported by Broomhall show a large reduction. But Broomhall's overseas shipments were naturally only imperfectly reported during the war, when current information was often suppressed; and we make no use of his data in this study.

² Other major routes were those from the west coast of North America through the Panama Canal or around Cape Horn; from Argentina across the South Atlantic; from Australia *via* the Indian Ocean, Suez Canal, and Mediterranean, and *via* the Cape of Good Hope; and from northwestern India *via* the Indian Ocean, Suez Canal, and Mediterranean.

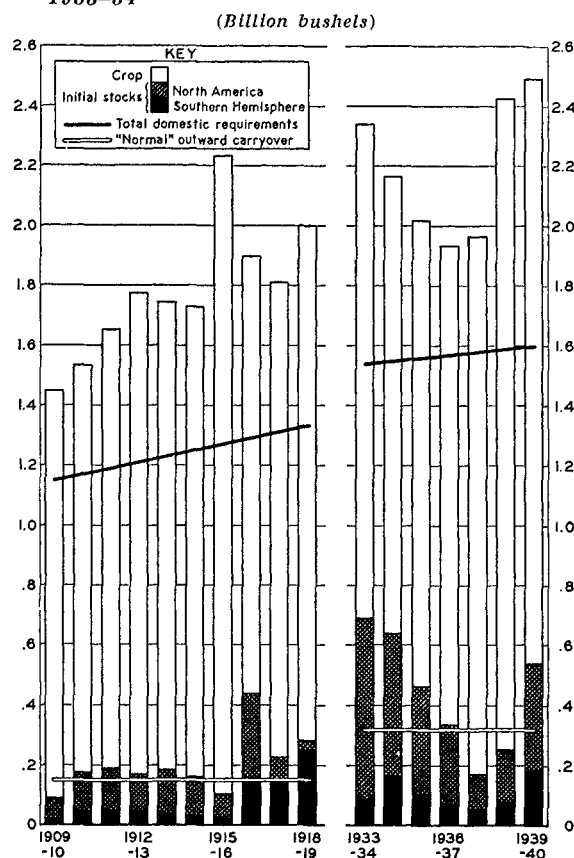
³ These sources, however, include the unpublished record of meetings of the Allied Wheat Executive, together with much data on shipments and losses furnished the Wheat Executive by the Royal Commission on Wheat Supplies, in the files of the Hoover Library on War, Revolution, and Peace.

lent to the imports of that area. During the crop year 1917-18 the quantity of all cereals directed to the United Kingdom but sunk at sea was about 2.2 per cent of the quantity shipped.¹ If this percentage should be applied to the "imports" of Europe in 1917-18 as we calculate them, then the shortage of wheat in the open countries of the importing area would be increased by about 10 million bushels² beyond the 225 million suggested above. In 1916-17, the losses were probably larger, because it was in the first six months of 1917 that shipping losses were heaviest.³ From November to July 1916-17, the quantity of all cereals shipped to the United Kingdom but lost at sea was 7.3 per cent of the quantity shipped; and this might mean not far from 25 million bushels of the total quantity of wheat shipped to Europe in those months.

The export surplus of wheat in the five major exporting countries in any year may be defined as total supply, from crop and inward carryover, minus (a) "normal" domestic utilization for food, seed, and miscellaneous other uses of which the principal one is feed, and (b) normal outward carryover. Sufficiently close approximations to (a) are perhaps provided merely by "smoothing" the trends of

actual utilization shown in Chart 2 (p. 70), and (b) can be fairly estimated. In Chart 10 we reproduce on a larger scale the supply

CHART 10.—WHEAT SUPPLIES, DOMESTIC REQUIREMENTS, AND EXPORT SURPLUSES IN FIVE OVERSEAS EXPORTING COUNTRIES, 1909-19 AND FROM 1933-34*



* Basic supply data from Tables I and II. Domestic requirements and export surpluses explained in accompanying text. See also notes to Charts 1 and 7.

¹ Royal Commission on Wheat Supplies, *First Report* , p. 37.

² Application of this percentage to the total imports of Europe cannot give an exact measure of wheat lost at sea, because one does not know even of the United Kingdom whether the percentage of all cereals sunk would apply to wheat alone, and because one does not know whether the percentage loss of cereals destined to the United Kingdom was smaller or larger than the percentage losses of cereals destined elsewhere.

³ Losses of allied and neutral merchant vessels were as follows, monthly, in thousand gross tons:

Month	1914-15	1915-16	1916-17	1917-18	1918-19
August . . .	64.8	183.6	165.1	488.7	270.5
September .	89.6	147.5	222.4	342.1	166.6
October . . .	95.3	88.7	344.0	429.5	113.1
November . .	26.8	144.9	318.7	284.6	24.3
December . .	44.0	124.6	348.4	385.8	....
January . . .	48.2	94.8	364.8	303.6	....
February . .	60.2	114.5	536.6	305.5	....
March	88.4	165.6	590.5	320.7	....
April	58.5	183.0	866.6	275.0	....
May	125.0	123.0	574.3	263.4	....
June	135.6	110.8	665.4	241.4	....
July	107.0	115.3	549.4	237.9	....
Total	942.4	1,596.3	5,546.2	3,878.2	580.5

Data from J. A. Salter, *Allied Shipping Control, An Experiment in International Administration* (Oxford, 1921), pp. 355-59.

data from Chart 2, here differentiating the carryovers as to location respectively in North America on the one hand, Argentina and Australia on the other. The upper solid line in Chart 10 represents the sum of our estimates of normal utilization and of normal outward carryovers as indicated by the lower hollow line in Chart 10. The portions of the bars above the upper solid lines represent approximately the size of export surpluses in the five overseas exporting countries.

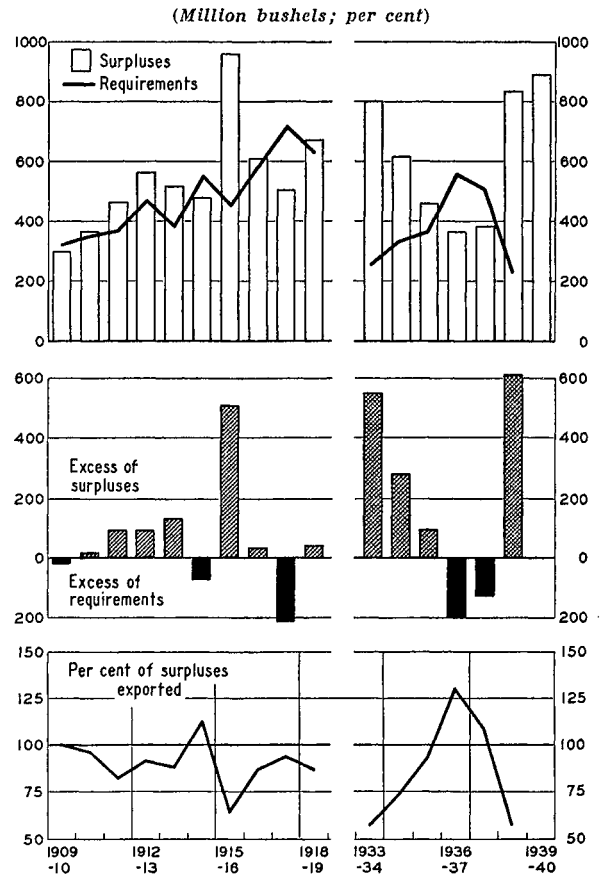
These surpluses averaged larger during the World War than before, in reflection partly of expanded production (p. 82) but also of a

higher wartime level of carryovers. The wartime carryovers were small at the beginning of 1915-16, but above normal thereafter. There would in any event have been a large carryover at the end of 1915-16, when more than enough wheat was shipped to satisfy normal wartime import requirements (Chart 8, p. 86). But even in this year stocks began to pile up in the Southern Hemisphere, as is shown by the lowest portions of the bars in Chart 10. By the end of 1916-17, a year in which not enough wheat was shipped to fill European normal wartime requirements, stocks remained piled up in the Southern Hemisphere; but at the same time the level in North America was exceptionally low. During 1917-18, year-end stocks in North America were drawn down to an extremely low level, while stocks in the Southern Hemisphere rose further. This fact emphasizes the shortage of shipping, for in 1917-18 Europe was in need of all the wheat that could have been brought in. This backing up of export surpluses persisted for another year, for at the end of 1918-19 the stocks in the Southern Hemisphere were only 5 or 6 million bushels less than at the beginning, while North American stocks had not risen to a normal level.

The bars in the upper section of Chart 11 show the annual export surpluses of the five overseas exporting countries, calculated as described above. The line running through the bars measures approximately the world requirements for wheat from the overseas exporters.¹ The relationship of tops of bars to points on the curve shows in what years the

export surpluses of overseas exporters exceeded world import requirements for overseas wheat, and in what years the import re-

CHART 11.—WHEAT EXPORT SURPLUSES OF FIVE OVERSEAS EXPORTERS, WORLD IMPORT REQUIREMENTS FOR OVERSEAS WHEAT, BALANCES BETWEEN SURPLUSES AND REQUIREMENTS, AND PERCENTAGES OF SURPLUSES EXPORTED, 1909-19 AND FROM 1933-34*



* See accompanying text. The export surplus of 1939-40 is here shown too low; see notes to Charts 1 and 7.

¹ The construction of these estimates of world import requirements for overseas wheat requires brief explanation. From 1909-10 to 1913-14 the estimates represent (a) total European requirements for imported wheat from all sources to satisfy customary utilization (line A in Chart 8, p. 86) minus (b) quantities actually exported from Russia (Chart 9) plus (c) import requirements of non-Europe (which are always filled by the overseas exporters) taken as 70 million bushels annually (see lowest tier of Chart 9, p. 88). From 1914-15 to 1918-19 the estimates of world import requirements for overseas wheat are (a) the total requirements of European countries open to receive overseas wheat, in terms of requirements for normal wartime utilization (line C in Chart 8) minus (b) such small quantities as were actually exported from Russia plus (c) import requirements of non-Europe again taken as 70 million bushels annually. From 1933-34 the estimates are on the same

requirements were the larger. This relationship is shown more readily in the second tier of the chart; excess of surpluses over requirements is indicated by cross-hatched bars above the base line, and excess of requirements over surpluses by black bars below the base line.

During the five prewar years, surpluses usually exceeded requirements by small or moderate margins. During the World War, import requirements moderately exceeded export sur-

basis as in the period 1909-10 to 1913-14, except that non-European requirements are taken as 100 million bushels annually.

pluses in 1914-15, there was a huge excess of surpluses over requirements in 1915-16, and there were small excesses of surpluses in 1916-17 and 1918-19. The principal point made by this chart is that in 1917-18 not enough wheat existed in the overseas exporting countries to supply what was required from them in order to cover the import requirements even of the importing countries open to receive shipments, and even if the imports were to be used to cover only "normal wartime requirements for utilization" rather than "customary utilization." The large indicated excess of requirements over surpluses in 1936-37 does not have the same meaning; for in that year import requirements represent quantities needed to bring utilization in importing areas up to customary levels, not the lower wartime levels.¹

Furthermore, it proved impossible in 1917-18, and also in 1916-17 and 1918-19, to export the surpluses in full. This is shown in the lower tier of Chart 11. The points on the line represent the ratio of actual exports of the overseas exporters (Chart 9, p. 88) to their exportable surpluses.

In years of peace, it is normal for exports to fall below exportable surpluses in years when export surpluses exceed import requirements, as in the three years 1911-12 to 1913-14, and more conspicuously in 1933-34, 1934-35, and 1938-39. Under such circumstances, the exporting countries either store or use for feed much of the excess of their surpluses over import requirements. In such years imports exceed import requirements (Chart 8, p. 86) because importers enlarge purchases, and both use and store more wheat. If the surpluses exceed the import requirements by a very large margin, as in 1915-16, 1933-34, and 1938-39, as little as 50 to 60 per cent of the surpluses may be exported.

On the other hand, it is normal for actual exports to exceed export surpluses in years when import requirements are larger than export surpluses, as in 1936-37 and 1937-38. In

such years feed use of wheat in the exporting countries tends to be reduced, so that less than the normal amount of wheat is used domestically; and stocks fall below normal levels. In such years also, importers will curtail their utilization and draw down stocks, and actual imports will fall below import requirements.

The first year of the war, 1914-15, was normal with regard to export behavior: exports exceeded export surpluses. But in 1917-18, when normal export behavior would have called for exports larger than the export surpluses, the exports were in fact smaller. This was due to the shortage of shipping which hampered outflow of the surpluses in the Southern Hemisphere. From North America, the surpluses were exported more than in full, as is indicated by the abnormally low level of year-end stocks at the close of 1917-18 (Chart 10). It was partly on account of economies in human consumption of wheat in the United States (p. 76) that overseas exports in 1917-18 came as near as they did to equaling the export surpluses. Exports in 1916-17 and 1918-19 were also abnormally low in view of the rather close adjustment of export surpluses to import requirements.

The world wheat stringency in 1917-18 may thus be characterized as follows: Small crops in the "open" importing region of the world created very heavy total import requirements, even with requirements for utilization defined in terms of wartime requirements that were substantially below customary peacetime requirements. Russia was not in a position to supply wheat to the importing area, so that the burden fell upon the overseas exporters. These secured crops so short that their total supplies were not large enough to yield exportable surpluses adequate to cover world import requirements. Shortage of shipping prevented Southern Hemisphere exportable surpluses from passing fully to export. Heavy drafts upon stocks in North America, and economies in American consumption, ameliorated the European situation somewhat. Strenuous efforts to stretch wheat supplies in the open countries of Europe succeeded in warding off mass starvation or hunger, but not privation or profound disturbance of consumption habits.

¹ In this year, however, the position of importers was not strictly comparable with their pre-1914 position; some importing countries in 1936-37 lacked the purchasing power to bring in enough wheat to cover requirements for "customary utilization."

CONTRASTS OF PREWAR POSITIONS

Certain further contrasts in the world wheat situation as it was in the five-year periods preceding 1914 and 1939, respectively, are revealed by Charts 8-11 (pp. 86, 88, 89, 90).

1. European (including northern African) import requirements (and imports) have averaged lower in recent years than was true before 1914. This is the obverse of the larger recent proportion of utilization supplied by domestic crops (p. 76).

2. European import requirements have fluctuated more violently in recent years, in considerable degree a reflection of larger dependence upon domestic crops. Actual imports have not fluctuated more violently. This may point towards larger elasticity in European demand (growth of feed use), but also in some countries merely to wider use of wheat substitutes when wheat supplies are scanty.

3. Non-European imports, unlike the European, have averaged considerably larger in recent years than in years before 1914. In substantial degree this represents emergence of the Orient as an import market.

4. The "normal" level of year-end stocks in the overseas exporting countries is prob-

ably substantially higher than it was in 1914. In part this reflects relative enlargement of production especially in Argentina and Australia, together with growing adequacy of storage facilities. There is probably more scope for reduction of these stocks to abnormally low levels than was true before 1914, if supplies flow freely from all exporters.

5. The export surpluses of the five overseas exporting countries have recently tended to exceed world import requirements for overseas wheat by larger margins than before 1914, and smaller fractions of the surpluses have been exported. Normal yields per acre on the areas sown for the crops of 1933-37 would have tended further to emphasize this evidence of chronic world wheat surplus.

6. The present great war begins with export surpluses in the five overseas exporting countries (if Southern Hemisphere crops are as expected) probably the largest in seven years, and far in excess of the largest world import requirements calculable (those of 1936-37) for any of the six years ending with 1938-39. The World War began under opposite circumstances, with import requirements in excess of export surpluses.

IV. PRICES

During the World War, "price control" tended to mean "restraint of price increase" in the interests of consumers—not, as it commonly has in recent years, "elevation of price to producers." Generally, price advance was expected, and governmental policies were directed toward the problem of holding advances in check so that not too great a disparity with wages of the mass of the populations would emerge, thus increasing real costs of living.

PRICE CONTROLS

Wheat prices during the war were not always prices determined under normal competitive processes. Perhaps the normal processes prevailed or were not greatly modified throughout the war in a few countries, of which Argentina seems the best example among the overseas exporters. Furthermore, there was relatively little direct interference of governments with world wheat prices in the

first two years of the war, though in much of Continental Europe domestic wheat prices fell early under governmental influences.

In France, for example, prices to domestic producers were in effect fixed (at 32 francs per quintal, close to their prewar level) as early as 1914-15 by a system of requisitioning of supplies for the army commissariat. In October 1915 a legally fixed maximum price to producers of 30 francs per quintal became effective. Successive steps brought fixed prices of 33 francs, on spring wheat only, from March 1916; of 33 francs on all wheat from July 1916; of 36 francs from April 1917; of 50 francs from July 1917; of 75 francs for the harvest of 1918.¹

Until late in the war, the policy in France was thus to hold the domestic wheat price well below the price of imported wheat,

¹ Augé-Laribé and Pinot, *Agriculture and Food Supply in France during the War*, pp. 82-85.

and the necessity of establishing prices high enough to maintain or encourage domestic production was only tardily recognized. The reason for holding down the prices of wheat to producers lay in the accepted policy of keeping bread cheap. "One purpose," said Augé-Laribé, "dominated French policy throughout the early course of the war, that of protecting the consumer from a marked increase in prices. The Government showed, in particular, a tenacious determination to keep the price of bread unchanged."¹ In short, France chose to subsidize bread consumption, in effect absorbing by the national treasury the difference between a low price of bread to consumers and a higher price of wheat to producers at home and abroad. In the attempt to minimize this drain on the treasury, prices of wheat to domestic producers were fixed below what had to be paid for imported wheats.

Germany, like France, undertook price control early—both of prices of wheat to producers, and of bread to consumers; but here the government sought to control the prices of wheat, flour, and bread in their usual relationships, thereby avoiding the burden of a bread subsidy.² Britain adopted the bread subsidy, though not until the spring of 1917. At about the same time, in April, maximum prices of wheat to producers were first established for the remnant of the crop of 1916. Italy began early, in January 1915, to fix prices to domestic wheat producers; and her wartime policy was bread subsidy, involving monopolistic wheat purchase both from do-

mestic producers and from abroad, with resale at lower prices so as to hold bread prices low.³

In the United States, prices of wheat were fixed for the crops of 1917 and 1918, but there was no attempt to keep bread cheaper than wheat prices would justify.⁴ Essentially the same policy was followed in Canada. In Australia, prices to producers were not fixed, but compulsory pools were established in November 1915 and a governmental agency was the sole seller of six succeeding crops to domestic millers and foreign buyers.

Beginning in October 1916, the great bulk of the wheat brought into Europe was purchased in foreign countries by a single governmental organization, the (British) Royal Commission on Wheat Supplies, which a little later acted as agent of the Allied Wheat Executive. This latter body eventually decided, for practically all of "open" Europe, how much to buy, where to buy it, how to transport it, and where to send it.⁵ Neutrals were "rationed." The Allied Wheat Executive, with its enormous resources and powers of bargaining and negotiation, was a large factor in eliminating normal interplay of supply and demand, and hence normal registration of price, in the world wheat market.

We do not attempt here either to describe in full the kinds of governmental influence on wheat prices during the World War, or to appraise their effects. It suffices to illustrate broadly how wheat prices moved in different parts of the world, and to venture explanations of some of the prominent diversities of movement.

OVERSEAS EXPORTERS

As Chart 12 (p. 94) shows, wheat prices in each of the overseas exporting countries averaged higher during the World War than before it. As the index numbers of wholesale prices suggest, price advances covering nearly the whole range of commodities were a common feature of the war. From this one may infer that wheat prices advanced partly (and largely) for reasons associated with other influences, including monetary factors, than those per-

¹ *Ibid.*, p. 70.

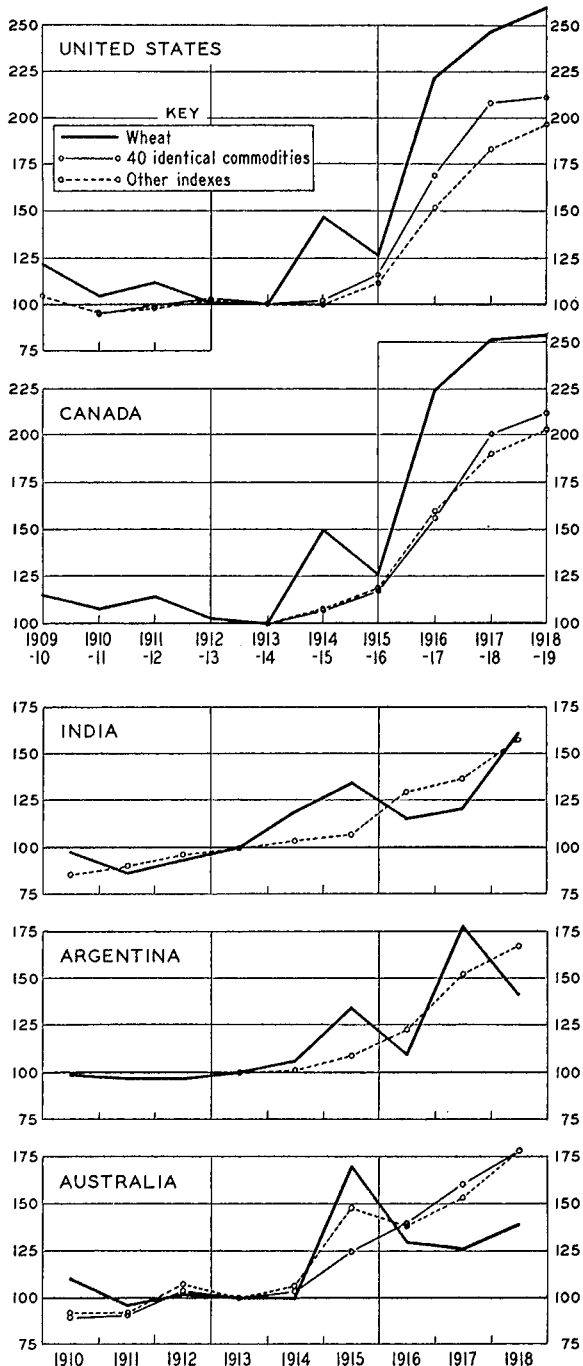
² Except perhaps on the small amount of foreign wheat used; the disposition of this wheat is not clear to us.

³ Riccardo Bachi, *L'alimentazione e la politica annonaria in Italia* . . . (Bari, 1926), p. 387.

⁴ Useful discussions of prices and price controls, in addition to those cited elsewhere, can be found in two bulletins of the U.S. War Industries Board—W. C. Mitchell, *International Price Comparisons* (Washington, 1919), and P. W. Garrett, *Government Control over Prices* (Washington, 1920); and in Simon Litman, *Prices and Price Control in Great Britain and the United States during the World War* (New York, 1920).

⁵ See Royal Commission on Wheat Supplies, *First Report* . . . , pp. 14-15.

CHART 12.—INDEX NUMBERS OF WHEAT PRICES AND WHOLESALE PRICES IN GENERAL IN OVERSEAS EXPORTING COUNTRIES, 1909-19* (1913-14 or 1913 = 100)



* Data in Tables VII, VIII.

taining strictly to the commodity position of wheat itself. These influences require no com-

ment here further than to point out that their effects appear to have been greater in the United States and Canada than in India, Argentina, and Australia. Wholesale prices in general increased by more than 80 per cent between 1913-14 and 1917-18 in North America, but by less than 60 per cent between 1913 and 1917 in India, Argentina, and Australia.

The principal point of importance is that wheat prices during the war tended broadly to rise *more* than wholesale prices in general in North America, but *less* than wholesale prices in general in India and the Southern Hemisphere. Under normal competitive conditions, one would expect that "sensitive" commodities, largely metals and agricultural products, would rise faster and farther than wholesale prices in general during a broad advance of prices, and that wheat might rise farther and faster than a substantial group of these relatively sensitive commodities. This occurred during the World War in North America, but not in the other three overseas exporting countries, at least after the calendar year 1915. As Chart 12 shows, wheat prices in India, Argentina, and Australia in 1916, 1917, and 1918 more commonly stood lower in relation to the wheat prices of 1913 than wholesale prices in general stood in the same years in relation to the wholesale prices of 1913.

The general reason for this diversity of behavior in export wheat prices was the development of shortage in shipping,¹ whereby wheat

¹ A broad indication of the periods of greatest shortage of shipping is given in the following tabulation from J. A. Salter, *Allied Shipping Control*, p. 363. This shows by specified periods the net losses or gains of British tonnage of merchant vessels (gross losses set against gains from new launchings, in thousand gross tons).

Period	Net gain or loss
Aug.-June 1914-15	+ 360
July-June 1915-16	- 461
July-June 1916-17	-1,874 ^a
July-June 1917-18	-1,267
July-Oct. 1918	+ 128

^a Of which 965 in April-June 1917.

The net losses over the three-year period July-June 1915-18 amounted to 17 per cent of British tonnage in the summer of 1914 (20,831 thousand gross tons). In a different sense, shortage of shipping is suggested by the tabulation on ocean freight rates, p. 98.

surpluses in the more distant overseas exporting countries in large degree accumulated instead of being shipped out, creating relative depression of wheat prices in those countries. At the same time the diversion of shipping to North America created relative wheat-price elevation in the United States and Canada.

To the tendency toward relative depression of wheat prices in the three distant overseas exporters in 1916-18 there were two temporary exceptions. Argentine wheat prices rose more than Argentine wholesale prices between 1913 and 1917, and Indian wheat prices rose more (though only slightly) between 1913 and 1918 than did Indian wholesale prices in general. The exceptional behavior in Argentina is explained by the near-failure of the Argentine wheat crop of 1916, harvested late in that year and early in 1917 (Chart 7, p. 82); Argentine wheat prices were abnormally high in 1917 because wheat was abnormally scarce in Argentina. The somewhat exceptional behavior of Indian wheat prices in 1918 is explained by a necessary adaptation of the allocation of shipping. In that year supplies of wheat were so short in North America that the principle of drawing European wheat imports from the nearest sources of supply had to be modified, and the modification consisted of allocating ships in increased proportion to the Indian wheat trade. This created an exceptional demand for Indian wheat not shared by Argentina and Australia, resulting in relative elevation of the wheat price in India in 1918.

Certain features of price changes in the first two years of the war warrant brief comment. Wheat prices rose sharply, and more than wholesale prices generally, between 1913-14 and 1914-15 in North America and between 1914 and 1915 in the distant exporting countries. This accords with what would be expected in view of the world supply position, which was easy in 1913-14 but tight in 1914-15. The strikingly large rise of Australian wheat prices between 1914 and 1915 reflects the failure of the Australian crop of 1914, harvested late in that year and early in 1915. The general decline of wheat prices between 1914-15 and 1915-16 is also about what would be expected from the marked shift in the international statistical position from tightness

to ease. In view of the enormous world wheat surplus of 1915-16, one might reasonably have expected that wheat prices in all the exporting countries, and especially in North America, would have declined more than they did, in that year. The fact that North American wheat prices in 1915-16 stood somewhat higher in relation to 1913-14 wheat prices than did wholesale prices in general in the same countries suggests that the exceptional demand for North American wheat induced by shipping shortage had already begun to be felt.

The changes in wheat prices between 1915-16 and 1916-17, and between 1916-17 and 1917-18, seem rather satisfactorily explicable in terms of changing balances between export surpluses and import requirements shown in Chart 11 (p. 90). From an excess of surplus of over 500 million bushels in 1915-16, the situation changed to a bare excess of only 30 million in 1916-17, and then to an excess of requirements over surpluses of some 210 million bushels in 1917-18. The quantitative changes here possibly explain why wheat prices in North America rose more between 1915-16 and 1916-17 than between 1916-17 and 1917-18, not only absolutely but also in relation to advances in wholesale prices. But the data are not sufficiently precise to answer the vexed question whether or not the fixed wheat prices of 1917-18 in the United States and Canada were as high as prices would have been in the absence of governmental price fixing.¹

One question remains. Why in North America did wheat prices rise higher in 1918-19 than in 1917-18, when our calculations in Chart 11 show that between these years the marked deficit of export surpluses in relation to import requirements in 1917-18 was changed to a small excess in 1918-19? In neither year could the export surpluses be shipped in full. This change in balance between surpluses and requirements as we calculate them was so large that it would suggest that wheat prices, instead of rising (even though they rose less than wholesale prices in general) might have been expected to de-

¹ On this subject see F. M. Surface, *The Stabilization of the Price of Wheat during the War and Its Effect upon the Returns to the Producer* (U.S. Grain Corporation, Washington, 1925).

cline. The explanation may lie partly in the fact that, with the armistice of November 11, 1918, an important element in demand for overseas wheat, previously bottled up, became effective on world markets. Our calculations of world import requirements do not allow for this; and if they did, it is conceivable that a deficit of surpluses in relation to requirements would emerge in 1918-19, perhaps not much smaller than that indicated for 1917-18. In addition, it is possible that speculative demand increased sharply with cessation of warfare, and was fostered by easier credit conditions in some countries.

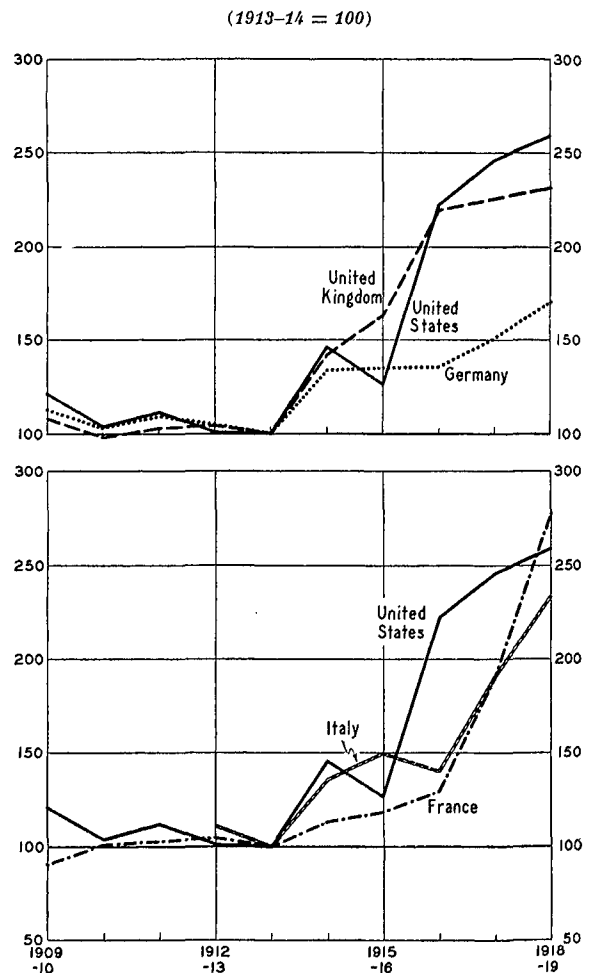
EUROPEAN COUNTRIES

Generally speaking, extreme peaks of wartime wheat prices in European countries were not so far above prewar levels as were the wartime peaks in North America—and this in spite of larger wartime advance of wholesale prices generally in the European countries. These facts are apparent from Charts 13 and 14. The first of these contrasts index numbers of wheat prices in the United States and four European countries, while the second contrasts index numbers of wholesale prices of relatively sensitive commodities in the same five countries.¹ The relatively smaller rise of wartime wheat prices in the European countries than in the United States (and Canada) is explicable broadly by the stronger European policies toward restraining advance of prices of so important an element in the national diets as wheat (p. 92).

It would appear that, of the four European countries, Germany exercised the most effective control of wheat prices.² At their war peak

in 1918-19, German prices of domestic wheat were only 70 per cent above their 1913-14 level, whereas in the United Kingdom the rise between the same years was 130 per cent, in Italy nearly 135 per cent, and in France nearly

CHART 13.—INDEX NUMBERS OF WHEAT PRICES IN THE UNITED STATES AND FOUR EUROPEAN COUNTRIES, 1909-19*



* Data in Table VII.

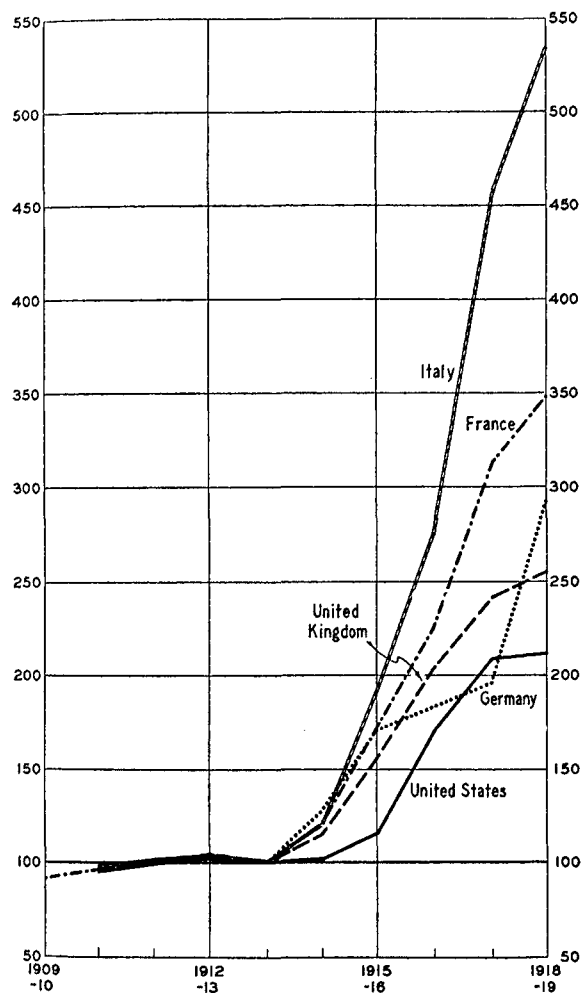
¹ For the comparison of wholesale prices we use, except for France, data compiled by G. F. Warren and F. A. Pearson (*World Prices and the Building Industry*, New York, 1937), applicable to the same 40 commodities in each country. The French index number, an official series, covers 45 commodities; Warren and Pearson give their index number for France only by calendar years.

² In the five crop years preceding 1914-15, German, French, and Italian domestic wheat prices, protected by tariffs, were 35-50 per cent higher than unprotected British prices; and of the three continental countries, Germany had somewhat the lowest prices.

180 per cent. But in France and Italy most of the large rise was concentrated in the last two years of the war. In the third year, 1916-17, French prices of domestic wheat were held to an increase of only about 30 per cent as compared with 1913-14, while wholesale prices generally had risen 125 per cent. This represented the policy of low fixed prices to produc-

ers in spite of their rising costs, which was not changed until June 1917 (see p. 92) and was then a compromise. In Italy in 1916-17, wheat prices to domestic producers were held to an

CHART 14.—INDEX NUMBERS OF WHOLESALE PRICES IN GENERAL IN THE UNITED STATES AND FOUR EUROPEAN COUNTRIES, 1909-19* (1913-14 = 100)



* Data (Indexes of 40 identical commodities, except for France) in Table VIII.

advance of only 40 per cent as compared with 1913-14, while wholesale prices generally increased about 175 per cent.¹ The German increase in wheat prices between these years was some 35 per cent, while wholesale prices rose nearly 85 per cent.

Measured by ratios of increase of wheat

price to increase of wholesale prices, the low-wheat-price policy through 1916-17 was most drastic in Italy and France (40:175 and 30:125), least so in Germany (35:85). The British policy was sharply in contrast; there domestic wheat prices rose some 130 per cent² between 1913-14 and 1916-17 while wholesale prices rose by only 105 per cent. It was not until 1917-18 and 1918-19 that advances in British wheat prices were exceeded by increases in wholesale prices generally.

In Great Britain, France, and Italy, prices of bread or of flour to consumers were prevented from rising as much as wheat prices even to domestic producers. In Britain, after September 1917, the price of bread was held at 9d. per four-pound loaf, no more than 60 per cent above its level of July 1914, while wheat went very much higher. From mid-July 1917 to March 1, 1920, the French bread price was held to 55 centimes per kilo, only about 27 per cent above the 1914 price. We have been unable to find usable records of bread prices in Italy.

A few features of the wheat-price movement in Britain warrant further comment, emphasizing the contrast with wheat prices in the United States given in Chart 13. It might seem reasonable to suppose that these two series would move closely together, since the British "prices" apply to imported wheat and sterling-dollar exchange remained very close to its prewar par through July 1919.³ It might further be thought that the advance of ocean

¹ One device used to restrain advance of wheat prices both in France and in Italy was suspension of import duties. In France, such suspension lasted only from outbreak of the war until October 1915, when they were restored at prewar rates; in Italy, duties were modified in October 1914 and suspended in January 1915. This device could not be used in the United Kingdom, where wheat entered duty-free. It was used also in Germany, but very little wheat could be imported during the war.

² That is, a little more than the prices of imported wheat shown in Chart 13, which rose by about 119 per cent. Throughout the World War, there was approximate correspondence of movement between British domestic wheat prices and declared values of wheats imported into the United Kingdom (Table VII).

³ See pertinent tables in T. E. Gregory, *Foreign Exchange Before, During, and After the War* (Oxford, 1922), pp. 110-11.

freight rates on grain during the war¹ might have caused British import prices of wheat to show a greater increase than did wheat prices in the United States. But the effects of higher freight rates were obscured. The only year in which the advance in British import wheat prices outstripped the advance in United States wheat prices was 1915-16.

It seems difficult to explain why the "prices" of British imported wheat in 1917-18 and 1918-19, as shown in Chart 13, had increased less than United States wheat prices.² Certainly the British general price level had risen more than the American (or the Canadian—see Chart 12), and in those years the British imports must have consisted in unusual proportion of North American wheats. The explanation probably lies in the manner in which the British imported wheat was purchased by the Royal Commission and the way in which its import value was declared. Under the circumstances of international purchase and trade in these two years, which involved bulk purchase long in advance of shipment, as well as special inter-governmental agreement on prices, the British import price was probably not a market price that could be expected to equal the market price in exporting countries plus cost of transport.

¹ Semi-annual index numbers of ocean freight rates on grain are as follows (based on average rates in 1913-14 = 100):

Period	Northern Range to United Kingdom	La Plata (down river) to United Kingdom
1914-15		
Aug.-Jan.	197	314
Feb.-July	370	545
1915-16		
Aug.-Jan.	575	775
Feb.-July	593	1,356
1916-17		
Aug.-Jan.	1,090	1,172
Feb.-July	1,635	1,151
1917-18		
Aug.-Jan.	1,817	1,377
Feb.-July	2,285	1,838
1918-19		
Aug.-Jan.	2,385	1,955
Feb.-Jan.	427	537

Compiled from data in *International Yearbook of Agricultural Statistics, 1909-21*, pp. 448-49. The rates for periods from January 1916 are not homogeneous, but are a mixture of "government rates," "rates for merchants," and "rates for neutrals."

² The policy of fixed domestic wheat prices in England could explain the discrepancy between domestic prices and United States prices.

CONTRASTS OF PREWAR POSITIONS

Charts in the foregoing discussion have not been designed to afford contrasts of wheat prices and price relationships in the periods preceding 1914 and 1939. In view of the numerous changes that have been made in national currency units since 1914, contrasts of wheat-price levels as between these two pre-war periods would hardly be illuminating. But certain types of contrasts are pertinent.

1. In the overseas exporting countries and on free import markets, wheat has lost purchasing power in the interval of years between 1914 and 1939. The point may be made by comparing actual prices in the crop years following 1933-34 with "parity prices." Here we take as the parity price that price which wheat would need to have brought in these recent years if it were to exchange for as large a quantity of other commodities as it actually exchanged for in the years preceding 1914. The formula here used to calculate "parity prices" since 1933-34 for each country is:

$$a : b = x : b'$$

where a = average currency price per unit of wheat in base year 1913-14 (sometimes 1913); b = index number of wholesale prices generally in 1913-14 (sometimes 1913), which is always 100 since 1913-14 or 1913 is taken as the base year; and b' = index number of wholesale prices generally in 1933-34 (or any subsequent year).

The following tabulation shows these so-called "parity prices" in comparison with actual prices in the United States and Canada by crop years since 1933-34:

Year	United States (July-June)		Canada (August-July)			
	U.S. cents per bushel ^a	Actual as per cent of parity	Canadian cents per bushel ^a		Actual as per cent of parity	
	"Parity"	Actual	"Parity"	Actual		
1933-34...	93.2	87.7	94	97.1	68.1	70
1934-35...	101.0	98.6	98	98.8	81.8	83
1935-36...	103.8	99.3	96	100.0	84.6	85
1936-37...	109.2	126.4	116	112.4	122.7	109
1937-38...	106.6	97.5	91	114.0	131.5	115
1938-39...	99.4	69.3	70	101.6	62.0	61
Average	102.2	96.5	94	104.0	91.8	88

^a Chicago cash wheat of lowest grade deliverable on futures contracts.

^b No. 1 Northern at Winnipeg.

Despite strenuous governmental efforts reinforced by seriously adverse weather for wheat, American wheat prices have not on the average attained this "parity,"¹ and neither have Canadian. If parity price was exceeded by actual price in both the United States and Canada in 1936-37, the explanation lies in the fact that 1936-37 was a year of extraordinary world wheat shortage due to a succession of low yields per acre. No such year occurred in the period from 1909-10 to 1913-14. The excess of actual prices over parity prices in Canada in 1937-38 reflects not only an international statistical position rather tight in that year also, but particular shortage of Canadian supplies (especially No. 1 Northern) as well.

Similar data calculated for Argentina and Australia by calendar years 1933-38 yield the following ratios of actual prices to parity prices in those countries, in percentage terms:

Calendar year	Argentina	Australia
1933	55	60
1934	54	53
1935	66	64
1936	93	81
1937	103	92
1938	73	61
Average ..	74	69

Here, on the average, actual prices have approximated only 70-75 per cent of levels that would have been necessary in order that wheat should have as high a purchasing power as it had in 1913.

The wheat-price position in Argentina and Australia is, moreover, the more accurate reflection of the world wheat situation. The past six years have been years of chronic world wheat surplus, interrupted by two years of exceptional stringency in 1936-37 and 1937-38. Except for the recent succession of low yields in the United States and Canada, and despite governmental price-supporting measures, the actual prices in these countries might have fallen below "parity" more as did prices in the Southern Hemisphere—and, indeed,

¹ The "parity price" in the United States as calculated by official methods would be much higher than the parity prices shown here. The official methods use farm prices and an index number of "commodities bought by farmers"; and this index number has risen considerably more between 1913-14 and recent years than has the index number used in our calculations.

prices in all four countries might have fallen even farther below parity than did those in the Southern Hemisphere.

On the British market, the situation has not differed much from that in the overseas exporting countries. The following tabulation shows ratios of actual prices to parity prices of imported wheat (A) and domestic wheat (B), again in percentage terms:

Aug.-July	A	B
1933-34	66	71
1934-35	73	80
1935-36	80	88
1936-37	99	109
1937-38	102	105
1938-39	64	67
Average	81	87

The ratio of import wheat prices to parity prices was somewhat higher than the ratios of export wheat prices to parity in Argentina and Australia. This is explained partly by the existence of tariff duties on non-Empire wheats during 1933-38, whereas in 1913-14 all wheat entered duty-free; partly also by the relatively larger proportion of high-priced Canadian wheats in the imports of recent years.

2. In European importing countries where wheat in recent years has been accorded a large degree of protection, actual prices of domestic wheats have tended to equal or exceed parity prices. Here wheat has either gained in purchasing power or lost little. Ratios of actual prices to parity prices in Germany, France, and Italy, are as follows:

Aug.-July	Germany	France	Italy
1933-34	98	123	106
1934-35	101	98	115
1935-36	100	91	111
1936-37	98	109	109
1937-38	98	113	105
1938-39	98	118	109
Average	99	109	109

These data, especially when considered together with the fact that wheat has received more protection than competing crops, help to explain why wheat producers in protected countries have had incentives in recent years to expand wheat acreage or intensify wheat cultivation with resulting higher yields, so contributing to maintenance of a position of chronic world wheat surplus.

3. A third contrast of price positions in years preceding 1914 and 1939 respectively lies in the much wider prevalence of governmental controls of wheat prices. This need not be elaborated. It suffices to say that in years before 1914 governments in exporting countries made little or no direct effort to control wheat prices, while the prevalent method of elevating wheat prices to domestic producers in importing countries was the relatively simple one of tariff duties. In recent years the exporting countries have tended to create many price-supporting agencies and devices. Importing countries have resorted to elaborate regulation of imports not only by tariffs but also by such methods as import quotas, licences, and control of quantities of foreign wheat used in milling mixtures; and fixed prices have become common. The war of 1939 begins with governmental machinery designed to regulate prices and price relationships much more prevalent, powerful, and ready to operate than was true in 1914.¹

4. A fourth contrast may be made with reference to shipping and freight rates. The world enters the war of 1939 with a substantially larger supply of shipping than existed in 1914, and the supply of shipping was probably more abundant relative to the demand for it just prior to 1939 than was true just before 1914. The world's supply of shipping tonnage is indicated by the following tabulation, in million gross tons of ships registered and exceeding 100 gross tons each:

Country	Midsummer 1914 ^a	June 30, 1938 ^b
British Empire	20.8	20.7
France	1.9	2.9
Germany ^c	5.4	4.2
Italy	1.5	3.3
Russia	0.9	1.3
Oslo states ^d	5.6	11.2
United States	2.6	11.9
Others	3.7	12.3
Total	42.4	67.8

^a Salter, *op. cit.*, p. 8.

^b "The Economic Alignment . . .," *Economist* (London), Sept. 2, 1939, p. 435.

^c Germany and Austria in 1914; for 1938, Germany with Austria and Czechoslovakia as of 1937 boundaries.

^d In 1914, Netherlands, Norway, Sweden, Denmark, Belgium; in 1938, the same, with Finland, Luxemburg, Belgian Congo, and Netherlands dependencies where statistics are available.

British and French tonnage was only a little larger in 1938 than in 1914; German was somewhat smaller; that of all others, particularly the United States, the Oslo states, and Japan (in "Others") was much larger. The increase of total tonnage, some 60 per cent, must have been more than twice as large as the increase in world population.² Ships were also faster and more economical to operate in 1938, consisting more of steam- and motor-driven vessels than in 1914.³

A crude indication of the probability that shipping was more abundant relative to the demand for it before 1939 than before 1914 is given by the following data, in which column A shows the Sauerbeck-Statist index (on the base 1898-1913 = 100) of wholesale prices of all commodities in the United Kingdom, and column B the *Economist* index of ocean freight rates (on the same base):

Calendar year	A	B
1912	114	131
1913	114	116
1937	137	149
1938	122	114

These two pairs of years are chosen because they are close to the war periods, and because each pair includes a year (1912, 1937) of freight rates exceptionally high in relation to those of the decade immediately preceding.⁴ British wholesale prices in general rose about 13.6 per cent between 1911-12 and 1937-38, while ocean freight rates increased only about 6.5 per cent. This may be taken as evidence that the purchasing power of the services of a unit of shipping has become somewhat smaller than it was just before 1914.

¹ It is also true, on the other hand, that belligerents (and most neutrals) enter the present war with heavier burdens of indebtedness than in 1914 and may encounter stronger pressure toward price inflation.

² The population of the wheat world ex-Russia, which is somewhat less than half of the total population of the world, increased about 21 per cent between 1912 and 1937 (see footnote 4, p. 76). It is not likely that total world population increased significantly more than this between 1914 and 1938, and it may not have risen as much.

³ See V. D. Wickizer, "Shipping and Freight Rates in the Overseas Grain Trade," *WHEAT STUDIES*, October 1938, XV, 49-120, esp. 50-55.

⁴ See chart in *ibid.*, p. 118.

V. PROSPECTS

The purpose of the present section is to examine the long-term prospects for changes in the world wheat situation in coming years. The short-term prospects will presumably be considered from time to time in later numbers of *WHEAT STUDIES*. Here the essential questions are: Can some or any of the striking developments during the World War be expected to repeat themselves? Or are the dominant factors in the world wheat situation now as compared with 1914 so different that events of the World War provide only poor indications of probable developments in the next few years?

These questions can be discussed coherently and with reasonable brevity only on the basis of assumptions—at least concerning the duration of the present war, and the belligerents. With no attempt to choose the assumptions most realistic in the political or military sense, we assume that the present war will last four or five years, and that the present alignment of belligerents will persist—the British Empire and France against Greater Germany, with the rest of the world remaining neutral with respect to this particular conflict.

These basic assumptions necessarily involve another assumption of importance to the prospective world wheat situation—namely, continuing substantial control of the seas by the British and French navies. If this control fails within a year or so—and the offensive power of German raiders, submarines, mines, and air fleet may not yet have been tested fully—we take it that war is unlikely to last as long as four or five years. Our assumption is that fundamental control of the seas and merchant shipping will rest with the allied powers; but this does not exclude possibilities of continued substantial loss of allied and neutral merchant shipping, and therefore of stringency in the supply of merchant shipping. Such losses apparently averaged below 200,000 gross tons in the first three months of the present war (September–November). This rate is far below the peak monthly rate of 702,100 gross tons in April–June 1917 of the World War, but well above rates recorded before September 1916 (p. 89).

Using these assumptions, the subsequent discussion deals with the following questions: (1) What are reasonable prospects for wheat supplies, from crops and imports, in German territory? (2) What are reasonable prospects for the volume of import requirements for wheat in the rest of Europe and northern Africa—the countries that will be open to overseas imports so long as control of the seas lies with the allies? (3) What are reasonable prospects that exportable surpluses will fall below, equal, or exceed the import requirements of Europe and non-Europe? (4) Is shipping shortage likely to hamper or disturb the outflow of export surpluses? (5) Are wheat prices in exporting countries likely to attain levels approximating those of 1917–19?

THE GERMAN POSITION

Under the stated assumptions, imports of wheat into territory ruled by Germany must come *via* other routes than terminals on the North Sea, aside from what may trickle through the blockade and the adjacent western neutrals and Italy on the south. Whether or not wheat utilization in German territory can be maintained at actual pre-1939 levels or at levels of “normal wartime utilization” depends, in the main, jointly upon domestic wheat production and upon the volume of imports obtainable from the northeast, east, and southeast.

It seems reasonably probable that total wheat requirements of German-ruled territory would increase if attempts were made to maintain utilization in customary forms, in reflection of enlarged physiological requirements per capita (see p. 70). But the exigencies of war will hardly permit such a policy, and it may be supposed that the quantity of wheat required to cover “normal wartime utilization” (see p. 86) will fall somewhat below the pre-1939 level of actual utilization, which was somewhere near 300 million bushels within Germany-Austria-Czechoslovakia and about half of Poland. Perhaps “normal wartime utilization” would be 5 to 10 per cent smaller—say 280 million bushels.

The wheat crops within this same territory

have averaged around 290 million bushels, somewhat larger than this guess at "normal wartime utilization." If crops equal to the average of recent years can be obtained in the future, the problem of wheat supply within German territory is not a difficult one. Production, however, seems likely to decline. In the World War, the decline of German wheat crops between 1911-13 and 1917-18 was around 40 per cent; and this decline reflected mainly shortage of labor and of fertilizer, which in turn curtailed both the acreage and the yield per acre. We take it that diversion of men and draft animals to military uses will inevitably create labor shortage in agriculture within German territory in the present war, and that fertilizer shortages, of phosphates rather than potash and nitrates, may again be expected to appear. If so, decline of wheat acreage, yield per acre, and production will again become evident in time.

Since recent levels of yield have been appreciably higher than those of years preceding 1914 and have stood higher mainly because of enlarged use of labor and fertilizer per acre, yields in German territory may now be more vulnerable to shortages of labor and fertilizer than they were in 1914. On the other hand, the experiences of the World War have presumably brought home to German authorities the fundamental importance of minimizing shortages of labor and fertilizer; and in addition, supplies of nitrogenous fertilizers can hardly be much affected in view of the present extent of German industry engaged in fixing nitrogen from the air. Our impression is that shortages of labor and fertilizer will be considerably less marked in the present war than in the World War. Labor supplies will probably be better managed, as will internal distribution of fertilizer supplies; and the available supplies of fertilizer—phosphates possibly excepted—will be more ample.

In view of these probabilities, we venture the suggestion that extreme decline of wheat production in German territory for any two-year period of a five-year war cannot reasonably be expected to exceed 20 to 25 per cent, whereas the extreme decline was 40 per cent during the World War. With very bad weather, one of the two years might be worse.

A curtailment of production by 30 per cent in a single year perhaps represents the extreme in probable reduction of wheat output in German territory. This would mean a crop of about 210 million bushels. Set against a "normal wartime requirement" for total utilization, such a crop would mean an import requirement of 70 million bushels. With normal weather within German territory, the largest import requirement in five years might not exceed 40 million bushels.

Wheat to fill the import requirement of German-ruled territory might be brought in by several routes. Yugoslavia, Hungary, Soviet Russia, and Lithuania all lie adjacent to German territory, and are in position to send wheat there by rail. In addition, wheat could move by water on the Baltic Sea from Russia, Latvia, Estonia, and Lithuania; and it could move up the Danube from Russia, Bulgaria, Rumania, Yugoslavia, and Hungary. The Baltic route is perhaps of least potential importance, because the surpluses of Lithuania, Latvia, and Estonia are very small and because heavy movement of Russian wheat *via* the Baltic might be relatively expensive. The rail and river routes from the southeast would perhaps be the more important ones.

It is pertinent, then, to inquire whether export surpluses that might move mostly by rail and river from the southeast could be expected to equal the import requirements of German-ruled territory. During the past six years, actual net exports of the five southeastern European countries were as follows, in million bushels:

Aug.-July	Hun- gary	Yugo- slavia	Ru- mania	Bul- garia	USSR	Total
1933-34.	29.3	1.1	0.2	4.0	34.3	68.9
1934-35.	12.8	4.3	4.2	0.4	1.9	23.6
1935-36.	17.3	0.8	5.9	1.1	28.5	53.6
1936-37.	25.1	18.3	37.6	7.9	4.6	93.5
1937-38.	9.0	4.7	32.2	7.9	43.0	96.8
1938-39.	29.6	5.5	44.8	3.5	34.0	117.4

In three of these years, actual exports have exceeded the maximum probable wartime import requirement of German-ruled territory, some 70 million bushels as calculated above. In five of these years, the exports have exceeded the largest import requirement of German territory that might be anticipated

with normal weather within that territory. The probabilities, then, seem to be that an import requirement of either 40 or 70 million bushels could be covered in the physical sense by export surpluses in the southeastern countries, except in event of strikingly unfavorable weather in those countries (as in 1934). It would hardly be expected, however, that an import requirement of 70 million bushels would coincide with an unfavorable year for wheat in the exporting countries, for this would imply exceptionally adverse weather over a range of territory and climate so wide that adverse weather throughout it would be most exceptional.

Physical surpluses in the southeast might not, probably would not, move in full to German territory even in years when they did not exceed German import requirements. Germany might encounter difficulties in filling her import requirements first because of competitive purchasing by other importing countries, and second because German financing of imports may meet with obstacles. We find it impossible to anticipate how these factors might develop. But our impression is that the near neighbors of Germany—Hungary and Yugoslavia—might regularly be induced to sell their wheat surpluses in full to Germany even if payment should take the form of promissory notes; while competitive purchasing (assuming, as we do, that the Dardanelles will remain open) might turn in other directions the bulk though not all of the surpluses of Soviet Russia, Bulgaria, and Rumania. We find it difficult to imagine that German imports from the southeast, if they were wanted, would fall below 20 million bushels even in a year of notably low yields per acre in the exporting countries. If it be supposed that German import requirements for normal wartime utilization would not exceed 50 million bushels in a year of low yields in the exporting countries, then the unfillable gap in total requirements of wheat within German-ruled territory might not exceed 30 million bushels, about 10 per cent.

Such a gap does not suggest that the wheat position in German territory is potentially highly vulnerable. The rye position may be regarded as still less vulnerable, in view both

of normally heavy feed use of rye (which can be diverted in large degree to food¹), and of the acquisition of a rye-surplus area in western Poland. Hence the bread-grain position seems moderately secure, at least if the German objective be to cover normal wartime requirements and not customary requirements. With respect to feed grains, fodder, livestock products, and especially fats and oils, the potential shortages in German territory seem to loom relatively more important.²

Shortage of wheat even in relation to requirements for customary utilization probably cannot appear in the current crop year. The inward carryover was very large,³ the new crop is reported a fairly good one, and some wheat appears to be moving from the southeast. It further seems possible that rationing of flour and bread, apparently already in force, might so far economize on the current year's

¹ The rye crops of Germany, Austria, and Czechoslovakia averaged 355 million 60-pound units in 1934-38; those of Poland, about 240 million. Perhaps the average crop of territory now ruled by Germany would be not far from 475 million. Average utilization within this territory would be about of the same volume, since net exports from Poland have only slightly exceeded the combined net imports of Germany, Austria, and Czechoslovakia. Rye utilization therefore exceeds wheat utilization in German-ruled territory. But at least in Germany proper, where the 1934-38 rye crops averaged about 280 million 60-pound units, between a fourth and a third of the rye utilized probably went for animal feed; according to Hans von der Decken, *Entwicklung der Selbstversorgung Deutschlands mit landwirtschaftlichen Erzeugnissen* (Berlin, 1938), p. 31, the proportion of all rye utilized that went for feed in the years 1931-35 to 1935-36 was 28 per cent. Corresponding data for other cereals and potatoes in these years were: wheat, less than 10 per cent; potatoes, 40 per cent; barley, 60 per cent; corn, 75 per cent; oats, 88 per cent. In more recent years, a smaller fraction of the wheat utilized has gone for feed.

² See "Germany's Food Supplies," *The Economist*, Sept. 16, 1939, pp. 515-16.

³ Around 95 million bushels in August 1939 in Germany, Austria, Bohemia, Moravia, Slovakia, and the part of Poland conquered by Germany, so far as we can judge, largely on the basis of official reports. This would be about double a normal carryover. A recent news dispatch, however, states that the official data on grain carryover (of which we use the wheat statistics for the old Reich) do not include large stocks held in "emergency warehouses." *Northwestern Miller*, Oct. 11, 1939, p. 25. How far such statements are trustworthy seems conjectural. In any event, there was an exceptionally large carryover of rye as well as of wheat in Germany at the outbreak of the war.

wheat supplies that large stocks could be carried into 1940-41.

IMPORT REQUIREMENTS OF "OPEN EUROPE"

In considering the prospects for wartime changes in the import requirements of other parts of the world, it seems advisable, so far as possible, to avoid discussion of particular countries and to consider (a) prospective change in demand on the part of Europe and northern Africa aside from German territory (that is, "open Europe") for wheat from Russia and the overseas exporting countries; and (b) prospective change in the demand from non-European countries for wheat from the overseas exporting countries.

The non-European demand for overseas wheat can be dismissed briefly. It would probably not much exceed 100 million bushels in years of moderately high prices, and might fall to 75 million bushels if prices were high, or rise to 150 million bushels if prices were low; and no major disturbance of national dietary habits in the importing countries would be involved in such fluctuations.

During the past six years, the amounts of overseas and Russian wheat needed to cover customary requirements for total wheat utilization in the open countries of Europe and northern Africa have ranged from about 160 to about 435 million bushels. Actual imports from Russia and overseas have fluctuated much less violently, from about 295 to 365 million bushels.

The import requirement of "open Europe" in 1936-37, which was about 435 million bushels, can probably be regarded as the maximum that would have emerged in the next five years in the absence of war. The yield per acre of open Europe in 1936 was remarkably low—trend considered, the lowest in more than a decade and hence one not very likely to have recurred within the period 1939-43. But the war has set in motion forces tending on the one hand to enlarge the prospective maximum annual import requirement in the next five years, and on the other hand to reduce it. Within England and France, at least, physiological needs for wheat for human consumption may tend to rise. In France, shortages of labor and fertilizer will

probably tend to reduce production, affecting both acreage and yield per acre adversely. Shortages of fertilizer may adversely affect yields per acre in some other countries where yields are high, especially northern Italy, Belgium, Holland, Switzerland, Denmark, and Sweden. These factors would tend to enlarge the prospective maximum annual import requirement of open Europe. If French production—the most important single crop—should fall 20 to 25 per cent below its lowest recent level (a reduction such as seems possible in German territory), this alone might increase prospective maximum import requirements by 50 to 60 million bushels. Smaller reductions elsewhere might increase the prospective maximum import requirements by approximately an equal amount.

But against such conceivable increases must be set the probabilities that acreage will be enlarged in some countries, and that economies will be achieved without much difficulty in uses of wheat for animal feed and for milling—the latter by compulsory elevation of milling extraction ratios. Both developments are already in evidence. Their ultimate importance is conjectural, but we hazard the opinion that prompt and adequate subsidization of wheat production in England, Switzerland, and a few other countries, together with restriction or proscription of feed use particularly in England, Holland, and Belgium, and elevation of milling extraction ratios only by the comfortable margin of 2 or 3 per cent, would tend to reduce the import requirements of open Europe by at least 50 million bushels.

Reasoning on this basis, we hazard the guess that the maximum annual requirement of open Europe for wheat from overseas and Russia in a five-year period of war might not appreciably exceed 500 million bushels. This is based on the assumption of a distinctly low yield per acre in open Europe, particularly in France. In years of better crops, the import requirements would be smaller.

In view of what is known of the situation at present, it is clear that the import requirement of open Europe cannot reach 500 million bushels in the present crop year. In view of the excessively high level of stocks at present, the fairly good crop of 1939, the steps

that have already been taken to curtail feed use and to elevate milling extraction ratios, and the fact that extreme decline in French wheat output could hardly come soon, there is little probability that a requirement of as much as 500 million bushels could appear in 1940-41. If such an import requirement emerges, it would seem more probable in the third, fourth, or fifth year of the present war than in the second, and is impossible in the first.

EXPORT SURPLUSES

If it be supposed that the largest import requirement of open Europe in any year of the next five would approximate 500 million bushels, it is next necessary to inquire whether such a requirement could be filled with or without substantial disturbance of production in the countries which must provide the exports. Those countries are the five overseas exporters and perhaps Soviet Russia. In addition to the import requirements of open Europe, the overseas exporting countries may be called upon to furnish as much as 150 or as little as 75 million bushels to non-European importers; but the larger quantity would not be required unless total export surpluses should greatly exceed the import requirement of open Europe, with resulting low export prices. For purposes of analysis, then, we take as 100 million bushels the import requirement of non-Europe that might coincide with a maximum import requirement of open Europe, calling 600 million bushels the maximum "world" import requirement reasonably likely to emerge in any of five years of war.

Export surpluses in the five overseas exporting countries alone have exceeded 600 million bushels in three of the past six years, namely 1933-34, 1934-35, and 1938-39 (Chart 10, p. 89). The only reason why export surpluses failed to exceed 600 million bushels in one or all of the other three years was the extraordinary succession of abnormally low yields per acre from 1933 to 1937 inclusive. It can be said with moderate assurance that normal yields per acre on a sown acreage about midway between the lowest and highest acreages of the period 1933-39 would yield an average crop of about 1,850 million bushels in

the four years beginning with 1940, taking the acreage conservatively at 160 million acres and the yield per acre still more conservatively at 11.5 bushels per acre. Average crops of 1,850 million bushels would yield, with trends of domestic utilization remaining as they were since 1933-34, an *average* export surplus of nearly 550 million bushels. The export surplus would be larger than this in the event that higher prices should curtail the quantities of wheat recently fed to livestock in North America.

Under such circumstances it is difficult to imagine, assuming normal yields in the exporting countries in every year, any single year in which the *maximum* probable world import requirement could not be covered in the physical sense; and this can be said while ignoring the possible contribution of Soviet Russia to world exports to non-German Europe. A physical deficit of surpluses in relation to world import requirements would seem to involve a succession of two or more years of abnormally low yields per acre in the overseas exporting countries, so timed as to coincide with a large world import requirement. This may happen, as it happened between the three successive years 1916-17, 1917-18, and 1918-19. But it cannot reasonably be characterized as probable. It is true that at present the yield per acre in overseas countries in 1940 seems likely to be on the low side, on account of the poor condition of winter wheat in the United States. But since the initial stocks of 1940-41 promise to be large, a low yield may not make the export surpluses of 1940-41 small. The probabilities would seem to call for good yields in the overseas exporters in 1941-42, with sizable exportable surpluses. Our impression is that chances of world wheat stringency are stronger for the last two years of a five-year war than for the first three—and probably not in the last two if yields per acre are then normal in the overseas exporting countries. What actually transpires will of course depend very heavily upon weather in the overseas exporting countries, and this seems unpredictable.

It seems further that occurrence of a year of world wheat shortage comparable with 1917-18 is distinctly less probable now than

it would have seemed in 1915, after the results of the enormous harvest of 1915 became known. Comparison is pertinent now because the 1915 crop provided an excess of export surplus over import requirements for 1915-16 roughly comparable with the excess now existing for 1939-40. In the autumn of 1915, it was known that the basis for the huge export surplus was an extraordinarily high yield per acre in exporting countries, notably of spring wheat in North America. It could further be anticipated that chances were against repetition of so extraordinary a yield. The need for continued expansion of acreage in the overseas exporting countries, if they were to continue to fill the void left by defection of Russian exports, was obvious. Some doubt of the possibility of adequate expansion might have existed in view of the abrupt cessation of European emigration to overseas countries and the high level of employment within them.

At present, on the contrary, it seems clear that the huge export surplus of 1939-40 does not rest so much as that of 1915-16 upon an extraordinarily high yield per acre, and is heavily based upon a chronic condition of expanded wheat acreage. It is certain that no such need for expansion of acreage in overseas countries as was apparent in 1915 is likely to arise because of defection of Russian exports; for recent exports from Russia have been too small to leave a large void even if they fail. No shortage of labor that might hamper expansion of overseas wheat acreage now seems to exist, partly because emigration from Europe has recently been so small that it cannot decline much, partly because unemployment of substantial magnitude now prevails.

SHIPPING

In 1917-18, the marked deficit of wheat supplies of open Europe in relation to either customary utilization or normal wartime utilization was due in part to inability to transport available export surpluses in the Southern Hemisphere to European destinations.

We find it impossible to appraise the probabilities that such circumstances may repeat themselves. It is true that the world's mer-

chant shipping has recently been relatively more abundant in relation to the demand for it than in years preceding 1914 (p. 100). It is probably true also that the maximum annual world wheat import requirement of the next few years may not involve as large a proportion of the world's merchant marine as did requirements in successive years of the World War. These points favor the prospect that shipping shortage may not become as acute as it became during the World War. Yet there seems at present no reliable basis for appraising either (a) the rate of probable net destruction of tonnage, (b) the rate of increase in demand for tonnage to transport other commodities than wheat, or (c) the extent to which neutral tonnage will be withheld from transport of commodities, including wheat, to belligerent countries, and may remain unemployed. These factors might conceivably create as marked a shortage of shipping as appeared in the World War; but what is likely to transpire is beyond our powers of analysis.

PRICES

Wheat prices rose to exceedingly high levels in the course of the World War partly in reflection of growing stringency of supply of wheat in relation to demand for it, and partly in reflection of influences summarized in the phrase "rise in the general level of prices."

The discussion above has summarized our impressions of the probabilities concerning margins between import requirements and export surpluses in the present war. Those margins seem unlikely to prove as narrow as those prevailing in four years out of five in the World War: if, as we expect, import requirements tend to rise, they may not rise greatly; and export surpluses may prove large enough to cover comfortably the increased import requirements.

Actual developments may hinge particularly upon yields per acre in the overseas exporting countries. It is quite possible that such yields might in the next four years alternate between normal and unusually good; if so, there would probably be no reason to anticipate enhancement of export wheat prices from strictly commodity influences. Such yields might on the other hand alternate between normal and un-

usually poor; if so, the commodity influence would tend to elevate export wheat prices, and a year or two of strikingly high prices might be witnessed if the yields were low enough. We are inclined to suppose, however, that normal yields on recent levels of acreage in exporting countries would not give rise to particularly narrow margins between import requirements and export surpluses and hence would not give rise to more than slight advance in wheat prices so far as these are influenced by the commodity position. In short, a position of not far from chronic world wheat surplus might persist throughout a five-year war, if yields in exporting countries are normal ones.

The complex subject of probable developments in levels of wholesale prices in general is beyond the scope of this study. Yet advances in wholesale prices contributed very strongly to the rise of wheat prices during the World War. Our impression, briefly stated without argument, is that wholesale prices in the present war are considerably more likely to rise than to remain stable or decline. If so, it seems probable that wheat prices in exporting countries may advance in sympathy with general price advance. The probable extent of such an advance seems conjectural. Yet, in spite of the present weaker financial position of many nations and the basis for credit expansion that exists in the United States, we hazard the guess that levels of wholesale prices may not advance as rapidly or as much as they did during the World War. Governmental recognition of the necessity for control is now far more widespread, and governmental machinery capable of exerting control is much superior.

Both on the strictly commodity side and on the side of general price increase, the prospects thus seem rather remote for wheat prices in exporting countries to rise as fast and as far as they did during the World War. Whether or not such rise as may occur will be of similar magnitude in the different exporting countries may depend, as it did during the World War, upon relative degree of change in general price levels and upon the shipping situation. The c.i.f. prices of import wheat on duty-free markets may be ex-

pected to advance more than f.o.b. prices in export markets if the recent advance in ocean freight rates holds or proceeds further.

INFLUENCE OF ITALY

In view of current interest in the probable alignment of Italy in the present war, we append here a brief discussion of effects on wheat import requirements if Italy should choose to join either Germany or the Allies.¹ Italy depends heavily on wheat as a source of national calorie consumption, uses practically all of her wheat for food, and mills it at fairly high extraction rates. The recent record of Italian wheat utilization, using official data except for our own approximations of changes in stocks, is as follows in million bushels:

Aug-July	Food use	Seed use	Total utilization	Crops	Net imports	Changes in stocks
1933-34...	263	23	286	299	8	+21
1934-35...	246	24	270	233	12	-25
1935-36...	259	24	283	283	5	+ 5
1936-37...	259	24	283	225	58	0
1937-38...	274	24	298	296	4	+ 2
1938-39...	276	24	300	297	13	+10
1939-40...	...	..	...	294	..	..

Italian import requirements have recently run small except in years when a low yield per acre of the domestic wheat crop, as in 1934 and 1936, coincides with a low level of inward carryover, as in 1936 alone. The recent period is remarkable in Italian history as including three successive years, 1937-39, of distinctly high yields per acre; since 1885, exceptionally high yields have never before been obtained in three successive years. A low yield seems reasonably to be expected soon, and perhaps more than one year of low yields in the next four.

If Italy joins Germany, but Britain and France continue to control the seas except the Adriatic, Italian imports must be drawn almost wholly from Hungary, Yugoslavia,

¹ We persist with the assumptions that no other change would occur in the alignment of belligerents and neutrals, that the war might last four or five years, and that the British and French would retain substantial control of the seas. At least the first of these assumptions can hardly appear realistic if Italy turns in either direction; but discussion of the prospective wheat situation on the basis of all of the assumptions that might seem realistic at this time would extend itself indefinitely.

Rumania, Bulgaria, and perhaps Soviet Russia, with the flow coming not through the Aegean but by rail and river to Adriatic ports or directly by rail into northeastern Italy. Italian demand would be added to the demand of German-ruled territory for wheat from these sources. The Italian demand could reasonably be expected to be large in at least one of the five crop years beginning in the summer of 1939, but not in 1939-40 and possibly not in 1940-41 if stocks are further accumulated during 1939-40. The additional demand of Italy in some subsequent year might well prove to be beyond the export capacities of southeastern Europe, particularly if a low yield per acre in Italy should correspond with a low yield in the Danube basin, as has occurred fairly frequently in the past fifty years. All told, the bread-grain position of Italy and Germany together—assuming Allied control of the seas—would be inherently weaker than

the bread-grain position of Germany alone. To the extent that Italian demand for wheat would no longer absorb part of the surpluses of the overseas exporters, the wheat position of the Allies and importing neutrals would be strengthened.

If on the other hand Italy should join the Allies, the bread-grain position of Germany would be affected very little. That of the Allies and wheat-importing neutrals, however, might be weakened, at least if participation of Italian forces was followed, as it probably would be, by deterioration of Italian agriculture. Under these circumstances the prospective maximum import requirement of "open Europe" would probably be larger, perhaps by as much as 25-50 million bushels, than was calculated above. But even in this event the emergence of a year of severe world wheat stringency would depend heavily upon yield per acre in the overseas exporting countries.

The author is indebted to his colleagues, Karl Brandt, J. S. Davis, V. P. Timoshenko, and Holbrook Working, for valuable criticisms and suggestions; to Rosamond Peirce and Ruth Lee Young for statistical and clerical assistance. Charts are by P. Stanley King.

APPENDIX TABLES

The following tables give the principal basic data used in the text and charts for the period 1909-19. Basic postwar statistics from 1933, also used in text and charts, for the most part are or will soon be readily accessible in various issues of *WHEAT STUDIES*, notably those of September, October, and December 1939.

TABLE I.—WHEAT PRODUCTION, ACREAGE, AND YIELD PER ACRE IN PRINCIPAL PRODUCING AREAS, 1909-18*

Year	Wheat world ex-Russia			France	Italy	Central Powers	Other Europe	Northern Africa	United States	Canada	Argentina	Australia	India
	Total	Importing part	Overseas exporters										
A. PRODUCTION (<i>Million bushels</i>)													
1909....	2,671	1,314	1,357	359	190	310	365	90	684	167	131	90	285
1910....	2,634	1,275	1,359	253	153	369	414	86	626	132	146	95	360
1911....	2,900	1,437	1,463	322	192	386	440	97	618	231	166	72	376
1912....	2,943	1,340	1,603	334	166	402	362	76	730	224	187	92	370
1913....	2,944	1,385	1,559	319	215	385	368	98	751	232	105	103	368
1914....	2,723	1,158	1,565	283	170	304	318	83	898	161	169	25	312
1915....	3,357	1,230	2,127	223	171	335	402	99	1,009	393	169	179	377
1916....	2,571	1,114	1,457	205	177	264	376	92	635	263	84	152	323
1917....	2,535	949	1,586	135	140	235	361	78	620	234	235	115	382
1918....	2,783	1,064	1,719	226	183	212	340	103	904	189	180	76	370
B. ACREAGE (<i>Million acres</i>)													
1909....	174.6	73.3	101.3	16.3	11.6	16.5	21.8	7.1	46.4	7.7	14.4	6.6	26.2
1910....	185.9	75.5	110.4	16.2	11.8	17.4	22.7	7.4	50.5	8.9	15.5	7.4	28.1
1911....	195.3	75.6	119.7	15.9	11.7	17.2	23.3	7.5	53.6	11.1	17.0	7.4	30.6
1912....	199.4	77.2	122.2	16.2	11.7	17.7	23.8	7.8	55.7	11.0	17.1	7.3	31.1
1913....	195.0	74.6	120.4	16.2	11.7	16.7	22.1	7.9	53.7	11.0	16.3	9.3	30.1
1914....	194.1	73.3	120.8	15.0	11.8	15.8	23.3	7.4	56.8	10.3	15.5	9.7	28.5
1915....	210.9	73.0	137.9	13.6	12.5	15.9	23.3	7.7	61.4	15.1	16.4	12.5	32.5
1916....	201.5	69.9	131.6	12.4	11.7	14.5	23.2	8.1	58.3	15.4	16.1	11.5	30.3
1917....	198.4	65.1	133.3	10.4	10.6	13.6	23.4	7.1	57.9	14.8	17.9	9.8	32.9
1918....	213.7	68.4	145.3	10.9	10.8	13.4	25.2	8.1	67.3	17.5	17.0	8.0	35.5
C. YIELD PER ACRE (<i>Bushels</i>)													
1909....	15.3	17.9	13.4	22.0	16.4	18.8	16.7	12.7	14.7	21.5	9.1	13.7	10.9
1910....	14.2	16.9	12.3	15.6	13.0	21.2	18.2	11.6	12.4	14.9	9.4	12.9	12.8
1911....	14.8	19.0	12.2	20.3	16.4	22.4	18.9	12.9	11.5	20.8	9.8	9.6	10.7
1912....	14.8	17.4	13.1	20.6	14.1	22.7	15.2	9.8	13.1	20.4	11.0	12.5	11.9
1913....	15.1	18.6	13.0	19.8	18.3	23.0	16.7	12.4	14.0	21.0	6.4	11.1	12.2
1914....	14.0	15.8	13.0	18.9	14.4	19.3	13.6	11.2	15.8	15.7	10.9	2.6	11.0
1915....	15.9	16.8	15.4	16.4	13.6	21.0	17.3	12.8	16.4	26.0	10.3	14.3	11.6
1916....	12.8	15.9	11.1	16.5	15.1	18.2	16.2	11.4	10.9	17.1	5.2	13.2	10.7
1917....	12.8	14.6	11.9	13.0	13.3	17.3	15.4	11.0	10.7	15.8	13.1	11.7	11.6
1918....	13.0	15.6	11.8	20.7	17.0	15.8	13.5	12.7	13.4	10.8	10.6	9.5	10.4

* Basic data as given in M. K. Bennett, "World Wheat Crops, 1885-1932," *WHEAT STUDIES*, April 1933, IX, 264 ff., with two exceptions. Here United States data are from U.S. Department of Agriculture, *Revised Estimates of Wheat Acreage, Yield and Production* (1934), using sown acreage for winter wheat and harvested acreage for spring wheat; and for Germany in 1909-13 production and yield per acre data used here are official estimates reduced by 10 per cent.

The "wheat world ex-Russia" includes all of Europe (1913 boundaries) west of the Russian Empire, including Finland; Egypt, Tunis, Algeria, and Morocco in northern Africa; and the five specified overseas exporting countries. The "importing part" of the wheat world ex-Russia includes all countries of non-Russian Europe and northern Africa. The Central Powers are Germany and Austria-Hungary.

TABLE II.—ESTIMATED STOCKS OF WHEAT IN WHEAT WORLD EX-RUSSIA AND ITS PRINCIPAL COMPONENTS, ABOUT AUGUST 1, 1909-19*

(Million bushels)

Year	Wheat world ex-Russia			United States	Canada	Argentina ^a	Australia ^b	British Isles	France	Italy	Central Powers ^c	Other Europe ^d
	Total	Europe	Overseas exporters ^a									
1909....	249	158	91	60	9	14	8	24	32	17	45	40
1910....	377	202	175	110	15	29	21	37	43	25	47	50
1911....	394	205	189	126	17	23	23	32	41	17	53	62
1912....	385	215	170	105	22	30	13	30	32	24	54	75
1913....	417	231	186	131	19	18	18	38	42	25	66	60
1914....	415	255	160	110	19	12	19	32	62	39	68	54
1915....	296	193	103	70	10	23	0	26	47	27	50	43
1916....	652 ^e	210	442 ^e	226	30	56	100	36	32	27	55	60
1917....	446	220	226	53	20	15	138	50	42	27	40	61
1918....	430	148	282	21	10	77	174	21	32	15	35	45
1919....	476	155	321	61	15	114	131	21	32	35	30	37

* Data for 1909-14 from H. C. Farnsworth, "World' Wheat Stocks, 1890-1914 and 1922-39," WHEAT STUDIES, October 1939, XVI, 64-65. Data for 1915-19 are rough approximations prepared for the present study except as follows: for the United States, from Holbrook Working, "Disposition of American Wheat since 1896, with Special Reference to Changes in Year-End Stocks," *ibid.*, February 1928, IV, 180 (data for July 1); for the British Isles, from Sir W. H. Beveridge, *British Food Control* (London, 1928), p. 361. The approximations of exportable surpluses in the Southern Hemisphere have a more reliable basis than the approximation of total stocks in Canada and Continental Europe.

^a United States, Canada, Argentina, Australia.

^b Exportable surpluses.

^c Germany, Austria-Hungary.

^d All European countries ex-Russia except British Isles, France, Italy, and Central Powers.

^e Including Indian stocks of 30 million bushels.

TABLE III.—NET EXPORTS OF WHEAT AND FLOUR AS WHEAT FROM PRINCIPAL EXPORTERS, AUGUST-JULY, 1909-19*

(Million bushels)

Year Aug.-July	Total	Russian Empire ^a	Five overseas exporters			United States ^e	Canada	Argentina	Australia	India
			Total	To Europe ^b	To non-Europe ^b					
1909-10....	533	234	299	240	59	89	68	61	47	34
1910-11....	584	234	350	284	66	76	62	97	58	57
1911-12....	464	84	380	307	73	78	97	98	50	57
1912-13....	619	107	512	425	87	157	115	122	51	67
1913-14....	620	171	449	372	77	166	135	44	71	33
1914-15....	548	14	534	469	65	319	85	93	.. ^d	37
1915-16....	630	13	617	542	75	241	269	64	34	9
1916-17....	538	10	528	471	57	179	174	49	69	57
1917-18....	469	.. ^e	469	415	54	113 ^f	169	106	41	40
1918-19....	588	.. ^e	588	522	66	288 ^f	97	124	76	3

* Data from official sources, International Institute of Agriculture, and U.S. Department of Agriculture.

^a July-June years.

^b Allocation between Europe and non-Europe determined by compiling gross exports from each of the five overseas exporting countries to non-European destinations and subtracting the totals from total net exports of the same countries to give net exports to European destinations (regarding northern African countries as "European"). A corresponding allocation for crop years from 1933-34 is as follows:

Destination	1933-	1934-	1935-	1936-	1937-	1938-
Europe	334	314	284	351	315	345
Non-Europe	123	142	143	126	105	141
Total	457	456	427	477	420	486

The shipments to non-Europe in 1934-35, 1935-36, and 1936-37 include 14, 34, and 34 million bushels respectively from Canada to the United States.

^c Including shipments to possessions.

^d Less than 1 million bushels.

^e Presumably negligible.

^f Not including shipments of 6 and 23 million bushels to relief organizations and A.E.F. These shipments, consisting as they did largely of supplies for the American army overseas, were not recorded as exports, did not represent commercial transactions, and were not in substantial degree a net addition to wheat supplies of European populations.

TABLE IV.—NET IMPORTS OF WHEAT AND FLOUR AS WHEAT INTO SPECIFIED COUNTRIES OF EUROPE, 1909-19*

(Million bushels)

Year Aug.-July	British Isles	France		Italy	Ger- many	Austria- Hungary	Belgium	Nether- lands	Switzer- land	Scandl- navia ^a	Spain, Portugal	Greece
		Commerce général	Commerce spécial									
1909-10..	218	9	..	40	75	34	42	22	17	22	8	7
1910-11..	210	100	..	59	70	3	56	23	18	20	7	8
1911-12..	210	27	50	47	58	2	55	19	19	21	3	7
1912-13..	238	52	56	73	69	(1)	48	23	22	27	8	6
1913-14..	211	58	65	46	67	15	45	25	20	26	20	8
1914-15..	205	22	62	60	.. ^b	.. ^b	23 ^c	30	21	23	19	10
1915-16..	213	75	81	77	.. ^b	.. ^b	24 ^c	23	16	25	19	11
1916-17..	224	161	119	72	.. ^b	.. ^b	15 ^c	23	18	20	7	7
1917-18..	155	73	75	67	.. ^b	.. ^b	17 ^c	1	7	6	4	5
1918-19..	175	75	74	92	.. ^b	.. ^b	27 ^c	12	11	13	13	8

* Data mainly from official sources, International Institute of Agriculture, and U.S. Department of Agriculture. August-July imports were occasionally estimated from data for July-June or calendar years. Net exports in parentheses.

^a Denmark, Norway, Sweden, Finland.

^c Data of Commission for Relief in Belgium on inshipments in November-October years, slightly adjusted. See

^b Not reported. For approximate quantities brought in chiefly from southeastern Europe, see text, p. 87.

G. I. Gay, *Statistical Review of Relief Operations*.

TABLE V.—INDIRECT ESTIMATES OF WHEAT UTILIZATION IN WHEAT WORLD EX-RUSSIA, 1909-19*

(Million bushels)

Year Aug.-July	Wheat world ex-Russia			British Isles	France ^a		Italy	Central Powers ^b	Other Europe ^c	United States	Canada	Argen- tina	Austra- lia	India
	Total	Importing part	Overseas exporters		A	B								
1910-11..	2,785	1,790	995	273	355	...	221	435	388	534	68	55	35	303
1911-12..	2,920	1,818	1,102	280	358	381	233	446	400	561	129	61	32	319
1912-13..	2,931	1,856	1,075	288	376	380	237	457	402	547	112	77	36	303
1913-14..	3,040	1,904	1,136	276	358	365	247	434	393	606	97	67	31	335
1914-15..	2,791	1,703	1,088	277	319	359	241	323	366	619	85	65	44	275
1915-16..	2,939	1,768	1,171	279	313	319	248	330	404	612	104	72	45	338
1916-17..	2,730	1,585	1,145	271	355	313	248	279	405	629	99	76	45	296
1917-18..	2,497	1,436	1,061	249	218	220	219	240	352	539	75	67	38	342
1918-19..	2,671	1,579	1,092	271	300	299	255	217	336	576	87	19	43	367

* See Tables I-IV for basic data. Except for India, utilization represents initial stocks plus new crops, minus net exports (or plus net imports), minus year-end stocks. Indian utilization is calculated without reference to stocks, except for the assumption that stocks were increased 30 million bushels in 1915-16 and correspondingly reduced in 1916-17. Utilization for the "importing part" of the wheat world ex-Russia is its crop, plus initial stocks except in northern Africa, plus total exports from Russia, plus exports from five overseas countries to this area, minus year-end stocks.

^a Using divergent data on imports (Table IV). Excludes utilization of occupied territory from 1914-15 (p. 73).

^b Understated from 1914-15; see text, p. 74.

^c Overstated from 1914-15; see text, p. 73.

TABLE VI.—DIRECT ESTIMATES OF WHEAT UTILIZATION IN FOUR EXPORTING COUNTRIES, 1909-19*

(Million bushels)

Year Aug.-July	Total food	Total seed	United States		Canada		Argentina		Australia	
			Food	Seed	Food	Seed	Food	Seed	Food	Seed
1909-10....	563	108	463	70	38	12	37	18	25	8
1910-11....	565	115	464	73	39	15	37	19	25	8
1911-12....	574	118	469	75	40	15	40	20	25	8
1912-13....	582	117	472	73	41	15	44	19	25	10
1913-14....	590	118	476	76	42	14	46	18	26	10
1914-15....	593	133	481	81	42	20	44	19	26	13
1915-16....	596	131	483	80	42	21	45	18	26	12
1916-17....	602	129	489	79	42	20	43	20	28	10
1917-18....	552	139	433	87	42	24	48	19	29	9
1918-19....	516	151	407	97	42	26	40	20	27	8

* Except for Canada, estimates of food use rest on official milling statistics. Canadian food use is estimated on assumptions that trend of per capita flour consumption resembled that in the United States; on post-1920 milling statistics; and on official population estimates, 1909-18. Estimates of seed use are official for the United States and Australia, and for Canada and Argentina are based on acreage sown multiplied by approximate seed use per acre.

TABLE VII.—ANNUAL AVERAGE CASH WHEAT PRICES IN EXPORTING AND IMPORTING COUNTRIES (DOMESTIC CURRENCIES), 1909-19*

Year Aug.-July	United States	Canada	Argen- tina ^a	Aus- tralia ^a	India ^a	United Kingdom		France	Italy	Germany
						Imported	Domestic			
1909-10....	107.5	101.0	8.55	4.000	3.844	8.868	....	24.46	.....	22.05
1910-11....	92.3	94.8	8.40	3.458	3.422	7.928	30.9	27.31	.....	20.28
1911-12....	99.5	100.4	8.44	3.708	3.688	8.328	34.8	27.76	.....	21.47
1912-13....	89.7	90.4	8.68	3.625	3.948	8.450	32.0	28.20	30.01	20.62
1913-14....	88.8	88.3	9.20	3.625	4.677	8.060	32.3	26.99	26.92	19.62
1914-15....	129.4	132.1	11.68	6.146	5.302	11.452	49.8	30.65	36.59	26.22
1915-16....	112.3	110.9	9.48	4.688	4.562	13.136	53.0	32.18	40.22	26.46
1916-17....	197.0	198.0	15.40	4.583	4.734	17.632	74.2	34.97	37.75	26.59
1917-18....	218.6	222.5	12.29	5.042	6.365	18.138	72.2	51.17	51.11	29.58
1918-19....	230.2	224.2	12.98	5.375	7.854	18.602	72.8	75.00	62.90	33.33

* Data mainly from official sources. United States: Chicago, U.S. cents per bushel, lowest grade deliverable without discount on futures contracts. Canada: Winnipeg, Canadian cents per bushel, No. 1. Northern basis Fort William and Port Arthur. Argentina: Buenos Aires, paper pesos per quintal. Australia: export wheats f.o.r. Australian ports, shillings per bushel. India: Calcutta, rupees per bazaar maund (82.3 lbs.), Calcutta Club No. 2. United Kingdom, imported: shillings per cwt., declared values divided by declared quantities of all imported wheat. United Kingdom, domestic: shillings per quarter of 480 lbs., all markets. France: domestic wheat at Paris, francs per quintal. Italy: domestic wheat at all markets, lire per quintal. Germany: domestic wheat at Berlin, marks per quintal.

^a Calendar years 1910 and following.

TABLE VIII.—INDEX NUMBERS OF WHOLESALE PRICES IN EXPORTING AND IMPORTING COUNTRIES, 1909-19*
(August-July 1913-14 = 100)

Year Aug.-July	Forty identical commodities						Other index numbers								
	United States	Canada	Aus- tralia ^a	United Kingdom	Italy	Ger- many	United States	Canada	Argen- tina ^a	Aus- tralia ^a	India ^a	United Kingdom	France	Italy	Ger- many
1909-10..	...	...	89	...	...	...	104	...	...	92	85	92	92	...	...
1910-11..	95	...	90	95	98	97	96	...	...	92	90	94	97	...	...
1911-12..	99	...	103	100	101	101	98	...	...	107	96	99	101	...	...
1912-13..	102	...	100	104	104	103	102	...	100	100	100	103	102	...	...
1913-14..	100	100	103	100	100	100	100	100	101	106	103	100	100	100 ^b	100 ^c
1914-15..	102	107	125	116	121	128	100	108	109	147	106	117	122	114	129
1915-16..	116	117	139	156	194	171	112	118	123	138	129	147	173	181	150
1916-17..	170	156	160	203	275	183	152	160	152	153	137	191	225	249	159
1917-18..	209	200	177	242	457	196	183	190	167	178	157	223	313	386	203
1918-19..	212	212	191	256	535	293	197	203	171	189	193	233	348	383	268

* Index numbers for 40 identical commodities derived from G. F. Warren and F. A. Pearson, *World Prices and the Building Industry* . . . (New York, 1937). Indexes for the United States and the United Kingdom are the familiar one of the U.S. Bureau of Labor Statistics, and the Sauerbeck-Statist index. For other countries, see Canada, Dominion Bureau of Statistics, *Prices and Price Indexes*, especially the issue for 1913-26; the *Economic Review* of the Banco de la Nación Argentina; for Australia, U.S. Bureau of Labor Statistics, *Bulletin 320*; *Statistical Abstract for British India, 1914-15 to 1923-24*; *Annuaire statistique de la France, 1928*; *Statistisches Jahrbuch für das Deutsche Reich*; Bachi's index for Italy in U.S. Bureau of Labor Statistics, *Bulletin 173*. The indexes for United States, Australia, India, France, and Germany are official ones.

^a Calendar years 1910 and following; 1913 = 100.

^b Averages for calendar years 1913 and 1914 = 100.

^c Calendar year 1913 = 100.

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