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PROVISIONAL INTELLIGENCE REPORT

THE PATTERN OF LAND USE IN RELATION TO TARGET GRAINS IN THE USSR AND THE PROBABLE SPREAD OF STEM RUST ON CEREAL GRAINS

CIA/RR PR-23
18 February 1953

Part II of this report was prepared by the Office of Scientific Intelligence.

150

CENTRAL INTELLIGENCE AGENCY

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Office of Research and Reports

FOREWORD

This report is in two parts. Part I deals with the relationship of the land-use patterns of the principal cereal grain-producing administrative districts in the biological warfare (BW) target regions of the USSR to the magnitude of local targets, in terms of vulnerable grain expressed as percentages of the total production of the USSR. Part II deals with the probable spread of stem-rust infection from foci of primary infection.

Part I is based on the latest available Soviet acreage statistics, those for 1938, a climatically normal year. The total acreage presently seeded to grain crops and its distribution by regions are still much the same. The 1938 pattern is therefore believed to be satisfactory for the purposes of this report, although the 1938 figures are only approximately applicable to present conditions and are subject to revision.

Part II is based largely on case histories of stem-rust spread from infected barberry bushes in the US. The spread of infection from the more or less concentrated yet limited foci of barberry bushes bears a very uncertain relation to the spread of infection from the larger and originally more diffuse centers developing from feather-bomb drops. A great many factors are involved, and the data now available are not adequate to assess these factors. It is therefore impossible at present to calculate with accuracy the area in which a specified crop loss will occur as a result of stem-rust spread from a given successfully established infected area.

CONTENTS

Appendixes

Map

Annex

NOTE ON CLASSIFICATION

The over-all classification of this report is TOP SECRET. The map and the Annex, however, are classified SECRET.

CIA/RR PR-23

SECURITY INFORMATION

THE PATTERN OF LAND USE IN RELATION TO TARGET GRAINS IN THE USSR AND THE PROBABLE SPREAD OF STEM RUST ON CEREAL GRAINS*

Summary

The grain surplus areas in the USSR in which growing grains may become biological warfare (BW) targets are located in the southern part of European USSR and in a narrow belt of Asiatic USSR extending eastward from the Ural Mountains to the Altai Mountains. In this report the grain surplus areas of European USSR are divided into three regions according to their principal crops: Region I, winter wheat** and barley; Region II, spring wheat**; and Region III-A, winter rye** and oats. The only grain surplus area of Asiatic USSR is designated Region IV, in which spring wheat and oats are the important crops. From a statistical analysis of the land-use patterns and production of the target grains in the administrative districts in each of these regions, it is possible to indicate the degree of vulnerability of target grains in the administrative districts and the statistical chance of making a direct hit with a single BW munition. Statistically, the chances in European USSR range from 4 percent in Groznyy Oblast of Region I to 58 percent in Nikolayev Oblast of Region I. Obviously, a BW attack would be more successful in those areas where the proportion of target grains is highest.

Complete and unqualified reliance should not be placed on the statistical approach to land use, because certain known physical features limit crop area and production in parts of every region. Thus the avoidance of mountainous or waste areas in a district with an over-all statistical chance of a direct hit of 28 percent -- the average for Regions I, II, and III-A of European USSR -- would increase the probability considerably. A study of aerial photographs should indicate some of these areas to be avoided. Certain qualifying factors are herewith considered in connection with the analysis of the statistics of land use.

A study of the famine that occurred in the USSR in 1932-33 indicates that it is possible for a stem-rust epidemic to extend over parts of the southern grain surplus regions in European USSR. The same study shows that Soviet crop requisitioning for nonfarm uses and exportation remained unchanged in spite of famine and starvation on the country's farms.

* This report contains information available to CIA as of 1 December 1952.

** The terms "winter wheat" and "winter rye" are applied to varieties seeded in the fall and harvested during the following summer. Spring wheat and spring rye are seeded in the spring and harvested in the summer or early fall of the same year. Because spring rye is a relatively unimportant cereal crop in the USSR, it has not been included in the grain statistics of this report.

Assuming that a BW attack is possible and that it can be directed toward areas of highest vulnerability, its success will depend on the extent of the rust spread grids and the intensity of destruction within these grids of wheat, rye, barley, and oats in the grain surplus regions at the time of the attack. Research now complete indicates that "heavy" damage in excess of 100 square miles can be expected from each focus of stem-rust infection that is established under favorable conditions.

Of 1,528 case histories of stem-rust spread from infected barberry bushes in the US, 132 cases showed damaging effect in excess of 1 mile from the focus of infection, and 28 cases were dramatic, with the spreads ranging up to 2,260 square miles and with heavy damage occurring up to 250 miles. A review of these cases, with their inherent and admitted limitations, shows positively that under a wide range of conditions as to terrain, geographic location, and season a destructive spread of varying extent will occur when a central source of inoculum is established.

PART I

PATTERN OF LAND USE IN RELATION TO TARGET GRAINS IN THE USSR

A. Introduction.

There is no single pattern of land use in the USSR. There are nearly as many patterns of land use as there are oblasts, krays, and other administrative districts. For the cereal grains -- wheat, rye, barley, and oats -- these varying patterns are indicated by statistics for the seeding and production of these grains, district by district. In this report, statistics for seeding in a district are given as a percentage of the total area of the district seeded to the specified grains, and statistics for production in a district are given as a percentage of the total Soviet production of the specified grains.

The consolidation of such seeding and production statistics for cereal grains which are all vulnerable to a certain strain of stem rust, serves to indicate the percentage chance of a direct hit being made by any single E-73 feather-bomb drop. It also serves to indicate the magnitude of local targets.

The last reliable official Soviet acreage statistics on the basis of small administrative districts are those of 1938. These data, which have been used by the US Department of Agriculture in plotting conventional dot maps to show the distribution of grains and other crops, are those on which the deductions made in this report are based. There are no official corresponding production statistics. The year 1938, however, was an average year, with rather good growing conditions in North Ukraine but dry in South Ukraine. The customary spring drought crept up the Volga River, and, early in the summer, hot winds swept across the Caspian Sea, reducing what otherwise might have been a bumper crop.* On the whole, however, weather conditions during the growing season, which largely determine yield, were about average. Therefore, in order to obtain an expression of quantity, or production, for each of the four cereal target grains in each oblast, kray, or other administrative district, the acreage seeded to each grain in each such district has been multiplied by the average yield of each grain for that district expressed in centners per hectare.** In Table 1,*** production bases computed on the 1938 acreage are shown. All computations and, in some cases, estimates were adjusted to conform with 1950 boundaries.

* The author of the land-use part of this report traveled through these regions in 1938 appraising the agricultural situation in the USSR for the US Department of Agriculture.

** A hectare equals 2.47 acres, and a Soviet centner equals 220.46 pounds (or 3.67 bushels of wheat, 3.94 bushels of rye, 4.59 bushels of barley, and 6.89 bushels of oats).

*** Table 1 follows on p. 4.

Table 1

Target Grains: Production Bases Computed on the 1938 Acreage of Winter Wheat, Spring Wheat, Winter Rye, Barley, and Oats in Specified Regions of the USSR

Area	Bread Grains								Feed Grains				Total All Grains	
	Winter Wheat		Spring Wheat		Winter Rye a/*		Total b/		Barley		Oats			
	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent
European USSR														
Surplus Regions														
Region I														
Winter Wheat and Barley	9,594.4	61.5	917.6	5.1	2,257.0	11.5	12,769.0	24.0	3,851.1	42.2	1,657.1	10.2	18,277.2	23.3
Region II														
Spring Wheat	613.9	4.0	4,971.0	27.7	3,116.6	15.8	8,701.5	16.3	1,039.3	11.4	1,593.5	9.9	11,334.3	14.4
Region III-A														
Winter Rye and Oats	2,359.6	15.1	1,547.0	8.6	5,915.0	30.0	9,821.6	18.4	928.3	10.1	3,195.8	19.8	13,945.7	17.7

* Footnotes to Table 1 follow on p. 6.

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Table 1

Target Grains: Production Bases Computed on the 1938 Acreage of Winter Wheat, Spring Wheat, Winter Rye, Barley, and Oats in Specified Regions of the USSR
(Continued)

Area	Bread Grains								Feed Grains				Total All Grains	
	Winter Wheat		Spring Wheat		Winter Rye [a]		Total [b]		Barley		Oats			
	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent
European USSR (Continued)														
Total European USSR														
Surplus Regions	12,567.9	80.6	7,435.6	41.4	11,288.6	57.3	31,292.1	58.7	5,818.7	63.7	6,446.4	39.9	43,557.2	55.4
Deficit Region														
Region III-B	1,351.1	8.7	1,387.1	7.7	7,015.9	35.6	9,754.1	18.3	1,698.0	18.6	5,758.2	35.6	17,210.3	21.9
Other Areas	178.7	1.1	20.6	0.1	45.9	0.2	245.2	0.5	72.5	0.8	64.6	0.4	382.3	0.5
Total European USSR	14,097.7	90.4	8,843.3	49.2	18,350.4	93.1	41,291.4	77.5	7,589.2	83.1	12,269.2	75.9	61,149.8	77.8

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Table 1

Target Grains: Production Bases Computed on the 1938 Acreage of Winter Wheat, Spring Wheat, Winter Rye, Barley, and Oats in Specified Regions of the USSR
(Continued)

Area	Bread Grains								Feed Grains				Total All Grains	
	Winter Wheat		Spring Wheat		Winter Rye [a]		Total [b]		Barley		Oats			
	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent	Thousand Metric Tons	Percent
Asiatic USSR														
Surplus Region														
Spring Wheat and Oats	27.7	0.2	6,030.1	33.6	1,046.7	5.3	7,104.5	13.3	368.5	4.0	2,547.1	15.8	10,020.1	12.8
Other Areas	1,471.1	9.4	3,089.0	17.2	312.0	1.6	4,872.1	9.2	1,173.5	12.9	1,349.1	8.3	7,394.7	9.4
Total Asiatic USSR	1,498.8	9.6	9,119.1	50.8	1,358.7	6.9	11,976.6	22.5	1,542.0	16.9	3,896.2	24.1	17,414.8	22.2
Total USSR	15,596.5	100.0	17,962.4	100.0	19,709.1	100.0	53,268.0	100.0	9,131.2	100.0	16,165.4	100.0	78,564.6	100.0

a. Spring rye, a relatively unimportant cereal crop in the USSR, is not included.
b. Figures for bread grains as such are not included in the area totals.

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While the data used in this report are based on the 1938 land-use patterns because 1938 is the last year for which published data are available on a detailed regional basis, it is believed that shifts in acreage during the past 14 years have not been sufficiently great to render the 1938 acreage and the computed production bases invalid for the purposes of this report. The total acreage seeded to grain crops is not materially different now from what it was in 1938, and distribution by regions is much the same. There have been some shifts among grains, such as a tendency to stress bread grains as against feed grains and to plant rye rather than wheat in some regions, but, generally speaking, these shifts have for the most part taken place within the potential target areas, the major grain surplus regions. Therefore, the 1938 pattern is still believed to be a realistic one. There has certainly been no shift in the weather pattern, and the use of average yields gives a basic picture of what may be expected under normal conditions as well as a point of departure for comparing the effect of annual fluctuations in weather and other growing conditions on production in other years.

In several treatises the vulnerability of Russian grain to BW attack has been analyzed in considerable detail, and certain potential target areas have been indicated. It is a matter of record that in 1938 the territories now comprising the USSR seeded 98.7 million hectares to the four cereal target grains -- wheat, rye, barley, and oats -- and that 74.8 million hectares, or 75.8 percent, were seeded in European USSR, while 23.9 million hectares, or 24.2 percent, were seeded in Asiatic USSR.

Under normal growing conditions the 75.8 percent of the total acreage of the USSR seeded in European USSR in 1938 would have accounted for 78 percent of all the cereal target grains produced in the USSR in that year, including 90 percent of the winter wheat, 49 percent of the spring wheat, 93 percent of the winter rye, 83 percent of the barley, and 76 percent of the oats (see Table 1). Likewise under normal growing conditions the acreage seeded in Asiatic USSR in 1938, 24.2 percent of the total, would have accounted for 22 percent of all the cereal target grains produced in the USSR in that year, including 10 percent of the winter wheat, 51 percent of the spring wheat, 7 percent of the winter rye, 17 percent of the barley, and 24 percent of the oats (see Table 1).

B. Regions of Production.

The grain surplus regions of the USSR are located in the southern part of European USSR and in a narrow belt of Asiatic USSR between the parallels of 45 and 55 degrees north latitude extending from the Ural Mountains eastward to the Altai Mountains. There are various ways of describing these European and Asiatic grain surplus regions in which growing grains may become logical targets for BW attack. If the attack is to be made with use of E-73 feather bombs which are carrying spores of rusts that will attack wheat, rye, barley, and oats separately or in combination, it is not necessary to consider separately the target potentialities of

the area seeded to each grain. For the purposes of this report, European USSR has been divided into three regions based on land use (see the accompanying map),* as follows: Region I, in which winter wheat is the most important crop and barley is second in importance; Region II, in which spring wheat is the most important crop; and Region III, in which winter rye and oats are the important crops. The only grain surplus region of Asiatic USSR, in which spring wheat and oats are the important crops, will be designated, for the purposes of this report, as Region IV (not shown on the map).

Ninety-nine of the varying land-use patterns of these regions are indicated in the tables of the Annex, The Statistical Basis Indicating the Land-Use Pattern and Distribution of Grain Production in Specified Administrative Districts of the USSR,** Tables 1 to 87, inclusive, being devoted to European USSR and Tables 88 to 99, inclusive, to Asiatic USSR. In each table the total area of each district is given, as well as the area seeded to each of the target grains -- winter wheat, spring wheat, winter rye, barley, and oats -- and the total area seeded to these target grains, together with the percentage that each such area is of the total area of each district. These percentages for European USSR are also indicated, in black, on the map in each corresponding district that is shown. The tables in the Annex also give the production of each target grain and the total of these grains, as well as the percentage that each such production is of the total production of the corresponding grain in the USSR. These percentages for European USSR are also indicated, in red, on the map in each corresponding district that is shown.

These grain surplus regions of European and Asiatic USSR show perceptible differences in land-use patterns, but, in reality, adjoining regions tend to merge and are not sharply delineated as indicated on the map for European USSR. A description follows of the broad characteristics of each region.

1. Region I.

Region I is the winter wheat and barley region, a surplus region, of European USSR, including parts of West and North Ukraine, all of South Ukraine, the Moldavian SSR, the Crimea, and the North Caucasus Economic Region.*** Winter wheat is the most important of the target grains in Region I.**** Winter rye is generally the second most important crop in West and North Ukraine, although barley follows winter wheat in order of importance in South Ukraine except in Voroshilovgrad and Stalino oblasts. Spring wheat is the least important target grain in this region.

* Following p. 18.
** Following p. 43.
*** The North Caucasus Economic Region comprises Krasnodar and Stavropol' krays, Groznyy Oblast, and Dagestan ASSR.
**** Ismail' Oblast (in South Ukraine), in which barley is the most important target grain, is the single exception.

Under normal growing conditions the acreage seeded in the potential target area* of Region I in 1938 would have accounted for 23 percent of all the target grains produced in the USSR in that year (see Table 1). The region would have produced 62 percent of the winter wheat, 5 percent of the spring wheat, 12 percent of the winter rye, 42 percent of the barley, and 10 percent of the oats. Under normal growing conditions the bread-grain production of the potential target area of Region I in 1938 would have been 24 percent of the total bread-grain production in the USSR.

In that part of the Ukraine which is included in Region I the statistical approach to the pattern of land use indicates that, for example, 58 percent of the total area of Nikolayev Oblast was seeded to the four cereal target grains (see the map and Table 13 in the Annex). The distribution of acreages in Nikolayev Oblast is fairly uniform. If it is assumed that the grain rust spores disseminated from a single E-73 feather-bomb drop have an initial spread of 10 square miles, it may be construed that some spores from a single feather-bomb drop in Nikolayev Oblast would have more than a 58-percent chance of hitting one or another of the four cereal target grains.

Conversely, as indicated on the map, the statistical chance of making a direct hit in the Transcarpathian Oblast in the extreme west of Region I is only 8 percent, whereas in Groznyy Oblast in the extreme southeast there is a statistical chance of only 4 percent and in Dagestan ASSR (not shown on the map) only 6 percent of making a direct hit. It is obvious that an attempt at a BW attack on the grain growing in these districts would not be worth while.

There are three districts in Region I in which the statistical approach to land use is not directly valid. In the southern part of the Crimea there is a range of low mountains where the use of land for field-crop production is negligible. In the area north of these mountains the chance of making a direct hit is greater than the 28 percent indicated on the map for the Crimea Oblast as a whole.

The two other questionable districts in Region I are Krasnodar Kray and Stavropol' Kray. For example, Krasnodar Kray (see the map and Table 19 in the Annex) has a total area of 8.5 million hectares, of which only 2.4 million hectares, or 28 percent, were seeded to target grains in 1938. These target grains, however, are distributed throughout the general seeded acreage of only 3.8 million hectares, or 45 percent of the total area. The seeded area lies north of the Caucasus Mountains, which occupy 55 percent of the whole area of the kray. Outside the seeded area the land of the kray is occupied by orchards, meadows, pastures, and agricultural wasteland. It is not possible at this time to delineate the land-use pattern within the limits of the total seeded area.

* In Region I, three districts lie outside the potential target area of a probable BW attack on grains: the Transcarpathian Oblast in the west and Groznyy Oblast and Dagestan ASSR in the southeast.

Stavropol' Kray (see the map and Table 20 in the Annex) has a total area of 7.66 million hectares, of which only 2 million hectares, or 26 percent, were seeded to target grains in 1938. These target grains, however, are distributed throughout the general seeded acreage of only 3.1 million hectares, or 41 percent of the total area, lying in the west-central part of the kray. A large percentage of the kray is occupied by the Caucasus Mountains to the south and by arid wastes to the northeast. It is not possible at this time to delineate the land-use pattern within the limits of the total seeded area.

Although in each of the several oblasts of the Ukraine, as well as in the Moldavian SSR, the statistical approach to land use indicates in a rough way the chance of making a direct hit by an E-73 feather-bomb drop. An analysis of aerial photographs may indicate, in some instances, localities to be avoided in a bombing attack, thus increasing the chance of a hit.

2. Region II.

Region II is the spring wheat region, a surplus region, of European USSR, including the oblasts of Rostov,* Stalingrad, Saratov, Ul'yanovsk, Kuybyshev, and Chkalov and Bashkir ASSR. Spring wheat is the most important of the target grains in Region II. Rye is second in importance except in Rostov Oblast, where it gives place to both barley and winter wheat. Except in Rostov Oblast, winter wheat is an unimportant grain. Oats are relatively unimportant in Rostov and Stalingrad oblasts but are third in importance in the northern oblasts. Barley is significant only in the south.

Under normal growing conditions the acreage seeded in the potential target area of Region II in 1938 would have accounted for 14 percent of all the target grains produced in the USSR in that year (see Table 1). The region would have produced 4 percent of the winter wheat, 28 percent of the spring wheat, 16 percent of the winter rye, 11 percent of the barley, and 10 percent of the oats. Under normal growing conditions the bread-grain production in the potential target area of Region II in 1938 would have been 16 percent of the total bread-grain production in the USSR.

The statistical method of describing the pattern of land use in the individual administrative districts of Region II loses much of its usefulness because a considerable part of each of the territories is made up of wasteland or land on which target grains are seeded on scattered acreages. The greater part of the region is adjacent to the vast Asiatic desert, and light rainfall and chronic drought have tended to crowd much of the agricultural production against the western boundary

* Rostov Oblast is conventionally considered as part of the Lower Don-North Caucasus Economic Region. In this discussion, however, Rostov Oblast is considered together with the oblasts of the Lower Volga because spring wheat is the dominant seeded grain in Rostov Oblast.

of the region.

For example, Rostov Oblast (see the map and Table 23 in the Annex) has a total area of 10.45 million hectares, of which only 3.13 million hectares, or 30 percent, were seeded to target grains in 1938. These target grains, however, are distributed primarily throughout the general seeded acreage of only 4.64 million hectares, or 44 percent of the total area, lying chiefly in the western part of the oblast. The eastern part of the oblast is largely land unsuited to profitable field-crop production, and seeded acreages are widely scattered. The land-use pattern of this oblast is varied, with barren stretches in the area of the city of Rostov and in other scattered localities. It is not possible at this time to delineate the intricate land-use pattern within the limits of the total seeded area. Similar land-use patterns prevail in the oblasts of Stalingrad, Saratov, Kuybyshev, and Chkalov.

In the north, Bashkir ASSR (see the map and Table 30 in the Annex) has a total area of 14.35 million hectares, of which only 2.6 million hectares, or 18 percent, were seeded to target grains in 1938. These target grains, however, are distributed largely throughout the general seeded acreage of only 3.5 million hectares, or 24 percent of the total area, concentrated in the western and northwestern parts of the republic. About 76 percent of the republic is mountainous or covered with forests, pastures, and other land areas not well suited to field-crop production.

3. Region III.

Region III, in which rye (almost exclusively winter rye) and oats are the predominating crops, is made up of a normally grain surplus region (III-A) in the south of European USSR and a normally grain deficit region (III-B) in the north.

a. Region III-A.

Region III-A includes all of West Ukraine (except the Transcarpathian and Chernovtsy oblasts); the North Ukrainian oblasts of Zhitomir, Chernigov, and Sumy; as well as the northern part of Kiev Oblast of North Ukraine. It also includes the Central Agricultural (Black Soil) Region,* as well as Chuvash ASSR and Tatar ASSR. This grain surplus region is characterized by winter rye as the most important of the target grains. The second most important crop is generally either winter wheat or oats. In North and West Ukraine, barley tends to be a more important crop than spring wheat, whereas in the Central Agricultural (Black Soil) Region the reverse tends to be the case.

* The Central Agricultural (Black Soil) Region includes the oblasts of Bryansk, Kursk, Orël, Voronezh, Tambov, and Penza and Mordvin ASSR.

Under normal growing conditions the acreage seeded in the potential target area of Region III-A in 1938 would have accounted for 18 percent of the production of all the target grains produced in the USSR in that year (see Table 1). The region would have produced 15 percent of the winter wheat, 9 percent of the spring wheat, 30 percent of the winter rye, 10 percent of the barley, and 20 percent of the oats. Under normal growing conditions the bread-grain production in the potential target area of Region III-A in 1938 would have been 18 percent of the total bread-grain production in the USSR.

The land-use pattern in most of the eastern half of Region III-A is more or less similar to that of North Ukraine. The country is generally open steppe with seeded acreages fairly uniform in their distribution, but wooded areas are more frequently encountered than in the south. Kursk Oblast presents at least a 37-percent statistical chance of a direct hit by a feather-bomb drop; Voronezh, 31-percent; Tambov, 34-percent; Penza, 33-percent; and so on. Toward the west the region is more heavily wooded, and the statistical chance of making direct hits on the oblasts in this area becomes less than in the east -- Chernigov, 23 percent; Zhitomir, 23 percent; Rovno, 22 percent; and so on.

Summarizing the situations in the grain surplus Regions I, II, and III-A, under normal growing conditions, the acreages seeded in the potential target areas of these three regions in 1938 taken as a whole would have accounted for 55 percent of the four target grains -- wheat, rye, barley, and oats -- produced in the USSR in that year (see Table 1). The three regions would have produced 81 percent of the winter wheat, 41 percent of the spring wheat, 57 percent of the winter rye, 64 percent of the barley, and 40 percent of the oats. Under normal growing conditions the combined bread-grain production in Regions I, II, and III-A would have been 59 percent of the total bread-grain production in the USSR.

This vast grain surplus region, which is the primary target for a BW attack on grains, has a total area of 775,900 square miles, of which 318,400 square miles, or 41 percent, were under field-crop production in 1938. Wheat, rye, barley, and oats were seeded on 215,300 square miles, or 28 percent of the total area.

Although, as pointed out in the discussion of Region II (the spring wheat region), the statistical approach to employing the land-use pattern as an indication of the percentage of chance of making a direct hit on one or another of the target grains by any single feather-bomb drop is, in some cases, invalid, nevertheless it would be the grain growing on this 28 percent of the total area of Regions I, II, and III-A that would logically be the potential primary target for a BW attack. In the Ukraine and the Central Agricultural (Black Soil) Region the chances are considerably more than 28 percent. By avoiding the mountains and wasteland areas of the North Caucasus region, the valleys of the Lower Don and the Volga rivers, and the mountainous and forested areas

of the Urals Economic Region, the chances of making a direct hit would also be greater than the 28-percent average for Regions I, II, and III-A.

b. Region III-B.

The districts in grain deficit Region III-B, on the other hand, offer relatively poor targets (less than a 28-percent chance) for successful feather-bomb drops. Vast forests cover the northern part of this whole region, and south of these primeval forests the region is characterized by marshes, pastures, and wooded areas, which in many oblasts are more uniformly distributed than are cultivated areas. Often these cultivated areas appear as "islands" scattered irregularly throughout lands that are not well suited to production.

The map shows only part of Region III-B, the northern limits of which extend above the Arctic Circle. Region III-B includes the Northwest Economic Region with Leningrad as a center; Northern European USSR with Arkangel'sk as a center; the Baltic Economic Region; Belorussia (west and east); Industrial Concentration B in Central European USSR with Moscow as a center; Velikiye Luki Oblast in the west; Kirov Oblast, Chuvash ASSR, and Mari ASSR in the east; and, finally, Udmurt ASSR and Molotov Oblast in the northern part of the Urals Economic Region.

Under normal growing conditions the acreage seeded in the potential target area of Region III-B in 1938 would have accounted for 22 percent of all the target grains produced in the USSR in that year (see Table 1). The region would have produced 9 percent of the winter wheat, 8 percent of the spring wheat, 36 percent of the winter rye, 19 percent of the barley, and 36 percent of the oats. Under normal growing conditions the bread-grain production of the potential target area of Region III-B would have been 18 percent of the total bread-grain production in the USSR.

The target potentialities of Region III-B are poor, with the exception of Tula Oblast, with a 29-percent statistical chance of a direct hit on one or another of the target grains by a feather-bomb drop, and Ryazan' Oblast, with a 31-percent statistical chance. Smolensk Oblast presents only a 19-percent statistical chance of a direct hit by a feather-bomb drop; Kirov, 15-percent; Minsk, 16-percent; Moscow, 9-percent; Kalinin, 11-percent; and so on.

4. Region IV (Asiatic USSR).

The chief grain-producing region of Asiatic USSR, which produces a surplus of spring wheat and oats, is a relatively narrow belt extending from the foothills of the Ural Mountains eastward to the foothills of the Altai Mountains.

Region IV includes all administrative districts for which data are given in Tables 88 to 99, inclusive, in the Annex. For the most

part, this surplus area lies in the West Siberia Economic Region. The remainder of Asiatic USSR (which is not included in Region IV and which is not included in the tables in the Annex), comprising most of the Central Asia, East Siberia, and Far East Economic Regions, is deficient in the production of all grains. Neither Region IV nor the remainder of Asiatic USSR is shown on the map in this report, as the seeding of grains therein is often discontinuous and is dispersed to such a degree that the seeded grains offer unsatisfactory targets.

Region IV irregularly follows the 55th parallel of north latitude and includes Chelyabinsk Oblast and the southern part of Sverdlovsk Oblast of the Urals Economic Region. It also includes Kurgan Oblast; the southern part of Tyumen Oblast; parts of Omsk, Novosibirsk, and Kemerovo oblasts; as well as the northern part of Altai Kray of the West Siberia Economic Region. The belt also includes North Kazakhstan Oblast and the northern parts of Kustanay, Kokchetav, and Pavlodar oblasts of Kazakh SSR.

Under normal growing conditions the acreage seeded in the potential target area of Region IV in 1938 would have accounted for only 13 percent of all the target grains produced in the USSR in that year (see Table 1). The region would have produced 0.2 percent of the winter wheat, 34 percent of the spring wheat, 5 percent of the winter rye, 4 percent of the barley, and 16 percent of the oats. Under normal growing conditions the bread-grain production in the potential target area of Region IV in 1938 would have been 13 percent of the total bread-grain production in the USSR.

Many of the rivers traversing Region IV take their rise in the Kazakh tableland and flow north to the Arctic Ocean. During part of the year their mouths are frozen, and their waters back up into the area of the surplus belt, creating extensive marsh lands bordered by areas suitable only for the production of grass. In fact, much of the grain can be grown only on "islands" of tilled land where the water table is sufficiently low to admit cultivation of field crops. Grain is grown extensively in the foothills of the mountains bordering the belt on the west and east, as well as in favorable valleys of the tablelands to the south.

The statistical method of indicating the land-use pattern is of questionable utility in such cases as Tyumen Oblast with 0.7 percent of the total area seeded to target grains in 1938, Sverdlovsk with 4 percent, Kemerovo with 3 percent, Kustanay with 3 percent, Kokchetav with 4 percent, and Pavlodar with 3 percent.

From dot maps based on seeded areas in 1938, it appears that the spring wheat and oats acreages in Kurgan Oblast are fairly evenly distributed. In Kurgan Oblast (see Table 90 in the Annex), with a total area of 7.11 million hectares, only 1.74 million hectares were under target grains in 1938 as follows: spring wheat, 14 percent; winter rye, 3 percent;

barley, 1 percent; oats, 6 percent; or 24 percent in all. Statistically, the grain in this oblast offers a fair target to a feather-bomb drop with a 24-percent chance of a direct hit. Grain in North Kazakhstan Oblast and the southern part of Omsk Oblast appears to have a concentration about the same as that in Kurgan. There is thus a strip of fairly heavily concentrated grain acreage extending about 600 miles from 65 to 75 degrees east longitude and 150 miles wide extending somewhat north and south of 55 degrees north latitude, or 90,000 square miles in all.

There appears to be considerable grain in Altai Kray (see Table 95 in the Annex), which has a total area of 26.16 million hectares with a total seeded acreage of 3.9 million hectares, or 15 percent of the total acreage. Scattered throughout this total seeded acreage 3.3 million hectares were seeded to target grains in 1938, largely in three river valleys some distance apart. It is questionable whether the grain in Altai Kray or in any other part of Asia, except in the limited belt indicated above, offers a worth-while target for a BW attack on grain.

About 10 percent of all the target grains grown in the USSR are produced in other parts of Asia (see Table 1), in scattered areas throughout East Siberia and the Far East, in and about the oases of Central Asia and South Kazakh SSR, or in Transcaucasus. These areas probably are of only secondary interest or of negligible value from the point of view of BW attack.

C. Famine of 1932-33. 1/*

There is no authentic information available relative to the extent of stem-rust spread from a single focus of infection in the USSR or relative to the degree to which any rust damage has reduced yields. Otto Schiller, the former Agricultural Attache of the German Embassy in Moscow, in discussing the agricultural crisis of 1932-33, which was attended by famine, mentions a stem-rust epidemic in that year in certain areas of the USSR. Since there has been considerable confusion in the minds of certain analysts as to the cause of the famine of 1932-33, the following discussion is given in some detail.

To understand the famine of 1932-33, it is essential to know that in 1930-31 grain production was "good" -- reported at 83.5 million metric tons, from which the Soviet government procured 22.1 million tons, or 26.5 percent, leaving 61.4 million tons on farms. The deduction of the 6 million tons that were exported from the government's procurement of 22.1 million tons leaves the equivalent of 16.1 million tons for nonfarm utilization.

* Footnote references in arabic numerals are to sources listed in Appendix C.

In 1931-32 there was a crop failure. Generally unfavorable growing conditions, including drought and hot winds from the Asiatic desert, destroyed a large part of the production in the Volga Valley, in the Urals Economic Region, and in West Siberia. Total grain production dropped to an estimated 66.1 million metric tons. In spite of the poor harvest the government exacted deliveries from farmers amounting to 22.8 million tons, or 34.5 percent. The government exported 4.8 million metric tons of grain that year, which,deducted from the procurement of 22.8 million tons, leaves the equivalent of 18 million tons for nonfarm utilization. Because 22.8 million tons had been procured by the government from a production of 66.1 million tons, only 43.3 million tons were left on farms as compared with 61.7 million tons in 1930-31. Although famine conditions were not reported, the populations of the chief agricultural regions were faced with the problem of mere existence. Farm stocks were depleted. Considerable numbers of livestock, including draft animals, were slaughtered, and in some areas farmers were forced to eat some of their seed reserves. It is reported that whole villages migrated from the worst stricken areas to seek better living conditions.

The seeding campaign for the harvest of 1932-33 was handicapped by a shortage of manpower and draft animals. There was also a shortage of seed because some had been consumed. The total grain acreage dropped 4.5 percent below that of 1931-32. The drastic steps taken by the government in forcing excessive deliveries of grain in 1931-32 had greatly lowered the morale of the peasants. The hastily established collectives were poorly managed and badly organized.* Work in collective fields was poorly done, and the peasants tended to concentrate their energies on the cultivation of their own garden plots. Because the peasants could not or would not cope with the situation, weeds gained the upper hand, and often it was impossible to identify what kind of grain had been seeded in a field.

There were also heavy harvesting losses because work was performed too late. Much grain spoiled in the sheaf and shock in the fields. Finally mice appeared in large numbers in North Caucasus, in South Ukraine, in the Crimea, and in Kazakh SSR, destroying much grain in stacks and storage sheds. In addition to the foregoing factors tending to lower production, Schiller makes the following statement: "Heavy rust damage appeared in certain areas in North Caucasus, in parts of the western side of the Lower Volga, in the Central Black Soil Belt, and in West Ukraine" 2/ -- that is, in the oblasts west of the Dnepr River. In certain other

* The great drive to collectivize 100 million peasants began in 1929. In March 1930, Stalin called a temporary halt, but the good harvest of 1930-31 was taken as an indication of the success of collectivization, and the drive was continued. By the middle of 1931, official statistics show that 13 million households, or 52.7 percent of the total, had been collectivized. The Ukrainians and the Cossacks living in the grain-producing regions had resisted collectivization, and the measures taken against them were ruthless, accompanied by marauding, arrest, and even slaughter of the better class of farmers, leaving the conduct of the collectivized land holdings in the hands of the poorer and less able peasants.

districts of the Central Agricultural (Black Soil) Region and of the western side of the Lower Volga, 1932-33 harvests were better than in 1931-32. There were also better harvests in South Ukraine and the Crimea. Although the harvests in 1932-33 in the Volga, the Urals, and West Siberia were better than in 1931-32, the production could not be considered "good." In Central* and West European USSR,** in East Siberia, and in Central Asia, an average production was obtained. On the other hand, production in the southern grain surplus regions of European USSR as a whole was poorer than in the previous year.

The weather conditions in 1932-33 were generally favorable, and, in fact, the production estimated at 66.4 million metric tons was slightly better in 1932-33 than in 1931-32 but about 20.5 percent below that of 1930-31. The government, however, again went onto the farms as though there had been no crop failure and exacted heavy deliveries amounting to 18.8 million tons, or 28.3 percent of the production.

During 1932-33 the government exported 1.5 million metric tons of grain, which, if deducted from the 18.8 million tons of procurements, indicates the equivalent of 17.3 million tons left for nonfarm utilization. This quantity was 3.9 percent below the nonfarm grain availability during 1931-32 but was 7.5 percent greater than during the good crop year 1930-31. Deducting 18.8 million tons of procurements from the estimated production of 66.4 million tons indicates that the farm population had about 47.6 million tons to carry them through the consumption year 1932-33. Although, taking the USSR as a whole, this total is 4.3 million tons left on farms in 1931-32, the distribution was irregular, with somewhat better availabilities in Asiatic USSR and in the central and northern parts of European USSR. The southern grain surplus regions suffered, and millions of the rural population, particularly in the Ukraine and Lower Don-North Caucasus Economic Regions, starved to death.

The situation in the USSR in 1932-33 brings out certain fundamental facts, as follows:

1. Although the grain production in 1932-33 was reduced for the second year, 20 percent below the good crop year 1930-31, the equanimity of the Kremlin was not disturbed. The government stripped farms of nearly the same quantities of grain for nonfarm utilization as in preceding years and, although millions of people were

* By "Mittelrussland," 3/ Schiller means the former Central Industrial Region, which conforms roughly to the modern Central European USSR.
** West European USSR, in this case, includes Kalinin and Smolensk oblasts and the oblasts of Belorussia (frontiers of 1937).

starving, ruthlessly exported 1.5 million metric tons of grain.*

2. It is possible for a stem-rust epidemic to spread over parts of the southern grain surplus Regions I, II, and III-A of European USSR There is, however, no evidence indicating the extent of the spread or the intensity of the damage caused by the infection.**

It must be borne in mind that the success of a BW attack on Soviet grain with feather-bomb drops will depend very largely on the extent of the stem-rust spread grids and the intensity of the destruction, within these grids, of the wheat, rye, barley, and oats growing in the three grain surplus regions of European USSR at the time of the attack.***

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* In a previous report, CIA/RR 5, A Preliminary Appraisal of the Effects of a Biological Attack on Grains in the USSR, 10 June 1952, TOP SECRET, an effort was made to assess the effects on Soviet economy attending each of three loss patterns of the grains most susceptible to rust. In discussing the first of these three loss patterns, it was concluded that if as a result of a BW attack on Soviet grain a 20-percent loss of all the wheat, rye, and oats and a 10-percent loss of all the barley produced in the USSR were sustained, the effects on the Soviet economy would be relatively small even in the second year of such an attack.

** It should be noted, however, that in two of the regions in which heavy stem-rust damage was reported the production was better in 1932-33 than in 1931-32. These regions are the Central Agricultural (Black Soil) Region (Region III-A) and the western part of the Lower Volga Valley (Region II).

*** An analysis of evidence based on US experience with stem-rust spread follows in Part II of this report.

PROVISIONAL

EUROPEAN USSR

Seeding and Production of Wheat, Winter Rye, Barley, and Oats by Administrative Districts

EXPLANATION

ZHITOMIR
22.7 — Percentage of area seeded to wheat, winter rye, barley, and oats

(Winter rye)	R	9.6	1.3
(Oats)	O	4.7	1.0
(Winter wheat)	WW	4.6	0.9
(Barley)	B	3.5	1.0
(Spring wheat)	SW	0.1	–

Production of each specified grain as a percentage of USSR total

Percentage of area seeded to each specified grain

GRAIN-PRODUCING REGIONS

Surplus Regions

Region I	Winter Wheat and Barley
Region II	Spring Wheat
Region III-A	Winter Rye and Oats

Deficit Region

Region III-B	Winter Rye and Oats

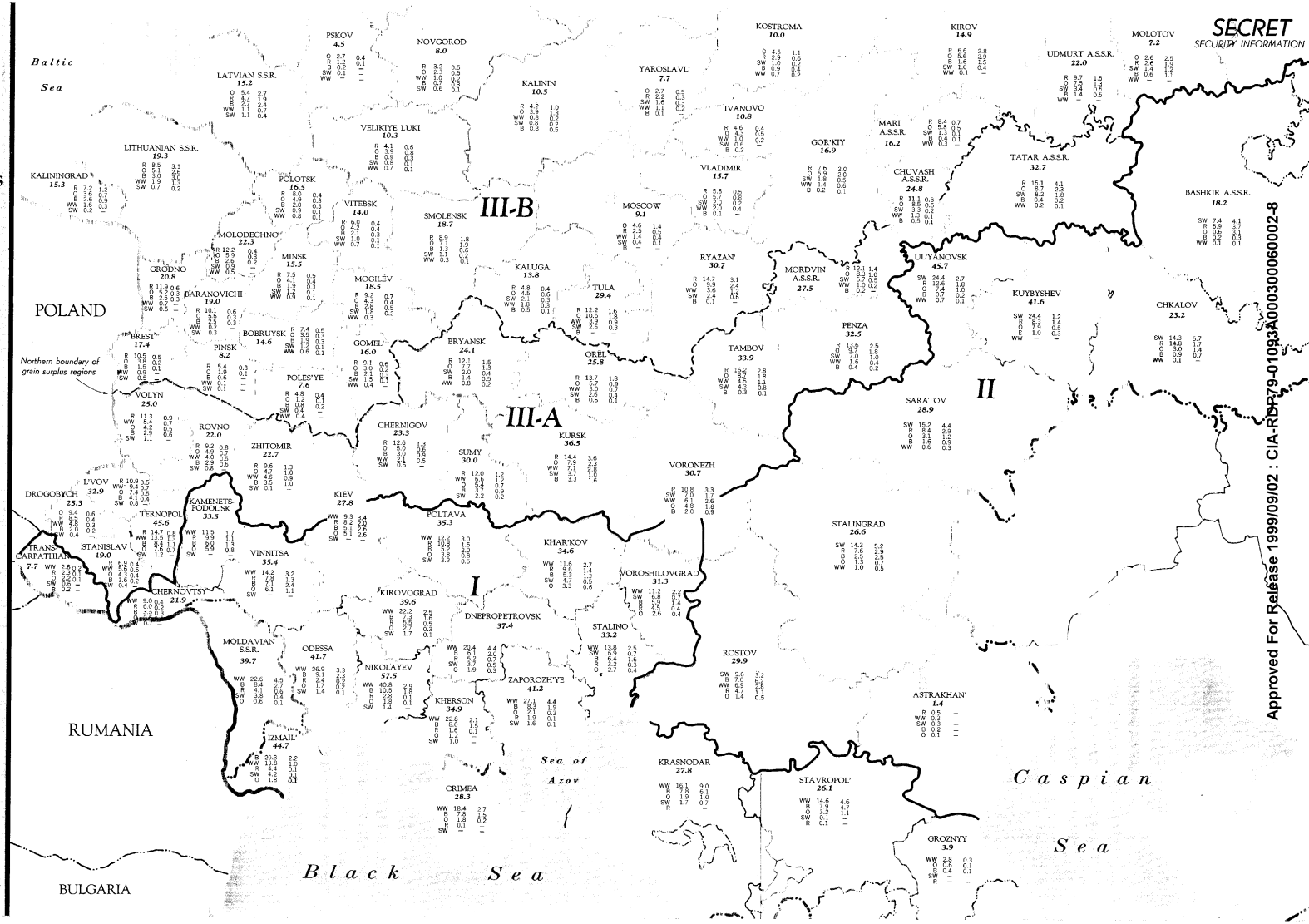
0 50 100 150 200 250 MILES

0 50 100 150 200 250 KILOMETERS

SECRET

Some boundaries shown on this map are de facto boundaries (1932), not necessarily recognized as definitive by the United States Government; the United States Government has not recognized the incorporation of Estonia, Latvia, and Lithuania into the Soviet Union.

12312 CIA, 12-52



SECRET
SECURITY INFORMATION

PART II

PRELIMINARY STUDY OF PROBABLE STEM-RUST SPREAD ON CEREAL GRAINS*

A. Problem.

To estimate on the basis of recorded instances of cereal stem-rust spread from infected barberry bushes in the US the areal extent which disease of damaging proportions might be expected to reach following a single drop of the currently available BW munition.

B. Conclusion.

In spite of limitations imposed in comparing stem-rust spread from barberry bushes with that from a munition drop, it is apparent that heavy damage over an area of not less than 100 square miles can be expected from each successfully established focus of infection resulting from BW attack with stem rust early in the growing season, given a susceptible variety of grain and at least reasonably favorable ensuing weather conditions.

C. Discussion.

1. Scope of Inquiry.

The success of overt attacks aimed at establishing cereal stem-rust spread of epidemic proportions is dependent on the same complex of time-weather factors which govern the development of natural epidemics. At the present time, data on all the factors in this complex, as related to natural epidemics, are inadequate for an accurate assessment of the development and spread of stem rust which might result from the artificial establishment of a single focus of infection. Within imposed time limits, full use has been made of available data on the natural spread of cereal stem rust from barberry bushes in the US (see Appendix A).

In connection with the barberry eradication program of the US Department of Agriculture, some 1,528 case histories of stem-rust spread from infected barberry bushes were compiled. The great majority of these case histories, over 90 percent, represent very limited spreads from small local foci of infection, obviously limiting their usefulness for the purpose of this survey. This limited spread may have resulted from one or more of several factors, as follows: (a) only one small bush or at best a few small bushes in a restricted area were involved; (b) the barberry bushes were only moderately infected; and (c) considerable distance intervened between barberry bushes and susceptible grain or grasses. Because these histories were collected during the course of barberry eradication work, many

* Prepared by the Office of Scientific Intelligence.

were taken two or more weeks before crop maturity and so do not give an accurate picture of total spread or final severity.

Some 132 cases, or 8.5 percent of the total, were selected as representing spreads of more than 1 mile. In the selected group are found examples from every kind of terrain and most of the broad land-use patterns under which small grains are grown in the US. The survey also includes, insofar as there are parallel conditions in the US, all of the climatic variants likely to be important in a target area.

2. Findings.

a. Of the 132 cases where stem-rust spread extended more than 1 mile, 28 were dramatic, ranging from 50 up to 2,260 square miles. Heavy damage in these instances covered from 5 to 250 square miles, depending on time and other factors, such as the amount of susceptible crops near the focus of original infection.

b. Presence of abundant early inoculum was common to all of the more dramatic spreads. The number of barberry bushes was less important than their size and the heaviness of infection. The distance of the barberry bushes from the susceptible crop has an important effect in determining the amount of original infection on the crop and the subsequent build-up and spread.

c. Stem-rust spread from local foci of infection has occurred under the full range of geographical location, climate, and terrain characterizing 18 states of the US in which barberry eradication has been conducted.

d. Land-use pattern -- that is, proportion of land in total farms, cropland, pasture, and woodland, where this last does not exceed 25 percent scattered through cropland -- does not seem to limit the spread of stem rust. When intensive infection is established on small grain, extensive spread is possible even though fields of susceptible small grain are scattered among nonsusceptible crops.

e. In open plains or rolling country, spread will go in any direction, controlled only by winds. In valleys, heavy infection patterns, probably influenced by diurnal air movements, often follow drainage lines. Woodland which is near or which completely surrounds barberry bushes has some effect in reducing build-up. Stem-rust spread was rarely symmetrical in the case histories reviewed, being commonly fan-shaped or some modification thereof, extending away from the focus of infection in the direction of prevailing winds.

3. Limitations Imposed by the Nature of the Survey.

The survey here reported is of a preliminary nature and will be supplemented, within a year, by the findings of work now under way,

part of it in the field. In view of this and of the nature of the material employed, it is essential to stress the following specific limitations in order that the findings be correctly evaluated:

a. The case histories which furnish the basis for this survey were developed primarily for educational and demonstration purposes and in the great majority of instances contain little data other than the extent of stem-rust spread from one or more barberry bushes which may have served as a primary source of inoculum. In some cases a general statement is made as to rust severity and grain loss. General statements on yields are occasionally given, but, on the whole, there is no very valid basis for estimating the extent of damage.

b. Time limitations have precluded the study of certain factors which should be taken into consideration in such a survey. Weather during the seasons and in the localities involved, the most important of these factors, has not been taken into account, nor has there been considered the relative earliness or lateness of the season as it influences the time for build-up of inoculum.

c. As noted above, available data were customarily taken at the time of barberry destruction work, considerably before actual harvest time. These data often represent a very much smaller total effect than that actually experienced.

d. It has not been possible to develop any satisfactory way of translating stem-rust spread occurring from the more or less concentrated yet limited foci of barberry bushes into what might be expected from the larger, and originally more diffuse, centers developing from feather-bomb drops. Case No. 11, Appendix A, most closely parallels the overt BW attack.

e. Presently available data are not adequate to predict with accuracy the square-mile area in which a crop loss of 50 percent will occur as a result of stem-rust spread from a successfully established infected area of 1 square mile (the problem originally proposed). The historical record of rust development in eastern Manitoba during the years 1929 and 1935 illustrates this fact. The former was a year of "light" rust; the latter, "very heavy."* Data comparing dates of crop heading, occurrence of spore showers, earliest and light general infection, and general harvest, together with the amounts of spore fall and final amounts of rust, are given in Table 2.**

Weather during the period from heading to harvest was clearly the determining factor. (See Appendix B.)

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* With one exception, in which "heavy" damage was defined as 20 percent or more (see Case No. 5, Appendix A), there are no percentage values equivalent to the terms "very heavy," "heavy," "moderate," "light," and the like.

** Table 2 follows on p. 22.

Table 2

Record of Stem-Rust Development in Eastern Manitoba
1929 and 1935

Year	Dates of Occurrence of Spore Showers	Number of Spores per Square Inch	Dates of Infection		Date of General Harvest	Amount of Rust
			Earliest	Light General		
1929	14 - 18 June	326	3 July	3 - 10 July	8 August	Light
1935	24 - 30 June	365	3 July	3 - 10 July	8 August	Heavy

4. Implications with Respect to Biological Warfare Operations.

While recognizing the above limitations, the several records of stem-rust spread from barberry bushes presented in Appendix A show positively that, under a wide variety of conditions as to terrain, geographical location, and season, a destructive spread of varying extent will occur when a central source of inoculum is established. It is believed that careful meteorological analysis of target areas, with current utilization of meteorological data and 3- to 5-day forecasts, will remove many elements of uncertainty from operations.

The failure of significant spread in over 90 percent of the case histories emphasizes the necessity for large amounts of early inoculum which, by infecting a sufficiently extensive area, builds up the immense quantities of inoculum required for major epidemic spread. As an alternative, the failure of significant spread suggests a large number of relatively closely spaced, smaller foci from which spreads will coalesce. One case, in Goodhue County, Minnesota (not included in the series of examples cited in this summary), illustrates such a situation. In this case a spread covering one township was formed of the coalesced small spreads from some 40 or more scattered foci. Intensive research is therefore necessary (a) to determine whether operational spore distribution should be diffuse over an entire area so as to form numerous relatively closely spaced, small foci or in more massive concentrations regularly distributed at intervals of several miles and (b) to perfect munitions designed most effectively to achieve optimum spore distribution.

In nature, those spore showers which establish original infection commonly extend over periods of time and occur at intervals of several days each. Hence, in connection with a BW operation, the number

of drops necessary to give reasonable assurance of an adequate initial infection must be determined.

The pattern of munition drop must take into account the unsymmetrical nature of the hoped-for spread in relation to wind and topographic features. It seems that land-use patterns will not materially affect development within wide limits.

The Pine Camp test of the currently available crop BW munition achieved primary infection over an area of 25 square miles. The early establishment of such a focus should result in a build-up and heavily damaging spread over at least 100 square miles. Actual experience in 1946 in Adams, Cumberland, and York counties, Pennsylvania, indicates that, in a favorable season, spread from a focus smaller than that reasonably expected from a BW drop covered 600 square miles, with 250 square miles of heavy damage. Recognizing that this spread of heavy damage is not to be expected under average conditions, it seems conservative to plan on the basis of 100 square miles. If weather conditions are so unfavorable that this result is not achieved, it is one of the calculated risks that must be taken.

APPENDIX A

SUMMARY OF ELEVEN CASE HISTORIES OF STEM-RUST SPREAD IN THE US

In studying the interrelations of land-use pattern, terrain, and general climate in stem-rust spread, 28 studies of case histories in the US showing extraordinary spread were analyzed. These were representative of at least four types, as follows:

(1) Level to gently rolling areas where a high proportion of all land was in cultivated crops, where grain crops occupied more than 20 percent of all land, and where woodland was less than 5 percent;

(2) Topographically similar areas where the proportion of all land in cultivated crops was 60 percent or less, where mixed cropping was general, where grain crops occupied less than 20 percent of all land, and where woodland was 0 to 10 percent;

(3) Wide stretches of rolling terrain, only a very small part of which was cropland and the remainder of which was an unimproved treeless expanse, with grain fields generally scattered widely; and

(4) Mixed farming confined to intermountain valleys, interspersed with woodland, with grain crops occupying 5 to 20 percent of the total cultivated area.

The geographic range of these studies includes northeastern Washington, Montana, Wyoming, Colorado, Nebraska, North Dakota, Minnesota, Iowa, Missouri, Wisconsin, Indiana, Michigan, Pennsylvania, and West Virginia. Summaries of 11 considered examples follow.*

1. Rice County, Minnesota, 1922.

In Rice County, according to the 1925 census, cropland made up 59.1 percent of the total area; small grains, 24.2 percent; pasture, 19.2 percent; and woodland, 8.7 percent.

Centering about the town of Northfield, at distances of 1 to 6 miles, were seven groups of barberry bushes from which stem-rust spread extended to the surrounding area in 1922. The average date of first infection of grains from aeciospores in Minnesota is 24 May. A map showing distribution as of 10 July, about 7 weeks later, indicates that the entire area within four townships (144 square miles)

* For presentation in tabular form, see Table 3, p. 32.

carried a stem-rust infection ranging from "heavy" in the area nearest to the barberry bushes to a "trace" in areas farthest away. The average date for spring wheat harvest in the area is 1 to 11 August, so that 3 to 4 weeks still remained prior to harvest. Winter wheat, on the other hand, was approaching maturity, while oats had approximately 3 weeks to go. On 10 July the map indicates that stem rust was "heavy" in 19 square miles, "moderate" in 38 square miles, and "light" in 72 square miles, with a "trace" infection in the remainder of the 144 square miles (leading off the map).

During the interval before harvest, "moderate" infection built up to the "heavy" level, and a large part of the entire 144 square miles developed a very seriously damaging epidemic, the total spread reaching 315 square miles. Data are not adequate on which to make a firm estimate of the area in which damage reached 50 percent of the crop.

2. Faribault County, Minnesota, 1926.

In Faribault County in 1925, farms made up 70.7 percent of the total land area; grain crops, 27.1 percent; and woodland, 2.5 percent.

In 1926, some 70 barberry bushes growing in the vicinity of Rice Lake served as an infection center for the spread of stem rust. A map, dated only as "July," covers 12 townships in which rust is shown over the entire area in varying degrees of intensity. Approximately 66 square miles are indicated to be "heavy"; 184 additional square miles, "moderate"; and the remainder of the 432 square miles, or 182 square miles, as a "trace" to "light." A report, apparently of a later date, states that stem-rust spread to wheat was "heavy" over the entire eastern half of the county, or 360 square miles. The inclusion of this later statement suggests that the data for the map were collected before harvest, but how long before is not indicated. No data are available on which to make a firm estimate of the area in which damage reached 50 percent of the crop.

3. Barnes County, North Dakota, 1925.

Barnes County is typical of the Northern Great Plains. In 1925, cropland made up 71.2 percent of the total land area; grain, principally wheat, 44.4 percent; and woodland, less than 1 percent.

Two groups of barberry bushes lying about 6.5 miles apart -- one 6 miles northeast of Valley City and the other 9 miles east -- served as focal points for stem-rust spread in Barnes County. One contained 15 bushes, and the other 10. A map dated only "August 1925," which probably indicates stem-rust spread at harvest or shortly before, harvest being 1 to 11 August in that area, shows coalescence of spread from the two foci. An area of "heavy" infection scales out something more than 20 square miles; "moderate" infection, 80 square miles; and "light" infection, 80 more square miles. The statement is made that,

within 1 mile of the first group of bushes, yields were between 6 and 11 bushels per acre and graded No. 3 and that at corresponding distances from the second group yields ranged between 7 and 9 bushels per acre of a corresponding grade. The statement suggests a probable reduction in the heavily infected area ranging from 20 to 40 percent depending on distance from the primary infection foci. There are no other data suggesting the degree of actual loss.

4. Grand Forks and Traill Counties, North Dakota, 1928.

These counties are typical of the Red River Valley. The terrain is level, and woodland occupies less than 2.5 percent of the total land area of both counties. In 1929 the percentage of all land in small grains was 38.8 in Grand Forks County and 43.9 in Traill County.

Two large barberry bushes, 9 feet high and with a spread of 107 square feet, located in Grand Forks County, were the center of a stem-rust spread in the two counties. Both bushes were very heavily infected. Spread to grains probably began in late June. Observations in August, presumably at about wheat harvest, showed a spread fanning out more than 10 miles to the southeast. Spread to the east reached the Red River, a distance of about 2.5 miles. The pattern of spread indicated continuation across the state line into Minnesota, but no observations were noted for that state. In North Dakota the map indicates a spread ranging in severity from "heavy" to "light" infection over an area of 55 square miles. Of this spread, some 12 square miles were indicated to be "heavy"; about an equal area was indicated to be "moderate," and the remainder "light." The pattern of spread suggests an added area in Minnesota approaching in size that in North Dakota. Although 1928 was a year of light stem rust in the north-central states, the amount and distance of spread in this instance indicates that conditions for the establishment and development of stem rust, at least in the Red River Valley, were favorable enough to create a destructive epidemic spread for at least 25 square miles, with less damage over a wider area. No data are available on which to make a firm estimate of the area in which damage reached 50 percent of the crop.

5. McLean, Sheridan, Burleigh, Oliver, and Morton Counties, North Dakota, 1929.

These counties are located along the Missouri River in the west-central part of the state. The area concerned, immediately northwest, north, and northeast of Bismarck, is typical of the Northern Great Plains. Taking Burleigh, Morton, and Oliver as typical, according to the 1930 census, cropland made up approximately 40 percent of the total land area of each county; small grains, approximately 24 percent; and woodland, less than 1 percent.

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Two large barberry bushes, 9 feet high and with a spread of 107 square feet, located in Grand Forks County, were the center of a stem-rust spread in the two counties. Both bushes were very heavily infected. Spread to grains probably began in late June. Observations in August, presumably at about wheat harvest, showed a spread fanning out more than 10 miles to the southeast. Spread to the east reached the Red River, a distance of about 2.5 miles. The pattern of spread indicated continuation across the state line into Minnesota, but no observations were noted for that state. In North Dakota the map indicates a spread ranging in severity from "heavy" to "light" infection over an area of 55 square miles. Of this spread, some 12 square miles were indicated to be "heavy"; about an equal area was indicated to be "moderate," and the remainder "light." The pattern of spread suggests an added area in Minnesota approaching in size that in North Dakota. Although 1928 was a year of light stem rust in the north-central states, the amount and distance of spread in this instance indicates that conditions for the establishment and development of stem rust, at least in the Red River Valley, were favorable enough to create a destructive epidemic spread for at least 25 square miles, with less damage over a wider area. No data are available on which to make a firm estimate of the area in which damage reached 50 percent of the crop.

5. McLean, Sheridan, Burleigh, Oliver, and Morton Counties, North Dakota, 1929.

These counties are located along the Missouri River in the west-central part of the state. The area concerned, immediately northwest, north, and northeast of Bismarck, is typical of the Northern Great Plains. Taking Burleigh, Morton, and Oliver as typical, according to the 1930 census, cropland made up approximately 40 percent of the total land area of each county; small grains, approximately 24 percent; and woodland, less than 1 percent.

In August 1929 the stem-rust spread was mapped from two groups of barberry bushes, one of 12 and the other of 16 bushes. The two groups were situated 2 miles apart, near the west bank of the Missouri in eastern Oliver County. A survey made in the week of 8 August showed a total spread, ranging from "light" to "heavy," covering some 2,260 square miles. Of this total, approximately 215 square miles were rated "heavy"; 245 square miles, "medium"; and the remaining 1,800 square miles, "light." Outside the 2,260-square-mile area, all grain was indicated to carry a "trace" of rust. Since 1929 was a year of "medium" stem-rust damage in the north-central region, a general sprinkling of stem rust would be expected by 8 August over most of North Dakota, including this area, even though it is outside the section where greatest damage occurred from the general epidemic of that year. In these counties the principal stem-rust damage was caused by the spread from the barberry bushes. No data are available on yields or extent of damage by field or areas. The survey was made by an experienced individual, however, and elsewhere in his surveys, "heavy" indicates damage ranging from 20 percent up.

6. Kit Carson County, Colorado, 1922.

Kit Carson County is typical of the high plains of eastern Colorado and northwestern Kansas. The topography is that of the rolling plains. In 1922, much of the land was still undeveloped. Cropland made up only 14.3 percent of the total land area; small grains, 6.2 percent; and woodland, all of which was along stream valleys, less than 2 percent.

Twelve heavily rusted barberry bushes in the town of Burlington provided the primary stem-rust inoculum. The average date in Colorado for the first appearance of rust infection on grains and grasses from barberry bushes is 2 June. By 26 June a "moderate" infection on grasses and grain extended one-half mile from the bushes; "light" infection, 1 mile; and a "trace," beyond 2 miles. Final reports indicated that in the 3 to 5 weeks before harvest, depending on whether the crop was winter wheat, spring wheat, or oats, the spread had extended 20 to 25 miles from the bushes, with a severity rendering many fields unfit for harvest. The final report gave no estimate of total area of spread or of the area within which damage was severe.

7. Decatur County, Indiana, 1922.

Decatur County is representative of the slightly rolling topography of the east-central states. According to the 1920 census, cropland made up 51 percent of the total land area; small grains, some 16 percent (or approximately 30 percent of all cropland); and woodland, slightly less than 10 percent.

One very large barberry bush, probably 60 years old, was the center of infection for an extensive spread. The average date of first infections on grains from barberry bushes in Indiana is 17 May. By 1 July the average date of the winter wheat harvest, severe infection had

spread to 50 square miles. The usual yield of wheat in the area at that time was about 22 bushels per acre, which was cut to an estimated 8.8-bushel average, or, considering reduced bushel weight and poorer quality, more than 60-percent damage. How much farther the spread extended with less damage was not recorded.

8. Laramie and Platte Counties, Wyoming, 1920.

The area in these two counties in which the spread occurred is typical of the rolling high plains. In 1920, only limited land had been broken out, and cropped and grain fields were few and far between. In the two counties, according to the 1920 census, the percentage of the total area in grain crops was only 3.9 percent in Laramie County and 1.9 in Platte County.

A barberry hedge surrounding a park in the city of Cheyenne was the center of a rather long-range spread in 1920. Fields some 42 miles north of Cheyenne were rusted from 20 to 35 percent, and at 80 miles north at Wheatland, 10 to 20 percent. At the same time, wheat at Pine Bluffs, 45 miles east of the barberry bushes, was pastured off as not worth cutting. Similar spreads occurred in 1921 and 1922, the bushes being removed in the latter year. The widely scattered occurrence of wheat and other grain fields did not give opportunity for extensive early season build-up close to the bushes and therefore gave no criterion of the area of "heavy" damage.

9. Flathead County, Montana, 1942.

The area involved was the Flathead Valley in western Montana immediately to the north and west of Flathead Lake and west of the Continental Divide. Farmland in Flathead County is practically all confined to this valley. Of the farmland, cropland (one-third in small grains) made up 31.5 percent; woodland, 45 percent; and pasture, the rest. Much of the cropland, however, is contiguous.

Two barberry bushes within 100 feet of a field of winter wheat located just west of the town of Big Fork were the center of infection. On 1 July, when wheat was flowering, only 4 weeks before harvest, stem-rust spread was fanning out into the wheat. A map prepared at the end of the season showed a "heavy" infection extending over 4 square miles, "moderate" infection over 4 additional square miles, a "light" spread over 57 more square miles, and a "trace" over the remainder of the 216 square miles that were mapped. This spread was very significant, considering the short time involved. No data are given on yields on which to make a firm estimate of the area in which damage reached 50 percent of the crop.

10. Monroe County, West Virginia, 1943.

Monroe County is in the mountainous country of southeastern West Virginia. A series of interconnecting mountain valleys with valley farmlands and hillside woodland and pasture is characteristic. Only about 20 percent of the land in farms is cropped, and about 20 percent of the cropland is in small grain. Woodland occupies about 30 percent of all farmland.

On a map of the area, barberry bushes are shown at nine points along a 5-mile stretch running southeast from the intersection of Greenbrier, Monroe, and Summers counties. Stem-rust spread was principally in Wolf Creek and Second Creek townships. The survey map, dated 16 June, indicates a "very heavy" infection over some 17 square miles, "heavy" over 8 more square miles, and "moderate" over at least 50 additional square miles. As mapping was stopped at geographic and other boundaries with no apparent relation to stem-rust spread, the extent of total spread cannot be determined. At the time when the crop was in the medium dough stage, rust severity ranged from 100-percent prevalence and 80-percent severity to 50-percent prevalence and 10-percent severity at the more distant points. Some 10 days remained before harvest, and these degrees of severity undoubtedly built up to more destructive proportions. No data are given on yields, but the rust readings suggest at least a 50-percent yield reduction from 10 to 15 June in the 25 square miles of "very heavy" and "heavy" infection.

11. Adams, Cumberland, and York Counties, Pennsylvania, 1946.

These counties, located in south-central Pennsylvania, represent an intensively farmed, productive area of moderately rolling terrain. There are a number of streams, draining generally northeast toward the Susquehanna River. In these counties, 76 percent of the total land area was in farms in 1946. About 63 percent of this farmland was in crops, of which grain crops made up one-third. Woodland occupied some 15 percent of the total land area.

Some 1,200 or more barberry bushes, of which about 50 large ones were strategically located near grain fields, all within a square-mile area, were the primary center of an extensive stem-rust spread in 1946. The stem-rust spread extended irregularly with a rough conformity to drainage patterns in all directions, but more particularly to the east, west, and north. The spread covered about 35 miles east to west and 30 miles north to south. An area approximating 600 square miles was generally infected. In some 250 square miles the damage was heavy. Farm yields were obtained on one leg to the east of the infection center in the most heavily damaged area. These yields ranged from reductions of 20 to 45 percent. A thresher operator in the area reported that the average yield for the area which he served in this heavily infected section was 20 bushels per acre as compared with an average of 30 bushels

in normal years -- an over-all reduction of 33-1/3 percent. If this reduction be accepted as average for "heavy" infection, it probably meant at least a 40-percent loss for half of the wheat in the 250-square-mile area.

Table 3

Selected Cases of Stem-Rust Spread in Specified Areas of the US
1920 to 1946

Case No.	Location	Date	Number and Location of Barberry Bushes	Land-Use Pattern (Percent)			Average Date of Initial Infection	Date Damage Examined	Area of Damage (Square Miles)					Other Indications of Degree of Loss
				Cropland	Grain	Woodland			Heavy	Moderate	Light	Trace	Total	
1.	Rice County, Minnesota	1922	7 groups of bushes, 1 to 6 miles from Northfield	59.1	24.2 (small grains)	8.7	24 May	a. 10 July b. Harvest time	19 "Large part of 144"	38	72	15	144 315	Data not adequate to make firm estimate of area in which damage reached 50 percent of crop.
2.	Faribault County, Minnesota	1926	70 bushes near Rice Lake	70.0 (in farms)	27.1	2.5	N.A.	a. "July" b. "Later date"	66 360	184	182		432	Data not adequate to make firm estimate of area in which damage reached 50 percent of crop.
3.	Barnes County, North Dakota	1925	2 groups of bushes, 6½ miles apart (25 bushes)	71.2	44.2 (mostly wheat)	1.0	N.A.	"August"	20	80	80		180	Probable reduction in "heavy" area of 20 to 40 percent depending on distance from primary infection foci.

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Table 3

Selected Cases of Stem-Rust Spread in Specified Areas of the US
1920 to 1946
(Continued)

Case No.	Location	Date	Number and Location of Barberry Bushes	Land-Use Pattern (Percent)			Average Date of Initial Infection	Date Damage Examined	Area of Damage (Square Miles)					Other Indications of Degree of Loss
				Crop-land	Grain	Wood-land			Heavy	Moderate	Light	Trace	Total	
4.	Grand Forks and Traill Counties, North Dakota	1928	2 large heavily rusted bushes in Grand Forks County, 2½ miles from Minnesota		38.8 and 43.9	2.5	Probably late June	August at above harvest	12	12	31		55	A year of light rust generally; probably spread to an area of about equal size in Minnesota; area with 50-percent loss cannot be estimated.
5.	Five Counties, North Dakota	1929	2 groups of bushes (12 and 16 bushes), 2 miles apart in west-central North Dakota on the Missouri River	40.0	24.0	1.0	N.A.	8 August	215	245	1,800	(Grain outside this area had a "trace")	2,260	"Heavy" indicates a year of medium rust damage ("heavy" indicating 20-percent damage and up).

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Table 3

Selected Cases of Stem-Rust Spread in Specified Areas of the US
1920 to 1946
(Continued)

Case No.	Location	Date	Number and Location of Barberry Bushes	Land-Use Pattern (Percent)			Average Date of Initial Infection	Date Damage Examined	Area of Damage (Square Miles)					Other Indications of Degree of Loss
				Crop-land	Grain	Wood-land			Heavy	Moderate	Light	Trace	Total	
6.	Kit Carson County, Colorado	1922	12 heavily rusted bushes in Burlington	14.3	6.2	2.0	2 June	26 June		"Extended ½ mile"	"Extended 1 mile"	"Extended beyond 2 miles"	N.A.	
7.	Decatur County, Indiana	1922	1 large bush	51.0	16.0 (small grains)	10.0	17 May	1 July	50				N.A.	60-percent damage; yield cut from 22 to 8.8 bushels; extent of further spread not recorded.
8.	Laramie and Platte Counties, Wyoming	1920	Barberry hedge in Cheyenne		3.9 in Laramie 1.9 in Platte		N.A.	N.A.					N.A.	Fields 42 miles north rusted 20 to 35 percent; 80 miles north, 10 to 20 percent; 45 miles east, wheat not worth cutting.

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Table 3

Selected Cases of Stem-Rust Spread in Specified Areas of the US
1920 to 1946
(Continued)

Case No.	Location	Date	Number and Location of Barberry Bushes	Land-Use Pattern (Percent)			Average Date of Initial Infection	Date Damage Examined	Area of Damage (Square Miles)					Other Indications of Degree of Loss
				Cropland	Grain	Woodland			Heavy	Moderate	Light	Trace	Total	
9.	Flathead County, Montana (Flathead Valley)	1942	2 bushes; 100 feet of winter wheat field; west of Big Fork	Farms practically confined to valley. Farms: 31.5	10.5	45.0	1 July (rust was spreading)	1 August	4	4	57	151	216	Considered significant spread in the short time involved; no basis for estimating area of 50-percent damage.
10.	Monroe County, West Virginia	1943	9 points on 5-mile stretch	Mountains and scattered farms. 20 percent farms cropped with 20 percent small grain; woodland 30 percent of farms.			N.A.	10-15 June	25 (17 "very heavy")	50			N.A.	Ranged from 100 percent prevalence and 80 percent severity to 50 percent prevalence and 10 percent severity. No data on yields, but readings suggest at least 50 percent yield reduction in the 25 square miles of "very heavy" and "heavy" infection.

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Table 3

Selected Cases of Stem-Rust Spread in Specified Areas of the US
1920 to 1946
(Continued)

Case No.	Location	Date	Number and Location of Barberry Bushes	Land-Use Pattern (Percent)			Average Date of Initial Infection	Date Damage Examined	Area of Damage (Square Miles)					Other Indications of Degree of Loss
				Crop-land	Grain	Wood-land			Heavy	Moderate	Light	Trace	Total	
11.	Adams, Cumberland, York Counties, Pennsylvania	1946	1,200 or more (50 large) within 1 square mile	76 percent farms, of which: 63.0	21.0	15.0 (all land)	N.A.	N.A.	250				600	Losses 20 to 45 percent, one leg of heavily damaged areas. One thresher operator indicated yields to be down one-third (30 to 20 bushels per acre) in a heavily infested area.

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APPENDIX B

RELATION OF SPORE SHOWERS IN THE CANADIAN PROVINCE OF MANITOBA TO YIELD OF GRAIN PER ACRE

1. General.

For wheat, rye, barley, and oats, Table 4* shows the seeded acreage, yield per seeded acre, and total production in the Canadian Province of Manitoba for the years 1929, 1935, and 1938, and a 43-year average, 1908-50. The table also shows the percentage relationship of the yield per acre in each of the three years to the 43-year average.

Table 5** shows precipitation figures reported by nine stations in Manitoba for the most critical months of the growing season in 1929, 1935, and 1938, together with the amount of deviation from the normal.

No very definite conclusions can be drawn from these data and from what little is known on the basis of available information about the stem-rust infestation. More detailed and "personalized" information relative to the exact conditions that existed in each of the years is necessary. In any case, it would be difficult to say much from only three examples, even if there appeared to be a fully consistent pattern. Some implications may be drawn, however, and some surmises made in each of the 3 years.

a. Case I.

"In 1935 at Winnipeg, Manitoba, a few rust spores were trapped on June 19, but in no significant quantity. Beginning 4 days later, in 96 hours ending June 26, there was a fall equivalent to 4.7 grams of spores per acre, or 300 per square inch of surface. First infections appeared in quantity six days later on July 2. This was a year of heavy rust." 4/

In 1935 a heavy infestation and heavy damage from stem-rust spread were reported. It was a very wet summer. Most of the nine weather stations in Manitoba reported weather conditions greatly above average. In June, especially, rainfall was heavy -- 3, 4, and 5 inches above normal at many stations. Wheat yields per seeded acre were almost 50 percent below normal and were the lowest in the 43-year history. Oats yields were 31 percent below normal, and barley 14 percent below normal. Rye yields were above normal, but rye acreage in Manitoba was very small. It appears likely that the stem-rust spread

* Table 4 follows on p. 40.
** Table 5 follows on p. 41.

got an excellent start as a result of the wet weather and that the low wheat yield may largely be attributed to rust damage. Inasmuch as the oats yield was also low, though not so low as wheat, it seems likely that rust, though a different variety from that attacking wheat, affected that grain also. Barley may have been affected to a lesser degree by the wheat rust. Precipitation continued heavy throughout the summer and perhaps was so heavy as to have had an adverse affect on yields, aside from providing a good environment for rust spores.

b. Case II.

"In 1938, rust fall began at Winnipeg on June 1, but was relatively light. In the 48 hours ending on June 14, there occurred a fall equivalent to slightly less than 0.1 gram. First infections appeared on June 22. Beginning two days before these first infections, in the 48 hours ending on June 20 there occurred a spore shower equivalent to 0.4 grams per acre. This shower undoubtedly had some effect, but the first infections were the important ones. The end result was heavy rust." 5/

In 1938, stem-rust infestation was light, but damage reportedly heavy. In June, precipitation was below normal, about 1.5 inches at most stations, and in July and August just about normal. Wheat yields per seeded acre were 9 percent below average; oats, 10 percent below; and barley, 4 percent below. Rye yields were practically average. It is difficult to draw any sure implications from this set of circumstances. However, it is possible that a light initial infestation of rust combined with the dry month of June sufficiently delayed the spread of the rust, so that even though there appeared to be extensive damage, it did not develop in time to greatly affect yields.

c. Case III.

"In 1929, there occurred at Winnipeg during the 96 hours from June 15 to June 18 spore showers equivalent to 5.0 grams per acre, or about 325 spores per square inch. Conditions were unfavorable for development of the rust, however, and while infection occurred, uredinia did not appear until 3 July, fifteen days late. In spite of heavy early exposure, because of otherwise unfavorable circumstances, 1929 was a light rust year in Manitoba." 6/

In 1929 a heavy stem-rust infestation was reported, but apparently very light rust damage resulted. Weather during the months of June and July was extremely dry. At all weather stations, rainfall was below normal for both months, in most areas about 2 inches below normal. In 1929, yields per seeded acre for each of the three grains widely grown (wheat, barley, and oats) suffered roughly about the same reduction from normal -- wheat, 28 percent; barley, 30 percent; and oats, 37 percent. Rye yields were about average. Apparently the dry weather adversely affected both the rust and the grain, with resulting small damage from

rust but low grain yields.

2. Conclusions.

It would appear from the rather sketchy data on which these conclusions are based that heavy moisture early in the growing season provides the environment necessary for a severe reduction in grain yields due to stem-rust, whereas little moisture, particularly in the early months, may either prevent the spread of rust or delay it sufficiently, so that actual damage to the crop may be minimized.

Table 4

Seeded Acreage, Yield per Seeded Acre, and Total Production of Wheat, Rye, Barley, and Oats in Manitoba for Specified Years

Grain	Seeded Acreage (Thousand Acres)	Yield per Seeded Acre (Bushels)	Total Production (Thousand Bushels)	Relation of Yield per Seeded Acre to 43-Year Average a/ (Percent)
1. Wheat				
1929	2,301	12.4	28,565	-28
1935	2,587	9.0	23,250	-48
1938	3,184	15.7	50,000	- 9
43-Year Average a/	2,637	17.2	44,930	
2. Rye				
1929	85	15.4	1,309	- 3
1935	107	17.0	1,816	+ 7
1938	205	15.8	3,240	- 1
43-Year Average a/	115	15.9	1,787	
3. Barley				
1929	2,182	16.7	36,518	-30
1935	1,121	20.6	23,100	-14
1938	1,355	22.9	31,000	- 4
43-Year Average a/	1,283	23.9	30,898	
4. Oats				
1929	1,558	19.7	30,740	-37
1935	1,434	21.4	30,700	-31
1938	1,462	28.0	41,000	-10
43-Year Average a/	1,535	31.1	47,690	

a. 1908-50.

Table 5

Precipitation in Manitoba for Specified Months
1929, 1935, and 1938

Inches

Stations	May		June		July		August		September	
	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average
1929										
Brandon (Experimental Farm)	1.86	+0.01	1.69	-1.41	2.27		0.43	-1.84	2.40	+0.98
Minnedosa	1.02	-0.91	1.39	-1.76	0.73	-1.90	0.27	-1.85	1.40	-0.14
Pierson	3.64	+1.68	0.62	-1.94	0.64	-1.60	0.60	-1.78	0.57	-0.91
Portage la Prairie	1.63	-0.22	0.87	-1.93	0.91	-1.72	0.35	-1.67	2.34	-0.10
Russel	2.50	+0.89	0.86	-2.26	2.04	-0.36	0.53	-1.54	0.55	-1.14
Morden (Experimental Farm)	0.92	-1.29	0.44	-2.67	1.25	-1.81	0.81	-1.10	2.59	-0.10
Sprague	2.45	+0.83	1.45	-1.21	1.68	-1.05	1.32	-0.18	1.76	-0.84
Winnipeg	2.69	+0.46	1.37	-1.90	1.10	-1.94	0.55	-1.83	2.39	+0.42
Dauphin	1.54	-0.36	0.73	-1.92	0.49	-2.50	0.87	-1.23	0.36	-1.77
1935										
Brandon (Experimental Farm)	1.40	-0.35	7.08	+3.98	6.68	+4.13	4.43	+2.14	1.05	-0.58
Minnedosa	0.93	-0.85	6.75	+3.77	5.92	+3.43	3.04	+0.91	1.47	-0.13
Pierson	3.55	+1.65	9.22	+6.65	4.53	+2.33	2.95	+0.76	0.40	-0.93
Portage la Prairie	2.42	+0.60	7.32	+4.49	4.38	+1.81	2.26	+0.34	1.51	-0.82
Russel	0.82	-0.83	6.08	+3.02	4.28	+1.90	2.74	+0.76	1.48	-0.14
Morden (Experimental Farm)	1.59	-0.60	5.33	+2.07	2.80	-0.29	3.59	+1.91	1.54	-1.02
Sprague	1.25	-0.95	2.38	-0.72	2.48	-0.32	5.96	+4.23	1.70	-0.54
Winnipeg	1.72	-0.47	4.15	+1.07	1.92	-1.15	4.75	+2.41	1.63	-0.63
Dauphin	0.87	-0.88	7.85	+5.35	4.77	+2.21	3.84	+1.95	2.14	+0.22

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Table 5

Precipitation in Manitoba for Specified Months
1929, 1935, and 1938
(Continued)

Inches

Stations	May		June		July		August		September	
	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average	Actual	Difference from Average
1938										
Brandon (Experimental Farm)	1.15	-0.60	1.64	-1.46	2.30	-0.25	1.31	-0.98	0.08	-1.55
Minnedosa	1.12	-0.66	1.62	-1.36	1.00	-1.49	1.75	-0.38	0.28	-1.32
Pierson	2.01	+0.11	1.14	-1.43	1.94	-0.26	2.80	+0.61	0.12	-1.21
Portage la Prairie	0.96	-0.86	1.66	-1.17	2.56	-0.01	1.13	-0.79	0.09	-2.24
Russel	2.00	+0.35	4.24	+1.18	1.62	-0.76	4.08	+1.10	0.88	-0.74
Morden (Experimental Farm)	1.47	-0.72	2.24	-1.02	4.26	+1.17	1.88	+0.20	0.02	-2.54
Sprague	3.79	+1.59	1.61	-1.49	1.73	-1.07	1.78	+0.05	0.61	-1.63
Winnipeg	1.60	-0.59	1.32	-1.76	4.08	+1.01	1.74	-0.60	0.24	-2.02
Dauphin	0.89	-0.86	1.99	-0.51	2.26	-0.30	2.81	+0.92	0.68	-1.24

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APPENDIX C

SOURCES

1. This discussion of the famine is based on Otto Schiller, Die Krise der sozialistischen Landwirtschaft in der Sowjetunion, Berlin, 1933, pp. 5-8; Naum Jasny, The Socialized Agriculture of the USSR, Stanford University Press, 1949, pp. 792-794; and Lazar Volin, A Survey of Soviet Russian Agriculture, Agricultural Monograph 5, US Department of Agriculture, 1951, p. 180.
2. Translated from Schiller, op. cit., p. 6.
3. Ibid., p. 7.
4. Dr. Max A. McCall: Data for Weapons System Evaluation Group (WSEG), pursuant to Three Questions Posed in Letter to Director, ORO, dated 18 Mar 1952, attached to letter of F.L. Weldon to Dr. Howard P. Robertson, Director of Research, WSEG, Office of the Secretary of Defense, dated 14 Apr 1952.
5. Ibid.
6. Ibid.

S-E-C-R-E-T

SECURITY INFORMATION

PROVISIONAL INTELLIGENCE REPORT

THE PATTERN OF LAND USE IN RELATION TO TARGET GRAINS IN THE USSR AND THE PROBABLE SPREAD OF STEM RUST ON CEREAL GRAINS

CIA/RR PR-23

ANNEX

THE STATISTICAL BASIS INDICATING THE LAND-USE PATTERN AND DISTRIBUTION OF GRAIN PRODUCTION IN SPECIFIED ADMINISTRATIVE DISTRICTS OF THE USSR

CENTRAL INTELLIGENCE AGENCY

Office of Research and Reports

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ANNEX

THE STATISTICAL BASIS INDICATING THE LAND-USE PATTERN AND DISTRIBUTION OF GRAIN PRODUCTION IN SPECIFIED ADMINISTRATIVE DISTRICTS OF THE USSR

FOREWORD

The varying land-use patterns of regions of European USSR and Asiatic USSR are indicated in the 99 tables that follow. Tables 1 to 87, inclusive, are devoted to European USSR, and Tables 88 to 99, inclusive, to Asiatic USSR. In each table the total area of each district is given, as well as the areas seeded to each of the target grains -- winter wheat, spring wheat, winter rye, barley, and oats -- and the total area seeded to these target grains, together with the percentage that each such area is of the total area of each district. The tables also give the production of each target grain and the total of these grains, as well as the percentage that each such production is of the total production of the corresponding grain in the USSR.

The acreage figures used in the tables are based on the Soviet 1938 land-use pattern because 1938 is the last year for which reliable published data exist on a detailed regional basis. It is not believed that shifts in acreage have been sufficiently great during the past 14 years to render the 1938 figures invalid for the purposes of this analysis. Total acreage seeded to grain crops is not greatly different now in the USSR from what it was in 1938. The distribution by regions is much the same. There have been some shifts as between grains, such as a tendency to stress bread grains as against feed grains and to shift from rye to wheat in some areas, but generally the 1938 pattern is still thought to be a realistic one.

There has been no shift in the weather pattern, so that the application of average yields to the 1938 acreage figures gives a production picture of what may be expected under normal conditions as well as furnishing a point of departure for comparing the effect of annual fluctuations in weather and in other growing conditions.

Table 1

Region I (Surplus): Winter Wheat and Barley
Ukraine (West): Transcarpathian Oblast
(Total Area as of 1 January 1946, 12,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,290.0	100.0		
Specified Bread Grains				
Winter Wheat	37.1	2.8	38.7	0.2
Spring Wheat	0.8	0.6	0.6	Negligible
Total Wheat	37.9	2.9	39.3	0.1
Winter Rye	30.1	2.3	30.0	0.1
Total Bread Grains	68.0	5.2	69.3	0.1
Specified Feed Grains				
Barley	2.9	0.2	2.9	Negligible
Oats	28.6	2.2	30.9	0.1
Total Specified Grains	99.5	7.7	103.1	0.1
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 2

Region I (Surplus): Winter Wheat and Barley
Ukraine (West): Chernovtsy Oblast
(Total Area as of 1 January 1947, 8,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	840.0	100.0		
Specified Bread Grains				
Winter Wheat	76.0	9.0	75.8	0.4
Spring Wheat	6.4	0.7	4.7	Negligible
Total Wheat	82.4	9.8	80.5	0.2
Winter Rye	50.5	6.0	46.7	0.2
Total Bread Grains	132.9	15.8	127.2	0.2
Specified Feed Grains				
Barley	29.4	3.5	28.1	0.3
Oats	21.9	2.6	24.1	0.1
Total Specified Grains	184.2	21.9	179.4	0.2
Area Seeded				
To All Grains	291.6	34.7		
To Other Crops	120.1	14.2		
Total	411.7	49.0		

Table 3

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Kamenets-Podol'sk Oblast
(Total Area as of 1 January 1947, 20,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,080.0	100.0		
Specified Bread Grains				
Winter Wheat	239.9	11.5	278.4	1.7
Spring Wheat	0.5	Negligible	0.4	Negligible
Total Wheat	240.4	11.5	278.8	0.8
Winter Rye	207.6	9.9	223.7	1.1
Total Bread Grains	448.0	21.4	502.5	0.9
Specified Feed Grains				
Barley	126.5	6.0	126.5	1.3
Oats	123.7	5.9	133.6	0.8
Total Specified Grains	698.2	33.5	762.6	0.9
Area Seeded				
To All Grains	894.7	43.0		
To Other Crops	444.0	21.3		
Total	1,338.7	64.3		

Table 4

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Vinnitsa Oblast
(Total Area as of 1 January 1947, 27,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,750.0	100.0		
Specified Bread Grains				
Winter Wheat	390.7	14.2	502.6	3.2
Spring Wheat	0.2	Negligible	0.2	Negligible
Total Wheat	390.9	14.2	502.8	1.4
Winter Rye	215.6	7.8	260.0	1.3
Total Bread Grains	606.5	22.0	762.8	1.4
Specified Feed Grains				
Barley	197.5	7.1	219.2	2.4
Oats	169.5	6.1	188.1	1.1
Total Specified Grains	973.5	35.4	1,170.1	1.4
Area Seeded				
To All Grains	1,223.8	44.5		
To Other Crops	617.1	N.A.		
Total	1,840.9	66.9		

Table 5

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Kiev Oblast
(Total Area as of 1 January 1947, 41,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,110.1	100.0		
Specified Bread Grains				
Winter Wheat	385.9	9.3	539.1	3.4
Spring Wheat	2.6	Negligible	2.3	Negligible
Total Wheat	388.5	9.4	541.4	1.6
Winter Rye	337.4	8.2	412.7	2.0
Total Bread Grains	725.9	12.6	954.1	1.8
Specified Feed Grains				
Barley	210.0	5.1	239.4	2.6
Oats	210.0	5.1	239.4	2.6
Total Specified Grains	1,145.9	27.8	1,432.9	1.8
Area Seeded				
To All Grains	1,438.0	34.9		
To Other Crops	673.2	16.3		
Total	2,111.2	51.3		

Table 6

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Poltava Oblast
(Total Area as of 1 January 1947, 34,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,430.0	100.0		
Specified Bread Grains				
Winter Wheat	420.8	12.2	483.4	3.0
Spring Wheat	110.1	3.2	96.9	0.5
Total Wheat	530.9	15.4	580.3	1.7
Winter Rye	371.0	10.8	300.3	1.5
Total Bread Grains	901.9	26.2	880.6	1.7
Specified Feed Grains				
Barley	181.6	5.2	188.9	2.0
Oats	130.4	3.8	135.6	0.8
Total Specified Grains	1,213.9	35.3	1,205.1	1.5
Area Seeded				
To All Grains	1,456.1	42.4		
To Other Crops	630.8	18.3		
Total	2,086.9	60.8		

Table 7

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Khar'kov Oblast
(Total Area as of 1 January 1947, 31,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,110.0	100.0		
Specified Bread Grains				
Winter Wheat	363.5	11.6	423.3	2.7
Spring Wheat	146.8	4.7	104.2	0.5
Total Wheat	510.3	16.4	527.5	1.5
Winter Rye	298.7	9.6	282.8	1.4
Total Bread Grains	809.0	26.0	810.3	1.5
Specified Feed Grains				
Barley	165.5	5.3	127.4	1.3
Oats	104.3	3.3	108.5	0.6
Total Specified Grains	1,078.8	34.6	1,046.2	1.3
Area Seeded				
To All Grains	1,244.7	40.0		
To Other Crops	504.6	16.2		
Total	1,749.3	56.2		

Table 8

Region I (Surplus): Winter Wheat and Barley
Ukraine (North): Moldavian SSR
(Total Area as of 1 January 1947, 33,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,380.0	100.0		
Specified Bread Grains				
Winter Wheat	765.3	22.6	704.2	4.5
Spring Wheat	128.5	3.8	79.7	0.4
Total Wheat	893.8	26.4	783.9	2.3
Winter Rye	139.7	4.1	124.7	0.6
Total Bread Grains	1,033.5	30.5	908.6	1.7
Specified Feed Grains				
Barley	287.0	8.4	252.6	2.7
Oats	23.2	0.6	25.5	0.1
Total Specified Grains	1,343.7	39.7	1,186.7	1.5
Area Seeded				
To All Grains	2,158.0	63.8		
To Other Crops	401.9	11.8		
Total	2,559.9	75.7		

Table 9

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Izmail' Oblast
(Total Area as of 1 January 1947, 12,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,240.0	100.0		
Specified Bread Grains				
Winter Wheat	171.5	13.8	159.6	1.0
Spring Wheat	52.6	4.2	32.6	0.1
Total Wheat	224.1	18.0	192.2	0.5
Winter Rye	55.3	4.4	38.6	0.1
Total Bread Grains	279.4	22.4	230.8	0.4
Specified Feed Grains				
Barley	251.9	20.3	206.4	2.2
Oats	23.2	1.8	19.7	0.1
Total Specified Grains	554.5	44.7	456.9	0.5
Area Seeded				
To All Grains	807.1	65.0		
To Other Crops	39.0	3.1		
Total	846.1	68.2		

Table 10

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Odessa Oblast
(Total Area as of 1 January 1947, 27,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,790.0	100.0		
Specified Bread Grains				
Winter Wheat	751.1	26.9	527.2	3.3
Spring Wheat	39.8	1.4	24.3	0.1
Total Wheat	790.9	28.3	551.5	1.6
Winter Rye	67.5	2.4	49.1	0.2
Total Bread Grains	858.4	30.7	600.6	1.1
Specified Feed Grains				
Barley	255.2	9.1	214.4	2.3
Oats	50.0	1.7	43.5	0.2
Total Specified Grains	1,163.6	41.7	858.5	1.0
Area Seeded				
To All Grains	1,328.2	47.6		
To Other Crops	444.5	15.9		
Total	1,772.7	63.5		

Table 11

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Kirovograd Oblast
(Total Area as of 1 January 1947, 24,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,490.0	100.0		
Specified Bread Grains				
Winter Wheat	554.1	22.2	405.5	2.5
Spring Wheat	43.6	1.7	26.6	0.1
Total Wheat	597.7	24.0	432.1	1.2
Winter Rye	137.0	5.5	105.1	0.5
Total Bread Grains	734.7	29.5	537.2	1.0
Specified Feed Grains				
Barley	182.9	7.3	153.6	1.6
Oats	69.1	2.7	60.1	0.3
Total Specified Grains	986.7	39.6	750.9	0.9
Area Seeded				
To All Grains	1,126.0	45.2		
To Other Crops	440.7	17.6		
Total	1,566.7	62.9		

Table 12

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Dnepropetrovsk Oblast
(Total Area as of 1 January 1947, 32,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,260.0	100.0		
Specified Bread Grains				
Winter Wheat	665.6	20.4	687.0	4.4
Spring Wheat	121.5	3.7	89.9	0.5
Total Wheat	787.1	24.1	776.9	2.3
Winter Rye	171.6	5.2	138.3	0.7
Total Bread Grains	958.7	29.3	915.2	1.7
Specified Feed Grains				
Barley	200.6	6.1	184.6	2.0
Oats	62.0	1.9	58.9	0.3
Total Specified Grains	1,221.3	37.4	1,158.7	1.4
Area Seeded				
To All Grains	1,415.4	43.4		
To Other Crops	508.0	15.5		
Total	1,923.4	59.0		

Table 13

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Nikolayev Oblast
(Total Area as of 1 January 1947, 19,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,950.0	100.0		
Specified Bread Grains				
Winter Wheat	796.2	40.8	466.7	2.9
Spring Wheat	28.8	1.4	17.6	Negligible
Total Wheat	825.0	42.3	484.3	1.4
Winter Rye	55.9	2.8	35.3	0.1
Total Bread Grains	880.9	45.1	519.6	1.0
Specified Feed Grains				
Barley	205.4	10.5	169.4	1.8
Oats	36.6	1.8	31.8	0.1
Total Specified Grains	1,122.9	57.5	720.8	0.9
Area Seeded				
To All Grains	1,282.4	65.7		
To Other Crops	513.4	26.3		
Total	1,795.8	92.0		

Table 14

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Kherson Oblast
(Total Area as of 1 January 1947, 27,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,750.0	100.0		
Specified Bread Grains				
Winter Wheat	629.1	22.8	334.2	2.1
Spring Wheat	28.8	1.0	8.5	Negligible
Total Wheat	657.9	23.9	342.7	1.0
Winter Rye	45.5	1.6	21.1	0.1
Total Bread Grains	703.4	25.5	363.8	0.7
Specified Feed Grains				
Barley	222.7	8.0	143.3	1.5
Oats	35.6	1.2	9.3	Negligible
Total Specified Grains	961.7	34.9	516.4	0.6
Area Seeded				
To All Grains	1,039.4	37.7		
To Other Crops	367.5	13.3		
Total	1,406.9	51.1		

Table 15

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Zaporozh'ye Oblast
(Total Area as of 1 January 1947, 26,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,690.0	100.0		
Specified Bread Grains				
Winter Wheat	730.3	27.1	689.6	4.4
Spring Wheat	43.6	1.6	32.3	0.1
Total Wheat	773.9	28.7	721.9	2.1
Winter Rye	53.1	1.9	36.0	0.1
Total Bread Grains	827.0	30.6	757.9	1.4
Specified Feed Grains				
Barley	223.7	8.3	181.1	1.9
Oats	58.0	2.1	48.7	0.3
Total Specified Grains	1,108.7	41.2	987.7	1.2
Area Seeded				
To All Grains	1,212.6	45.0		
To Other Crops	401.2	14.9		
Total	1,613.8	59.9		

Table 16

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Stalino Oblast
(Total Area as of 1 January 1947, 26,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,650.0	100.0		
Specified Bread Grains				
Winter Wheat	367.9	13.8	399.6	2.5
Spring Wheat	184.6	6.9	131.1	0.7
Total Wheat	552.5	20.8	530.7	1.5
Winter Rye	86.4	3.2	64.1	0.3
Total Bread Grains	638.9	24.0	594.8	1.1
Specified Feed Grains				
Barley	169.9	6.4	147.8	1.6
Oats	73.5	2.7	67.6	0.4
Total Specified Grains	882.3	33.2	810.2	1.0
Area Seeded				
To All Grains	992.4	37.4		
To Other Crops	495.3	18.6		
Total	1,487.7	56.1		

Table 17

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Voroshilovgrad Oblast
(Total Area as of 1 January 1947, 26,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,670.0	100.0		
Specified Bread Grains				
Winter Wheat	301.5	11.2	348.0	2.2
Spring Wheat	184.0	6.8	127.0	0.7
Total Wheat	485.5	18.1	475.0	1.4
Winter Rye	120.7	4.5	95.9	0.4
Total Bread Grains	606.2	22.6	570.9	1.1
Specified Feed Grains				
Barley	159.6	5.9	129.3	1.4
Oats	70.9	2.6	65.2	0.4
Total Specified Grains	836.7	31.3	765.4	0.9
Area Seeded				
To All Grains	937.8	35.1		
To Other Crops	342.5	12.8		
Total	1,280.3	47.9		

Table 18

Region I (Surplus): Winter Wheat and Barley
Ukraine (South): Crimea Oblast
(Total Area as of 1 January 1947, 26,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,600.0	100.0		
Specified Bread Grains				
Winter Wheat	479.6	18.4	429.9	2.7
Spring Wheat	N.A.	N.A.	N.A.	N.A.
Total Wheat	479.6	18.4	429.9	1.2
Winter Rye	3.6	0.1	2.2	Negligible
Total Bread Grains	483.2	18.5	432.1	0.8
Specified Feed Grains				
Barley	204.3	7.8	138.7	1.5
Oats	49.0	1.8	36.8	0.2
Total Specified Grains	736.5	28.3	607.6	0.7
Area Seeded				
To All Grains	780.9	30.0		
To Other Crops	198.9	7.6		
Total	979.8	37.6		

Table 19

Region I (Surplus): Winter Wheat and Barley
North Caucasus: Krasnodar Kray
(Total Area as of 1 June 1946, 85,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	8,500.0	100.0		
Specified Bread Grains				
Winter Wheat	1,370.9	16.1	1,418.8	9.0
Spring Wheat	149.4	1.7	133.0	0.7
Total Wheat	1,520.3	17.8	1,551.8	4.6
Winter Rye	5.4	Negligible	5.2	Negligible
Total Bread Grains	1,525.7	17.8	1,557.0	2.9
Specified Feed Grains				
Barley	669.5	7.8	562.3	6.1
Oats	168.0	1.9	176.4	1.0
Total Specified Grains	2,363.2	27.8	2,295.7	2.9
Area Seeded				
To All Grains	2,609.0	30.6		
To Other Crops	1,228.7	14.4		
Total	3,837.7	45.1		

Table 20

Region I (Surplus): Winter Wheat and Barley
North Caucasus: Stavropol' Kray
(Total Area as of 1 January 1947, 76,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	7,660.0	100.0		
Specified Bread Grains				
Winter Wheat	1,121.6	14.6	721.5	4.6
Spring Wheat	10.2	0.1	6.3	Negligible
Total Wheat	1,131.8	14.7	727.8	2.1
Winter Rye	15.3	0.1	15.2	Negligible
Total Bread Grains	1,147.1	14.8	743.0	1.4
Specified Feed Grains				
Barley	610.4	7.9	438.1	4.7
Oats	245.7	3.2	184.3	1.1
Total Specified Grains	2,003.2	26.1	1,365.4	1.7
Area Seeded				
To All Grains	2,107.9	27.5		
To Other Crops	1,032.6	13.4		
Total	3,140.5	40.9		

Table 21

Region I (Surplus): Winter Wheat and Barley
North Caucasus: Groznyy Oblast
(Total Area as of 1 January 1947, 33,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,300.0	100.0		
Specified Bread Grains				
Winter Wheat	93.3	2.8	51.3	0.3
Spring Wheat	2.6	Negligible	1.4	Negligible
Total Wheat	95.9	2.9	52.7	0.1
Winter Rye	0.1	Negligible	0.1	Negligible
Total Bread Grains	96.0	2.9	52.8	0.1
Specified Feed Grains				
Barley	14.2	0.4	12.8	0.1
Oats	21.4	0.6	19.7	0.1
Total Specified Grains	131.6	3.9	85.3	0.1
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 22

Region II (Surplus): Spring Wheat
North Caucasus: Dagestan ASSR
(Total Area as of 1 January 1947, 38,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,820.0	100.0		
Specified Bread Grains				
Winter Wheat	117.6	3.0	82.0	0.5
Spring Wheat	13.0	0.3	7.8	Negligible
Total Wheat	130.6	3.4	89.8	0.2
Winter Rye	9.6	0.2	5.6	Negligible
Total Bread Grains	140.2	3.6	95.4	0.2
Specified Feed Grains				
Barley	77.7	2.0	50.4	0.5
Oats	10.6	0.2	8.5	Negligible
Total Specified Grains	228.5	5.9	154.3	0.1
Area Seeded				
To All Grains	296.8	7.7		
To Other Crops	48.9	1.2		
Total	345.7	9.0		

Table 23

Region II (Surplus): Spring Wheat
Lower Don: Rostov Oblast
(Total Area as of 1 January 1947, 104,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	10,450.0	100.0		
Specified Bread Grains				
Winter Wheat	730.8	6.9	450.7	2.8
Spring Wheat	1,010.1	9.6	585.9	3.2
Total Wheat	1,740.9	16.6	1,036.6	3.0
Winter Rye	500.8	4.7	218.8	1.1
Total Bread Grains	2,241.7	21.3	1,225.4	2.4
Specified Feed Grains				
Barley	738.1	7.0	568.0	6.2
Oats	151.4	1.4	84.8	0.5
Total Specified Grains	3,130.7	29.9	1,908.2	2.4
Area Seeded				
To All Grains	3,466.7	33.1		
To Other Crops	1,168.6	11.1		
Total	4,635.3	44.3		

Table 24

Region II (Surplus): Spring Wheat
Lower Volga: Astrakhan' Oblast
(Total Area as of 1 January 1947, 92,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	9,220.0	100.0		
Specified Bread Grains				
Winter Wheat	24.4	0.3	6.7	Negligible
Spring Wheat	28.3	0.3	10.8	Negligible
Total Wheat	52.7	0.6	17.5	Negligible
Winter Rye	42.7	0.5	10.2	Negligible
Total Bread Grains	95.4	1.1	27.7	Negligible
Specified Feed Grains				
Barley	16.0	0.2	6.4	Negligible
Oats	14.0	0.1	5.5	Negligible
Total Specified Grains	125.4	1.4	39.6	Negligible
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 25

Region II (Surplus): Spring Wheat
Lower Volga: Stalingrad Oblast
(Total Area as of 1 January 1947, 127,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	12,720.0	100.0		
Specified Bread Grains				
Winter Wheat	123.2	1.0	75.9	0.5
Spring Wheat	1,816.4	14.3	926.4	5.2
Total Wheat	1,939.6	15.2	1,002.3	3.0
Winter Rye	964.2	7.6	580.0	2.9
Total Bread Grains	2,903.8	22.8	1,582.3	3.0
Specified Feed Grains				
Barley	318.9	2.5	229.6	2.5
Oats	167.1	1.3	115.3	0.7
Total Specified Grains	3,389.8	26.6	1,927.2	2.5
Area Seeded				
To All Grains	3,654.6	28.7		
To Other Crops	808.5	6.4		
Total	4,463.1	35.1		

Table 26

Region II (Surplus): Spring Wheat
Middle Volga: Saratov Oblast
(Total Area as of 1 January 1947, 102,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	10,230.0	100.0		
Specified Bread Grains				
Winter Wheat	63.0	0.6	51.0	0.3
Spring Wheat	1,552.9	15.2	792.0	4.4
Total Wheat	1,615.9	15.8	843.0	2.5
Winter Rye	856.0	8.4	567.9	2.9
Total Bread Grains	2,471.9	24.2	1,410.9	2.6
Specified Feed Grains				
Barley	171.2	1.6	83.9	0.9
Oats	313.5	3.1	191.2	1.2
Total Specified Grains	2,956.6	28.9	1,686.0	2.1
Area Seeded				
To All Grains	3,278.2	32.0		
To Other Crops	617.2	6.0		
Total	3,895.4	38.1		

Table 27

Region II (Surplus): Spring Wheat
Middle Volga: Ul'yanovsk Oblast
(Total Area as of 1 January 1947, 37,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,720.0	100.0		
Specified Bread Grains				
Winter Wheat	25.9	0.7	16.9	0.1
Spring Wheat	906.2	24.4	476.3	2.7
Total Wheat	932.1	25.0	493.2	1.5
Winter Rye	467.5	12.6	359.7	1.8
Total Bread Grains	1,399.6	37.6	852.9	1.6
Specified Feed Grains				
Barley	25.1	0.7	16.6	0.2
Oats	273.9	7.4	166.1	1.0
Total Specified Grains	1,698.6	45.7	1,035.6	1.3
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 28

Region II (Surplus): Spring Wheat
Middle Volga: Kuybyshev Oblast
(Total Area as of 1 January 1947, 53,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	5,390.0	100.0		
Specified Bread Grains				
Winter Wheat	2.0	Negligible	1.2	Negligible
Spring Wheat	1,312.2	24.4	219.2	1.2
Total Wheat	1,314.2	24.4	220.4	0.7
Winter Rye	450.0	8.3	275.4	1.4
Total Bread Grains	1,764.2	32.7	495.8	0.9
Specified Feed Grains				
Barley	54.0	1.0	24.0	0.3
Oats	423.9	7.9	84.0	0.5
Total Specified Grains	2,242.1	41.6	603.8	0.8
Area Seeded				
To All Grains	2,612.4	48.5		
To Other Crops	634.3	11.8		
Total	3,246.7	60.2		

Table 29

Region II (Surplus): Spring Wheat
Urals: Chkalov Oblast
(Total Area as of 1 January 1946, 122,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	12,280.0	100.0		
Specified Bread Grains				
Winter Wheat	7.7	0.1	5.7	Negligible
Spring Wheat	1,758.6	14.3	1,020.0	5.7
Total Wheat	1,766.3	14.4	1,025.7	3.0
Winter Rye	596.0	4.8	333.5	1.7
Total Bread Grains	2,362.3	19.2	1,359.2	2.6
Specified Feed Grains				
Barley	108.5	0.9	61.8	0.7
Oats	374.2	3.0	220.8	1.4
Total Specified Grains	2,845.0	23.2	1,641.8	2.1
Area Seeded				
To All Grains	3,086.8	25.1		
To Other Crops	474.3	3.8		
Total	3,561.1	28.9		

Table 30

Region II (Surplus): Spring Wheat
Urals: Bashkir ASSR
(Total Area as of 1 January 1946, 143,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	14,350.0	100.0		
Specified Bread Grains				
Winter Wheat	15.9	0.1	11.7	0.1
Spring Wheat	1,056.0	7.4	739.2	4.1
Total Wheat	1,071.9	7.5	750.9	2.2
Winter Rye	850.3	5.9	737.4	3.7
Total Bread Grains	1,922.2	13.4	1,488.3	2.8
Specified Feed Grains				
Barley	31.8	0.2	24.2	0.3
Oats	661.7	4.6	496.3	3.1
Total Specified Grains	2,615.7	18.2	2,008.8	2.6
Area Seeded				
To All Grains	3,012.1	20.9		
To Other Crops	483.4	3.3		
Total	3,495.5	24.3		

Table 31

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): L'vov Oblast
(Total Area as of 1 January 1947, 11,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,110.0	100.0		
Specified Bread Grains				
Winter Wheat	104.6	9.4	109.3	0.7
Spring Wheat	9.7	0.8	7.8	Negligible
Total Wheat	114.3	10.2	117.1	0.3
Winter Rye	122.0	10.9	103.3	0.5
Total Bread Grains	236.3	21.1	220.4	0.4
Specified Feed Grains				
Barley	46.4	4.1	43.0	0.4
Oats	83.0	7.4	93.8	0.5
Total Specified Grains	365.7	32.9	357.2	0.4
Area Seeded				
To All Grains	393.5	35.4		
To Other Crops	189.9	17.1		
Total	583.4	52.5		

Table 32

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): Stanislav Oblast
(Total Area as of 1 January 1947, 13,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,390.0	100.0		
Specified Bread Grains				
Winter Wheat	77.9	5.6	81.4	0.5
Spring Wheat	6.0	0.4	4.6	Negligible
Total Wheat	83.9	6.0	86.0	0.2
Winter Rye	96.6	6.9	95.6	0.4
Total Bread Grains	180.5	12.9	181.6	0.3
Specified Feed Grains				
Barley	23.2	1.6	23.2	0.2
Oats	60.4	4.3	65.2	0.4
Total Specified Grains	264.1	19.0	270.0	0.3
Area Seeded				
To All Grains	319.8	23.0		
To Other Crops	165.1	11.8		
Total	484.9	34.8		

Table 33

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): Drogobych Oblast
(Total Area as of 1 January 1947, 10,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,040.0	100.0		
Specified Bread Grains				
Winter Wheat	50.2	4.8	52.5	0.3
Spring Wheat	5.0	0.4	4.0	Negligible
Total Wheat	55.2	5.3	56.5	0.1
Winter Rye	89.1	8.5	87.6	0.4
Total Bread Grains	144.3	13.8	144.1	0.3
Specified Feed Grains				
Barley	21.0	2.0	20.5	0.2
Oats	98.0	9.4	105.8	0.6
Total Specified Grains	263.3	25.3	270.4	0.3
Area Seeded				
To All Grains	275.4	26.4		
To Other Crops	141.5	13.6		
Total	416.9	40.0		

Table 34

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): Volyn Oblast
(Total Area as of 1 January 1947, 19,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,990.0	100.0		
Specified Bread Grains				
Winter Wheat	108.4	5.4	116.4	0.7
Spring Wheat	22.1	1.1	17.9	Negligible
Total Wheat	130.5	6.5	134.3	0.4
Winter Rye	225.3	11.3	192.3	0.9
Total Bread Grains	355.8	17.8	326.6	0.6
Specified Feed Grains				
Barley	59.3	2.9	55.6	0.6
Oats	83.6	4.2	94.5	0.5
Total Specified Grains	498.7	25.0	476.7	0.6
Area Seeded				
To All Grains	535.5	26.9		
To Other Crops	197.2	9.9		
Total	732.7	36.8		

Table 35

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): Rovno Oblast
(Total Area as of 1 January 1947, 20,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,060.0	100.0		
Specified Bread Grains				
Winter Wheat	83.4	4.0	89.6	0.5
Spring Wheat	16.8	0.8	13.6	Negligible
Total Wheat	100.2	4.8	103.2	0.3
Winter Rye	191.2	9.2	163.3	0.8
Total Bread Grains	291.4	14.0	266.5	0.5
Specified Feed Grains				
Barley	60.9	2.9	57.2	0.6
Oats	102.6	4.9	115.9	0.7
Total Specified Grains	454.9	22.0	439.6	0.5
Area Seeded				
To All Grains	508.7	24.6		
To Other Crops	193.8	9.4		
Total	702.5	34.1		

Table 36

Region III-A (Surplus): Winter Rye and Oats
Ukraine (West): Ternopol' Oblast
(Total Area as of 1 January 1947, 13,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,370.0	100.0		
Specified Bread Grains				
Winter Wheat	186.1	13.5	203.3	1.3
Spring Wheat	17.1	1.2	13.7	Negligible
Total Wheat	203.2	14.8	217.0	0.6
Winter Rye	201.7	14.7	172.3	0.8
Total Bread Grains	404.9	29.5	389.3	0.7
Specified Feed Grains				
Barley	116.0	8.4	108.6	1.1
Oats	104.8	7.6	118.4	0.7
Total Specified Grains	625.7	45.6	616.3	0.7
Area Seeded				
To All Grains	755.9	55.1		
To Other Crops	253.4	18.4		
Total	1,009.3	73.6		

Table 37

Region III-A (Surplus): Winter Rye and Oats
Ukraine (North): Zhitomir Oblast
(Total Area as of 1 January 1946, 30,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,000.0	100.0		
Specified Bread Grains				
Winter Wheat	139.3	4.6	150.6	0.9
Spring Wheat	4.6	0.1	3.7	Negligible
Total Wheat	143.9	4.7	154.3	0.4
Winter Rye	288.2	9.6	257.9	1.3
Total Bread Grains	432.1	14.3	412.2	0.8
Specified Feed Grains				
Barley	105.7	3.5	99.4	1.0
Oats	143.5	4.7	162.2	1.0
Total Specified Grains	681.3	22.7	673.8	0.8
Area Seeded				
To All Grains	845.6	28.1		
To Other Crops	390.5	13.0		
Total	1,236.1	41.2		

Table 38

Region III-A (Surplus): Winter Rye and Oats
Ukraine (North): Chernigov Oblast
(Total Area as of 1 January 1947, 31,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,160.0	100.0		
Specified Bread Grains				
Winter Wheat	66.9	2.1	78.2	0.5
Spring Wheat	17.0	0.5	16.2	Negligible
Total Wheat	83.9	2.6	94.4	0.2
Winter Rye	399.9	12.6	273.8	1.3
Total Bread Grains	483.8	15.2	368.2	0.7
Specified Feed Grains				
Barley	95.0	3.0	90.2	0.9
Oats	160.1	5.0	110.5	0.6
Total Specified Grains	738.9	23.3	568.9	0.7
Area Seeded				
To All Grains	985.3	31.1		
To Other Crops	460.9	14.5		
Total	1,446.2	45.7		

Table 39

Region III-A (Surplus): Winter Rye and Oats
Ukraine (North): Sumy Oblast
(Total Area as of 1 January 1947, 24,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,440.0	100.0		
Specified Bread Grains				
Winter Wheat	161.3	6.6	194.6	1.2
Spring Wheat	56.0	2.2	49.3	0.2
Total Wheat	217.3	8.9	243.9	0.7
Winter Rye	293.7	12.0	246.1	1.2
Total Bread Grains	511.0	20.9	490.0	0.9
Specified Feed Grains				
Barley	90.4	3.7	83.2	0.9
Oats	132.8	5.4	119.5	0.7
Total Specified Grains	734.2	30.0	692.7	0.8
Area Seeded				
To All Grains	933.2	38.2		
To Other Crops	381.1	15.6		
Total	1,386.0	56.8		

Table 40

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Bryansk Oblast
(Total Area as of 1 January 1947, 34,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,470.0	100.0		
Specified Bread Grains				
Winter Wheat	27.4	0.8	28.9	0.2
Spring Wheat	70.0	2.0	64.4	0.4
Total Wheat	97.4	2.8	93.3	0.3
Winter Rye	419.7	12.1	295.0	1.5
Total Bread Grains	517.1	14.9	388.3	0.7
Specified Feed Grains				
Barley	52.0	1.4	44.2	0.5
Oats	268.3	7.7	209.3	1.3
Total Specified Grains	837.4	24.1	641.8	0.8
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 41

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Kursk Oblast
(Total Area as of 1 January 1947, 50,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	5,080.0	100.0		
Specified Bread Grains				
Winter Wheat	360.6	7.1	431.0	2.8
Spring Wheat	185.6	3.7	174.5	1.0
Total Wheat	546.2	10.8	605.5	1.8
Winter Rye	734.0	14.4	710.8	3.6
Total Bread Grains	1,280.2	25.2	1,316.3	2.5
Specified Feed Grains				
Barley	168.7	3.3	148.5	1.6
Oats	403.8	7.9	371.5	2.3
Total Specified Grains	1,852.7	36.5	1,836.3	2.3
Area Seeded				
To All Grains	2,212.0	43.5		
To Other Crops	757.7	14.9		
Total	2,969.7	58.5		

Table 42

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Orël Oblast
(Total Area as of 1 January 1947, 31,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,160.0	100.0		
Specified Bread Grains				
Winter Wheat	96.3	3.0	109.4	0.7
Spring Wheat	83.3	2.6	73.3	0.4
Total Wheat	179.6	5.7	182.7	0.5
Winter Rye	433.8	13.7	349.0	1.8
Total Bread Grains	613.4	19.4	531.7	1.0
Specified Feed Grains				
Barley	20.0	0.6	12.4	0.1
Oats	182.0	5.7	142.0	0.9
Total Specified Grains	815.4	25.8	686.1	0.9
Area Seeded				
To All Grains	1,171.5	37.1		
To Other Crops	889.8	28.2		
Total	2,061.3	65.2		

Table 43

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Voronezh Oblast
(Total Area as of 1 January 1947, 68,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	6,840.0	100.0		
Specified Bread Grains				
Winter Wheat	415.0	6.1	406.6	2.6
Spring Wheat	479.4	7.0	311.6	1.7
Total Wheat	894.4	13.1	718.2	2.1
Winter Rye	741.1	10.8	648.9	3.3
Total Bread Grains	1,635.5	23.9	1,367.1	2.6
Specified Feed Grains				
Barley	135.3	2.0	83.9	0.9
Oats	331.4	4.8	281.7	1.8
Total Specified Grains	2,102.2	30.7	1,732.7	2.2
Area Seeded				
To All Grains	2,488.1	36.4		
To Other Crops	1,009.7	14.8		
Total	3,497.8	51.1		

Table 44

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Tambov Oblast
(Total Area as of 1 January 1947, 34,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,430.0	100.0		
Specified Bread Grains				
Winter Wheat	153.1	4.5	173.6	1.1
Spring Wheat	146.9	4.3	135.1	0.8
Total Wheat	300.0	8.7	308.7	0.9
Winter Rye	554.8	16.2	546.9	2.8
Total Bread Grains	854.8	24.9	855.6	1.6
Specified Feed Grains				
Barley	9.8	0.3	10.3	0.1
Oats	299.7	8.7	284.7	1.8
Total Specified Grains	1,164.3	33.9	1,150.6	1.5
Area Seeded				
To All Grains	1,472.0	42.9		
To Other Crops	487.0	14.2		
Total	1,959.0	57.1		

Table 45

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Penza Oblast
(Total Area as of 1 January 1947, 43,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,330.0	100.0		
Specified Bread Grains				
Winter Wheat	71.1	1.6	68.8	0.4
Spring Wheat	304.5	7.0	194.9	1.0
Total Wheat	375.6	8.6	263.7	0.7
Winter Rye	591.1	13.6	498.2	2.5
Total Bread Grains	966.7	22.2	761.9	1.4
Specified Feed Grains				
Barley	20.0	0.4	14.8	0.2
Oats	423.1	9.7	300.4	1.8
Total Specified Grains	1,409.8	32.5	1,077.1	1.3
Area Seeded				
To All Grains	1,788.4	41.3		
To Other Crops	422.2	9.7		
Total	2,210.6	51.0		

Table 46

Region III-A (Surplus): Winter Rye and Oats
Central Black Soil: Mordvin ASSR
(Total Area as of 1 January 1947, 26,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,610.0	100.0		
Specified Bread Grains				
Winter Wheat	28.3	1.0	33.8	0.2
Spring Wheat	151.3	5.7	104.4	0.5
Total Wheat	179.6	6.8	138.2	0.4
Winter Rye	316.4	12.1	290.4	1.4
Total Bread Grains	496.0	18.9	428.6	0.8
Specified Feed Grains				
Barley	5.7	0.2	4.3	Negligible
Oats	218.1	8.3	163.6	1.0
Total Specified Grains	719.8	27.5	596.5	0.7
Area Seeded				
To All Grains	891.6	34.1		
To Other Crops	236.3	9.0		
Total	1,127.9	43.2		

Table 47

Region III-A (Surplus): Winter Rye and Oats
Upper Volga: Tatar ASSR
(Total Area as of 1 January 1947, 67,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	6,760.0	100.0		
Specified Bread Grains				
Winter Wheat	14.9	0.2	10.9	0.1
Spring Wheat	556.3	8.2	322.6	1.8
Total Wheat	571.2	8.4	333.5	1.0
Winter Rye	1,020.3	15.1	817.7	4.1
Total Bread Grains	1,591.5	23.5	1,151.2	2.2
Specified Feed Grains				
Barley	28.7	0.4	22.4	0.2
Oats	588.6	8.7	364.9	2.3
Total Specified Grains	2,208.8	32.7	1,538.5	2.0
Area Seeded				
To All Grains	2,670.3	39.5		
To Other Crops	567.3	8.4		
Total	3,237.6	47.9		

Table 48

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Grodno Oblast
(Total Area as of 1 January 1946, 13,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,300.0	100.0		
Specified Bread Grains				
Winter Wheat	9.6	0.7	7.7	Negligible
Spring Wheat	6.5	0.5	4.5	Negligible
Total Wheat	16.1	1.2	12.2	Negligible
Winter Rye	155.5	11.9	116.2	0.6
Total Bread Grains	171.0	13.1	128.4	0.2
Specified Feed Grains				
Barley	32.3	2.5	24.2	0.3
Oats	67.4	5.2	43.8	0.3
Total Specified Grains	270.7	20.8	196.4	0.3
Area Seeded				
To All Grains	292.9	22.5		
To Other Crops	129.0	9.9		
Total	421.9	32.4		

Table 49

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Pinsk Oblast
(Total Area as of 1 January 1946, 16,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,630.0	100.0		
Specified Bread Grains				
Winter Wheat	2.9	0.1	2.8	Negligible
Spring Wheat	1.8	0.1	1.3	Negligible
Total Wheat	4.7	0.2	4.1	Negligible
Winter Rye	89.0	5.4	75.4	0.3
Total Bread Grains	93.7	5.6	79.5	0.1
Specified Feed Grains				
Barley	10.0	0.6	8.5	Negligible
Oats	31.0	1.9	27.6	0.1
Total Specified Grains	134.7	8.2	115.6	0.1
Area Seeded				
To All Grains	149.9	9.1		
To Other Crops	81.1	4.9		
Total	231.0	14.1		

Table 50

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Brest Oblast
(Total Area as of 1 January 1946, 13,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,350.0	100.0		
Specified Bread Grains				
Winter Wheat	12.5	0.9	11.5	Negligible
Spring Wheat	7.3	0.5	5.3	Negligible
Total Wheat	19.8	1.4	16.8	Negligible
Winter Rye	143.0	10.5	115.5	0.5
Total Bread Grains	162.8	11.9	132.3	0.2
Specified Feed Grains				
Barley	21.2	1.5	16.5	0.1
Oats	51.7	3.8	35.2	0.2
Total Specified Grains	235.7	17.4	184.0	0.2
Area Seeded				
To All Grains	251.3	18.6		
To Other Crops	106.6	7.8		
Total	357.9	26.5		

Table 51

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Molodechno Oblast
(Total Area as of 1 January 1946, 13,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,370.0	100.0		
Specified Bread Grains				
Winter Wheat	7.6	0.5	4.2	Negligible
Spring Wheat	12.8	0.9	3.4	Negligible
Total Wheat	20.4	1.4	7.6	Negligible
Winter Rye	168.5	12.2	97.0	0.4
Total Bread Grains	188.9	13.6	104.6	0.2
Specified Feed Grains				
Barley	36.3	2.6	25.6	0.2
Oats	81.5	5.9	53.9	0.3
Total Specified Grains	306.7	22.3	184.1	0.2
Area Seeded				
To All Grains	335.0	24.4		
To Other Crops	163.9	11.9		
Total	498.9	36.4		

Table 52

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Baranovichi Oblast
(Total Area as of 1 January 1946, 14,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,480.0	100.0		
Specified Bread Grains				
Winter Wheat	5.6	0.3	7.2	Negligible
Spring Wheat	5.2	0.3	9.2	Negligible
Total Wheat	10.8	0.7	16.4	Negligible
Winter Rye	150.6	10.1	129.0	0.6
Total Bread Grains	161.4	10.8	145.4	0.3
Specified Feed Grains				
Barley	37.1	2.5	28.3	0.3
Oats	82.9	5.6	58.7	0.3
Total Specified Grains	281.4	19.0	232.4	0.2
Area Seeded				
To All Grains	305.1	20.6		
To Other Crops	151.3	10.2		
Total	456.4	30.8		

Table 53

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Polotsk Oblast
(Total Area as of 1 January 1946, 18,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,800.0	100.0		
Specified Bread Grains				
Winter Wheat	13.9	0.8	9.8	0.1
Spring Wheat	15.8	0.9	9.6	0.1
Total Wheat	29.7	1.7	19.4	0.1
Winter Rye	143.7	8.0	86.0	0.4
Total Bread Grains	173.4	9.7	105.4	0.2
Specified Feed Grains				
Barley	35.6	2.0	23.1	0.3
Oats	88.8	4.9	57.7	0.3
Total Specified Grains	297.8	16.5	186.2	0.2
Area Seeded				
To All Grains	320.5	17.8		
To Other Crops	494.8	27.4		
Total	815.3	45.2		

Table 54

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Vitebsk Oblast
(Total Area as of 1 January 1946, 19 600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,960.0	100.0		
Specified Bread Grains				
Winter Wheat	14.0	0.7	10.8	0.1
Spring Wheat	19.8	1.0	13.7	0.1
Total Wheat	33.8	1.7	24.5	0.1
Winter Rye	118.0	6.0	74.3	0.4
Total Bread Grains	151.8	7.7	98.8	0.2
Specified Feed Grains				
Barley	40.5	2.1	27.9	0.3
Oats	81.8	4.2	60.5	0.4
Total Specified Grains	274.1	14.0	187.2	0.2
Area Seeded				
To All Grains	297.8	15.1		
To Other Crops	165.4	8.4		
Total	463.2	23.6		

Table 55

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Mogilëv Oblast
(Total Area as of 1 January 1947, 20,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,070.0	100.0		
Specified Bread Grains				
Winter Wheat	6.8	0.3	5.7	Negligible
Spring Wheat	37.2	1.8	30.5	0.2
Total Wheat	44.0	2.1	36.2	0.1
Winter Rye	191.4	9.2	135.7	0.7
Total Bread Grains	235.4	11.3	171.9	0.3
Specified Feed Grains				
Barley	59.0	2.8	44.2	0.5
Oats	88.4	4.3	71.6	0.4
Total Specified Grains	382.8	18.5	287.7	0.4
Area Seeded				
To All Grains	429.0	20.7		
To Other Crops	196.0	9.4		
Total	625.0	30.1		

Table 56

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Minsk Oblast
(Total Area as of 1 January 1947, 20,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,080.0	100.0		
Specified Bread Grains				
Winter Wheat	18.4	0.9	17.0	0.1
Spring Wheat	24.3	1.2	17.2	0.1
Total Wheat	42.7	2.1	34.2	0.1
Winter Rye	155.5	7.5	105.4	0.5
Total Bread Grains	198.2	9.6	139.6	0.3
Specified Feed Grains				
Barley	39.5	1.9	30.8	0.3
Oats	85.7	4.1	64.3	0.4
Total Specified Grains	323.4	15.5	234.7	0.3
Area Seeded				
To All Grains	351.1	16.8		
To Other Crops	165.0	7.9		
Total	516.1	24.8		

Table 57

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Bobruysk Oblast
(Total Area as of 1 January 1946, 19,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,970.0	100.0		
Specified Bread Grains				
Winter Wheat	12.3	0.6	11.4	0.1
Spring Wheat	23.4	1.2	16.6	0.1
Total Wheat	35.7	1.8	28.0	0.1
Winter Rye	145.4	7.4	100.7	0.5
Total Bread Grains	181.1	9.2	128.7	0.2
Specified Feed Grains				
Barley	37.9	1.9	30.3	0.3
Oats	69.6	3.5	55.7	0.3
Total Specified Grains	288.6	14.6	214.7	0.3
Area Seeded				
To All Grains	321.5	16.3		
To Other Crops	148.4	7.5		
Total	469.9	23.8		

Table 58

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Gomel' Oblast
(Total Area as of 1 January 1947, 15,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,580.0	100.0		
Specified Bread Grains				
Winter Wheat	6.1	0.4	5.4	Negligible
Spring Wheat	23.3	1.5	19.1	0.1
Total Wheat	29.4	1.9	24.5	0.1
Winter Rye	143.4	9.1	110.8	0.6
Total Bread Grains	172.8	11.0	135.3	0.3
Specified Feed Grains				
Barley	33.8	2.1	28.4	0.3
Oats	46.9	3.0	39.4	0.2
Total Specified Grains	253.5	16.0	203.1	0.3
Area Seeded				
To All Grains	305.0	19.3		
To Other Crops	171.4	10.8		
Total	476.4	30.1		

Table 59

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Poles'ye Oblast
(Total Area as of 1 January 1947, 21,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,170.0	100.0		
Specified Bread Grains				
Winter Wheat	9.0	0.4	8.3	Negligible
Spring Wheat	9.8	0.4	7.0	Negligible
Total Wheat	18.8	0.8	15.3	Negligible
Winter Rye	103.2	4.8	79.2	0.4
Total Bread Grains	122.0	5.6	94.5	0.2
Specified Feed Grains				
Barley	16.8	0.8	14.8	0.2
Oats	26.5	1.2	23.3	0.1
Total Specified Grains	165.3	7.6	132.6	0.2
Area Seeded				
To All Grains	202.9	9.3		
To Other Crops	91.2	4.2		
Total	294.1	13.5		

Table 60

Region III-B (Deficit): Winter Rye and Oats
Belorussian SSR: Kaliningrad Oblast
(Total Area as of 1 January 1947, 15,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,580.0	100.0		
Specified Bread Grains				
Winter Wheat	25.9	1.6	54.7	0.3
Spring Wheat	3.9	0.2	7.7	Negligible
Total Wheat	29.8	1.8	62.4	0.1
Winter Rye	114.3	7.2	237.8	1.2
Total Bread Grains	144.1	9.1	300.2	0.5
Specified Feed Grains				
Barley	41.7	2.6	89.6	0.9
Oats	57.0	3.6	118.3	0.7
Total Specified Grains	242.8	15.3	508.1	0.6
Area Seeded				
To All Grains	314.7	19.9		
To Other Crops	261.3	16.5		
Total	576.0	36.4		

Table 61

Region III-B (Deficit): Winter Rye and Oats
Baltic: Lithuanian SSR
(Total Area as of 1 January 1946, 80,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	8,090.0	100.0		
Specified Bread Grains				
Winter Wheat	156.7	1.9	206.1	1.3
Spring Wheat	60.6	0.7	45.2	0.2
Total Wheat	217.3	2.6	251.3	0.7
Winter Rye	689.4	8.5	623.7	3.1
Total Bread Grains	906.7	11.2	875.0	1.6
Specified Feed Grains				
Barley	246.0	3.0	274.0	3.0
Oats	413.1	5.1	420.0	2.6
Total Specified Grains	1,565.8	19.3	1,569.0	1.9
Area Seeded				
To All Grains	1,771.6	21.8		
To Other Crops	881.5	10.8		
Total	2,653.1	32.7		

Table 62

Region III-B (Deficit): Winter Rye and Oats
Baltic: Latvian SSR
(Total Area as of 1 January 1946, 63,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	6,360.0	100.0		
Specified Bread Grains				
Winter Wheat	71.1	1.1	113.2	0.7
Spring Wheat	73.5	1.1	78.7	0.4
Total Wheat	144.6	2.2	191.9	0.5
Winter Rye	302.0	4.7	378.7	1.9
Total Bread Grains	446.6	7.0	570.6	1.0
Specified Feed Grains				
Barley	177.9	2.7	220.6	2.4
Oats	347.9	5.4	446.6	2.7
Total Specified Grains	972.4	15.2	1,237.8	1.5
Area Seeded				
To All Grains	1,091.6	17.1		
To Other Crops	870.2	13.6		
Total	1,961.8	30.8		

Table 63

Region III-B (Deficit): Winter Rye and Oats
Baltic: Estonian SSR
(Total Area as of 1 January 1947, 45,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,510.0	100.0		
Specified Bread Grains				
Winter Wheat	28.8	0.6	44.5	0.2
Spring Wheat	42.3	0.9	41.0	0.2
Total Wheat	71.1	1.5	85.5	0.2
Winter Rye	147.8	3.2	188.0	0.9
Total Bread Grains	218.9	4.8	273.5	0.5
Specified Feed Grains				
Barley	87.7	1.9	96.7	1.0
Oats	148.9	3.3	176.5	1.0
Total Specified Grains	455.5	10.0	546.7	0.6
Area Seeded				
To All Grains	544.4	12.0		
To Other Crops	351.8	7.8		
Total	896.2	19.8		

Table 64

Region III-B (Deficit): Winter Rye and Oats
Northwest: Pskov Oblast
(Total Area as of 1 January 1946, 31,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,170.0	100.0		
Specified Bread Grains				
Winter Wheat	2.1	Negligible	1.5	Negligible
Spring Wheat	6.0	0.1	3.7	Negligible
Total Wheat	8.1	0.2	5.2	Negligible
Winter Rye	40.0	1.2	28.5	0.1
Total Bread Grains	48.1	1.5	33.7	Negligible
Specified Feed Grains				
Barley	9.0	0.2	6.4	Negligible
Oats	86.9	2.7	66.9	0.4
Total Specified Grains	144.0	4.5	107.0	0.1
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 65

Region III-B (Deficit): Winter Rye and Oats
Northwest: Novgorod Oblast
(Total Area as of 1 January 1946, 53,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	5,370.0	100.0		
Specified Bread Grains				
Winter Wheat	56.2	1.0	39.5	0.2
Spring Wheat	34.0	0.6	20.4	0.1
Total Wheat	90.2	1.6	59.9	0.1
Winter Rye	173.8	3.2	117.2	0.5
Total Bread Grains	264.0	4.9	177.1	0.3
Specified Feed Grains				
Barley	41.0	0.7	33.2	0.3
Oats	126.4	2.3	93.5	0.5
Total Specified Grains	431.4	8.0	303.8	0.3
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 66

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Kalinin Oblast
(Total Area as of 1 January 1947, 66,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	6,600.0	100.0		
Specified Bread Grains				
Winter Wheat	50.4	0.8	37.7	0.2
Spring Wheat	52.0	0.8	39.0	0.2
Total Wheat	102.4	1.6	76.7	0.2
Winter Rye	279.9	4.2	194.3	1.0
Total Bread Grains	382.3	5.8	271.0	0.5
Specified Feed Grains				
Barley	52.0	0.8	42.1	0.5
Oats	260.0	3.9	213.2	1.3
Total Specified Grains	694.3	10.5	526.3	0.6
Area Seeded				
To All Grains	778.6	11.8		
To Other Crops	1,009.4	15.3		
Total	1,788.0	27.1		

Table 67

Region III-B (Deficit): Winter Rye and Oats
Central European USSR: Velikiye Luki Oblast
(Total Area as of 1 January 1947, 44,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,490.0	100.0		
Specified Bread Grains				
Winter Wheat	31.8	0.7	21.7	0.1
Spring Wheat	34.0	0.8	19.0	0.1
Total Wheat	65.8	1.5	40.7	0.1
Winter Rye	184.2	4.1	120.8	0.6
Total Bread Grains	250.0	5.6	161.5	0.3
Specified Feed Grains				
Barley	38.5	0.9	25.0	0.3
Oats	173.0	3.9	122.8	0.8
Total Specified Grains	461.5	10.3	309.3	0.4
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 68

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Smolensk Oblast
(Total Area as of 1 January 1947, 49,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,900.0	100.0		
Specified Bread Grains				
Winter Wheat	15.1	0.3	12.7	0.1
Spring Wheat	51.5	1.1	44.8	0.2
Total Wheat	66.6	1.4	57.5	0.2
Winter Rye	437.6	8.9	351.0	1.8
Total Bread Grains	504.2	10.3	468.5	0.8
Specified Feed Grains				
Barley	65.8	1.3	54.0	0.6
Oats	347.4	7.1	302.2	1.9
Total Specified Grains	917.4	18.7	764.7	1.0
Area Seeded				
To All Grains	1,009.5	20.6		
To Other Crops	955.7	19.5		
Total	1,965.2	40.1		

Table 69

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Kaluga Oblast
(Total Area as of 1 January 1947, 29,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,980.0	100.0		
Specified Bread Grains				
Winter Wheat	52.6	1.8	47.0	0.3
Spring Wheat	63.0	2.1	47.2	0.3
Total Wheat	115.6	3.9	94.2	0.3
Winter Rye	143.2	4.8	84.3	0.4
Total Bread Grains	258.8	8.7	178.5	0.3
Specified Feed Grains				
Barley	16.1	0.5	10.0	0.1
Oats	135.0	4.5	95.8	0.6
Total Specified Grains	409.9	13.8	284.3	0.4
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 70

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Moscow Oblast
(Total Area as of 1 June 1944, 55,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	5,500.0	100.0		
Specified Bread Grains				
Winter Wheat	79.7	1.4	57.2	0.4
Spring Wheat	26.6	0.4	20.0	0.1
Total Wheat	106.3	1.9	77.2	0.2
Winter Rye	138.3	2.5	97.0	0.5
Total Bread Grains	244.6	4.4	174.2	0.3
Specified Feed Grains				
Barley	2.4	Negligible	1.7	Negligible
Oats	255.7	4.6	217.3	1.4
Total Specified Grains	502.7	9.1	393.2	0.5
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 71

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Tula Oblast
(Total Area as of 1 January 1944, 31,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,190.0	100.0		
Specified Bread Grains				
Winter Wheat	124.8	3.9	137.5	0.9
Spring Wheat	84.0	2.6	48.7	0.3
Total Wheat	208.8	6.5	186.2	0.6
Winter Rye	390.3	12.2	308.3	1.6
Total Bread Grains	599.1	18.7	494.5	0.9
Specified Feed Grains				
Barley	2.7	Negligible	2.2	Negligible
Oats	337.8	10.5	293.9	1.8
Total Specified Grains	939.6	29.4	790.6	1.0
Area Seeded				
To All Grains	1,099.7	34.4		
To Other Crops	578.6	24.0		
Total	1,678.3	52.6		

Table 72

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Ryazan' Oblast
(Total Area as of 1 January 1947, 43,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,390.0	100.0		
Specified Bread Grains				
Winter Wheat	157.1	3.6	189.6	1.2
Spring Wheat	107.4	2.4	98.8	0.6
Total Wheat	264.5	6.0	288.4	0.9
Winter Rye	647.2	14.7	604.5	3.1
Total Bread Grains	911.7	20.7	892.9	1.7
Specified Feed Grains				
Barley	3.7	0.1	3.6	Negligible
Oats	434.1	9.9	382.0	2.4
Total Specified Grains	1,349.5	30.7	1,278.5	1.6
Area Seeded				
To All Grains	1,598.8	36.4		
To Other Crops	675.0	15.3		
Total	2,273.8	51.7		

Table 73

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Vladimir Oblast
(Total Area as of 1 January 1947, 26,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,680.0	100.0		
Specified Bread Grains				
Winter Wheat	54.7	2.0	54.6	0.4
Spring Wheat	52.4	2.0	33.5	0.2
Total Wheat	107.1	4.0	88.1	0.3
Winter Rye	155.8	5.8	106.6	0.5
Total Bread Grains	262.9	9.8	194.7	0.4
Specified Feed Grains				
Barley	4.0	0.1	3.3	Negligible
Oats	153.3	5.7	125.7	0.8
Total Specified Grains	420.2	15.7	323.7	0.4
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 74

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Ivanovo Oblast
(Total Area as of 1 January 1947, 24,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,460.0	100.0		
Specified Bread Grains				
Winter Wheat	25.7	1.0	23.8	0.2
Spring Wheat	14.2	0.6	8.7	Negligible
Total Wheat	39.9	1.6	32.5	0.1
Winter Rye	112.9	4.6	76.3	0.4
Total Bread Grains	152.8	6.2	108.8	0.2
Specified Feed Grains				
Barley	6.0	0.2	4.9	Negligible
Oats	106.0	4.3	81.6	0.5
Total Specified Grains	264.8	10.8	195.3	0.2
Area Seeded				
To All Grains	346.1	14.0		
To Other Crops	484.5	19.6		
Total	830.6	33.7		

Table 75

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Yaroslavl' Oblast
(Total Area as of 1 January 1947, 36,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	3,690.0	100.0		
Specified Bread Grains				
Winter Wheat	40.2	1.1	34.5	0.2
Spring Wheat	59.8	1.6	47.8	0.3
Total Wheat	100.0	2.7	82.3	0.2
Winter Rye	81.5	2.2	68.0	0.3
Total Bread Grains	181.5	4.9	150.3	0.3
Specified Feed Grains				
Barley	4.0	0.1	3.7	Negligible
Oats	98.6	2.7	85.8	0.5
Total Specified Grains	284.1	7.7	239.8	0.3
Area Seeded				
To All Grains	315.2	8.5		
To Other Crops	528.7	14.3		
Total	843.9	22.8		

Table 76

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Kostroma Oblast
(Total Area as of 1 January 1946, 58,000 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	5,800.0	100.0		
Specified Bread Grains				
Winter Wheat	40.0	0.7	34.2	0.2
Spring Wheat	60.4	1.0	32.6	0.2
Total Wheat	100.4	1.7	66.8	0.2
Winter Rye	166.0	2.9	113.8	0.6
Total Bread Grains	266.4	4.6	180.6	0.3
Specified Feed Grains				
Barley	50.7	0.9	38.5	0.4
Oats	260.0	4.5	184.6	1.1
Total Specified Grains	577.1	10.0	403.7	0.5
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 77

Region III-B (Deficit): Winter Rye and Oats
Industrial Concentration B: Gor'kiy Oblast
(Total Area as of 1 January 1947, 75,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	7,540.0	100.0		
Specified Bread Grains				
Winter Wheat	102.4	1.4	101.0	0.6
Spring Wheat	139.9	1.8	86.7	0.5
Total Wheat	242.3	3.2	187.7	0.6
Winter Rye	576.2	7.6	406.6	2.0
Total Bread Grains	818.5	10.8	594.3	1.1
Specified Feed Grains				
Barley	13.1	0.2	10.1	0.1
Oats	445.7	5.9	329.8	2.0
Total Specified Grains	1,277.3	16.9	934.2	1.2
Area Seeded				
To All Grains	1,447.6	19.1		
To Other Crops	608.7	8.0		
Total	2,056.3	27.2		

Table 78

Region III-B (Deficit): Winter Rye and Oats
Central European USSR: Chuvash ASSR
(Total Area as of 1 January 1947, 18,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	1,830.0	100.0		
Specified Bread Grains				
Winter Wheat	24.0	1.3	20.7	0.1
Spring Wheat	61.1	3.3	35.4	0.2
Total Wheat	85.1	4.6	56.1	0.2
Winter Rye	203.9	11.1	165.9	0.8
Total Bread Grains	289.0	15.7	222.0	0.4
Specified Feed Grains				
Barley	8.7	0.5	6.7	0.1
Oats	155.8	8.5	91.9	0.6
Total Specified Grains	453.5	24.8	320.6	0.4
Area Seeded				
To All Grains	527.4	28.8		
To Other Crops	193.4	10.5		
Total	720.8	39.3		

Table 79

Region III-B (Deficit): Winter Rye and Oats
Central European USSR: Mari ASSR
(Total Area as of 1 January 1947, 23,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	2,310.0	100.0		
Specified Bread Grains				
Winter Wheat	6.3	0.3	3.0	Negligible
Spring Wheat	29.8	1.3	17.3	0.1
Total Wheat	36.1	1.6	20.3	0.1
Winter Rye	194.4	8.4	140.1	0.7
Total Bread Grains	230.5	10.0	160.4	0.3
Specified Feed Grains				
Barley	9.9	0.4	7.8	0.1
Oats	133.6	5.8	85.5	0.5
Total Specified Grains	375.0	18.2	253.7	0.3
Area Seeded				
To All Grains	395.2	17.1		
To Other Crops	101.3	4.3		
Total	496.5	21.4		

Table 80

Region III-B (Deficit): Winter Rye and Oats
Central European USSR: Kirov Oblast
(Total Area as of 1 January 1946, 121,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	12,160.0	100.0		
Specified Bread Grains				
Winter Wheat	12.9	0.1	5.1	Negligible
Spring Wheat	119.2	1.0	73.9.	0.4
Total Wheat	132.1	1.1	79.0	0.2
Winter Rye	809.8	6.6	552.1	2.8
Total Bread Grains	941.9	7.7	631.1	1.2
Specified Feed Grains				
Barley	195.4	1.6	138.7	1.5
Oats	679.0	5.6	461.7	2.9
Total Specified Grains	1,816.3	14.9	1,231.5	1.6
Area Seeded				
To All Grains	1,884.0	15.4		
To Other Crops	273.9	2.2		
Total	2,157.9	17.7		

Table 81

Region III-B (Deficit): Winter Rye and Oats
Urals: Udmurt ASSR
(Total Area as of 1 January 1947, 42,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,220.0	100.0		
Specified Bread Grains				
Winter Wheat	2.2	Negligible	0.4	Negligible
Spring Wheat	142.9	3.4	88.6	0.5
Total Wheat	145.1	3.4	89.0	0.3
Winter Rye	408.3	9.7	289.4	1.5
Total Bread Grains	553.4	13.1	378.4	0.7
Specified Feed Grains				
Barley	59.1	1.4	42.6	0.5
Oats	317.7	7.5	216.0	1.3
Total Specified Grains	930.2	22.0	637.0	0.8
Area Seeded				
To All Grains	1,006.8	23.8		
To Other Crops	240.2	5.6		
Total	1,247.0	29.5		

Table 82

Region III-B (Deficit): Winter Rye and Oats
Urals: Molotov Oblast
(Total Area as of 1 January 1947, 170,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	17,080.0	100.0		
Specified Bread Grains				
Winter Wheat	0.1	Negligible	N.A.	N.A.
Spring Wheat	233.0	1.4	207.4	1.2
Total Wheat	233.1	1.4	207.4	0.6
Winter Rye	449.4	2.6	372.1	1.9
Total Bread Grains	682.5	4.0	579.5	1.1
Specified Feed Grains				
Barley	99.7	0.6	100.7	1.1
Oats	444.8	2.6	409.2	2.5
Total Specified Grains	1,227.0	7.2	1,089.4	1.4
Area Seeded				
To All Grains	1,337.3	7.8		
To Other Crops	272.6	1.5		
Total	1,609.9	9.4		

Table 83

Region III-B (Deficit): Winter Rye and Oats
Northwest: Leningrad Oblast
(Total Area as of 1 January 1946, 85,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	8,510.0	100.0		
Specified Bread Grains				
Winter Wheat	19.0	0.2	14.8	Negligible
Spring Wheat	40.0	0.4	25.6	0.1
Total Wheat	59.0	0.6	40.4	0.1
Winter Rye	69.4	0.8	48.4	0.2
Total Bread Grains	128.4	1.5	88.8	0.1
Specified Feed Grains				
Barley	31.1	0.3	24.0	0.2
Oats	50.0	0.5	42.0	0.2
Total Specified Grains	209.5	2.4	154.8	0.1
Area Seeded				
To All Grains	277.4	3.2		
To Other Crops	700.6	8.2		
Total	978.0	11.4		

Table 84

Region III-B (Deficit): Winter Rye and Oats
Northwest: Karelo-Finnish SSR
(Total Area as of 1 January 1946, 178,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	17,850.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	2.9	Negligible	2.0	Negligible
Total Wheat	2.9	Negligible	2.0	Negligible
Winter Rye	13.0	Negligible	9.2	Negligible
Total Bread Grains	15.9	Negligible	11.2	Negligible
Specified Feed Grains				
Barley	6.2	Negligible	5.2	Negligible
Oats	15.8	Negligible	11.4	Negligible
Total Specified Grains	37.9	0.2	27.8	Negligible
Area Seeded				
To All Grains	40.3	0.2		
To Other Crops	18.8	0.1		
Total	59.1	0.3		

Table 85

Region III-B (Deficit): Winter Rye and Oats
Northwest: Arkhangel'sk Oblast
(Total Area as of 1 January 1946, 594,200 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	59,420.0	100.0		
Specified Bread Grains				
Winter Wheat	4.8	Negligible	3.6	Negligible
Spring Wheat	36.2	Negligible	25.0	0.1
Total Wheat	41.0	Negligible	28.6	Negligible
Winter Rye	96.1	0.1	64.1	0.3
Total Bread Grains	137.1	0.2	92.7	0.1
Specified Feed Grains				
Barley	45.6	Negligible	42.0	0.4
Oats	96.2	0.1	63.0	0.3
Total Specified Grains	278.9	0.4	197.7	0.2
Area Seeded				
To All Grains	291.8	0.4		
To Other Crops	70.5	0.1		
Total	362.3	0.6		

Table 86

Region III-B (Deficit): Winter Rye and Oats
Northern European USSR: Vologdsk Oblast
(Total Area as of 1 January 1947, 147,400 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	14,740.0	100.0		
Specified Bread Grains				
Winter Wheat	13.3	Negligible	10.1	Negligible
Spring Wheat	104.2	0.7	71.9	0.4
Total Wheat	117.5	0.7	82.0	0.2
Winter Rye	250.2	1.6	179.6	0.9
Total Bread Grains	367.7	2.4	261.6	0.4
Specified Feed Grains				
Barley	106.0	0.7	86.9	0.9
Oats	242.8	1.6	182.1	1.1
Total Specified Grains	716.5	4.8	530.6	0.6
Area Seeded				
To All Grains	756.3	5.1		
To Other Crops	293.3	1.9		
Total	1,049.6	7.1		

Table 87

Region III-B (Deficit): Winter Rye and Oats
Northern European USSR: Komi ASSR
(Total Area as of 1 January 1946, 404,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	40,460.0	100.0		
Specified Bread Grains				
Winter Wheat	0.3	Negligible	0.2	Negligible
Spring Wheat	3.8	Negligible	2.6	Negligible
Total Wheat	4.1	Negligible	2.8	Negligible
Winter Rye	18.8	Negligible	12.5	Negligible
Total Bread Grains	22.9	Negligible	15.3	Negligible
Specified Feed Grains				
Barley	21.4	Negligible	19.7	0.2
Oats	12.3	Negligible	8.4	Negligible
Total Specified Grains	56.6	0.1	43.3	Negligible
Area Seeded				
To All Grains	58.3	0.1		
To Other Crops	22.8	Negligible		
Total	81.1	0.2		

Table 88

Region IV (Surplus): Spring Wheat and Oats
Urals: Sverdlovsk Oblast
(Total Area as of 1 January 1946, 193,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	19,310.0	100.0		
Specified Bread Grains				
Winter Wheat	2.2	Negligible	1.0	Negligible
Spring Wheat	299.8	1.6	204.5	1.1
Total Wheat	302.0	1.6	205.5	0.6
Winter Rye	210.0	1.1	171.6	0.9
Total Bread Grains	512.0	2.7	377.1	0.7
Specified Feed Grains				
Barley	52.8	0.3	53.3	0.6
Oats	278.2	1.4	255.9	1.6
Total Specified Grains	843.0	4.4	686.3	0.9
Area Seeded				
To All Grains	908.8	4.7		
To Other Crops	182.7	0.9		
Total	1,091.5	5.6		

Table 89

Region IV (Surplus): Spring Wheat and Oats
Urals: Chelyabinsk Oblast
(Total Area as of 1 January 1946, 87,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	8,780.0	100.0		
Specified Bread Grains				
Winter Wheat	2.3	Negligible	1.3	Negligible
Spring Wheat	673.4	7.7	417.5	2.3
Total Wheat	675.7	7.7	418.8	3.2
Winter Rye	173.8	2.0	80.1	0.4
Total Bread Grains	849.5	9.7	498.9	0.9
Specified Feed Grains				
Barley	18.0	0.2	10.8	0.1
Oats	270.0	3.1	164.7	1.0
Total Specified Grains	1,137.5	13.0	674.4	0.8
Area Seeded				
To All Grains	1,320.1	15.0		
To Other Crops	333.6	3.7		
Total	1,653.7	18.8		

Table 90

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Kurgan Oblast
(Total Area as of 1 January 1946, 71,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	7,110.0	100.0		
Specified Bread Grains				
Winter Wheat	2.1	Negligible	1.9	Negligible
Spring Wheat	1,010.0	14.2	656.5	3.6
Total Wheat	1,012.1	14.2	658.4	2.0
Winter Rye	237.7	3.3	133.2	0.7
Total Bread Grains	1,249.8	17.5	791.6	1.5
Specified Feed Grains				
Barley	81.7	1.1	48.2	0.5
Oats	405.0	5.7	214.6	1.3
Total Specified Grains	1,736.5	24.3	1,054.4	1.3
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 91

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Tyumen Oblast
(Total Area as of 1 January 1947, 139,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	136,300.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	561.0	0.4	398.3	2.2
Total Wheat	561.0	0.4	398.3	1.2
Winter Rye	97.9	0.1	67.0	0.3
Total Bread Grains	658.9	0.5	465.3	0.9
Specified Feed Grains				
Barley	46.0	Negligible	37.7	0.4
Oats	258.0	0.2	178.0	1.1
Total Specified Grains	962.9	0.7	681.0	0.9
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 92

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Omsk Oblast
(Total Area as of 1 January 1947, 139,300 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	13,930.0	100.0		
Specified Bread Grains				
Winter Wheat	6.9	Negligible	1.4	Negligible
Spring Wheat	842.3	6.0	598.0	3.3
Total Wheat	849.2	6.1	599.4	1.8
Winter Rye	234.7	1.7	156.9	0.8
Total Bread Grains	1,083.9	7.8	756.3	1.4
Specified Feed Grains				
Barley	64.5	0.5	52.9	0.6
Oats	387.0	2.8	267.0	1.7
Total Specified Grains	1,535.4	11.0	1,076.2	1.4
Area Seeded				
To All Grains	1,680.3	12.0		
To Other Crops	518.6	3.7		
Total	2,198.9	15.7		

Table 93

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Novosibirsk Oblast
(Total Area as of 1 January 1947, 178,800 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	17,880.0	100.0		
Specified Bread Grains				
Winter Wheat	18.7	0.1	12.9	0.1
Spring Wheat	1,286.2	7.2	964.6	5.4
Total Wheat	1,304.9	7.3	977.5	2.9
Winter Rye	253.2	1.4	185.6	0.9
Total Bread Grains	1,558.1	8.7	1,163.1	2.2
Specified Feed Grains				
Barley	66.8	0.4	56.1	0.6
Oats	635.0	3.5	533.4	3.3
Total Specified Grains	2,259.9	12.6	1,752.6	2.2
Area Seeded				
To All Grains	2,385.5	13.3		
To Other Crops	443.2	2.4		
Total	2,828.7	15.8		

Table 94

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Kemerovo Oblast
(Total Area as of 1 January 1947, 95,500 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	9,550.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	64.0	0.7	48.0	0.3
Total Wheat	64.0	0.7	48.0	0.1
Winter Rye	90.5	0.9	64.5	0.3
Total Bread Grains	154.5	1.6	112.5	0.2
Specified Feed Grains				
Barley	10.0	0.1	8.4	0.1
Oats	122.0	1.3	102.5	0.6
Total Specified Grains	286.5	3.0	223.4	0.3
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 95

Region IV (Surplus): Spring Wheat and Oats
West Siberia: Altai Kray
(Total Area as of 1 January 1947, 261,600 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	26,160.0	100.0		
Specified Bread Grains				
Winter Wheat	9.3	Negligible	8.9	0.1
Spring Wheat	2,466.2	9.4	1,849.6	10.3
Total Wheat	2,475.5	9.5	1,858.5	5.5
Winter Rye	97.6	0.4	71.3	0.4
Total Bread Grains	2,573.1	9.9	1,929.8	3.6
Specified Feed Grains				
Barley	45.6	0.2	38.3	0.4
Oats	726.1	2.8	609.9	3.8
Total Specified Grains	3,344.8	12.8	2,578.0	3.3
Area Seeded				
To All Grains	3,467.6	13.2		
To Other Crops	475.6	1.8		
Total	3,943.2	15.0		

Table 96

Region IV (Surplus): Spring Wheat and Oats
Kazakh SSR: Kustanay Oblast
(Total Area as of 1 January 1947, 198,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	19,870.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	424.6	2.1	246.3	1.4
Total Wheat	424.6	2.1	246.3	0.7
Winter Rye	37.1	0.2	22.3	0.1
Total Bread Grains	461.7	2.3	268.6	0.5
Specified Feed Grains				
Barley	39.6	0.2	17.0	0.2
Oats	74.1	0.4	36.3	0.2
Total Specified Grains	575.4	2.9	321.9	0.4
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 97

Region IV (Surplus): Spring Wheat and Oats
Kazakh SSR: North Kazakhstan Oblast
(Total Area as of 1 January 1947, 45,700 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	4,570.0	100.0		
Specified Bread Grains				
Winter Wheat	0.4	Negligible	0.3	Negligible
Spring Wheat	532.6	11.7	314.2	1.7
Total Wheat	533.0	11.7	314.5	0.9
Winter Rye	21.1	0.5	13.7	0.1
Total Bread Grains	554.1	12.2	328.2	0.6
Specified Feed Grains				
Barley	53.9	1.2	30.2	0.3
Oats	36.0	0.8	22.0	0.1
Total Specified Grains	644.0	14.1	380.4	0.5
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 98

Region IV (Surplus): Spring Wheat and Oats
Kazakh SSR: Kokchetav Oblast
(Total Area as of 1 January 1947, 74,100 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	7,410.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	236.0	3.1	144.0	0.8
Total Wheat	236.0	3.1	144.0	0.4
Winter Rye				
Total Bread Grains	236.0	3.1	144.0	0.3
Specified Feed Grains				
Barley	4.0	Negligible	2.4	Negligible
Oats	48.0	0.6	29.8	0.1
Total Specified Grains	288.0	3.8	176.2	0.2
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

Table 99

Region IV (Surplus): Spring Wheat and Oats
Kazakh SSR: Pavlodar Oblast
(Total Area as of 1 January 1947, 138,900 Square Kilometers)

	1938 Area Base (Thousand Hectares)	Percentage of Total Area	1938 Production Base (Thousand Metric Tons)	Percentage of 1938 Production Base
Total Area	13,890.0	100.0		
Specified Bread Grains				
Winter Wheat				
Spring Wheat	283.3	2.0	184.1	1.0
Total Wheat	283.3	2.0	184.1	0.5
Winter Rye	1.5	Negligible	1.0	Negligible
Total Bread Grains	284.8	2.0	185.1	0.3
Specified Feed Grains				
Barley	17.7	0.1	11.5	0.1
Oats	62.7	0.4	38.9	0.2
Total Specified Grains	365.2	2.6	235.5	0.3
Area Seeded				
To All Grains	N.A.	N.A.		
To Other Crops	N.A.	N.A.		
Total	N.A.	N.A.		

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