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# W H E A T   S T U D I E S

## OF THE

### FOOD RESEARCH INSTITUTE

VOL. VIII, NOS. 5 and 6

(Price \$2.00)

MARCH and APRIL 1932

## RUSSIA AS A PRODUCER AND EXPORTER OF WHEAT

SOVIET RUSSIA seems unlikely, in the next few years at least, to recover the pre-war position of the Russian Empire as an exporter of wheat. Russia's domestic requirements for wheat have increased, and are increasing steadily, with the growth of population and the limited expansion of rye production. The large wheat exports of 1930-31 were made possible by exceptionally high yields per acre and rationing of domestic consumption; and large as they were, they were small in contrast with pre-war exports in years of high yields. As before the war, the volume of exports will fluctuate widely from year to year. Sizable exports are to be anticipated in years of high yields, but not in years when the yields are average or low.

Broadly speaking, exports can attain the pre-war level only if acreage and/or yield per acre can be increased more rapidly than the population grows. But expansion of the total crop area must take place principally on relatively poor-quality land in Asiatic Russia, and through diversion of fallow land to crops. In either direction the process must proceed under substantial difficulties, and at a moderate rate. It will also be difficult to increase average yields per acre for the territory as a whole, as the new land in the east comes under cultivation. Even if the total crop area should expand more rapidly than the population increases, this may not be true of the area in bread grain. Development of animal husbandry is needed (and is planned) in the USSR, and this involves more rapid expansion of areas in forage crops than of those in bread grains. The wheat area may expand more rapidly than the rye area, but since rye is almost wholly a food crop in Russia, the level of wheat exports is conditioned by the production of wheat and rye in relation to domestic requirements for bread grains.

STANFORD UNIVERSITY, CALIFORNIA

March and April 1932

# W H E A T   S T U D I E S

## OF THE

### FOOD RESEARCH INSTITUTE

The central feature of the series is a periodic analysis of the world wheat situation, with special reference to the outlook for supplies, requirements, trade, and prices. Each volume includes a comprehensive review of the preceding crop year, and three surveys of current developments at intervals of about four months. These issues contain a careful selection of relevant statistical material, presented in detail in appendix tables for reference purposes, and in summary form in text tables and charts.

Each volume also includes six special studies bearing on the interpretation of the wheat situation and outlook or upon important problems of national policy. Subjects of issues published in recent volumes are listed inside the back cover.

The series is designed to serve the needs of all serious students of the wheat market, in business, government, and academic circles, by summarizing and interpreting basic facts and presenting current developments in due perspective. The special studies are written not merely for students of the wheat market, but as well for various groups of readers who are especially concerned with the fields discussed.

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The Food Research Institute was established at Stanford University in 1921 jointly by the Carnegie Corporation of New York and the Trustees of Leland Stanford Junior University, for research in the production, distribution, and consumption of food.

# RUSSIA AS A PRODUCER AND EXPORTER OF WHEAT

In the decade before the war, the Russian Empire came to surpass the United States as the country producing and exporting the greatest quantity of wheat. In the five years immediately preceding the war, Russia's wheat exports averaged 165 million bushels a year, and constituted

nearly one-fourth of the world's wheat export movement. After a lapse of ten years characterized successively by war, revolution, famine, and recovery, the smaller territory of Soviet Russia again led the world in wheat production in 1925, 1926, and 1930. As an exporter of wheat, however, Russia was a negligible factor in most years since the war, and of secondary importance in others, until 1930-31. Then, favored by excellent yields on increased acreage, Soviet Russia harvested a bumper post-war crop, and exported around 111 million bushels. In 1931-32, despite lower yields, exports have again been liberal.

The return of Russia to the ranks of major exporters of wheat, though by no means to her pre-war eminence, occurred in a period of exceptional wheat surplus. Russia's large exports contributed heavily to depress world wheat prices to new low levels. The Soviet policy is still further to increase wheat acreage, production, and exports. Russia's position and potentialities therefore constitute outstanding factors in the world wheat situation today and the outlook for the next few years.

These recent developments accentuate the need for an adequate, unbiased study of Russia as a producer and exporter of wheat. Not only wheat but rye and to a lesser degree other grains are involved, and indeed some consideration of Russian agriculture as a whole. This subject is, of

course, dealt with or touched upon in many books and articles that have appeared since the attention of the world has been focused on Russian communism, and particularly since the Five-Year Plan was inaugurated in the fall of 1928. The present analysis differs from others chiefly, perhaps, in re-

lating recent developments to the sweep of Russian agricultural history, and in basing inferences and conclusions upon a study of available statistics, rather than on impressions gained through recent travel and observation.

The subject is so complex and controversial that it merits fuller treatment than can be given in WHEAT STUDIES. Yet it has seemed desirable to include a study of Russia in our established series dealing with important wheat-producing countries. The present

study is therefore a condensed version of a more extended and detailed treatise that will shortly be published in book form by the Food Research Institute. The book will contain more of fact and of argument, and fuller statistics and citations of authorities. It will accordingly afford a more satisfactory basis for considering interpretations that will be questioned, as seems inevitable in almost every aspect of the Russian situation. Nevertheless, this briefer presentation gives practically in full the conclusions of the larger work, and also the general course of argument and a considerable portion of the statistical data.

The main conclusion is that Soviet Russia is unlikely, in the next few years at least, to recover the pre-war position of the Russian Empire as an exporter of wheat. Russia's domestic requirements for wheat have increased, and are increasing steadily, with the growth of population and the

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## I. PHYSICAL FEATURES, POPULATION, AND LAND UTILIZATION

Soviet Russia (more properly the Union of Socialistic Soviet Republics, abbreviated USSR) is the largest country of the world with continuous territory. Within Russia lies the largest area devoted to wheat in any country. The USSR consists of six so-called federal republics. Of these the Russian Socialistic Federated Soviet Republic (RSFSR) is by far the largest, covering 7.6 million square miles of the total territory of 8.2 million. The other five republics are the Ukrainian, the White Russian, the Transcaucasian, the Uzbek, and the Turkmen.<sup>1</sup> Map I shows the names of further

political subdivisions as they were in 1926, and also the names of important rivers and cities.

The European part of the USSR is a continuous low plain, sometimes flat, sometimes slightly hilly; the highest parts of it are below 1,640 feet in elevation. To the east rise the Ural Mountains, separating European Russia from Asiatic Russia.<sup>2</sup> This long ridge running north and south is not high (4,900 to 5,250 feet at its highest points), and is not difficult to cross, especially in the south. Between the southern end of the Urals and the Caspian Sea stretches a large low plain uniting the steppes of European Russia with those of Central Asia (Kazakhstan) and western Siberia.

The southern plains are bordered by low mountains along the southern coast of Crimea, and by the high Caucasus Mountains. The Transcaucasian region (in Asia) lies beyond the ridge of the Caucasus Mountains. The rest of Asiatic Russia may be divided into three large regions: (1) western Siberia,<sup>3</sup> extending east from the Ural Mountains to the Yenisei River, a huge low plain in which flow the rivers Ob, Irtysh, and the western tributaries of the Yenisei; (2) eastern Siberia,<sup>4</sup> stretching east from the Yenisei, mostly mountainous country, not high but difficult of access; and (3) south of these, Central Asia and Turkestan,<sup>5</sup>

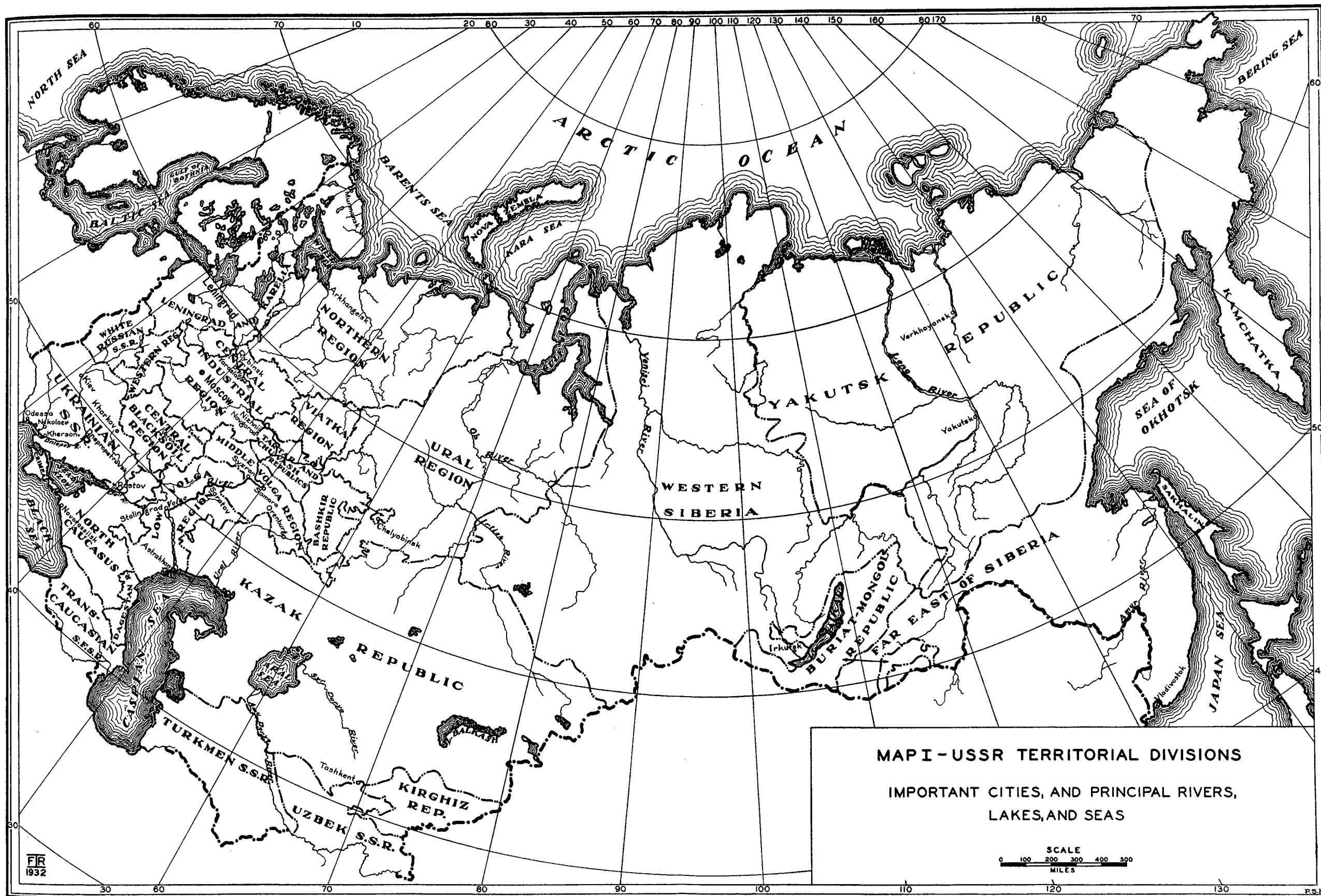
<sup>1</sup> This was the division in 1926, with which many statistical data accord. There is now a seventh republic, the Tadzhikistan, formed from the southern portion of what appears on Map I as the Uzbek SSR.

<sup>2</sup> The Ural Mountains, not shown on Map I, lie roughly along a line running from Orenburg northeast to Chelyabinsk, thence north along the 60th meridian to and along the boundary between the Ural and Northern Regions.

<sup>3</sup> As the term is here used, in accordance with a common pre-war classification, western Siberia includes most of what is shown on Map I as the Ural Region and only that part of Western Siberia which lies west of the Yenisei River.

<sup>4</sup> Eastern Siberia includes what is shown on Map I as Western Siberia east of the Yenisei, and the Yakutsk Republic, the Buriat-Mongol Republic, and the Far East of Siberia.

<sup>5</sup> Central Asia accords roughly with the Kazak Republic on Map I; Turkestan with the Turkmen and Uzbek Republics and some territory to the north.





a low level basin separated from the plain of western Siberia by the Kirghizian hilly region and bordered on the south by the high mountains of the center of the Asiatic continent.

Thus, except for mountainous eastern Siberia, the country is mostly low level plain, with mountains on the frontiers—a country favorable for agricultural activity except as conditioned by climate and soil. The level land is threaded by many large and quiet rivers. Those most important from the point of view of transportation are the Volga and the Dnieper. The largest rivers, however, are in Asiatic Russia—the Ob, Irtish, Yenisei, Lena, and Amur. All of these but the Amur flow into the Arctic Ocean, and this lessens their significance as arteries of transport. The Amu Darya and the Syr Darya rivers, debouching into the inland Aral Sea, are important for irrigating the dry steppes of Turkestan and Central Asia.

#### CLIMATE AND RAINFALL

There are great climatic differences within the far-flung territory of the USSR. In general the country lies within the zones of temperate and cold climate, but some parts (Transcaucasia and Turkestan) are subtropical. Temperatures range widely: in European Russia, from a yearly average of  $-4^{\circ}$  C. in the basin of the Pechora River (debouching into Barents Sea south of Nova Zembla) to  $+13^{\circ}$  C. on the Crimean coast; in Asiatic Russia, from  $-17^{\circ}$  C. in eastern Siberia (at Verkhoyansk) to  $+17^{\circ}$  C. in the southern and warmest part of Turkestan.<sup>1</sup>

Despite these wide ranges of temperature, the USSR as a whole has a continental climate; that is, extreme differences between summer and winter temperatures are characteristic, and become more marked from west to east. Even along the western frontier, the difference between the average July and the average January temperature is  $25-27^{\circ}$  C.; it is  $35-38^{\circ}$  C. along the eastern borders of European Russia, and in eastern

Siberia, at Verkhoyansk, fully  $67^{\circ}$  C. Especially east of the Volga, the summers are very hot and the winters very cold.

Only a small part of the USSR escapes freezing temperatures in winter—the southern coast of the Crimean peninsula in European Russia, and Transcaucasia and the southern part of Turkestan in Asiatic Russia. Winter temperatures decline both from south to north and from west to east. For example, in Kiev in Ukraine and along the Amur River in eastern Siberia, both on the 50th parallel, the yearly average temperature is  $+7^{\circ}$  C. in the former but  $0^{\circ}$  C. in the latter. The prevalence of hot summers is illustrated by the course of the July isotherm  $+20^{\circ}$  C. From the west it passes from near Kiev to the northeast near Moscow and beyond to the north of Nizhnii Novgorod on the Middle Volga, thence east along the 55th parallel through Ural province and Western Siberia, and in eastern Siberia moving farther north to the 60th parallel. Yakutsk, in eastern Siberia, has an average July temperature not far from  $+20^{\circ}$  C., and spring wheat matures there, although the ground never thaws below 6 or 7 feet.

Yet, despite hot summers, much of the USSR lies outside the limits of agricultural production. Even in European Russia, parts of the Northern and Ural Regions are too far north; much more so a large part of Siberia. Siberia can grow only spring wheat, not winter; and even winter rye cannot be cultivated extensively there. Perhaps Siberia has a larger fraction of uncultivable land even than Canada. Even in European Russia, it is only in the southwestern regions, especially western Ukraine and southwestern North Caucasus, that the winters are mild enough or have enough snow to permit the cultivation of winter wheat.

With the exception of a few localities, precipitation is scanty in the USSR. The average yearly rainfall in European Russia ranges from 6 inches in the southeast (Astrakan) to 24 inches on the northwestern frontier. Precipitation tends to decline from the west toward the east, the south, and the north. The decline toward the north is not significant for agriculture, for here evaporation is so small that 16 inches of rain is sometimes more than sufficient

<sup>1</sup> Since on the Centigrade scale  $0^{\circ}$  represents the freezing point ( $+32^{\circ}$  F.) and  $+100^{\circ}$  the boiling point of water ( $+212^{\circ}$  F.), one degree Centigrade is equal to 1.8 degrees Fahrenheit,  $-4^{\circ}$  C. equals approximately  $25^{\circ}$  F., and  $+13^{\circ}$  C. equals approximately  $57^{\circ}$  F.

for vegetation. But the decline toward the south and east is of great significance. As we move eastward across the southern part of European Russia, we pass into a larger and larger dry area. The southeastern corner, around the Lower Volga and north of the Caspian Sea, gets less than 12 inches of rain a year. The short supply is in effect made the shorter by the very hot summers.

Asiatic Russia is on the whole even less favored. There is heavy precipitation only in Transcaucasia (on the Black Sea coast) and far on the eastern borders. Elsewhere, in Siberia and Central Asia, there is less than 20 inches of rainfall—even below 16 inches if we further exclude small areas near mountains (the Altai region and a small area east of southern Ural).

The southwestern part of Siberia does not suffer much from deficiency of moisture, with 12 to 16 inches over most of the area. But the steppes of Kazakstan, south of western Siberia, all lie within a dry area. The impingement of the dry area upon the suitable agricultural land in this part of Asiatic Russia is brought out by the line of 30-centimeter (about 12-inch) average annual rainfall as shown in Map II. Grain (mostly spring wheat) can be cultivated only in the northern part of these steppes bordering the southern boundaries of western Siberia. To the south and west, the dry area becomes the central Asiatic desert. Even at the foot of the mountains to the south, where the rainfall is heavier, irrigation is necessary in most places on account of the hot summers.

Such rain as there is in the USSR falls mostly in May, June, and July; and this is favorable for agriculture. The maximum is in July in most areas of European Russia, but in June in the southernmost regions. Only a limited area has a second peak of rainfall during the autumn (October). Generally a dry late summer is followed by a dry fall, another unfavorable feature for the cultivation of fall-sown wheat. The summer rainfall, moreover, is heavily concentrated in downpours often separated by long dry periods, so that moisture is lost. Again, the distribution of rainfall from year to year is highly variable, sometimes 2 or 3 times as heavy in wet years as in dry. Yield per acre is inevitably uncertain and erratic under the circumstances.

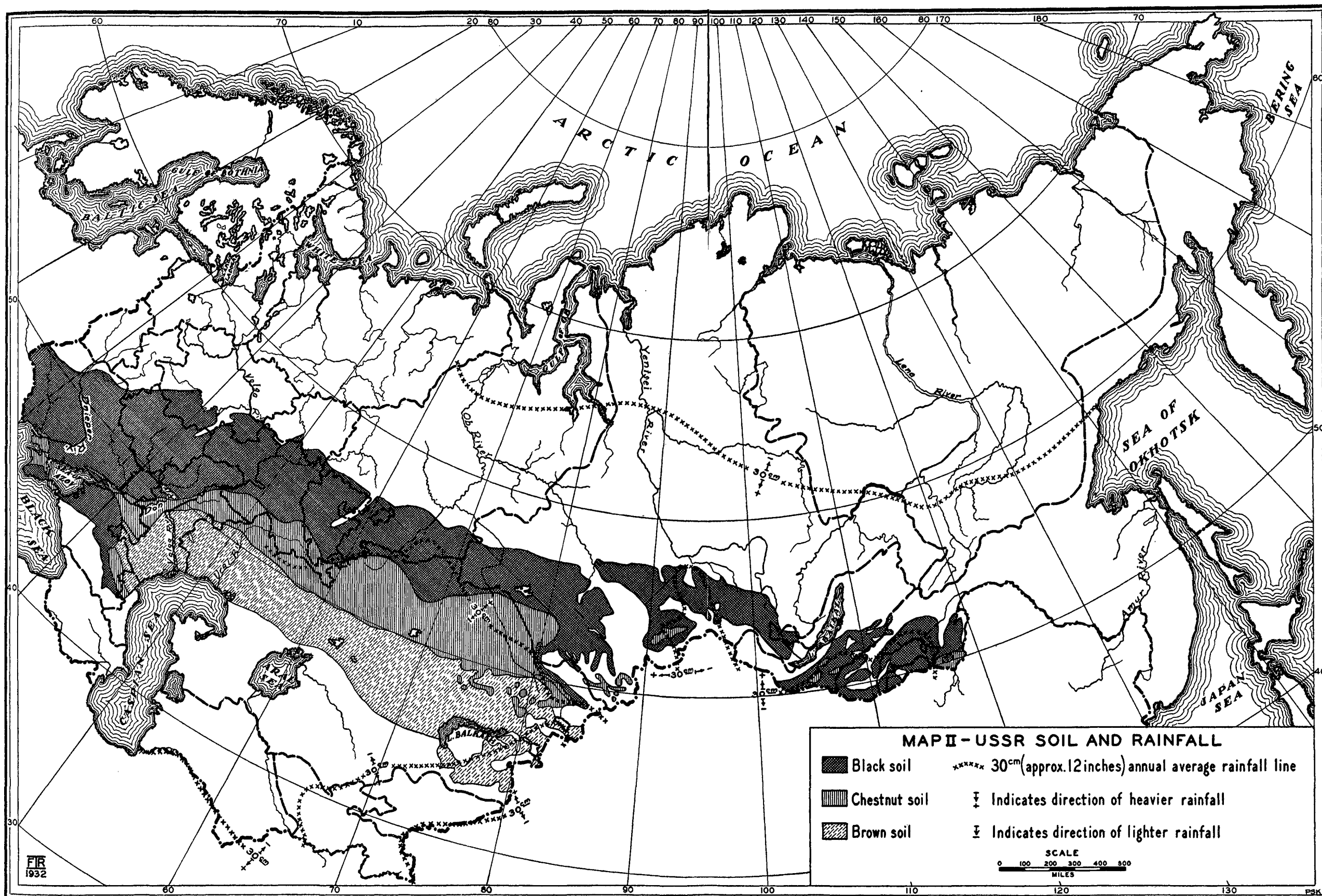
## SOILS

The principal subdivisions of the soil regions of Soviet Russia and their geography may be related to the climatic zones of the country. The principal groups of soils from the point of view of agriculture are, from south to north, the *colian* (aerial) *loess soils*, the *brown soils of the dry prairies*, the *black soils* or *tchernoziem*, and *dark-gray and light-gray forest-prairie and forest soils*. To the north is a vast stretch of tundra (cold treeless plain). The extent of the blacksoil and brown-soil zones, of chief importance so far as concerns wheat, is shown in Map II.

The *colian loess soil*, characteristic of Turkestan and the Transcaspiian region of Central Asia, is a very fine soil, yellow or light orange in color. It is not rich in humus (1-2½ per cent), though this small percentage is itself rich in nitrogen; its chemical composition is such that it yields under irrigation the best crops in the southernmost regions of the USSR.

The brown soils of the dry prairies are more characteristic of Central Asia than of European Russia, though even here is a large area north of the Caspian Sea, around the Lower Volga, and extending east of the Volga into Central Asia. A tongue passes westward through eastern North Caucasus, the lower part of the Don River valley, and farther along the coast of the Black Sea through Ukraine to the Roumanian frontier. In Central Asia the brown soil is characteristic of the northern part, up to the southern borders of western Siberia. The brown-soil zone in general is a semi-arid region with less than 16 inches of rain, hot summers, and cold winters with little snow. There are two types of brown soils: light-brown or brown-gray in the southern and drier regions, chestnut in the northern, more humid regions. The chestnut soils are the deeper, about 1-1½ feet, while the light-brown soils are not usually more than a foot deep. The brown soils are not very rich in humus; the chestnut variety has 3 to 4 per cent, the light-brown variety only about 2 per cent. But with sufficient moisture, these soils are very fertile.

To the north of the brown-soil zone lies the belt of *tchernoziem*, the best soil in Rus-





sia for agriculture. Stretching from west-southwest to east-northeast in European Russia, it covers most of Ukraine, the valley of the Don, the western part of North Caucasus, the western parts of Lower and Middle Volga, and thence extends east of Middle Volga into southern Ural. In pre-war European Russia this belt covered from 220 to 270 million acres, about a fourth of the territory. At its maximum width in the basin of the Don, it stretches north and south about 600 miles. All of the blacksoil zone except Bessarabia (now part of Roumania) lies within the borders of the USSR.

In Asiatic Russia the blacksoil belt stretches directly west to east, growing in general narrower—about 200 to 250 miles wide in western Siberia, and not more than 125 miles wide east of the Altai Mountains. A strip of this width extends even beyond Lake Baikal, lying on both sides of the Trans-Siberian railroad as far as the basin of the Amur and the Manchurian frontier. The northern limit of the blacksoil zone practically coincides with the July isotherm  $+20^{\circ}$  C.; rainfall over the belt averages 16 to 20 inches.

The black soils are of several varieties. In the south bordering the chestnut soils are so-called chocolate black soils, with humus content of 4 to 6 per cent. Common black soils lie to the north, with 6 to 10 per cent of humus. In the central and eastern part of the belt are found islands of "fat" black soils, with more than 10 per cent of humus. Farther north are brown-black soils, on a loess base, with 3 to 6 per cent of humus, intermixed with dark-gray soils of the forest-steppe regions.

The black soils vary in depth from 2 to 5 feet, on the average  $2\frac{1}{2}$  to 3. Available content of nitrogen ranges from 0.2 to 0.7 per cent; of phosphate, from 0.1 to 0.3 per cent; of potash, from 2 to 2.5 per cent. The physical properties, especially of the common heavy black soils, are not very advantageous on account of the fine texture, for moisture is easily lost through capillarity and evaporation; but virgin black soils of more granular structure are better. The problem of cultivation is to conserve the natural structure. The black soils are well suited to wheat, and little wheat is grown to the north of this belt.

The northern edge of the blacksoil zone

meets a narrow strip of dark-gray soils, which farther north meet with the light-gray soils that stretch to the tundra zone. Dark-gray soils are often regarded as degraded black soils, resulting from encroachment of the northern forests upon the prairie region. Here the land is less level than farther south, and the soil is less fertile.

The light-gray soils, so-called lawn or podzol soils, cover about two-fifths of European Russia in the north, and much of northern Siberia below the extensive area of tundra. These are much less fertile than the black and the brown soils. The soluble mineral components are washed into the lower strata, and humus formed slowly is easily dissolved. Here fertilizers are required. The area of light-gray soils is the cereal-deficiency area in Russia. Statistics often apply to this area in contrast with the blacksoil area, in which the belt of brown soils is frequently included.

#### POPULATION

There have been only two formal censuses of population in Russia (taken by a central organization), one in 1897 and one in 1926;<sup>1</sup> accordingly, and the more so because of changes in territory, study of the population problem is fraught with difficulties. The official estimate of the population of the Russian Empire on July 1, 1914, was 178.3 million, of which 21.1 million were in Siberia, Central Asia, and Turkestan, and the remainder in the western portion of the Empire, mostly European Russia. This estimate, however, was considered by many authorities as too high, particularly as regards the rural population; and a figure of 167 million is widely accepted.<sup>2</sup> Of this number, 31.4 million were in the territory lost after the war. Hence the pre-war population within the present boundaries of the USSR was about 135.6 million, or 138.1 million if we add a rough estimate of the population of Bo-

<sup>1</sup> There was an incomplete census in 1920.

<sup>2</sup> This is the estimate of V. G. Mikhailovsky, published in the *Statistical Yearbook for 1918-20*. A book by S. N. Prokopovich, *Essay on the Estimate of the National Income in 50 Provinces of European Russia* (Moscow, 1918), contains a discussion of the estimates of the rural population, citing the important work of A. A. Tschuprov and A. E. Lositsky.



khara and Khiva in southern Central Asia, which were not included.

The following tabulation, after Mikhailovsky, shows the change in population of the present USSR between the censuses of 1897 (February 8) and of 1926 (December 17), in millions:

Area	Population		Increase
	1897	1926	
Total USSR .....	106.0	147.0	38.7%
<i>European part</i> .....	86.8	116.0	33.6%
European RSFSR ..	61.9	82.0	32.5%
Ukrainian SSR ....	21.2	29.0	36.8%
White Russian SSR	3.7	5.0	35.1%
<i>Asiatic part</i> .....	19.3	30.9	60.1%
Asiatic RSFSR ....	10.0	18.8	88.0%
Transcaucasian			
SFSR .....	4.5	5.9	31.1%
Uzbek and Turk-			
men SSR .....	4.8	6.3	31.2%

The increase for the whole country was 38.6 per cent, an average yearly rate of increase (geometric) of 1.00 per cent. But before the war, the population of the Empire had increased at a rate of 1.5 per cent; and in 1924-26 the rate for the USSR was about 2.0 per cent. There were, in short, intervening periods of decrease. The following tabulation, in millions for the territory of Soviet Russia, is illustrative:

	Population in millions
Census of February 8, 1897.....	106.0
Estimate for January 1, 1914.....	138.1
Estimate for August 28, 1920 <sup>a</sup> ...	134.2-134.5
Estimate for January 1, 1923 <sup>b</sup> .....	135.9
Census of December 17, 1926.....	147.0

<sup>a</sup> Based on census of 1920 and other data, including a special census of the army; see *Statistical Yearbook for 1921* (Moscow, 1922), p. 8, Table IB.

<sup>b</sup> Estimate by O. Kvitkin, assuming that in 1923-26 the yearly rate of increase was 2.0 per cent; see "Short Summary of the Census of 1926," *Population of the USSR*, Issue III (Moscow, 1927), p. xi.

The decline in population between 1914 and 1920 was not continuous. There was increase during the war,<sup>1</sup> and decline during the revolution. A further decline occurred after 1920, with the famine of 1921 to which the Central Statistical Office at-

<sup>1</sup> Despite war losses and decline of birth rate, Professor S. N. Prokopovich estimates that the population increased about 1.5 per cent between January 1, 1914 and 1917. See his "Dynamics of the Population of the USSR," *Bulletin of the Economic Cabinet of Professor S. N. Prokopovich* (Prague, 1931), No. 80.

tributed a gross loss of about 5 million (though this estimate was revised later). Some estimates put the population on January 1, 1922, as low as 131.7 million, though this may be too low because the population could hardly increase to 135.9 million (the well-founded estimate for January 1, 1923) in one year.

The lowest point was therefore about 133-134 million in 1922. By December 17, 1926, the population had increased 10 per cent (to 6.5 per cent above the pre-war level), and it continued to increase rapidly thereafter, at a rate of something over 2 per cent per year. The number was 150.5 million on January 1, 1928; 154.0 million a year later; and 158.5 million on April 1, 1930. These are official estimates, and appear to be reasonable ones. The latest figure is 15 per cent above the pre-war figure—a growth of population important to bear in mind in connection with the subject of domestic consumption of grain.

The first of the tabulations above shows that between 1897 and 1926 the growth of population was nearly twice as great in the Asiatic as in the European part of the Union. In Transcaucasia and Turkestan there was little room for an influx of Slavs, and the population increase was chiefly in the native population. The rest of Asiatic Russia included several areas in course of colonization. In Siberia and the steppe region of Central Asia the great growth of population, over 88 per cent, was due to an influx of Slavs and hardly at all to growth of the native population. The Siberian population grew more rapidly than that of Central Asia, increasing about 250 per cent as against 41. This was because Siberia was new country, thinly settled; whereas Central Asia had a larger native population which grew but slowly. The strictly Slavic population of Central Asia grew even more rapidly than that of Siberia, but was only 30 per cent of the total in 1926. Siberia became as Slavic as European Russia. All told, Siberia and Central Asia gained about 6 million from immigration over the whole period, European Russia losing about 5. The Slavic population moved eastward, enlarging the territory of its dominance. This group increased 45 per cent over the period, non-Slavic groups only 20.6 per cent.

Within the European territory itself the growth of population between 1897 and 1926 was uneven. North Caucasus, a region of new colonization, gained 58.3 per cent. One would expect some such increase in the Volga regions, particularly Trans-Volga; but here the famine of 1921 struck hardest, and in 1926 the population was smaller than in 1920. Nor did the population of the Ukrainian steppes grow rapidly; here too the famine was a factor. Growth was also slow in areas of agricultural overpopulation, the Central Agricultural Region<sup>1</sup> and northern Ukraine, whence many emigrants went out. Growth was rapid, however, in the regions where industry was concentrated (Moscow Industrial Region, a southern region around the Donetz coal basin, and in the Ural).

The growth of urban and rural population separately in the USSR, excluding Turkestan, Transcaucasia, and the Far East of Siberia, is shown by the following tabulation, in millions:<sup>2</sup>

Year	POPULATION IN MILLIONS			Percentage urban
	Rural	Urban	Total	
1897 .....	81.6	11.3	92.9	12.2%
1916 .....	102.7	21.6	124.3	17.4%
1920 .....	102.7	12.9	115.6	11.1%
1926 .....	111.0	18.6	129.6	14.4%

The urban population was growing rapidly before the revolution, nearly doubling in 20 years. The revolution completely reversed the tendency, and after 1918 the cities were deserted on account of disorganization of industry and trade, and of difficulties in the food supply. Revival of cities began with the introduction of the New Economic Policy in 1921. The migration of the rural population to cities and to Asia before the war was not enough to prevent a rapid increase in the rural areas; the figures cited indicate a growth of 25 per cent in 20 years, and this may be an understatement. Growth of the rural population

occurred even in the blacksoil zone and farther north.

The result was agricultural overpopulation and parcellation of land holdings, accentuated after 1918 by the flight of city dwellers to the country. This continued also after 1922, the growth of the rural population being too great to be offset by the return to cities. Even as late as April 1, 1930, the Gosplan estimated that the urban population was only 19.4 per cent of the total. This figure, not quite comparable with those of the tabulation above, is lower than a comparable figure for 1916.

After the war and the revolution, emigration to Asiatic regions slowed down; in fact, the reserve of land ready for settlement is now exhausted (see below, p. 285). One cannot anticipate in the near future as large a movement from European to Asiatic territory as occurred in the decade before the war. If the recent natural rate of growth of population does not decline, the process of overcrowding the countryside will be inevitable in spite of industrialization. It is hard to believe that industrial development can take care of the total increase of population. The menace of agricultural overpopulation still confronts Soviet Russia, as it confronted the Russian Empire before the war.

The density of the rural population, which even before the war in some regions of European Russia was greater than in several densely populated countries of western Europe, is becoming still greater. It may at first seem surprising that a country with wide stretches of thinly settled land can suffer from agricultural overpopulation. But much land is unfit for agriculture, and in the country as a whole the percentage of the population occupied in agriculture was and is extremely large. Before the war, about three-fourths of the total active population was engaged in agriculture, and in 1927-28 about four-fifths. In the United States, only about a fourth of the population over 10 years of age was so occupied in 1920, and even in the agricultural northwest central region, only 43 per cent.

Hence in Russia a moderate density of total population goes with a high density of agricultural population. As early as in 1897, the southern prairie region of the

<sup>1</sup> The Central Agricultural Region, a term frequently used, corresponds roughly but not precisely to the area designated on Map I as the Central Blacksoil Region.

<sup>2</sup> Based on census data, the first three years (including some of Lositsky's estimates) as given in *Agriculture in Russia in the XX Century* (Moscow, 1923), edited by N. P. Oganovsky. Data for 1926 taken from *Population of the USSR* (Moscow, 1927), published by the Central Statistical Office.

Russian Empire had a density of rural population 50 per cent greater than that of the total population of Iowa over two decades later, in 1920; and in Iowa a third of the population was in cities. At the present time the density of the rural population in the total area of the steppe region of Ukraine is about 90 per square mile. This is more than 3 times as dense as the rural population of Iowa, and 6 times as dense as in Kansas and Nebraska, which closely resemble the southern Ukrainian steppe in climatic conditions. North Caucasus, still considered a region for new settlement, has a density of rural population 4 times that of Kansas or Nebraska. Even in southwestern Siberia, the density is about the same as or greater than in Minnesota, Kansas, or Nebraska, and in some districts even denser than in Iowa. The population of Siberia as a whole is very sparse because so much land is wholly unfit for agriculture, or can be made suitable (the forest or "tayga" land) only by costly improvements. The land in Siberia fit for agricultural purposes as it stands is already as densely populated as the best agricultural regions of the United States. Extensive increase of population in these Siberian areas depends upon a change in the present extensive system of agriculture, and such a change would not be easy in view of the great distances from markets.

In general, the agricultural population of Soviet Russia is settled in villages; farmsteads are common only in the forest regions to the north and northwest. Large villages are characteristic of the blacksoil zone and particularly of the prairie regions. Typical villages have populations of 400 to 500 in the whole blacksoil zone, with 1,000 to 2,000 and 2,000 to 5,000 in Ukraine, and 2,000 to 5,000 and 5,000 to 10,000 in North Caucasus. In regions of new colonization, like western Siberia, the villages often have populations of 1,000 to 2,000. Kazakstan, with small villages, is an exception, perhaps because the native population is largely nomadic. This system of large villages, with the arable farm land far from the dwellings, is naturally disadvantageous for agriculture. It is, however, traditional and difficult to change. Inadequate water supplies on the steppe favored the formation of large villages.

#### LAND UTILIZATION AND THE OUTLOOK FOR EXPANSION OF CROP AREA

Reliable statistics on land utilization throughout the USSR are not available. Yet crude approximations, naturally better for European than for Asiatic Russia, may be had; the data are given in Appendix Table I.

The agricultural area of the USSR (including arable land, permanent meadows, and pasture) is about 680 million acres out of a total area of 5,392 million; that is, about an eighth. This low percentage, however, does not mean that there is room for enormous expansion.

In European Russia, the agricultural area occupies two-fifths of the total area, but more than three-fifths if we exclude regions north of the 60th parallel; and the fraction rises to more than two-thirds if we include in the agricultural area the land in farmsteads and gardens. This is even larger than in many western European countries. The area in forest is rather small, about 17.2 per cent of the total area excluding two extreme northern regions. The forest lies mostly in the north, so that very little expansion of the agricultural area in European Russia is possible through deforestation. Expansion must come principally through reclamation of unproductive land, which makes up a seventh of the total area excluding the cold northern regions. This land is mostly marsh in the north, semi-desert in the south, and its reclamation must be both slow and expensive. The possibilities for expansion of strictly arable land are even more limited, for the area in pasture and meadows is relatively small. The historical tendency has been to increase arable at the expense of meadow and pasture, a process that has gone too far in some regions, leading to agricultural crisis. The remaining pastures and meadows in such regions are not sufficient to supply livestock with feed. Peasants utilize fallow land as pasture, and this prevents early plowing and results in low yields, especially in semi-arid regions.

In Asiatic Russia the situation may be quite different, though even here the possibilities of expansion are less than they may at first appear. Hardly more than a twen-

tieth of the total area is now devoted to agriculture, it is true. But the tundra zone, which covers nearly a fifth of the total area, is quite unfit for agriculture. South of this lies the huge zone of cold forests ("tayga"), estimated to cover nearly 3.9 million square miles in Siberia and the northern part of European Russia (north of the 60th parallel), or a little more than half of the corresponding total area. This zone can be used for crops only in a very limited degree. In western Siberia it is marshy, in eastern Siberia mountainous. Pre-war official estimates<sup>1</sup> gave about 150 million acres of unoccupied land as suitable for agriculture in western Siberia, and several million acres more farther to the east; but this estimate included both the tayga zone and regions to the south. Soviet estimates of the area suitable for agriculture in the tayga zone itself run up to 75 million acres, two-thirds in Siberia and one-third in the Far East of Siberia.<sup>2</sup>

Outside of the tayga zone, there remain in Siberia less than 50 million acres of land more or less suitable for agriculture; this is wooded-prairie or prairie country, lying along the Trans-Siberian railroad. The area now actually devoted to agriculture in Siberia covers between a fourth and a third of this area south of the tayga zone; that is to say, the area of Siberia where agriculture meets with relatively favorable conditions is already in use to a considerable degree.

There is doubtless still room for expansion of the crop area in Siberia, both in uncolonized and in colonized territory. But free lands, in order to be used, require the construction of railways and also improvement of the land by deforestation, drainage, etc. It is through better utilization of the now occupied land that early expansion is most feasible; for under the existing extensive agricultural system, only a small part of the arable land is used for crops. Most of the arable land is in fallow or pasture.

The three-field system, wherein two-thirds of the arable land is under crop, would be progressive practice in Siberia.

In Central Asia, south of the 50th parallel, the factors limiting expansion are different. Here the unoccupied land is largely dry, to all appearances desert or dry steppe, suitable only for grazing. The better area, just south of the Trans-Siberian railroad, is already occupied. Before the war, it was officially estimated that there might be taken from the nomads of Central Asia, without detriment to their husbandry, from 87.5 to 112.5 million acres. Opinions differ as to how much of this land is suitable for crops; various Soviet estimates may be interpreted to range from 7.5 to 63-75 million acres.<sup>3</sup> But the higher estimate includes largely land where the annual rainfall is below 12 inches, and only 12-16 inches in the best (northern) part. Here dry farming methods will be required.

It is in this area that the Soviet government plans to increase the area under grain crops, especially spring wheat, by 20 to 25 million acres in the next five years—on the whole a rather optimistic plan. The so-called state grain farms ("sovkhozs") are planned largely for these regions, and also for the semi-arid regions of the Volga and North Caucasus. Expansion in Central Asia would be facilitated by completion of the Southern Siberian railroad, planned even before the war; and also by the newly completed Turkestan-Siberian railroad. Further irrigation in southern Turkestan along the Syr Darya and Amu Darya would expand crop areas there, possibly by 12 to 18 million acres according to official estimates; but here only the production of intensive crops would warrant the heavy investment.

On the whole, therefore, expansion of agricultural land in the USSR must come mostly upon lands of inferior quality (with cold or dry climate), and/or only with large investment of capital for roads, buildings, and land improvement. All specialists on the colonization problem are agreed that mass colonization in Siberia and Central Asia, permitting an influx of several hundred thousand colonists each year, is a thing of the past. The most optimistic recent estimate has contemplated a flow of

<sup>1</sup> See *Asiatic Russia* (St. Petersburg, 1914), 2 vols., I, 497.

<sup>2</sup> See Commissariat of Agriculture, *Soviet Land Organization and Improvement* (Moscow, 1925), p. 39.

<sup>3</sup> For the lower estimate see *op. cit.*, p. 40; for the higher, Jakovleff in *Pravda*, July 12, 1930.

colonists at the rate of 100,000 a year. Actual emigration has been much smaller,<sup>1</sup> whereas in 1906-10 it was more than 400,000 a year. Expansion through better utilization of crop land already occupied involves heavy investment of capital (especially railroads) and hence must be rather slow. It is erroneous to picture the vast unoccupied area of Central Asia and western Siberia as a rich prairie country subject to easy exploitation by a stream of colonists equipped with bare essentials.

Since a good deal of arable land remains fallow each year in European Russia, expansion of the crop area is possible there also through better utilization of the arable part. Such improvement characterized pre-war European Russia taken as a whole. It was most notable in the southeast, where the fraction of the arable land left fallow declined substantially between 1887 and 1917. There was no such decline in areas like the Central Agricultural Region

and the Middle Volga, where even in 1887 the three-field system was dominant; about a third of the arable remained idle each year over the 30-year period. In a narrower area, northwestern and northern Ukraine and to the north, more intensive forms of agriculture secured a foothold, and the percentage of arable land idle declined to 25 per cent, at which level it now rests.

All told, European Russia had a little less than a third of the arable land idle in 1917. If this land is to go into crops, a complete reorganization of the traditional system of agriculture is necessary. The three-field system must give place to a system involving more rotation of crops, different crops, and more livestock. This can proceed only slowly, and its progress means not more grain crops, including wheat, but such other crops as roots and seeded hay. It is in Siberia and Central Asia that the arable land can be utilized more fully and the crop area expanded more rapidly.

## II. LAND TENURE, THE AGRARIAN REVOLUTION, AND SOVIET AGRICULTURAL POLICY

### PRE-WAR AGRARIAN RELATIONS

The outstanding characteristic of land tenure in pre-war Russia was the small importance, even in some regions the complete absence, of medium-sized land holdings. As in pre-war Roumania, Hungary, and eastern Prussia, there were in general some large estates on the one hand, and a mass of small peasant holdings on the other.

The abolition of serfdom, in 1861, was accompanied by the allotment of land holdings to former serfs with the purpose of making them independent farmers. This

objective was not always achieved. In the blacksoil zone, for example, it is estimated that the peasants obtained from a fifth to a fourth less land than they had held as serfs. Although the outcome was less unfavorable in other areas, the peasants generally in Russia did not obtain as much land as they had held before.

The following figures are of interest both as to average size of allotments and as to allotments to different groups of peasants:<sup>2</sup>

Group	Acres per male peasant
Serfs of private landowners.....	9.4
Appanage peasants .....	13.0
State peasants .....	14.3
All peasants .....	13.8

<sup>1</sup> In 1929-30 the total number of emigrants to new settlements, including southeastern European Russia, was 72,000; of these half returned. See *Economic Life*, May 15, 1931.

<sup>2</sup> Data from an official publication of the Ministry of Agriculture, *Addition to the Statistical Data on the Land Question in Russia* (St. Petersburg, 1907), pp. 30-33 and Table VI in the Appendix. Other estimates differ from these.

<sup>3</sup> According to the census of 1858, there were then 10 million male serfs, 9.2 million male state peasants, and 0.9 million male appanage peasants. State peasants were on state land, appanage peasants on land held directly by the Emperor and members of his immediate family.

If the average size of a peasant family at that time was 6 persons, of which 3 were males, then the average allotment was a little over 40 acres per family—larger for some groups, smaller for others, especially the former serfs of private landowners (30 acres or less).<sup>3</sup> Allotments varied in size from region to region, being largest in the east, southeast, and north, and smallest in

northwestern Ukraine. These regional differences persisted up to the recent agrarian revolution. The average size of peasant holding (of the allotted land), however, declined everywhere as the result of the rapid growth of population. In 1905, it was only 30 acres per peasant family, or 25 per cent lower than at the Emancipation.

Between 1861 and 1914, the area of peasant land was continuously increasing at the expense of land owned by the gentry and other private landowners. Statistics covering the period 1862-1911<sup>1</sup> show that in 47 provinces of European Russia the estates of the gentry shrank from 235 to 117 million acres, or about 50 per cent; and that in the same period the peasants bought about 67 million acres.<sup>2</sup> It was especially in 1906-11 that large estates were sold, many landowners being affected by the revolutionary movement of the peasants in 1905. But even though peasant land holdings grew, the growth of peasant population was even more rapid; and peasants always felt the hunger for land.

The area of small peasant holdings in 1916, in 50 provinces of European Russia, may be estimated as about 447.5 million acres (374.5 million of allotted land, according to official statistics of 1905, and 73 million purchased<sup>3</sup> after that year); and the area in large estates as 201.7 million acres. Thus by 1916 the large estates had

less than half as much land as the peasants held, whereas in 1877 they had held more than three-quarters as much. Outside of European Russia, large estates had practically no importance, except perhaps in Transcaucasia. Hence the 200 million acres within large estates in European Russia was the objective of the agrarian revolution of 1917-20, the only source for expansion of peasant agriculture.<sup>4</sup>

Some of this 200 million acres was wooded (a larger fraction than was true of peasant land), and some of it was leased to peasants—perhaps a third to a half of the whole.<sup>5</sup> Hence large-scale or estate farming was not as prevalent in Russian farming as the amount of land in estates suggests. Perhaps 10.7 per cent or somewhat more<sup>6</sup> of the crop area was in large estates in 1916. In general, farming on large holdings was much more important in the blacksoil zone than it was to the north; and more important in the western part of the Russian Empire than in the eastern. Large estates were particularly important in northwestern Ukraine, and in the Baltic provinces lost after the war.

The confiscation of large estates that was to come later was bound to affect agricultural output unfavorably, then, on something like 10 to 15 per cent of the crop area, with larger and smaller percentages in different regions. The effect upon output was not bound to be unfavorable, however, so far as concerned estate land customarily leased to peasants (usually on short term, for one crop).

#### AGRARIAN REVOLUTION, 1917-20

In effect, however, confiscation applied not only to estates but to part of the landed property of the wealthier peasants who operated such middle-sized farms as there were in Russia. Hence agricultural production was strongly affected, especially where large farming, whether estate or peasant, was common—as in Ukraine particularly.

The agrarian revolution in general equalized the distribution of landed property, though again with regional differences. It was usually undertaken within small geographical units, mostly within volosts. Since the size of peasant holdings had

<sup>1</sup> See N. P. Oganovsky, *Agriculture in Russia in the XX Century* (Moscow, 1923), pp. 60-69. Here are given official statistics published by the Department of Taxes, Ministry of Finance.

<sup>2</sup> However, something like 24 million acres of this was bought by individual peasants (by descent) who turned it into larger holdings ranging from 135 to 2,000 acres.

<sup>3</sup> See N. P. Oganovsky, "The Results of the Agrarian Revolution," *Agriculture of the USSR in 1924-25* (Moscow, 1925); also his *Essays on the Economic Geography of the USSR* (Moscow, 1924), pp. 105-6.

<sup>4</sup> There were, however, large areas of state land. But not much of this was arable, and the arable land itself was mostly leased to peasants.

<sup>5</sup> See especially A. N. Chelintsev, *Agricultural Geography of Russia* (Prague, 1924), pp. 120-25; and A. A. Kaufman, *Problems of Economics and Statistics of Peasant Farming* (Moscow, 1917), p. 89.

<sup>6</sup> This is the figure given in the census of 1916. But the war perhaps affected estate farming more than peasant farming; see A. N. Antsiferov, M. O. Batshev, D. N. Ivantsov, and A. D. Bilimovich, *Russian Agriculture during the War* (Economic and Social History of the World War, Russian Series, Vol. VII), 1930.

varied widely from province to province before confiscation, it continued so thereafter. Overpopulated regions continued to be overpopulated, with intensification because of the flight from cities.

The following tabulation gives the distribution of peasant holdings (of allotted land only, not of purchased land) by sizes in 1905, in 43 provinces which now lie within the USSR:<sup>1</sup>

Size of holdings (acres)	Number of holdings		Area		Average holding (acres)
	(thousands)	(percentage of total)	(thousands of acres)	(percentage of total)	
Below 13.5	2,684.1	23.1	22,904	6.6	8.6
13.5 to 27.	4,949.8	42.5	98,593	28.5	19.9
Above 27..	3,999.8	34.4	224,951	64.9	56.2
Total .....	11,633.8	100.0	351,036 <sup>a</sup>	100.0	30.2

<sup>a</sup> Including 4,588 thousand acres undistributed by size.

These figures, though they apply to 1905 and do not cover peasant land other than allotted land, may be taken as representing moderately well (though somewhat overstating sizes of holdings) the general distribution of peasant property as it was around 1916. The average holding was only 30 acres. A third exceeded 27 acres and included two-thirds of the land; but a fourth of the holdings were very small (below 13.5 acres, averaging 8.6) and included only a fifteenth of the land.

The distribution in 1924-25, after the revolution, was as follows,<sup>2</sup> according to the Commissariat of Finance:

Group	Size of holdings	Number as percentage of total	Area as percentage of total
I	Less than 10.8 acres of crop land and meadow, or than 5.4 acres of crops .....	31.3	11.7
II	10.8 to 21.6 acres of crop land and meadow, or 5.4 to 10.8 acres of crops .....	49.5	45.7
III	21.6 to 30.5 acres of crop land and meadow, or 10.8 to 21.6 acres of crops .....	15.2	26.3
IV	More than 30.5 acres of crop land and meadow, or more than 21.6 acres of crops .....	4.0	16.3

These figures are not directly comparable with those of the preceding tabulation, though both tabulations relate to the same

territory and the groupings by size are not too far different. It is clear that holdings in Groups III and IV (equivalent to the highest group in the preceding tabulation) decreased in importance, while those in Group II increased, the latter partly at the expense of the former. Yet the group of smallest holdings did not decrease; in fact the smallest holdings were about a fourth of the total number in 1905, but nearly a third in 1924-25.

Hence the subdivision of about 100 million acres of estate land<sup>3</sup> did not solve the agrarian problem; the increase in the number of peasant households (from 12 million in 1905 to about 20 million in 1924-25) was too large. There was a reduction in large holdings, but not in small ones. Overpopulation prevails now, as it did before the revolution, and is especially prevalent in the northern provinces of Ukraine (the so-called wooded prairie area), and in the Central Blacksoil Region of Russia, occupying the northern borders of the blacksoil zone. In the south and southeast, the situation is better, though partly because the famine of 1921 prevented equally rapid growth of population. If the revolution did not eliminate small farms, it did reduce the number of landless peasants.

Equalization went beyond land, to other agricultural capital such as livestock, machinery, and other equipment. Not only estates but also the larger peasant farms had their capital subdivided, and perhaps to a greater extent even than land. Even so (and in part because there was a decline in the number of working horses and oxen at a time of increase in the number of farms), the number of farms without any working livestock actually increased. In 1920 such farms made up 27.0 per cent of all farms; in 1917, 27.1 per cent; and in 1922, 37.5 per cent.<sup>4</sup> Many families that obtained land

<sup>1</sup> Compiled from *Statistics of Landed Property in 1905*, by the Central Statistical Office.

<sup>3</sup> As given in N. P. Oganovsky, "The Results of the Agrarian Revolution and Present Stratification of the Peasantry," in *Agriculture in the USSR in 1924-25* (Moscow, 1925).

<sup>3</sup> Based upon estimates by Oganovsky, *op. cit.*

<sup>4</sup> Within the territory of the USSR excluding Ukraine, Turkestan, and Transcaucasia. Data from *Collection of Statistical Information for the USSR 1918-1923* (Moscow, 1924), published by the Central Statistical Office.

during the revolution failed to obtain livestock to work the land.

#### AGRARIAN RELATIONS AFTER THE REVOLUTION

During the years just after the revolution, land was regarded as national property, to be held by peasants while they worked their lots without hired help. There was little renting. The New Economic Policy with its accompanying Law on Land (1922) permitted renting, but only up to about six years, and the renter could not employ hired labor on it. In 1925 there were relaxations, both as to length of term and use of hired labor. Purchase, sale, and mortgage were all consistently forbidden. Thus leasing was the only feasible method of land "mobilization," and leases became more and more common until restrictions were again applied in 1927-28.

The importance of leasing in the year of its maximum development is brought out by a sample census of farms in typical localities.<sup>1</sup> In the regions where grains were the principal cash crops, about 27.8 per cent of all farms rented land, and 20.3 per cent put out land in lease. The percentages were as follows in some important regions:

Region	Renting	Giving in rent
North Caucasus .....	26.3	33.3
Crimea .....	33.8	30.3
Transural and Siberia..	33.3	25.0
Ukrainian steppe .....	35.3	24.9

This considerable development of leasing did not mean that land holdings were concentrated thereby, for the percentage of farms taking land in rent tends to equal or exceed the percentage giving it in rent; the inference stands even though the latter farms might not have been as well included in the census as the former. In general, land was leased mostly by farmers who lacked livestock and equipment to those who had.<sup>2</sup> Thus leasing permitted an adjustment of land holdings to means of production, which clearly were less equalized than land.

The situation was in sharp contrast with that before the war, when land was rented by estate owners to peasants and, as agricultural economists pointed out, the renters were dependent on landowners. But with better-equipped peasants renting from those poorly equipped, the Soviet economists consider that it was not renters who are exploited, but those who had land for rent; the renters were the "capitalistic" farmers, the "kulaks."

At the same time there was the possibility for a peasant who had land but not equipment to rent the equipment, and this was not uncommon. In 1927, in the principal grain-growing regions, only 6.1 per cent of the peasant families had no crops, while 30.7 per cent had no working livestock. Hence 25 per cent of the families worked their land with rented livestock. This again is regarded by Soviet economists as evidence of capitalistic exploitation of poorer by richer peasants.

In effect, the agrarian revolution greatly equalized land holdings, and to a lesser degree agricultural capital. Large-scale farming and the stratum of medium-sized farms were practically destroyed, and along with this some of the most progressive farming in Russia. But equalization was within narrow regions, without transfer of population. Overpopulated areas remained overpopulated, not only because of the regional nature of the subdivision of land, but also on account of the growth of the number of peasant households, the breaking up of larger households, the flight from the city, and the general growth of population. The revolution did not create a stratum of strongly intrenched peasant farmers. Equalization was made on so low a level that farmers had to produce largely for household use rather than for market. The introduction of the NEP gave impetus to a new stratification and to the selection of a group of enterprising well-to-do farmers, who could rent land and hire labor, and who might be expected to improve the productivity of agriculture. But in 1927-28 the hostile policy of the Soviet government against the "kulaks" supervened. It is necessary, in order to understand the organization of agriculture on the new basis of property distribution, to follow the changes

<sup>1</sup> This census covered about 155,000 farms. See K. Vorobiev, "Grain Producing Regions," *Statistical Review*, 1929, No. 4, pp. 3-18.

<sup>2</sup> Vorobiev, *op. cit.*, pp. 3-18.



in this policy from the revolution to the last step of wholesale collectivization of agriculture.

#### EARLY AGRICULTURAL POLICY

The agricultural policy of the Soviet government has been, in 15 years of Communist power, more hesitant and less stable than its economic policy in other branches of activity. The pre-revolutionary Russian Communist party, or the Bolshevik group of the Russian Social Democratic party, favored large-scale farming in theory, as it had always done. It did not admit that in agriculture small-scale farming had better prospects for development than small-scale production in industry.

Force of circumstances, however, compelled the Communists to adopt a practical policy quite different from their theoretical position. Desire for the support of the peasantry led to proclamation of the subdivision of large estates and the equalization of land holdings. The first decree on the abolition of property in land (fall of 1917) was influenced more by the left wing of the Social Revolutionary party acting through local peasant councils than by the Communists; and the first more complete agrarian law, the "law on the socialization of land" (February 6-19, 1918) was similarly influenced. This law abolished individual ownership of land, transferring it on the principle of equalization according to need to the whole working people. But in fact the land fell into the possession of individuals in the local population, and only 2 to 3 per cent of the arable and pasture land was left directly in the hands of the Soviet government. The early policy was always regarded by Communists not as their own, but as representing a necessary concession to the peasantry.

As early as July 3, 1918, the Soviet government made attempts to establish large-scale farming on socialistic lines, in the form of agricultural communes and state farms; sums were assigned for this purpose. A decree of February 14, 1919, developed with details the principles of "socialistic organization of agricultural production," and contemplated displacement of individualistic forms of land utili-

zation by collective forms: land was to be used first for state farms and communes, next for artels and locser types of collective farming, and only last to satisfy the needs of individuals. But very little land was readily available for the allocation contemplated in the decree.

In these years a few thousand state farms ("sovkhozs") and agricultural communes were organized, mostly by city workers who had fled to the country. Some agricultural laborers joined these groups, but most of the laborers aligned themselves with the peasants who favored subdivision and occupation of estate land. Nor did the Communists' instigation of class struggle in the country (the laborers and poor peasants against the rich) much advance the collectivization of farming. It proved impossible to retain for the state significant fractions of the confiscated estates.

Accordingly, farming on a relatively large scale (though in fact rather a modest one) at that time could be organized only on about 2 or 3 per cent of the arable area. Nor were these larger farms successful. They failed to produce more than was required on them for consumption,<sup>1</sup> and rented more than half of their land to individual peasants. With the introduction of the New Economic Policy, many were abandoned, unable to exist without financial aid from the state. The collective farms (communes) were hardly more successful. Of these there were about 14,000 in May 1921, occupying some 3.5 million acres. The number declined with the introduction of the NEP. Individual peasant farming proved itself the more efficient during this early period.

State farms and communes together failed to produce even a small part of the food supply necessary for the cities; this had to come (and food for the army as well) from the peasant farms, and through confiscation. The government forbade all trade in agricultural products, and confiscated all surpluses of peasants above consumptive needs, defining these needs very narrowly. The policy of confiscation was largely responsible for an enormous de-

<sup>1</sup> A. T. Swidersky, "Agricultural Policy over a Period of 10 Years," *Paths of Agriculture* (Moscow, 1927), No. 10, pp. 18-49.

cline in agricultural production, and for the disappearance of the production of surpluses for the market.<sup>1</sup> Peasants produced for home consumption almost exclusively. The ensuing difficulties in collecting food (in connection with the sailors' revolt at Kronstadt and some peasant uprisings) were among the more important factors which compelled the government in the spring of 1921 to introduce the more liberal New Economic Policy.

#### THE NEP IN ITS RELATIONS TO AGRICULTURE

The NEP was first of all a new agricultural policy. Taxes in kind were substituted for the policy of confiscating all surpluses; trade in agricultural products was re-established. The aim was to stimulate agricultural production and marketable surpluses by appeal to individual initiative. A new Law on Land was incorporated in the Land Code of 1922.

This law practically recognized the status quo of existing agrarian relations, and sought to stop further changes and thus remove uncertainties regarding land tenure. The principle of abolition of private property in land was maintained in the first articles, but succeeding ones recognized practically unlimited tenure for agricultural use by the actual holders. New forms of tenure were not imposed; in fact, all existing forms were given equal legal standing. Restrictions on leasing and hiring labor were lessened, though not removed completely; and in practice the peasants went beyond the law, without much attempt by the government to prevent them. In 1925, in fact, the *de facto* situation with regard to leases and hired labor was recognized by law.

It is essential to recognize that the new policy was to a certain degree successful. During the period 1922-26, the Russian peasantry made a great effort to recover the pre-war and the pre-revolutionary agricultural production, though the area in 1922 was so low that there would doubtless have been some recovery under almost any set of circumstances. In this period the peasant crop area increased about 50 per cent.

But the recovery was accompanied by a differentiation of the peasantry, as would be expected with the wider latitude given to individual initiative. Land equalization had not meant equalization of managerial ability, thrift, and other attributes; and given the opportunity under the NEP, the process of selection began to work. A group of well-to-do peasants sprang up when scope was left to hire land and labor and to market produce. The stratification, however, was not pronounced. The upper stratum of peasants, regarded in Soviet Russia as capitalistic producers, were of very modest means as judged by the standards of North America or western Europe.

From the first, the Communist party was suspicious of this group. The so-called "left opposition" (Trotsky's group) adopted an "anti-kulak" policy, insisting that a limit must be placed on the possible growth in strength of the well-to-do peasant class. Reduction of agricultural prices and increase of taxation were advocated. A "right opposition," however, favored further concessions to the peasantry, viewing such a course as the only way to enlarge marketable agricultural surpluses. The ruling group of the Communist party sought to maintain a balance between the two "oppositions"; in the main, this group regarded the middle group of peasants as the important one, and supported a plan for union of the proletarians with the middle peasants ("seredniaki"). With differing opinions within the party, the governmental policy was inevitably unstable.

Thus the general policy was to increase the productivity of agriculture, and to this end efforts were made to supply the peasantry with agricultural machinery, to develop agronomic assistance, to organize agricultural credit, and to diminish the prevalence of "strip" farming by facilitating consolidation of the strips. On the other hand, the taxation policy was directed more and more against the well-to-do peasants, with graduation of taxes so as to make larger farms unprofitable; this contributed to further parcellation of land and hence was detrimental to agricultural production. Moreover, agricultural prices were held at a low level in relation to industrial prices; if the government made

<sup>1</sup> See further below, p. 303.

some effort to raise the ratio before 1924–25, it sought to lower it in the two following years. Finally, although the Land Code of 1922 recognized different forms of land tenure, including tenure of land in closed fields or in separate farms, the government discouraged such tenure although its advantages over strip farming were obvious from the point of view of production.

#### THE RETURN TO SOCIALISTIC AGRICULTURE

Concessions to individualism reached their maximum in 1925. Between 1925 and 1927 the policy toward the well-to-do peasantry was vacillating, but gradually more and more hostile. The winter of 1927–28 was a definite turning point. At that time the government faced great difficulties in collecting grain, and chose to return to the methods of military communism prevalent in the first period of the revolution.

The reversal of policy was registered at the 15th Congress of the Communist party, in resolutions that were in effect directed toward extermination of the idea of private rights to land. Renting, particularly by well-to-do peasants, was to be limited; the term of rent was shortened from twelve years to six; the segregation of fields was forbidden; the use of hired labor was curtailed; supplies of machinery available to well-to-do peasants were to be limited and credits curtailed; steps were to be taken to eliminate kulaks from the governing bodies of co-operatives; the kulaks (a term always of vague meaning, and defined largely at the discretion of local administrations) were to be deprived of the right to take part in the meetings of land communities which decided on the vital questions of utilization and distribution of land, and landless peasants were to take their places. Thus the views of the "left opposition" became the views of the ruling faction of the Communist party, though Trotsky had earlier been expelled from the party and exiled. Legal expression came with a new Land Code, the "General Principles of the Use of Land and of Land Organization," adopted December 15, 1928. This law applied to all of Soviet Russia; previously, the several federal republics had had their own codes. Thus came further centralization of authority.

But Soviet economists were well aware that hand in hand with restriction of the activities of individual well-to-do peasants must go expansion of production by organizations socialistic in form and better amenable to control.<sup>1</sup> In short, collectivization was to be stimulated in various ways set forth in the resolutions of the 15th Congress, and state farms were to be organized on a large scale. The government thus felt itself in a position to return to the original Communist principles. The well-to-do peasants had in fact attained a powerful position as the producers of the surpluses needed to feed the cities, a position so powerful that Communist power was endangered unless the well-to-do peasants could be broken. It was largely for political and doctrinaire reasons that the drive against the kulaks began; further encouragement of individual initiative was recognized as an alternative method of enlarging production and marketable surpluses, but this alternative was rejected. The step was taken even though the experience with collective and state farms had not been encouraging.

#### COLLECTIVIZATION BEFORE 1929

During the period of the NEP (1921–27), the collective farms created in 1918–20 made little progress. They declined in number and in area, numbering in 1927 only 14 to 15 thousand, their crop land occupying less than half of 1 per cent of the total crop area. Deprived of state aid and forced to meet the competition of individual farms, many communes and artels, especially the former, were broken up between 1921 and 1924. Thereafter (to 1927) there was an increase in number, though this was because a simpler type of association was set up. Governmental privileges such as tax reduction, preferred place in the supply of equipment, and preferential treatment in land settlement were not enough to result in widespread formation of collectives before 1927–28.

After 1927–28, with the policy of expanding socialistic agriculture once adopted, the

<sup>1</sup> See J. A. Jakovleff, ed., *The Problems of Socialistic Reorganization of Agriculture* (Moscow, 1928), preface, pp. xxvii–xxviii. Mr. Jakovleff is the Commissary of Agriculture of the USSR.

measures (implemented by the governmental monopoly of agricultural products and of the system for distributing industrial products) that had been adopted at the 15th Congress resulted in great expansion. The expansion was not a spontaneous movement of the peasantry. It resulted merely because collective farms obtained numerous privileges in the form of credits, preferential treatment, tax reduction, and the like, which formerly they had not had, while individual peasants no longer had open to them the opportunities that had previously existed.

By October 1929, collective farms had increased in number from 14,800 to 67,400; the number of peasant households involved from 195,000 to 1,919,000; the ratio of peasant households in collectives to all peasant households from 0.8 per cent to 7.4 per cent. The grain-surplus regions witnessed the greatest growth of collectivization, partly because the government sought especially to increase marketable surpluses of grain; partly because collectivization has some direct technical advantages in small-grain farming, especially if the collectives have some modern machinery; partly because in these regions, where stratification of the peasantry into well-to-do and proletarian groups had proceeded relatively far, it was easy to organize the class struggle; and partly because there was little livestock, which hampers collectivization in regions where it is prevalent, as in the regions north of the blacksoil zone.

The process of collectivization in the steppe areas, however, involved mainly the poor peasants, who could bring but slender resources to the organizations of which they became members (and who sometimes sold some equipment before joining). Consequently many collectives had as resources mostly what they received from the state as credits. Some two-thirds to four-fifths of the members of collective farms in 1928 were poor peasants; it was only the looser forms of collective that the middle peasants joined freely.

At this time it was not supposed that collectivized farms could be relied upon as the main source of marketable agricultural products. Indeed, the Five-Year Plan then elaborated contemplated collectivization

only to the extent of 15–20 per cent of all peasant farms by 1932–33. Individual farms were to remain the major source of supply, and hence the well-to-do peasants were not to be neglected completely. The attempt was even made to distinguish between well-to-do peasants and kulaks.<sup>1</sup> The small size of collective farms (only about 110 to 120 acres of crops on the average in the RSFRS, and less in Ukraine) was a basis for this view, and also their instability of organization, with turnover of membership so large as to give rise to the ironical description “houses with thoroughfare.” With the autumn of 1929, however, there came another change of policy, such as to result in wholesale collectivization of a sort not in evidence before.

#### RECENT DEVELOPMENTS IN COLLECTIVIZATION

Prior to this time, the struggle against the kulaks was not designed to eliminate them. But perceiving some success in the spread of collectivization, and anxious definitely to break the resistance of the peasantry, the government adopted in the winter of 1929–30 a policy of expropriation of the kulaks. Thus Stalin spoke before a conference of Marxian agricultural economists in December 1929:

Until recently the policy of the party was to check the tendencies of kulaks to exploit others. . . . This policy was confirmed by the 15th Congress of our party and it was executed until recently. . . . It is known that in 1929 the grain production of the collective farms and of the state farms was not smaller than 400 million poods.<sup>2</sup> This means, that it is only about 200 million poods below the grain production of the kulaks in 1927. For this reason we decided to change our policy from the policy of limitation of the tendency of kulaks to exploit others, to the policy of liquidation of the kulaks as a class.

“Liquidation of the kulaks as a class” became the Communist slogan in following years. On January 6, 1930, the Central Committee of the Communist Party accepted a decision to alter the Five-Year Plan so that in the Middle and Lower Volga regions and North Caucasus collectivization was to be completed by the fall of

<sup>1</sup> See *Five Year Plan of Economic Construction of the USSR* (Moscow, 1929), Vol. II, Part 1, pp. 282–83.

<sup>2</sup> This figure is about twice as high as one given in the official statistics of the Gosplan.

1930, and not later than the spring of 1931; the latest date for completion in the grain-surplus region as a whole was to be the spring of 1932.<sup>1</sup> The general instruction was shortly given to replace the complicated system of organization of agricultural land for individual farming with some simplified system of land organization.

Anticipating profit through confiscation of the property of the kulaks, the semi-proletarian peasantry was attracted to the cause of the Communist party. The middle peasants, faced with the indistinct and often arbitrary definition of the term "kulak," were forced into collectives by the fear of being themselves placed within the proscribed group. In fact many thousand were so placed, and suffered confiscation of their property.<sup>2</sup> Officially, the responsibility for this was laid at the door of local administrative organs, though it is difficult to believe that the policy could have been pursued so vigorously for several months in the absence of at least passive assent of the central authorities. But the pressure to join collectives applied to the middle peasantry was more or less incidental to the bitter struggle against the kulaks. These suffered confiscation of property, expulsion from their homes, and transfer to remote regions; they were not allowed to join collectives, even as simple workers. There was, in fact, a real civil war in Russian villages in the winter of 1929-30, a social revolution the consequences of which, inevitably important, are not yet fully apparent.

The extent of confiscation from kulaks is suggested by the statement (made by the Commissary of Agriculture at the 16th Congress of the Communist party) that 15

per cent of the capital of all collective farms consisted of confiscated equipment; even this figure may be too low<sup>3</sup> on account of undervaluation of confiscated material. The kulaks (a million peasant households) lost, according to an official statement, a third of their means of production, not including land. Not only were their means of production confiscated, but to a large degree homes and such personal possessions as clothes, linen, and household articles. Of such property much went not to collectives, but to the semi-proletarian peasants who helped in the confiscation.<sup>4</sup> Under these circumstances it is easy to see why the middle peasants flocked to collectives.

In five months (October 1, 1929, to March 1, 1930), the number of peasant households that were members of collectives increased from 1.9 to over 14 million; and 59.3 per cent of all households were collectivized.<sup>5</sup> The percentage was even higher in some important grain-surplus regions: 85 per cent in North Caucasus, 71 in Lower Volga, 72 in Ural. More surprising, the percentages were 70 in the Moscow Industrial Region, and above 85 in the Central Blacksoil Region, where the diversification of agriculture would lead one to expect less rapid collectivization. Here, according to official pronouncements, "measures of constraint were applied in relation to medium and poor peasants to form collectives; the small livestock and cows of members of collectives, which served only for consumptive purposes, were collectivized. The rapid tempo of collectivization projected by the Central Committee only for the grain-surplus regions was applied to other regions . . . ."<sup>6</sup>

The coercive measures provoked an outburst of peasant resentment, which took the form particularly of wholesale slaughter of livestock. Kulaks slaughtered their livestock to avoid the full effect of prospective confiscation. The middle peasants slaughtered theirs because to bring it into collectives meant low valuation and no better place in the collective than a poor peasant would get, and also partly because it was supposed that the collectives would be supplied with tractors and other equipment. In addition to what was slaughtered,

<sup>1</sup> *Pravda*, January 6, 1930.

<sup>2</sup> See Stalin's "Giddiness from Success," widely published by the Soviet press on March 2, 1930; also articles by F. Tsylko, Karovaev, and Shumsky, in *On the Agrarian Front*, 1930, Nos. 5, 7, and 8.

<sup>3</sup> See *Bulletin of the Economic Cabinet of Professor S. N. Prokopovich* (Prague), January 1931, No. 85, p. 15.

<sup>4</sup> See Karovaev and Shumsky, *op. cit.*, pp. 93-96.

<sup>5</sup> Tsylko, *op. cit.*, pp. 25-27.

<sup>6</sup> See *Izvestia*, March 15, 1930; W. N. Chamberlin's *The Soviet Planned Economic Order* (Boston, 1931), pp. 217-22; or *Bulletin of the Economic Cabinet of Professor S. N. Prokopovich* (Prague), January 1931, No. 85, pp. 9-10.

much livestock perished in the newly formed collectives from lack of care.<sup>1</sup>

The active and passive resistance became so serious that a crisis appeared to threaten not only agriculture but the whole Soviet system. Then came a change of policy, announced by Stalin in his famous "Giddiness from Success," March 2, 1930. Here the methods of collectivization followed earlier were denounced, and the voluntary nature of collectives was proclaimed. There was immediately an outflow of peasants from collectives, so marked that on April 5 "new privileges for collectives and their members" were announced, involving certain exemptions from taxes, the promise of a further extension of credit, and a year's moratorium on indebtedness of peasant members. Whereas on March 1 over half of the peasant households were in collectives, the fraction was nevertheless only 24.1 per cent in May and 21.5 per cent on October 1, 1930.<sup>2</sup> This decline was most striking in the north, where peasants had always been opposed to collectivization, less striking in the grain-surplus areas.

In the autumn of 1930, however, the drive for collectivization was resumed. By mid-summer 1931, more than 55 per cent of all peasant households were collectivized—more than 80 per cent in the steppe regions. On August 2, 1931, the Central Committee of the Communist party announced that it regarded collectivization as complete in North Caucasus, Lower and Middle Volga, the steppe area of Ukraine, and Crimea. Thus Russia is now practically a country of collectivized agriculture. The resistance of the middle peasantry was broken. Seeing the hopeless and uncertain situation of individual farmers, the impossibility of attaining a higher level by pursuing individual farming, the arbi-

trary way in which they were taxed, and the way in which the government monopoly deprived them of any possibility of acquiring machinery and other manufactured goods, the middle peasants evidently decided that it was far better to join collectives than to remain in the desperate situation of the individual farmer.

Collective farming is therefore of paramount importance in Russian agriculture, particularly in the grain-surplus regions. This is true not only because many peasants and much land are involved, but also because collective farms became much larger than they were earlier, and hence of of size more suitable for the application of modern machine technique. It is not yet possible to draw inferences as to their vitality and efficiency; yet that there are significant limitations is clear. The collectives were organized so hastily that there was no chance for rational organization, especially in view of the lack of standards or of precedent. There was not enough machinery to mechanize many of them (only 15 per cent had tractors in 1930), although it was the opinion of the Council for Collective Farming that it would be impossible to create successful collectives without furnishing them with tractors and modern machinery.<sup>3</sup> Many collective farms also lack trained agriculturists and other trained technicians in their membership. Even the Council for Collective Farming has recognized that it is much more difficult to organize successful large collective or co-operative farms than large state or private farms; and that a large staff of experts, not now available, would be required. This matter is the more important because the collectives do not include in their membership the former kulaks, who were surely the best organizers and managers amongst the peasants themselves. That difficulties in securing efficient operation have been encountered is evidenced by the introduction of the piece-work system in 1931. It may be that the major limitation of collectives is that both income and work are determined by central authority, and not on the principles of free co-operation. Members can hardly regard themselves as responsible member-workers, but merely as hired laborers, with the difference that they

<sup>1</sup> See M. Solomonov, "In the Regions of Thorough Collectivization," *Planning Economy*, 1930, No. 2, pp. 235-36.

<sup>2</sup> *New York Times*, December 1, 1930, quoting the head of the Council of National Economy.

<sup>3</sup> Since the spring of 1931, it has been the Soviet policy to remove tractors and complex machines from collectives, and to concentrate them in so-called Machine-Tractor Stations (MTS). By summer there were about 1,400 such stations; so that with what were on state farms, practically the whole supply of tractors in the country was in official hands. See further below, pp. 317-18.

cannot be sure of the amount of their remuneration and have no freedom in their choice of work.

It is important to observe that the peasantry is now deprived of any stimulus toward saving. Under the NEP, agriculture was the only branch of industry which could exist and develop itself through the voluntary savings of the population. Other industries rested upon state finance, fundamentally on taxation, or upon price regulation. Under the NEP, the accumulation of capital by the well-to-do peasants was substantial, and it was largely responsible for the considerable recovery of agriculture. Later the stimulus to saving was weakened; the state began to finance the collectives, and later it had to order collectives to set aside from their incomes a certain percentage as "indivisible funds." The necessary subsidization was a tremendous burden upon state finances; not foreseen in the original Five-Year Plan, it serves largely to explain the disorganization of finance in Soviet Russia in recent years, and the consequent monetary inflation, which in turn reacted unfavorably on the collection of agricultural products from the peasants.

The picture that one may patch together of farming in Russia under the system of collectives is therefore one predominantly of peasant farming, but by peasants grouped rather than individually, and by grouped peasants lacking the stimulus lent by individual initiative and lacking a leavening percentage of enterprising and experienced operators of fair-sized farms. To what extent and how rapidly the technique of large-scale farming (involving both the equipment and the direction) will proceed, and what will be the effects upon production, one cannot say with assurance. It may be supposed, however, that the processes of organizing efficient farms, of securing equipment, and of expanding the cultivated area cannot be as rapid as was the break-up of individualistic farming after the fall of 1929.

With practically all of the peasants of the grain-surplus area in collectives, the government cannot continue the policy of extending privileges to collectives. This would now mean privileges for the peas-

antry as a whole, not for one class as against another. The Soviet policy is necessarily one of pressing upon the peasantry the cost of industrialization of the country; hence collection of grain must be enforced from collectives as rigorously as earlier it was from individual peasants. Recent information shows that collectives, like individuals earlier, tend to resist deliveries of grain to the state. How far this resistance may go, and what may be the consequences, are of course not clear; but it is certain that a stable situation has not yet been attained.

#### STATE FARMS

The rapid organization of large-scale state farming, as well as of collective farms, was part of the Soviet plan. We have seen that in the early years of the revolution, not much land could be retained by the state, and that during the period of the NEP state farms had difficulty in maintaining themselves in the absence of state assistance, and had to rent much of their land to peasants.

During the period of the NEP, the state farms were used mostly to produce certain technical raw materials, chiefly sugar beets; some farms were engaged in reproducing improved seed selected in the agricultural experiment stations, others in animal breeding. The farms were not very large or numerous: 1,000 acres of crops on the average in 1928, with 3,318 farms (less than in 1918-20), and 3.5 million acres or a little more than 1 per cent of the total crop area.

In the spring of 1928, when there were great difficulties with grain collections, the government fixed upon an ambitious program of expansion. It was decided to organize a grain trust to include many very large state farms, which in five years were to yield from 16 to 17 million quintals of marketable grain, mostly wheat. The purpose in view—to free the state from dependence upon the kulaks for supplies—itsself conditioned the plan of organization; the farms were to be thoroughly mechanized, with practically no livestock and a minimum number of laborers, so that as much grain as possible would be left for delivery to the state.

Since experience had shown that land could not be taken from peasants, the large state farms were at the outset planned for unoccupied land in sparsely populated regions. In European Russia, such land existed only in the regions east of the Volga or in North Caucasus, which had suffered most severely from the famine of 1921. Of 10 million acres planned in September 1928 for the Grain Trust's farms, half was to be in these areas and half in Western Siberia and Central Asia. All of this land is semi-arid, with rainfall from 10 to 14 inches a year and fluctuating widely, and hence risky for colonization by peasants.

The farms were planned to be of enormous size, and with changing plans the size increased. From 75 to 100 thousand acres at first, the optimum size was raised to 175 to 200 thousand acres, and some experts favored 300 to 400 thousand. A mania for "giants" seems to have obsessed many Communist economists and technicians. The same mania prevailed during the great drive for collectives, though later Communist leaders themselves were disappointed with huge collective farms. But on the state farms small-grain farming was projected, and this called for large units. Moreover, the necessity of achieving large production in a short time, with but few specialists available, directed emphasis toward huge "grain factories," as the Soviet press calls them. The actual average size of the farms in the Grain Trust was 140 thousand acres in 1929; some were much larger, as for example the "Giant" farm in North Caucasus, so well known to American readers through the frequent writings of visitors.

Early in 1929 it was decided to put 25 to 30 million acres into state farms within five years: 17 to 18 million in regions east of Ural, 8 to 9 million in Lower and Middle Volga and North Caucasus, and 4 to 5 million in other parts of European Russia. In 1929-30 some 17 million acres were already in 121 such farms, with 2 million acres under crops. It was planned that in 1930-31 there should be 10 to 11 million acres in crops on farms of the Grain Trust. It is stated that in 1931 there were 207 state grain farms in the Grain Trust, with a crop acreage of 12 to 13 million acres, 16,000 tractors, and 5,200 combines.<sup>1</sup> An official

list of state grain farms in 1931 shows that it is projected to increase the total acreage of the existing state grain farms to 41 to 42 million acres, of which 21 to 22 million would be east of Ural, 16 to 17 million in southeastern and eastern European Russia, and 1 million in the west.

The economic soundness of the whole project of the state Grain Trust is at least open to question. It may be granted that extensive small-grain farming on large farms supplied with modern machinery may be profitable if the management is efficient and if yields are not too low. The experience with state farms even up to 1928, however, indicated rather inefficient management; and since the later state grain farms were formed on a scale unprecedented as to size and organization, it is hardly to be supposed that management and organization could be efficient at least in the period of organization. The organizers thus far have stressed quantitative achievements, not costs of operation;<sup>2</sup> the farms thus far seem to work as industry did in war times. Hence it is not surprising that in 1930, according to preliminary records, the cost of production per quintal of grain (in rubles) was 26 per cent higher than was planned, although the yield per acre in 1930 was exceptionally high. The principal reasons were said to be (a) tractors required 38 per cent more hours per acre than was planned; (b) 25 per cent more workers were used than was planned; and (c) standards of productivity for harvesting machinery were not fulfilled.<sup>3</sup> The cost of production per bushel of wheat, at the nominal rate of exchange, was 82 cents (5.85 rubles per quintal).<sup>4</sup> It is clear that the Soviet government itself is dissatisfied with the operations of the state grain farms. Recent official statements stress inefficient use of the equipment, the low level of ag-

<sup>1</sup> *Pravda*, November 29, 1931.

<sup>2</sup> Chamberlin (*The Soviet Planned Economic Order*, p. 129) observes: "The Communists are inclined to emphasize the incontestable achievement of increased production rather than to worry about problems of cost accounting."

<sup>3</sup> See P. Kulikov, "The Sovkhozs on the Sharp Increase," *On the Agrarian Front*, 1930, No. 9, pp. 98-99.

<sup>4</sup> The figure in American currency should not be taken too seriously, in view of the internal depreciation of Russian currency.



ricultural technique, and improper utilization of state property; it also appears that direction of operations and control of machinery are hereafter to be less centralized on the several farms—in effect a subdivision into smaller units.<sup>1</sup>

Quite aside from the problem of cost of production, the wisdom of heavy investment of capital by the state in grain farming is open to question. It has been estimated that \$15 an acre of investment is involved in the farms of the Grain Trust; some authorities say even more, and experience has shown that projected outlays are usually exceeded in fact. This means around a half a billion dollars on 30 million acres.

Yet not only are huge state grain farms projected and organized, but a plan for organizing animal industry on a large scale was endorsed, in order in this instance to overcome the difficulties created by the decline in livestock that accompanied the drive for collectivization. These projected trusts ("skotovod" or cattle breeding, "ov-

tsevod" or sheep breeding, and dairy trusts) are much more in their infancy than the Grain Trust. These farms require even heavier investment than the grain farms, and quite as skillful management. The investment in 1930-31 alone was projected as 765 million rubles.

All these investments in large state farms (and in collectives), unforeseen in the original Five-Year Plan, are unquestionably in a large measure responsible for the unbalanced financial situation in Soviet Russia, and for monetary inflation that dangerously affects the whole economic system. The experiments are too short in duration to provide a secure basis for evaluation of their results. But it may be said without hesitation that the Soviet government took upon itself an extremely heavy burden, and one which, if political expediency had permitted, the peasants might have borne at least while the state was engaged in the tremendous project of industrializing the country in accordance with the Five-Year Plan.

### III. THE DEVELOPMENT OF RUSSIAN AGRICULTURAL PRODUCTION

Quantitative analysis of the development of crop production in Russia is possible, with some approximation, for the last 50 years. Agricultural statistics have been gathered regularly since 1881, though not for Asiatic Russia for the first two decades, and not for all of European Russia until after 1892.

These five decades may be divided into shorter periods differing one from another in important economic characteristics. The closing decade of the nineteenth century witnessed a world-wide agricultural crisis and low prices, in Russia as well as elsewhere. From about 1900 to the war there was a period favorable for development and expansion, especially in Asiatic Russia. Decay of agricultural production be-

gan with the war, was greatly accelerated by the revolution, and resulted in complete disorganization and in the famine of 1921. Recovery began in 1922; fostered by the NEP, it was rapid in 1922-27, slower thereafter. In the winter of 1929-30 the new period opened, characterized by reorganization of agriculture on socialistic lines—collective farming and large state farms. Such is the general scheme; more detailed analysis, primarily statistical, is presented in the following pages.

#### THE LATE NINETEENTH CENTURY

Within a large fraction of that part of pre-war European Russia which now lies within the USSR, the total crop acreage grew rather slowly between 1881 and 1899, from 154.2 to 166.9 million acres, an increase of 12.7 million acres or only 8.2 per cent in 18 years. There was little change prior to 1893, and even with the more rapid growth thereafter the increase over 18 years was at a rate of less than one-half of 1 per cent per year.<sup>2</sup>

<sup>1</sup> *Pravda*, November 28 and 29, 1931.

<sup>2</sup> The figures here given apply to 42 provinces out of 50 in pre-war European Russia for which statistics are available, excluding Orenburg on the east and 3 Baltic and 3 Lithuanian provinces and Bessarabia on the west. In the 50 provinces, the area increased from 171.5 to 186.3 million acres, or 8.7 per cent. The increase in the full number of provinces in European Russia (64) cannot be measured for this period.

There was a decrease of crop area in the central regions (Moscow Industrial, Central Agricultural, and part of Middle Volga); these areas, especially the last two, were strongly affected by the agricultural crisis. Here, where the population was most dense, even as early as the 'eighties, further expansion had become impossible without modification of the three-field system; 80 per cent of the total area (excluding forests) was in crops; meadow and pasture land had been taken for crops; the resulting shortage of forage created a crisis in the livestock industry. Earlier, in the 'seventies, there had been a similar situation in the more westerly provinces, but by the 'eighties and 'nineties more diversified farming was gaining a foothold there. With modification of the three-field system, expansion of crop area was possible here, and the area increased 15–20 per cent in the two decades.

The largest increase of area, however, occurred in the southern and southeastern provinces, where expansion of extensive agriculture was still possible. Here the population was not very dense and colonization was still in process. The crop area expanded more than 30 per cent, and 50 per cent and more in some provinces. During the 'eighties the percentage of fallow arable land exceeded 33 per cent, and hence was larger than was normal for the three-field system. This slack was in course of being taken up. It was the growth of crop area here that accounted for most of the growth in European Russia. The total increase of 12.7 million acres went into the four principal small grains, wheat, rye, barley, and oats; that is, agriculture developed along extensive and not intensive lines.

#### 1900–1914

The following 15 years were favorable for Russian agriculture; world grain prices were rising, and permitted agriculture to expand even in the areas of chronic crisis of the three-field system. Except in the Moscow Industrial Region, the crop area elsewhere expanded considerably. The main facts are summarized in Table 1.

In about ten years the area under the

principal crops increased 16.2 per cent, averaging about 1.5 per cent per year; this applies fairly closely to the present territory of the USSR excluding Transcaucasia, Turkestan, and the Far East of Siberia.

TABLE 1.—AREAS UNDER THE PRINCIPAL CROPS IN RUSSIA, BY REGIONS, 1901–05 AND 1913\*

Region	1901–05 (million acres)	1913 (million acres)	Increase (%)	
			Total	Grain
<i>European territory</i> . . . .	187.6	208.7	11.2	....
1. Region north of the blacksoil zone (deficiency area) ..	42.4	44.0	3.8	2.4
2. Blacksoil zone (surplus area) . . . . .	132.6	145.2	9.5	11.8
a) The western part (wooded prairie of Ukraine) . . . . .	28.3	30.0	6.0	5.0
b) The central part (Central Agricultural Region and Middle Volga) . . . . .	55.9	59.4	6.3	4.3
c) The southern and southeastern steppe. . . . .	48.3	55.9	15.7	16.6
3. North Caucasus . . . . .	12.7	19.4	52.8	51.4
<i>Asiatic territory:</i>				
1. Siberia . . . . .	9.2	16.7	81.5	84.7
2. Central Asiatic steppe . . . . .	7.8	12.4	59.0	67.4
Total territory . . . . .	204.6	237.8	16.2	....

\* The figures apply to the territory of the Russian Empire which now lies within the USSR, but this territory does not include Transcaucasia, Turkestan, and the Far East of Siberia. The area under seeded hay is included as it was in 1901 and 1912, there being no data for other years. Data according to the official crop statistics of the Central Statistical Committee, here compiled from *Agriculture of Russia in the XX Century* (Moscow, 1923), edited by N. P. Oganovsky.

Within the 42 provinces of European Russia, the increase was only 8.2 per cent, the same as in the early period (which, however, was nearly twice as long). The crop area increased 6.3 per cent in the Central Agricultural Region, where in the earlier period it had declined. With free lands exhausted on the southern Ukrainian and Lower Volga steppes, growth of crop area here was only 15 to 16 per cent, as against 30 per cent in the earlier period. The general expansion in European Russia was facilitated by progress of diversification in the Central Agricultural Region, as had earlier been the case with more westerly regions; in all parts of the blacksoil zone

total crop areas increased more than the areas under the four principal small grains.

But in the steppe regions, growth of the total area exclusively represented expansion of the area in small grains, as had been true in the earlier period; the small-grain area grew faster (in percentage terms) than the total crop area. It was particularly in North Caucasus, Central Asia, and western Siberia that this sort of growth occurred; percentage increases of total crop area were 50, 60, and 80, respectively. In this period colonization was moving farther east, and millions of colonists crossed the Ural mountains and spread around the Trans-Siberian and Trans-Central Asian railroads, the construction of which had been completed in the 'nineties. On the whole, peasants continued to follow the line of least resistance, preferring to practice extensive forms of agriculture in new regions rather than to reorganize their agriculture in older regions on intensive lines.

It is true that diversification began to appear in other regions than the west. Yet the following tabulation, giving the percentage of grain areas to the total crop areas of various regions, shows that the process<sup>1</sup> had not gone far:

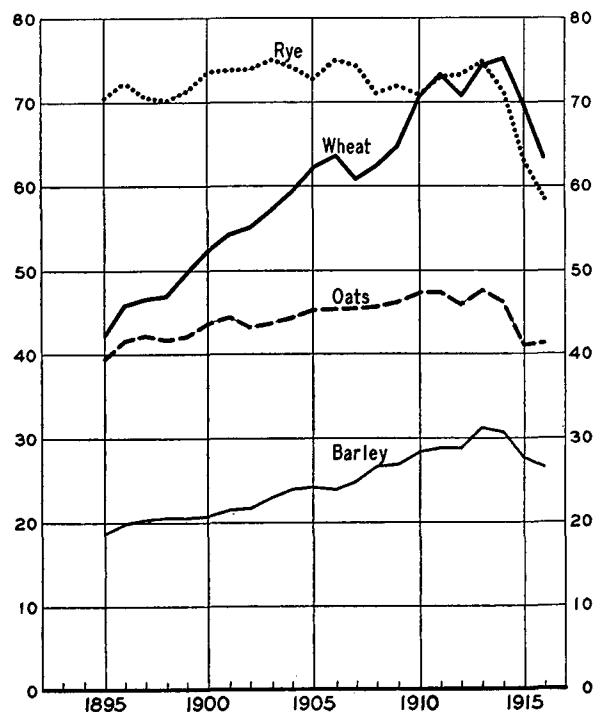
Region	1901-05	1913
North of the blacksoil zone.	86.4	84.4
Blacksoil zone .....	92.5	91.4
North Caucasus .....	95.0	93.1
Siberia .....	94.5	95.3
Central Asia .....	96.6	96.2
Total territory .....	91.6	90.8

Except in the western regions, grains occupied 90 per cent or more of the total crop area; and the grains meant small grains, for corn, even in the southern steppe (Bessarabia excluded) and North Caucasus where most of it was grown, occupied only 2 to 5 per cent of the crop area. Extensive and monotonous types of farming were dominant just before the war, particularly in the east and south-east.

<sup>1</sup> Data according to official statistics, from N. P. Oganovsky, *Essays on the Economic Geography of the USSR* (Moscow, 1924), pp. 165-66. The total crop area includes areas under grain (wheat, rye, oats, barley, buckwheat, millet, and corn); roots (potatoes and sugar beets); oil seeds and fibers (flax, hemp, sunflower); legumes (peas, beans, lentils); and seeded hay.

There was, however, a movement toward diversification in European territory. Taking smaller areas, one finds that in the western and central regions the areas devoted to small grains occupied from 2 to 4 per cent less of the total crop area in 1913 than in 1901-05. The areas in roots, oil seeds and fibers, and seeded hay increased more than the areas in grain. Seeded hay expanded most north of the blacksoil zone, where a more intensive livestock industry began to develop. Sugar beets were important in the western blacksoil zone. Nevertheless, the small grains occupied at least 75 to 85 per cent of the crop area everywhere—a much larger fraction than in

CHART 1.—ACREAGE OF THE PRINCIPAL CEREALS IN THE RUSSIAN EMPIRE (72 PROVINCES), 1895-1916\*  
(Million acres)

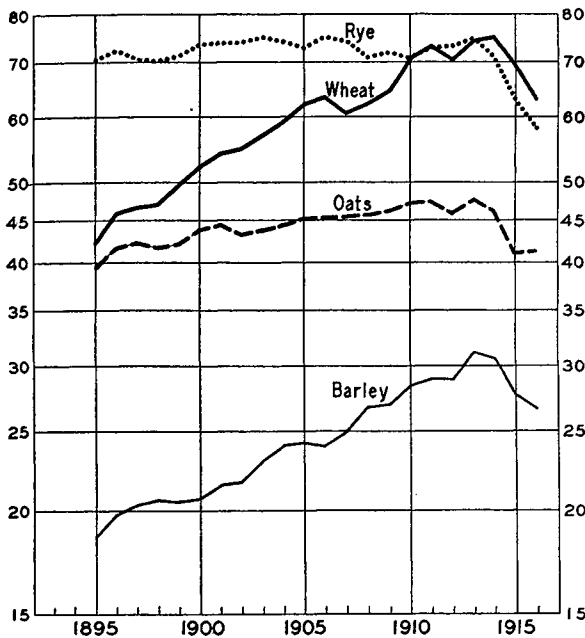


\* Data from Appendix Table II. Figures for 1914-16 exclude territory occupied by the enemy. The 72 provinces represent the Russian Empire excluding Turkestan, Transcaucasia, and eastern Siberia.

western European countries or in the United States. Agriculture remained extensive, even in densely populated regions. The process of reorganization to an intensive basis lagged, and in the densely populated central region there was a crisis of

the three-field system<sup>1</sup> even up to the beginning of the war. Here was the center of peasant land hunger, of dissatisfaction, and of the peasant revolutionary movement.

CHART 2.—ACREAGE OF THE PRINCIPAL CEREALS IN THE RUSSIAN EMPIRE (72 PROVINCES), 1895–1916\*  
(Million acres; logarithmic vertical scale)



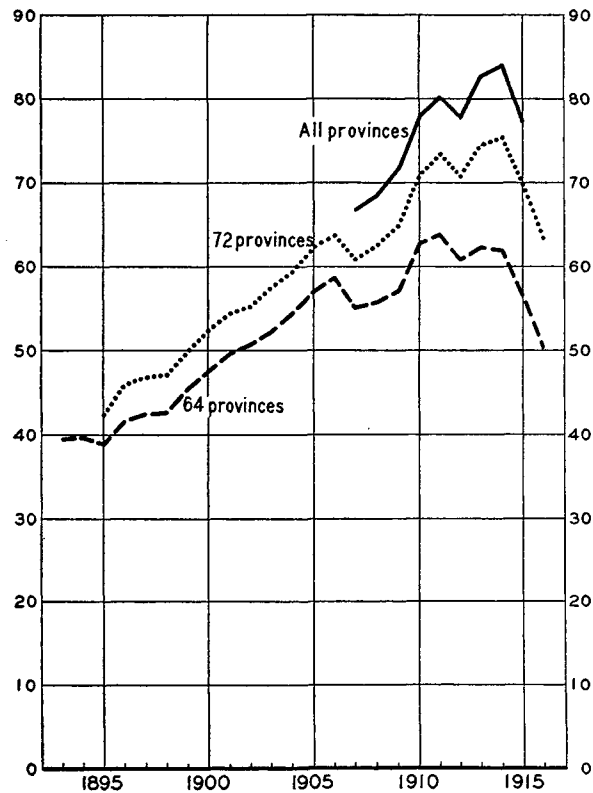
\* See footnote to Chart 1.

Yet in Russia as a whole agriculture was progressing in the 15 years preceding the war—in the west toward diversification, in the east and southeast toward production for market. Agriculture was becoming commercialized; wheat and barley, the marketable and exportable grains, were expanding in area more rapidly than rye and oats, the grains used chiefly for home consumption. The general course of this development (in 72 provinces of the Russian Empire, a territory that excludes Transcaucasia, Turkestan, and eastern Siberia) is apparent from Charts 1 and 2.

Within 42 provinces of European Russia, the growth of the total area between 1881 and 1899 was less than the growth of the areas of wheat and barley. Other grains even declined here during this period, and in western areas some of the increase in wheat was at the expense of

rye. The general process went further in 1901–14. Between 1901–05 and 1913, when the total area in grain in the Russian Empire increased 15.1 per cent, the wheat area increased 31.8 per cent and the barley area 39.1 per cent, whereas the rye and oats areas increased only 1.7 and 7.9 per cent respectively. The areas in buckwheat and millet actually declined (8.4 and 1.7 per cent, respectively). The areas in corn and other grains increased substantially in percentage terms (33.0 and 10.0 per cent), but even in 1913 these crops together occu-

CHART 3.—WHEAT ACREAGE IN THE RUSSIAN EMPIRE (64, 72, AND ALL PROVINCES), 1893–1916\*  
(Million acres)



\* Data from Appendix Table II. Figures for 1914–16 exclude territory occupied by the enemy. The series covering 64 provinces applies to the European provinces of the Russian Empire; that covering 72 provinces applies to the whole Russian Empire except Turkestan, Transcaucasia, and eastern Siberia.

pied only 2.4 per cent of the total grain area. By 1913, the area in wheat had come to exceed the area in rye. The wheat acreage expanded most notably in the east, Siberia and Central Asia, and also in the

<sup>1</sup> See below, p. 311.

Middle Volga and the Central Agricultural Region. This feature of the growth of wheat acreage is brought out by Chart 3. Barley acreage grew most strikingly in the southern steppe of Ukraine and the steppe of North Caucasus. In these regions close to the export outlets on the Black Sea, the barley acreage grew faster than the wheat acreage, causing the fraction of the total crop acreage in wheat to decline. The commercial and export character of agriculture in these regions before the war is attested by the fact that in 1901-5 wheat and barley together occupied nearly three-fourths of their total crop area, and in 1913 slightly more.

#### THE DECLINE OF AGRICULTURAL PRODUCTION

The period of decline in Russian agriculture, 1915-22, falls into two shorter periods, the war (1915-17) and the revolution (1918-22). As in other countries, the war had its effects, in Russia by diverting a large fraction of the population (and of horses) from productive work in agriculture to the army, and by stopping the export of agricultural products.

Mobilization involved a huge number of men: 6.5 million by the end of 1914, 11.5 million in 1915, 14.3 million in 1916, and 15.1 million at the end of the war. The men taken into the army by June 1, 1917, amounted to 22.6 per cent of the male population of European Russia, and 47.4 per cent of the male population of working age—probably more in the country districts. Some 9 to 10 per cent of all horses were requisitioned, and a larger fraction of the working horses. Necessarily these reductions affected agriculture. Even so, with so much of the country overpopulated, the decline of agricultural production during the war was small. The sparsely populated exporting regions were most affected (south and southeast), and also regions where large estates were common.

In 1914-17 the total crop area<sup>1</sup> of the USSR, excluding Transcaucasia, Turkestan, and the Far East, declined from 233.3 million acres in 1913 to 213.8 million in 1916 and 213.5 million in 1917, or about 8.5 per cent.<sup>2</sup> Regionally, declines were as follows: North Caucasus, 23.8 per cent in

1913-16; steppe of Lower Volga, 18.1 per cent in 1913-17; southern steppe of Ukraine and Don, 12.9 per cent in 1913-17; and northern and northwestern provinces of Ukraine, 14.2 per cent in 1913-17. These were the export regions and also (northern Ukraine excepted) regions deficient in labor. There was also a large decline (22.8 per cent in 1913-16) in the Moscow Industrial Region, where laborers flocked to work in the war industries. Elsewhere there was less decline, and in Siberia and Central Asia an increase.

The total area in grain declined about as much as the total crop area, 8.9 per cent in 1913-16, but with very different effects upon the several grains. The spring-wheat area declined most, while the winter-wheat area increased.<sup>3</sup> Spring wheat declined strikingly in the southern steppe of Ukraine and in North Caucasus, the exporting areas; and this decline was only partially compensated by increases in Asiatic Russia. The Russian area in all wheat declined about 13 per cent (1913-17); spring wheat alone declined about 20 per cent, but by 30 to 35 per cent in European Russia, with an increase of 20 per cent in Asiatic Russia. Rye area declined about 10 per cent, more in Asiatic than in European Russia.

All told, the Russian grain area declined by a smaller percentage than had been the percentage of grain exports to total grain production in pre-war years. Since exports ceased, the decline in grain acreage could not in itself have created a deficiency of grain on interior markets during the war. The maintenance of the grain area reflected the energy of the peasantry, for large estates were from the outset badly hit; the area in estates was curtailed while the area in peasant land increased.

It was between 1918 and 1922, the period of revolution and military communism, that the Russian crop area showed its great

<sup>1</sup> Excluding seeded hay, sugar beets, and some other crops of minor importance.

<sup>2</sup> N. P. Oganovsky, "Decay, Recovery, and Reconstruction of Agriculture during the 10 Years 1917-27," *Economic Review*, October 1927, pp. 55-72, fixes the decline as follows: 7.6 per cent, 1913 to 1916; 8.9 per cent, 1914 to 1916.

<sup>3</sup> This shift, however, may be partly a purely statistical phenomenon. It shows up in the census data for 1916 and 1917 rather suddenly; the estimates in earlier years may not have taken full account of it.

decline. On account of the disintegration of statistical organizations, it is difficult to measure the extent of decline. The figures below, showing total crop areas in different regions in 1921 and 1922 expressed as relatives with areas in 1916 taken as 100, seem to represent the best available approximation:<sup>1</sup>

Region	1921	1922
Total USSR <sup>a</sup> .....	81.1	68.7
Grain deficiency area, European Russia .....	85.5	90.7
Grain surplus area, European Russia .....	74.3	60.6
North Caucasus .....	61.7	51.3
Ukrainian SSR .....	96.4	81.6
White Russian SSR .....	78.6	93.8
Siberia (eastern and western) .....	98.2	73.9
Central Asia .....	72.9	42.3

<sup>a</sup> Excluding Transcaucasia, Turkestan, and Burlat-Mongol territory of eastern Siberia.

By 1921, the total crop area was four-fifths of that of 1916, and by 1922 only two-thirds.

The decline from 1921 to 1922 may be regarded as a consequence of the famine of 1921, which caused a shortage both of working livestock and of seed in the affected areas, notably the dry southeastern part of European Russia and Asiatic Russia. This extended westward into Ukraine; in the northern part there was increase of area between 1921 and 1922, but in the southern part a decline much larger than the increase in the north. The famine area increased in extent from the west to the east and north.

The general decline in crop area between 1916 and 1921, however, was not the result of the famine, but of civil war and of the Soviet policy of requisitioning surpluses from peasants; and of these it was the policy rather than the civil war that was mainly responsible. This is clear because the areas where civil war was most prevalent showed smaller declines in area than regions where civil war terminated early and where Soviet control was earliest consolidated. Ukraine was an area of protracted civil war (up to 1921); but even in 1921 the crop area there was 96.4 per cent of the 1916 area. In Siberia, where civil

war was also protracted, the area in 1921 was 98.2 per cent of that of 1916. By contrast, in such areas as the southeastern grain surplus area of European Russia, or White Russia, or the grain deficiency area—in all of which Soviet control was early attained—the crop areas of 1921 fell much farther below those of 1916.

Now if we compare areas in 1922 with those of 1913, the full and catastrophic extent of the decline in crop area becomes apparent. The area of 1922 was around 63 per cent of that of 1913. Thus around two-fifths of the 1913 area was left idle in 1922. Four years of war were responsible for about a fourth of the decline; the remaining three-fourths of the decline is attributable to five years of revolution, communist policy, and (at the end) famine.

The decay of agriculture during the first years of Soviet power was evidenced not only in decline of the aggregate crop area, but also in the recession of production for market as compared with production for farm consumption. Thus the cash grain crops, spring wheat and barley, occupied 23.7 and 10.6 per cent, respectively, of the total crop area in 1909-13, but only 10.4 and 5.9 per cent in 1922; meanwhile the percentage in rye increased from 26.7 to 33.6, and in millet from 3.7 to 10.9. In part this was due to the general decline of crop area in the southeast, which was partly the result of the famine. But the process of reducing the areas in cash grains began before 1921—in the earlier years because the export market was closed, in the later ones because the domestic market was disorganized through the policy of war communism. In short, it is clear that peasants fell back upon the production of crops for home use and tended to abandon production for the market; this was their reaction to the government policy of confiscating surpluses. The general decline of crop area, and particularly in the area of cash grain crops, was important in bringing about the introduction of the New Economic Policy in 1921.

#### AGRICULTURAL RECOVERY, 1922-29

Statistical measurement of the recovery of agriculture from the depths is complicated by the facts that post-war official

<sup>1</sup> Compiled from *Population, Crops, Livestock, Poultry, and Agricultural Machinery in 1923, 1924* (Moscow, 1926).

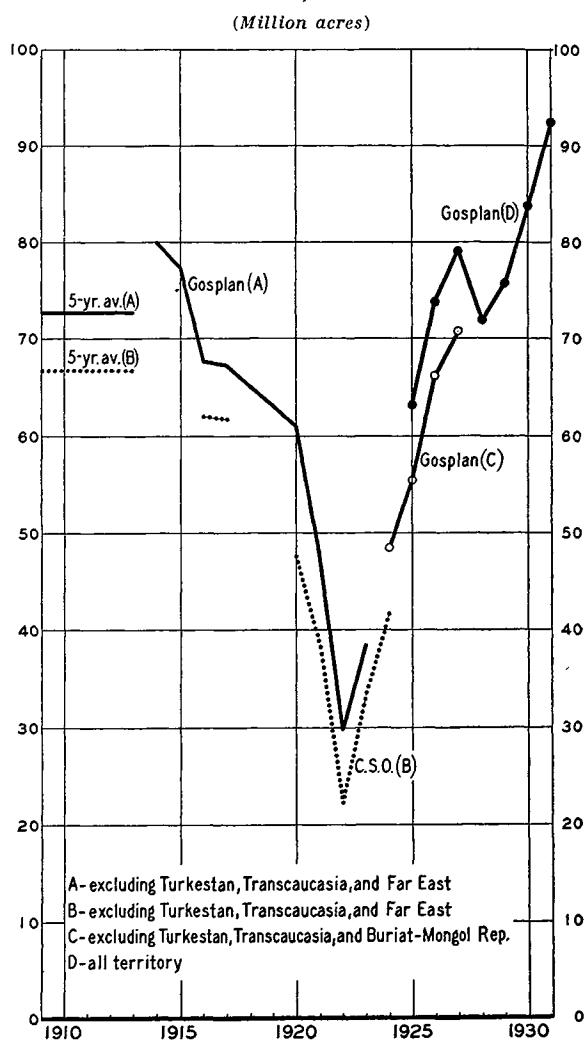
statistics were published by at least two organizations, the two sets of data do not agree, and neither set carries through the whole series of post-war years. Opinions differ as to what statistics are the better to use in attempting comparisons of pre-war and post-war areas and production. The main facts are that post-war statistics (extending only to 1925) published by the Central Statistical Office were designed to be comparable with pre-war official statistics; but that statistics published by the Gosplan (which involve upward revisions of the data of the Central Statistical Office, and are the only available data after 1925) were from the outset regarded as not comparable with official pre-war statistics. It is quite impossible to show what have been the year-to-year changes in area or production of the grains for the whole period 1922 to date, for there is no homogeneous series. These changes (though not for identical territories) can be shown from 1925 on the basis of the Gosplan's data, or from 1922 to 1924 on the basis of the data published by the Central Statistical Office before revision was made by the Expert Council. Contrasts between the two sets of data on wheat acreage are brought out by Chart 4.

It is important to emphasize that official (Russian Empire) pre-war statistics cannot be compared as they stand with the Gosplan's statistics for 1925 to date. The Gosplan itself raises the pre-war figures for area about 9 per cent, for yield per acre about 9 per cent, and for production about 19 per cent. This general method of comparing pre-war and post-war statistics is current Russian practice, but the fact is apparently not well known outside of Russia. There are variations in official Soviet practice, however; and there seem to be better reasons for correcting the pre-war statistics of acreage than those of yields per acre. Hence some degree of uncertainty inevitably surrounds any attempt to ascertain when agricultural output in Soviet Russia recovered to the pre-war level.

Recovery was clearly very rapid between 1922 and 1926. About all of the crop area that had been lost to cultivation in 1916-22 was regained in these four years. Thus unrevised estimates by the Central Statistical Office show that (excluding Turkestan

and Transcaucasia) the total crop area of Soviet Russia in 1925 was 95 per cent of what it had been in 1916; and revised estimates show an increase of 5.7 per cent

CHART 4.—WHEAT ACREAGES IN PARTS AND ALL OF THE USSR, ACCORDING TO DIFFERENT OFFICIAL STATISTICS, 1909-31\*



\* Data from Appendix Table II. The figures for 1930 and 1931 are those reported to the International Institute of Agriculture; the former is presumably for area harvested, the latter for area sown.

between 1925 and 1926. From year to year the growth was about as follows: 1922 to 1923, 18 per cent; 1923 to 1924, 9.0 per cent; 1924 to 1925, 7.6 per cent; 1925 to 1926, 5.7 per cent. The rate of growth thus tended to diminish as the pre-revolutionary level was approached. This growth accompanied

the New Economic Policy, which left a good deal of initiative to individual peasants. Even though there would doubtless have been some recovery from the very low area of 1922 under almost any conditions, a good part of the growth in area between 1922 and 1926 must be ascribed to this policy.

After 1926, growth became slower. The total crop area was only 2.4 per cent larger in 1927 than in 1926, and there was almost no increase between 1927 and 1928, with an actual decline of 1 to 2 per cent in harvested area on account of winterkilling in 1928. It was sought for a time to explain this slow growth by unfavorable climatic conditions; but later, even official documents gave weight to socio-political factors, the outstanding being the change in policy toward the well-to-do peasants.<sup>1</sup> Beginning with 1926-27, discriminatory taxation began; governmental restrictions were put upon credits, sales of agricultural machinery, and rent of land to the kulaks; grain prices were drastically lowered; in 1927-28 there was resort to the earlier confiscatory methods of grain collection. Well-to-do peasants who produced largely for market became less interested in expanding their production.

With this slowing down of production, all economic development was endangered and this led the government to resort to new and energetic measures, as described above.<sup>2</sup> Yet these measures resulted in no large expansion of crop areas: apparently 4 per cent from 1928 to 1929; 6 per cent from 1929 to 1930; and 7.5 per cent from 1930 to 1931. These are no larger than occurred in 1925 and 1926, when the peasants were left to their own devices. Moreover, with changes in the methods of estimating crop areas that had to follow the wholesale collectivization of agriculture, and with the inevitable desire of the authorities to prove that this has been successful, it seems probable that these percentages of increase may go beyond the facts. One must remember that the sowing campaigns of 1930 and

1931 occurred in the midst of severe class struggle, of redistribution of land, and of decline in livestock numbers; and also that sowings were very late in the spring of 1931. Surely the conditions were far from propitious for increase of crop area in these years.

Comparisons of pre-war and post-war areas, as given officially, are summarized in Table 2 (p. 306). According to these figures, the total area in 1927 was almost at the pre-war (1913) level. But the area under grain had barely attained the pre-war level even by 1930; and in 1929 the areas both of wheat and rye were only about 90 per cent of the pre-war level, having decreased since 1927. The struggle for grain was the principal field of struggle between the peasants and the government.

Now in the first years of the New Economic Policy, the grain area had increased rapidly. But it increased only 1.7 per cent in 1927, and declined in 1928—a decisive matter in inducing the change of policy. The new policy against the well-to-do peasants, however, according to official statistics, resulted in increases of only 3 to 4 per cent in 1929 and 1930, and (according to preliminary data) less than 1 per cent in 1931. This slow increase occurred with the grain area still below the pre-war level, at least up to 1931. The grain area, in short, after 1927 lagged behind the growth of areas in other crops.

For this the price policy of the government was mainly responsible—a policy of keeping agricultural prices low in relation to industrial prices, and also of changing grain prices in such a way as to make them less advantageous than the prices of other agricultural products. The following tabulation<sup>3</sup> showing prices paid by collecting agencies in 1925-26 to 1929-30 as percentages of 1911-14 prices, is pertinent:

July-June	Grains	Oil seeds	All industrial crops	Animal products (food)
1925-26 ...	151.8	98.8	137.5	155.2
1926-27 ...	118.7	101.2	133.0	172.7
1927-28 ...	129.1	118.0	138.1	174.1
1928-29 ...	154.4	128.8	144.4	196.6
1929-30 ...	154.4	128.8	147.2	196.6

<sup>1</sup> See, for example, N. Vishnevsky, "Agriculture of the USSR in 1928-29," *On the Agrarian Front*, 1928, No. 10.

<sup>2</sup> See pp. 292-98.

<sup>3</sup> Data from *Control Figures for 1929-30*, p. 580.

At first grain prices were on a level advantageous as compared with the prices of



oil seeds and industrial crops, in fact enough so that areas in these crops declined in 1926. But in 1926-27 grain prices were drastically lowered, while the prices of oil seeds and animal products were

regions than for the whole territory, and with changes in the administrative areas to which the available statistics apply, it is difficult or impossible to secure a comprehensive and accurate picture of the re-

TABLE 2.—CROP AREAS IN THE USSR IN 1913, 1927, 1929, AND 1930\*

Crops	Million acres in 1913		Million acres in 1927	Million acres in 1929	Million acres in 1930	Percentage of 1913 corrected		
	Uncorrected	Corrected				1927	1929	1930
All crops .....	.... <sup>a</sup>	288.4 <sup>b</sup>	284.2	297.3	315.3	98.6	103.1	109.4
Grain .....	234.5	253.8 <sup>b</sup>	239.9	242.7	252.5	94.6	95.6	99.5
Wheat .....	79.1	84.5	79.1	75.6	.... <sup>a</sup>	93.4	89.5	.... <sup>a</sup>
Rye .....	64.2	70.2	69.9	64.5	.... <sup>a</sup>	99.6	91.9	.... <sup>a</sup>
Industrial crops .....	.... <sup>a</sup>	13.6	17.8	21.7	24.5	131.4	160.0	180.0
Oil seeds <sup>c</sup> .....	.... <sup>a</sup>	10.1	14.1	17.0	.... <sup>a</sup>	139.1	170.0	.... <sup>a</sup>
Sugar beets .....	.... <sup>a</sup>	1.5	1.7	2.0	.... <sup>a</sup>	106.5	126.0	.... <sup>a</sup>
Cotton .....	.... <sup>a</sup>	1.7	2.0	2.5	.... <sup>a</sup>	107.1	149.0	.... <sup>a</sup>
Other crops .....	.... <sup>a</sup>	21.0	26.4	33.1	38.5	124.7	158.0	184.0
Potatoes .....	.... <sup>a</sup>	9.6	13.6	14.6	.... <sup>a</sup>	140.5	151.0	.... <sup>a</sup>
Tame hay .....	.... <sup>a</sup>	4.7	6.2	10.9	.... <sup>a</sup>	131.0	231.0	.... <sup>a</sup>

\* Uncorrected data for 1913 are official pre-war statistics adjusted to new frontiers. Corrected data for 1913 from *Control Figures for the USSR for 1928-29*; data for 1927 and 1929 from *Control Figures for the USSR for 1929-30*, for 1930 from *Agricultural Statistics of the USSR*. Data for 1913 represent official pre-war statistics corrected (raised) by the following percentages: total grain acreage 8 per cent; wheat acreage 7 per cent; rye acreage 9 per cent.

<sup>a</sup> Data not given.

<sup>b</sup> Lower figures are used in *Control Figures for 1929-30*, but identical ones in *Agricultural Statistics*.

<sup>c</sup> Including flax.

raised. It was only when the grain crop area declined and difficulties were encountered in collections that grain prices were raised, and then not to a position relatively as advantageous as in 1925-26.

The measures of recovery given in Table 2 may somewhat overstate its degree; there were incentives to do this, and there are other estimates (including official ones) that do not show as great recovery.<sup>1</sup> The several estimates, however, do not differ much one from the other. It is important to observe that if one accepts the figures cited, the per capita grain acreage in 1927 to 1929 was only about 80 per cent of the 1913 level, for there had been an increase in population of about 12 per cent over the interval.

With less reliable statistics available for

covery of crop acreage by regions. The Gosplan has, however, published figures showing total grain areas in 1928 as percentages of areas in 1913; these are as follows:<sup>2</sup>

Region	Percentage of 1913
Deficiency area north of the black-soil zone .....	92.4
White Russia .....	103.2
Central Blacksoil Region .....	94.6
Ukraine .....	83.6
Middle Volga .....	92.9
Lower Volga .....	72.2
North Caucasus .....	63.3
Kazakstan (Central Asia) .....	82.8
Siberia .....	112.7
Total USSR .....	87.9

This picture is somewhat more unfavorable than one given by Professor Oganovsky in less detail, presumably because winter-killing was heavy in 1928 and reduced harvested grain areas in 1928 as compared with 1927, the year which Oganovsky used in his comparison.<sup>3</sup> But in general the estimates are in accord in showing the greatest decline of area in the south and southeast,

<sup>1</sup> See, for example, H. Dubenetsky, "Grain Production in the USSR in 1925 and 1926," *Statistical Review*, 1927, No. 1, p. 25; N. Vishnevsky, "Agriculture in the USSR in 1928," *On the Agrarian Front*, 1928, No. 10; and *Bulletin of the Economic Cabinet of Professor S. N. Prokopovich* (Prague), May 1929, No. 69.

<sup>2</sup> Data from *Control Figures for 1928-29*, p. 221.

<sup>3</sup> See *Yearbook of the Grain Trade, 1927-28* (Moscow, 1929).

with the largest increase or smallest decrease in the northern reaches, and particularly in Siberia.

#### CHANGES IN THE DISTRIBUTION OF LAND IN CROPS

The recovery of Russian agriculture witnessed certain significant changes in the distribution of the crop area amongst different crops, both in the period of recovery and as compared with pre-war years. As we have seen, the period of decay witnessed the greatest relative shrinkage in the areas of commercial and export crops, while crops used mostly for home consumption (rye, buckwheat, and millet) declined less or even increased (millet).

In 1923, the distribution was about as it was in the period of deepest decay, so that resumption of grain exports in 1923-24 meant exports chiefly of rye, not of wheat and barley as before the war. In this year such crops as oil seeds and hemp, widely used in peasant households, covered even a larger area than before the war, while such commercial crops as sugar beets, cotton, and in a lesser degree flax, covered smaller areas.

As the market developed under the NEP and as city life recovered, the distribution of the crop area began to approach the pre-war position. Data for 1916, 1925, 1927, and 1929 are given in Table 3. From their depths in 1922 and 1923, the percentages of commercial crop areas to total crop area began to increase rapidly, those of crops for home consumption to decline. The ratio of wheat area to total crop area rose from 17 to 18 per cent in 1922 and 1923 to 24.1 per cent in 1925 and 27.8 per cent in 1927; meanwhile that of rye fell. But even in 1927 wheat had not regained its pre-war position, even the position of 1916, which had been lower than in some immediately preceding years. The relative importance of barley continued to decline even in the period of recovery. Price relationships were more favorable for wheat than for barley, though pre-war wheat prices had been more advantageous than post-war.

There was no tendency for grains as a group to decline in relative importance between 1923 and 1927, though they did not

occupy as large a fraction of the total crop area as in 1916. But by 1929 a change was apparent, following the reduction of grain prices in 1926-27 and the maintenance of prices of other crops. The grains as a group occupied a smaller fraction of the total crop area in 1929 than they had in 1927

TABLE 3.—PERCENTAGE DISTRIBUTION OF THE CROP  
AREA OF THE USSR IN THE DIFFERENT CROPS,  
IN SELECTED YEARS, 1916-29\*

(Percentage of total crop area)

Crops	1916	1925	1927	1929
Winter wheat .....	7.9	24.1	9.6	6.0
Spring wheat .....	21.2			
Rye .....	24.2	26.3	24.6	22.0
Barley .....	10.3	6.1	6.1	6.8
Oats .....	17.3	13.0	15.8	15.7
Corn .....	1.5	3.2	2.4	2.9
Buckwheat .....	2.1	2.8	2.4	2.3
Millet .....	3.4	6.1	3.4	4.6
Other grains .....	1.4	2.0	1.9	2.0
Total grains .....	89.3	83.6	84.4	81.5
Industrial crops .....	4.7	6.9	6.2	7.4
Flax .....	1.5	1.6	1.4	1.7
Sunflower .....	1.3	3.0	2.5	3.0
Sugar beet .....	0.5	0.5	0.6	0.7
Other .....	1.4	1.8	1.7	2.0
Other crops .....	6.0	9.7	9.4	11.1
Potatoes .....	2.6	5.0	4.8	4.7
Hay .....	2.3	1.6	2.4	4.0
Other .....	1.1	3.1	2.2	2.4

\* Data for 1916, 1927, and 1929 from *Agricultural Statistics of the USSR* (Moscow, 1930), published by the Lenin Academy of Agricultural Sciences. Data for 1925 compiled from *Control Figures for 1929-30*. Distribution relates to the crop area harvested.

or 1925, although grain prices had to be raised again in 1928-29. It seems that in later years industrial and other crops have continued to expand in area more rapidly than the grain crops, so that in 1931, according to preliminary statistics, the grain crops occupied only 75 per cent of the total crop area.

This form of growth is one objective of the Five-Year Plan. It was planned that from 1927-28 to 1932-33 the grain area should increase 15 per cent, but the area in other crops over 50 per cent. Such a development would be progressive for Russian agriculture, in which the characteristically extensive system of farming always involved too high a percentage of

small grains. If such development is in fact witnessed, it must limit further growth of the grain area, and particularly of the area under bread grain. More intensive farming means larger fractions both of non-grain and of forage grain crops in the total crop area, and smaller fractions of bread grain.

The large fraction of the total grain area devoted to the bread grains (wheat and rye) in Russia warrants emphasis. The figures were 61.2 per cent in 1913, 59.7 in 1916, 60.4 in 1925, 62.0 in 1927, and 57.1 in 1929. Still higher figures (around 70 per cent) appear if we include buckwheat and millet, which, like rye, are food grains rather than feed grains in Russia. The forage grains (oats, barley, and corn) occupy less than a third of the total grain area. By way of contrast, these crops in the United States occupy an area nearly  $2\frac{1}{2}$  times as large as the area in wheat and rye. The figures reflect the very low level of animal husbandry in Russia. The statistics, however, show that expansion of forage-grain areas in Russia tends to be more rapid than expansion of bread-grain areas—26.7 of the total grain area in 1925, but 31.7 per cent of the larger total grain area of 1929. It is reasonable to expect this tendency to continue,<sup>1</sup> for unless it does so the livestock industry cannot recover and expand; and recovery and expansion of animal husbandry seem more necessary and inevitable than any other development in Russian agriculture. Whatever may be the growth of total crop acreage in coming years, it may reasonably be supposed that the growth of the bread-grain area will be substantially smaller.

This does not mean, however, that the wheat acreage may not grow more rapidly than the bread-grain acreage, perhaps even as rapidly as or more rapidly than the total

crop acreage. In 1927–29 the relationship between wheat and rye was close to the pre-war ratio, the wheat acreage slightly exceeding that of rye. It is Soviet policy (and plan) to encourage the shift from rye to wheat. Since the total crop area is increasing mostly in the dry south and southeast, the natural regions for wheat production, the importance of wheat is bound to increase more than that of rye in the total crop area of the USSR. In some other regions increased diversification of farming, resulting in declining bread-grain or total grain areas, must impinge chiefly upon rye; and a shift from rye to winter wheat in some other areas would act in the same general direction. These matters, and also the shift from spring to winter wheat, are discussed more fully in a later section. Here it seems desirable only to say that the outlook for wheat exports depends not so much upon the expansion of wheat acreage as upon the expansion of the areas of wheat and rye together, and that this in turn rests mainly upon the use of new land which is difficult to bring into production and is treacherous as regards stability of yield. The diversification of agriculture in the older regions would tend to curtail bread-grain acreage, not to expand it.

#### PROGRESS OF DIVERSIFICATION

It is important to consider briefly the evidence that diversification has tended to progress in Russia, and in what regions. Statistics showing the percentages of grain areas to total crop areas in 1916 and in 1928 provide the best available material; data are given in the tabulation on p. 309.<sup>2</sup> The figures are not altogether satisfactory because the areas are not identical in the two years, and because in some regions the grain areas were reduced by the occurrence of severe winterkilling.

It is clear that in 1928, as well as before the revolution, the most diversified farming was in the regions north of the blacksoil zone and in the western part of the blacksoil zone—the wooded steppe of Ukraine and the Central Agricultural Region of Russia. Farther to the east, both in 1928 and 1916, there was less diversification. The rate of progress of diversification was on the whole greatest in the west, in Ukraine

<sup>1</sup> It appears to have been interrupted in 1931, the forage grains being only 26.6 per cent of the total grain area; but this probably reflects an abnormal situation involving strenuous efforts to increase the wheat acreage so as to obtain a surplus for export, and also the lack of success of the sowing campaign of 1930–31, which involved emphasis on wheat sowings rather than on sowings of forage grains.

<sup>2</sup> Data for 1916 compiled from *Resultats préliminaires du recensement agricole de toute la Russie pour 1916* (Petrograd, 1916), Issues I–III; data for 1928 from *Statistical Handbook of the USSR for 1928* (Moscow, 1929).

and the Central Agricultural Region. Here there had been significant diversification only on estates before the war, but by 1928 the peasant farms were fairly well diversified. This must be regarded as a considerable achievement; sugar beet farming has been involved.

Region	Peasant land 1916	Estates 1916	All land 1916	All land 1928
North of the blacksoil zone .....	.... <sup>a</sup>	.... <sup>a</sup>	.... <sup>a</sup>	71.6
Central Industrial Region .....	75.6	62.0	75.1	71.9
White Russia .....	78.3	71.2	77.8	74.0
Wooded steppe of Ukraine .....				
Right bank of Dnieper .....	90.7	74.9	86.3 <sup>b</sup>	78.5
Left bank of Dnieper .....	88.2	74.0	86.2 <sup>b</sup>	
Central Agricultural ... ..	88.9	76.8	87.4	78.5
Middle Volga .....	94.5	89.8	94.2	90.0
Southern steppe of Ukraine .....	94.3	93.8	94.1	81.0 <sup>c</sup>
North Caucasus .....	86.2	85.2	86.0	78.5 <sup>c</sup>
Lower Volga .....	96.2	89.7	95.8	87.0
Steppe of Central Asia ..	96.6	99.0	96.6	90.8
Ural .....	.... <sup>a</sup>	.... <sup>a</sup>	.... <sup>a</sup>	93.8
Siberia .....	95.4	.... <sup>a</sup>	95.4	92.3
USSR .....	.... <sup>a</sup>	.... <sup>a</sup>	.... <sup>a</sup>	82.4

<sup>a</sup> Adequately comparable data not available.

<sup>b</sup> In 1927, 87.4 per cent. <sup>c</sup> In 1927, 82.4 per cent.

Diversification also progressed in the southern steppe of Ukraine and in North Caucasus, even if we consider the figures for 1927, which are better suited for comparison with 1916 than those of 1928. In both of these areas considerably smaller fractions of the total area were in grain after the war and revolution than before; and when one considers that the area in corn (included as a grain but a crop promoting diversification because it is cultivated) increased greatly, the progress is even more striking.<sup>1</sup> It is difficult to say, however, whether or not this change is purely temporary or has some aspects of permanence, for the areas may have been affected chiefly by the low prices paid for grain in 1927 and 1928.

Elsewhere, in the east, diversification made less progress, though apparently a little. Extensive production of small grains, particularly wheat, remains characteristic. The Five-Year Plan involves expansion of the grain area, particularly wheat, in these eastern areas, and this seems to have occurred in 1931.<sup>2</sup> With wheat cultivation expanding from the regions around the Black Sea toward the east and inland, exports will involve longer hauls to export harbors.

#### IV. AGRICULTURAL ORGANIZATION AND PRACTICE

##### SYSTEMS OF AGRICULTURE AND ROTATION

We have seen that agriculture in Russia, both before and since the war, has been characteristically of the extensive type, in the main a system of small-grain production. Forage grains, forage crops like tame hay, and other more intensive crops covered relatively small fractions of the total crop area. Even before the war there was a tendency to expand arable land at the expense of meadows and permanent pastures. Small grains predominated among the agricultural exports.

There were, however, regional differences in types of farming. These deserve brief explanation, at least so far as concerns the blacksoil zone that coincides roughly with the grain-surplus area of the USSR, covering practically all of the wheat-producing regions. The analysis can re-

late, however, only to conditions as they were before the collectivization of peasant farms; but land utilization on collective farms probably approaches rather closely what it was on peasant farms prior to collectivization. The differences in agricultural systems between regions appear to be substantial and persistent.<sup>3</sup>

We have already seen that farming becomes less diversified in the blacksoil zone as we move from west to east and south-

<sup>1</sup> In 1916, corn occupied 4 to 5 per cent of the crop area in these regions, but 8 per cent in 1927.

<sup>2</sup> See *Foreign Crops and Markets*, August 3, 1931, p. 160.

<sup>3</sup> For example, the subdivisions into regions according to intensity of agriculture was about the same in two investigations applying to 1916 and to post-revolutionary conditions. See A. N. Chelintsev, *Russian Agriculture before the Revolution* (Moscow, 1928), pp. 65-74; and A. V. Chaianov, *Experimental Farming of the People's Commissariat of the RSFSR* (Moscow, 1929), pp. 150-78.

east, in some degree in accord with density of population and time of colonization. But even in the western wooded-prairie area diversification on peasant farms did not go far; even here the three-field system<sup>1</sup> was characteristic. On the southern and southeastern steppe, farming was even more extensive in character than under the three-field system, notably in the eastern (dry) part of North Caucasus and the Lower Volga and Trans-Volga regions, and eastward into the steppe of Siberia and Central Asia.

These eastern areas still have plenty of land not under crops. Arable land is sown from year to year with some small grain, the same grain (mostly spring wheat) following year after year. With decline of fertility, a piece of land is left idle for several years, being used for pasture after it has become covered with wild hay. Thus livestock production of the extensive form (mostly sheep) is combined with small-grain production; the system is called "pereleg" or "zalezh." It can persist without diminishing fertility of the soil only if half or more of the land is left idle each year. In different areas, according to natural fertility and the extent of unoccupied land, the duration of fallow is 6, 8, 12, or even 15 years. A system like this prevailed 30 or 40 years ago on a vast area in the southern and eastern steppe of European Russia, but is not to be found there now (and was not to be found even just before the war) except in a limited area of the southeast.

In the southern steppe of Ukraine and in North Caucasus (except the dry eastern part) the system of pereleg disappeared long since, and with increase of population and growth of export demand, the percentage of arable land left idle just before the war had fallen to 25 or even 20 per cent and less, which is below the 33 per cent normal for the three-field system. Here the pereleg system did not evolve into the

normal three-field system; what developed was a rather abnormal system called "pestropolje" (variegated fields). Under this system there is no regular rotation: small grains succeed other small grains or repeat themselves for several years, and land is left fallow not regularly one year out of three, but for several years after it has become exhausted. Under this system land cannot remain idle as long as a proper pereleg system requires.

Without a systematic method of renewing fertility, this system (dominant in the most important wheat-producing regions) must be regarded as less rational and more exhaustive even than the three-field system. Before the war cultivation on estates was superior, more land being left fallow and sown with alfalfa when fallow, and more winter wheat being grown. But the peasant land under the degenerated pereleg or the pestropolje systems was more and more exhausted, and even aside from climatic conditions the yield became very unstable, particularly in the Volga basin. These developments, involving reduced area of pasture, also involved a decline of the extensive form of livestock industry, particularly sheep raising; since this was not widely replaced by intensive forms of livestock raising such as pig breeding, small-grain farming tended to dominate more and more.

There was, however, some development of diversified farming. In these regions a farmer requires some kind of hay suitable for the dry climate, and some kind of a cultivated crop. Agricultural experiment stations showed that alfalfa and corn were advantageous, and in recent years the area in corn has grown considerably; moreover, the ratio of grain area to total crop area has declined. The area in sunflower has also become more important, though sunflower exhausts the soil more than corn and is not so suitable to precede wheat as is corn or alfalfa. In the western, more humid region of North Caucasus, corn and sunflower have come in so much, and some tobacco (and sugar beets and peanuts are projected), that farming here is hardly now to be classified as an extensive, one-crop, small-grain system. This region is more promising than others as indicating a tran-

<sup>1</sup> Under the three-field system, one of the three large fields into which arable land around a village is divided is left idle each year, and is worked to renew productivity and to eliminate weeds. Each peasant household cultivates one or more strips of land in each field; the same rotation, obligatory for all, is followed. The rotation usually involves one field in fall-sown grain, one in spring-sown, and one in fallow.

sition directly to diversified rational farming, avoiding the three-field system. Winter wheat is important here. It is usually sown after fallow, though in the northern reaches rye is the first claimant to fallow land.

The wooded-prairie area of the blacksoil zone was and is the main stronghold of the three-field system, at least in the east, particularly Middle Volga. One of the three fields is sown with a winter crop (here rye); another with a spring small grain (mostly oats except in the Volga region, where spring wheat is more important); the third is left fallow. This fallow is not worked rationally. It is so much used as common pasture that it cannot be plowed until midsummer, although early plowing, in the previous fall or early spring, has been shown to increase the yields of winter crops by 30 to 40 per cent, particularly in the drier eastern regions. In the absence of forage crops (hay, roots), such prolonged pasturing of the fallow affords the only way to feed peasant livestock. With a dense population, this procedure represents a vicious circle and brings a crisis of the three-field system, of which there is no solution except complete reorganization.

In the western part of the wooded-prairie area, reorganization toward more diversified and rational farming has made some progress. Generally, however, nothing more has been done than to introduce such intensive crops as potatoes, sunflower, and hemp upon the spring-sown field. In the extreme west, in northern Ukraine particularly on the right bank of the Dnieper, the process has gone farthest and the three-field system has been more or less supplanted by diversified farming. This was an area where before the revolution progressive farming was common on estates, largely in connection with sugar beets. This was destroyed by the revolution, but afterwards the peasants tended to organize diversified farming, expanding their cultivation of sugar beets, potatoes, and seeded hay, with some development also of pig fattening and dairy farming. This is the most diversified area of the whole blacksoil zone. Winter wheat here has grown in importance, sometimes surpassing rye.

North of the blacksoil zone, farming is

in general more diversified than in the blacksoil zone itself, and especially in the western and northwestern parts. Hay, the dairy industry, potatoes and other vegetables, and flax all became important in different areas. This grain-deficiency region remains much less collectivized than the grain-surplus area.

#### FERTILIZERS

With all of the blacksoil zone dominated by small-grain farming except in the extreme west, the maintenance of soil fertility is difficult, the more so because fallowing is the method and in a large area land cannot be left fallow long enough. Fertilization is therefore an important problem.

North of the blacksoil zone, where the soil is relatively poor, manure has long been used. But in the blacksoil zone itself no fertilizer was used until recently; indeed, it was a common opinion that fertilizer would promote lodging of grain crops or make them less resistant to drought. It has been demonstrated, however, that manure is useful on the black soils, though it must not be applied in the same way as in more humid regions, and has relatively less effect, more particularly in the drier regions where the lack is not nutritive elements in the soil, but moisture.

Several experiment stations concluded that the use of manure on wheat in the southern steppe was uneconomical.<sup>1</sup> In the more humid wooded-prairie area, however, manure was shown to be advantageous; it was also shown, however, that a greater effect upon yield could be had from early plowing of fallow or from plowing land for spring crops in the preceding fall. The use of manure became more or less common in this area; the frontier of farming with manure moved with time more and more to the southeast.<sup>2</sup>

Some statistical evidence is available for post-revolutionary years, from what is called the autumn sample census of agriculture. North of the blacksoil zone, some

<sup>1</sup> See V. V. Marachevsky, *Agronomic Assistance in Russia* (Petrograd, 1914), pp. 591-96.

<sup>2</sup> See *Agricultural Enterprise in Russia* (Petrograd, 1914), p. 18. This is a valuable collection of maps and diagrams, accompanied by French and Russian text, published by the Russian Department of Agriculture.

two-thirds or three-fourths of the peasants, and in some regions practically all, apply manure yearly on the fallow to be used for winter crops, mostly rye. Not all of the peasants who use fertilizer, however, can apply it to all of their fallow.<sup>1</sup> In the region transitory to the blacksoil zone, and in the wooded-prairie area of the blacksoil zone, not more than 30 per cent (and in some regions less) of the peasants apply manure to winter crops. Thus in the Ukrainian wooded-steppe area where farming is relatively intensive, the percentage ran from 15 to 30; but in the Central Blacksoil Region only from 5 to 6 per cent.

Farther east and south fertilizer is still less used; winter crops are fertilized by only 2 to 5 per cent of the farmers in the southern steppe and North Caucasus, and only 1 to 2 per cent of the crop area was fertilized in 1927. In Lower Volga, Siberia, and Central Asia, there was practically no use of fertilizer. Hence wheat in Russia as a whole is little grown with fertilizer.

Spring crops generally are less fertilized than winter crops, and this holds for spring and winter wheat. Even in the northern and northwestern parts of the non-blacksoil zone only about 30 per cent of the farmers apply manure to spring crops, and elsewhere in this region only 10 per cent. Spring wheat receives fertilizer only in the northwestern part of Ukraine. The quantity of manure used varies widely, from 15 to 50 tons per hectare, mostly 20 to 25 tons.

Mineral fertilizer was little used, though before the war the consumption was increasing rapidly. There was little domestic production—even in 1913 only somewhat more than half a million tons. Total min-

eral fertilizer consumption in the Russian Empire in 1913 was about three-fourths of a million tons, of which a sixth was nitrate and potash and the rest phosphates of different kinds. It was largely used in areas now lost, and on estates rather than on peasant land within the present boundaries of the USSR.

The war and the revolution put a stop to such use of mineral fertilizer as there was, and the recovery of agriculture in 1922-27 did not bring it back to the pre-war level. Half as much was used in 1927-28 as before the war.<sup>2</sup> The price was kept very high, and the mineral fertilizers were economical mostly for industrial crops like sugar beets and cotton, not for grain. The Five-Year Plan, however, projects great increases of production (particularly of natural phosphates), and wide use for grain as well as for other crops. In the most ambitious variant of the Plan, 9 million tons are to be produced in 1932-33,<sup>3</sup> and also some imported; but domestic production seems to have lagged far behind this plan.<sup>4</sup> It would hardly seem wise to import heavily to obtain fertilizer for use on grain crops that bring low export prices, especially in view of the relatively small effect to be secured by its use in most regions.

#### MACHINERY

We have seen that the Russian crop area was expanding rapidly from 1900 to the outbreak of the war. This expansion was possible partly because of the rapid spread of agricultural machinery, for which the demand was so great that domestic production could not satisfy it.

The following figures show, in million rubles, the value<sup>5</sup> of domestic production in various pre-war years:

Year	Value
1876 .....	2.4
1890 .....	5.1
1894 .....	9.6
1900 .....	10.4
1908 .....	36.2
1911 .....	50.3
1913 .....	60.5

The growth, rapid at all times, was strikingly so between 1900 and 1911, which witnessed a five-fold increase. The industry was in fact one of the most rapidly de-

<sup>1</sup> See Jurtsovsky, "Application of Manure by Peasants in the USSR," *Statistical Review*, 1928, No. 12, pp. 6-13.

<sup>2</sup> A. Vainstein, "Evolution of the Yield of Cereals in Russia," *Planning Economy*, 1927, No. 8.

<sup>3</sup> *Five-Year Plan of Economic Reconstruction* (Moscow, 1929), second edition, Vol. II, Part 1, pp. 295-96.

<sup>4</sup> See *Control Figures for 1929-30*, p. 132; also M. Volf, "Plan of Socialistic Reconstruction of Agriculture in 1931," *Planning Economy*, 1930, No. 12, pp. 164 ff.

<sup>5</sup> Data from an article by N. J. Vorobiev, in *Agriculture on the Way to Recovery* (Moscow, 1925), p. 632. The figures cover only improved machinery and implements, not wooden plows and harrows made by peasants, and not the output of small craftsmen, which Vorobiev estimates to have had a value of 8-9 million rubles in 1913.

veloping of any in pre-war Russia. It was located mostly in the south and southeast. Only about 10 per cent of it was in territory lost after the war. The USSR therefore inherited a comparatively well developed industry, largely of foreign origin.

Total imports, again expressed in million rubles, were as follows:

Year	Value
1895 .....	10.1
1900 .....	15.9
1905 .....	20.3
1910 .....	42.0
1912 .....	59.5

Here again we see a great increase after 1900, coming particularly between 1905 and 1912. The period just before the war therefore witnessed an insistent demand for agricultural machinery, with roughly half of it supplied by home manufacture. About two-thirds of the simpler implements, plows and seed-drills, were made in Russia, whereas two-thirds of the more complex harvesting machines were imported, mostly from the United States. Such complicated machines as binders and steam-power threshers came entirely from abroad.

A census of agricultural machinery, taken in 1910, yields a picture of the equipment of the country by regions. The following tabulation shows the number of plows,<sup>1</sup> classified by types:

Type	Number (millions)	Percentage of total
Primitive wooden plows..	8.2	52.6
Improved wooden plows..	2.5	16.0
Iron plows .....	4.9	31.4
Total .....	15.6	100.0

It is clear that there was great room for general improvement, for more than half of the plows were primitive wooden ones ("sokha," "kosulia") that merely scratch the ground. Roughly, the proportion of iron plows to the total was as follows in different regions:

Region	Proportion
North of blacksoil zone.....	1/10
European blacksoil zone.....	1/2
Central Agricultural Region..	1/6 to 1/4
Middle Volga .....	1/6 to 1/4
Southern steppe of Ukraine and Don .....	9/10
Wooded prairie of Ukraine...	1/2 to 3/4
North Caucasus .....	9/10
Lower Volga .....	3/4
Central Asia .....	3/4

Thus the grain-producing regions were well supplied with iron plows. Primitive plows predominated only in the older agricultural areas of the blacksoil zone, the area characterized by dense population, slow growth of the crop area, and the persistent crisis of the three-field system.

The supply of machinery increased between 1910 and 1915, and began to decline only with the cessation of imports and the disorganization of the home industry. Although in 1915-24 machinery deteriorated more rapidly than it was replaced, there were more iron plows even in 1920 than in 1910, as the census of 1920 showed. Within the USSR excluding Ukraine and North Caucasus, about half of the plows were iron, as against a fifth in 1910. The area north of the blacksoil zone witnessed the greatest increase. Presumably, in general, equipment was at its best just before the revolution.

It may be said that at this time the peasantry as a whole was accustomed to the use of improved plows. But war and revolution disorganized the manufacturing industry, and up to 1925, as Soviet economists recognize, production did not suffice for replacement. After 1925, however, the production of agricultural machinery is said to have attained the pre-war level.<sup>2</sup>

According to estimates based on the spring sample census, nearly two-thirds of the plows used in the USSR in 1926 were iron. Only in the Central Agricultural Region were primitive implements still common; in some areas (North Caucasus, Ukraine), they had practically disappeared. Official statistics give production of iron plows as .95 million in 1926-27, 1.1 million in 1927-28, and 1.7 million in 1928-29, as against about .7 million in 1913. At this rate, primitive plows may soon be displaced everywhere.

We present this picture partly because people frequently seem to think that the drive for mechanization of agriculture in the USSR means a revolution in methods of tilling, and therefore an advance in yield per acre. But over wide regions, particularly the southeast, it means a change in draft power (tractors for horses), not the

<sup>1</sup> Data from N. J. Vorobiev, *op. cit.*

<sup>2</sup> *Control Figures for 1929-30*, p. 437.



substitution of effective iron plows for ineffective wooden ones. The tractor doubtless permits deeper plowing, but this may not be an advantage for grain in a dry climate. Agricultural experiment stations have shown that seven inches is deep enough, and that little gain is realized by increasing the depth even from five to seven inches; and a five-inch depth is easy with horse-drawn iron plows.

Before the war, seed-drills were much less common than iron plows; there were only 330,000 in 1910 (within present boundaries), and only 2 per cent of the peasant households had them. Production was increasing, however. They were distributed geographically about like iron plows, perhaps with more concentration in the south and southeast. In 1926, there were 500,000 to 600,000 drills. Not until 1928-29 did production attain the pre-war level. A seed-drill is uneconomical to use on small farms and small patches of land, so that co-operation in use, or renting, was necessary. Both of these practices were followed.

Small farms also made the use of harvesting machinery by individuals uneconomical. Moreover, where the population was dense there was no great economic incentive to harvest with machines, on account of the low wages of agricultural labor. This was the situation particularly in Central Agricultural Russia, though even here harvesting machinery was used on estates. It was commonly used by peasants in the newer and less densely populated steppe areas, where farming was on a larger scale. In 1910, some 85 per cent of the 700 to 800 thousand harvesting machines were in this area and farther east in Siberia and Central Asia. The remaining number about corresponded to the number of estates in European Russia. The number of harvesting machines increased rapidly for some years after 1910 up to the beginning of the war. Even in 1920, after some decline, there were within the USSR excluding Ukraine and North Caucasus about 70 per cent more machines than in 1910, though the condition of machines in 1920 was presumably poor.

In 1926, it is estimated that there were 865,000 reapers within the USSR excluding Transcaucasia, Central Asia, and Turke-

stan;<sup>1</sup> that is, about 20 per cent more than in 1910 on the same territory, and hence fewer than in 1920 or just before the revolution. Their condition must have been poor, for production did not reach the pre-war level (itself equal only to necessary replacements) until 1925 or 1926. Yet even under these circumstances, two-thirds or more of the grain in the steppe area was harvested with machines in 1924-25.<sup>2</sup> The present supply of harvesting machinery is probably better than it was before the revolution, for recent production has been reported, in thousands, as 131 in 1926-27, 190 in 1927-28, and 234 in 1928-29, as against 99 in 1913.

This machinery, however, is largely of a simple type; binders are few. In 1914 only about 2 thousand were produced in Russia, and in 1928-29 less than 1 thousand. There have been imports from America in recent years, both of binders and of combines; but these, going mostly to state farms, have not much altered the picture. The following figures are illuminating, showing the estimated numbers (in thousands) of various sorts of harvesting machines used in the harvest of 1931:<sup>3</sup>

Kind	Horse-drawn	Tractor-drawn
Reapers <sup>a</sup> .....	1,184.0	57.0
Binders .....	31.5	3.4
Combines .....	....	4.5
Total .....	1,215.5	64.9

<sup>a</sup> Two-thirds of these were of the hand-throw-off type, not automatic.

These figures mean about 1.2 machines per 250 acres of grain crops. It was stated that about 40 per cent of the grain crops would have to be cut with sickles and scythes, presumably mostly in the Central Agricultural Region. It is to be observed that tractor-drawn machines as late as 1931 were a very small fraction of the total. If the official estimates cited are fairly accurate, the extensive use of binders and combines is still a project, not yet an accomplished fact.

<sup>1</sup> See *Statistical Review*, 1927, No. 7, pp. 17-25.

<sup>2</sup> See *Standards for Agricultural Work* (Moscow, 1927).

<sup>3</sup> Data from *Pravda*, July 1, 1931, giving estimates of the Commissariat of Agriculture.

Threshing machines in pre-war Russia were less heavily concentrated in the steppe area than were reapers and seed-drills. Of the horse-operated threshers, only a fourth were in these regions, and of the steam-powered, only a half. In 1910 there were only 20,000 steam-powered threshers within the present territory of the USSR, but some 455,000 horse-operated ones. There was a great decrease in the number of threshers during the war and revolution, as was not true of tilling and harvesting machines. In 1926 there were only 404,000 horse-operated threshers (excluding, however, Central Asia, Turkestan, and Transcaucasia)—10 per cent less than in the same area in 1910; but of the number many were badly worn. Since production (of horse-drawn threshers) was some 84,000 in 1927–28 and 99,000 in 1928–29 as against 35,000 in 1913, it seems probable that the present supply exceeds the pre-revolutionary supply. The same may be said of grain hullers or winnowing machines.

This material leads to the conclusion that, despite the great publicity given to mechanization of agriculture in the USSR, there is not yet in evidence a radical change as compared with the pre-war situation. The output of agricultural machinery (which is said officially to have attained the pre-war level about in 1925–26) had to go first to fill the great gaps caused by ten years of war and revolution. At the end of 1927 agriculture was apparently worse equipped with machinery than it was just before the war,<sup>1</sup> as judged by values excluding tractors. An estimate for 1929–30, however, places value per acre 50 per cent above the pre-war level<sup>2</sup> (a curiously large change from 1927, which arouses doubts as to its real significance); but even so the change from the pre-war situation could not be called a radical one.

<sup>1</sup> See N. P. Oganovsky's article (written for the ten-year jubilee of the Soviet government and hence one not likely to understate its accomplishments), in "Decline, Recovery, and Reconstruction of Agriculture during Ten Years, 1917–1927," *Economic Review*, October 1927, pp. 55–72.

<sup>2</sup> M. Golendo, "Mechanization of Agriculture in the USSR," *On the Agrarian Front*, 1930, No. 1, pp. 59–60.

<sup>3</sup> Data from N. P. Oganovsky, *Essays on the Economic Geography of the USSR* (Moscow, 1924), p. 198.

## DRAFT POWER: HORSES, OXEN, TRACTORS

Draft power is a very important matter, and warrants rather close study of pre-war and post-war conditions.

The horse was the principal source of draft power in pre-war Russia, and so it remains. Oxen were of some importance in Ukraine and the southern steppe, but had been declining for two or three decades before the war. On the eve of the revolution, oxen throughout European Russia were in number 7 per cent of the number of horses (taking one horse equal to a pair of oxen), but 15 to 20 per cent in Ukraine and North Caucasus. There were relatively fewer oxen in Asiatic Russia, though here there were some camels and buffalo.

Horse censuses taken for military purposes yield the following figures for the European territory of pre-war Russia now included in the USSR, in millions:<sup>3</sup>

Years	Working horses	All horses
1890's .....	13.5	16.0
1901–06 .....	15.2	18.5
1912 .....	15.5	18.5

The early increase was large, the later one small; but the earlier came partly because the famine of 1891 had caused the first number to be abnormally small (some statisticians estimate 17 per cent below normal). In the decade before 1912, there must have been a decline in the absolute number of draft animals, with oxen declining in Ukraine. Accordingly there were fewer draft animals per peasant household and per crop acre at the end of the decade than at the beginning. Expansion of the crop area was apparently made possible by the introduction of improved tilling implements.

Yet in 1916 (according to census data) the number of draft animals per 250 acres of crops in European Russia was not small. The figures are as follows:

Kind of animals	On peasant farms	On estates	On all land
Working horses...	24.9	12.9	23.6
Oxen (pair) ....	1.5	3.0	1.7

For each working horse (or pair of oxen) there were only 10 acres of crops, which

cannot be considered too heavy a burden. On estates 15 acres were cultivated per horse, though the scattered strips of peasant land made as large an area impossible there; moreover, peasant horses were less powerful. The total supply, however, left many peasant households (in 1917 over a fourth) without horses.

The war did not greatly affect the draft power. Many horses were requisitioned for the army, but more were bred. The census of 1916 showed more horses than there were in 1912, though the earlier figure may have been understated. Later, particularly with the famine of 1921, there was a great decline in working livestock. This is shown by the following official estimates for the territory of the USSR excluding Turkestan, Transcaucasia, and the Far East of Siberia, in millions:<sup>1</sup>

Year	Horses		Oxen		3-yr. old
	Total	Working	Total	Working	
1916 ....	31.5	24.3	3.5	...	..
1920 ....	25.4	20.6	3.0	2.7	.3
1921 ....	23.3	18.9	2.6	2.3	.3
1922 ....	18.9	15.6	2.2	1.9	.3

The period of war communism witnessed a decline of over 20 per cent in the working horses; the famine of 1921 brought the number still lower. This decline helps to explain the decline in crop area, and to substantiate the low estimates of the crop area in 1922. The southern and southeastern areas were particularly affected, and indeed did not recover their losses up to 1929, when a new decline set in.

The number of draft animals grew rather rapidly under the NEP up to 1927, but thereafter the rate of growth was smaller. Measurement of numbers of draft animals, like measurement of crop areas, is a controversial subject, though differences in estimates are smaller. One may suppose that since draft animals provided a basis for distribution of taxes, the enumerations ought to be better than the enumerations or estimates of areas. Table 4 gives two sets of official estimates.

<sup>1</sup> Data from *Collection of Statistical Data for the USSR, 1918-23* (Moscow, 1924).

<sup>2</sup> See *Statistical Review*, 1928, No. 10, p. 10; also N. P. Oganovsky, "Decline, Recovery, and Reconstruction of Agriculture during Ten Years, 1917-1927," *Economic Review*, October 1927, pp. 55-72.

According to the data of the Central Statistical Office (which in the judgment of those who compiled the figures were comparable with pre-war data), the number of working horses in 1928 was about 81 per

TABLE 4.—COMPARATIVE OFFICIAL ESTIMATES OF NUMBER OF DRAFT ANIMALS IN THE USSR IN 1916 AND 1924-29\*

Year	Million work animals				Percentage of number in preceding year			
	Horses		Oxen		Horses		Oxen	
	C.S.O.	Gosplan	C.S.O.	Gosplan	C.S.O.	Gosplan	C.S.O.	Gosplan
1916...	27.3	27.3	5.45 <sup>a</sup>	5.45	....	....	....	....
1924...	18.4	19.5	4.09	....	....	....	....	....
1925...	18.8	19.9	4.25	4.33	101.9	102.0	103.7	....
1926...	20.0	21.2	4.90	4.97	106.4	106.4	115.3	115.0
1927...	21.3	22.8	5.15	5.25	106.4	107.6	105.1	105.5
1928...	22.1	24.0	4.85	5.14	104.1	105.1	94.2	97.9
1929...	....	24.3	....	4.60	....	101.4	....	89.6

\* Data for 1916 based on the agricultural census of 1916, and taken from *Control Figures for 1927-28*, p. 114. Central Statistical Office figures for 1924-28 from *Statistical Handbook for the USSR for 1928*; Gosplan figures for 1925-29 from *Control Figures for 1929-30*. The data of the Central Statistical Office relate to livestock on individual peasant farms; but this does not explain the difference between the two sets of data because the number of working horses in collective and state farms in 1928 was, according to official data, below 0.2 million.

<sup>a</sup> Data on working oxen are not quite comparable for 1916 and for later years because of differences in grouping by ages.

cent of the number in 1916; according to the Gosplan, about 88 per cent. Taking a different area, the USSR excluding Turkestan, Transcaucasia, and the Far East, and the data of the Central Statistical Office (given for 1916 in the tabulation preceding Table 4), we obtain a figure of 85 per cent. There are other estimates close to this figure,<sup>2</sup> so that it may be taken as a reasonable measure of the net reduction from 1916 to 1928.

The extent of recovery differed from region to region. In the area north of the blacksoil zone, in White Russia, and in northern Ukraine, there was more livestock in 1928 than in 1916, but elsewhere much less. In the southern steppe of Ukraine, in the Central Blacksoil Region, and in Ural the figures were not very low, 82 to 86 per cent. But in the Volga regions, in North Caucasus, in Central Asia (that is, in the famine-stricken regions) the figures were

only 50 to 75 per cent. Expressed in terms of horses per peasant household, the picture for 1928 is still darker; in no single region of the USSR was the number of horses per 1,000 peasant households as large in 1928 as in 1916.

We have seen that the crop area in 1927-29 has been estimated as about on the pre-war level. The data on draft animals serve to support our conclusion that such estimates must be regarded as optimistic ones. It is difficult to believe that with 85 per cent as many draft animals, peasants could plow as large an area as they did before the war, the more so because the area in crops requiring more tillage has expanded, and there were more small strips of land after the war than before. In 1928 the supply of tractors was insignificant—not more than 30,000, the equivalent of only a small part of the reduction of draft animals.

After 1928, conditions became worse with regard to draft animals. There was a small increase between 1928 and 1929, but a great decline in 1930. Official statistics put the number of horses in 1930 at only 90.4 per cent of the number in 1929;<sup>1</sup> on this basis, the number in 1930 could have been only about 78 to 80 per cent of the number in 1916. The number of oxen also declined. It may be estimated that as compared with 1916, there were 5 to 6 million fewer horses in the USSR in 1930, and about 2 million fewer oxen.

The most optimistic estimate of the average number of tractors for the sowing campaign of 1929-30 would be from 50 to 60 thousand. For the moment disregarding these, it appears that in 1930 there were about 14 acres of crops per horse (or pair of oxen) as compared with 10 acres in 1916—an increase of 40 per cent. The burden on a peasant horse in 1930 was close to the burden on an estate horse in 1916. But in 1930 only a third of the land could possibly be worked in large fields, the rest lying in small strips; and there is no reason to believe that peasant horses in 1930 were at all the equal of estate horses in 1916. This

evidence and reasoning compels us to question the official estimates of crop areas in late years, simply because it is hard to see how the draft power available could have put in the estimated acreage.

Further, this general situation helps to explain the government's strenuous drive for tractors; the tractors seemed necessary in order to compensate for deficiency in draft animals, which, in turn, had resulted from the policy toward the kulaks. This policy after 1927 slowed the rate of increase of draft animals, and the drive toward wholesale collectivization begun in the fall of 1929 resulted in an absolute decline. In one year working horses declined by 2.4 million and oxen by more than 1.2 million, a decline that could by no means be offset by an increase of 30,000 tractors.

Two tractor factories are now operating in Soviet Russia, one in Leningrad and another in Stalingrad; two are under construction, in Kharkov<sup>2</sup> and Chelyabinsk. Even so, the Soviet government is obliged to spend very heavily for imported tractors. The plan was to more than double the power of mechanical traction<sup>3</sup> between 1930 and 1931—from 900,000 horsepower to 2,057,000. It is difficult to say whether or not the plan was fulfilled, though the available information does not so indicate, on the counts both of output and deterioration of tractors through intensive use, and of lack of trained drivers and mechanics. But even if 2 million horsepower in tractors existed in the fall of 1931, there was a deficiency of 5 or 6 million horses and 2 million oxen. Hence the Soviet insistence on efficient utilization of tractors is not surprising.

As a means to this end, the greatest possible concentration of tractors is sought. Before 1926-27, individual farmers could still purchase what few tractors were available, but with the drive for collectivization only collective or state farms could obtain them. In 1930-31 it was thought better to remove tractors from collectives, and to concentrate them in so-called Machine-Tractor Stations (MTS). Each such station has 50 or more tractors and attendant implements, and with them it cultivates the land both of collectives and of individual farmers in its neighborhood. New tractors

<sup>1</sup> *Agricultural Statistics of the USSR*, p. 26.

<sup>2</sup> This factory appears to have begun operation very recently.

<sup>3</sup> See "Economic Plan for 1931," *Planning Economy*, 1930, No. 12, p. 365.

go to these MTS. In 1931, the collectives were planned to have only 80 thousand horsepower units as against 243 thousand in 1930; the MTS were to have 980 thousand as against 215 thousand; the state farms were to have the other million. In the spring of 1931 there were 1,227 MTS with 663 thousand horsepower units (46.7 thousand tractors), as against 158 stations with 7 thousand tractors in 1930.<sup>1</sup>

This concentration of tractors may be rational in view of the limited number of trained drivers and mechanics. It also has its socio-political foundations. Collective farms can be kept dependent on the MTS, and hence directly controlled by the government; for the MTS are directly controlled and the MTS control the principal means of production, the only co-operative element in them being that collectives and individuals must contribute to them in order to pay for their equipment.<sup>2</sup> Even horses seem to be partially under the control of the MTS. The stations are also agencies for collecting grain from the collectives and farmers whose land they plow.<sup>3</sup>

At present all problems of farm management are discussed from the point of view of efficient utilization of tractors. It is clear, however, that this is not the same problem as the most efficient organization of farms. The emphasis falls where it does because tractors are regarded as the solution of an emergency problem—the lack of draft power in agriculture, itself in part an effect of Soviet policy.

Agriculture in Russia is not yet reorganized on the basis of mechanization and tractorization; the process (involving not only tractors but also attendant machinery) has barely begun. The extent of mechanization is indicated by the fact that in 1930 tractors contributed only 5 to 6 per cent of the motive power of agriculture, and only 12 per cent was planned for 1931; this is one set of estimates. With intensive use of tractors (2,500 hours per year, and working 2 or 3 shifts of drivers), another set of

estimates gave 9 per cent in 1930, and 22 per cent in 1931.<sup>4</sup> But with domestic production lagging behind the plan, and the sowing campaign for 1930–31 not fulfilled, it seems probable that the plan for expanding the ratio of mechanical power to total power was also not fulfilled.

#### AGRICULTURAL LABOR

Even before the war there was only a small group of strictly agricultural laborers, and this mostly in the lost Baltic provinces. Elsewhere the main source of labor was peasant households with an excess labor supply. Large estates often rented land rather than hire labor, and often hired peasants to cultivate on a piece-work basis. The operation of estate farms with hired labor was most common in the wooded-prairie area of Ukraine, on the right bank of the Dnieper; but even here the labor came mostly from neighboring peasant families. In general, local labor from peasant families was abundant because peasant farms were so small and families so large in the more northerly regions.

In the south and southeast, however, there was before the war a net deficit of agricultural labor. The imported labor came from the north, mostly the wooded-prairie area; but it was mostly the younger members of peasant households, not proletarian agricultural labor. In the southern steppes even the larger peasant farms hired some of this seasonal labor. It is clear from the low wages that labor was in general abundant. As time passed, however, wages tended to increase. By regions, they were highest in the steppe area—about 50 per cent higher than in the more densely populated part of the blacksoil zone.

The revolution changed the situation. Disappearance of large estates and equalization of land holdings decreased the demand for hired labor, and hiring was in fact forbidden in the earlier years. It was permitted after 1922, though with many limitations (rented land could not be worked with hired labor) until the decree of April 25, 1925. The years 1925–27 witnessed the widest use of hired labor; after 1927 it declined as measures were taken against the well-to-do peasants who did most of the hiring. However, the use of

<sup>1</sup> *Pravda*, May 26, 1931.

<sup>2</sup> See M. Golendo, "Organization of the MTS," *On the Agrarian Front*, 1930, No. 2, pp. 10–11, 15.

<sup>3</sup> See further below, p. 356.

<sup>4</sup> See M. Volf, "Plan of Socialistic Reconstruction of Agriculture for 1931," *Planning Economy*, 1930, No. 12, pp. 159–63.

hired labor on state farms then began to increase.

In August 1926 and 1927, hired laborers in agriculture (yearly, seasonal, and monthly) numbered about 2.5 million. Two-thirds of these were on individual peasant farms, a fourth (mostly shepherds) in community villages, the rest on state farms.<sup>1</sup> Agricultural laborers made up about a fifth of all people receiving wages of the USSR. The number on peasant farms (yearly and seasonal laborers) declined from 1,637 thousand in 1927 to 1,491 thousand in 1928, though the number of day laborers increased; this development suggests that use of day workers tended less to cause well-to-do peasants to be classified as kulaks than use of seasonal or yearly laborers. Including day laborers, which numbered 2.7 million in 1927 and 2.9 million in 1928, over 5 million agricultural laborers were employed in the USSR at harvest time.

About three-fourths of the seasonal or yearly laborers were local, coming from the nearest village or from the nearest volost. The southern steppe remained a region of influx of wandering labor. Two-fifths of the laborers were below 18 years of age, and a fourth to a third only 18–22 years old. Less than a fourth were heads of families. Only about a third were landless; that is, were not members of peasant families which farmed for themselves. These landless laborers tended to wander farthest, so that the labor supply in the southeastern

steppe was more largely proletarian in character than was true of the supply in the more densely populated regions to the north and west.

Around 6 to 7 per cent of the peasant households used hired laborers in 1926 and 1927, the percentage being highest in Crimea, North Caucasus, and the southern steppe of Ukraine, and considerably lower in the Central Blacksoil Region and the Middle Volga. Farms were larger in the south and east, the peasantry was more differentiated, and more peasant families had no working horses. It is of interest to observe that it was here that the drive for collectivization went farthest, probably because here there was a good deal of participation by proletarianized peasants and purely proletarian agricultural laborers.

Wages were low—according to the Gosplan, only 40 per cent of the wages of industrial workers.<sup>2</sup> Even on state farms, where wages were some 11–12 per cent higher than on peasant farms (1926 and 1927), the wages were well below the pre-war level. Drozdov has estimated that, with allowance for the purchasing power of the ruble, average daily wages were in 1924 only 54.1 per cent of those of 1913; in 1925 only 58.1 per cent, and in 1926 only 65.4 per cent.<sup>3</sup> Since there is no distinctive line between agricultural laborers and peasants in Russia, these figures may be taken as characterizing the earning capacity of the Russian peasant before and after the revolution.

## V. CULTIVATION OF THE BREAD GRAINS

### RELATIVE IMPORTANCE OF WHEAT AND RYE

We have observed that a great preponderance of grain in the total crop area is typical of Russian agriculture, but that this preponderance has tended to diminish. Among the grains, the two bread grains (wheat and rye) have always predominated, constituting some 60 per cent of the grain area. This is important in consider-

ing the outlook for wheat. So large a preponderance of bread grain strongly suggests the improbability of further increase in the ratio of bread-grain area to total grain area, for this would imply little or no advance in the livestock industry. The probable tendency in agriculture is a shift from grain to other crops, and among the grains a shift from bread grains to forage grains.

Yet the high ratio of bread-grain area to the total grain area has remained rather stable for a long time. In 72 provinces of the Russian Empire (excluding Turkestan, Transcaucasia, and eastern Siberia), it was

<sup>1</sup> See A. Melnikov, "Agricultural Labor in 1928," *Statistical Review*, 1929, No. 10, pp. 57–66.

<sup>2</sup> *Control Figures for 1929–30*, p. 489.

<sup>3</sup> I. Drozdov, "Agricultural Wages before and after the October Revolution," *On the Agrarian Front*, 1928, No. 607.

59.6 per cent in 1901-05, 59.2 per cent in 1906-10, and 59.8 per cent in 1913. In European Russia (50 provinces except in 1916, when data are available only for 48) the ratios were 58.3 per cent in 1881, 60.0 in 1913, and 57.9 in 1916. The ratios for the present territory of the USSR were 61.0 per cent in 1913 (the lost provinces as a group being relatively unimportant bread-grain producers), and 60.7 per cent in 1925-28.

The bread-grain area has been about equally divided between wheat and rye, though before the war the wheat area was increasing more rapidly than the rye area (see Chart 1, p. 300). During the years just after the revolution, however, this relationship was reversed, for wheat production was more affected than rye by the closed export outlets, the disorganization of the interior markets, and the famine of 1921. After 1923, wheat recovered while rye remained stationary or declined; and by 1927 the pre-war relationship of areas was about re-established (see Appendix Table II). Thus the ratio of the total bread-grain area to the total grain area has remained more stable than the ratios to total grain area of either wheat or rye. These two grains tend to shift at the expense one of the other. This is important in its bearing on the outlook for wheat, for increase of the wheat area at the expense of the rye area has a far different bearing on wheat export surpluses than would an increase of both grains together.

The following figures, showing the ratios of wheat and rye areas (separately and together) to the total grain area of the USSR, serve to illustrate recent tendencies.<sup>1</sup>

Year	Wheat	Rye	Wheat and rye
1916	32.6	27.1	59.7
1927	33.0	29.0	62.0
1928	29.9	27.0	56.9
1929	31.0	26.1	57.1
1930	32.6	.... <sup>a</sup>	.... <sup>a</sup>
1931	.... <sup>a</sup>	.... <sup>a</sup>	63.1 <sup>b</sup>

<sup>a</sup> Data not available.

<sup>b</sup> Preliminary.

Winterkilling seemingly made the ratios low in 1928 and 1929, though it is difficult to distinguish between sown and harvested areas in official statistics. In 1930, the ratio of wheat area to the total grain area was apparently just what it was before the revo-

lution; but with a tendency for rye to fall below the pre-war level, the ratio of the wheat-and-rye area to the total area may have been lower in 1930 than in 1916. This ratio was distinctly high in 1931, according to preliminary data. For this reason, the series as a whole does not indicate a tendency for bread grains to occupy increasingly smaller fractions of the total grain area. Yet we believe that such a tendency exists. The barley area was considerably below the pre-war level in 1929, and the area in corn tends to increase. There was great (presumably unusual) pressure to expand the wheat area in 1931 in order to be able to export. The preponderance of bread grains and the necessity for and movement toward diversification are more significant than the rather fragmentary series of ratios given above. The wheat area may tend to rise in its ratio to the total grain area, but the ratio of the rye area to total (as in pre-war years) may tend to decline. This view of the subject involves the assumption that increase of the bread-grain area on new land (which will involve wheat rather than rye) is likely to progress rather less rapidly than increase of the forage grain areas in the older regions.

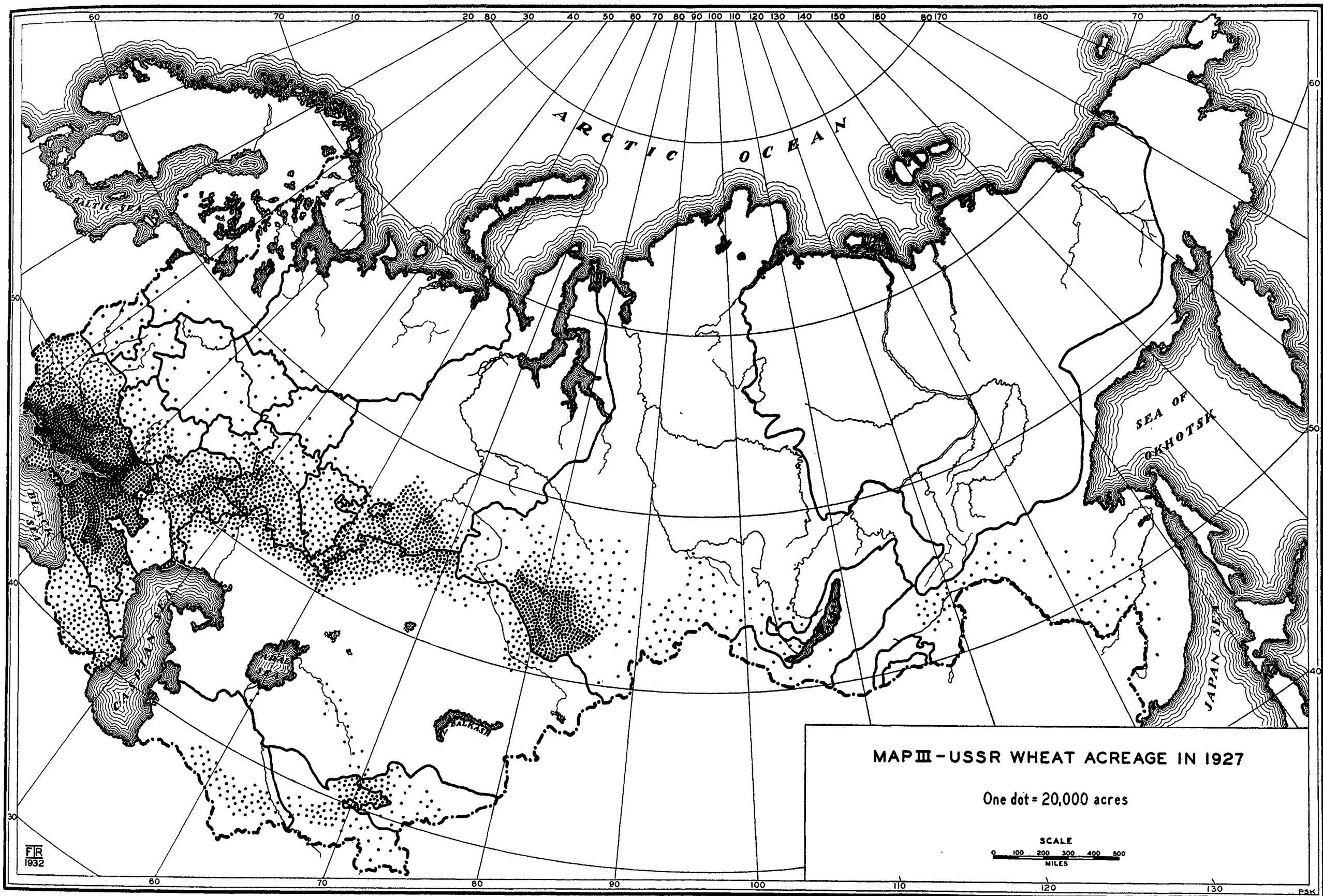
#### WHEAT REGIONS

The area where wheat is widely cultivated in the USSR coincides closely with the blacksoil zone. Map III shows the distribution of the wheat area in 1927;<sup>2</sup> comparison with Map II, p. 280, shows how closely the wheat zone and the blacksoil zone coincide. The northern limits are about the same. If we define wide-spread cultivation of wheat as meaning that wheat occupies more than 5 per cent of the total crop area, then all provinces in the blacksoil zone would be included in the wheat area except a few in the Central Blacksoil Region and one in the Middle Volga. North

<sup>1</sup> Data for 1916 and 1927-29 from *Agricultural Statistics of the USSR* (Moscow, 1930). Data for 1930 are based on statistics of wheat acreage released by M. Lubimof at the Wheat Conference in London, May 1931, and total grain acreage statistics as published by the U.S. Department of Agriculture.

<sup>2</sup> The distribution shown is only approximate. Data are not available applicable both to a recent year and to territorial divisions small enough to permit the construction of an accurate dot map. The same qualification applies to Map IV.









of the blacksoil zone, wheat is of little importance.

The northern border of the wheat zone in European Russia passes from southwest to northeast. In the southeast, the wheat area extends beyond the blacksoil zone into the brown-soil zone of the arid steppes. In Siberia and Central Asia, farther east, the wheat zone coincides with the blacksoil zone and extends south into the brown soils as far as the moisture supply permits. Wheat is also important farther south, in Turkestan and Transcaucasia; and also in the Far East of Siberia.

The relative importance of wheat increases from north to south and from west to east. The wheat area exceeds the rye area in the Ukrainian steppe, Crimea, North Caucasus, Lower Volga and Trans-Volga, Western Siberia, Central Asia, Transcaucasia, Turkestan, and the Far East of Siberia. In many of these regions, especially the east, wheat occupies more than 50 per cent of the total crop area, up to two-thirds or three-fourths, but in southern Ukraine 40 to 50 per cent.

To the north, in the wooded-prairie area of the blacksoil zone, rye is predominant. In northern Ukraine rye predominates in some provinces, wheat in others. In the Central Blacksoil Region and the Middle Volga, rye definitely predominates over wheat. Wheat occupies only 5 per cent of the crop area, rye 40 per cent in the Central Blacksoil Region; for Middle Volga the figures are 20 and 40 per cent. In these regions wheat and rye compete for land, and it is here that there are possibilities for wheat to expand at the expense of rye. The overlapping of wheat and rye areas may be observed by comparison of Map IV with Map III.

Expansion of wheat at the expense of rye can occur in other regions also, where wheat now predominates, for in many areas (except Central Asia, Turkestan, Transcaucasia, and Crimea), rye occupies at least 5 per cent of the crop area, usually more than 10 per cent. The cultivation of rye is rather less localized than that of wheat. In the more northerly regions, where rye now predominates but wheat is also cultivated, climatic limitations do not preclude expansion of wheat. Rye, it is

true, is less exacting on the soil and more resistant to cold, and this limits the possible shift from rye to wheat. But the fact that spring wheat is so largely grown in the wooded-prairie area of Siberia suggests the possibility of expansion at the expense of rye in the corresponding zone of European Russia; and winter wheat also could expand in European Russia.

Winter wheat is mostly grown in European Russia, but even here there are few areas where it predominates over spring wheat—only in Ukraine, Crimea, the European North Caucasian steppe, and (in Asia) Turkestan and Transcaucasia. Spring wheat is also cultivated in these areas; it predominates in other wheat areas of wider extent.

The limitations on expansion of area are different for the two kinds of wheat. Lack of moisture, especially in the southeast, limits the expansion of spring wheat. Low winter temperatures and late spring frosts limit the expansion of winter wheat in the northeast. In the east the winters are both cold and snowless. The Volga basin, even its lower part, and the greater part of the basin of the Don are unfitted for winter wheat, though they lie rather to the south; much less so are Western Siberia and Central Asia. Expansion of winter wheat to the north in European Russia is more possible in the west than in the east on account of heavier snowfall and hence of less risk of winterkilling. But here there is said to be danger of decay of seeds caused by heavy snows on unfrozen ground, and of "soaking" in spring as the snow melts; rye resists these vicissitudes better than wheat. Resistant wheat varieties are being sought both for the dry and the northern regions. Yet it seems probable that wheat now occupies most of the regions naturally fitted for its cultivation, and that rapid expansion to new districts is not likely.

There has been a tendency to shift from spring to winter wheat, especially in southern Ukraine; winter wheat yields better than spring, and in semi-arid regions makes better use of the available moisture. This shift was first clearly revealed in its full significance by the census of 1916. The following figures show winter and spring wheat areas as percentages of total crop

areas in pre-war years first in the USSR as a whole (excluding, however, Turkestan, Transcaucasia, and the Far East of Siberia), and in Tauride province (Crimea), where the shift went farthest:<sup>1</sup>

Years	USSR		Tauride province	
	Winter	Spring	Winter	Spring
1901-05 . . . . .	5.9	20.6	19.3	30.4
1906-10 . . . . .	5.9	22.4	22.5	29.8
1911-15 . . . . .	6.3	23.9	27.8	21.1
1916 . . . . .	7.4	21.7	37.6	4.3

The tendency to shift was so strong that in 1916, despite a decline in the total wheat area, the area in winter wheat increased.

Such a shift, promising an increase in yield per acre, has been favored by the Soviet government; and the area in winter wheat recovered better than that in spring. But in the winter of 1927-28 there was severe winterkilling in Ukraine and North Caucasus, in the latter region affecting 20 per cent of the sown area. How far this was due solely to climate, how far to introduction of newly selected and insufficiently tested varieties, is not clear; but winterkilling often occurred before the war, for more or less of it occurred in the southern steppe in 14 to 16 years out of 35, according to official data.<sup>2</sup> The following official figures on areas of winter and spring wheat in percentages of total grain area are pertinent:<sup>3</sup>

Year	Winter wheat	Spring wheat	All wheat
1916 . . . . .	8.9	23.7	32.6
1927 . . . . .	11.3	21.7	33.0
1928 . . . . .	6.6	23.3	29.9
1929 . . . . .	6.8	24.3	31.0

The set-back to winter wheat for the crop of 1928 seems to have weakened the confi-

dence of the peasants, and to have set back the trend toward winter wheat for several years. Yet preliminary data suggest a new drift toward winter wheat in 1930 and 1931, mostly at the expense of rye.

#### PREPARATION OF THE SOIL FOR BREAD GRAINS

It is feasible here to describe only the processes of bread-grain cultivation as they were under a peasant economy, before the drive for collectivization. But since (as we have seen) cultivation still has to be done mostly with the old motive power, horses, and the old types of machines, such a description cannot depart very far from the present situation.

Winter wheat and winter rye are mostly sown on fallow. This is the normal procedure in the northern edge of the blacksoil zone and beyond, where the fallowing system prevails. Here winter rye predominates, except in Ukraine. In the southern steppe, winter grains are not always sown on fallow; in 1926, some two-thirds in Lower Volga and Crimea, only a third in North Caucasus, only a fourth in southern Ukraine.<sup>4</sup> The rest of the winter grain followed other crops, though wheat goes on fallow more than rye.

Fallow land is usually worked more intensively than land to be sown with spring grain, though there are regional differences in practice. Preparation of fallow tends to be less thorough from north to south and from west to east, except for Siberia. In the north and northwest, fallow for winter crops is usually plowed three times; twice in central Russia, including the northern part of the blacksoil zone; only once in the southern and southeastern steppes, where winter crops are often sown after other crops, with merely a harrowing after sowing. The number of harrowings in different regions tends to correspond to the number of plowings.

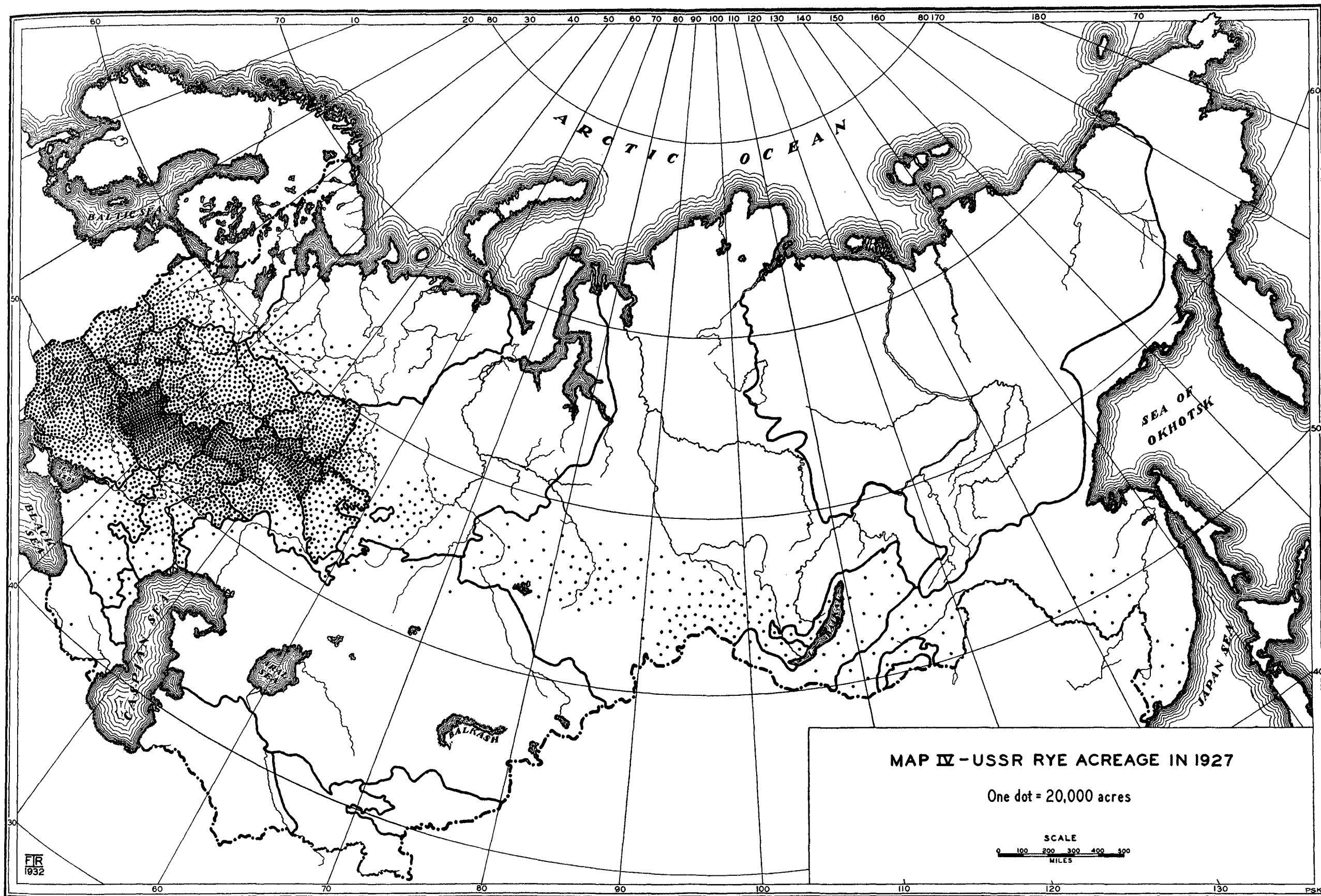
The time of plowing is very important in Russia. Experiment stations have long stressed the importance of plowing fallow in the previous fall (black fallow) or in the early spring; these methods are about equally good in the drier areas. But postponement until May or as late as the second half of June affects yields unfavorably (also of crops following the winter crops),

<sup>1</sup> Census data for 1916; data for earlier years from N. P. Oganovsky, ed., *Agriculture in Russia in the XX Century* (Moscow, 1923).

<sup>2</sup> Nearly 12 per cent of the winter-wheat acreage of the United States was abandoned on the average in 1919-28—in 1928 as much as 23.5 per cent. The statements above are not to be interpreted as indicating that winterkilling is peculiarly heavy in Russia. Winterkilling has a different meaning in countries of small and of large farms.

<sup>3</sup> Data from *Agricultural Statistics of the USSR*, p. 20.

<sup>4</sup> Data of the fall sample census; see M. Jurtkovsky, "Methods of Cultivation of Crop Land," *Statistical Review*, 1927, No. 12, pp. 36-45.





because the moisture is less well conserved. The Bezenchuk experiment station (Trans-Volga) concluded that delay in plowing for a month after April would tend to reduce rye yields by 20 per cent; delay to June 20, by 50 per cent.<sup>1</sup> In smaller degree, such an effect would probably be found throughout the blacksoil zone. Although there was a good deal of propaganda to advance the practice of early plowing, peasants were constrained to continue to use fallow as pasture and to plow it late. In spite of the efforts of the Soviet government, this practice persisted after the revolution, though in Ukraine and the Central Blacksoil Region some progress was made. A thoroughgoing change to the superior practice involves reorganization of the whole system of agriculture, which can only be slow. A change would contribute substantially to increase yields per acre.

Fall plowing for spring wheat, like fall or early spring plowing of fallow for winter wheat, tends to increase yields per acre. This also has been demonstrated by experiment stations. But it has not become common practice in western and central Russia. It did become more or less common in the basin of the Volga and in the Trans-Volga and Ural regions, and in some degree in Ukraine; in these regions, the very ones where the effect on yield is greatest, half or more of the spring crops are sown on fields plowed in the preceding fall ("ziab"). The Soviet government seeks to further the practice. But it is already fairly common where it can have the largest effect.

A single plowing is the common practice for spring wheat—in some regions in the fall, in others in the spring. Double plowing was not uncommon in northern European Russia, but here spring wheat was little grown. There was more double plowing in Siberia and Ural, and considerable in Central Asia, both plowings occurring in the spring. In the southern steppe of Ukraine, spring wheat was frequently sown even without any plowing. Harrowings

usually coincide in number with plowings, or fall below. In some southern and eastern regions (Ukraine, Crimea, North Caucasus, Kazakstan) plowing is often done with a light multi-shared plow called a "bukker," which is used in preparing the soil both for winter and for spring wheat.

All told, the soil is not very well prepared for wheat in the USSR, particularly for spring wheat. This is to be expected in the regions of extensive forms of farming, in which Russian wheat is mostly grown.

#### SOWING OF BREAD GRAIN

With relatively few seed-drills in use, grain was and is sown mostly by hand in Russia. Only in the south and southeast were drills moderately common; but even in 1924–25 rather less than half of the grain area was seeded with drills in North Caucasus and the southern steppe of Ukraine, and elsewhere less. There are no statistical data to tell how common machine sowing has become on collective farms since that date.

The time of sowing, like the time of plowing, is of great importance. The Bezenchuk experiment station found experimentally that spring wheat sown at the first of April in a certain year yielded three times as much as that sown at the end of April; and also that there was no yield from spring wheat sown in the middle of May.<sup>2</sup> In the steppe regions sowing must be early, and must be done with great haste; drought is dangerous in the southeast, a short growing season in the north.

In the USSR as a whole, the sowing period is naturally prolonged. Spring wheat is sown earliest<sup>3</sup> (excluding Transcaucasia and Turkestan) in Crimea (mid-March) and North Caucasus (end of March); the duration is about three weeks. Ukraine follows a few days after North Caucasus (beginning early April); here the duration is about two weeks. Sowings in the Lower Volga start later, in the second half of April, and in the Middle Volga not until the end of May; here the duration is shortest, ten days to two weeks. Last come Siberia and the Ural regions, about in the second week of May and lasting two weeks. Thus the latest date of wheat sowing in the main producing regions is about the

<sup>1</sup> See V. V. Morachevsky, ed., *Agronomic Assistance in Russia* (Petrograd, 1914), p. 574.

<sup>2</sup> V. V. Morachevsky, *op. cit.*, p. 576.

<sup>3</sup> See articles on the sowing campaigns for spring and winter crops (data of 1922–27) by M. Jurtsovsky, *Statistical Review*, 1928, No. 3, pp. 16–23, and No. 8, pp. 20–26.

end of the third week of May. These are average or "normal" dates; there are exceptional years, like 1931, when the whole sowing period was late. Lateness increases the chances of crop failure or of low yields. Timely sowing in the dry regions may mean more than good preparation of the soil. Soil not plowed in the fall has to be hurriedly prepared in the spring.

Winter-wheat sowing begins earliest in the wooded-prairie area of Ukraine, in the last week of August; farther south in Ukraine, it begins early in September; in North Caucasus, in the middle of September; still later, near the end of September, in Crimea. The latest seeding anywhere comes about in the second half of October. Rye is sown at about the same time as winter wheat, though a little earlier; the period is more protracted, for in the rye regions of the north sowing begins in early August, before harvest.

The quantities of seed used per unit of area vary widely. Hand sowing requires more than drill sowing; before the war, peasants used more than estate owners. Since dry regions do not require heavy sowings, the seed use per acre decreases from the north to the south and east. The average requirement for rye is about 133 to 134 kilograms per hectare or 2.12 to 2.13 bushels per acre in the USSR excluding Transcaucasia and Turkestan; and for wheat about 123 kilograms per hectare or 1.83 bushels per acre, according to pre-war official data for 1905-14.<sup>1</sup> The heaviest sowings of spring wheat are in the northeastern part of the spring-wheat area, the Ural Region, Siberia, and the Middle Volga, where some 140 to 175 kilograms per hectare (2.08 to 2.60 bushels per acre) are used. The requirement is least in the southern steppe of Ukraine and the southeastern part of the Lower Volga, about 80 to 110 kilograms per hectare (1.19 to 1.64 bushels per acre). Winter-wheat seed re-

quirements per acre average larger than those of spring wheat, since winter wheat is more grown in the relatively humid areas. Northwestern Ukraine has the largest requirements (150 to 160 kilograms per hectare or 2.23 to 2.38 bushels per acre); the southern steppe of Ukraine and Crimea the smallest (105 to 130 kilograms per hectare or 1.56 to 1.93 bushels per acre). Increasing use of seed-drills is bound to reduce seed requirements per acre, and so also may improvement in the quality of seed.

#### HARVESTING AND THRESHING

Wheat and rye are not cultivated between sowing and harvesting. The bread-grain crops, particularly rye, ripen at widely different times in different regions. The wheat harvest begins earliest in Crimea (ignoring Turkestan and Transcaucasia), about at the end of June; thence it spreads through North Caucasus and southern Ukraine, where it begins early in July. In northern Ukraine and the Volga basin, the harvest starts in mid-July, spreading later to the steppe of Central Asia and then to Siberia. Here the rye harvest begins early in August, the spring-wheat harvest in mid-August. August is the month of rye harvest in the northern and northeastern regions of European Russia.

The duration of harvest is shortest in the south, where dry weather makes for rapid and simultaneous ripening of the several grains; and the campaign is strenuous because the population is relatively sparse and because delay may mean heavy losses. Such a situation favors the use of machinery. In 1926 as before the war, more than half of the grain crops were harvested with machines in the steppe regions; and in North Caucasus, southern Ukraine, and Crimea, from two-thirds to four-fifths. Machine harvesting also dominated in Trans-Volga and Siberia, but not in central and northern Russia, where scythes are used in the south and sickles in the north. This means that in Russia as a whole wheat is cut mostly with machines, rye mostly by hand. In the USSR as a whole, in 1931, at least 40 per cent of all grain crops had to be cut with scythes and sickles.<sup>2</sup> Clearly mechanization of the harvesting process

<sup>1</sup> See article by N. Debenetsky, in *Balance of Economy of the USSR*, published by the Central Statistical Office of the USSR, p. 123. By way of contrast, seed use of wheat per acre is about .95 bushel in Australia, 1.3 bushels in the United States, and 1.75 bushels in Canada, but exceeds 2 bushels in most European countries.

<sup>2</sup> *Pravda*, July 1, 1931. This figure represents a plan, not the recorded fact.

still has far to go, particularly in the older agricultural regions.

Wheat and rye are usually bound into bundles, shocked, and left to dry in the fields, though in the dry southeastern areas wheat is sometimes brought directly to the threshers, even without binding (and binders are rare as compared with the less automatic reapers). The state grain farms in the southeast recently have used combines in considerable numbers, though there were only about 5,000 in 1931.

Steam-power threshers are rare, and even horse-powered threshers are not common enough to have displaced flails in central and northern regions and rollers in the south and west. Accordingly, threshing continues long after the harvest is over. In middle and northern Russia, threshing takes place on the farmsteads from stacks; straw is valued here as livestock feed and hence is not left in the fields, as it often is in the southeast, where stacking in farmsteads is not typical practice. In the extreme north and northeast, the wet weather necessitates storing and drying of rye in special barns called "ovine."

All told, there is room for a good deal of improvement of harvesting and threshing methods. It is difficult to say how far collectivization may contribute to this end. At present collectivization has outstripped the supply of machinery, so that no great advantage can have been gained. But the reduction in the number of small peasant farms at least opens the way to wider use of harvesting machinery and to more rapid machine threshing.

#### YIELD OF BREAD GRAINS AND THE FACTORS DETERMINING IT

Before the war, the yields per acre of the bread grains in Russia were low, not only below those of western Europe, but also below those of southeastern Europe (Italy, the Danube countries) where climatic and social conditions were more similar to those of Russia. Russian yields, particularly of wheat, were also lower than those of Argentina, Australia, Canada, and the United States.

One often encounters speculation about what are termed the practically unlimited

possibilities of increased yields per acre (and hence production) of grain in Russia. But the inherent possibilities are limited by the dry climate. The reasonable ideal is not the yield in humid western Europe, but the yield in Hungary, or Italy, or Canada. Russia produces hard red wheats, the yield of which never reaches the level of the yield of soft wheats. Climatic disadvantages increase with the expansion of cultivation toward the east, into regions where the annual rainfall is only 12-15 inches, or even less than 12. The general subject, however, warrants examination in perspective. Pertinent data appear in Table 5 (p. 326).

It is important to observe that the data in Table 5 are those collected by the Department of Agricultural Economics and Statistics, and that these differ from statistics of yields gathered by the Central Statistical Committee, being on the whole higher. The former organization received reports from voluntary correspondents numbering about 8,000 just before the war; the latter from secretaries of local administrative units, the volosts. The correspondents of the Department of Agricultural Economics were better than average farmers, and this accounts partly for the higher figures on yields. Vinogradova has shown<sup>1</sup> that the differences in the two sets of statistics resulted mostly from differences in collecting data, and that the Central Statistical Committee's figures "established the level of yield very close to the actual." The Gosplan, however, regards the Central Statistical Committee's estimates of yields as too low.

The data of Table 5 indicate first that yields of each grain were higher by 15 to 20 per cent on estates than on peasant land. Alternative explanations are better cultivation, better seed, or better land on the estates; but of these the main reason must have been better cultivation. If so, the agrarian revolution of 1917-20 could only have tended to lower general average yields; and in turn collectivization accompanied by better machinery and seed and larger fields holds the possibility of an increase in yields. But up to 1929 at least, it

<sup>1</sup> N. M. Vinogradova, "Russian Crop Statistics," *Messenger of Statistics*, XXIII, Nos. 10-12, and XXIV, Nos. 1-6.



is clear that post-war yields must be compared with pre-war yields on peasant land, for from the revolution until 1929 there was practically nothing in Russia to compare with the farming on estates before the war.

USSR is to be anticipated as a result of the shift—rather the contrary.

By regions, wheat yields before the war were highest in northern Ukraine, where moisture was relatively ample and farming relatively intensive; thence it tended to de-

TABLE 5.—AVERAGE YIELD PER ACRE OF BREAD GRAINS ON ESTATES AND ON PEASANT LAND, AVERAGES 1883-1900 AND 1901-1913\*

(Bushels per acre)

Regions	Peasant land		Estates	
	1883-1900	1901-13	1883-1900	1901-13
<b>A. Spring Wheat</b>				
Blacksoil zone, European Russia.....	8.12	9.74	9.23	11.55
Central Agricultural Region.....	8.32	11.10	10.46	12.93
Middle Volga .....	8.12	8.61	8.74	9.92
Lower Volga .....	7.25	7.18	7.83	8.63
Ukraine—right bank of Dnieper.....	9.10	11.59	10.95	13.64
Ukraine—left bank of Dnieper.....	9.03	12.17	10.34	13.80
Southern steppe .....	7.33	9.10	8.90	11.48
Non-blacksoil zone, European Russia.....	9.88	10.88	11.48	11.82
Polish provinces .....	12.04	14.27	12.55	15.12
North Caucasus .....	.... <sup>a</sup>	11.30	.... <sup>a</sup>	12.33
<b>B. Winter Wheat</b>				
Blacksoil zone, European Russia.....	9.43	13.42	11.12	14.47
Central Agricultural Region.....	11.57	12.75	13.29	15.96
Ukraine—right bank of Dnieper.....	12.17	16.63	14.02	18.77
Ukraine—left bank of Dnieper.....	9.65	13.87	11.70	17.01
Southern steppe .....	7.42	10.61	9.45	13.96
Non-blacksoil zone, European Russia.....	11.10	12.73	13.71	14.78
Polish provinces .....	14.05	15.54	15.83	17.30
North Caucasus .....	.... <sup>a</sup>	13.22	.... <sup>a</sup>	14.09
<b>C. Winter Rye</b>				
Blacksoil zone, European Russia.....	9.87	12.37	12.09	15.24
Non-blacksoil zone, European Russia.....	10.87	12.35	13.19	14.26
50 provinces, European Russia.....	10.30	12.25	12.45	14.86
Polish provinces .....	12.18	14.86	14.33	16.46

\* Data for 1883-1900 from *Collection of Statistical Information on Agriculture in Russia to the End of the XIX Century* (St. Petersburg, 1902); for 1901-13, from *Recueil des données statistiques et économiques sur l'industrie agricole en Russie* (Petrograd, 1915).

<sup>a</sup> Data not available.

The figures also show that throughout Russia yields per acre of winter wheat exceeded those of spring wheat. This explains the tendency to shift from spring to winter wheat which began before the war and which is now favored by the government. We have seen, however, that this shift has its limitations (the matter of breeding varieties of winter wheat resistant to winter-killing is discussed below); and since expansion of wheat acreage in the east would maintain the predominance of spring wheat in Russia, no considerable increase in the average yield per acre of all wheat in the

crease toward the south and east. The lowest yields were in Lower Volga, and eastward into the dry area of Central Asia.

The figures on yields of bread grain before the war suggest that agricultural productivity in Russia was not stagnating, but was progressing, if not very rapidly. The increase in yield was more rapid in the blacksoil zone than in the northern area, and was most rapid in the wooded-prairie (relatively intensive farming) area of Ukraine. Here the increases were 30 to 40 per cent between 1883-1900 and 1901-1913. Elsewhere yields increased more slowly,

partly because the improvement of agricultural technique was slower, partly because wheat culture was extending upon drier land.

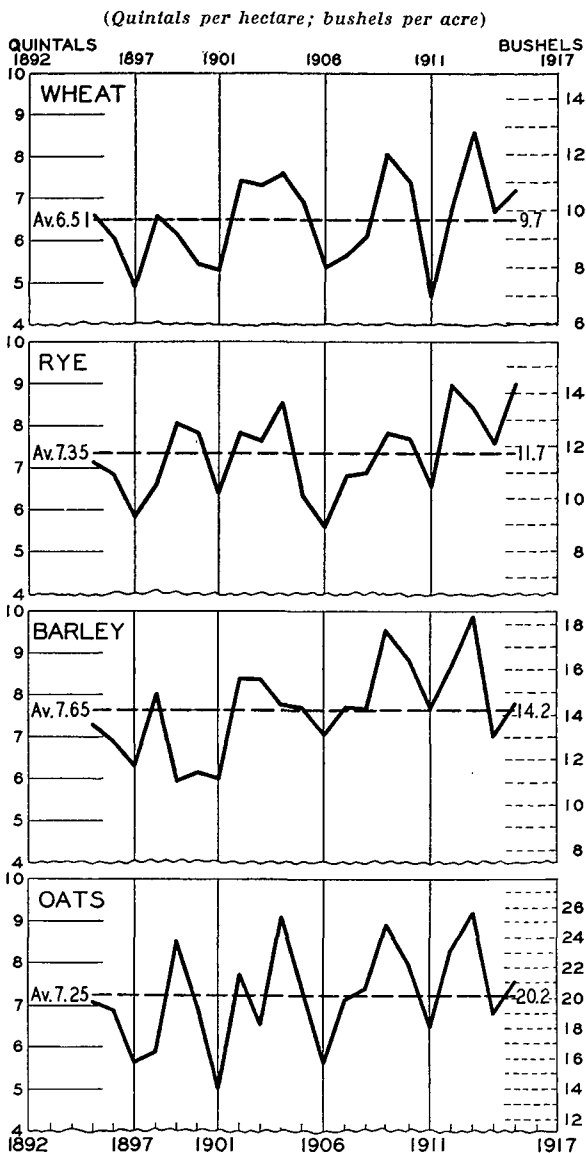
An exhaustive study of the evolution of yields has been made recently in connection with the project of the Soviet government rapidly to increase yields.<sup>1</sup> According to this study, the average yield of all grain increased in 1883-1915 annually on the average by half a pood per dessiatine, or about 1 per cent of the average yield of the period, with more increase on estates than on peasant farms. Winter wheat yields increased most rapidly of the several grains (.7 pood per dessiatine, or 1.4 per cent, as against increases of spring wheat yields of .3 pood or .9 per cent). Increase in yield was ascribed to increasing use of machinery rather than to wider use of fertilizer (either manure or mineral).

Not only are yields per acre of grain low in Russia; they are also highly variable. This may be illustrated graphically by Chart 5, which summarizes data of the Central Statistical Committee comparable with the data on acreage shown in Chart 1, p. 300; post-war statistics are shown in Appendix Table V. By regions, yields are most variable in the southeast, in Trans-Volga, and in the southern steppe of Ukraine. An interesting recent inquiry by Professor Tschetverikoff deals at length with the subject.<sup>2</sup> He found well-defined geographical regions, each characterized by different variability of yield; the regions were closely similar for all of the principal grains.

The highest variability appeared in the southeastern regions of brown and chestnut soils, and in the southern area of the blacksoil zone. The wooded-prairie area showed moderate variability, and the northwestern part of the blacksoil zone the least variability. Since spring wheat predominates in the first area, spring wheat shows the highest variability of yield. But rye is also variable, the typical deviation in the blacksoil zone (from the average yield

1895-1912) being either 15 to 20 per cent or 20 to 25 per cent in most regions, and over 30 per cent in Lower Volga, and as low as

CHART 5.—AVERAGE YIELDS PER HECTARE AND PER ACRE OF THE PRINCIPAL CEREALS IN THE RUSSIAN EMPIRE (72 PROVINCES), 1895-1915\*



\* Data from Appendix Table V. The 72 provinces represent the Russian Empire excluding Turkestan, Transcaucasia, and eastern Siberia.

6 to 15 per cent only north of the blacksoil zone. Winter wheat fluctuated more than rye but less than spring wheat; the principal cause was winterkilling.

It is significant that in the south and

<sup>1</sup> See A. Vainstein, "The Evolution of Yield," *Planning Economy*, 1927, Nos. 7 and 8.

<sup>2</sup> N. S. Tschetverikoff, "Fluctuations of Yields as a Factor Influencing the Stability of Agriculture in Russia," *Problems of Yield* (Moscow, 1926), pp. 138-81.

southeast of European Russia, fluctuations in the yields of the several principal grains correlate closely (spring wheat and rye, for example, showed correlation coefficients of  $+.60$  to  $+.90$  in most provinces of the area). North of the blacksoil zone, there were independent fluctuations. The spring grains (spring wheat, barley, and oats) fluctuated together practically throughout European Russia. Consequently total grain production in Russia is notably variable. With expansion of cultivation to the southeast, this instability tends to increase; agricultural technique needs to be more and more developed in order to combat it.

Post-revolutionary data on yields per acre have differed according to the organizations by which they were issued. Up to 1925, there were estimates issued by the Central Statistical Office; but the Gosplan issued estimates higher than those of the Central Statistical Office, and caused those for later years to be revised upward. From 1924 we have estimates of yield formulated according to the principles and methods of the Gosplan. These figures may be taken as official, and at the same time as representing a homogeneous series. But no homogeneous series is available for all years since the revolution.

For pre-war years, as we have seen, there are available estimates of yields by the Department of Agricultural Economics and also by the Central Statistical Committee; and also of yields on peasant land and on estate land. For comparison with post-war statistics, it seems proper to employ the pre-war statistics of yields on peasant land.

The following tabulation shows pre-war (1905-14 average) yields per acre both on peasant land and on all land according to the two organizations, in bushels per acre:

Crop and organization	Peasant land	All land
Winter rye		
Committee .....	10.04	10.44
Department .....	11.25	12.78
Average .....	10.64	11.61
Winter wheat		
Committee .....	11.06	11.61
Department .....	11.06	13.62
Average .....	11.06	12.62
Spring wheat		
Committee .....	9.38	9.74
Department .....	9.68	10.81
Average .....	9.53	10.28

The ten-year period 1905-14 may be taken as satisfactorily representative, including as it does two years of low yields (1906 and 1911) and two of high yields (1909 and 1913).

For the post-war period we may take six years, 1924-29; earlier statistics are not comparable, and later ones are not available. The following tabulation gives these statistics,<sup>1</sup> in bushels per acre:

Year	Winter wheat	Spring wheat	Winter rye
1924 ....	11.15	8.03	10.67
1925 ....	13.83	11.75	12.59
1926 ....	14.42	11.45	13.22
1927 ....	12.04	8.62	13.70
1928 ....	9.96	11.90	11.95
1929 ....	10.85	8.92	12.43
Average..	12.04	10.11	12.43

Although the period is rather short, the average yield may reasonably be regarded as representative of post-revolutionary conditions.

The average post-revolutionary yields appear to be considerably higher than pre-war yields on peasant land, according to the Central Statistical Committee. If these pre-war yields are taken as 100, the post-revolutionary yields are as follows: winter wheat, 108.9; spring wheat, 107.8; winter rye, 123.8. If we take as the pre-war base the average of the average yields as determined by the two organizations, the relatives are as follows: winter wheat, 108.8; spring wheat, 106.1; winter rye, 116.8. If we reason that this average of the average pre-war yields is the highest reasonable one to be obtained from official statistics (the Department of Agricultural Economics having obtained its data from better-than-average farmers), it still remains true that post-revolutionary yields appear to have exceeded pre-war yields substantially. Moreover, if we could extend the post-war series to include 1923 and 1930, both of which were unquestionably favorable years climatically, there is no doubt that the post-revolutionary figures would exceed the pre-war by even larger percentages than are shown in the comparisons above.

This relationship itself provides a basis for the statement that post-war statistics

<sup>1</sup> Data from official publications, *Statistical Handbook of the USSR for 1928*, and *Agricultural Statistics*.

are not properly comparable with pre-war statistics. The official post-war estimates of average yields are about equal to pre-war figures for average yields on *all* crop land, when these are determined by averaging the estimates of the two pre-war statistical organizations. These would be the highest pre-war figures that it would be reasonable to accept as representative of pre-war Russian yields. But to compare post-war statistics with these would be quite improper because the post-revolutionary technique and methods of agriculture were equivalent to those used before the war on peasant land, not to those used on estates. Now unless it can be shown that the years 1924-29 were more favorable in climate than the years 1905-14, or witnessed superior methods of cultivation, it would follow that the post-war statistics cannot be comparable with the pre-war. Neither of these explanations seems to be tenable.

In any event the official statistical institutions of the USSR openly recognize the lack of comparability of pre-war and post-war statistics. The Gosplan, when comparing pre-war and post-war statistics of yield, raises the pre-war yield per acre by 9 per cent. If we compare the yields of bread grain per sown area as they are given in official post-war statistics with pre-war yields increased by 9 per cent, then post-war average yields would be about on the level of pre-war yields on peasant land. This was presumably the actual situation:<sup>1</sup> there was no increase in average yields per acre. Instability of yield and wide variations from region to region continued to characterize Russian grain production after the revolution as before the war.

The Soviet government has planned to raise grain yields per acre radically and

very rapidly. The early plans (there were several beginning with 1924) were more or less realistic. They presupposed that production would continue to be based upon small peasant farming with slow dissemination of technical progress; the first plan assumed an average yearly increase in grain yield of 1.2 per cent, in accord with the pre-war trend. A later plan projected an increase no larger than 9.2 per cent between 1927-28 and 1931-32. Vainstein, in his detailed analysis of the evolution of yield, went further, and concluded that the maximum possible increase was about 2 per cent per year—a growth about twice as rapid as the pre-war increase in Russia, and equal to the increase of yield in Germany. But he took this position because of the very low level of actual yield and because he assumed a future governmental economic policy more favorable to agriculture than it was when he wrote (1926-27). Still later, in 1928, a special conference of agronomists discussed the known possibilities and methods of increasing yields; their discussion shows that application of these methods would often require considerable reorganization of agriculture and would at best require a considerable period of time.<sup>2</sup>

Nevertheless, a part of the present Five-Year Plan for agriculture is that yields per acre of grain shall be raised by 35 per cent in 5 years, or more than 6 per cent yearly. The principal means of raising yields are listed as follows by the present director of agricultural policy, J. Jakovlev:<sup>3</sup> (1) the introduction of selected seed; (2) better treatment of seed; (3) introduction of tractors and improved agricultural machinery; and (4) measures against crop pests and diseases. To each of these he assigns the possibility of increasing yields by a certain percentage. Our earlier discussion has shown that undoubtedly these yields could be increased by better methods of husbandry. But it is necessary to recall that the Five-Year Plan supposes also a shift in wheat production to the eastern dry regions, a development that can only tend to keep average Russian yields from rising as rapidly as otherwise they might. Under the circumstances, the project to increase grain yields by 35 per cent in five years (winter wheat 40 per cent) can only be considered

<sup>1</sup> N. P. Oganovsky, in "Decline, Recovery, and Reconstruction of Agriculture during the Ten Years 1917-27," *Economic Review*, October 1927, pp. 55-72, concluded that average yields of grain in 1927 if lower than pre-war were only slightly so, though he stated that "existing statistical data do not permit one to establish the average yield of grain crops." From 1927 to 1929 the yields of grain did not increase; hence his conclusion that post-war yields fall below pre-war may hold for the period of 1927-29.

<sup>2</sup> See *Paths of Agriculture*, 1928, Nos. 9 and 10.

<sup>3</sup> See J. Jakovlev, *Struggle for Yield* (Moscow, 1929). This pamphlet presents his report to the fourth session of the Central Executive Committee of the USSR.

as unrealistic, if not fantastic. Improvement of this sort involves a spread of improved method (including equipment adequate to the method) that is unimaginable within the brief space of time allotted. Some years have already passed since the project received official approval; but we find no evidence suggesting that methods of cultivation have changed sufficiently to warrant the inference that the project bids fair to be realized. The more reasonable view is that some tendency for yield to increase may be present, but that the increase can proceed only slowly.

#### CHARACTERISTICS OF RUSSIAN WHEAT

Russian wheat is preponderantly spring wheat; this occupies two-thirds of the total wheat area, and such a relationship is likely to continue as cultivation expands toward the east. How much of the spring wheat is durum is not known; some authorities say about a fifth to a fourth in pre-war Russia.<sup>1</sup> Practically all Russian wheat may be classified as hard wheat. Most varieties of common wheat are red-grained; they are both awned and awnless, and both white-eared and red-eared.

The status of durum wheat is different in Russia from what it is in North America. Flour containing a considerable fraction of durum (50 per cent or more) was considered one of the best Russian flours before the war; it was called "krupchatka," and was produced especially in the flour mills of the Volga region. The durum wheat of the neighboring regions (mostly amber durum) was a premium wheat, seldom exported. Exports of durum wheat came mostly from regions around the Azov Sea, and this wheat was regarded as a less desirable type. In North America and in western Europe, durum wheat is not regarded as a desirable component of bread flour.

Work on selection and improvement of wheat did not begin very early in Russia;

agricultural experiment stations were occupied with other problems of agricultural technique, and before the Stolypin agrarian reform of 1907 only a few were equipped for work on selection. The war intervened before definitive results had been obtained. War and revolution slackened or disorganized the work; but the trained specialists continued to work as best they could, and with revival of the activity of experiment stations in 1924 were soon in a position to secure practical results. The period of experimentation has now passed, and many new varieties have been selected and tested in various networks of experimental plots. By 1928 the work was far enough advanced to define preliminary regions for which particular varieties of spring and winter wheat may be advised as the best fitted, by reason of yield, flour quality, or other features.<sup>2</sup>

In general, the problem in selecting winter wheat has been to develop resistance to winterkilling and at the same time higher yields; the most popular new variety is called "Ukrainka," selected from Hungarian "Banat." But apparently no variety has yet been developed hardy enough to justify a considerable expansion of winter wheat north of the blacksoil zone.<sup>3</sup> Thus far the selection of winter wheats suggests some improvement of yield and quality in old winter-wheat regions rather than expansion into new regions, though some expansion seems probable if the setback of 1928 and 1929 was not too serious.

The main problem in breeding spring wheat is to find varieties that give good and stable yields under conditions of semi-dry or dry farming in eastern Russia. Certain varieties that give good yields have been developed ("Albidum 0721" and "Lutescens 062"), but they are not of superior quality. There is evidence (from the networks of testing plots) that widespread use of the new varieties could increase yields of spring wheat rather substantially.

In 1927-28, the area sown with improved seed in the RSFSR was 3.5 per cent of the total crop area, and in Ukraine 6 per cent; in 1928-29 the figures were 6 and 14 per cent; the plan for 1929-30 was 19 and 37 per cent. The Central Committee of the Communist party decided recently to com-

<sup>1</sup> See N. Jasny, "Der Russische Weizen," *Landwirtschaftliche Jahrbücher*, 1926, p. 421.

<sup>2</sup> See V. V. Talanov, ed., *The Regions of the Best Varieties of Spring and Winter Wheats of the USSR* (Leningrad, 1928).

<sup>3</sup> See V. E. Pisarev, "Winter Wheat in the Non-blacksoil Zone," in V. V. Talanov, ed., *op. cit.*, pp. 85-88.

plete the replacement of common seed of wheat by improved seed in 1933,<sup>1</sup> and in the same year to introduce improved seed on half of the total crop area of rye. How practical this plan may be, we have no way of knowing.

It is difficult to describe the quality of Russian wheats. Data are scarce; there was no official grain inspection system before the war; the samples of export wheat analyzed abroad were not always representative; conditions have changed since before the war.

The Russian climate in general makes the wheat both hard and of high protein content. Russian wheats are strikingly small-grained. The weight of 1,000 kernels is generally lower than is true of Danubian wheats, though these are produced under rather similar conditions. Pre-war German analyses found the average weight of 1,000 kernels of Russian wheat to be about the same as that of Canadian Manitobas or United States hard winter, but considerably lower than that of Roumanian or of American soft winter.<sup>2</sup> Such post-war data as are available indicate that Russian wheat continues to be characteristically small-grained. The weight per measured bushel is on the whole rather low; in post-war years it has been higher for exported wheat than for that retained domestically.

Some idea of the protein content of Russian wheats may be obtained from a study by the United States Department of Agriculture, in which forty samples of Russian wheat of the crops of 1926 or 1927 were analyzed.<sup>3</sup> The conclusion was as follows: "The protein content of the Russian varieties was outstanding. In every instance the percentage of protein was very high." The analyses gave the following results:

Type	Number of samples	Protein content (%)
Hard red spring.....	5	14.51
Durum .....	13	15.28
Hard red winter ....	11	13.00
Soft red winter .....	9 <sup>a</sup>	12.44
White .....	2	10.64

<sup>a</sup> One of the varieties included as soft red winter is, according to Russian sources, spring wheat ("Lutescens 062").

The samples, however, were not adequately representative, for there were (out of a total of 40) only five samples of hard red spring wheat, which makes up around half of the wheat produced in Russia. Samples from the omitted areas (Siberia and the Volga basin) would unquestionably have shown very high protein content.

As would be expected, the protein content was highest in the spring wheat, both bread wheat and durum; and the samples of these types did not cover certain areas where protein content would have been relatively high. By way of comparison, it may be noted that the Canadian Grain Research Laboratory established the protein content of wheat from the three Prairie Provinces (mostly hard red spring) as follows: 11.4 per cent in 1927; 12.3 in 1928; 13.3 in 1929; and 13.1 in 1930. It would not be proper to compare closely the result of the analysis of five samples of Russian hard red spring wheat with these figures; yet Russian analyses<sup>4</sup> suggest that the high figure of 14.51 per cent protein is not exaggerated. These Russian analyses show that protein content of hard red spring wheat varies from region to region, and more so than the protein content varies from variety to variety of spring wheat.

Talanov<sup>5</sup> gives a tentative classification of the Russian wheat area by regions according to the quality of wheat produced. The spring-wheat regions are as follows:

1. The southern steppe zone (blacksoil and chestnut brown soil) of Western Siberia and Central Asia occupies first place: highest weight per hectolitre, highest weight per 1,000 kernels, greatest hardness, highest protein content, and highest percentage of flour yield. But the flour is of only fair baking quality.

2. The central and lower Volga regions and the droughty zone of North Caucasus

<sup>1</sup> *Pravda*, August 3, 1931.

<sup>2</sup> See A. Ploetz and M. Kalning, "Beschaffenheit des Brotgetreides auf dem Deutschen Markt in den Jahren 1911, 1912, und 1913," *Zeitschrift für das Gesamte Getreidewesen* (Berlin, 1924), No. 12. Here quoted from N. Jasny, "Der Russische Weizen."

<sup>3</sup> D. A. Coleman, *et al.*, *Milling and Baking Qualities of World Wheat* (U.S. Department of Agriculture, Technical Bulletin 197), October 1930.

<sup>4</sup> See V. V. Talanov, *ed.*, *op. cit.*

<sup>5</sup> *Op. cit.*, pp. 104, 111 in Russian text, and pp. 139-40 in the English summary.

produce grain of high weight per hectolitre and high weight per 1,000 kernels. The wheat is hard and of high protein content, but the yield of flour only fair. In baking quality the flour of wheat from this region is the best in the USSR.

3. The wooded-prairie area of Western Siberia usually produces grain of medium weight per hectolitre but of high weight per 1,000 kernels. It is moderately hard, but with protein content medium or below; the yield of flour is high, but the baking strength only medium.

4. The moister zone of North Caucasus produces wheat low in weight per hectolitre and per 1,000 kernels. Here the wheat is least hard, and least high in protein content (though Ukraine is not included in the comparison). The yield of flour and the baking strength are below medium.

The winter-wheat regions are as follows:

1. The southern steppe of Ukraine and the zone of scanty rainfall in North Caucasus produce the winter wheat of highest quality (highest weight per hectolitre, hardness, highest yield of flour, and best baking strength).

2. The wooded-prairie area of Ukraine on the left bank of the Dnieper and the Central Blacksoil Region produce winter wheat of fair quality (high weight per hectolitre, large heavy grains, but somewhat lower hardness and milling and baking qualities).

3. The humid zone of North Caucasus and the comparatively moist western part of Ukraine usually produce winter wheat of but medium quality. It has smaller kernels, and is of lower weight per hectolitre than in the preceding regions; is less hard, and has a smaller yield of flour and poorer baking strength.

Although all analyses recognize the generally high protein content of Russian wheat, opinions are less favorable regard-

ing the baking qualities of flour made from Russian wheat. We have seen that in Russia, but not elsewhere, a heavy admixture of amber durum wheat was regarded as resulting in a superior flour. The study of the United States Department of Agriculture led to the conclusion that "Russian spring wheats appear to be somewhat deficient in baking strength when compared with those grown in North America and South America"; Russian hard red winter wheat was found to be "lacking in baking strength"; but Russian soft red winter was found to be much better than wheats grown in western Europe. Pre-war Russian export wheats were classified by D. W. Kent-Jones as high in protein content, but the protein was said to be "of rather a runny nature";<sup>1</sup> and the wheat was said to produce flour of poor flavor and dull color. Yet a German specialist, M. P. Neumann,<sup>2</sup> regarded Russian wheats as very serviceable for German conditions, and as giving a certain strength and plasticity to the dough. There was therefore some difference of opinion. Specialists familiar with Russian conditions, however, generally insist that after Canadian, Russian wheats are the strongest.<sup>3</sup> Before the war, wheat merchants and millers in western Europe had developed great skill in selecting Russian wheats by sample. Despite lack of grading and often heavy and sometimes surprising admixtures of non-wheat and dirt, experts were able to obtain hard wheats which fulfilled every requirement for blending; the recent revival of Russian exports provoked the same experience. The place of Russian hard wheat in the bread program of western Europe is not defined by comparing flour made from Russian wheat with flour made from North American hard wheat according to their behaviors in making American type of bread. Moreover, Europeans have become less dependent on strong wheat.

## VI. CROPS AND THEIR DISPOSITION

### THE PRE-WAR PERIOD

Regular crop statistics began to appear in the Russian Empire in 1883. But it was not until 1892 that data covering grain production in all of European Russia were obtained; not until 1895 that the major pro-

ducing provinces of Asiatic Russia were included; and not until 1907 that the statistics

<sup>1</sup> *Modern Cereal Chemistry* (Liverpool, 1924), p. 25; see also P. A. Amos, *Processes of Flour Manufacture* (London, 1925), pp. 22-27.

<sup>2</sup> *Brotgetreide und Brot* (Berlin, 1923), p. 283.

<sup>3</sup> See, for example, N. Jasny, *op. cit.*, pp. 446-47.

covered all provinces of the Russian Empire.

The following tabulation shows pre-war wheat and rye production in terms of five-year averages and in million quintals (a) in 64 provinces of European Russia and (b) in 72 provinces of European and Asiatic Russia.<sup>1</sup> The figures for European Russia cover all of the designated territory; those for European and Asiatic Russia cover all bread-grain-producing provinces of the designated area except Transcaucasia, Turkestan, and eastern Siberia. Supplementary data, including production of barley and oats, are given in Charts 6, 7, and 8.

Period	Million quintals		Relatives	
	Wheat	Rye	Wheat	Rye
IN 64 PROVINCES OF EUROPEAN RUSSIA				
1893-1897.....	102.7	193.0	100	100
1898-1902.....	117.6	209.9	114	109
1903-1907.....	143.2	202.2	139	105
1908-1912.....	161.7	215.0	157	111
1909-1913.....	180.7	225.9	176	117
IN 72 PROVINCES OF EUROPEAN AND ASIATIC RUSSIA				
1895-1900.....	113.5	203.8	100	100
1901-1905.....	161.1	220.1	142	108
1906-1910.....	170.7	204.2	150	100
1909-1913.....	203.1	232.1	179	114

Within the European territory, wheat production increased in 16 years by 76 per cent, rye production by much less. In the Russian Empire (excluding the three mentioned provinces), wheat production increased 79 per cent during a shorter period, rye production again by much less. The growth of wheat production in the Empire was more rapid than in the European territory alone, for wheat was the dominant crop in the Asiatic territories where agriculture was expanding most rapidly.

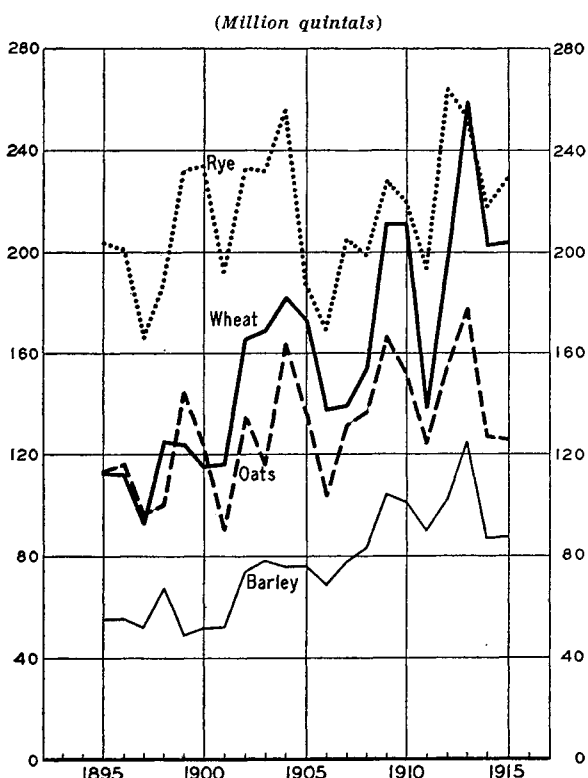
The following tabulation shows, in million quintals, average wheat and rye production in 1909-13:

Area	Wheat	Rye	Total
Russian Empire .....	221.8	234.2	456.0
72 provinces .....	203.1	232.1	435.1
64 European provinces..	180.7	225.9	406.6

Practically all rye was accounted for in the statistics covering 72 provinces; of the three omitted Asiatic areas, only eastern Siberia

produced more than a negligible amount of rye. But this area, together with Transcaucasia and Turkestan, produced 8.4 per cent of the wheat crop of all the Russian Empire in 1909-13. These three Asiatic provinces, however, were deficiency regions in bread grain, importing (a little from

CHART 6.—PRODUCTION OF THE PRINCIPAL CEREALS IN THE RUSSIAN EMPIRE (72 PROVINCES), 1895-1915\*



\* Data from Appendix Table III. Figures for 1914-15 exclude territory occupied by the enemy.

abroad but mostly from other areas of Russia) an average of 6.3 million quintals of wheat (including flour) and 0.4 million quintals of rye. Consequently the 72 provinces covered by the longer series of statistics may be regarded as the source of Russian grain exports. Moreover, the 64 provinces of European Russia may be so regarded, for only 0.3 to 0.5 million quin-

<sup>1</sup> Official data of the Central Statistical Committee, compiled from A. K. Broshniovsky, *Conditions for the Sale of Russian Grain Abroad* (Petrograd, 1914), and *Recueil de données statistiques et économiques* (Petrograd, 1915).



tals of wheat from Asiatic Russia were exported annually in the decade before the war, and only 1.8 to 2.0 million quintals of bread grain went to European Russia—that is, less than went from European Russia to the deficiency areas of Asiatic Russia.

In view of these facts, the difference between production in European Russia and exports of the Russian Empire may be regarded as a good approximation to domestic consumption (retention) within the territory of European Russia. The following tabulation summarizes the pertinent data in million quintals except as noted.<sup>1</sup>

Five-year period ending	Production	Exports <sup>a</sup>	Percentage exported	Domestic retention	Per capita retention <sup>b</sup>
<b>WHEAT</b>					
1897.....	102.7	34.6	33.7	68.1	0.6
1902.....	117.6	24.7	21.0	92.9	0.8
1907.....	143.2	40.2	28.1	103.0	0.8
1912.....	161.7	40.0	24.7	121.8	0.9
1913.....	180.7	43.9	24.3	136.8	1.0 <sup>c</sup>
<b>RYE</b>					
1897.....	193.0	12.5	6.7	180.5	1.7
1902.....	239.0	14.6	7.0	195.3	1.7
1907.....	292.2	11.9	5.9	190.2	1.6
1912.....	215.0	7.4	3.4	207.7	1.5
1913.....	225.9	7.9	3.5	217.9	1.6 <sup>c</sup>

<sup>a</sup> Grain and flour together. Conversions assume 75 per cent extraction for wheat, 85 per cent for rye.

<sup>b</sup> Quintals. Population statistics as follows for European Russia, in millions:

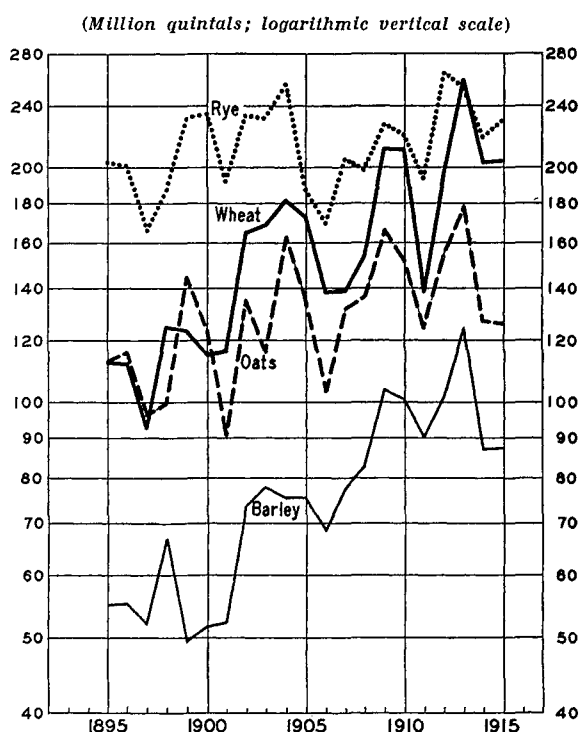
1893-1897.....	105.5	1908-1912.....	135.6
1898-1902.....	112.1	1909-1913.....	138.2
1903-1907.....	122.6		

<sup>c</sup> Equivalent to about 3.7 bushels of wheat, and 6.3 bushels of rye.

It is clear that total domestic retention of wheat was increasing very rapidly. Rye was roughly twice as important as wheat; but the per capita consumption of rye was falling, while that of wheat was rising. The per capita consumption of the two bread grains taken together was, however, about stationary; though it is to be remembered that the per capita statistics include seed use on an expanding bread-grain area. The shift from rye to wheat rested mainly upon the relatively more rapid growth of the urban population, which consumed relatively

more wheat than the rural population; and also upon the relatively more rapid growth of the rural population in the southeast, where wheat was the principal bread grain even in rural areas. There was not much of a tendency for the rural population to

CHART 7.—PRODUCTION OF THE PRINCIPAL CEREALS IN THE RUSSIAN EMPIRE (72 PROVINCES), 1895-1915\*



\* Data from Appendix Table III. Figures for 1914-15 exclude territory occupied by the enemy.

shift from rye to wheat consumption, for wheat was a cash crop in the areas where both wheat and rye were extensively grown.

Wheat exports were about a fourth to a third as large as wheat production, and (as will later appear) about the same quantity went to domestic markets. In the two decades preceding the war, domestic retention increased more rapidly than exports: not only of rye, but also of wheat. Although the volume of wheat exports was increasing while rye exports were tending to decline, the percentage of the crop exported tended to decline rather continuously and regularly. This is even more apparent if we consider total Russian exports as percentages of production in 72 provinces:

<sup>1</sup> Data chiefly from A. K. Broshniovsky, *op. cit.*, p. 155.

	Wheat	Rye
1895-1900 .....	26.6	6.7
1901-1905 .....	24.1	6.6
1906-1910 .....	22.8	4.0
1910-1913 .....	21.6	3.4

Production for the market increased, with both peasants and estates selling more of their output shortly before the war than they had done 15 or 20 years earlier; much more grain went to domestic markets while a smaller proportion went to export. In the Russian Empire as a whole, the railways transported only 21.6 per cent of the wheat crop in 1895-1900, but 28.8 per cent in 1909-13; corresponding figures for rye were 5.7 and 6.3 per cent. The growth of the importance of the interior market as

cent. As for rye, 40.7 per cent of the rail shipments went to domestic markets in 1895-1900, and 59.3 per cent to export harbors; but in 1912 the figures were 59.7 and 40.3 per cent respectively.<sup>1</sup>

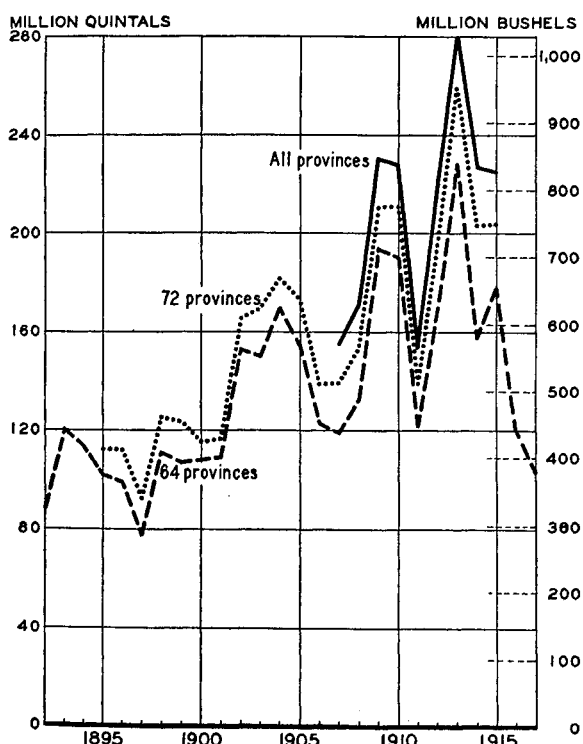
Despite the growing importance of the domestic market, many regions continued to be predominantly export regions, and in fact tended to increase the fraction of their rail shipments that went to export. The following figures show what percentages of total wheat shipments by rail went to export in 7 important regions in 1901-03 and in 1908-11:<sup>2</sup>

Regions	1901-03	1908-11
Southern steppe of		
Ukraine and Don....	66.7	70.5
North Caucasus .....	66.1	75.1
Trans-Dnieper .....	70.0	72.0
Dnieper-Don .....	26.0	26.5
Volga-Don .....	9.5	47.3
Middle Volga .....	3.6	30.0
Trans-Volga .....	11.7	41.5

Thus the regions surrounding the Black Sea continued to produce wheat mainly for export, and the importance of the export market was increasing substantially for the Volga regions.

The foregoing statistics serve mainly to characterize the dynamics of grain disposition; but since wheat and rye were marketed by water and by carts as well as by rail, they do not serve to show how large a fraction of the bread-grain crop was marketed from farms. In 1909-13, shipments of wheat by rail and water amounted to 34.5 per cent of the total production of the Russian Empire, and of rye 9.8 per cent; about three times as much wheat was shipped by rail as by water, and about twice as much rye. Kondratieff<sup>3</sup> estimated that in 1909-13 about 55.7 per cent of the wheat produced in the surplus regions was marketed by rail, water, and carts, and about 23.3 per cent of the rye. Peasants marketed 51.3 per cent of their wheat and 21.5 per cent of

CHART 8.—WHEAT PRODUCTION IN THE RUSSIAN EMPIRE (64, 72, AND ALL PROVINCES), 1893-1917\*



\* Data from Appendix Tables III and IV. Territories covered are described in note to Chart 3, p. 301.

compared with the export market may be illustrated by the fact that in 1895-1900, of all wheat shipped by rail, 41.8 per cent went to interior markets and 58.2 per cent to export harbors; whereas in 1912 the corresponding figures were 59.9 and 40.1 per

<sup>1</sup> These figures presumably somewhat overstate the growth of importance of the domestic market for wheat, for the crops of 1911 were relatively short.

<sup>2</sup> Data from P. Liashchenko, *Grain Husbandry and the Grain Trade of Russia and Germany* (Petrograd, 1915), pp. 34-35.

<sup>3</sup> N. D. Kondratieff, *The Grain Market* (Moscow, 1922), pp. 14-15 and 204-23.

their rye; corresponding figures for estates were 81.1 and 42.0 per cent.

In absolute figures, Kondratieff estimated that total marketings in the grain-surplus regions, on the average in 1909-13, were as follows in million quintals:

	Wheat	Rye
Total .....	94.8	35.4
By peasants .....	75.8	29.6
By large estates. ....	19.0	5.7

As the author himself recognizes, these figures may understate the importance of marketings from estates, for they are based upon the census of 1916, taken at a time when production on estates was curtailed on account of the war. Nevertheless it is clear that large estates did not market more than half as much wheat as was exported. Complete disappearance of their surplus from the market could not in itself create a deficiency on the interior markets, with cessation of exports. The difficulties in the domestic grain supply which appeared after the revolution are not to be explained wholly by the confiscation of large estates.

The following figures, in million quintals, give more detailed statistics on the disposition of the bread grains in the Russian Empire<sup>1</sup> on the average for 1909-13:

Grain	Production	Seed use	Net exports	Domestic consumption
Wheat ...	221.8	40.2	42.7	138.9
Rye .....	234.2	40.3	6.6	187.2
Total ....	456.0	80.5	49.3	326.1

The figures for domestic consumption represent food use mainly, for little wheat or rye was fed to animals. Only the bran was not used for domestic human consumption.

In terms of per capita consumption, the figures above come to 83 kilograms of wheat per year, 112 of rye, 195 of both. These figures are considerably lower than comparable pre-war figures for some importing countries, particularly France, where the

per capita consumption of wheat was 223.5 kilograms.<sup>2</sup> Yet in Russia the per capita consumption was some 9 kilograms higher than in Austria-Hungary, which among the larger countries of western Europe was most closely comparable with Russia, being largely agricultural, with a high percentage of rural population, a large Slavic population, and a comparatively low standard of living. Consequently it is improper to say that Russia was on a "hunger standard" of grain consumption. It is something of an exaggeration to say that before the war Russia exported grain heavily because her own population did not consume enough bread. The really low per capita disappearance was not of bread grain, but of fodder grains—oats, barley, and corn; Russian exports of grain were high because of poor feeding of livestock rather than because of low human consumption of bread grain. Neither the United States nor Canada had as high per capita consumption of bread grain as Russia, though fodder grains were much more heavily consumed. So it was with Germany, if allowance is made for rather extensive use of rye for feed. In Russia, moreover, fairly substantial quantities of buckwheat and millet were used for human food (mostly as grits for porridge), these grains making up about 10 to 15 per cent of the grain consumed for food.

We shall see later that per capita bread-grain consumption in Russia was not increased after the revolution, as was sometimes asserted by Soviet statisticians; and that it is unreasonable to suppose that post-war exports fell below pre-war on account of expansion of per capita consumption in comparison with pre-war standards.

Subsequent comparisons are facilitated by insertion at this point of crop disposition statistics (1909-13 averages, in million quintals) applicable to the present territory of the USSR.

Grain	Production	Seed use	Net exports <sup>a</sup>	Domestic consumption
Wheat ...	206.3	36.9	44.5	124.9
Rye .....	188.9	33.4	7.6	147.9
Total ....	395.3	70.4	52.1	272.6

<sup>1</sup> Production according to the Central Statistical Committee. Net exports from *Production, Transportation, and Consumption of Grain in Russia in 1909-13* (Petrograd, 1916). Seed requirement for wheat 123 kilograms per hectare, for rye 133 kilograms, according to statistics of the Central Statistical Committee for 1905-14.

<sup>2</sup> In western Europe, however, more wheat was used for feed per capita than in Russia.

<sup>a</sup> Including the imports from other Russian provinces into the western provinces lost after the war. This causes net exports of 1909-13 from the present territory of the USSR to exceed net exports from the Russian Empire.

The per capita consumption of the two bread grains together was practically the same in the present territory of the USSR as in the Russian Empire (195.7 kilograms as against 195); but since the lost provinces consumed relatively more rye than wheat, than was true for the Empire, wheat consumption per capita averaged 90 as against 83 kilograms, and rye consumption 106 as against 112.

#### THE WAR PERIOD, 1914-17

The cessation of bread-grain exports during the war greatly altered the disposition of Russian crops. Exports of wheat and rye were as follows, in million quintals:<sup>1</sup>

Years	Wheat	Rye
1909-13 av.....	42.4	6.6
1914 .....	24.1	3.8
1915 .....	1.8	1.0
1916 .....	2.4	1.0
1917 .....	0.1	0.03

Exports were sizable in 1914 because of normal exports before the war began. By 1917 they were negligible. But bread-grain production decreased relatively much less, as may be illustrated by the following figures on combined crops of wheat and rye (not including, however, territory occupied by the enemy after 1914), in million quintals:<sup>2</sup>

Years	Million quintals	Relatives
1909-13 av....	456.0	100.0
1914 .....	456.7	100.0
1915 .....	480.8	105.6
1916 .....	373.8 <sup>a</sup>	82.0
1917 .....	355.0	77.9

<sup>a</sup> Professor S. S. Demosthenov, who was in 1916-17 a member of the staff of the Secretariat of the Special Committee on Food Supply, regards this estimate as too low. See *Food Supply in Russia during the World War* (New Haven, 1930), p. 310.

On account of the good crops of 1914 and 1915 and the curtailment of exports, Russia

<sup>1</sup> Official data, as cited in N. D. Kondratieff, *The Grain Market* (Moscow, 1922), p. 5. These are exports across European frontiers, including the Black Sea; they include flour as grain.

<sup>2</sup> Data for 1909-13 to 1915 according to the Central Statistical Committee; for 1916, according to the Secretariat of the Special Committee on Food Supply; for 1917, according to A. E. Lositsky, *Crops of Grain in 1917*. Quotations from N. D. Kondratieff, *op. cit.*, p. 43.

<sup>3</sup> On these matters see *Food Supply in Russia during the World War*.

during the war had larger quantities of bread grain available for domestic consumption than she had on the average in the five pre-war years. Unless domestic consumption increased, stocks must have been heavy at the end of the war.

There is some evidence of increase in consumption. Soldiers had a bread ration larger than the pre-war average per capita consumption, and it seems probable that grain consumption among the rural population increased somewhat. Yet this alone cannot account for the great decline in the quantity of grain marketed. Nor can the decline in grain marketed be accounted for either by the decline of production on estates or the smaller decline on peasant farms. The peasants lost interest in selling grain: their need for money became less, their expenditures decreased, or they were able to obtain money from other sources. Prohibition curtailed expenditures for liquor; there were government allowances to soldiers' families; money was obtained for requisitioned horses and cattle and for hauling government freight; opportunity to spend was restricted by the shortage of manufactured goods.<sup>3</sup> It was this situation that restricted the marketed grain supply, and not shortage of grain or expansion of domestic consumption. The extent of the decline in marketed supplies is suggested by the fact that shipments of wheat by rail were 25.8 per cent of the total crop in 1909-13, but only 19.6 per cent in 1914 and 14.3 per cent in 1915.

In general, peasant economy tended toward self-sufficiency, a development that had its origin early in the war but became more marked after the revolution. In the country as a whole there was accumulation of stocks. This accumulation enabled peasants to maintain consumption during the early years of the revolution before the famine of 1921. The withholding of grain by peasants created such difficulties that the Provisional Government introduced the Grain Monopoly in 1917. Monopolization of the grain markets was inherited by the Soviet government and was continued.

#### THE POST-REVOLUTIONARY PERIOD

It is impossible to obtain for post-revolutionary years a series of crop statistics

comparable with pre-war official statistics. Up to 1926-27, two different statistical organizations published different statistics, but in that year the views of the Gosplan prevailed, and earlier estimates of crops by the Central Statistical Office were superseded. The Office had sought to obtain statistics comparable with the official pre-war data; the Gosplan regarded these pre-war figures as understating the facts. Hence in order to achieve comparability between the Gosplan's statistics and the official pre-war statistics, the pre-war figures (for identical boundaries) have to be raised by about 19 per cent. Chart 9 shows the wheat statistics of the Central Statistical Office in contrast with those of the Gosplan.

Both sets of data show that in 1920 the production of bread grain had fallen to about half of the pre-war level; and both sets of data show that in the famine year 1921 production of wheat was only 30 per cent of the pre-war level, of rye not much over 50 per cent. The Gosplan estimates show a much greater degree of recovery in 1922. The estimates for 1923 and 1924 again came somewhat closer together, even though there is evidence that the Central Statistical Office considered its estimates as overstating rather than understating the facts for comparison with the pre-war official statistics. The two sets of statistics agree in showing that in 1924 wheat production was close to 50 per cent of the pre-war level, and rye about 90 per cent.

It is important here again to emphasize the fact that the statistics of the Gosplan are not comparable with official pre-war statistics. This has been openly stated by the principal statisticians of the Gosplan, but it seems not to be well known outside of Russia. It does not follow, however, that the pre-war official statistics have been clearly and unequivocally demonstrated to have understated pre-war production; there is no general agreement on this point among Russian statisticians. It is not unreasonable to regard the Gosplan's crop estimates as too high, a subject about which more will be said later. Furthermore, it is important to observe that even for years after 1925, crop statistics published in one source often disagree with those published in another, the later sources usually giving higher fig-

ures than the earlier ones. In subsequent analysis we employ the latest and consequently the highest figures.

The following tabulation, in million quintals, shows the post-war disposition of wheat and rye crops,<sup>1</sup> averages for the years 1925-26 to 1928-29, in comparison with averages for 1909-10 to 1913-14:

Grain	Production	Seed use	Net exports	Domestic consumption
AVERAGES FOR 1909-10 TO 1913-14				
Wheat .....	206.3	36.9	44.5	124.9
Rye .....	188.9	33.4	7.6	147.9
Total .....	395.2	70.3	52.1	272.8
AVERAGES FOR 1925-26 TO 1928-29				
Wheat .....	222.2	37.4	5.6	179.2
Rye .....	226.2	36.3	1.9	188.0
Total .....	448.4	73.7	7.5	367.2

The decline in exports is the most striking feature of the tabulation; from 21.6 per cent of the production in 1909-13, exports of wheat fell to 2.5 per cent, and exports of rye fell from 4.0 to less than 1 per cent. Although exports are discussed more fully later, it is necessary here to say something in explanation of this striking decline.

At first glance it seems possible to explain this decline by reference to an increase in per capita domestic retention (consumption). The figures above, indeed, yield per capita domestic retention statistics as follows, in kilograms:

Grain	Pre-war	Post-war
Wheat .....	90	120
Rye .....	106	126
Total .....	196	246

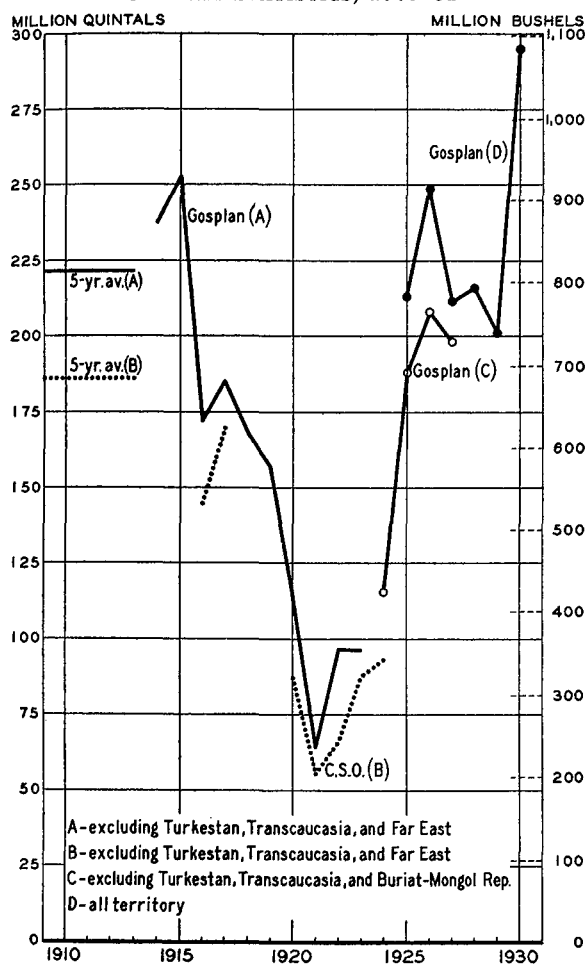
But before accepting increase of per capita consumption as the main explanation of the decline in exports, we must consider consumption in its component parts, with reference to consumption of bread grain as food and as feed, and to changes in stocks.

It is clearly unreasonable to suppose that the period 1925-26 to 1928-29 could have witnessed an upbuilding of stocks of such

<sup>1</sup> Data mainly from Appendix Tables IV and VI. Seed requirements for wheat 123 kilograms per hectare, for rye 133 kilograms.

a magnitude that allowance for the change would reduce per capita disappearance from 246 kilograms of bread grain to something close to the pre-war figure of 196 kilograms. Estimates of changes in stocks exist, and these show an increase of 36.6 million

CHART 9.—WHEAT PRODUCTION IN PARTS AND ALL OF THE USSR, ACCORDING TO DIFFERENT OFFICIAL STATISTICS, 1909–31\*



\* Data from Appendix Tables III and IV.

quintals between the summer of 1925 and the summer of 1929.<sup>1</sup> We do not find it easy to reconcile this increase with the extreme difficulties encountered by the Soviet government in collecting grain in 1927–28 and 1928–29, with the elaborate system of espionage in the country that must have

made concealment of stocks extremely difficult, and with the fact that the estimates of stocks show the accumulation at the end of the period to have constituted a larger fraction of the net crop of bread grain than was the case in pre-war years according to pre-war estimates. Increase of stocks is altogether credible for 1925–26 and 1926–27, but substantial diminution seems more probable in 1927–28 and 1928–29.

Even if stocks were increased by 36.6 million quintals in the period 1925–26 to 1928–29, allowance for this increase would reduce per capita consumption in the period only to 240 kilograms per year, a figure much in excess of the pre-war average of 196 kilograms. Soviet economists advance two explanations of the relatively high post-war figure: increase of human consumption as the result of improved material conditions among the peasantry, and wider use of bread grain for livestock feeding than was the case before the war.

Something of a check upon the theory that per capita human consumption of bread grain was larger in post-war than in pre-war Russia is feasible by reference to budget statistics dealing directly with consumption. The following tabulation<sup>2</sup> shows per capita consumption of *all* grain in 14 provinces (partly grain-deficiency areas and partly grain-surplus areas) in terms of index numbers, with pre-war statistics taken as 100.

Period	Deficiency area	Surplus area
1919–20 Jan.–Feb. . . . .	77	96
1920–21 Nov.–Dec. . . . .	83	70
Feb. . . . .	81	67
1921–22 Oct. . . . .	85	56
Feb. . . . .	77	48
1922–23 Oct. . . . .	95	97
Feb. . . . .	98	99
1923–24 Feb. . . . .	100	103
June . . . . .	106	102
1924–25 Oct. . . . .	108	96
Feb. . . . .	98	90
June . . . . .	107	92
1925–26 Oct. . . . .	101	98
Feb. . . . .	102	98
1926–27 Oct. . . . .	98	96
Feb. . . . .	96	96
1927–28 Oct. . . . .	97	100

These figures, relating to human consumption of all grain by peasant families, suggest that post-war per capita food-grain

<sup>1</sup> *Statistical Handbook of the USSR for 1928*, pp. 236–37.

<sup>2</sup> Data from *ibid.*, p. 853.

consumption seldom exceeded the pre-war consumption to an appreciable extent.

Further statistics of per capita consumption are available for the years 1923-24 to 1926-27, covering the whole territory of the USSR. The data are as follows,<sup>1</sup> in kilograms per capita:

Year	All grain products	Wheat flour	Rye flour	Other flour	Grains	Other grains
RURAL POPULATION						
1923-24.....	242	43	146	16	32	5
1924-25.....	229	54	134	12	26	3
1925-26.....	232	67	125	15	22	3
1926-27.....	229	72	120	11	23	3
URBAN POPULATION						
1923-24.....	196	79	94	1	19	3
1924-25.....	175	103	54	3	14	1
1925-26.....	178	115	47	1	14	1
1926-27.....	172	115	43	1	12	1

If we average the data on consumption of wheat and rye flour, convert the figures to obtain consumption of wheat and rye grain, and give appropriate weights to consumption in the city and in the country,<sup>2</sup> the outcome is a figure for per capita bread-grain consumption of about 214 kilograms. This is higher than the pre-war figure of 196 kilograms, but lower than the post-war (1925-26 to 1928-29) figure obtained from crop, export, and seed statistics of 246 kilograms, or of 240 kilograms with allowance for changes in stocks. This set of statistics therefore does not accord with the preceding set, for it suggests fairly substantial increase of per capita bread-grain consumption between pre-war and post-war years. However, Soviet statisticians when they estimate the human consumption of grain themselves reduce the figures in the tabulation above by 5 per cent in order to eliminate overstatement supposed to arise from the unrepresentative character of the

families which gave the data on consumption; such a reduction would bring the per capita bread-grain consumption in 1923-24 to 1926-27 to 204 kilograms, or less than 5 per cent above the pre-war figure. More than this, since the figures show a decline in per capita consumption between the period 1923-24 to 1926-27 and the period 1925-26 to 1928-29, it may be said that direct official Soviet statistics of consumption show at best only a small increase in human consumption of bread grain per capita between 1909-10 to 1913-14 and 1925-26 to 1928-29. The evidence pointing to substantial increase lies principally in the crop statistics.

From 1923-24 to 1926-27, total human grain consumption (rather, consumption of grain products) tended to fall. Wheat-and-rye consumption remained stationary or rose a little in the rural districts, but declined somewhat in the city. Rye consumption declined, and wheat consumption increased. Since, as we have seen, Russian bread-grain consumption before the war had tended to shift from rye to wheat, the similar tendency apparent from the figures above was not a new one. It was rather a tendency that had been reversed by the revolution, when wheat production declined much more than rye production; after 1923 the drift to wheat began again. The figures suggest that even by 1926-27 wheat consumption may have been a slightly smaller fraction of per capita bread-grain consumption than it was before the war—roughly 45 per cent in 1926-27, and 45.7 per cent in 1909-13.

Our analysis of consumption statistics does not substantiate the theory that increase in the per capita domestic disappearance of bread grain is to be explained by increase in human consumption of bread grain, nor does it show that wheat consumption increased relatively to rye consumption in post-war as compared with pre-war years.

It remains to consider whether or not the increase in apparent per capita bread-grain consumption from 196 to 246 (240) kilograms between pre-war and post-war years can be explained by reference to increase in the use of bread grain for animal feed. This is a field for statistical speculation, and one

<sup>1</sup> Official data, here taken from A. Lositsky, "Dynamics of Grain Consumption," *Statistical Review*, 1927, No. 12.

<sup>2</sup> Conversions of wheat and rye flour used by the rural population and rye flour used by the urban population each at 88 per cent; of wheat flour used by the urban population at 75 per cent. The approximate distribution of population between city and country was 20 and 80 per cent respectively.

in which there may be wide differences of opinion. Official estimates of the total consumption of all grain by livestock have run as follows, in million quintals:

1923-24 .....	90
1924-25 .....	60
1925-26 .....	184
1926-27 .....	209
1927-28 .....	205

The great apparent increase between the first two and the last three years is not to be explained by an increase in the number of livestock. There was no mention of the use of wheat as feed in an official investigation of 1923-24. Yet detailed statistics show that in 1926-27, if the total amount of grain fed was 209 million quintals, some 60 million must have been wheat and/or rye. One may estimate that of this there may have been roughly 40 million quintals of bran, leaving nearly 20 million quintals to have been fed as grain. Some other data suggest that it must have been wheat that was so used, if in fact this use was made of bread grain. That is, one may calculate per capita human consumption of wheat and rye in 1926-27 as 215 kilograms (95 of wheat and 120 of rye), on the basis of the consumption statistics given above. At this figure, on the average in the period 1925-26 to 1928-29, the average yearly consumption of wheat would have been 142 million quintals, of rye 180 million. Yet the crop statistics show for the same period 179 million quintals of wheat left available for domestic disposition, and 188 of rye. Hence it would follow that very little rye was available to feed livestock, and a good deal of wheat. We find ourselves unable to accept the notion that the most valuable bread grain, wheat, would have been fed rather than rye. Nor does it seem probable that the estimates of grain consumption by livestock are sufficiently well founded upon statistical evidence. The view that per capita disappearance of bread grain increased between pre-war and post-war years on account of an expansion in feed use seems to us to be untenable; and so also with explanations that involve either increase of human per capita consumption or increase in stocks.

The more tenable explanation seems to be that the pre-war and post-war statistics

of bread-grain crops are not comparable, and hence that the apparent increase in per capita disappearance of bread grain from 196 to 246 kilograms is almost entirely a statistical phenomenon, and not an indication of an actual occurrence. Speculation about increased per capita human consumption of bread grain in Russia, and about increased use of grain for livestock, is in fact superfluous, and arises from the incomparability of statistics. As we have said, this is implicit in certain Soviet publications. The Gosplan itself publishes statistics of the production of all grain, with comparisons in which 1913 is taken as 100, as follows:<sup>1</sup>

1913 .....	100.0
1925 .....	91.3
1926 .....	96.0
1927 .....	90.2
1928 .....	89.1
1925-28 .....	91.7

The comparison involves increasing the pre-war official estimates (over a period of years like 1909-13, or the ordinate of trend, but not a single year like 1913) of total grain production by 19 per cent. In such calculations, acreage is increased by 9 per cent, and ordinates of trend of yields by 9 per cent. But figures are not published for the several grains separately. Thus if we increase 1909-13 official statistics of wheat and rye together by 19 per cent, and then calculate per capita disappearance, the pre-war figure is 242 kilograms, which is much the same as the Gosplan's figure of 246 kilograms for 1925-26 to 1928-29. But the same procedure gives discrepant figures for wheat and rye separately—for wheat, 106 kilograms pre-war and 120 post-war, and for rye 136 pre-war and 126 post-war.

If we consider the Gosplan's own statistics as given in the tabulation above, production of all grain in 1925-28 was only 91.7 per cent of production in 1913; and per capita production was only 85.6 per cent of 1913. In 1909-13, 87.5 per cent of the total production was retained domestically; post-war production was only 85.6 per cent of 1909-13 production; consequently even without post-war exports, post-war total

<sup>1</sup> Data from *Control Figures for 1928-29 and Control Figures for 1929-30*.



domestic consumption must have fallen below the pre-war. We take it that this was in fact the course of events—all the more so because there were in fact exports of grain amounting to about 3 per cent of the production in 1925–26 and 1926–27, and no substantial offset by imports in 1927–28 or 1928–29. We believe that this was in general true of the bread grains, wheat and rye, which constitute so large a fraction of Russian grain production, though it is true that official Soviet comparisons of pre-war and post-war production do not extend to the several grains individually.

We find it impossible to reach a definitive conclusion regarding the relative accuracy of pre-war and of post-war statistics. Neither, perhaps, sets forth the facts with complete accuracy. Yet it must be said that there is not much convincing evidence to suggest that pre-war statistics of production were as much as 19 per cent too low, for even if areas were understated, yields per acre seem to have been measured fairly accurately. At the same time it seems that a policy of arriving at liberal estimates of post-war crops would have fitted in with procedures employed in fixing the quantities of grain to be collected. The manner in which the earlier estimates of the Central Statistical Office were discarded in favor of higher estimates does not seem to bear the stamp of a purely disinterested and scientific procedure. We therefore incline to the opinion that recent official Russian crop statistics tend somewhat to overstate the facts, though it does not follow that overstatement amounts to as much as 19 per cent, the amount by which the Gosplan raises pre-war official statistics.

#### RAILWAY SHIPMENTS OF BREAD GRAINS

We have already observed that the quantity of bread grain marketed from farms declined greatly during the war and early revolution; peasant farming became more and more self-sufficient, and in addition output was curtailed. Even with the recovery of grain production after the introduction of the NEP, marketable surpluses of grain did not increase in proportion to the recovery of production. Statistics of grain transportation provide the best available measure for determining the flow of

grain to markets, aside from strictly rural marketing. These data, which are considered in the following paragraphs, have the advantage of being based upon actual records; in no way do they involve arbitrary estimates.

The quantities of wheat and rye transported by rail, by interior waterways, and coastwise are shown in Table 6, with pre-

TABLE 6.—SHIPMENTS OF WHEAT AND RYE IN THE USSR BY RAILROADS, INTERIOR WATERWAYS, AND COASTWISE, PRE-WAR AND POST-WAR\*

(Million quintals)

Years	Wheat				Rye			
	Total	Rail-roads	Inter-ior water-ways	Coast-wise	Total	Rail-roads	Inter-ior water-ways	Coast-wise
Average 1909–13 <sup>a</sup> . .	78.1	57.3	19.2	1.5	23.4	15.4	7.6	0.3
1913. . . . .	76.6	56.8	18.0	1.8	22.3	12.7	9.2	0.4
1922–23. . .	11.4	9.3	0.9	1.2	37.0	33.4	3.3	0.3
1923–24. . .	19.0	17.1	1.0	0.9	37.7	33.3	3.9	0.4
1924–25. . .	27.7	23.9	2.8	1.0	21.5	18.5	2.5	0.5
1925–26. . .	43.8	37.9	2.8	3.1	19.1	16.0	2.3	0.8
1926–27. . .	55.1	49.9	3.1	2.1	22.6	20.2	2.0	0.4
1927–28. . .	45.5	40.5	2.7	2.3	21.3	18.9	2.0	0.4
1928–29. . .	47.8	....	...	...	12.8	....	...	...

\* Data for 1909–13 from *Production, Transportation, and Consumption of Grain in Russia* (Petrograd, 1916), published by the Special Committee on Food. Data for 1913 and 1922–23 to 1925–26 from *Data upon the Dynamics of Freight Transportation* (Moscow, 1927), Issue 3, published by the Central Statistical Office of the USSR. Data for 1926–27 to 1928–29 from *Statistical Review*, 1928, No. 8, p. 62, and 1929, No. 8, p. 82. Data on railroad transportation for 1925–26 to 1927–28 are according to *General Statistics of Transportation by Railroads for 1927–28*, Vol. I, published by the People's Commissariat of Communication. Data for 1928–29 are preliminary.

<sup>a</sup> Territory of the Russian Empire.

war and post-war comparisons. Shipments, particularly of wheat, had not recovered to the pre-war level in any post-war year at least prior to 1929–30. The table lends emphasis to the fact that in the earliest post-war years of recovery, the whole country was using mostly rye bread; rye shipments to cities were even larger than before the war, while wheat shipments were strikingly small. Wheat shipments were larger after 1925–26, and about equalled pre-war shipments minus pre-war exports. During 1927–28 and 1928–29 shipments of both grains declined from the level of 1926–27; these were years characterized by great difficul-

ties in collecting grain for the cities, and by cessation of exports as well.

If we express these shipments as percentages of total production (using pre-war official production statistics for pre-war years), the results are as follows:

Year	Wheat shipments	Rye shipments
1909-13 (Russian Empire) .....	35.2	10.0
1913 (USSR) .....	29.2	10.5
1922-23 .....	13.2	21.0
1923-24 .....	18.2	20.2
1924-25 .....	26.0	12.4
1925-26 .....	20.6	8.4
1926-27 .....	22.1	9.5
1927-28 .....	21.6	8.9
1928-29 .....	22.1	6.7

Even after 1925-26, when according to the Gosplan's estimates bread-grain production had presumably reached 92 per cent of the pre-war level, the percentage of wheat marketed was less than two-thirds of the pre-war percentage; only a little more than a fifth of the crop was marketed as compared with a third in pre-war years. Rye also became less of a commercial crop. The problem in the USSR is therefore to increase not only bread-grain production, but also the portion of the crop that is brought to market.

The agrarian revolution, with its equalization of peasant holdings, accelerated the tendency for peasants to limit production of grain for the market which had appeared during the war. The NEP led to something of a reversal of this tendency; but after 1926-27, with Soviet policy directed against the well-to-do peasants who created the marketable surpluses, the tendency set in again, and was apparent up to 1930. The price policy of the Soviet government, which kept agricultural prices (particularly of grain) low in relation to industrial prices, was an important factor in curtailing marketable surpluses; the new policy that favors large-scale state and collective farms is designed not only to increase production, but also the proportion of the output that is marketed.

Statistics of shipments by rail also permit us to see which grain surplus areas were mainly responsible for the decline of grain surpluses destined for different do-

mestic regions and for export. Table 7 summarizes such statistics by regions for certain pre-war and post-war years. It

TABLE 7.—RAILROAD SHIPMENTS OF BREAD GRAIN AND FLOUR FROM THE PRINCIPAL GRAIN-SURPLUS AREAS OF THE USSR\*

(Thousand quintals)					
Region	1901	1913	1925-26	1926-27	1927-28
<b>WHEAT</b>					
Central Blacksoil ....	1,576	2,847	556	951	775
Southern steppe ....	15,816	28,951	22,731	21,532	20,250
Volga .....	5,820	14,787	3,305	9,269	2,457
Asiatic area .....	3,401	7,003	9,266	16,339	12,085
Total surplus area.	26,613	53,588	35,848	48,091	35,567
<b>RYE</b>					
Central Blacksoil ....	3,499	2,244	1,185	3,198	5,240
Southern steppe ....	5,346	4,784	7,309	6,342	5,416
Volga .....	3,420	3,641	3,402	5,550	3,849
Asiatic area .....	245	993	2,199	2,437	1,880
Total surplus area.	12,510	11,662	14,095	17,525	16,381
<b>FLOUR (ALL KINDS)</b>					
Central Blacksoil ....	4,066	5,044	1,876	3,238	4,281
Southern steppe ....	6,889	14,286	15,840	14,441	17,083
Volga .....	6,403	9,167	4,677	7,401	6,312
Asiatic area .....	2,515	4,979	5,517	5,951	6,283
Total surplus area.	19,873	33,476	27,910	31,031	33,959
<b>WHEAT FLOUR</b>					
Central Blacksoil ....	....	....	1,059	1,751	1,793
Southern steppe ....	....	....	12,714	11,455	14,263
Volga .....	....	....	2,695	4,587	3,311
Asiatic area .....	....	....	4,414	4,844	5,431
Total surplus area.	....	....	20,882	22,637	24,798
<b>RYE FLOUR</b>					
Central Blacksoil ....	....	....	803	1,478	2,474
Southern steppe ....	....	....	3,063	2,936	2,681
Volga .....	....	....	1,968	2,802	2,992
Asiatic area .....	....	....	1,041	1,100	846
Total surplus area.	....	....	6,875	8,316	8,993

\* Compiled from *General Statistics of Transportation by Railroads for 1927-28* (Moscow, 1929), published by the People's Commissariat of Communication.

should be observed that since shipments by waterways cannot be included, and since shipments by water were less important in post-war than in pre-war years, the figures

cited tend to swell the post-war shipments as compared with the pre-war.

Even so, post-war rail shipments of wheat in a period as late as 1925-26 to 1927-28, when grain production had recovered substantially, were considerably below the pre-war (1913) level. Shipments of rye, however, were relatively larger, though not by enough to offset the decline in wheat shipments. It was only in 1926-27, the best agricultural year since the war except for 1930-31, that combined shipments of wheat and rye equaled those of 1913 (which were close to average shipments in 1909-13); and in making this comparison one must remember that shipments by waterways, larger before the war than after, are omitted.

It is clear that all three of the European surplus areas were responsible for this decline, but most of all the Volga region. This region shipped on the average in 1925-26 to 1927-28 only a third of its pre-war shipments. The shipments varied widely from year to year; in some post-war years, the Volga region could not even supply its well-developed flour-milling industry with wheat. In general this situation represents the severe blow struck by the famine of 1921, from which full recovery had not been made even by 1927-28. The reduced shipments from the Volga had to be replaced by shipments from other areas.

Wheat shipments from the southern regions bordering the Black Sea (formerly the chief wheat-exporting regions of the Russian Empire) also declined considerably, averaging in 1925-26 to 1927-28 about three-fourths of the pre-war level. These regions were called upon to replace the decreased surpluses from the Volga; the other European surplus area, the Central Black-soil Region, had not been a wheat surplus region before the war, and could help but little. Hence the southern regions, typical exporting areas before the war, became the source of wheat and wheat flour for the domestic markets. Moreover, these regions became less distinctively wheat-shipping regions, and turned more to rye.

Unlike the European areas, the Asiatic surplus area increased its shipments of bread grain, particularly wheat; it was by shipments from Asia that the decline in shipments from the Volga region was

largely replaced. The pre-war governmental railroad rate policy had not favored movement of Siberian wheat to eastern domestic markets. The post-war policy was different under the stress of domestic shortage of marketable surpluses; it perhaps went too far in disregarding the cost of hauling grain over long distances. In considerable degree the important rôle of the Asiatic surplus area in shipments of bread grain (one-third of the wheat in 1925-26 to 1927-28, as against an eighth in 1913) represents the result of intensive colonization in the decade just before the war. The fact that Siberia, whence wheat must be hauled over long distances and at considerable expense, has risen in importance as a wheat-surplus area, is of some importance in the outlook for Russian exports. In 1928-29, when there was heavy winterkilling, Siberia became the principal source of wheat for all of the USSR.

Changes in the importance of surplus bread-grain areas may be illustrated more completely by reference to statistics of net excess (or net deficit) of bread grain based upon statistics of transportation both by rail and by water, for a period covering 1913 and 1922-23 to 1928-29. These data are summarized for exporting regions in Table 8; account is also taken of exports and imports.

First of all it is clear that net excesses of wheat declined much more than shipments by rail, wheat grain declining much more than wheat flour because cessation of exports affected grain rather than flour shipments, and perhaps also because there has been a tendency to produce flour in surplus rather than in deficiency regions. In the period 1925-26 to 1929-30, which according to the Gosplan witnessed recovery of production of all grain to over 90 per cent of the pre-war level, the excess of wheat in surplus areas came to only about half of the pre-war excess.

The Volga region had an excess of wheat only in years of high yields, 1926-27 and 1928-29, and in other years shipped in wheat for milling; flour shipped out except in 1928-29 fell below pre-war outward shipments of flour. Although the southern steppe area had wheat surpluses not more than a third of the pre-war magnitude, the

cessation of exports from this area released a larger supply for interior markets than was so directed before the war. In this area the excess of wheat flour was maintained much better than the excess of wheat; and excesses of rye and rye flour even stood

plus area, with some help from the Volga region, had to supply with wheat practically the whole deficiency area of the USSR, a fact that lends emphasis to the changes in the location of surpluses in post-war years.

TABLE 8.—NET EXCESS (+) OR DEFICIT (—) OF BREAD GRAIN AND FLOUR BY PRINCIPAL GRAIN SURPLUS REGIONS OF THE USSR\*

(Thousand quintals)

Regions	1913 <sup>a</sup>	1922-23 <sup>a</sup>	1923-24 <sup>a</sup>	1924-25 <sup>a</sup>	1925-26 <sup>a</sup>	1926-27 <sup>a</sup>	1927-28 <sup>b</sup>	1928-29 <sup>b,c</sup>
WHEAT								
Central Blacksoil .....	— 680	— 157	— 222	— 798	— 1,367	— 2,127	— 1,486	— 2,364
Southern steppe .....	+28,538	+ 1,511	+ 8,710	+ 2,495	+11,353	+ 8,807	+ 7,591	— 2,237
Volga .....	+10,648	— 408	+ 8	— 1,648	— 122	+ 3,391	— 2,921	+ 1,710
Asiatic surplus area.....	+ 4,143	+ 891	+ 928	+ 5,617	+ 5,232	+ 9,845	+ 7,611	+12,455
Total surplus area.....	+42,649	+ 1,637	+ 9,425	+ 5,666	+15,095	+19,916	+10,795	+ 9,563
WHEAT FLOUR								
Central Blacksoil .....	+ 1,093	— 58	— 234	— 561	— 33	+ 1,041	+ 2,086	+ 1,827
Southern steppe .....	+10,967	+ 3,288	+ 5,961	+ 6,020	+10,659	+ 9,240	+ 9,857	+ 2,512
Volga .....	+ 4,560	+ 223	+ 469	— 81	+ 1,316	+ 3,280	+ 2,766	+ 6,222
Asiatic surplus area.....	+ 1,307	— 71	+ 130	+ 1,917	+ 1,784	+ 1,610	+ 1,242	+ 3,558
Total surplus area.....	+17,927	+ 3,384	+ 6,326	+ 7,294	+13,726	+15,171	+15,951	+14,119
RYE								
Central Blacksoil .....	+ 653	+ 5,361	+ 3,273	— 2,056	— 346	+ 1,561	+ 3,549	— 34
Southern steppe .....	+ 5,120	+ 5,833	+15,647	+ 1,842	+ 5,103	+ 4,980	+ 3,125	+ 562
Volga .....	+ 7,215	+ 474	— 27	+ 2,743	+ 2,013	+ 3,679	+ 2,565	+ 1,856
Asiatic surplus area.....	+ 1,049	— 383	+ 507	+ 3,374	+ 1,284	+ 1,320	+ 871	+ 1,813
Total surplus area.....	+14,037	+11,284	+19,400	+ 5,903	+ 8,053	+11,540	+10,109	+ 4,197
RYE FLOUR								
Central Blacksoil .....	+ 2,351	+ 751	+ 683	— 78	+ 474	+ 1,728	+ 1,487	+ 1,294
Southern steppe .....	+ 667	+ 319	+ 1,787	+ 338	+ 2,671	+ 2,451	+ 3,405	+ 263
Volga .....	+ 5,790	+ 371	+ 394	+ 1,596	+ 1,598	+ 2,689	+ 2,163	+ 3,260
Asiatic surplus area.....	+ 279	— 30	+ 295	+ 882	+ 323	— 226	+ 570	+ 576
Total surplus area.....	+ 9,086	+ 1,411	+ 3,159	+ 2,739	+ 5,066	+ 6,342	+ 7,625	+ 5,366

\* Condensed from data in *Statistical Review*, Nos. 8 (1928) and 9 (1929).

<sup>a</sup> October–September.

<sup>b</sup> July–June.

<sup>c</sup> Preliminary.

above the pre-war level. In general, the data of Table 8 confirm and supplement those of Table 7. The main facts are the decline in the importance of the Volga surplus area; the decline in the southern steppe area, its shift from an area exporting abroad to one supplying the domestic market, and its tendency to ship out more rye; and the rise in importance of Siberia as a surplus area. In 1928-29, the Asiatic sur-

This variability in the sources of supply helps to explain the persistent difficulties of the Soviet government in collecting grain. It is obvious that the organization for grain collection must be decidedly flexible and well managed when collecting activities must be concentrated on the Black Sea coast in one year and on the steppes of Central Asia and Siberia in the next.

We have so far considered only the grain-

TABLE 9.—NET INFLOW (—) OR OUTGO (+) OF BREAD GRAIN AND FLOUR IN THE PRINCIPAL GRAIN-DEFICIENCY AREAS OF THE USSR\*

(Thousand quintals)

Regions	1913 <sup>a</sup>	1922-23 <sup>a</sup>	1923-24 <sup>a</sup>	1924-25 <sup>a</sup>	1925-26 <sup>a</sup>	1926-27 <sup>a</sup>	1927-28 <sup>b</sup>	1928-29 <sup>b,c</sup>
WHEAT								
European deficiency area.....	- 6,367	- 621	-1,016	-2,077	- 3,063	- 4,084	- 4,825	- 7,760
Transcaucasia .....	- 1,099	- 109	- 325	- 571	- 814	- 471	- 1,035	- 1,221
Turkestan .....	- 664	- 766	- 468	-1,087	- 3,650	- 3,293	- 3,646	- 2,682
Total .....	- 8,130	-1,496	-1,809	-3,735	- 7,527	- 7,848	- 9,506	-11,663
WHEAT FLOUR								
European deficiency area.....	-10,542	-2,994	-6,097	-8,224	-10,885	-11,520	-12,106	-10,683
Transcaucasia .....	- 1,368	- 414	- 437	-1,442	- 1,821	- 1,845	- 2,093	- 1,636
Turkestan .....	- 1,730	- 96	- 137	- 152	- 792	- 995	- 1,421	- 1,205
Total .....	-13,640	-3,504	-6,671	-9,818	-13,498	-14,360	-15,620	-13,524
RYE								
European deficiency area.....	- 6,828	-6,135	-7,290	-6,403	- 6,506	- 6,379	- 8,174	- 3,909
Transcaucasia .....	- 276	- 53	- 49	- 102	- 5	- 36	- 116	- 65
Turkestan .....	- 42	+ 54	- 66	- 29	+ 2	- 71	- 132	- 9
Total .....	- 7,146	-6,134	-7,405	-6,534	- 6,509	- 6,486	- 8,422	- 3,983
RYE FLOUR								
European deficiency area.....	- 7,474	-1,393	-3,115	-2,464	- 5,157	- 5,957	- 6,648	- 4,474
Transcaucasia .....	- 20	- 6	- 15	- 15	- 4	- 5	- 2	- 22
Turkestan .....	- 43	+ 7	- 6	+ 2	- 2	- 5	- 32	- 3
Total .....	- 7,537	-1,392	-3,136	-2,477	- 5,163	- 5,967	- 6,682	- 4,499

\* For sources of data, see footnote to Table 8, p. 345.

<sup>a</sup> October-September.<sup>b</sup> July-June.<sup>c</sup> Preliminary.

surplus areas. Table 9 summarizes net receipts for bread grain and of flour in the principal deficiency areas. In the European deficiency area, net receipts of wheat (including flour) were about the same in 1925-26 to 1928-29 as in 1913, but receipts of rye were relatively small. In view of the rapid growth of the city population, it is clear that the needs of this area were much less well filled after than before the war. The deficiency of the Asiatic areas increased substantially, especially that of Turkestan. Here a shift from wheat to cotton production during the war and again in recent years was important; this shift raises the new problem of supplying parts of Asia as well as much of European Russia with increased supplies of bread grains. In view of the relatively small excess supplies of

wheat and rye in surplus areas, and also of the increased needs of deficiency areas, it is difficult to understand from what sources the exports of bread grain in 1925-26 and 1926-27 were gathered.

#### THE MILLING INDUSTRY

Flour milling before the war was about equally divided between commercial mills and small rural wind- and watermills. Rye was ground mostly in small country mills; in general, peasants used flour ground in their own or in village mills. The city population used flour from commercial mills. In 1909, in European Russia, about three-fourths of the rye and one-fourth of the wheat was ground in country mills. On account of the long distances required to haul grain to railroads and flour from com-

mercial mills, and on account of the poor roads, the peasants gained by local milling of their grain; they were apparently satisfied with a coarse flour. Bread was and is baked at home, not in village bakeries. In post-war years there has been even less incentive to buy flour from commercial mills, for the shortage of grain compelled the government to require very high extraction.

The available statistics on flour milling are meager. Commercial flour mills numbered roughly 2,500 before the war, rather less in 1925; loss of territory and civil war caused the reduction. Very few of the pre-war commercial mills were really large mills; only 200 to 350 milled annually more than 5,000 tons of grain. The number of country mills was roughly estimated as 141,000 in 1908 and 241,000 in 1925, but the increase seems to be mainly a statistical phenomenon. Each village had several wind or watermills; the silhouettes of several windmills around a village are typical in Ukraine and the steppe area.

Commercial flour mills were located mostly in grain-surplus regions. Of the grain-deficiency regions, only the Upper Volga had a fairly well-developed industry, particularly in Rybinsk and Yaroslavl. To Rybinsk, an old milling center, wheat came by water from the Middle Volga, and rye from the basin of the Kama, tributary to the Volga. Nizhnii-Novgorod was perhaps the largest milling center of the Empire, famous for its large mills and their "krupchatka" flour; it is located on the Volga and the Oka, on the frontier of the Volga grain-surplus area adjoining the deficiency area of Central Industrial Russia. In the Volga surplus area there were other milling centers, notably Saratov and Samara. The flour mills on the Volga were the largest in Russia. Their location at once on the great waterway and on railways enabled them to draw grain advantageously not only from the Volga basin, but also from Trans-Volga, Ural, and Siberia; transit milling was common. East of the Volga there were only two large milling centers, one in Orenburg on the railroad from Turkestan to the Volga basin, the other in Chelyabinsk on the frontier between European Russia and Siberia. The rise in the importance of Siberia has

involved plans for expanding the milling industry there.

The oldest milling center was in the Central Agricultural Region south of Moscow (Elets, Livny, Borisoglebsk, Tambov, Voronezh). It milled in 1908 around half as much grain as the Volga mills, though mostly rye. Ukraine was also an old milling center, next in importance to the Volga region, but with smaller mills. These mills used less durum wheat than the Volga mills and more soft wheat; hence they produced flour more like that in Hungary or Roumania. Exports went to the Baltic provinces, White Russia, and Poland. The milling industry in North Caucasus is of more recent origin, but was of considerable importance before the war. Flour from Stavropol and Kuban provinces was famous for high quality. North Caucasus sent flour mostly to Transcaucasia and parts of Turkestan, and also as far north as St. Petersburg. Along the north coast of the Black and Azov seas there were also milling centers—Rostov-on-Don and Odessa particularly. Flour from Rostov, of high quality, was sold not only domestically but also in the Near East and a little in western Europe.

Pre-war Russia thus had a moderately well-developed milling industry. The war and revolution involved disorganization and some destruction, though perhaps not a large amount. New construction began only rather recently; Soviet appropriations have gone principally for repairs and reconstruction of mills inherited from the old régime.

The following tabulation shows the number and volume of grinding of commercial flour mills of factory type for five years beginning with 1923-24:<sup>1</sup>

Year	Number of mills	Grain ground (million quintals)		
		Wheat	Rye	Total
1923-24	.... 1,533	25.60	15.56	41.16
1924-25	.... 1,755	33.65	15.79	49.44
1925-26	.... 1,826	53.24	18.18	71.42
1926-27	.... 1,833	62.74	22.65	85.39
1927-28	.... 1,867	68.89	24.83	93.72

The recovery during the period of the NEP was substantial, particularly as regards

<sup>1</sup> Compiled from *Yearbook of the Grain Trade* (Moscow, 1928 and 1929), No. 1 and No. 2.

wheat milling. But even in 1927-28 less grain was milled than had been milled in the Russian Empire in 1908, when the grindings of 2,416 commercial mills in European Russia had been 108 million quintals. This decline is not to be explained by loss of territory, for in the western grain-deficiency areas there were few commercial mills, and the post-war figure includes grindings of Asiatic mills not covered by the figure for 1908. The smaller post-war outturn of commercial mills supports our earlier analysis which showed a decline in the marketed crop of bread grain. The milling statistics, moreover, were not much affected by the cessation of exports, for flour exports had always been small.

After the revolution, commercial flour mills were nationalized along with other industries. The NEP witnessed considerable leasing to private entrepreneurs, especially of the smaller mills; some mills were turned over to co-operative organizations. The policy changed beginning with 1925-26, and by 1927-28 very few mills were operated by private entrepreneurs. Commercial mills privately operated had furnished 19.6 per cent of the gross flour production of all commercial mills in 1923-24, and 15.1 per cent in 1925-26; but only 2.5 per cent in 1927-28. Country mills remained in the hands of peasants until recently, when they were presumably collectivized.

The larger commercial mills are now mostly operated by the principal state grain-collecting organizations, formerly the *Khleboprodukt* and now the *Soiuzkhleb*. The smaller ones are largely operated by co-operative collecting agencies, principally the Central Union of Consumers'

Co-operatives. With such monopolization and centralization, one might have expected an improvement in operation. It is clear from official publications, however, that the general difficulties of grain collection and the lack of stocks have made operations erratic in most mills, and that the changing location of grain surpluses has resulted in great variations in activity from year to year. In order to assure continuity of mill operation, grain has sometimes been moved in irrational directions: for example, from North Caucasus to Ukraine and at the same time from Ukraine and Siberia to the Central Blacksoil Region.<sup>1</sup>

With the Turkestan-Siberian railroad now completed, so that Turkestan can draw supplies from Siberia, half of the projected construction of flour mills in the five-year period (a total milling capacity of 26 million quintals) is destined for Asiatic regions; but construction is proceeding slowly.<sup>2</sup>

On account of the difficulties of grain collection, there was practically no white flour or white bread in Russia, at least in the crop years 1927-28 to 1929-30; the wheat and rye flour supplies had to be stretched by higher extraction and by admixture of barley and corn. In 1926-27, the extraction ratio for wheat was made 75 per cent; but in the fall of 1927 the ratio was raised to 80 per cent; and in 1928-29 to 85 per cent, yielding a flour necessarily far from white, to which, moreover, 15 per cent of rye flour was added. As early as 1927-28, corn meal was mixed with rye and wheat flour. Perhaps the requirements were less drastic in 1930-31, following a good crop; but some evidence suggests that white flour remained scarce.

## VII. DOMESTIC MARKETING AND EXPORTS

Certain aspects of domestic marketing in Russia have been considered in the preceding section in connection with discussion of grain shipments and of the milling industry. It remains to consider particularly the system of "grain collections" under the Soviet regime and the flow of grain to export both before and after the war. Some description of roads, the railways and wa-

terways, and the elevator system is useful as background.

### TRANSPORTATION

Grain (sacked) is usually moved from farms to railway stations or waterways in

<sup>1</sup> *Yearbook of the Grain Trade*, No. 1, p. 43; No. 2, p. 24.

<sup>2</sup> *Economic Life*, July 11, 1930, August 29, 1931.

carts drawn by horses or oxen (often camels in Central Asia). The distances are rather long, the roads distinctly poor. Attention has always fallen upon railways rather than roads. Road construction is often expensive because local building materials are lacking over wide areas. Public roads are about 3 million kilometers in length, but macadamized and improved roads less than 50 thousand kilometers. In the rainy season, transportation on roads becomes practically impossible everywhere. Hence grain must be hauled either early in the fall, or in winter when the ground is frozen and snow provides highways. It will be very difficult to introduce automotive transport, not only because of the very poor roads but also because of the long cold winters.

Rapid development of the Russian railway system began after the abolition of serfdom in 1861. Before 1863 there were only 2,000 kilometers of railway. A wave of construction in 1869-78 added over 15,000 kilometers, but only about 10,000 kilometers were built in 1879-93. The years 1894-1903 witnessed the construction of over 25,000 kilometers, some of it in Asia. The Trans-Siberian railroad was opened in the middle 'nineties, and another road was built extending across Central Asia from the Volga region to Tashkent and farther southeast; these roads opened new regions for colonization. Only about 12,000 kilometers were built in 1904-13.

At the end of 1913 the mileage was 70,500 kilometers, with 58,500 within the present territory of the USSR. The Russian system was smaller only than that of the United States. Two-thirds of it was owned by the state. Several railroads were in course of construction at the outbreak of the war, a part of a new plan of extensive construction. Important roads were completed during the war. One connected Petrograd with the Arctic Ocean. Another (the Amur railroad) connected Siberia with the Pacific at Vladivostok, wholly within Russian territory. New tracks were laid on the Trans-Siberian railroad in Western Siberia and Ural. Several roads were built in Ukraine and North Caucasus. The war-time construction amounted to about 12,000 kilometers, and in addition some 13,000

kilometers were far enough in course of construction at the time of the revolution that 4,000 could be opened for traffic in the first seven years of the Soviet regime. Construction between 1924 and 1929 was not very rapid; about 1,000 kilometers were opened for traffic per year. In general, Soviet construction has represented completion of roads begun earlier, and not new undertakings. This is true even of the important railroad connecting Turkestan and Siberia, which was begun in 1914-15 and completed in 1930.

The main purpose of the early railways was to connect Moscow and St. Petersburg with the agricultural regions of central European Russia. In the early 'seventies this link was made, and several railways radiated from Moscow to the south, southeast, and east. Somewhat later roads were built connecting the agricultural center with the Baltic ports—from Tsaritsin (now Stalingrad), Saratov, and Syzran on the Volga, and from northern Ukraine, to Riga and Libau. Roads were also built in the south and southeast extending to ports on the Black and Azov seas. The early system favored the Central Agricultural Region and the Middle Volga, which (unlike the southern regions) were otherwise poorly connected with either interior or foreign markets; evidence of this lies in the fact that in the 'seventies grain exports from Baltic ports grew more rapidly than those from Black Sea ports.

Railways built in the 'nineties and later, however, opened domestic and foreign markets to the new agricultural regions in southeastern and eastern European Russia and in Asia. Competition arose between these new regions and the older agricultural center, and contributed to an agricultural crisis in the latter. The government regulated railway rates so as to reserve the domestic market for the agricultural center, and to promote the flow of exports on the one hand from regions around the Black Sea and on the other from newly colonized regions east of the Volga. Siberian grain, however, was not accorded the full benefit of low rates on long hauls until shortly before the war. Maintenance of this rate structure was abandoned after the revolution, either because grain had to be col-



lected where it could be found, or because not much attention was paid to cost of transportation. The average haul for grain in 1925-26 and 1926-27 was at least double what it was in 1913.<sup>1</sup> This fact helps to explain the extreme strain on the transportation system observable in recent years. With longer post-war hauls, costs of transportation before the war amounted to one-seventh to one-sixth of the price paid to producers for wheat, whereas in 1926-27 it amounted to nearly one-fourth.<sup>2</sup>

Grain producers in the distant regions, particularly Siberia, now seem to have some advantages as compared with producers in European Russia, having a wider market than they had before the war. Distances from farms to railways, however, are much greater in the Asiatic and Trans-Volga regions than in the southern and central agricultural regions of European Russia. In general, the railway net is too thinly spread. Even in Ukraine and the Central Blacksoil Region, many farmers have to haul grain 15, 20, or even 25 miles—a situation to be found elsewhere in Europe only in such Balkan countries as Roumania and Bulgaria. Expansion of the railway net is particularly necessary if grain production is to expand in the Asiatic areas which hold the significant possibilities for expansion of the crop area.

There can be little question that the railway system is now overstrained, that expansion is needed to keep pace with growth of trade and population, and that it is difficult to obtain the capital required for expansion. The requirement for railway services is increasing more rapidly than the services themselves—not because of grain, but because of other products. This makes the problem of expansion of the railway net even more pressing, in view of the general objective of industrializing the country. In the west expansion is necessary for industry, in the east for agriculture, at least if industry is itself to grow rapidly in the west and agriculture in the east.

Interior waterways were important before the war in the movement of grain,

though their importance was relatively declining as the railway net expanded. About a fourth of all grain hauled other than by cart was moved on interior waterways in the 'nineties, and a fifth even as late as 1911-13. But in 1925-26 to 1927-28, only 7-8 per cent of the grain was transported on waterways, and since then recovery has been slow. One reason is that water transport was a private enterprise, and nationalization was a larger task than was the case with railways. In this period, when grain shipments by rail and water together amounted to more than four-fifths of shipments in 1913, shipments by waterways were only one-fifth of those of 1913. Perhaps grain shipments were so badly needed that the faster method of movement was preferred. Shipments of lumber and petroleum by waterways recovered much better than shipments of grain.

Before the war the Volga system was the most important waterway for grain; half of all the grain and grain products moved by water was transported in the basin of the Volga. Shipments went mostly to interior markets, upstream to the milling centers. A system of canals connected the Volga with St. Petersburg. Some grain went down-river to export, in which event it was transferred to the railroad at Tsaritsin and sent to Novorossiisk. Projects for a canal between the Volga and the Don have long been discussed, and are endorsed by the Soviet government, but technical difficulties stand in the way.

Such rivers as the Dnieper, the Don, and the Bug, all flowing into the Black Sea, were of more or less importance for transportation of grain. Rapids below Ekaterinoslav (now Dnepropetrovsk) handicapped movement on the Dnieper, but below the rapids a good deal of grain moved down-river to Kherson for export. Shipments down the Bug went to Nikolaev, down the Don to Rostov-on-Don on the Azov Sea. Construction of a dam at the rapids on the Dnieper, and canalization, have been begun, and completion of the projects will enhance the importance of the Dnieper and serve the major part of the Ukrainian agricultural region.

In Siberia, the systems of the Ob and the Irtysh were important arteries of water

<sup>1</sup> See *Inter-regional Freight Traffic on Railroads for the Years 1926-27 and 1927-28* (Moscow, 1930), pp. 88-89.

<sup>2</sup> *Ibid.*

transport, partly because of the lack of railways. But the Ob flows into the Arctic Ocean, and hence does not provide a feasible outlet for exports. Connection of the Ob with the Volga by canal, a project contemplated before the war, would be of great economic importance, though not so much for grain as for coal and iron.

#### TERMINALS, ELEVATORS, AND GRAIN INSPECTION

Before the war, Russian grain exports went mostly through ports of the Black and Azov seas—not only wheat and barley, but rye also. In 1909-13, these ports handled three-fourths of the rye exports, four-fifths of the wheat, practically all of the barley, and all of the corn. Only oats went mostly through Baltic ports, largely Libau and St. Petersburg. Roughly the same situation prevailed after the revolution.

The principal ports are Odessa, Nikolaev, Kherson, and (to the east) Novorossiisk on the Black Sea; and Rostov-on-Don and such secondary harbors as Berdiansk, Mariupol, Taganrog, and Eisk on the Sea of Azov.

Odessa is the largest port in the western group, and the oldest and in general the most important. It was formerly the only Black Sea port important for merchandise imports. Just before the war Nikolaev displaced Odessa as the greatest grain-export point, the result partly of better rail connections with surplus areas of central and eastern Ukraine, and partly of the movement toward diversification in Ukraine north of Odessa. It also had better facilities for transshipment, for Odessa's elevators are located 8-10 miles from the harbor, while Nikolaev's elevators were directly on the harbor. Both ports now have mechanical equipment for transshipment of grain directly from railway cars into steamers, and both have some rather primitive warehouses.<sup>1</sup> A large new terminal elevator seems to have been completed at Nikolaev in 1930. These two ports are open to navigation practically throughout the year, with the help of ice-breakers during about a month at Odessa and two or three months at Nikolaev.

Kherson lies near the mouth of the Dnieper, but navigation has to be facilitated by a dredged channel some 30 kilometers in length, which since the revolution seems to have become shallow. This was one of the least improved terminals before the war, with no elevator and rather poor equipment for non-mechanized storage. It was planned to complete a large elevator by November 1931. At this port grain can be transferred directly from barges to ships with the aid of floating elevators. Canalization of the Dnieper at the rapids may enhance the importance of Kherson.

Of the eastern group of ports, Novorossiisk was one of the best equipped before the war; it had and still has the largest harbor elevators. There were also several mechanized flat warehouses. This port became more important after the revolution than before, and may become still more so with further development of grain production in the southeast and with better connections with the Trans-Volga regions. These same developments may enhance the importance of Rostov-on-Don, though here a dredged channel is necessary, which in 1927 was only 10 or 12 feet deep. This port, like Taganrog and Eisk, which suffer the same disadvantage of inconvenient and expensive loading of grain on ships because large vessels cannot reach the harbors, has become relatively unimportant. These ports are open only from 7 to 9 months. Berdiansk and Mariupol are relatively unimportant grain-exporting harbors, without much storage space or mechanical equipment, though an elevator is projected for Mariupol in 1932. Here navigation is open about 9 months. In Crimea, the principal port is Feodosia, which has flat warehouses and some mechanical equipment for direct transfer of grain from railway cars to ships.

Amongst the harbors on other seas, Leningrad, and since the war Murmansk on the Arctic Ocean (yet open throughout the year) are of some importance. The Baltic ports of Riga, Libau, Windau, and Reval now lie in Latvia or Estonia, but may still be used for Russian grain exports. Of these ports, Leningrad is best equipped with elevators, in this respect ranking second only to Novorossiisk.

Although several Russian harbors had

<sup>1</sup> For information on the equipment of ports as it was in 1927-28, see the *Encyclopedia of Soviet Exports* (Berlin, 1928), pp. 322-28.

grain-handling equipment, there was no system either of interior terminal or of country elevators before the war. A system of interior elevators was planned just before the war; it was assigned for execution to the Central State Bank—which suggests that the main purpose was to organize the financing of the grain trade through credit of the State Bank with stored grain as security. Some elevators of rather large capacity were constructed in the Central Agricultural Region and in the Volga. The turnover, however, was slow, not more than 2.0 times the capacity before the revolution, and only 1.3, 1.6, and 1.4 times in the three years 1925–26 to 1927–28. There were about 90 of these interior elevators in 1928, but some of these are hardly larger than country elevators.

After 1924, the Soviet government began the construction of lines of smaller local elevators of around 1 to 2 thousand tons capacity. There were about 200 of these by the end of 1928. About a third were in North Caucasus and Ukraine, and 30 to 40 in Siberia and Kazakstan. The turnover, 4 to 5 times capacity, has been better than that of the larger elevators, yet they seem not to have covered expenses.<sup>1</sup> It was found necessary to permit elevators to pay higher prices than other grain-collecting organizations, and also to prohibit the establishment of grain collecting points within certain distances of the elevators. Several uneconomical elevators had to be closed in 1927–28.

Thus the local and interior terminal elevator system is still very modest in Russia, despite some recent growth. Primitive flat warehouses, involving sack rather than bulk handling of grain, remain typical of the interior grain trade. The system for handling grain is better developed in the harbors; here the plan for construction was rather extensive, though it must be said that we have seen specific information only with regard to completion of the Nikolaev elevator in 1930 and with regard to construction on the Kherson elevator planned for completion in 1931 and the Mariupol elevator planned for completion in 1932.

<sup>1</sup> See D. V. Shumsky, "The Work of Grain Elevators during 1927–28," *Yearbook of the Grain Trade for 1927–28*, No. 2, pp. 30–33.

In the absence of a well-developed system of handling grain, it is not surprising that there was no official system of grain inspection in pre-war Russia. Control of quality was vested by law in Boards of Trade at harbors, a step taken to combat the practice of deliberate admixture of dirt with exported grain. There is now a state grain inspection system organized as a special bureau of the Commissariat of Trade, with ten geographical regions. All grain exported, shipped commercially to interior markets, passing through elevators, or destined for seed, must be inspected. The points of inspection are mainly export harbors and junctions of railways or of railways and waterways. Certificates as to quality are issued and domestically are accepted as final; but these certificates are not accepted by importing countries other than a few small ones like Greece and Latvia. The inspection service studies the quality of the crops through analysis of samples. The official commercial classification in 1927–28 involved six major types ("classes" in United States parlance) of common wheat and one of durum wheat; each main type was subdivided into subtypes according to source of origin; each sub-type fell into the equivalent of one of three grades, according to natural weight, percentage of admixture, and moisture content. Since the Russian grain trade is a monopoly, the grain inspection system naturally does not carry the commercial significance that it does in Canada or the United States.

In early days, the Russian grain trade consisted mostly of firms sufficiently supplied with capital to enable them to store large quantities of grain for a long time in order to cope with slow transportation by waterways and highways. The building of the railway system altered their character, for less capital was required when movement became faster and bills of lading could be used as a basis for credit. The grain trade was "democratized," and became the province of small buyers with little capital who moved grain rapidly in small lots, often sending it to export harbors before it was sold. Profit came from rapid turnover, and this made for a rush of grain to ports, a process accelerated by

the absence of a well-developed elevator system. Such a movement made for pressure on grain prices after harvest. The grain traders, interested in rapid turnover, were not particularly careful of their reputations or of the quality of the grain they sold. This was especially true of the trade around the Black and Azov seas. In the Volga basin, where transportation was slower, the trade was more stable and reliable.

Large firms, using either bank capital or that of international grain-trading organizations, were nevertheless growing in importance just before the war. Dreyfus, Neufelt, and other houses were organizing such large grain-collecting systems as they had in the Danube basin; large banks were also dealing in grain. But the supply of capital was generally erratic and scarce, and it may be on this account that Russian grain, in spite of its good natural quality, failed to obtain as secure a position on the world market as did American grain. There was no futures market in Russia, and there was always a fall rush of marketing. But there was acute competition among traders, and hence presumably performance of marketing services at low rates.

The decay of the private grain trade began even before the revolution, with disorganization of the export trade at the outbreak of the war. Collections for the army at once became substantial. Beginning with the second year of the war, there was more and more governmental intervention. As early as 1915-16 the greater part of the grain was diverted from the private trade. Moreover, prices were fixed and transport regulated. By 1916, the government found it necessary to resort to direct compulsory collections from producers, and also to undertake to supply the cities with grain. A monopoly was established in March 1917; it was decreed that all of a producer's output except a rather generous reserve for his consumption became the property of the state, to be delivered at a fixed price only to state agencies. Thus there was no private grain trade before the Communists came into power, and the principle of requisitioning surpluses at fixed prices through bureaucratic organizations had already been established.

#### GRAIN COLLECTIONS: METHODS AND POLICIES

The Soviet government developed the inherited principles in its own way. The temporary movement had fixed prices fairly high and had not exerted much pressure on producers. The Soviet government at once encountered inflation of currency and loss of confidence in the fixed prices, and supplies were cut off from the principal grain-surplus areas for other reasons. Great pressure had to be put upon peasants in areas where this was possible. The collecting organization became in fact a military one.

The element of class struggle was at once introduced into the collecting process—mainly between city workers and well-to-do peasants. Armed companies of city workers were organized, which invaded villages to take what they could find, often to be resisted by peasants with the arms brought back from the war. Poor peasants were also set against the well-to-do, being formed into groups whose duty was to denounce those peasants who had surpluses. The denouncers were given part of the surpluses which they unearthed. The government was not in a position to exchange manufactured goods freely for grain, for manufacturing was practically at a standstill. Such goods as were available were given to poor peasants to stimulate their denunciations. Grain collection meant simple confiscation.

Despite the drastic methods, supplies for the cities were short, and city folk sought to aid themselves, engaging in barter with peasants at first hand. There was a good deal of transportation of food by individuals, both city and country people, on passenger trains, a practice which the government sought to eliminate by searches which often led to fighting between passengers and the searchers. Collections increased in successive years from 1918-19 to 1920-21, the period of war communism, but were never adequate to meet the requirements. The drastic policy led to reduction of acreage and of agricultural output; and upon this the widespread crop failure of 1921 supervened. The Soviet government was impelled to abandon its earlier policy of grain collection, and to adopt the New Economic Policy.

The NEP did not mean at once the re-establishment of a free market; taxes in kind at first had to be delivered before grain could be sold, though by 1924-25 these taxes were completely replaced by monetary taxes. Nor did the new policy mean a return to the pre-war system of grain marketing. At the outset in 1922-23, the government undertook to purchase grain directly from producers, though its organization for so doing was not well developed for two or three years; and at all times foreign trade remained a government monopoly. Yet there was a good deal of private trade, and more or less purchase of grain from producers by so-called "non-planned" organizations—that is, nationalized factories, railroads, and other institutions that purchased grain for their own purposes.

Of the governmental organizations specifically designed as grain-collecting agencies, there were 18 in 1923-24; but the purpose of the government was to reduce the number, and also to reduce the activities both of the "non-planned" organizations and of the private trade. The "planned" organizations were either state or co-operative, though there was not much difference between the two because co-operatives were directly controlled by the state. One large state organization was the *Khleboprodukt* (after 1928 the *Soiuzkhleb*), a corporation whose shares were held by state institutions. This corporation in the course of time absorbed others which had existed as independent state or regional collection organizations—a fact which bears witness to the tendency to concentrate control of grain collection. Other central state organizations which collected grain (though not as their main function) were the "Gostorg" (an organization for trading in merchandise) and the State Bank; but with growth of the *Khleboprodukt* these ceased collecting activities, the one in 1925-26 and the other in 1926-27. Thereafter this corporation was the only central state collecting agency.

The co-operatives were not particularly important as grain-collecting agencies in early years, partly because Soviet policy was to destroy strong co-operatives (especially credit and agricultural ones) that had

existed under the old régime. Existing consumers' co-operatives, however, were re-organized into state-controlled compulsory co-operatives, and these were more important in grain collections in the early years. They later grew in importance under a policy that gave them a field for collection in localities distant from railways and waterways, the state organizations retaining the nearer positions as their field of activity. In 1924-25 the co-operatives collected less than a fifth of the grain collected by planned organizations, by 1927-28 more than three-fifths. Of the quantity collected by co-operatives in that year, nearly half was obtained by agricultural (producers') co-operatives, a branch that grew substantially in importance. This was partly because a policy was developed of leaving collecting functions to producers' co-operatives, the consumers' co-operatives concentrating on distribution to consumers. By 1930 this division of functions was completed.

The *Soiuzkhleb* collected grain from producers only through its net of grain elevators and through flour mills, and in 1927-28 had about 700 collecting points as against 10,000 allocated to co-operatives.<sup>1</sup> But in addition it eventually secured all of the grain collected by co-operatives. Thus it was a central state-controlled organization both for collection and distribution, for it also controlled milling. It is hardly necessary to say that under this system neither producers' nor consumers' co-operatives are co-operatives as the term is understood elsewhere; neither type represents free union of members to protect their own particular interests, and neither has a voice in determining prices. The prices are what the government decides upon and enforces through its control of the *Soiuzkhleb*.

The interests of producers were perhaps best protected by the competition between the private trade and the state-controlled organizations. This was especially true in the early years of the NEP. Even as late as 1924-25 about half of all the grain marketed passed through the hands of the private trade. But in 1924-25, with its own

<sup>1</sup> K. N. Koptev, *Interior Trade of the USSR during Ten Years* (Moscow, 1928), p. 179.

system in better order and with rising grain prices following the short crop of 1924 and consequent difficulties with state collections, the government began to launch a vigorous drive against private trade.

First of all, pressure was exerted in the direction of transportation, which of course was state-controlled; state or co-operative grain was given time preference and lower rates, and in some instances the railways were forbidden to transport privately-owned grain. The private trade had shortly to fall back upon transport by carts. Limitations were also put upon the extension of bank credit to private traders; credit was finally completely refused. Mills were taken from the private trade. Hence by 1926-27 the private trade was able to ship into deficiency regions only 3 per cent of all grain sent there. To complete the monopolization, non-planned state institutions were forbidden to continue their grain-collecting activities. All grain-collecting activities are now controlled, regulated, and directed by the People's Commissariat of Commerce (previously the Commissariat of Interior Commerce), which also manages the elevator system and the milling industry and controls the grain-exporting organization, the Exportkhleb.

Even as early as 1926-27, peasants were under the necessity of selling all but a very small fraction of their grain to state-controlled organizations. In this year, after a good crop, grain prices were put at a low level, so that, quite as would be expected of a monopoly of buyers in a capitalistic society, prices were kept low and stable under a socialistic monopoly.

We have already observed that this low-price policy led to silent resistance on the part of the peasants, who beginning with 1927-28 ceased to expand their acreage, and blocked the government's efforts to increase grain supplies for cities and for export not only in this way but by retaining stocks rather than selling them. In the fall of 1927 collections fell off so greatly that practically the whole Soviet system was menaced. The recourse was mainly to "extraordinary measures" of collection rather than to higher prices. First came pressure from the fiscal apparatus: acceleration of the collection of regular state

taxes, then "self taxation" for local cultural and other purposes. This "self taxation" was determined by two-thirds vote in localities, the poor peasants without taxable property having a vote. A compulsory loan was raised. Co-operative societies pressed for collection of membership fees from "members." It was sought also to increase the supply of manufactured goods exchangeable for grain, but the supply was short. The final step was pure coercion. The executive committees of co-operative associations were "purified" by removal of well-to-do peasants. Brigades of city workers were sent into the country to accelerate collections. By law all who concealed stocks suffered confiscation and a fine of five times the value of confiscated goods. There was again a system of espionage by poor peasants, and to stimulate the activities Communist leaders advised giving 25 per cent of the confiscated grain as a loan for seed or consumption.<sup>1</sup>

The so-called "extraordinary measures" were nominally abandoned after the fall of 1928, but in fact they continued to be used. Grain prices were, however, raised for the campaign of 1928-29. Even so, collections were smaller than in 1927-28; the attempts to collect were doubtless strenuous, but stocks had been depleted in 1927-28 and the crop of 1928 was poor as regards winter wheat and rye on account of winter-killing. In the spring of 1929 bread rationing in cities began, without at first any guarantee of a fixed quantity in the ration. From this time onward no statistics of grain collections are available.

It is unnecessary to prove that 1929-30 witnessed severe administrative coercion in grain collecting. In the winter began the great drive for compulsory collectivization, in which practically any measure was used against the well-to-do peasants. It is known that committees of poor peasants ("komsody") were formed in villages, whose purpose was to determine the surpluses of the well-to-do, to fix the amount to be delivered, and to enforce delivery. Brigades of city workers were assigned to the task of helping the komsody in their struggle against the "class enemies."

<sup>1</sup> *Pravda*, February 15, 1928.

It is to be remembered that even after 1928-29, there was a little purchase of grain by non-planned organizations, and that these organizations were ready to pay prices 150 to 200 per cent higher than the officially fixed prices.<sup>1</sup> This fact lends emphasis to the confiscatory nature of grain collections; the system after 1927-28 lost all resemblance to a commercial system, even a monopolistic one.

The system of collection, including the komsody, remained substantially unaltered even in 1930-31 with the big crop of grain. But wholesale collectivization of farming brought with it some new methods of collection.

Of these, one was a system of contracts for future crops, applied early to some technical crops, and in 1928 to grain. In the spring of 1928 only 7 to 8 per cent of the total spring-wheat area for 1928 was "contracted"; but a fifth of the total grain area of 1929 was so contracted, and it was planned to contract two-fifths of the 1930 area. Actually 52 per cent was so purchased, and 85 per cent in 1931.<sup>2</sup>

Contracts are usually concluded before sowing begins. Producers receive a certain advance payment (sometimes in money and sometimes in materials, financed by the system of agricultural credit), and in return undertake to deliver at fixed prices a certain fraction of gross grain production per acre after harvest. The general idea is not a new one. The government has sought to use the contracting system not only to assure collections, but to improve agricultural technique and the quality of grain; appropriate clauses are written into the contracts. The early policy was to contract with individual peasants (largely the poor, who needed advances); the later was to contract with groups, thus taking a step toward collectivization. Expansion of area was also involved.

With deliveries contracted at fixed prices, and with "free" prices much higher, there was violation of contracts, at least in 1928-

29. But the system gives something of a legal foundation for coercion, and it strengthens the hands of collecting organizations. It is now practically obligatory, for all collective farms must enter into contracts, and in the grain-surplus regions individual farmers as well. These farmers have to deliver as large a fraction of their grain as do the collectives. The contracts with collectives are regarded as taking precedence over all other obligations, even to the extent that the terms must be fulfilled whether or not requirements for local consumption are secured. Moreover, maximum limits of retention for local consumption are fixed, so that in effect the country population is rationed. One may infer that now the governmental policy is even more rigid than it was during the period of war communism, for at that time peasants could (in theory) keep what they required for consumption, whereas now this principle has been supplanted. How successful the plans to expand acreage and production will be under a system even more rigid than one that resulted in a great decline of acreage remains to be seen.

A second recent innovation is collection of grain through the Machine-Tractor Stations. These control all tractors and some of the other machines and implements in the areas where they are organized. They make contracts to plow adjacent collective and individual farms, requiring in exchange the delivery of a certain fraction of the harvested crop. It is clear that if they control plows they are in a position to dictate the terms of contracts, and that they are accordingly a powerful device for strengthening the hands of the state. In theory, the MTS are to control all of the principal means of production, and if this eventuates the last vestige of economic freedom of the collective farms would disappear. One is reminded of the capitalistic organization of manufacturing before the factory system, when traders provided households with the means of production and dictated the terms of delivery.

#### STATISTICS OF GRAIN COLLECTIONS

Collections of all grain (the only statistics available) were as follows, in million quintals, in the period of war communism:<sup>3</sup>

<sup>1</sup> See *Control Figures for 1929-30*, p. 115.

<sup>2</sup> See V. Sergeev, "Making Contracts for Crops in 1928," *Paths of Agriculture*, 1929, No. 4, pp. 11-20; also *Control Figures for 1929-30*, pp. 134-35; also *Pravda*, June 22 and July 29, 1931.

<sup>3</sup> *Interior Trade of the USSR during Ten Years* (Moscow, 1928), pp. 156-57.

1918-19 .....	17.7
1919-20 .....	34.8
1920-21 .....	60.1

The increase represented not only improvement in the collecting organizations and more severe enforcement of monopoly, but also extension of the territory over which collections could be undertaken.

The years 1921-22 to 1923-24 represented a transitional period, when monopoly was abolished but when taxes were collected in kind and when the state collecting organization was being improved. Grain collections as taxes in kind were 38.1 million quintals in 1921-22 (a low figure on account of the famine), 59.2 million in 1922-23, and 17.2 million in 1923-24. In 1922-23 the government's grain-collecting agencies collected 10.0 million quintals, making a total of 69.2 million for the year; and 48.1 million quintals in 1923-24, making a total of 65.3 million. In addition these two years witnessed a sizable volume of private trade, so that peasants sold or delivered considerably more in the aggregate than they had done in the last year of war communism, 1920-21. The influence of the NEP was so favorable that exports of grain were resumed in 1922-23 and 1923-24 for the first time since the revolution, though only in limited volume.

The following figures, in million quintals, show collections by planned organizations from 1923-24 to 1928-29, the period for which data are available.<sup>1</sup>

July-June	All grain	Wheat	Rye	Wheat and rye
1923-24 .....	65.3	17.5	32.3	49.8
1924-25 .....	45.5	16.9	13.8	30.7
1925-26 .....	84.4	37.8	18.6	56.4
1926-27 .....	108.4	61.6	23.0	84.6
1927-28 .....	102.7	54.5	26.8	81.3
1928-29				
(July-Feb.) <sup>a</sup> .	69.3	38.0	7.9	45.9

<sup>a</sup> Data for later months not available.

Only the figures for 1923-24 include taxes in kind (17.2 million quintals of all grain, 1.9 million of wheat, and 14.5 million of rye), which were abolished in 1924-25. The

poor crop of 1924 led to reduced collections in 1924-25; the situation was so difficult that the government had to import some grain. Collections were larger in 1925-26 and 1926-27. But at this time, with private trade shrinking, the planned agencies were obtaining a larger fraction of all grain marketed. These fractions were 55 per cent in 1924-25, and 65, 75 to 80, and 85 per cent in the three following years. The total quantity of grain marketed was about 80 million quintals in 1924-25, and 122, 134 to 139, and 122 million in the following years; but this includes what was purchased by the country population. The Gosplan estimates the quantities supplied to cities as 94 million quintals in 1925-26; 98 million in 1926-27; 83 million in 1927-28; and 83 million in 1928-29. These figures illustrate the shortage of grain outside of rural districts after 1927-28. There was clearly a large reduction in total grain marketed between 1926-27 and 1927-28; another very substantial one came between 1927-28 and 1928-29, partly because stocks had been depleted in 1927-28, partly because well-to-do peasants were unwilling to expand and willing to contract their acreage, and partly because the winter crops of 1928 yielded poorly.

Such was the course of difficulties with the grain supply, which seem to have continued but were probably less marked in 1929-30. There was a distinctly large crop in 1930-31. But no data on volume of collections are available for these two years nor for 1931-32 to date.

Grain collections begin early in summer or during or after harvest. In 1924-25 to 1927-28, bread-grain collections in July-September amounted on the average to a little more than a fourth of the annual total. October-December witnessed the heaviest collections, about a third of the total. A fifth to a fourth came in January-March, and 10 to 15 per cent in April-June. There were, however, wide variations from year to year in the seasonal course of collections, in part because of the timing of the "extraordinary measures." Recently the policy has been to conclude the collection campaign early, about in January, it may be in order to obtain supplies before peasants have had the opportunity to feed much grain to livestock. With a collecting policy

<sup>1</sup> Data from *Yearbook of the Grain Trade*, Nos. 1 and 2, and *Statistical Review*, March 1929, No. 3. Certain adjustments have been made between collections of planned and non-planned organizations in order to make the series homogeneous.



formulated without regard to the consumption requirements of peasants, it is clear that the earlier collections start, the better are the chances of obtaining grain.

Collections by regions fluctuate widely from year to year in consequence of the regional variations in yields. Table 10 sum-

western Europe when exports from North America and the Southern Hemisphere were still small. The Napoleonic wars reduced exports from Russia sharply, but thereafter they increased so much and so rapidly as to bring on an agricultural crisis in some western European countries.<sup>2</sup> After

TABLE 10.—REGIONAL COLLECTIONS OF BREAD GRAIN BY PLANNED GRAIN-COLLECTING ORGANIZATIONS\*  
(Million quintals)

Region	WHEAT				RYE			
	1924-25	1925-26	1926-27	1927-28	1924-25	1925-26	1926-27	1927-28
Southern steppe .....	8.17	24.62	31.41	35.68	2.61	8.98	9.30	8.97
Volga basin .....	1.03	3.88	11.79	2.21	4.48	6.01	7.18	8.26
Asiatic surplus area <sup>a</sup> .....	6.91	8.21	17.42	15.89	4.30	2.43	2.70	2.30
Central Blacksoil Region .....	.20	.46	.37	.60	.95	.60	2.88	6.62
Deficiency area <sup>b</sup> .....	.64	.59	.56	.09	1.40	.52	.93	.66
Total <sup>c</sup> .....	16.49	37.75	61.56	54.47	13.75	18.55	22.98	26.81

\* Condensed from data in *Yearbook of the Grain Trade* (Moscow, 1929), No. 2, appendix tables.

<sup>a</sup> Including the Ural region.

<sup>b</sup> Including White Russia.

<sup>c</sup> Excluding Transcaucasia, Turkestan, and the Far East of Siberia.

marizes data on collections of wheat and rye by larger regions. Over the period 1924-25 to 1927-28, the southern prairie regions (including Ukraine, North Caucasus, and Crimea) provided a half to two-thirds of the total, and was the most important single source. The Asiatic area increased in importance so far as concerns wheat; so also did the Volga region with regard to rye, but it was of secondary importance for wheat except in the good agricultural year 1926-27. In 1928-29, with poor yields of winter crops in the west and south, the Asiatic area yielded fully half of the wheat collected in eight months. The figures above lend emphasis to the fact that the southern steppe area has become so important a source of domestic grain supplies that little is left for export from that area; and also to the fact that it has become an important source for rye used domestically.

#### HISTORY OF RUSSIAN GRAIN EXPORTS

Regular exports of grain<sup>1</sup> from the Russian Empire in fair quantities began as early as the late eighteenth century, and still earlier from territory that later became a part of the Empire. Russia was an important source of bread-grain supplies for

a decline in the 'twenties, Russian exports increased continuously up to the World War. Statistics in terms of annual average exports of the four principal grains by decades are given in Table 11. Growth was especially rapid in the 'sixties and 'seventies, after the abolition of serfdom and as the first railway net was built. In this period rye exports increased more than wheat exports.

Even though wheat exports continued to increase in absolute amount after the 'seventies (though with wide annual fluctuations), their relative importance did not increase. Prior to the 'seventies, wheat exports had been about two-thirds of the total; thereafter they were from 40 to 45 per

<sup>1</sup> The following analysis of Russian exports deals only with grain, not with flour or bran. Pre-war wheat flour exports amounted only to 3.0 per cent of wheat grain exports in 1906-10, and to only 4.0 per cent in 1911-13. The type of flour produced in Russia did not meet the requirements of western Europe; it was made from hard wheat, contained durum, and was rather coarse. The cost of production was also rather high. Bran exports, however, were large before the war, partly because the domestic livestock industry was not well developed. Since the war, neither flour nor bran has been exported in significant quantities.

<sup>2</sup> See J. C. L. Sismonde de Sismondi, *Nouveau principes d'économie politique* (second edition, Paris, 1827), II, 399-400.

cent. In the 'seventies and 'eighties, it was rye and oats exports that expanded more rapidly than those of wheat; beginning with the 'eighties and continuing until just before the war, it was barley exports that expanded most rapidly. Just before the war, barley became almost as important as wheat.

other commodities such as eggs, butter, and flax fiber grew more rapidly than the value of grain exports, so that grain somewhat diminished in relative importance despite the large absolute increase in its value; but even up to the war grain made up 40 or 45 per cent of the value of total exports.

TABLE 11.—AVERAGE ANNUAL EXPORTS OF THE PRINCIPAL GRAINS FROM RUSSIA, BY TEN-YEAR PERIODS, 1820-1913\*

Period	Million quintals					Percentage of total			
	Wheat	Rye	Barley	Oats	Total	Wheat	Rye	Barley	Oats
1820-29 .....	1.51	.49	.18	.21	2.39	63.4	20.7	7.3	8.6
1830-39 .....	2.54	.95	.21	.20	3.90	65.3	24.2	5.5	5.0
1840-49 .....	4.23	1.21	.23	.34	6.01	70.1	20.3	3.9	5.7
1850-59 .....	5.13	1.65	.52	.88	8.18	62.5	20.2	6.4	10.9
1860-69 .....	8.89	2.64	.82	1.39	13.74	64.8	19.1	6.0	10.1
1870-79 .....	16.46	10.61	2.64	4.98	34.69	47.5	30.6	7.6	14.3
1880-89 .....	21.54	11.38	6.93	9.07	48.92	44.0	23.4	14.1	18.5
1890-99 .....	28.76	10.50	14.33	8.16	61.75	46.5	17.0	23.2	13.3
1900-09 .....	33.37	13.55	21.84	10.88	79.64	41.5	17.0	27.4	14.1
1910-13 .....	40.12	6.73	37.49	10.55	94.89	42.3	7.1	39.5	11.1

\* Data from 1820 to 1899 from a publication by the Department of Customs of the Ministry of Finance, *Collection of Data upon the History and Statistics of the Foreign Trade of Russia* (St. Petersburg, 1902), edited by V. S. Pokrovsky. Data for 1900-13 from *Review of Foreign Trade*, published yearly by the Department of Customs, Ministry of Finance, St. Petersburg.

Barley exports went largely to Germany, where imports were favored by low customs duties on feedstuffs, and after 1906 by lower duties on barley than on the corn from other countries with which Russian barley had to compete. This situation helps to explain why barley competed successfully with wheat for land in the eastern steppe of Russia, and also why, with this advantage lost, the area of barley in Russia has been slow to recover after the war and revolution.

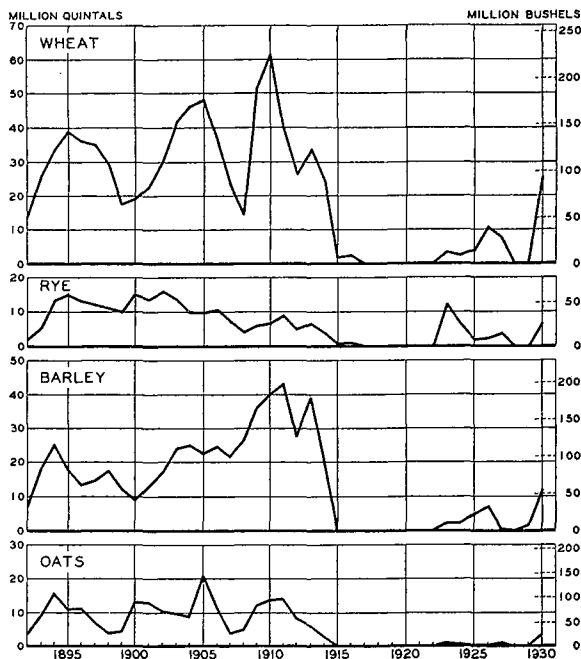
In value, Russian total grain exports were not important in total Russian exports of all commodities in the first half of the nineteenth century, though their importance increased after England abandoned agricultural protective tariffs in 1846-49. In the 15 years preceding 1861, grain exports were a third of all exports in value, and in 1875-80 over a half. Thereafter grain exports remained the most important amongst Russian exports, and the whole balance of trade and payments depended heavily upon fluctuations in grain exports. After the 'nineties, however, the value of exports of

In spite of the rapid growth of grain exports, the ratio of grain exported to grain produced in Russia declined continuously (particularly in two or three decades preceding the war) as a result of growth of the domestic market. This reflected growth of population, and relatively greater growth of urban and industrial population. The export market, however, remained very important for wheat and barley, of which one-fifth and two-fifths, respectively, of the production went to export; but the export market was much less significant for rye and oats.

Grain exports, particularly wheat exports, fluctuated widely in quantity before the war, as is apparent from Chart 10 (p. 360). Within short periods of time exports increased or decreased three- or even four-fold. The average deviation of wheat exports over the period 1892-93 to 1913-14 was 32 per cent. The fluctuations were not so much from year to year as from one group of years to another, as is apparent from the chart. These waves reflected variations in total production or in yield per

acre; the correlation between size of crop and exports was very high, much higher than for the United States. The wide fluctuations in Russian wheat exports affected not only Russian domestic wheat prices, but also wheat prices on the world market.<sup>1</sup>

CHART 10.—GROSS EXPORTS OF THE PRINCIPAL CEREALS (GRAIN ONLY) FROM THE RUSSIAN EMPIRE AND THE USSR, FROM 1892\*



\* Data from Appendix Table VI.

The final destination of Russian wheat exports is difficult to determine from Russian trade statistics. In the first half of the nineteenth century, for example, Constantinople was an important distributing center, as were Genoa and Livorno in Italy. Wheat sent to these ports might be recorded in Russian statistics as going to the countries in which they lie, whereas in fact a good deal of it went finally to other countries. Hence in this period we find little wheat recorded as destined to France or Great Britain, and much to Italy and Turkey. But by the 'sixties and 'seventies, the Russian statistics show Great Britain and France to

have been the principal purchasers of Russian wheat exports, taking two-thirds to three-fourths of the total. Germany too had begun to assume some significance. At this time, Russia was the largest supplier of wheat to the largest wheat-importing country of the world, far ahead of the United States and of Germany, which was then a net exporter but was becoming a net importer. From 1860 to 1875, British imports from Russia amounted to around 25 per cent of total imports of wheat grain. Thereafter Russia lost her dominant position on the British market as a consequence of some poor crops and of the successive rise of the United States, India, Argentina, Canada, and Australia as wheat exporters. The earlier position was never recovered, and Russian wheat went more and more to Germany, Italy, and other countries of central and southern Europe.

During the late 'eighties and the first half of the 'nineties, Germany and Netherlands took less than one-fifth of the total Russian wheat exports, but in the decade preceding the World War they took from one-fourth to a third of the much larger total; and the importance of these markets was even greater as regards Russian rye exports. Italy had taken only a little more than one-tenth of Russian wheat exports in the earlier period, but about one-fifth in the later. Italy was the largest single market for durum wheat, part of which was imported duty-free and re-exported in the form of macaroni. Russia occupied a strong position on the Italian market, for two-thirds to four-fifths of the Italian wheat imports came from Russia, as against one-third to two-fifths in Germany. But in Italy competition with Roumania, Argentina, and the United States (durum) was becoming strong, and in the five years preceding the war Italy obtained less than two-fifths of her wheat from Russia. On the whole, Russian wheat held a stronger position in protected import markets than on free ones like Great Britain, Belgium, Denmark, and other Scandinavian countries; here ground was lost particularly to overseas exporting countries.

Nevertheless, just before the war Russia was the leading source of supply for grain imported into western Europe, which in

<sup>1</sup> See V. P. Timoshenko, *Wheat Prices and the World Wheat Market* (Cornell Agricultural Experiment Station Memoir 118, Ithaca, N.Y., 1928). Before the war Liverpool wheat prices correlated more closely with fluctuations of wheat production in Russia than with its production in America or other countries.

1908-12 obtained from Russia 29 per cent of the imported wheat, 47 per cent of the rye, 67 per cent of the barley, and 46 per cent of the oats.<sup>1</sup> The position of Russia was weakest as regards wheat, but even here she occupied first place. Argentina furnished 17 per cent of the European wheat import, the United States 15 per cent, no other country more than 10 per cent. These data serve to emphasize the importance to Europe of the cessation of Russian grain exports with the beginning of the war.

The importance of the Russian Empire as an exporter of grain may be illustrated in another way. The following tabulation, in million bushels, shows net exports of five grains from Russia (average 1909-10 to 1913-14) in contrast with net exports from other countries and total world net exports:<sup>2</sup>

Grain	Russia	Other countries	Total
Wheat . . . .	164.3	499.7	664.0
Rye . . . . .	28.6	47.8	76.4
Barley . . . .	173.1	70.3	243.4
Oats . . . . .	69.3	92.9	162.2
Corn . . . . .	28.1	214.4	242.5

Russia furnished nearly three-fourths of the barley, over a third of the rye, nearly half of the oats, about a fourth of the wheat, and over a tenth of the corn. Russia was the world's leading net exporter of wheat, rye, barley, and oats; and only Argentina, Roumania, and the United States exported more corn, though this crop was relatively unimportant in the Russian crop area.

#### POST-WAR EXPORTS

When the war began, Russian grain exports practically ceased. If the calendar year 1914 witnessed sizable exports, it was only because the war did not come until August. But in 1915 and 1916, wheat exports were only 5 per cent of the 1909-13 average,

and rye exports 15 per cent. The Black Sea and Baltic routes were closed, and shipments had to be made through Murmansk and Arkhangelsk. With 1917 exports ceased entirely until 1922-23. After the famine of 1921, relief grain was brought in from the United States.

By crop years, gross exports and imports of wheat and rye (grain only) were as follows after 1922-23, in thousand quintals:<sup>3</sup>

July-June	Wheat		Rye	
	Exports	Imports	Exports	Imports
1922-23 . . . .	167	....	4,286	....
1923-24 . . . .	6,018	....	13,625	....
1924-25 <sup>a</sup> . . . .	110	4,668	665	1,680
1925-26 . . . .	7,377	....	1,810	....
1926-27 . . . .	13,464	....	4,128	....
1927-28 <sup>a</sup> . . . .	1,085	913	1,149	....
1928-29 <sup>a</sup> . . . .	29	1,602	4	....
1929-30 <sup>a</sup> . . . .	2,560	153	2,264	....
1930-31 . . . .	29,284 <sup>b</sup>	....	5,000 <sup>c</sup>	....

<sup>a</sup> August-July.

<sup>b</sup> Eleven months, August-June.

<sup>c</sup> Eight months, August-March.

Chart 10 shows exports of the four principal grains by calendar years.

It was not until the good crop of 1923 was harvested that exports became moderately substantial. Then followed the poor crop of 1924 with practical cessation of exports. Exports appeared again in 1925-26 and 1926-27, following good yields on acreage expanded largely because of the earlier comparatively liberal policy of the government toward the peasantry. But even in these years the exports of bread grain were small as compared with the pre-war. Wheat exports were about one-fifth of the 1909-13 average in 1925-26, and one-third in 1926-27; rye exports one-fourth in 1925-26 and a little more than half in 1926-27.

Following the change of policy toward the peasants and with somewhat lower yields in 1927, bread-grain exports had to be discontinued. Not until the summer of 1930, as the result of unusually high yields per acre, and presumably some increase of acreage, following vigorous governmental measures, did surpluses above the strictly rationed domestic consumption again appear.

These irregular post-revolutionary bread-grain exports are explained by the limited recovery of production and the rapid increase of population after 1922, and not by

<sup>1</sup> Data from Broshniovsky, *op. cit.*, p. 323. Spain and Portugal not included.

<sup>2</sup> Computed from data given in *Agriculture Yearbook, 1931*. The figures for wheat, rye, oats, and corn include flour or meal in terms of grain.

<sup>3</sup> Data for 1922-23 to 1926-27 from *Yearbook of the Grain Trade for 1927-28* (Moscow, 1929); data for subsequent years from *International Yearbook of Agricultural Statistics, 1930-31*. The first source cited gives imports only for 1924-25; in other years before 1927-28 imports were presumably small.

increased per capita consumption. Before the war, as we have seen, there were wide fluctuations in exports, but there were surpluses every year. But the post-war situation involved a level of production persistently so low that surpluses for export could be found only in years of yields per acre higher than average. It is a distinct disadvantage for a country not to export persistently and continuously, for under these circumstances stable trade relationships with buyers cannot be maintained. When exports are made, they acquire something of the aspect of forced sales even if there is no conscious intention of cutting prices in order to find a market.

The large exports of 1930-31, which considerably affected the world wheat market, are to be explained as the effect of an unusual rather than of a normal situation; they resulted mainly from exceptionally favorable climatic factors affecting yield per acre and from rationing of the domestic consumption. Even these large exports were only two-thirds of the average wheat exports in the five years preceding the war, and less than half of the exports in two years of good crops, 1909-10 and 1910-11. The exports of 1930-31 do not lead to the conclusion that Russia has already recovered permanently her pre-war position or reached one approaching it.

The geographical sources of post-war exports are less clear than were the pre-war sources. Before the war the major wheat-exporting regions were those surrounding the Black and Azov seas (Ukraine, Crimea, North Caucasus), with the Volga and Trans-Volga regions contributing less. Proximity to export harbors and costs of railroad transportation formerly determined which regions would export and which would supply domestic deficiency areas. But now, under state monopoly of exports, cost of transportation is less determinative; the state may send exports more or less from any region which happens to have a surplus above its own requirements, and these surpluses vary greatly in location. The Black Sea regions of course continue to be the main source of exports, but in some years (as for example 1926-27) Siberia and Central Asia may be important sources of exports. The use of the railway system in

hauling grain over long distances without much regard to costs helps to explain why export regions are not now very clearly defined.

There is also variability and shifting in the destinations of post-war exports. With monopoly control, political rather than economic factors may determine where grain will go. The interrupted character of the flow of exports, involving as it does instability of relationships with customers, contributes to the lack of established markets. Yet Germany (including the transit trade through the Netherlands), Italy, the United Kingdom, and France continue to be the principal markets for wheat, as they were before the war. The principal markets for rye are Germany and Scandinavia, though some now goes to the Baltic countries formed from territory previously in the Russian Empire.

The seasonal movement of Russian pre-war grain exports was strongly affected by the need of peasants to sell crops promptly in order to pay fall taxes and to procure supplies of goods for the winter. The pressure was so great that poor peasants often sold larger quantities than they had as real surpluses, and had to repurchase grain in the spring. These heavy fall offers tended to depress fall grain prices. The trade, moreover, was unable to hold stocks and rushed grain to export harbors, and there was no widespread system of elevators. All this made for an early movement of grain to export. On the other hand, there was delay on account of the small supply of threshing machinery, the insufficiently developed railway system, the slow movement on waterways, and the long distances over which much grain had to be moved.

The outcome was a moderately even seasonal movement of exports. Over the period 1904-05 to 1913-14, the percentages of annual totals shipped out in successive four-month periods were as follows:<sup>1</sup>

Period	Wheat	Rye
August-November .....	44.8	42.6
December-March .....	23.2	18.5
April-July .....	32.0	38.9

<sup>1</sup> Data from *Annuaire international de statistique agricole, 1913-14*. The months are according to the Julian calendar, lagging 13 days behind the standard calendar.

During December–March, exports were smallest, for practically all Baltic ports and several Azov and Black Sea ports were closed. They were naturally largest in August–November, but the April–July exports following opening of navigation were substantial. The seasonal concentration of Russian pre-war exports was less striking than that in most other grain-exporting countries, from which in general more than half of the annual exports went out in the months corresponding to August–November in Russia. In Russia the concentration of exports in the fall was greatest as regards barley; wheat came next. This reflected the relative proximity of barley and wheat export areas to the ports.

After the revolution, the waxing and

waning of grain exports gave rise to an irregular seasonal distribution. The Soviet government always sought to export as much as possible early in the season. In 1927–28 bread-grain exports began early, but had to be stopped; and grain at harbors had to be reshipped to interior points. Monopolization has not resulted in more orderly marketing than prevailed before the war. The financial pressure under which the Soviet government labors has resulted in a stronger tendency to export grain early in the season than was true even with the financially weak pre-war private grain trade. Post-war exports, both interrupted and not of long duration, can hardly be said to have shown a characteristic seasonal distribution.

### VIII. THE OUTLOOK

The present moment is unpropitious for considering the outlook or for drawing definitive conclusions as to further development of agricultural production and organization in the USSR. Since 1928 Russian agriculture has undergone a new revolution, perhaps even more radical than the agrarian revolution of 1917–21. Agricultural organization is now in a period of transition from small-scale peasant farming, which was at its apogee during the post-revolutionary period 1922–27, to large-scale farming on co-operative or socialistic lines (collective and state farms). The drive toward the new organization was so vigorous and precipitate that the outcome, without regard to its present apparent importance, cannot be considered as having attained to a position of stability. The new forms of agricultural organization, representing a very far-reaching change from the older system, are still not established. This may be seen from the fact that in the summer and autumn of 1931 the Soviet government and the Communist party themselves found it necessary to check further spread of collectivization, and instead to proceed toward strengthening existing collectives in the direction of their better organization,<sup>1</sup> and also to reorganize the most important element of the state farms, the Grain Trust, abandoning in some degree the project of huge farms and subdi-

viding them into smaller units.<sup>2</sup> Still longer experience is necessary before definitive conclusions can be safely drawn regarding the efficiency and vitality of the new socialistic organization of agriculture.

It may properly be said, however, that the instability of the new forms of agricultural organization may affect unfavorably or may check rapid development of agricultural production at least for a certain period of time, as would any instability of economic or social relations. Periods of transition are likely to be periods of hesitation. This must be particularly the situation in the USSR because of the lack of cultural forces and of the trained specialists that are so necessary for execution of reorganization on a scale unprecedented as to form and size.

There is, however, some possibility of reaching more definite conclusions and of formulating the outlook for further development of agricultural production and exports, with reference particularly to the bread grains, if we use as our basis relatively objective and stable factors. These are the natural and geographic conditions

<sup>1</sup> Resolution of the Central Committee of the Communist Party, August 2, 1931.

<sup>2</sup> Decisions of the Federal Commissariat of Agriculture, August 25, 1931, and of the Central Executive Committee of the USSR and the Council of People's Commissariats, November 28, 1931.

of the USSR, the long-time trend of population growth, and the persistent historical tendency toward diversification of farming. Doubtless the influence of these more stable factors will be considerably modified by socialistic reorganization of agriculture; but there are certain limits which may be determined, and these cannot easily be exceeded even by the most radical reconstruction of agricultural organization.

To begin with the natural and geographic conditions, it is clear that the limits to further expansion of the agricultural area, particularly of the crop area under grain on new unoccupied lands, are much narrower than is often supposed. The process of extensive expansion of the arable area in the European part of the USSR was completed even before the war. During the decade just before the war, rapid growth of the crop area within the European territory of the Russian Empire was to be observed only in the southeastern corner, in the North Caucasian steppe area. In all other regions of the European territory (including the southern steppe area of Ukraine and the Don), the growth of the crop area was slower than the growth of population. Free, unoccupied agricultural areas were to be found, at the time of the outbreak of the World War, only in the Asiatic parts of the Empire, in Siberia and in the steppe area of Central Asia. Here the crop area increased during the decade just before the war by two-thirds or four-fifths of its size in 1901-05. Only here may extensive expansion of the crop area be expected now that recovery of agricultural production to the pre-war level has been practically achieved. If considerable increase in the crop area in 1930 and 1931 took place in the Volga basin and in North Caucasus, that was possible only because, following the revolution and the famine of 1921-22, the crop area in these regions was until recently far below the pre-war level.

Even in the Asiatic part of the USSR, the possibilities for extensive expansion of the arable area are not so unlimited as some may infer from the fact that occupied arable land comprised (in 1928) only about 2 to 3 per cent of the total area of Asiatic Russia. It must be remembered that climatic conditions in the larger part of the

Asiatic territory are unfavorable for crop production. If we eliminate from the total area of Asiatic Russia the areas completely unfitted for crops, such as tundra, dry steppe, deserts, and the greatest part of the tayga (cold forest area), then the agricultural area of Siberia already occupied would comprise from a fourth to a third of the area where agriculture meets with favorable conditions. This is by no means a low percentage for a region so distant from market outlets as Siberia is.

The prairie area and the wooded-prairie area of Siberia and of Central Asia, located mostly in the southwestern part of Siberia and in the adjacent northern belt of Central Asia, are now populated as densely as or more densely than some of the best agricultural regions of the United States (Kansas, Nebraska, Minnesota, or even Iowa). No doubt there is still a good deal of unused land fitted for crops in this area. But the unoccupied free land is of relatively low quality as to climate or soil. It is difficult, practically impossible, at this time to estimate the possible further expansion of arable area on new land in Asiatic Russia; there is great diversity among estimates and no objective data are available. Yet all specialists on colonization in Russia are of the opinion that mass colonization of Siberia and of Central Asia, such as would permit several hundred thousand colonists to enter upon the land each year, is to be regarded as terminated; another flow of colonists such as took place during the ten years preceding the war is not possible. The Soviet statistics of the flow of colonists during recent years tend to confirm this opinion. Further expansion of the agricultural area in Asiatic Russia *on new unoccupied lands* must go rather slowly, for it will generally require reclamation and improvement of land (drainage of marshy land in tayga regions and irrigation on the dry steppes). Comparatively rapid expansion of the crop area here may proceed for some time only in the area having from 10 to 14 inches of rainfall annually, where hazardous dry farming must be practiced. Even expansion of the area devoted to this hazardous dry farming will require considerable development of the railroad system in Asiatic Russia.

It is important also to recall that of all the agricultural regions of the world, those of Siberia and Central Asia are the remotest from market outlets. During the second half of the nineteenth century and in the beginning of the twentieth, when Russian agriculture was expanding around the Black Sea and had the best outlets for foreign markets, Siberian grain had great difficulties (much more serious than those of Canada) in reaching foreign or even interior Russian markets.

In connection with the outlook for further extensive expansion of the crop area on new lands, it is necessary to discuss the outlook for further growth of population. Rapid growth of population (urban as well as rural) was typical of Russia in the pre-war period. After 1922 the growth of the Russian population became even more rapid than it had been before the war. The birth-rate changed only slightly as compared with pre-war years, but the death-rate declined substantially in 1922-27. Perhaps this is to be explained partially by the high death rate during the period of civil war and famine in 1921-22, which only the strongest could survive. Yet the decline of child mortality suggests that the death-rate in Russia may be expected to be lower than the pre-war for a considerable period of time. The growth of population in the USSR has been very rapid in recent years: 2 per cent yearly, or a little higher.<sup>1</sup>

According to official estimates the population of the USSR in 1929-30 was about 13 to 15 per cent larger than in 1913. If in later years the growth of population continued at the recent rate, then at present the population of the USSR must be over 20 per cent larger than the pre-war population (1913) within the same territory. If so, it would be necessary, in order to keep interior consumption of agricultural products (particularly of bread grain) at the pre-war level and in order to recover to the pre-war level of grain exports, to raise grain production about 20 per cent above the pre-war level. The present area in grain is only on the pre-war level.<sup>2</sup> If the growth of population should continue for a considerable period at the same rate as prevailed in 1922-27, then in addition to an increase of grain production by 20 per cent in order to reach

the pre-war per capita level,<sup>3</sup> it would be necessary further to increase production by 2 per cent per year.

A population growing so rapidly, if not absorbed in the process of industrialization, must be settled in new agricultural areas, for present agricultural areas are mostly overpopulated. Under such conditions the existing unoccupied agricultural areas in Asiatic Russia would soon be exhausted. In any event, the growth of the importance of interior markets for grains as compared with the export markets, which was characteristic before the war, must continue in future years. Thus, even if through great efforts the pre-war level of grain exports should shortly be recovered, the long-time tendency would be toward continuous decrease of grain surpluses for export on account of the growth of interior markets. A continuance of rapid growth of population in the USSR is reasonably to be expected, for changes in the rate of population growth of a people, apart from special catastrophes, take place but slowly.

The growth of the grain production necessary for the growing population may conceivably be achieved, it is true, not only by extensive growth of the arable area,<sup>4</sup> but

<sup>1</sup> It was on this level in 1922-27. After 1928, on account of the more strained food supply conditions and of civil war in the countryside, the growth may not have been so rapid. We do not have at our disposal objective statistical data as to the growth of population after 1928 throughout the USSR. In Ukraine, however, the rate of growth in 1929 was lower than in 1926, though it reached 1.7 per cent per year.

<sup>2</sup> The official estimate by the Gosplan is that the grain area of 1930 was 99.5 of that in 1913. The grain area of 1931 did not change substantially as compared with that of 1930.

<sup>3</sup> At some time in the future, it is possible that the pre-war per capita consumption of bread grain may be lowered through increase of per capita consumption of other foods, notably meat and milk. But for some years to come the supply of meat and milk will presumably be too low to give rise to this development.

<sup>4</sup> Some writers regard as important the possibility of expanding the crop area through elimination of strip farming that would come with collectivization. It is true that some gain is possible, for more or less land lying between strips and formerly not bearing crops would be brought under crops when strips were consolidated. But in the steppe areas the strips were not very numerous, and the saving there cannot be strikingly large; and in the northern wooded regions the variegated nature of the surface will not permit the consolidation of the numerous small strips to be carried out to the full extent. It may also be doubted if collective farms would be as economical of land as were small individual holders.



also (1) by better utilization of the existing arable area, through reduction of the percentage of arable land now fallow, (2) by replacement of other crops by grains, and (3) by increase of the yield per acre.

There are undoubtedly great possibilities for better utilization for crops within the present agricultural area both in European and in Asiatic Russia, for a large percentage of the occupied arable land in Russia is now left idle as fallow in rotation or as temporary pasture. Up to 30 per cent of the arable land was idle in 1917, even in the densely populated regions. During the three decades preceding the war the percentage decreased considerably, but mostly on account of improved utilization of land in the steppe regions, where thirty years before the war large areas of very extensive types of agriculture still existed. But in the regions where the traditional three-field system was dominant there was little change, and about 30 per cent of the arable land lay idle even just before the revolution. Here better utilization of the arable area can occur only after complete reorganization of the traditional three-field system of agriculture and replacement of it by a rational system of diversified farming. This process had begun in some densely populated regions even before the war, but it proceeded slowly. After 1922 the diversification of farming progressed further there and also extended into some other regions. There are trustworthy indications that the process will continue, resulting in better utilization of arable land and in a smaller percentage of idle land. Yet replacement of the three-field system by diversified farming does not involve an increase of the area under grain. The fallow land would be utilized not for grain but for other crops such as hay, forage crops, roots, technical crops, etc. Increased diversification of farming, improved crop rotation, means a decrease in the fraction of the crop area that is under small grain.

Not only was diversification a natural development, but it is also part of the plan for reorganization of agriculture in the USSR. The plan contemplates a more rapid increase of non-grain than of grain crops, and replacement of grain by certain more intensive crops in the western part of the black-

soil zone. Hence the grain area cannot be substantially increased through better utilization of actually occupied arable land in Russia; the outcome of increased diversification is more likely to be a relatively smaller area under grain, in view of the very high percentage of small-grain crops to the present total crop area in Russia. Furthermore, in some northern regions and in the semi-arid regions of the southeast, the practice of leaving a certain percentage of arable land idle as fallow would be necessary, on account of climatic conditions, under any system of agriculture.

The possibility of growth in the grain area through the process of replacing other crops by grain crops seems also to be excluded, for the tendency is just the opposite. The fraction of the total crop area devoted to small grain tends to decline with the diversification of farming. Grain crops now occupy about 80 per cent of the total crop area, as against about 90 per cent in 1916. The process must proceed further, for a total crop area of which 80 per cent is in grain is impossible for rational diversified farming. The relative importance of the grain area must decline.

In the first instance, wheat may replace other grains somewhat, but the process cannot go very far. One must distinguish between bread grains and forage grains. A strikingly high percentage of bread grain in the total grain area has been typical of Russian agriculture for several decades. This percentage was high, and the corresponding percentage of forage grain was low, only because the livestock industry remained at a very primitive level. Livestock received very little concentrated feed. At present animal husbandry is in a more critical position than any other branch of agriculture in the USSR, and it is to be improved only by better feeding of livestock. The production of forage crops, particularly of forage grain, is of first necessity for Russia. The Soviet plan for reorganization of agriculture projects a larger increase of forage-grain production than of bread-grain production. Expansion of the area under bread grain at the expense of forage grain is thus unlikely.

It is true that if horses should be replaced to some degree by tractors, less oats would

be required; but this process can hardly proceed rapidly, for a smaller number of horses might require more oats, the per capita consumption of oats by horses being now too low. Other livestock—cattle, hogs, poultry—certainly require much more concentrated feed in the form of barley or corn. Thus expansion of the wheat area in the USSR must proceed mostly through displacement of rye but not of other grain crops.

This process has been apparent, and it is reasonable to expect that it will continue. Wheat will replace rye in those regions where climatic and soil conditions permit. The expansion of agriculture toward the east will accelerate this process, since the southeastern regions are relatively more favorable for spring wheat than for rye. Some expansion of wheat at the expense of rye may also occur in the northern part of the blacksoil zone in Central Russia. Expansion of wheat at the expense of rye, it should be observed, does not mean increase in the surplus wheat for export; a larger quantity of wheat has to be used for domestic consumption in order to replace the decreased production of rye.

For these reasons we cannot expect substantial expansion of the crop area under both bread grains together, at least so far as this expansion is based upon better utilization of the existing area of arable land or upon replacement of other crops by wheat and rye. The opposite tendency is the more probable and reasonable from the point of view of the rational development of Russian agriculture. It is possible that under extreme pressure of need for increased exports, the government will try for a time to shift from forage grains to wheat, as was seemingly done in 1931; but this is to be regarded only as an emergency action.

Such is the outlook for increase in the production of bread grain, particularly wheat, so far as it may come through expansion of the crop area. What are the possibilities for an increase in the average yield of grain per acre?

The yield per acre in Russia is so very low that for this reason alone discussion seems warranted as to the possibility of a great increase in the near future. The Soviet plan is to raise the yield of grain per

acre by 35 per cent in five years, and that of wheat by as much as 40 per cent. Now it is clear that climatic conditions in Russia, particularly the rainfall, are such that enhancement of the yield in Russia to the level of yields in the more humid countries of western Europe is out of the question. This is true particularly of wheat. Russia is a country producing hard wheats, of which the yields are never as high as those of soft wheats. Standards with which the yield per acre in Russia may more fairly be compared are yields of wheat in the United States west of the Mississippi, or in western Canada, or in the Danube Basin—not in western Europe. Even this level would leave considerable possibilities for increase of the yield in Russia. Before the war, the yield per acre of grain in Russia was increasing slowly, on the average by one per cent per year. The average yield in recent years has been probably about the same as in 1909–13. Russian agricultural economists and statisticians in 1926–28 considered the possibility of increase in yield of about 2 per cent per year, which corresponds to the increase in Germany in the decades prior to the war, when the progress of agricultural technique in Germany was very rapid. They accepted the possibility of such an increase of yield in the USSR only under the condition that Soviet policy should be more favorable to agriculture than it was at about that time, and they also took into consideration the very low level of the yield in Russia at that time. Increase in yield of about 2 per cent per year may still be regarded as possible, perhaps probable. But the project of the Soviet government to increase yield per acre by 35 per cent in five years, which means more than 6 per cent per year, can only be considered unrealistic and without a basis in precedent. In this connection it is significant that Molotov, President of the Council of People's Commissariats, said in a recent speech concerning the second Five-Year Plan that no significant change in yield per acre had occurred in recent years, and that increase of yield was the major problem of the new plan.<sup>1</sup>

Increase of yield by 2 per cent per year

<sup>1</sup> *Pravda*, February 6, 1932.

would take care only of increase of domestic consumption resulting from the increase of population. Hence to recover the pre-war per capita level of grain production and exports, it is necessary first to enlarge the present grain crop area by 20 per cent in accord with the increased population, and then to raise the yield per acre by about 2 per cent yearly. Obviously, this task is not easy to accomplish in the present conditions of Russian agriculture and of the Russian economic situation in general. It would be difficult in any country.

What, then, are the major difficulties for rapid expansion of agricultural production, particularly of grain production during the next following years? One we have already mentioned: the instability of the present organization of agriculture in the USSR and its transitory character. Even if the new organization of agriculture on the basis of large-scale socialistic enterprise should eventually be successful, it can hardly be efficient during the period of organization, which itself must be rather protracted because so many peasants still regard it as a system imposed on them and not as their own. Peasants do not feel themselves to be masters of the collective farms. The most energetic of the peasants, the better organizers and managers, are completely excluded from collectives; they are classified as kulaks and are dispossessed, and at a time when managerial ability and education would be invaluable for the development of Russian agriculture.

Another factor that creates enormous difficulties for immediate expansion of agricultural production, particularly of grain production, is the deficiency of draft power in agriculture. The shortage of horses after the civil war and the famine of 1921 was one of the obstacles which substantially retarded recovery of the crop area to the pre-war level, particularly in the south-eastern steppe area. The struggle with the well-to-do peasants begun by the Soviet government in 1928 increased this difficulty; the vigorous drive for collectivization resulted in a wholesale slaughter of livestock, including horses. In the summer of 1930 there were in the USSR only 80 per cent of the pre-war number of horses within the same territory; the decline came

to 5-6 million horses, and in addition about 2 million oxen. On the credit side there were some seventy-five thousand tractors, naturally not enough to compensate for the great deficiency of horses and oxen. The vigorous drive for mechanization of agriculture in the USSR must be regarded largely as emergency action. Not until the deficiency of horses and oxen, caused mainly by the social policy of the government, is compensated either by recovery of the number of horses or by the introduction in agriculture of a sufficient number of tractors, will it be reasonable to anticipate substantial expansion of the grain area which now in the USSR stands only at about the pre-war level.

Neither way of increasing draft power is easy, and both require time. Recovery of animal husbandry, always a slow process, is particularly difficult under existing conditions in Russia; the experience of recent years does not indicate that the new forms of socialistic organization of agriculture (collective and state farms) are well fitted for the livestock industry. It may be reasonably doubted if bureaucratic trusts organized for reorganization and development of animal husbandry can be strikingly successful, at least in the next few years of experiment.

The introduction of a sufficient number of tractors encounters difficulties in two directions. The financial situation does not permit the purchase from abroad of tractors in adequate numbers; and production in the newly created domestic tractor factories is not proceeding as rapidly and smoothly as was planned. There are also great difficulties in using effectively the tractors actually available in agriculture. A lack of trained drivers and a lack of familiarity among the peasants with mechanical contrivances, both tractors and other machines, is pronounced under Russian conditions. Only the process of increasing mechanical skill among the peasants can meet this difficulty, and this process must necessarily be slow. In order to meet the emergency the Soviet government has concentrated all tractors except for those on state farms in so-called Machine-Tractor Stations (MTS), of which there were about 1,400 by the summer and the autumn of

1931. Each MTS is supposed to have from 50 to 100 or more tractors, and to plough the land of collective and individual farms in sizeable neighboring regions. As an emergency measure such an organization may have its merits, but its usefulness as an effective permanent organization may be doubted. Here there is evidence of the fondness of Soviet economists and organizers for giant enterprises. Experiences with giant state farms have been rather disappointing, and quite recently the government decided to subdivide them. It seems that in the USSR all problems of farm management are attacked not from the point of view of better organization of farming, but from the less searching and more temporary point of view of a better utilization of tractors. These points of view are quite different. The whole organization for the use of tractors in the USSR may reasonably be regarded as an emergency organization. It will inevitably require the lapse of a considerable period of time before the problem of draft power in Russian agriculture is solved. Until it is solved, one can hardly expect a rapid increase of the grain area from the present level, which itself corresponds to the pre-war level.

Without an increase of the grain area in proportion to the increased population (that is, by 20 per cent) it is unreasonable to anticipate the continuous recovery of the grain exports to the pre-war level. With the present grain area, the surpluses of grain for export would be generally smaller than they were before the war and exports would be intermittent. Only in

years of above-average yields could grain exports, particularly wheat exports, be highly important. In years with average or below-average yields, grain exports are bound to be rather small, at least unless domestic consumption should be rationed on a distinctly low level. Such fluctuating exports of grain (and particularly of wheat) from the USSR are reasonably to be expected, the more so because to stabilize the yield of grain, especially wheat, is impossible. Climatic factors are so important for Russian yields of grain, particularly of wheat in the prairie area, that continuous stable production is hardly to be anticipated. On the contrary, the shift of wheat production from west to east, which is characteristic of recent years, would result rather in larger fluctuations of yield than in smaller ones.

The fact that exports of wheat from the USSR in 1930-31, a year of exceptionally high yield, were less than half of comparable exports in pre-war years of good yields like 1909-10 and 1910-11 shows that in spite of rigorous rationing of domestic consumption the USSR cannot attain to the pre-war level of exports without considerable expansion of the grain area. A tremendous effort would be necessary rapidly to increase the grain area to a level which would permit continuous grain exports of pre-war magnitude. Even if such efforts should be successful and the grain crop area should be enhanced by some 20 per cent in the next few years, the continuous rapid growth of the population would tend to reduce these exports in the course of a longer time.

*This study is based upon the work of Vladimir P. Timoshenko. It represents a condensation, written by M. K. Bennett, of a much longer study by Dr. Timoshenko, which will shortly be published in full as a book. Dr. Timoshenko received his academic training in Russia, and traveled widely there before 1919; he subsequently taught at the Ukrainian University at Prague, Czecho-Slovakia, and is now Associate Professor of Economics at the University of Michigan.*

# APPENDIX

TABLE I.—UTILIZATION OF LAND IN THE USSR IN 1928\*

(Million acres)

Region	Farmsteads	Arable land	Meadows	Permanent pasture	Forests, woods, shrubs	Other productive land	Total productive land	Total unproductive land	Unclassified <sup>a</sup>	Uninhabited and unappropriated	Grand total
Total USSR .....	22.5	432.7	89.1	158.0	1,472.3	99.2	2,274.0	296.8	689.5	2,132.0	5,392.1
Russian SFSR .....	14.7	334.6	78.7	138.6	1,438.8	90.3	2,095.7	276.3	492.1	2,132.0	4,996.1
White Russian SSR .....	.7	10.3	4.9	1.0	7.8	.8	25.3	3.2	3.6	....	32.1
Ukrainian SSR .....	6.4	75.4	4.7	2.4	8.0	1.8	99.0	8.1	....	....	106.8
Transcaucasian SFSR ..	.7	8.8	.9	15.9	8.4	...	34.6	9.2	....	....	43.9
Uzbek SSR .....	...	...	...	...	2.5	6.3	8.8	...	76.6	....	85.4
Turkmen SSR .....	... <sup>b</sup>	3.6	...	...	6.9	...	10.6	...	117.2	....	127.8
Regions of RSFSR											
Northern .....	.2	3.3	4.5	4.8	128.0	.1	140.8	67.5	.6	30.3	239.3
Leningrad and Karelia..	.6	8.2	9.0	1.2	52.0	3.7	74.7	32.7	... <sup>b</sup>	12.2	119.6
Western .....	.7	9.4	4.4	.4	5.4	2.7	22.9	1.1	....	....	24.1
Central Industrial .....	2.5	34.0	12.6	4.7	34.9	7.9	96.5	5.8	.6	....	103.0
Central Blacksoil .....	2.9	33.7	2.0	1.6	3.3	... <sup>b</sup>	43.7	2.5	.5	....	46.7
Viatka .....	.7	12.4	2.9	.8	17.3	2.4	36.5	3.3	... <sup>b</sup>	....	39.7
Bashkir .....	.3	14.3	3.4	3.5	12.6	1.9	36.0	3.2	1.0	....	40.2
Middle Volga, all.....	2.5	51.2	4.4	5.1	11.3	2.3	76.9	5.3	.4	....	82.5
Middle Volga, proper..	1.5	39.4	3.1	4.3	7.1	2.0	57.4	3.8	.1	....	61.4
Tartar and Chuvash...	1.0	11.8	1.3	.8	4.2	.3	19.4	1.5	.2	....	21.1
Lower Volga .....	1.1	30.0	3.4	10.3	3.1	2.9	50.9	10.6	18.6	....	80.1
Ural .....	.7	26.8	9.9	5.5	86.8	1.8	131.4	25.8	30.3	231.4	419.0
Crimea .....	.2	3.7	... <sup>b</sup>	1.2	.5	... <sup>b</sup>	5.7	.6	....	....	6.3
North Caucasus .....	.8	38.8	1.7	2.7	6.7	7.4	58.1	5.3	9.0	....	72.5
Dagestan .....	... <sup>b</sup>	1.1	.5	5.5	.6	.1	7.8	5.7	....	....	13.5
Western Siberia .....	1.0	48.2	12.4	15.2	362.6	28.1	467.5	86.1	3.3	466.0	1,023.0
Yakutsk .....	... <sup>b</sup>	.1	.3	.2	444.8	... <sup>b</sup>	445.4	.3	11.1	712.2	1,169.0
Buriat-Mongol .....	... <sup>b</sup>	1.3	1.9	4.4	47.6	4.7	60.0	6.2	....	....	66.1
Kazak .....	.2	11.9	2.7	65.7	22.1	19.1	121.6	8.8	168.6	432.6	731.7
Kirghiz .....	...	1.9	...	...	2.9	...	4.7	...	43.5	....	48.2
Far East .....	.2	4.4	2.7	5.7	196.4	5.1	214.5	5.4	204.4	247.2	671.6

\* Data from *Statistical Handbook of the USSR for 1928*, described as based on estimates of local statistical offices. Areas in forest in the several regions of the RSFSR are described as roughly estimated. Dots (...) in a particular column indicate either that no estimates were given, or that land was classified in some category other than that designated at the head of the column. The summations do not check precisely in the original source; but conversions from thousand hectares to million acres, and rounding of figures, have also affected summations slightly.

<sup>a</sup> Unclassified as to productive or nonproductive.

<sup>b</sup> Less than 100,000 acres.

TABLE II.—AREAS OF PRINCIPAL GRAINS IN RUSSIA, FROM 1893\*

(Million acres)

Year	A. RUSSIAN EMPIRE											
	In 64 European provinces				In 72 European and Asiatic provinces				All provinces			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1893.....	39.5	67.2	18.2	36.3	....	....	....	....	....	....	....	....
1894.....	39.7	68.3	18.0	35.9	....	....	....	....	....	....	....	....
1895.....	38.9	67.7	18.2	37.1	42.2	70.4	18.6	39.4	....	....	....	....
1896.....	41.6	69.6	19.3	38.8	45.9	72.3	19.8	41.6	....	....	....	....
1897.....	42.4	68.0	19.7	39.4	46.7	70.5	20.3	42.2	....	....	....	....
1898.....	42.5	67.6	20.1	38.8	47.0	70.1	20.6	41.7	....	....	....	....
1899.....	45.3	68.8	20.0	39.3	49.7	71.2	20.5	42.1	....	....	....	....
1900.....	47.5	71.3	20.3	40.7	52.3	73.5	20.7	43.8	....	....	....	....
1901.....	49.6	71.6	21.0	41.4	54.3	73.8	21.5	44.5	....	....	....	....
1902.....	50.7	71.7	21.4	40.8	55.1	73.9	21.7	43.2	....	....	....	....
1903.....	52.2	72.4	22.6	41.2	57.2	75.0	23.0	43.8	....	....	....	....
1904.....	54.4	71.3	23.6	41.5	59.2	74.1	24.0	44.4	....	....	....	....
1905.....	56.9	70.4	23.7	42.2	62.2	72.8	24.2	45.3	....	....	....	....
1906.....	58.6	72.6	23.6	42.0	63.6	75.0	24.0	45.4	....	....	....	....
1907.....	55.0	71.6	24.3	41.8	60.8	74.3	24.9	45.5	66.7	75.0	26.7	46.2
1908.....	55.8	68.7	26.1	41.6	62.4	71.0	26.7	45.7	68.4	71.8	28.5	46.4
1909.....	57.0	69.6	26.2	41.5	64.7	71.9	26.9	46.2	71.7	72.7	28.8	46.9
1910.....	62.6	68.8	27.7	42.9	70.6	70.9	28.4	47.3	77.9	71.7	30.5	48.2
1911.....	63.7	70.8	28.1	42.6	73.2	73.0	28.9	47.5	80.1	74.0	30.9	48.3
1912.....	60.7	70.8	28.1	41.2	70.7	73.2	28.9	46.0	77.8	74.1	30.9	46.9
1913.....	62.1	71.9	30.2	42.0	74.4	74.8	31.2	47.7	82.6	76.0	33.7	48.7
1914.....	61.9 <sup>ab</sup>	68.1 <sup>ab</sup>	29.8 <sup>ab</sup>	40.3 <sup>ab</sup>	75.2 <sup>a</sup>	71.1 <sup>a</sup>	30.7 <sup>a</sup>	46.3 <sup>a</sup>	83.9 <sup>a</sup>	71.9 <sup>a</sup>	33.1 <sup>a</sup>	47.8 <sup>a</sup>
1915.....	56.5 <sup>ab</sup>	60.1 <sup>ab</sup>	26.7 <sup>ab</sup>	34.9 <sup>ab</sup>	69.7 <sup>a</sup>	62.9 <sup>a</sup>	27.7 <sup>a</sup>	41.1 <sup>a</sup>	77.2 <sup>a</sup>	63.6 <sup>a</sup>	29.7 <sup>a</sup>	42.4 <sup>a</sup>
1916.....	50.3 <sup>ab</sup>	56.2 <sup>ab</sup>	25.8 <sup>ab</sup>	35.5 <sup>ab</sup>	63.3 <sup>a</sup>	58.5 <sup>a</sup>	26.6 <sup>a</sup>	41.4 <sup>a</sup>	....	....	....	....
1917.....	....	....	....	....	....	....	....	....	....	....	....	....
Year	B. UNION OF SOCIALISTIC SOVIET REPUBLICS											
	International Institute				Central Statistical Office				Gosplan			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1918.....	....	....	....	....	....	....	....	....	65.2°	61.4°	24.2°	41.5°
1919.....	....	....	....	....	....	....	....	....	63.1°	60.9°	22.7°	38.7°
1920.....	47.6	47.1	16.4	28.0	47.6°	47.2°	16.5°	28.0°	61.0°	60.5°	21.2°	35.9°
1921.....	38.4	47.9	15.7	24.1	38.4°	47.9°	15.7°	24.1°	47.9°	60.0°	19.7°	30.2°
1922.....	24.4°	51.6°	9.0°	20.3°	22.3°	45.3°	7.9°	17.9°	29.8°	60.7°	10.6°	24.0°
1923.....	39.2	64.3	17.2	26.0	34.0°	62.6°	15.5°	25.6°	38.4°	73.4°	18.3°	29.3°
1924.....	52.7	68.8	18.1	31.6	42.2°	65.5°	15.5°	28.8°	48.5°	66.0°	16.6°	31.6°
1925.....	....	....	....	....	47.6'	66.7'	14.6'	28.9'	55.5°	70.8°	14.5°	31.4°
1926.....	61.5	71.0	15.3	32.2	....	....	....	....	63.1	72.1	15.7	33.3
1927.....	73.9	71.1	17.9	39.6	....	....	....	....	66.3°	69.7°	17.0°	37.6°
1928.....	77.4	67.4	17.1	44.1	....	....	....	....	73.9	71.1	17.9	39.6
1929.....	68.5	60.9	18.0	42.6	....	....	....	....	70.8°	69.0°	16.1°	42.6°
1930.....	73.5	61.6	20.0	46.6	....	....	....	....	79.0	70.0	17.1	45.1
1931.....	83.8	72.2	18.4	44.3	....	....	....	....	71.9	64.4	17.7	42.6
1931.....	92.4 <sup>b</sup>	70.1 <sup>b</sup>	17.1 <sup>b</sup>	42.5 <sup>b</sup>	....	....	....	....	75.7	64.4	20.0	46.5

\* Sources of Russian Empire statistics: Columns 1-8, years 1893-1913, from A. K. Broshniovsky, *Conditions for Russian Grain Exports Abroad* (Petrograd, 1914); other pre-war figures from *International Yearbook of Agricultural Statistics*, 1913-14 and 1909-21. For the USSR, figures in columns 1-4 are the most recently published figures given in successive issues of the *International Yearbook of Agricultural Statistics*; columns 5-8, years 1920-22 from *Collection of Statistical Material for the USSR, 1918-1923*, years 1923-24 from *Works of the Central Statistical Office*, VIII, issue 7, and year 1925 from *Bulletin of the Central Statistical Office*, No. 116, February 1926; columns 9-12, years 1918-27, from *Encyclopedia of Soviet Exports* (Berlin, 1928), pp. 237-38, and years 1925-29 from *Control Figures for 1929-30*, pp. 532-33. Dots (....) indicate that data are not available. Data appear to apply mostly to areas sown (particularly columns 9-12, years 1925-29), though figures of the International Institute are described as applying to areas harvested wherever possible.

<sup>a</sup> Excluding invaded territory.

<sup>b</sup> 63 rather than 64 European provinces.

<sup>c</sup> Excluding Turkestan, Transcaucasia, and the Far East.

<sup>d</sup> Excluding Turkestan, Transcaucasia, and Buriat-Mongol Republic. Acreages for the same area and excluding also the Far East are: (1923) wheat, 33.2; rye, 62.2; barley, 15.5; oats, 24.9; (1924) wheat, 41.7; rye, 64.9; barley, 15.5; oats, 28.2.

<sup>e</sup> Excluding Turkestan and Transcaucasia.

<sup>f</sup> Excluding parts of Turkestan.

<sup>g</sup> Preliminary data as of October 20, 1927.

<sup>h</sup> Data from *Monthly Crop Report and Agricultural Statistics*, October 1931.

TABLE III.—PRODUCTION OF THE PRINCIPAL CEREALS IN RUSSIA, FROM 1892\*

(Million quintals)

Year	A. RUSSIAN EMPIRE											
	In 64 European provinces				In 72 European and Asiatic provinces				All provinces			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1892.....	88.2	159.6	45.8	77.5	....	....	....	....	....	....	....	....
1893.....	120.1	191.1	73.6	110.7	....	....	....	....	....	....	....	....
1894.....	113.8	221.3	59.7	110.7	....	....	....	....	....	....	....	....
1895.....	102.5	199.1	53.7	106.3	112.5	203.5	55.1	113.1	....	....	....	....
1896.....	99.4	194.9	53.2	105.8	112.1	200.6	55.2	116.1	....	....	....	....
1897.....	77.9	158.9	50.2	86.5	92.6	166.2	52.0	96.3	....	....	....	....
1898.....	111.1	181.4	65.2	91.1	125.0	187.3	66.8	99.8	....	....	....	....
1899.....	107.2	223.7	47.5	131.9	123.6	231.6	49.4	144.5	....	....	....	....
1900.....	107.7	229.6	50.7	118.0	115.1	233.7	51.6	123.9	....	....	....	....
1901.....	109.3	187.7	51.3	86.5	116.4	191.8	52.2	90.6	....	....	....	....
1902.....	152.6	227.2	72.4	128.8	165.3	233.4	73.6	135.1	....	....	....	....
1903.....	150.2	223.5	76.3	105.7	169.1	231.6	77.8	116.1	....	....	....	....
1904.....	169.4	248.4	74.0	154.6	181.5	256.2	75.4	163.2	....	....	....	....
1905.....	154.7	180.0	73.8	123.6	173.2	187.3	75.6	136.0	....	....	....	....
1906.....	122.8	162.2	66.9	91.9	138.4	169.4	68.6	103.5	....	....	....	....
1907.....	119.2	196.7	75.4	119.3	139.0	205.3	77.4	131.7	155.3	207.1	82.1	133.7
1908.....	133.1	192.7	80.5	121.1	154.1	198.7	82.8	136.6	170.8	200.7	87.6	139.3
1909.....	193.7	213.0	101.8	155.0	211.2	227.6	103.8	166.1	230.3	229.5	109.3	168.8
1910.....	190.4	214.3	98.7	140.3	210.7	220.3	100.9	151.8	227.6	222.3	106.2	154.5
1911.....	121.7	188.6	88.0	115.1	138.5	193.5	90.2	124.6	153.4	195.3	95.1	127.1
1912.....	169.8	256.8	99.3	141.3	196.0	264.7	101.9	155.0	218.1	266.9	108.1	158.1
1913.....	228.1	246.9	121.4	160.5	259.2	254.2	124.6	177.9	279.7	256.9	130.6	181.6
1914.....	157.7 <sup>ab</sup>	208.6 <sup>ab</sup>	83.5 <sup>ab</sup>	104.9 <sup>ab</sup>	203.2 <sup>a</sup>	218.4 <sup>a</sup>	87.1 <sup>a</sup>	127.1 <sup>a</sup>	226.9 <sup>a</sup>	220.9 <sup>a</sup>	94.2 <sup>a</sup>	132.8 <sup>a</sup>
1915.....	177.8 <sup>ab</sup>	223.5 <sup>ab</sup>	85.4 <sup>ab</sup>	113.6 <sup>ab</sup>	203.6 <sup>a</sup>	229.4 <sup>a</sup>	87.4 <sup>a</sup>	125.9 <sup>a</sup>	225.0 <sup>a</sup>	231.1 <sup>a</sup>	93.4 <sup>a</sup>	130.3 <sup>a</sup>
1916.....	119.8 <sup>ab</sup>	214.3 <sup>ab</sup>	76.3 <sup>ab</sup>	122.4 <sup>ab</sup>	....	....	....	....	....	....	....	....
1917.....	102.9 <sup>ab</sup>	154.2 <sup>ab</sup>	....	....	151.6 <sup>a</sup>	162.0 <sup>a</sup>	....	....	165.6 <sup>a</sup>	165.1 <sup>a</sup>	....	....
	B. UNION OF SOCIALISTIC SOVIET REPUBLICS											
	International Institute				Central Statistical Office				Gosplan			
1918.....	....	....	....	....	....	....	....	....	167.6°	184.3°	50.9°	112.7°
1919.....	....	....	....	....	....	....	....	....	156.6°	172.3°	77.6°	113.8°
1920.....	86.6	93.7	46.1	70.2	87.2°	93.4°	47.1°	70.5°	114.8°	127.1°	63.1°	94.8°
1921.....	55.7	101.8	26.6	52.2	55.7°	101.8°	26.0°	52.2°	64.2°	119.6°	30.1°	61.3°
1922.....	87.5°	181.5°	38.3°	73.8°	66.1°	144.4°	29.8°	59.3°	96.5°	213.4°	43.9°	88.1°
1923.....	114.1	199.2	45.5	77.6	104.6 <sup>d</sup>	186.7 <sup>d</sup>	51.2 <sup>d</sup>	75.5 <sup>d</sup>	96.5°	207.2°	50.5°	87.1°
1924.....	128.5	187.2	39.3	87.6	106.7 <sup>d</sup>	173.8 <sup>d</sup>	38.5 <sup>d</sup>	76.8 <sup>d</sup>	115.5°	187.1°	34.1°	87.5°
1925.....	206.1	229.5	58.8	121.4	....	....	....	....	188.2°	222.6°	56.0°	115.8°
1926.....	248.7	239.1	53.5	155.4	....	....	....	....	212.9	230.2	58.5	121.7
1927.....	213.5	241.4	44.3	132.4	....	....	....	....	207.7°	228.7°	50.6°	143.3°
1928.....	216.4	190.5	55.8	164.8	....	....	....	....	248.7	239.1	53.5	155.4
1929.....	191.3	207.9	70.7	166.1	....	....	....	....	198.2° <sup>f</sup>	246.9° <sup>f</sup>	44.1° <sup>f</sup>	133.5° <sup>f</sup>
1930.....	295.0	....	....	....	....	....	....	....	211.2	244.2	45.0	133.1
1931.....	....	....	....	....	....	....	....	....	215.9	191.2	54.9	164.8
	....	....	....	....	....	....	....	....	201.1	202.2	73.5	166.1

\* For sources of data see Table II. Dots (....) indicate that data are not available.

<sup>a</sup> Excluding invaded territory.<sup>b</sup> 63 rather than 64 European provinces.<sup>c</sup> Excluding Turkistan, Transcaucasia, and the Far East.<sup>d</sup> Total for the USSR. Totals for the USSR excluding Turkistan, Transcaucasia, Buriat-Mongol Republic, and the Far East, are: (1923) wheat, 87.6; rye, 185.5; barley, 46.0; oats, 72.7; (1924) wheat, 93.1; rye, 172.2; barley, 34.0; oats, 73.9.<sup>e</sup> Excluding Turkistan and Transcaucasia.<sup>f</sup> Preliminary data as of October 20, 1927.

TABLE IV.—PRODUCTION OF THE PRINCIPAL CEREALS IN RUSSIA, FROM 1892\*  
(Million bushels—wheat, 60 lbs.; rye, 56 lbs.; barley, 48 lbs.; oats, 32 lbs.)

Year	A. RUSSIAN EMPIRE											
	In 64 European provinces				In 72 European and Asiatic provinces				All provinces			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1892...	324.2	628.3	210.2	533.9	....	....	....	....	....	....	....	....
1893...	441.3	752.4	338.0	762.8	....	....	....	....	....	....	....	....
1894...	418.1	871.2	274.2	762.4	....	....	....	....	....	....	....	....
1895...	376.8	783.6	246.5	732.1	413.4	801.3	252.9	779.5	....	....	....	....
1896...	365.0	767.4	244.5	728.9	412.0	789.6	253.6	799.8	....	....	....	....
1897...	286.3	625.5	230.4	595.6	340.2	654.3	238.6	663.7	....	....	....	....
1898...	408.2	714.1	299.3	627.8	459.3	737.5	307.0	687.5	....	....	....	....
1899...	393.7	880.4	218.1	908.7	454.1	911.7	226.9	995.4	....	....	....	....
1900...	395.9	903.9	232.8	812.8	423.0	920.1	237.0	853.7	....	....	....	....
1901...	401.6	738.9	235.8	595.6	427.8	755.0	239.9	624.1	....	....	....	....
1902...	560.7	894.4	332.6	887.1	607.4	919.0	338.3	930.7	....	....	....	....
1903...	551.8	879.9	350.5	728.1	621.4	911.9	357.4	799.8	....	....	....	....
1904...	622.3	978.0	339.8	1,065.1	666.8	1,008.4	346.2	1,124.2	....	....	....	....
1905...	568.4	708.7	338.9	851.7	636.3	737.5	347.0	936.7	....	....	....	....
1906...	451.0	638.7	307.3	633.3	508.4	666.9	315.1	713.0	....	....	....	....
1907...	437.9	774.2	346.1	822.1	510.7	808.2	355.4	907.2	570.6	815.1	377.0	921.1
1908...	489.2	758.7	369.9	834.5	566.4	782.0	380.2	941.4	627.6	790.1	402.2	959.4
1909...	711.6	838.5	467.7	1,067.7	775.9	895.9	476.5	1,144.2	846.2	903.6	501.9	1,163.0
1910...	699.6	843.7	453.5	966.4	774.0	867.2	463.6	1,045.5	836.2	875.1	488.0	1,064.5
1911...	447.1	742.4	404.2	792.9	508.8	761.9	414.2	858.2	563.5	768.7	436.6	875.9
1912...	623.8	1,011.0	456.0	973.4	720.0	1,042.0	468.2	1,067.6	801.5	1,050.8	496.4	1,089.4
1913...	837.9	972.0	557.6	1,105.6	952.4	1,000.9	572.2	1,225.4	1,027.7	1,011.3	599.9	1,251.2
1914...	579.3 <sup>ab</sup>	821.1 <sup>ab</sup>	383.6 <sup>ab</sup>	722.5 <sup>ab</sup>	746.5 <sup>a</sup>	859.9 <sup>a</sup>	399.8 <sup>a</sup>	875.6 <sup>a</sup>	833.6 <sup>a</sup>	869.6 <sup>a</sup>	432.6 <sup>a</sup>	914.9 <sup>a</sup>
1915...	653.3 <sup>ab</sup>	880.0 <sup>ab</sup>	392.2 <sup>ab</sup>	782.6 <sup>ab</sup>	747.9 <sup>a</sup>	903.0 <sup>a</sup>	401.3 <sup>a</sup>	867.4 <sup>a</sup>	826.8 <sup>a</sup>	909.9 <sup>a</sup>	429.2 <sup>a</sup>	897.5 <sup>a</sup>
1916...	440.1 <sup>ab</sup>	843.7 <sup>ab</sup>	350.2 <sup>ab</sup>	843.3 <sup>ab</sup>	....	....	....	....	....	....	....	....
1917...	377.9 <sup>ab</sup>	607.1 <sup>ab</sup>	....	....	557.1 <sup>a</sup>	637.8 <sup>a</sup>	....	....	608.3 <sup>a</sup>	649.8 <sup>a</sup>	....	....
	B. UNION OF SOCIALISTIC SOVIET REPUBLICS											
	International Institute				Central Statistical Office				Gosplan			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1918...	....	....	....	....	....	....	....	....	615.7°	725.5°	234.0°	776.4°
1919...	....	....	....	....	....	....	....	....	575.4°	678.4°	356.6°	784.3°
1920...	318.2	368.9	211.7	483.6	320.5°	367.6°	216.3°	485.6°	421.9°	500.4°	289.7°	653.4°
1921...	204.8	400.8	122.0	359.4	204.8°	400.8°	119.3°	359.4°	235.9°	470.8°	138.4°	422.1°
1922...	321.4°	714.5°	175.7°	508.3°	242.8°	568.3°	136.8°	408.7°	354.5°	840.3°	201.6°	607.1°
1923...	419.1	784.2	209.0	534.9	384.4°	735.0°	235.0°	519.8°	354.5°	815.8°	231.7°	600.4°
1924...	472.3	737.0	180.6	603.3	391.9°	684.1°	176.9°	529.0°	424.3°	736.4°	156.5°	602.6°
1925...	785.2	903.5	270.1	836.4	....	....	....	....	691.6°	876.4°	257.3°	797.9°
1926...	913.8	941.3	245.7	1,070.6	....	....	....	....	782.3°	906.2°	267.8°	838.4°
1927...	784.6	950.3	203.4	912.2	....	....	....	....	763.2°	900.2°	232.5°	987.5°
1928...	795.2	750.0	256.2	1,135.4	....	....	....	....	913.8°	941.3°	245.7°	1,070.6°
1929...	702.9	818.5	324.8	1,144.3	....	....	....	....	728.3° <sup>f</sup>	971.8° <sup>f</sup>	202.4° <sup>f</sup>	919.7° <sup>f</sup>
1930...	1,083.9	....	....	....	....	....	....	....	776.0°	961.4°	206.7°	917.0°
1931...	....	....	....	....	....	....	....	....	793.3°	752.7°	252.2°	1,135.4°
	....	....	....	....	....	....	....	....	738.9°	796.0°	337.6°	1,144.3°

\* For sources see Table II. Dots (...) indicate that data are not available.

<sup>a</sup> Excluding invaded territory.

<sup>b</sup> 63 rather than 64 provinces.

<sup>c</sup> Excluding Turkestan, Transcaucasia, and the Far East.

<sup>d</sup> Total for USSR. Totals for USSR excluding Turkestan, Transcaucasia, Buriat-Mongol Republic, and the Far East are: (1923) wheat, 321.7; rye, 730.3; barley, 211.2; oats, 501.2; (1924) wheat, 342.2; rye, 678.0; barley, 156.1; oats, 509.4.

<sup>e</sup> Excluding Turkestan and Transcaucasia.

<sup>f</sup> Preliminary data as of October 20, 1927.



TABLE V.—YIELD PER ACRE OF THE PRINCIPAL CEREALS IN RUSSIA, FROM 1893\*  
(Bushels per acre—wheat, 60 lbs.; rye, 56 lbs.; barley, 48 lbs.; oats, 32 lbs.)

Year	A. RUSSIAN EMPIRE											
	In 64 European provinces				In 72 European and Asiatic provinces				All provinces			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1893....	11.17	11.20	18.57	21.01	....	....	....	....	....	....	....	....
1894....	10.53	12.76	15.23	21.24	....	....	....	....	....	....	....	....
1895....	9.69	11.57	13.54	19.73	9.80	11.38	13.60	19.78	....	....	....	....
1896....	8.77	11.03	12.67	18.79	8.98	10.92	12.81	19.23	....	....	....	....
1897....	6.75	9.20	11.70	15.12	7.28	9.28	11.75	15.73	....	....	....	....
1898....	9.60	10.56	14.89	16.18	9.77	10.52	14.90	16.49	....	....	....	....
1899....	8.69	12.80	10.90	23.12	9.14	12.80	11.07	23.64	....	....	....	....
1900....	8.33	12.68	11.47	19.97	8.09	12.52	11.45	19.49	....	....	....	....
1901....	8.10	10.32	11.23	14.39	7.88	10.23	11.16	14.02	....	....	....	....
1902....	11.06	12.47	15.54	21.74	11.02	12.44	15.59	21.54	....	....	....	....
1903....	10.57	12.15	15.51	17.67	10.86	12.16	15.54	18.26	....	....	....	....
1904....	11.44	13.72	14.40	25.67	11.26	13.61	14.42	25.32	....	....	....	....
1905....	9.99	10.07	14.30	20.18	10.23	10.13	14.34	20.68	....	....	....	....
1906....	7.70	8.80	13.02	15.08	7.99	8.89	13.13	15.70	....	....	....	....
1907....	7.96	10.81	14.24	19.67	8.40	10.88	14.27	19.94	8.55	10.87	14.12	19.94
1908....	8.77	11.04	14.17	20.06	9.08	11.01	14.24	20.60	9.18	11.00	14.11	20.68
1909....	12.48	12.05	17.85	25.73	11.99	12.46	17.71	24.77	11.80	12.43	17.43	24.80
1910....	11.18	12.26	16.37	22.53	10.96	12.23	16.32	22.10	10.73	12.21	16.00	22.09
1911....	7.02	10.49	14.38	18.61	6.95	10.44	14.33	18.07	7.03	10.39	14.13	18.13
1912....	10.28	14.28	16.23	23.63	10.18	14.24	16.20	23.21	10.30	14.18	16.06	23.23
1913....	13.49	13.52	18.46	26.32	12.80	13.38	18.34	25.69	12.44	13.31	17.80	25.69
1914....	9.36 <sup>ab</sup>	12.06 <sup>ab</sup>	12.87 <sup>ab</sup>	17.93 <sup>ab</sup>	9.93 <sup>a</sup>	12.09 <sup>a</sup>	13.02 <sup>a</sup>	18.91 <sup>a</sup>	9.94 <sup>a</sup>	12.09 <sup>a</sup>	13.07 <sup>a</sup>	19.14 <sup>a</sup>
1915....	11.56 <sup>ab</sup>	14.64 <sup>ab</sup>	14.69 <sup>ab</sup>	22.42 <sup>ab</sup>	10.73 <sup>a</sup>	14.36 <sup>a</sup>	14.49 <sup>a</sup>	21.10 <sup>a</sup>	10.71 <sup>a</sup>	14.31 <sup>a</sup>	14.45 <sup>a</sup>	21.17 <sup>a</sup>
1916....	8.75 <sup>ab</sup>	15.01 <sup>ab</sup>	13.57 <sup>ab</sup>	23.75 <sup>ab</sup>	....	....	....	....	....	....	....	....
1917....	....	....	....	....	....	....	....	....	....	....	....	....
	B. UNION OF SOCIALISTIC SOVIET REPUBLICS											
	International Institute				Central Statistical Office				Gosplan			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1918....	....	....	....	....	....	....	....	....	9.44 <sup>c</sup>	11.82 <sup>c</sup>	9.67 <sup>c</sup>	18.71 <sup>c</sup>
1919....	....	....	....	....	....	....	....	....	9.12 <sup>c</sup>	11.14 <sup>c</sup>	15.71 <sup>c</sup>	20.27 <sup>c</sup>
1920....	6.68	7.83	12.91	17.27	6.74 <sup>c</sup>	7.79 <sup>c</sup>	13.11 <sup>c</sup>	17.34 <sup>c</sup>	6.92 <sup>c</sup>	8.27 <sup>c</sup>	13.67 <sup>c</sup>	18.20 <sup>c</sup>
1921....	5.33	8.37	7.77	14.91	5.34 <sup>c</sup>	8.38 <sup>c</sup>	7.60 <sup>c</sup>	14.91 <sup>c</sup>	4.92 <sup>c</sup>	7.85 <sup>c</sup>	7.03 <sup>c</sup>	13.98 <sup>c</sup>
1922....	13.17 <sup>c</sup>	13.85 <sup>c</sup>	19.52 <sup>c</sup>	25.04 <sup>c</sup>	10.89 <sup>c</sup>	12.56 <sup>c</sup>	17.32 <sup>c</sup>	22.83 <sup>c</sup>	11.90 <sup>c</sup>	13.84 <sup>c</sup>	19.02 <sup>c</sup>	25.30 <sup>c</sup>
1923....	10.69	12.20	12.15	20.57	11.31 <sup>d</sup>	11.74 <sup>d</sup>	15.16 <sup>d</sup>	20.30 <sup>d</sup>	9.23 <sup>c</sup>	11.11 <sup>c</sup>	12.66 <sup>c</sup>	20.49 <sup>c</sup>
1924....	8.96	10.71	9.98	19.09	9.29 <sup>d</sup>	10.44 <sup>d</sup>	11.41 <sup>d</sup>	18.37 <sup>d</sup>	8.75 <sup>c</sup>	11.16 <sup>c</sup>	9.43 <sup>c</sup>	19.07 <sup>c</sup>
1925....	12.77	12.73	17.65	25.98	....	....	....	....	12.46 <sup>c</sup>	12.47 <sup>c</sup>	17.74 <sup>c</sup>	25.41 <sup>c</sup>
1926....	12.37	13.24	13.73	27.04	....	....	....	....	12.40 <sup>c</sup>	12.57 <sup>c</sup>	17.06 <sup>c</sup>	25.18 <sup>c</sup>
1927....	10.14	14.10	11.89	20.68	....	....	....	....	11.51 <sup>c</sup>	12.92 <sup>c</sup>	13.68 <sup>c</sup>	26.26 <sup>c</sup>
1928....	11.61	12.32	14.23	26.65	....	....	....	....	12.37 <sup>c</sup>	13.24 <sup>c</sup>	13.73 <sup>c</sup>	27.04 <sup>c</sup>
1929....	9.56	13.29	16.24	24.56	....	....	....	....	10.29 <sup>ef</sup>	14.08 <sup>ef</sup>	12.57 <sup>ef</sup>	21.59 <sup>ef</sup>
1930....	12.93	....	....	....	....	....	....	....	9.82 <sup>c</sup>	13.73 <sup>c</sup>	12.09 <sup>c</sup>	20.33 <sup>c</sup>
1931....	....	....	....	....	....	....	....	....	11.03 <sup>c</sup>	11.69 <sup>c</sup>	14.25 <sup>c</sup>	26.65 <sup>c</sup>

\* Computed from data in Appendix Tables II and IV.

<sup>a</sup> Excluding invaded territory.

<sup>b</sup> Excluding Turkistan, Transcaucasia, and the Far East.

<sup>c</sup> Acreage figures exclude Turkistan, Transcaucasia, and Buriat-Mongol Republic. Production figures are for the total USSR. Yields per acre for comparable acreage and production areas (i.e., excluding Turkistan, Transcaucasia, Buriat-Mongol Republic, and the Far East, as given in footnote <sup>d</sup>, Appendix Tables II and IV) are: (1923) wheat, 9.69; rye, 11.74; barley, 13.63; oats, 20.13; (1924) wheat, 8.21; rye, 10.45; barley, 10.07; oats, 18.06.

<sup>d</sup> Excluding Turkistan and Transcaucasia.

<sup>e</sup> 63 rather than 64 provinces.

<sup>f</sup> Preliminary data as of October 20, 1927.

TABLE VI.—GROSS EXPORTS OF THE PRINCIPAL CEREALS FROM RUSSIA, FROM 1892\*  
(Million bushels and million quintals)

Year	A. RUSSIAN EMPIRE								
	Million bushels				Million quintals				Total four grains
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats	
1892 .....	49.1	7.8	33.1	23.1	13.37	1.98	7.21	3.36	25.92
1893 .....	94.0	20.8	83.7	64.1	25.59	5.27	18.22	9.30	58.38
1894 .....	123.2	52.2	115.2	106.5	33.53	13.27	25.08	15.46	87.34
1895 .....	142.8	58.9	81.5	75.3	38.85	14.96	17.74	10.93	82.48
1896 .....	132.2	51.1	61.4	76.2	35.97	12.99	13.37	11.06	73.39
1897 .....	128.4	47.4	67.3	49.2	34.94	12.04	14.64	7.14	68.76
1898 .....	106.8	43.1	80.0	28.6	29.08	10.96	17.41	4.14	61.59
1899 .....	64.5	39.1	56.1	32.2	17.54	9.94	12.20	4.67	44.35
1900 .....	70.4	60.1	40.4	90.3	19.15	15.27	8.80	13.10	56.32
1901 .....	83.4	53.3	58.4	90.6	22.70	13.55	12.71	13.15	62.11
1902 .....	111.9	63.3	78.4	71.4	30.47	16.09	17.07	10.37	74.00
1903 .....	153.4	53.0	109.5	67.1	41.75	13.46	23.85	9.75	88.81
1904 .....	169.1	38.8	114.2	61.1	46.01	9.84	24.87	8.86	89.58
1905 .....	176.8	38.5	104.1	143.7	48.13	9.78	22.65	20.85	101.41
1906 .....	132.4	42.2	111.9	78.4	36.04	10.71	24.37	11.38	82.50
1907 .....	85.3	29.1	99.8	29.5	23.21	7.40	21.74	4.28	56.63
1908 .....	54.0	16.1	121.4	33.2	14.71	4.08	26.44	4.82	50.05
1909 .....	189.3	22.9	164.9	84.3	51.52	5.82	35.91	12.24	105.49
1910 .....	225.5	26.1	184.1	94.7	61.36	6.63	40.08	13.74	121.81
1911 .....	144.8	34.8	197.6	96.0	39.40	8.83	43.02	13.94	105.19
1912 .....	96.9	19.7	126.9	58.5	26.37	5.01	27.63	8.49	67.50
1913 .....	122.4	25.5	180.3	41.3	33.30	6.47	39.26	6.00	85.03
1914 .....	88.6	15.0	90.8	19.2	24.12	3.82	19.77	2.79	50.50
1915 .....	7.0	3.7	.3	.3	1.91	.95	.07	.05	2.98
1916 .....	8.7	4.0	.1	.0	2.36	1.02	.03	.00	3.41
1917 .....	.3	.1	....	....	.08	.03	....	....	.11
1918 .....	....	....	....	....	....	....	....	....	....
1919 .....	....	....	....	....	....	....	....	....	....
1920 .....	....	....	....	....	....	....	....	....	....
1921 .....	.... <sup>ab</sup>	.0 <sup>b</sup>	.0 <sup>b</sup>	.0 <sup>b</sup>	.... <sup>ab</sup>	.00 <sup>b</sup>	.00 <sup>b</sup>	.00 <sup>b</sup>	.... <sup>ab</sup>
1922 .....	.0 <sup>b</sup>	.1 <sup>b</sup>	.0 <sup>b</sup>	.0 <sup>b</sup>	.00 <sup>b</sup>	.03 <sup>b</sup>	.00 <sup>b</sup>	.00 <sup>b</sup>	.03 <sup>b</sup>
1923 .....	12.2	47.2	10.1	7.1	3.33	12.00	2.20	1.04	18.57
1924 .....	9.1	25.0	10.5	4.1	2.48	6.35	2.28	.60	11.71
1925 .....	14.5	6.9	22.3	.9	3.95	1.75	4.86	.13	10.69
1926 .....	38.5	8.8	33.1	1.1	10.47	2.23	7.21	.16	20.07
1927 .....	28.3	14.0	2.9	6.9	7.69	3.55	.64	1.00	12.88
1928 .....	.1 <sup>b</sup>	.4 <sup>c</sup>	.... <sup>ac</sup>	.... <sup>ac</sup>	.03 <sup>b</sup>	.10 <sup>c</sup>	.... <sup>ac</sup>	.... <sup>ac</sup>	.13 <sup>c</sup>
1929 .....	.... <sup>ab</sup>	.... <sup>ac</sup>	7.3 <sup>c</sup>	.5 <sup>c</sup>	.... <sup>ab</sup>	.01 <sup>c</sup>	1.59 <sup>c</sup>	.08 <sup>c</sup>	1.68 <sup>c</sup>
1930 .....	93.0	25.4 <sup>c</sup>	54.3 <sup>c</sup>	24.3 <sup>c</sup>	25.31	6.46 <sup>c</sup>	11.81 <sup>c</sup>	3.53 <sup>c</sup>	47.11 <sup>c</sup>

\* Pre-war data, for 1892-1913, from A. K. Broshniovsky, *Conditions for Russian Grain Exports Abroad*, Petrograd, 1914, pp. 112-16; for 1914-16, from *International Yearbook of Agricultural Statistics, 1909-21* (these figures apply to exports across European frontiers); for 1917, from N. D. Kondratieff, *The Grain Trade*, Moscow, 1922, p. 5 (these figures include flour as grain, and for the years 1914-16 differ a little from those published by the International Institute). Dots (...) indicate that data are not available.

<sup>a</sup> Less than 100,000 bushels.

<sup>c</sup> Import statistics not available.

<sup>b</sup> Imports exceeded exports.

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