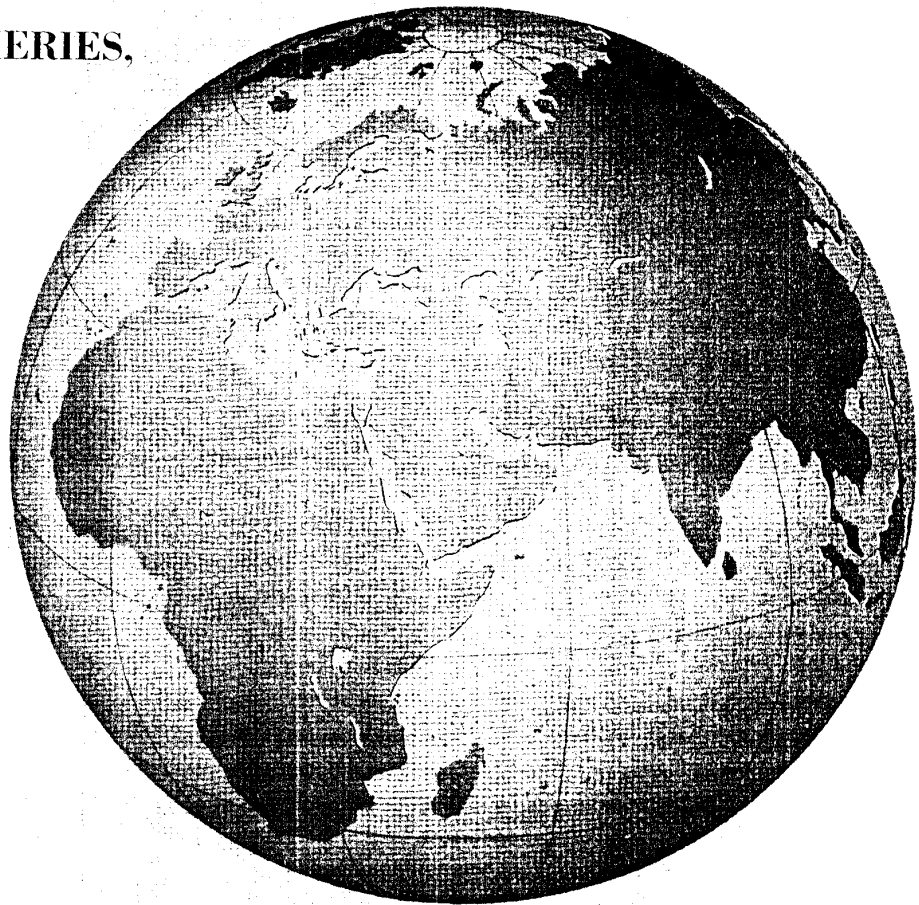


NATIONAL INTELLIGENCE SURVEY

U.S.S.R.

**AGRICULTURE, FISHERIES,
and FORESTRY**

DECEMBER 1968



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*This section was prepared for the NIS by the
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Agriculture, Fisheries, and Forestry

A. General

Although the land area of the Soviet Union encompasses a vast expanse, only a small proportion of it is suitable for cultivation, and the possibilities for agricultural expansion are severely limited by the climate. In the expansion of the cultivated area in the mid-1950's, much of the land plowed-up was of such marginal productivity that it would not be cultivated in the more richly endowed United States.

The total land area of the U.S.S.R. is about 2.2 billion hectares, or about one-sixth of the earth's land area not permanently covered by ice. The U.S.S.R. classifies about 27% of its land as agricultural land, but only about 11% of the total area is actually under cultivation, compared with 38% in France, 34% in West Germany and 20% in the United States. The growing season is relatively short over most of the U.S.S.R. because of its northern location and its continental climate. Most of the country is situated north of 47° latitude (which runs, for example, through Quebec-Duluth-Tacoma), while most of the United States lies south of this line. The crucial disadvantage of the climate of the continental U.S.S.R., however, is the lack of regional coincidence between the distribution of heat and moisture. The maximum of heat tends to be accompanied by a minimum of moisture. Confined by these climatic conditions, most of Soviet agricultural production takes place within a triangular area, having as its base a line running between Leningrad and Odessa, with Irkutsk on Lake Baikal in Eastern Siberia as its apex.

Despite the rapid pace of Soviet industrialization, agriculture remains a major sector of the economy. In 1967 agriculture employed about 35% of the civilian labor force and contributed about one-fourth of the gross national product (GNP). In comparison, agriculture in the United States employed about 6% of the labor force and contributed about 4% of the GNP.

During the period 1954-58, the U.S.S.R. achieved substantial increases in agricultural output by increasing the rate of agricultural investment, by raising government purchase prices for farm products, by instituting a number of organizational measures, and by making some important concessions to the farm population. Much of the increment in investment went into the development of new lands, primarily for the cultivation of wheat. To support expansion of the livestock industry, a program for a large increase in the area planted to corn—made possible to some

extent by the eastward expansion of the wheat area—was inaugurated in 1955.

These measures, aided by better than normal weather conditions, lifted agriculture out of the stagnation Stalin's policies had caused and temporarily provided a better balance between agricultural and industrial development. During the subsequent 5-year period, 1959-63, however, agricultural output again stagnated. With an increasing population the deterioration in the food supply became a source of popular discontent. Soviet prestige suffered a sharp setback in 1963, when crop failure forced the U.S.S.R. to purchase grain from the West, a move that produced a shock to Soviet vanity as well as a drain on Soviet reserves and foreign exchange. In its efforts to find a solution to its agricultural problems, the Soviet leadership adopted in December 1963 a program calling for a vast increase in production of agricultural chemicals by 1970 and for a major expansion in irrigation. Khrushchev's successors since October 1964 have continued to place strong emphasis on the role of chemical fertilizers and land reclamation, although there have been several reductions of goals.

In March 1965, the Brezhnev-Kosygin leadership outlined a far-reaching program for stabilizing output and regaining the high growth rates of the 1954-58 period. They charged that Khrushchev, especially in the latter part of his tenure, established grandiose objectives for agriculture without providing the necessary economic support measures. The new prescription for agriculture included a sharp rate of increase in agricultural investment, higher prices to producers for major agricultural products, lower prices on non-agricultural goods sold to the farms, and an easing of restrictions on private plots and privately owned livestock. The new regime also proposed to reduce the interference of the Party in farming operations. The average annual rate of growth in net agricultural production in 1966-67 was almost one-fourth larger than the average growth rate during 1961-65. The increase was a result of more favorable weather, enlarged supplies of fertilizer and other inputs, and improved financial incentives.

Grain, including pulses, is the most important agricultural commodity in the U.S.S.R. During the 1950's, major efforts—such as the new lands and corn programs—were expended toward increasing grain output through expansion of acreage. In more recent years efforts have been directed, with a fair degree of success, toward increasing yields per hectare

through increased application of mineral fertilizer and other agricultural chemicals, improved varieties, and improvements in agricultural techniques and management. Production during 1963-67 averaged nearly 115 million tons. A record grain crop was harvested in 1966, estimated at 140 million tons (although officially reported at 171 million tons on a bunker-weight basis, which includes trash, immature grain, excess moisture, etc.). This crop was grown on an area of 125 million hectares, or about 60% of the sown area. Another good crop, estimated at 120-125 million tons, was harvested in 1967. Wheat is the most important grain and food crop, accounting for more than one-half of the total grain crop in 1966-67.

Potatoes, the second most important food crop, are also valuable as livestock feed and for industrial purposes. Production of potatoes averaged about 87 million tons during the 1963-67 period; the 1967 production was 95 million tons, very close to the record 96 million tons produced in 1956.

Sugar beets constitute practically the only domestic source of sugar in the U.S.S.R., which is the world's leading producer of sugar beets. Production of beets for processing into sugar averaged almost 72 million tons during 1963-67, an increase of more than 40% over the annual average of the previous 5-year period. A record of almost 87 million tons was harvested in 1967.

Cotton, the leading fiber crop in the U.S.S.R. and the principal irrigated crop, has held a favored position in Soviet agriculture since World War II. In the early 1960's cotton yields per hectare declined slightly but since 1963 have been on an upward trend. Production during the last 3 years has been in the range of 5.7-6.0 million tons (seed, or unginned, basis).

The U.S.S.R. is the world's largest producer of flax fiber, producing about two-thirds of the world's output. During the last three years production has been in the range of 460-480 thousand tons annually.

Sunflower seed is the principal source of edible vegetable oil in the U.S.S.R. The sunflower is well adapted to the climate, especially of the southern regions of European U.S.S.R., and Soviet plant breeders have had good success in developing new varieties with a high oil content. Estimated production of sunflower seeds in 1967 was about 6.1 million tons (the official Soviet figure on a bunker weight basis was 6.6 million tons).

Livestock production contributes about one-half of the value of net agricultural production in the U.S.S.R. Official statistics for meat and milk production are believed to be exaggerated (currently about 10% and 6%, respectively). Estimated production of livestock products in 1967 is as follows: meat, 10 million metric tons; milk, 74.5 million metric tons; eggs, 33.7 billion units; and wool, 395,000 metric tons. Substantial increases in livestock products occurred in the 1954-67 period: meat, 91%; milk 115%; eggs, 109%; and wool, 68%.

Numbers of livestock on 1 January 1968 in millions of animals were as follows: all cattle, 97.1, including cows, 41.6; swine, 50.8; and sheep and goats, 143.9. Recent trends in livestock numbers and Soviet policy statements indicate that the growth in livestock numbers has been slowed down in favor of a policy of increasing efficiency of feed utilization through higher productivity per animal. Western observers have felt that Soviet livestock numbers were excessive in terms of available feed supply, resulting in poor efficiency of livestock production. Trends in livestock numbers and output of livestock products have generally reflected the availability of feed supplies. Despite the progress which has been made, animal husbandry remains one of the most backward sectors of the agricultural economy.

As a means of improving the Soviet diet, especially by providing more high quality protein, the U.S.S.R. has become a major fishing country with the largest and most modern high seas fishing fleet in the world. The catch has more than doubled since 1959. The 1967 catch was 6.5 million tons, 6.7% larger than the 1966 catch. Annual fish consumption is about 13 kilograms per capita, and fish provides an estimated 13% of the animal protein consumed in the U.S.S.R.

The average diet of the Soviet people, while monotonous, apparently provides adequate nutrition. The average daily per capita caloric intake, estimated as 3,180, is about the same as in the United States. Cereals and potatoes, however, constitute 55%-60% of the caloric intake, compared with about 25%-30% in the United States. In the United States animal products account for about one-third of total caloric intake, compared with less than one-fourth in the U.S.S.R. In addition the consumption of livestock products and especially protective foods such as fruits and vegetables is affected by a sharp seasonality. The lack of adequate refrigeration and transport facilities adversely affects the regional distribution and ready availability of perishable foods. The per capita consumption of sugar has increased almost 30% above the 1960 level, as a result of sharp increases in the domestic production of sugar beets and the import of raw cane sugar from Cuba.

Forests cover almost 747,000,000 hectares or one-third of the U.S.S.R.'s total land area. The country has about one-fourth of the world's productive forest land. Forest resources are reportedly so vast that log production could be doubled without reducing the annual growth rate of timber.

The U.S.S.R. produces more timber and lumber than any other country in the world and is on a par with the United States in the production of industrial logs. It is a major wood-exporting country, with annual exports in the period 1964-66 averaging about US\$574 million. The logging industry ranks first in terms of employment among the extractive industries, and uses a considerable portion of the transportation system in the movement of wood products.

Despite enormous timber resources, the U.S.S.R. has been unable to satisfy its combined wood needs for home consumption and export, although it is a net exporter in terms of value. This has been largely because of the unfavorable geographic location of forests in relation to centers of wood consumption. With the depletion of forest resources in the more densely populated regions of the European U.S.S.R., a shift began in the 1950's of logging operations to the remote and less productive forest areas in the Dvina-Vycheda and Pechora River basins of the Northwest, to the Urals, and to the West and East Siberian regions.¹ After the initial disruptions which accompanied the logging shift, industrial wood production increased significantly with most of the increase being accounted for by the new areas. Logging in the remote areas and the geographical separation of logging and milling, increases the cost of timber products and presents the Soviets with the problem of allocating huge investments to shift sawmill capacity to the principal logging areas. Progress in the relocation of sawmill capacity has been steady but slow.

B. Agriculture

1. Physical factors affecting agriculture

With a total land area of nearly 2.23 billion hectares, the U.S.S.R. has an estimated arable area of only 0.24 billion hectares. In 1967 some 206.9 million hectares were actually sown for crop production. Although this tillable area exceeds that of the United States, the overall productive capabilities per hectare are considerably lower.

The prime area of Soviet agriculture may be described as a transition zone between the areas which are either too cold or too dry. This zone resembles an elongated triangle formed by Leningrad in the north, Odessa in the south and Irkutsk in the east. Much of the land north of latitude 55° (passing south of Moscow), is tundra waste or dense forest with unproductive soils and short growing seasons. In the arid lands to the south, productive agriculture is generally limited to irrigated oases. Thus, at either physical extreme, efficient agriculture often requires costly reclamation measures.

The great soil zones of the U.S.S.R. are distributed in well-defined geographical zones or belts which reflect the same physical environment so important to agricultural fertility (Figure 2). The most significant of these soil belts is that of the fertile chernozem (black) soils, on which modern Soviet agriculture has largely been developed. Outside, but immediately adjacent to the regions of chernozem soils are secondary agricultural regions. To the north and northwest, podzolic and gray-brown podzolic soils provide a large, but less productive, agricultural land base. Much of

¹ Certain regional designations used in this Section—i.e., Northwest, North Caucasus, Central, etc., refer to the agricultural regions designated on the map, Figure 1.

the farmland is swampy and requires extensive drainage prior to cropping. Low temperatures limit the variety of crops that can be grown in this zone. The soils are relatively shallow and infertile. In the south the chestnut and desert soils of the arid zone are utilized for important industrial crops as well as general field crops. Crop production in the arid zone, however, is largely based upon irrigation which is absolutely necessary in the true deserts and which insures reliable harvests in the less arid areas.

No aspect of the climate is so well known as the long cold winter, but even in the far north the short days of winter have their counterpart in the long hours of daylight during the short fairly warm summer. The use of plant varieties and farm practices especially adapted to climate and topography has made possible a limited extension of agriculture into the far north.

Even in the southern U.S.S.R., the average growing season is comparatively short. Kharkov (50°N.), in the northeastern Ukraine, has 150 days, or about the same as on the Minnesota-Iowa border. As far south as Krasnodar (45°N.) an average of 190 days are frost-free, comparable with Omaha, Nebraska. In Moscow a frost-free season of 130 days corresponds to parts of North Dakota. Beyond the Urals the growing season is still shorter, with a range of 95 to 125 days that is comparable to the prairie provinces of Canada.

In the better agricultural lands of the Soviet Union, moisture deficiency limits agricultural production more than does the short growing season. In the central and western parts of the country, the mean annual precipitation ranges from 20 to 25 inches. Precipitation decreases southward and eastward and is lowest in the desert steppes which extend from the lower Volga east across the southern part of Kazakh S.S.R. and south into Soviet Central Asia (Figure 2).

The seasonality of precipitation in the arid zones of the southeast is unfavorable to crop production. These areas are characterized by an autumn or winter maximum as opposed to a summer maximum in most of the country. In the northern part of European U.S.S.R. the highest monthly rainfall occurs in August, while in the central areas July receives more. This rainfall pattern is poorly adapted to the production of small grains and in some years may be detrimental to the tuber harvest.

In the semiarid zones June rains can be beneficial, but their poor dependability is a problem. A good harvest of small grains in these lands, when dry-farming techniques are used, can be expected only once in 5 or 6 years. Even in the years of seemingly adequate rainfall, the torrential nature of the precipitation may greatly decrease its value for crop production.

Because of lower temperatures and the resultant decrease in evaporation rates for northern European U.S.S.R., the relatively low precipitation is generally

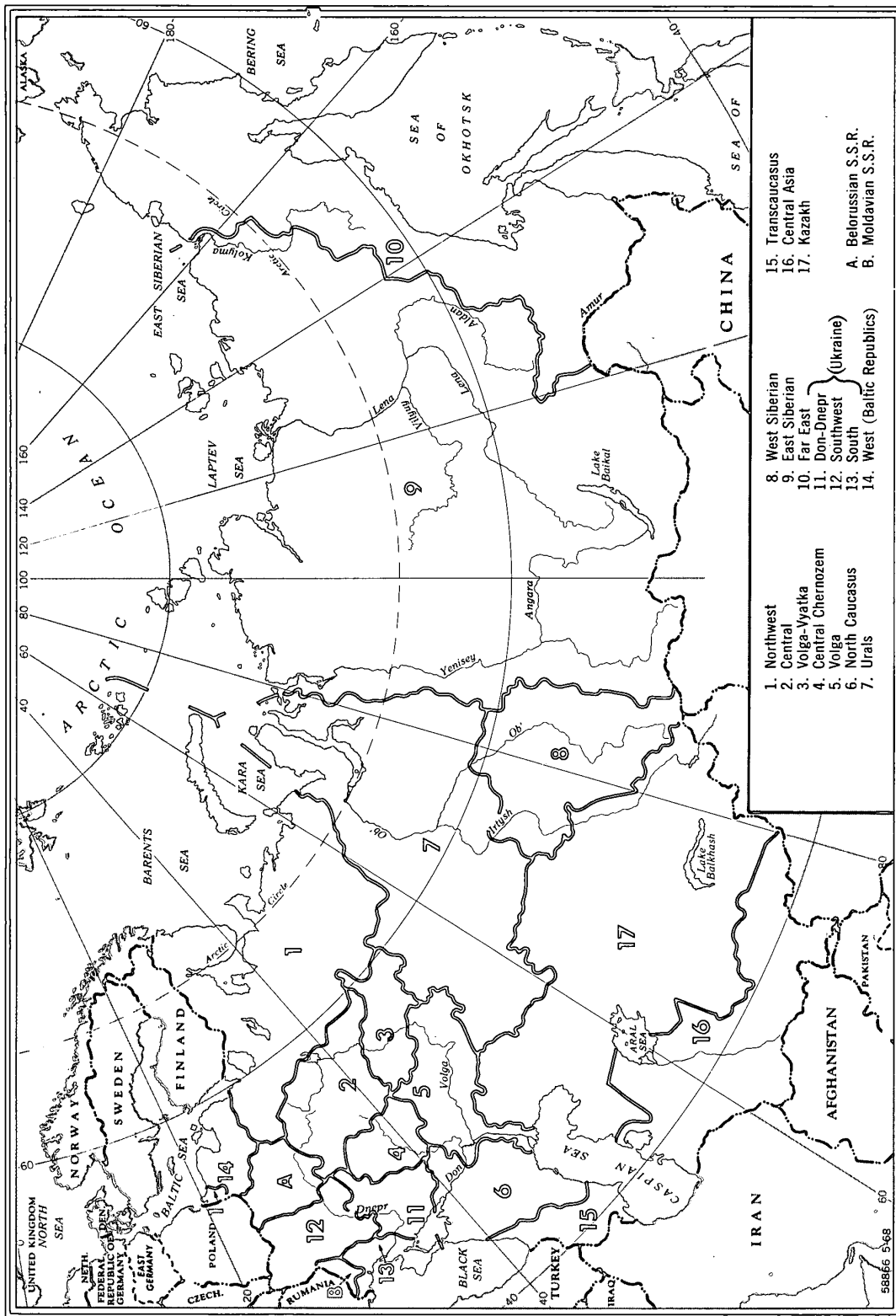


FIGURE 1. AGRICULTURAL REGIONS

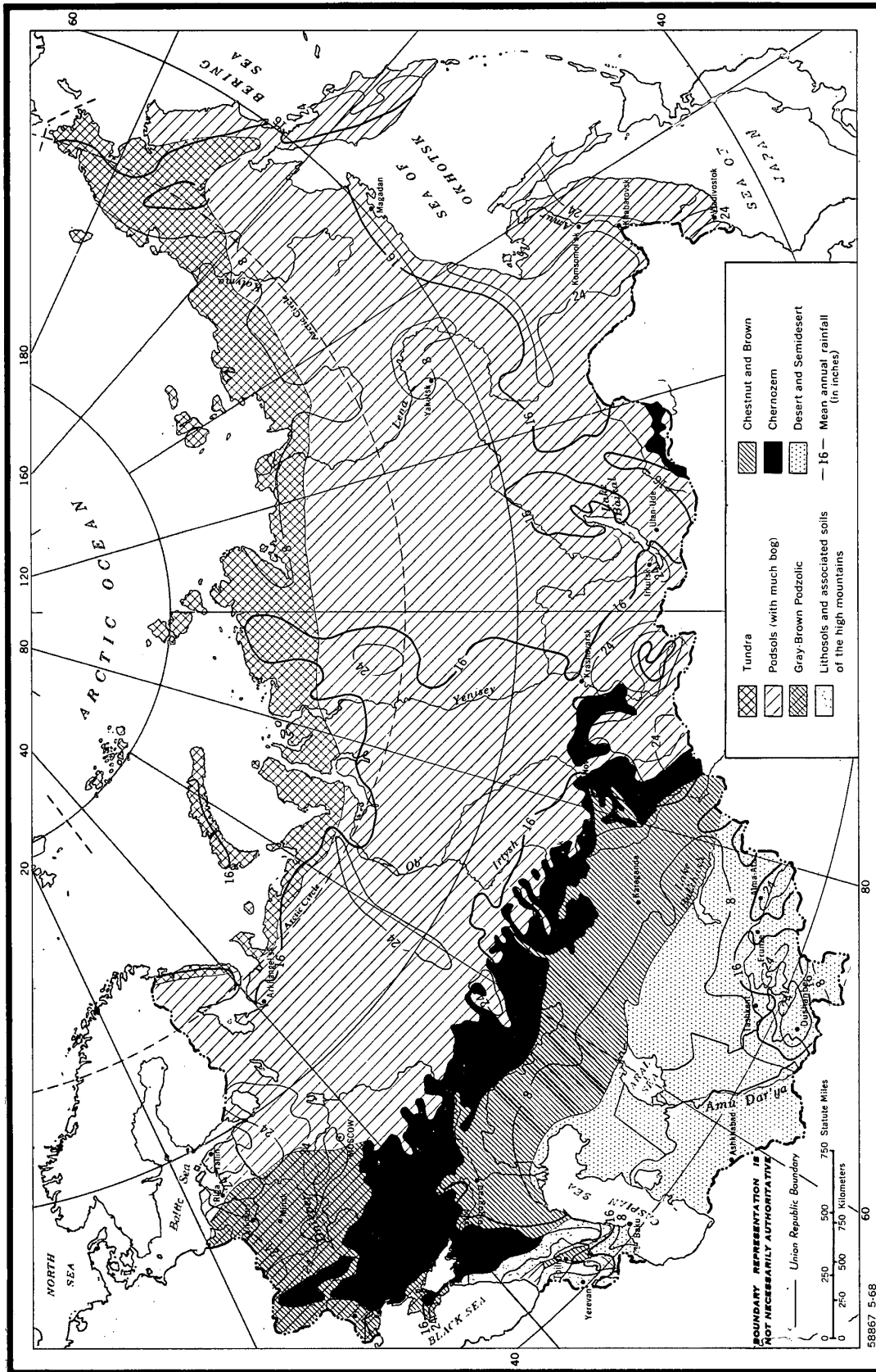


FIGURE 2. AVERAGE ANNUAL PRECIPITATION AND MAJOR SOIL TYPES

adequate for crop production. In general these regions suffer more from poor seasonal distribution of precipitation and poor drainage than from deficiency of moisture. In the south and southeast, however, light rainfall is accompanied by high summer temperature, and moisture deficiency is the limiting factor in crop production.

2. Land utilization

Of the total 2,227.2 million hectare land area of the U.S.S.R., arable lands in 1966 comprised only 235.7 million hectares of which 206.8 million hectares were sown to crops in that year, more than 17 million were fallow in rotation, and 4.7 million were in orchards and vineyards. The remaining area of approximately 6.9 million hectares was primarily unused agricultural land (Figure 3).

Natural grasslands in the principal agricultural areas covered 373.2 million hectares. This includes 324.1 million hectares of land used for pasturing grazing animals, except reindeer, and 49.1 million hectares of natural haylands. As a unit these forage lands tend to be poorly utilized. Reindeer pasture, which includes 358.2 million hectares, is considered separately because of extremely low utility, mainly due to the high latitudes in which it is located.

The forest-covered lands comprise 747 million hectares, or one-third of the total land area. Other lands—comprising 513.1 million hectares or 23% of the Soviet landmass—include agriculturally unproductive sections such as deserts, swamps, and barren mountains, as well as urban areas, transportation networks, and small inland waters.

There are considerable variations among regions in the proportion of arable land to total area. In the Ukrainian S.S.R., with its large tracts of chernozem soils, 56.2% of the total area was sown in 1965. Altogether the European part of the U.S.S.R., which consists roughly of the area to the west of the Ural

Mountains, accounted for 68.7% of the total sown area. Conversely, in Kazakh S.S.R., with its vast stretches of sparse pasture, barren wastes, and desert sand, only 11% was seeded, and in East Siberia only 1.8% was seeded.

Although the total land area of the U.S.S.R. is impressive, the reserve of suitable agricultural lands is small. A relatively rapid expansion of the cultivated area was achieved during 1954-56 by plowing up pastures and meadowlands in the more favorably located regions and by plowing up grasslands in the semiarid steppes in the eastern regions under the New Lands program. This has leveled off in recent years, and the emphasis has shifted from physical expansion of cultivated area to intensified use of lands already producing crops. Irrigation of arid lands in the south and southeast and drainage of bogs in the north and northwest continue to contribute to expansion. Most of the expansion between 1958 and 1963 in the area sown to crops was due to a reduction in the amount of land sown to cultivated grass and legumes and land left in clean fallow. These lands were sown to more intensive crops such as corn, peas, beans, and sugar beets. Beginning in 1964 this trend was reversed, due primarily to recognition of the value of clean fallow in maintaining the productivity of land in areas of low and unstable precipitation.

3. Farm system

a. SECTORS — Soviet agriculture is divided into three principal sectors: the state sector, the collectivized sector, and the private sector. Since all land in the U.S.S.R. is nationally owned, the basic differences between these sectors lie in the ownership of other productive assets, in the formation of capital, in the means of labor payment, and in the marketing of agricultural production.

In the state sector—which includes state farms (*sovkhozes*), the subsidiary farms of nonagricultural state enterprises, and agricultural research facilities—all productive assets are nationally owned. By far the most important source of capital investment in the state sector is the state budget, supplemented by smaller funds originating in the retained profits of the enterprise. An experiment in self-support, begun in 1967 on a few state farms, is described under B,3,a, Developments in the Socialized Sector. State farm workers are paid for completing planned daily work with little regard to quantity or quality of the end product. State farms market their products almost entirely through the government purchasing and distribution networks and rarely dispose of commodities on the so-called collective farm market—a free market at the retail level. State farms are generally regarded in Communist ideology as the highest form of agricultural enterprise. In 1966, the state sector (including 12,200 state farms, plus other state enterprises) contained about 47% of the total sown area

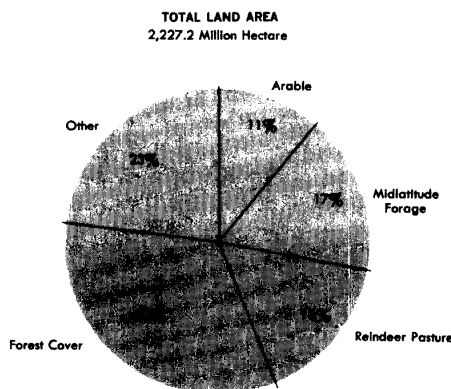


FIGURE 3. LAND UTILIZATION, 1966

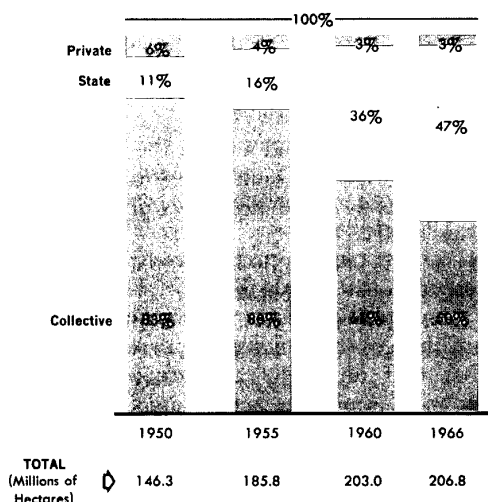


FIGURE 4. DISTRIBUTION OF SOWN AREA, BY SECTORS

(Figure 4). In addition to producing a significant portion of total agricultural output, state farms are regarded by the regime as models for other agricultural enterprises, such as the collective farms, to emulate in adopting advanced production methods. Their production efficiency, however, generally has been lower and their overall cost of production higher than collective farms. Because the state farms function as part of the state budget, the prices paid by the state for their agricultural products have been lower than those paid to the collective farms. Direct subsidies from the state budget, however, more than compensate for this difference in prices.

The collectivized sector is composed entirely of collective farms (*kolkhozes*) which in 1966 numbered 37,100 and accounted for 50% of the total sown area. In these collective farms all productive assets, except the land, are nominally owned collectively by the members. These collective productive assets are commonly referred to as the "indivisible fund." Collective farm investment is financed almost entirely from retained profits and long-term state loans and relies only to a small degree upon grants from the state budget. Traditionally, collective farm workers have shared as residual claimants in the collective farm income, net of allocations to the indivisible fund and other financial obligations, but during the past several years a system of guaranteed minimum monthly wages has been introduced in the majority of collective farms.

Thus, in contrast to state farms, the level of both investment and wages on the collective farms depends to a major degree upon the level of production. Collective farm output, in excess of that procured by the state and consumed on the farm, is sold primarily on the collective farm market. Collective farm market prices, although free of controls,

are influenced by state procurement policies and the government's control of urban wages and retail prices charged in state stores.

The individual farmers in the private sector—the majority of whom also work as collective farm members, state farm or other agricultural workers, industrial workers, or in other occupations—own their own livestock and simple agricultural implements. Private sector agriculture consists of small plots of land, either as personal plots adjacent to a family's village dwelling or other small plots of land assigned to their personal use from collective farm or other agricultural lands. The greater proportion of the output of the private sector, if not used as a resource in further production, is consumed directly in the family household. Since the abolition in 1958 of procurement quotas levied against the personal plots in the private sector, the market output has been sold largely on the collective farm market.

From the earliest days of socialized farming, the collective farm has been the dominant form of organization in Soviet agriculture. State farms have become increasingly important since the death of Stalin, although the process of converting collective farms to state farms has slowed substantially in the past several years. The intensively cultivated private plots, despite their small size, yield a large share of the total output of potatoes, vegetables, and fruits. The proportion of livestock products from the private sector is also high, but livestock feed is provided mainly by the socialized sector (see B,3,c, Importance of the Private Sector).

b. DEVELOPMENTS IN THE SOCIALIZED SECTOR—Developments under the Brezhnev-Kosygin leadership have tended to narrow, or portend the narrowing of, differences between the two major organizational forms of Soviet socialized agriculture—the collective and the state farms. These developments have affected the systems of labor payment, capital formation, and marketing of agricultural production. Guaranteed minimum monthly labor payments to collective farmers were recommended, starting in July 1966. Depending on production results, additional payments are made at the end of the year. Under this system, guaranteed minimum labor payments are a primary claimant on the farm's income. All labor payments previously had been a residual claimant on the majority of farms, and the amount of money and other income available for distribution to farmers was not determined until the year's results were known. By the latter part of 1967 the majority of collective farms reportedly were making guaranteed monthly payments to their members.

An experiment was initiated in July 1967 to determine the feasibility of operating state farms on a cost accounting, or self-supporting, basis, instead of financing them primarily from the state budget. About 400 state farms, or 3% of the total number in the country, were placed on the experiment. These

farms were to reinvest profits and were given more freedom of choice in the allocation of resources. Commodity prices were raised to the level of those paid to collective farms, to enable more profitable operations. An incentive fund was established out of profits in order to relate labor payments to production results achieved by a farm. A decision subsequently was made to transfer an additional 400 farms to a self-supporting basis in the second quarter of 1968.

Some easing of marketing restrictions was granted to state farms in 1967. Initially, the farms on the experiment were given the right to market freely any perishable produce refused by the designated state procurement agency. Subsequently, this right was extended to all state farms and other state agricultural enterprises.

Some experimentation with land tenure policies has occurred in recent years, although there has been little indication of a reversal to individual private holdings (other than the small subsidiary private plots now held by collective farmers and others). Most experimentation has involved attempts to optimally relate a work team to a given unit of land for at least the length of a rotation period so as to create some feeling of direct responsibility for land management and production results and at the same time maintain work teams of adequate size to use efficiently their assigned, highly-mechanized equipment parks. For example, in Volgograd Oblast, these so-called mechanized teams, or "links," typically include about 10 machine operators and work about 2,000 hectares of land.

C. IMPORTANCE OF THE PRIVATE SECTOR — The small private garden plots and privately held livestock are one of the last remnants of legal private enterprises in the U.S.S.R. These plots, which have always been ideologically unpalatable in the Soviet system, have been tolerated for pragmatic reasons. The intensively cultivated plots, which occupied only 3% of the total sown area in 1966, and the private livestock contribute a disproportionately large share of the total amount of many important food items. The following tabulation indicates the share of the private sector in the production of selected products, in percent of the total:

	1940	1953	1961	1966
Potatoes	65	72	64	64
Vegetables	48	48	45	43
Meat	72	52	45	42
Milk	77	67	46	40
Eggs	94	84	78	66

The tendency of private output to decline in relative importance has been a function of growth of output in the socialized sector rather than a marked decline in the output of the private sector. The plots provide a means for individual Soviet citizens to provide themselves with many food items that would not otherwise be available, and furnish farmers, particularly collective farmers, with a considerable share

of their money income. Much of the feed consumed by the privately owned livestock comes from the socialized sector, partly as wages in kind. Privately owned livestock also are permitted to graze on unused state or collective farm land.

The private plots compete with the socialized sector for the labor time of the farmers, and this competition has been of considerable concern to Soviet officials. Officials recognize, however, that the existence of private plots permits a better utilization of labor resources that otherwise would not be fully employed (the aged, adolescents, and women). The attitude of the government toward these private plots prescribes that ultimately as socialized agriculture becomes more profitable and is able to supply the entire population with food, the private plots should decrease in importance and eventually die out.

After Stalin's death the regime adopted a rather lenient attitude toward the private sector. The response to these concessions was an increase in private holdings of livestock—increases both in absolute numbers and as a share of total livestock holdings. In 1956, however, new legislation was passed aimed at reducing the size of the plots and the private livestock holdings, both of collective and state farm members and urban workers. The drive against the private sector reached a high point in 1958-60. Sown area in private plots in 1960 was 7% below the 1959 level and private holdings of cattle and hogs dropped by 14% and 9%, respectively. In 1963 additional restrictions were placed on private livestock holdings, and the penalties for feeding bread to privately owned animals were made more severe.

After Khrushchev's ouster in late 1964, one of the first actions of the Brezhnev-Kosygin leadership was to lift "the unfounded limitations" on the private plot sector. Decrees were issued in several republics directing collective farms and local authorities to ease restrictions on plot size and private livestock holdings and help the peasants buy livestock and feed. The desirable scope of the private sector continues to be an important but controversial point of agricultural policy. During 1967 the Soviet press was unusually quiet on the subject of private agricultural production, but a January 1968 Pravda article reaffirmed much of the party line established after Khrushchev's ouster. The article stated

"Subsidiary farming under present conditions supplements the income from the communal economy. Private subsidiary farming, within statutory norms, fulfills also an important function—it assists the better utilization of labor resources of all family members (the aged, adolescents, women); it also facilitates the work of state retail trade in providing the population with foodstuffs."

Present Soviet policy thus appears to be to encourage maximum private plot output within the current re-defined limits on private plot size and livestock holdings. Local party authorities, government offi-

cials, and collective and state farm managers are not everywhere in agreement with official policy, however, and there is considerable evidence that extralegal restrictions have been applied to private plot farming in some regions of the country.

4. Administration and policy

a. ADMINISTRATION OF AGRICULTURE — Major organizational changes in Soviet agriculture during the decade following Stalin's death gradually shifted the administration of agriculture out of the governmental bureaucracy (the managerial-specialist class) and into the more politically reliable and responsive Party channels. On the one hand, the dominance of the Party in agricultural administration led to a waste of resources and a stifling of local initiative. The majority of the Party officials knew little of what could be accomplished on the farm, and the chief measure of their success was their ability to meet unrealistic pledges for the delivery of farm produce to the state. In many instances these officials advanced their careers by meeting pledges at any cost—by misusing farm resources at their disposal or by falsifying records and achievements.

On the other hand, a responsive, militant Party apparatus probably was needed to overcome the inertia of the conservative governmental bureaucracy in implementing such bold measures as the New Lands program, which, although wasteful, provided a vital stimulant to Soviet agriculture. This Party-dominated system of agricultural administration, however, was not particularly suited to the needs of some of the subsequent programs such as the fertilizer and land reclamation programs which are more complicated and require a higher level of technical and managerial skills.

The most radical change in agricultural organization since the collectivization drive of the 1930's was the abolition of the Machine Tractor Stations (MTS) in the spring of 1958. Almost from the beginning of collectivization, the MTS had controlled nearly all the machinery used on the collective farms and had used this monopoly to control the activities of the collective farms. Under the reorganization the MTS were stripped of their power and relegated to the status of repair and supply depots, and the supervision of the *kolkhozes* passed to agricultural inspectorates under the rayon executive committees. In February 1961 the remaining functions of the old MTS were gathered into an All-Union Farm Machinery Association which continues to serve as a middleman between farms and factories in distributing agricultural capital goods, operates machinery repair workshops and inspects the use of farm machinery on farms.

The elimination of the MTS precipitated a reform in the system of state procurement of agricultural products. Payment-in-kind by the *kolkhozes* to the MTS came to an end. The old custom of paying low

prices for compulsory deliveries and much higher prices for additional deliveries was replaced by a single procurement price for both compulsory and above quota deliveries. These unified prices, which were differentiated regionally for variations in costs of production, were considerably higher than the former compulsory delivery prices. Further revisions in the procurement procedure were made in 1965. At that time delivery quotas for farm commodities were fixed in advance for the years 1966 to 1970. These planned deliveries are paid for by a fixed single price, still differentiated regionally. Farms are encouraged to deliver commodities above the set quota, in fact the state actually plans the above quota deliveries. Above plan deliveries are paid for with bonuses (a fixed portion of the basic purchase price) in addition to the basic price, much like the two-price system abolished with the MTS's.

In 1961 the rayon agricultural inspectorates were abolished, and the Ministry of Agriculture was reduced to a body supervising agricultural research and education; its functions were scattered among several government organizations leaving no clear delineation of primary administrative responsibility. This reorganization weakened the position of the governmental bureaucracy and enhanced the position of the Party in agricultural administration. A Party Plenum in March 1962 endorsed another reorganization which clarified responsibility and formalized the dominant position of the Party in the administration of agriculture. Territorial production directorates were set up to administer agricultural production through direct contact of its agents with farms. A Communist Party organizer of the republic or oblast Party Committee, which was installed in each territorial production directorate, became the most powerful figure in the directorate with a position analogous to that of the former MTS political section heads, with authority over all local agricultural matters. Another Party Plenum in November 1962 again altered arrangements somewhat. The Party committee in each oblast was replaced by two committees, one to guide industrial production and the other to guide agricultural production. A bureau for agriculture and a bureau for industry and construction also were established in each republic Party committee.

Khrushchev's successors removed the agricultural-industrial split in the local level Party organizations in November 1964. Then, early in 1965, V. V. Matskevitch was reappointed to head a revitalized Ministry of Agriculture. Although certain key functions, such as planning, procurement, and agricultural supply, remained outside the Ministry, the reorganization strengthened centralized control over state and collective farms. First Secretary Brezhnev, in his speech at the March 1965 Plenum of the CPSU Central Committee outlining the regime's new agricultural program, commented on the "great deficiencies and mistakes in agricultural management in recent years."

He urged that specialists and farm managers be given a greater role in agriculture with less outside interference in day-to-day affairs.

b. MAJOR PROGRAMS, 1953-64 — Numerous measures have been applied to agriculture, with varying degrees of success, since the death of Stalin in 1953 in an effort to make it more responsive to the needs of the growing economy. The New Lands program, which was largely implemented during 1954-56, resulted in a one-fourth expansion in the sown acreage of the U.S.S.R. and significantly altered land use patterns. Under this program, about 42 million hectares of virgin and long-fallow land were brought under cultivation, largely in West Siberia and North Kazakhstan. The latitude, soils, and climate of much of the new lands area are somewhat analogous to those of the prairie provinces of Canada—one of the greatest wheat-producing areas of the world. The average annual rainfall in the new lands ranges from about 9-10 inches on their southern boundary in Kazakhstan to about 16 inches on their northern edge in Western Siberia. Because of the extreme annual fluctuations in the amount and distribution of rainfall, the size of the harvest varies sharply in the new lands, especially in Kazakhstan. Nevertheless, the new lands have provided a hedge against national crop failure because poor crops in the traditional grain area of the European U.S.S.R. frequently are offset by good ones in the new lands and vice versa.

Production of wheat in the new lands relieved the pressure on the traditional agricultural areas for production of food grains and permitted the expansion of the area planted to corn and other feed crops as well as some technical crops in the more humid areas of the European U.S.S.R. In January 1955 Khrushchev proposed to increase the area planted to corn from 4.3 million hectares in 1954 to at least 28 million hectares in 1960. The program was rapidly implemented, and by 1962 the acreage of corn reached a peak of 37 million hectares (including corn for grain, silage, and green feed). Much of this expansion took place in areas where corn had never been grown and where it was impossible for commonly grown types of corn to mature as grain. Khrushchev therefore emphasized production of corn silage and green feed as well as corn for grain. Because of the inexperience of Soviet farmers in growing corn, the lack of locally adapted hybrids, equipment shortages, and variable weather, the size of the corn crop fluctuated greatly from year to year—from a low of less than 5 million tons of mature grain in 1957 to a high of 17 million tons in 1961. In spite of these sharp fluctuations in the size of the crop, the corn program contributed considerably to the feed supply and to increases in the output of livestock products. In the fall of 1961, when the push for corn was near its peak, Khrushchev introduced a "plow-up" program calling for a drastic reduction of the acreage under

grasses and oats and virtual elimination of clean fallowing² in order to increase the acreage planted to cultivated crops such as corn, peas, field beans and sugar beets. In 1961, 64 million hectares, or almost 30% of the cultivated area, was in sown grass, clean fallow and oats, but in 1963 this area dropped by 22 million hectares. After Khrushchev's removal from office his successors repudiated this program. In the March 1965 Plenum of the Central Committee several speakers condemned the plow-up program as damaging and disrupting to livestock raising because fodder supplies were depleted both by the reduction in perennial grasses and by lower crop yields resulting from disruption of crop rotations. Corn also has now lost its special status as queen of the fields with efforts being made to establish it in its proper role where conditions are most suitable for its growth.

In the last year or two of his leadership, Khrushchev began to push hard on several sound, but expensive, remedial programs for agriculture. In 1963 he laid out a very ambitious chemical fertilizer program calling for production to reach 70 to 80 million tons (standard units) in 1970. (Production in 1963 was 19.9 million tons.) In February 1964 plans were also announced calling for an addition of 5.8 million hectares of irrigated land in 1964-70. Khrushchev's successors have continued to place strong emphasis on the role of chemical fertilizers and land reclamation, although the goals have been scaled down.

c. THE BREZHNEV PROGRAM — At the party Plenum in March 1965, Brezhnev announced a new program of economic and administrative measures designed to overcome the stagnation of agriculture since 1958 which was adversely affecting the growth of the economy as a whole. These measures fall into three main categories: 1) an increase in investment; 2) improvement of agricultural management; and 3) improvement of rural incomes and living standards. The Brezhnev program was subsequently translated into more specific goals at the 23rd Party Congress in 1966, when the targets for the Five Year Plan, 1966-70, were announced. Emphasis was placed on the intensification of agriculture. Productivity per hectare is to be raised by greatly increased use of mineral fertilizer and pesticides, expansion of irrigated and drained land, increased mechanization, and improved seed and agrotechniques. Productivity in animal husbandry is to be increased through improvement in the supply and quality of livestock feed and also by feeding synthesized protein (urea), vitamins, and growth stimulants.

The average annual rate of growth in net agricultural production in 1966-67 was almost one-fourth larger than the average growth rate in 1961-65. The increase came about as a result of more favorable

² Land under clean fallowing is not planted and is cultivated only as needed to prevent weeds growing. The practice also permits accumulation of moisture in the soil.

weather, greater supplies of fertilizer and other inputs, and improved financial incentives. The relative successes attained in agriculture during 1966-67, which coincided with increased demands for defense expenditures, have led to a cutback in the original agricultural investment program, however, with the result that the agricultural sector has been somewhat downgraded as a priority recipient in the allocation of resources. Although the proponents of continuing a high priority for agricultural investment appears to have suffered a setback, the issue remains a subject of disagreement and discussion at the highest level of political authority.

Increased supplies of mineral fertilizer are playing a key role in raising Soviet crop yields. Plans call for the delivery of 55 million tons of fertilizer (standard units)³ to the agricultural sector in 1970 or twice as much as in 1965, although some 10%-15% underfulfillment of this goal is likely. Nonetheless, average annual deliveries of fertilizer to agriculture in 1966-67 increased more than three-fourths over the average annual deliveries in 1961-65. Increased applications of lime have supplemented the increased use of mineral fertilizer.

Production of mineral fertilizer has been as follows (in thousands of metric tons):

	STANDARD UNITS	NUTRIENT CONTENT
1963	19,935	4,647
1964	25,562	6,009
1965	31,253	7,389
1966	35,800	8,400
1967	40,100	9,400

Land reclamation—irrigation in areas of inadequate precipitation and drainage of waterlogged lands in areas of stable precipitation—also is scheduled to play an important role in the intensification of agriculture. Brezhnev's two-pronged program for land reclamation represents a more balanced approach to the problem than Khrushchev's efforts, which were overly concentrated on irrigation. Current emphasis on the drainage and development of lands in the areas of stable precipitation, primarily in the non-black soil zone, is obvious recognition of the large potential for increasing agricultural production from these lands. The 1966 Five Year Plan called for the addition of about 9 million hectares of reclaimed land by 1970 (2.5-3.0 million hectares of irrigated land⁴ and 6.0-6.5 million hectares of drained land), but in October 1967 this goal apparently was cut by some 20%-25%. Based on progress through 1967, however, it seems unlikely that even this reduced goal will be met.

³ In converting mineral fertilizers from nutrient content to standard units, the U.S.S.R. uses the following factors: nitrogen 20% N; potassium, 41.6% K₂O; phosphorous, 18.7% P₂O₅; and phosphorite meal, 19% P₂O₅.

⁴ Irrigated land in crops 1965 estimated at about 9 million hectares.

Measures were initiated, starting in 1965, to increase the earnings of farms and of farmworkers, especially collective farmers. This has resulted, as was expected, in some improvement in overall farm management as well as in better economic incentives for individual agricultural workers. Prices on obligatory sales of grains and livestock products to the state were increased, substantial premiums for above-obligatory sales of grain and several other commodities were brought into play, while firm and specific plans were established for several years in advance. Along with this, income taxes as well as prices on machinery and electricity purchased by farms were lowered. At the same time, debts of weak farms were canceled, and some additional land improvement costs were assumed by the state.

Although much of the increased farm income was channeled into investment, some of the increase was used to augment the incomes of individual farm workers. Labor payments to collective farmers reportedly increased by 16% in 1966 and by an additional 6% in 1967. As one important recent innovation, guaranteed minimum monthly payments to collective farmers are being introduced on a current basis, although their total income from communal farming still depends on the farm's aggregate output. Old-age pensions were established for collective farmers in mid-1964. More recently some retail price discrimination in rural areas was eliminated.

5. Production and supply

a. MAJOR CROPS — The U.S.S.R. grows most crops common to the temperate zone, but grains dominate the crop pattern and accounted for 59% of the total sown area in 1967. Fodder crops accounted for 29% of the 1967 total sown area, industrial crops for 7%, and potatoes and other vegetables for 5% (Figure 5).

The sown acreage statistics (Figure 6) include: a) acreages sown to winter crops in the fall for harvest in the subsequent summer, minus the acreage which is found in the spring to have been winter-killed; and b) acreages sown or resown in the spring or early summer. Abandonment of acreages after spring sowing is not reported in Soviet statistics (as in the United States), and, therefore, is not reflected in the acreage figures used here. As a result, sown acreage and harvested acreage are used interchangeably. The total sown acreage for each particular year also includes the acreage under perennial crops, such as clover and alfalfa, which are harvested in the current year, but planted in previous years.

The reliability or accuracy of Soviet agricultural statistics, particularly since 1958, is open to serious question. At the January 1961 Party Plenum and during the succeeding months much publicity was given to widespread statistical falsification or irregularities at the lower administrative levels, including some of

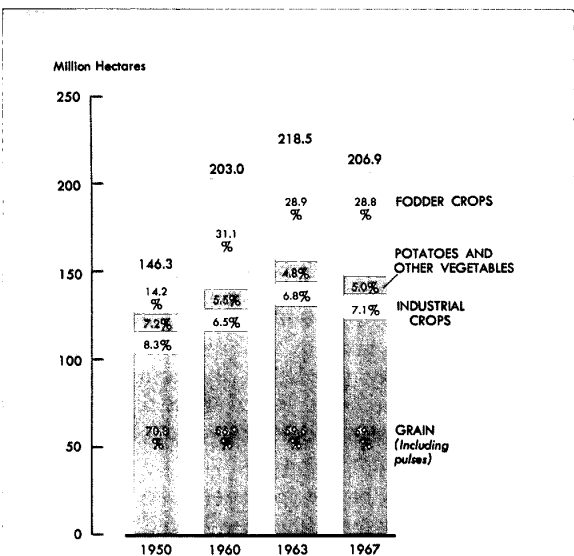


FIGURE 5. TRENDS IN SOWN AREA

FIGURE 6. SOWN AREA, BY CROP CLASSES
(Million hectares)

	1950	1960	1963	1967
Grain (including pulses)	102.9	115.6	130.0	122.2
Industrial crops	12.2	13.1	14.9	14.8
Potatoes and other vegetables	10.5	11.2	10.5	10.3
Fodder crops	20.7	63.1	63.1	59.6
Total	146.3	203.0	218.5	206.9

the republic levels. In general, acreage and livestock herd data are considered to be more accurate than yield and production data for crops and livestock. For example, Soviet grain production figures are given on a bunker weight basis (i.e. as the grain comes from the combine) and hence include trash, immature grain, excess moisture, etc. During the past 8 years official grain figures have been discounted by Western specialists on Soviet agriculture by 15%-25%.

The total sown area in the U.S.S.R. began to recover immediately after World War II and in 1951 exceeded the previous peak (1940) of 151 million hectares. Expansion of sown area continued in the 1950's and was particularly rapid during the height of the new lands program in 1954-56 and during the campaign to plow up grasslands in the early 1960's. After 1963, when the sown area reached a record level of 218.5 million hectares, there was a gradual decline to 206.9 million hectares in 1967.

The expansion of sown area between 1950 and 1963 occurred partly as a result of the plowing up of natural meadows and the so-called long-fallow and idle lands and partly because the amount of area tilled as clean fallow was reduced. Since 1963, the tilled land area has stabilized, the amount of tilled

land devoted to clean fallow has increased, and emphasis has shifted to obtaining higher yields per hectare of sown lands.

Between 1950 and 1963, the sown area increased by almost 50%. Most of this increase was in grain crops and forage crops area, which increased by about 25% and 200% respectively; the area sown to industrial crops increased only slightly during this period, and the area of potatoes and other vegetables did not change. Since 1963 only relatively minor shifts have occurred in the general cropping pattern.

The production of grains and pulses, which occupy about three-fifths of the sown area, varies considerably from year to year, largely as a result of weather (Figure 7). Wheat and rye, the principal food grains (bread grains), accounted for 65% of the area in grain crops and pulses in 1967 as compared with 60.4% in 1950. Of the principal feed grains, barley occupied 15.6% of the acreage sown to all grain and pulses in 1967; corn harvested as mature grain occupied 2.9%; oats 7.1%; and pulses 4.5%.

In 1966, grain production in the U.S.S.R. was estimated at approximately 140 million metric tons, from a sown area of about 125 million hectares. (The Soviet claim for this record harvest was 171.2 million metric tons.) The previous record grain crop was an estimated 120 million metric tons (Soviet claim of 152.1 million metric tons) in 1964 from a slightly larger area of 133 million hectares.

Very little information is published on the utilization of grain in the Soviet Union. No data on carry-over or stocks are available. Because of the rigorous system of government procurement of agricultural products, stocks are held predominately by the central government. Grain, especially, has been stockpiled, but statistics on stocks are closely guarded secrets. A period of relative stagnation in grain production after the bumper 1958 harvest, culminating in the very poor crop in 1963, probably forced a serious depletion of grain reserves. The severe drought in 1963 and again in 1965 necessitated the importation of about \$1.5 billion worth of grain. Good grain crops in 1966 and 1967, however, probably permitted substantial replenishment of the grain reserves.

FIGURE 7. GRAINS AND PULSES: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950	102.9	7.9	81
1955	123.5	8.4	104
1960	115.6	8.0	93
1963	130.0	6.2	92
1964	133.3	8.5	120
1965	128.0	7.8	100
1966	124.8	11.2	140
1967	122.2	9.9	122

FIGURE 8. WHEAT: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	38.5	8.1	31
1955.....	60.5	7.8	47
1960.....	60.4	7.6	46
1963.....	64.6	7.1	40
1964.....	67.9	6.2	58
1965.....	70.2	6.8	48
1966.....	70.0	11.7	82
1967.....	67.0	9.4	63

(1) *Wheat* — The leading crop in the U.S.S.R., wheat accounted for 32.4% of the total sown area in 1967 as compared with 26.3% in 1950. Production data are given in Figure 8. Although wheat acreages are scattered through the European U.S.S.R., they tend to be concentrated in the fertile black soils, extending in a belt from the Moldavian S.S.R. in an easterly direction to the Ural mountains and eastward through the southern oblasts of Western Siberia and the northern oblasts of Kazakh S.S.R. (Figure 52). There are also small pockets of production in Central Asia, the southern portions of Eastern Siberia and the Far East.

In the U.S.S.R., as in the United States, both winter wheat and spring wheat are grown. In the United States, winter wheat predominates at about 79%, while in the U.S.S.R., spring wheat is the more important, accounting for 71% of wheat acreage in 1967. Winter wheat is concentrated mainly in the southern areas of the European U.S.S.R., where the climate is sufficiently mild for its development and where it returns higher yields than spring wheat. The average yield of winter wheat in the U.S.S.R. is almost double the yield of spring wheat. Spring wheat is grown principally in the Volga region, the Urals region, the southern oblasts of Western Siberia, and the northern oblasts of Kazakh S.S.R., as well as in Eastern Siberia. Most of these regions are typically semiarid, and spring wheat frequently suffers from drought.

Wheat acreage, particularly that of spring wheat, increased sharply during the mid-fifties. Most of this increase was brought about by bringing under cultivation virgin and fallow land east of the Volga, mainly in Western Siberia and Kazakh S.S.R. Because of unfavorable soil and climatic conditions much of the new lands area may generally be expected to produce relatively low and variable yields. However, poor spring wheat crops east of the Volga frequently have been accompanied by good winter wheat crops in the European U.S.S.R. and vice versa, thus providing some hedge against national crop failure. Yields of spring wheat, especially in the new lands area, are restricted primarily by the weather but also by the depletion of initial soil fertility in the virgin lands, and serious weed infestation caused by

poor tillage practices and continuous cropping of wheat. Some progress is being made in overcoming these problems by increased use of such practices as clean fallowing, stubble mulch tillage methods, better varieties, and increased use of agricultural chemicals.

(2) *Rye* — Rye, along with wheat is important as a breadgrain, particularly for the inhabitants of the European U.S.S.R., where most of the rye acreage is located. It now follows barley as the third ranking grain in area sown. Rye is generally a winter crop, seeded in the fall and harvested the following summer. Although it is sensitive to excessive heat and is not grown too far south, it withstands drought better than spring-sown grains and is a valuable insurance crop in such semiarid regions as the Middle and Lower Volga. Also, weeds are easier to control when rye is grown, a highly important factor in the U.S.S.R., where weeds have been a serious problem. The distribution of rye acreage and production data are given in Figures 53 and 30, respectively.

Rye predominates over wheat in the whole northern and central European U.S.S.R., as well as in the Baltic republics and the former Polish territory, but its acreage is exceeded by that of wheat in the southern and eastern regions. Just as wheat is the typical grain in the black (chernozem) soil zone, rye is the leading grain in the nonblack soil zones to the north for which it is better adapted. During the last 18 years, however, rye acreage has declined while that of wheat has increased. Rye is more resistant to low winter temperatures than any other cereal. The yields of winter wheat, however, are generally higher than rye yields in areas where both crops can be grown successfully. The 1967 acreage of rye was only 52% of the 23.7 million hectares sown to that crop in 1950 (Figure 30). Rye production has also been declining since 1950 although not quite as much as acreage. Production of rye in 1966 and 1967 was 11 million tons, or about 60% of the 1950 level. The acreage and production of rye may decline further as new wheat varieties with improved winter-hardiness become available and as consumption of wheat bread increases at the expense of rye. In some areas, however, rye may be used more extensively as a feed for livestock, as is the practice in some Western European countries.

(3) *Barley* — Barley became a more important crop than rye in terms of production in 1962 and in acreage in 1963. By 1967 the area of barley exceeded that of rye by 54%; in 1950 the barley area was only 36% of the rye area. The acreage sown to barley increased rapidly from 1961 to 1964 as a result of the campaign to shift acreage from low yielding sown grasses and oats to higher yielding crops. Barley acreage declined from the 21.7 million hectares 1964 peak to 19.1 million hectares in 1967 in line with the overall decrease in the total grain area (Figure 31). Although grown mostly in the south of

the European U.S.S.R. and predominately a spring sown crop, barley's adaptability permits it to be grown from the Black Sea littoral to the far north (Figure 54).

Barley is primarily a feed grain, and a valuable one because of the high protein content that characterizes most of the varieties. In some of the northern districts, however, it is used extensively as a source of *kasha* (grits or porridge), and in the north and northwest, as barley flour to be mixed, sometimes, with rye and oats for breadmaking. Barley is also used industrially, chiefly as a source of malt for distilleries and in beermaking. The variety grown in the western districts of the Ukraine, former Polish territory, and the Baltic Republics is best suited for these uses. The expansion in barley acreage was accompanied by an increase in output. Increased use of fertilizer and use of improved varieties of seed have contributed to greater barley yields.

(4) *Corn* — The total acreage devoted to corn in 1967 was 23.1 million hectares or about 11% of the total sown area. Of this total, 3.5 million hectares produced fully mature corn for grain. From the remainder, corn was harvested in various stages of immaturity for silage and green feed. Although corn is a staple in the diet of the people of Moldavia and parts of the Caucasus, it is primarily a feed grain. The heaviest concentration of acreage is in the Ukraine (Figure 55).

Corn acreage began to expand in 1955 under Khrushchev's influence and reached a peak in 1962. Much of this expansion took place in regions where soil and climatic conditions were not best suited to corn growing. However, there is no major area in the U.S.S.R. where conditions for growing corn are equivalent to those of Illinois and Iowa in the United States corn belt. Under Khrushchev's successors, corn acreage has shown a gradual decreasing trend, stabilizing at about 3 million hectares of corn for grain and 20 million hectares for silage and green feed.

The overemphasis on corn during the Khrushchev era led to a practice of reporting the mature grain equivalent of corn harvested for silage at the so-called "milk-wax" stage of maturity, a practice which was discontinued by Khrushchev's successors. Production of mature corn grain since 1950 has varied with acreage, but yields are now higher (Figure 32). Production in 1966-67 averaged 7.5 million tons, compared with a peak production of 14 million tons in 1961. Yields of corn exceed those of other grains, partly because of the more favorable locations in which it is grown and the relatively high levels of fertilizer applied to the crop.

(5) *Miscellaneous grains* — Among the other grains grown in the U.S.S.R., pulses furnish additional protein both for the diets of humans and the rations of livestock. Oats have decreased sharply in importance, but millet and buckwheat remain as significant sources of porridge *kasha*. Rice is of local but

increasing importance under present plans to meet rice needs through indigenous production. In the 8-year period 1960-67, the total acreage of grains in the miscellaneous category averaged 21.5 million hectares, or about one-sixth of the total grain acreage. On the other hand, the production of these grains represented about one-seventh of total grain production or an average of 15.5 million tons annually. The acreage and production of miscellaneous grains in 1967 were about 20 million hectares and 20 million tons, respectively (Figure 33).

(a) *PULSES* — Pulses, such as beans, peas, and lentils, are included in Soviet statistics with grain crops. These crops provide a valuable food and feed source rich in protein. Acreage devoted to these crops reached a high of 10.8 million hectares in 1963, but had diminished to 5.5 million hectares by 1967.

(b) *OATS* — The importance of oats has been decreasing. This spring sown crop is used predominately as a feed grain and is widely distributed over the U.S.S.R., except in the more southern and drier regions, where it is replaced by the more drought-resistant barley.

Oats acreage decreased sharply in 1962 after having declined gradually over the past several decades as horse numbers decreased. As a result of the classification of oats as a low-yielding crop in the campaign to shift land into more productive crops, the average of 7.5 million hectares sown to this crop in 1965-67 was about one-half of the average of 14.9 million hectares sown in 1954-58.

(c) *MILLET AND BUCKWHEAT* — Millet is drought-resistant and an excellent insurance crop in the semiarid zone. Buckwheat, which has modest soil requirements and a short period of vegetation but is sensitive to drought, can be cultivated far north. The annual average sown area of these two crops in 1963-67 was 5.3 million hectares, with millet occupying about two-thirds of the total. The acreage devoted to these crops has remained comparatively constant in recent years.

(d) *RICE* — Normally, the U.S.S.R. supplements its production of rice, which is a crop of only local importance, with imports. At the March 1965 plenum of the Central Committee, Brezhnev reported that in the previous 5-year period the U.S.S.R. had imported 1.5 million metric tons of rice, "for which we had to pay a great deal of money." He recommended that measures be taken to ensure that by 1970 domestic rice production would fully satisfy requirements. Rice is grown principally in the irrigated regions of Central Asia and Transcaucasus, where it is an important item in the diet. The total acreage under rice in the U.S.S.R. declined in the late 1950's from 148,000 hectares in 1956 to 95,000 hectares in 1960. Acreage subsequently increased gradually to 276,000 hectares in 1967 and additional rice producing areas are being prepared. Production of rice has

increased from 190,000 tons in 1960 to 890,000 tons in 1967, attributable to more intensive production techniques as well as the larger area.

(6) *Potatoes and other vegetables* — Next to wheat and rye, potatoes constitute the most important food crop in the U.S.S.R. This crop is more important in the western and central regions of the European U.S.S.R. than in the east and south or in the Asiatic U.S.S.R. (Figure 56). In Belorussia about one-sixth of the sown acreage was devoted to potatoes in 1965, with the proportion being slightly more than one-tenth in the southwestern region of the Ukraine, the central and northwestern regions of the R.S.F.S.R. and the Baltic Republics.

The acreage of potatoes has declined almost steadily during the past decade, from 9.8 million hectares in 1957 to 8.3 million hectares in 1967. A postwar record crop of 96 million tons was harvested in 1956 and the smallest crop in more than a decade, only about 69 million metric tons, was produced in 1962. Following poor crops in 1962 and 1963, four successively good crops were produced in 1964-67 (Figure 9).

The acreage planted to other vegetables has remained relatively stable at about 1.4 million hectares in recent years (Figure 34). Production during 1960-67 averaged 17.4 million tons annually and reached a record level of 19.8 million tons of 1967, more than double the 1950 production. Cabbage, cucumbers, and tomatoes account for about three-fourths of production, with onions, beets, and carrots accounting for most of the remainder.

(7) *Sugar beets* — Sugar beets constitute practically the only domestic source of sugar. The Soviet Union is the leading producer of sugar beets, producing about 35%-40% of the world output and 3 to 4 times as much as the United States, the second largest producer. The principal area of production encompasses the western and the north-central provinces of the Ukraine and the adjoining black soil areas of the R.S.F.S.R., which accounts for about 80% of total production. Another area of increasing importance in production (over 8%) is located in the North Caucasus region just east of the Sea of Azov.

FIGURE 9. POTATOES: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	8.6	104	88.6
1955.....	9.1	79	71.8
1960.....	9.1	92	84.4
1963.....	8.5	84	71.8
1964.....	8.5	110	93.6
1965.....	8.6	103	88.7
1966.....	8.4	105	87.9
1967.....	8.3	114	95.0

FIGURE 10. SUGAR BEETS:* SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	1.31	159	20.8
1955.....	1.76	176	31.0
1960.....	3.04	191	57.7
1963.....	3.75	120	44.1
1964.....	4.11	199	81.2
1965.....	3.88	188	72.3
1966.....	3.80	195	74.0
1967.....	3.80	229	86.8

*Not including sugar beets sown for and used as livestock feed.

The distribution, sown area, and production of sugar beets are given in Figures 57 and 10.

The acreage of sugar beets for processing into sugar, which had been steadily increasing, reached a peak of 4.11 million hectares in 1964. In 1967, a total of 3.8 million hectares of sugar beets were planted for processing into sugar, an area almost triple the acreage planted in 1950. The production of sugar beets also has increased, due both to expansion of acreage and increased yields. An annual average of 79 million tons of sugar beets for processing into sugar was produced in the period 1964-67 compared with 50 million tons average during 1960-63. The output of cane sugar in Cuba and the stability of raw sugar exports to the U.S.S.R. will likely be a factor in Soviet decisionmaking with regard to sugar beet acreage, but the Soviets do not need Cuban sugar to meet their own domestic needs. Sugar beets have been a heavily fertilized crop in the Soviet Union, but some increase in average yields may be possible. A record yield of 229 quintals per hectare was achieved in 1967, compared with the previous record level of 218 quintals per hectare in 1958. The Soviets consider the sugar content of their beets to be unnecessarily low because of delays in processing the harvested beets and because payment to the agricultural enterprises is on the basis of gross weight of the beets without consideration of the sugar content of the beets.

In 1959 the U.S.S.R. began to grow sugar beets instead of feed beets as livestock feed, presumably as a hedge against a shortfall in production of sugar beets for processing. Production of these beets reached 24.4 million tons in 1962, but since that year official reporting on this category of beets has been discontinued.

(8) *Sunflower seed* — Oil from sunflower seed is the basic edible vegetable oil in the U.S.S.R., accounting for 73% of the vegetable oil produced in the state industrial enterprises in 1967. In addition to their use as a source of vegetable oil, roasted sunflower seeds are eaten like peanuts and constitute a popular delicacy in the Soviet Union. The main

areas of sunflower production are in the southern half of the Ukraine, the North Caucasus, and into the Volga region (Figure 58). Hardy and drought resistant, the sunflower plant is well suited to the climate, especially that of the southern regions of European U.S.S.R.

The acreage planted to sunflowers trended upward during the period 1960-67, from 3.9 million hectares in 1959 to a record high of 5.0 million hectares in 1966. Production of sunflower seeds was at a record level of 6.06 million tons in 1967 (Figure 11). Yields of sunflower seeds averaged 10.5 quintals per hectare during the period 1960-67, compared with 7.8 quintals per hectare in the prior 8-year period. This increase in yields is attributable largely to the development of new varieties which also have a higher oil content. Monetary premiums are paid on high-oil varieties. During the 10-year period 1955-64, the average growth in oil content was 0.95% per year; during 1960-64 increase in oil content averaged 1.05% annually. The oil content of seeds received for processing in 1966 averaged 44%, as compared to 28.5% in 1940.

(9) *Cotton* — Cotton is the leading fiber crop and is also the principal irrigated crop. The Soviet Central Asian republics, southern Kazakh S.S.R., and the eastern part of the Transcaucasus are the principal cotton growing regions (Figure 58). Uzbekistan accounts for about two-thirds of annual Soviet cotton production of almost 6 million tons. The United States is the only country in the world that produces more cotton than the U.S.S.R., although the United States suppresses expansion of cotton acreage while the Soviets are striving to boost cotton output. For many years Soviet cotton has been a priority recipient of the limited supply of fertilizer. Cottonseed is a valuable source of vegetable oil, contributing about 19% of vegetable oil production. The U.S.S.R. imports cotton from Egypt and other countries in the Middle East but is a net exporter of cotton, most of which goes to the European satellites. Some of the cotton shipped to the satellites is in exchange for finished goods manufactured from Soviet cotton. Cotton production data reported by the Soviet Union are raw, or unginced, cotton. The figures

FIGURE 11. SUNFLOWER SEED: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	Million hectares	Quintals	Million metric tons
1950.....	3.59	5.0	1.80
1955.....	4.24	9.0	3.80
1960.....	4.19	8.7	3.65
1963.....	4.39	8.9	3.94
1964.....	4.61	12.1	5.58
1965.....	4.87	10.3	5.01
1966.....	5.00	11.3	5.65
1967.....	4.77	12.7	6.06

include approximately two-thirds cottonseed, linters, and foreign matter, and one-third lint cotton (ginced), which is the raw material of the textile industry.

The acreage planted to cotton has been holding rather steady since 1963, with slight yearly fluctuations, but averaging slightly less than 2.5 million hectares during 1963-67 (Figure 35). Cotton acreage averaged 2.78 million hectares in 1951-52, when irrigation facilities were less developed, but declined sharply in 1953 when an attempt to grow nonirrigated cotton, primarily in the southern Ukraine and North Caucasus, was discontinued.

(10) *Flax* — The U.S.S.R. is the world's largest producer of flax fiber, producing an average of 60% of world output in the period 1961-65. Relative importance in the production of linseed, however, is much less, an average of 13% of world production during 1961-65. The stalk of the flax plant furnishes fiber for linen fabrics, and the seed furnishes linseed oil, which is used as a drying oil or, after refining, as an edible oil or for making margarine. The oilcake is a valuable feed concentrate, especially for ruminants.

Different varieties of flax are planted in various regions of the U.S.S.R., depending on whether it is grown primarily for fiber or for seed. Varieties grown for fiber do not yield much seed. Fiber varieties require a humid climate with moderate summer temperature, while the oilseed types grow better in a warmer and drier climate. Fiber flax is grown chiefly in the western and northern regions of the European U.S.S.R. (Figure 58). Fiber varieties also predominate in the Urals and West Siberian regions. The Lower Volga and the southern regions of the European U.S.S.R. lead in seed flax acreage.

Flax fiber production levels in 1965-67 were well above previous years, but acreages sown have been decreasing gradually (Figure 36). The latter trend has been attributed to a decline of population in flax growing regions and a need for more advanced mechanization which has been intensified by a shortage of the machines that have been developed. During 1966-67, an average of 1.4 million hectares were sown to fiber flax, while flax sown primarily for seed has occupied only about one-fifth to one-fourth as large an area. Production of fiber flax was 460,000 tons in both 1966 and 1967. Linseed production including seed output of fiber varieties amounted to approximately 250,000 tons in 1966.

(11) *Miscellaneous crops* — Numerous other crops are grown in the U.S.S.R. Hemp is the third-ranking fiber crop, following cotton and flax. The fiber is used in making rope and durable cloth such as canvas, bagging, and sailcloth. Acreage devoted to hemp has shown a continuing downward trend in recent years. Sown area in 1965 was only about 77% of that sown in 1960. The principal hemp growing areas are the central black soil zone and the Ukraine.

Two kinds of tobacco are grown. In recent years approximately 141,000 hectares have been planted to so-called yellow tobacco, which is predominately a cigarette leaf of the oriental type. The acreage devoted to *makhorka*, a low-grade, coarse, strong tobacco high in nicotine content, which declined rapidly in the late fifties to only 50,000 hectares in 1959, had declined to 22,600 hectares by 1966.

Several types of oil-bearing plants, such as soybeans, castor beans, sesame seed, peanuts, and perilla were introduced into the U.S.S.R. between World War I and World War II. Of these, only soybeans remain significant, having occupied 855,000 hectares in 1966. Mustard, an oil-bearing and spice crop that long has been grown in the U.S.S.R., was grown on 261,000 hectares in 1966. The principal oilseed, sunflower, is discussed separately.

Forage-type crops grown specifically for livestock feed occupied 59.6 million hectares, or 28.8% of the total sown area, in 1967. The area of these crops showed a steady increase from 20.7 million hectares in 1950 to a record 63.1 million hectares in 1960 and again in 1963. Corn planted for harvest as silage or green feed occupied about 20 million hectares in 1967. This use of corn began in the U.S.S.R. in 1955 and reached a peak area of 30 million hectares in 1962, after which it began to decline. A number of other annual crops are grown for forage. The so-called annual grasses, including such crops as sudan grass and millet and also cereal crops used as forage, occupied about 19 million hectares in 1967, which is about the same area as in 1960 but almost double the 1955 level. Perennial grasses and legumes cut for hay occupied 16.5 million hectares in 1967. The area devoted to these crops since 1950 has ranged between 11.2 million hectares in 1950 and 19.4 million hectares in 1961. Feed roots and feed melons together, including sugar beets grown for feed, occupied 1.7 million hectares in 1967, having declined from the peak level of 3.3 million hectares in 1962. Silage crops other than corn were grown on about 3 million hectares. These feed crops supplement the forage produced on natural meadows and pastures. Other roughage feeds include straw residues from grain crops and sugar beet tops.

b. LIVESTOCK AND LIVESTOCK PRODUCTS — Livestock production contributes about one-half of the value of net agricultural production in the U.S.S.R. The value of annual livestock production in 1966-67 was about twice the 1950 level. Livestock products have been a principal source of the postwar improvement in the quality of the Soviet diet. Increased output of livestock products is directly reflected in food consumption patterns since Soviet foreign trade in livestock products is relatively minor.

(1) *Number and distribution of livestock* — Fluctuations in feed supplies and agricultural policy have had varying effects on numbers in the different categories of livestock. (Figures 37 and 12). Geo-

graphical distribution of cattle, swine, and sheep and goats are shown in Figures 59 thru 61. Ownership of livestock by type of farm enterprise is shown in Figure 13.

Despite attempts by the government to rebuild herds depleted as a consequence of collectivization and huge wartime losses, livestock numbers in 1953, except hogs, were significantly below the precollectivization level of January 1928. Measures taken after 1953 resulted in a rapid increase in stock, and by 1958 herds equaled or exceeded the 1928 level, except for cows, which reached the 1928 level in the following year. (Horses are discussed separately.) A relatively steady and rapid growth of livestock numbers after 1958 was interrupted by a severe downturn in feed supplies as a result of widespread drought in 1963. All livestock numbers, except cows, declined in 1963, but the 42% drop in hog numbers was by far the most severe. A relatively poor crop year again in 1965 moderated the expansion of livestock numbers after the 1963 decline, and institutional factors caused sheep and goat numbers to decline further. More recently, following good crop production in 1966 and 1967, increases in livestock numbers appear to have been purposely restricted in line with a policy of stressing more rapid growth and heavier slaughter weights of animals as a means of expanding output of livestock products.

In the opinion of Western observers, the buildup of herds after 1958 had proceeded without due regard to the number of animals that could be properly maintained with the available feed base. This view has been supported by recent Soviet statements indicating dissatisfaction with productivity per animal. The 12% decline in hog numbers in 1967 and little or no increase in cattle, sheep and goats may thus reflect a Soviet effort to bring about a more favorable balance of livestock numbers and feed supplies. The possibility that disease may have been a contributing factor to the 1967 decline in hog numbers and the lack of increase in cattle numbers cannot be discounted. Outbreaks of foot and mouth disease, which is endemic to the U.S.S.R., were widespread during the 1965/66 season. A decline in the production of piglets in the socialized sector, partly as a result of increasing specialization of farms in livestock raising, was cited as a reason for a 1967 decline in hog numbers in the private sector. Production of livestock in the private sector, although officially approved by the present leadership, is being squeezed economically, however, by such factors as higher feed prices and government subsidy to meat production from the socialized sector.

Possibilities of increasing meat production through more rapid growth of animals probably are greatest in hog production; in the U.S.S.R. more than a year frequently is required to grow hogs to market weight, in contrast to 6 months or less in the United States.

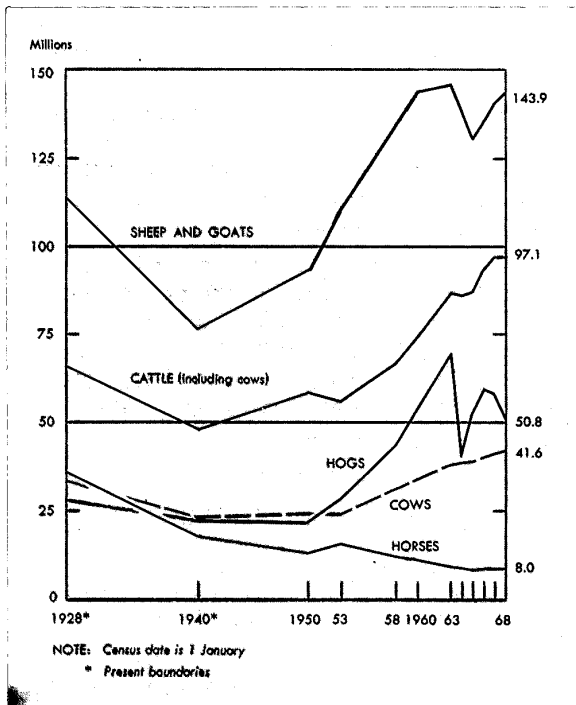


FIGURE 12. TRENDS IN LIVESTOCK NUMBERS

In cattle breeding the Soviets are anxious to continue an upward trend in milk production per cow and to fatten more properly cattle for slaughter. Efforts are underway to develop more beef-type cattle for better utilization of the extensive, sparse grass, natural pastures. Soviet purchases of purebred cattle from abroad show an awareness of the value of high-producing stock. However, much remains to be done with respect to staffing, equipping, and specializing breeding farms. Expansion of sheep numbers is being encouraged, although goats, largely held by the private sector, may decline further in numbers.

Horse numbers have stabilized at about 8 million head in recent years, after having declined almost steadily since 1928. As a result of mechanization, horses no longer account for a significant share of Soviet farm draft power. In 1966, they accounted for only about 1.4% of total farm draft power in the U.S.S.R.

(2) *Livestock products* — In September 1953, Khrushchev singled out the livestock sector as the most backward segment of Soviet agriculture, revealing that the numbers of cows and of all cattle were less than in 1916 and that only small increases had been achieved in the number of hogs, sheep, and goats. Increases in procurement prices during 1953-56, however, and record grain and potato harvests in 1956 resulted in a significant improvement in the livestock sector, and in May 1957 Khrushchev launched a program to catch up to the United States in per capita production of milk and meat. In June he boasted that the U.S.S.R. would produce 62 mil-

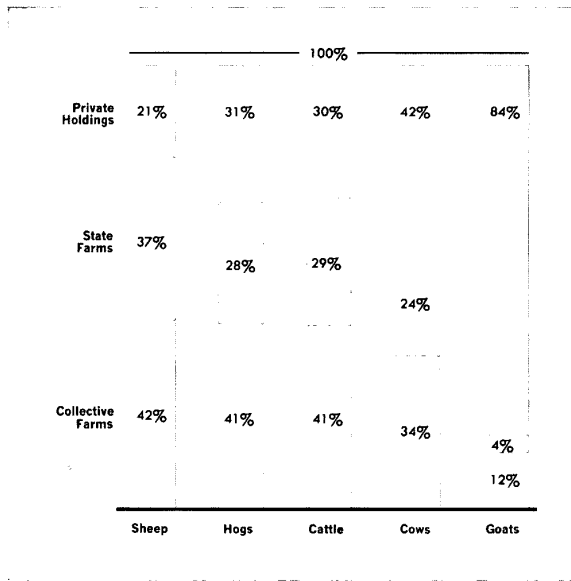


FIGURE 13. PERCENTAGE DISTRIBUTION OF LIVESTOCK OWNERSHIP, 1 JANUARY 1966

lion tons of milk in 1958 and about 14 million tons of meat by 1960 or 1961. Khrushchev admitted that some Soviet economists had calculated that Soviet per capita production of milk and meat could not be raised to United States levels until 1975; however, this advice was ignored. Although the Party Central Committee continued to refer to the "catch-up" campaign in its official May Day Slogans until 1960, the meat production goal was lowered to 11 million tons by 1965. In May 1961 the "catch-up" campaign posters were replaced by fresh pledges to surpass the United States in per capita milk output in 1963 and in per capita meat output in 1970. Output actually achieved is shown in Figure 14. Official Soviet statistics for meat and milk production are discounted (currently 6% for milk and 12% for meat) to remove the combined effects of a deliberate upward bias and of valid errors in estimation. Even with these discounts, the increases in production of livestock products, since 1953, have been substantial. Increases in the output of livestock products during the 1954-67 period were: meat, 91%; milk, 115%; eggs, 109%; and wool 68%. Population of the U.S.S.R. increased by 24% during this 14-year period. Although the "catch-up" campaign goals were not achieved, the Soviets now have surpassed the United States in total and per capita production of milk, but are still far behind in meat production, as the following 1966 tabulation shows:

	U.S.S.R.	UNITED STATES
Milk production		
Total (million tons)	71.2	54.5
Kilograms per capita	305.3	276.8
Meat production		
Total (million tons)	9.46	19.1
Kilograms per capita	40.6	97.0
Population, midyear (millions)	233.2	196.9

FIGURE 14. ESTIMATED OUTPUT OF BASIC LIVESTOCK PRODUCTS

	MEAT*	MILK**	EGGS	WOOL (UNWASHED)
	<i>Million metric tons</i>	<i>Million metric tons</i>	<i>Billion units</i>	<i>Million metric tons</i>
1928***	4.90	31.0	10.8	0.182
1953	5.24	34.7	16.1	0.235
1958	6.78	54.6	23.0	0.322
1959	7.67	56.1	25.6	0.356
1960	7.38	55.5	27.5	0.357
1961	7.40	56.3	29.3	0.366
1962	8.14	58.1	30.1	0.371
1963	8.87	56.3	28.8	0.373
1964	7.29	59.5	26.7	0.341
1965	8.67	68.2	29.1	0.357
1966	9.46	71.2	31.7	0.371
1967	10.00	74.5	33.7	0.395

*Carcass weight, bone-in basis, including slaughter fats. Meat from cattle, hogs, sheep, goats, poultry, rabbit, horse, camel, and deer. Official production data for the 1953-67 period have been discounted 10%-15%.

**Whole milk. Official production data for the 1953-67 period have been discounted 5%-10%.

***1928 boundaries.

In making comparisons between the United States and the U.S.S.R. it is important to note that United States production is being restricted through national agricultural programs, whereas the U.S.S.R. strives for maximum output. In the United States, milk production declined 4% in 1966 to the level produced in 1953, but with 34.5% fewer dairy cows. Less than one-third of United States cows are kept for dairy purposes whereas practically all cows in the U.S.S.R. are milked.

In 1966, the output of meat by major categories was as follows: beef and veal, 39%; pork, 41%; lamb and mutton (including goat meat), 10%; poultry, 7%; other, 3%. About 75% of total meat production in 1966 was produced in the Ukraine and the R.S.F.S.R., with the latter republic accounting for 52% of the total. Meat production in the R.S.F.S.R. is concentrated primarily in the Urals, the North Caucasus, the Volga, and the Central regions (Figure 1). The regional production of milk follows the same general pattern as for meat, with the Ukraine

and the R.S.F.S.R. accounting for 78% of milk production in 1966, the R.S.F.S.R. producing 55% of total.

Poultry production has shown substantial gains in the last three years, after having suffered serious setbacks after the 1963 harvest failure. In 1965, 80% of the poultry in the Soviet Union were in the R.S.F.S.R. and the Ukraine.

The U.S.S.R. is an important wool-producing country. Production rose from 180,000 tons in 1950 to 395,000 tons in 1967. The majority of wool production is concentrated in the R.S.F.S.R. and Kazakhstan, with these two regions accounting for 70% of total production in 1966. In 1965, 55% of the wool produced was of the fine grade.

Facilities for transporting, processing, and distributing livestock products to consumers are grossly inadequate in design and capacity. The efficiency in utilizing milk for consumption is low. A government decree issued in 1967 called for expanded construction of meat and dairy processing facilities.

Continued gains in Soviet livestock production will be primarily influenced by the level of feed supplies but also by improvements in efficiency in utilization of feed. Livestock numbers probably will continue to expand but at a slow rate. National goals call for 86.9 million tons of milk and 12.9 million tons of meat (83.4 million tons and 11.4 million tons, respectively, on a discounted basis) to be produced in 1970.

6. Foreign trade in agricultural products

The commodity structure of agricultural exports and imports for 1962-66 is outlined in Figures 38 and 39. During this period, the U.S.S.R. was a net exporter of agricultural commodities (chiefly cotton and grain) to East Germany, Poland, and Czechoslovakia, and a net importer of agricultural commodities from the rest of the world (Figure 15).

Imports of agricultural products from Communist China declined sharply during 1959-61, becoming almost negligible in 1961, but have increased slightly in recent years. Livestock products and vegetables make up the bulk of the agricultural products imported from Communist China.

FIGURE 15. NET AGRICULTURAL TRADE*

	EAST GERMANY, POLAND AND CZECHOSLOVAKIA	COMMUNIST CHINA	OTHER COMMUNIST COUNTRIES**	NON- COMMUNIST COUNTRIES	NET AGRICULTURAL TRADE
	<i>Million U.S. dollars</i>				
1962	+657	-34	-267	-323	+33
1963	+653	-31	-278	-560	-216
1964	+476	-62	-439	-1,057	-1,082
1965	+485	-88	-494	-1,036	-1,133
1966	+590	-64	-452	-1,007	-933

*Plus indicates net exports; minus indicates net imports.

**Includes Albania, Bulgaria, Cuba, Hungary, Mongolia, North Vietnam, North Korea, Rumania, and Yugoslavia.

The principal commodity affecting the agricultural trade balance during 1963-66 was grain and grain products. In 1964 alone, following the very poor grain harvest in the fall of 1963, the Soviets imported grain and grain products valued at US\$628 million. Sugar is imported almost exclusively from Cuba as raw sugar. Malaysia is the U.S.S.R.'s chief supplier of raw rubber and Egypt is the main source of its cotton imports. Livestock and livestock products are imported from a number of countries, primarily from Communist China.

Exports of grain and grain products, which in 1962 accounted for 44% of Soviet agricultural exports, fell off to 21% of the total in 1966. The share of exports of oilseeds, on the other hand, increased from 7% to 15% of total agricultural exports. The growth of exports of oilseeds and oilseed products reflects the large increase in domestic production of oilseeds.

C. Fisheries

1. Importance to the economy

The U.S.S.R.'s extensive and rapidly developing fisheries are important for both economic and strategic reasons. In 1965, the fishing industry provided about 9.7% of the output of the food industry, or about 1% of gross industrial output. In the same year, about 323,500 workers were employed in the fishing industry, or about 17.4% of the food industry labor force. Capital investment in the fishing industry during 1959-65 was 2.3 billion rubles, including 1.8 billion rubles investment in the fishing fleet. The fishing industry employs 28.5% of the fixed capital of the food industry.

The U.S.S.R., since the early 1960's, has ranked 4th after Japan, Peru, and Communist China among the world's fishing nations. The consumption of fish has been increasing steadily from 9.9 kilograms per capita in 1960 to about 12.6 kilograms in 1965. An estimated 13% of the animal protein consumed in the U.S.S.R. comes from fish. In addition, the U.S.S.R. since 1959 has been a net exporter of fish and fish products, with 1965 exports exceeding imports in value by more than US\$42 million.

The U.S.S.R. has the largest and most modern fishing fleet in the world. In addition to the obvious economic successes of Soviet fishing activities, the fishing fleet serves as a cover for intelligence operations during peacetime, and in the event of war could be converted to an augmentation force in support of operations of a more direct military nature. In recent years, the Soviets have been exploiting their fishing and scientific research fleets to gain respect and influence in strategic underdeveloped countries. In the event of hostilities, however, the fishing industry would be very vulnerable because more than 80% of the fish catch is obtained from international waters, and almost all of the most productive fishing grounds lie adjacent to foreign coasts. Even under normal conditions, fish-

ing activities in the coastal waters of much of the U.S.S.R. are handicapped by the prevalence of fog and ice for a large part of the year.

2. Catch of fish and other aquatic products

From the standpoint of volume of catch, which reached 6.5 million tons in 1967, the Soviet fishing industry has been remarkably successful (Figure 16). During the Seven Year Plan (1959-65) the annual rate of increase of the catch was about 10%, increasing from 2.9 million tons in 1958 to 5.8 million tons in 1965. In 1965, the U.S.S.R. was responsible for 9.5% of the world's fish catch and 33% of the world's whale catch. The Soviets plan to catch 8,500,000 tons of fish and marine animals by 1970 (Figure 40).

The increase in the Soviet fish catch since World War II is a result primarily of expansion in fishing on the high seas. The high seas catch as a percentage of the total catch has increased as follows:

1940	40
1946	45
1958	72
1960	79
1962	81
1965	82

The shift of fishing to the high seas has led to a shift in the composition of the catch (Figure 41). Since 1940, herring, ocean perch, cod, flounder, and other sea fish have contributed heavily to the growth of the catch. Herring alone increased from 191,000 tons in 1940 to 940,000 tons in 1965. Of the cod and related species, the catches of walleye pollock and silver hake in 1966 amounted to 425,200 tons and 224,600 tons, respectively. In 1966, herring-type species and cod-type species accounted for 64% of the fish catch. Soviet officials are concerned over the decrease in the

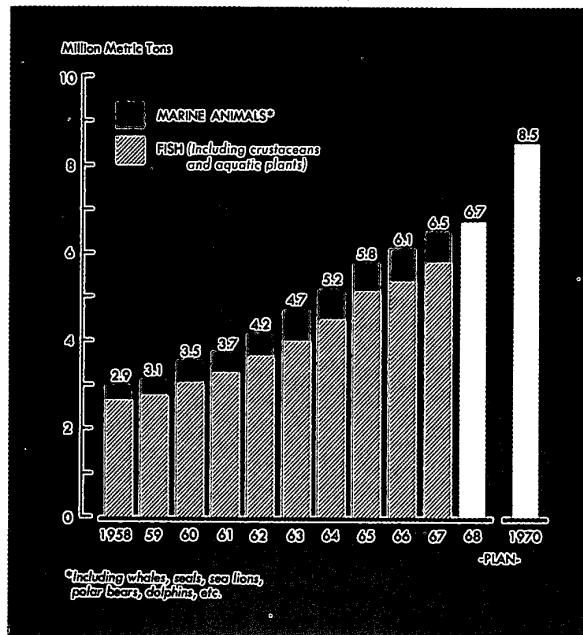


FIGURE 16. TRENDS IN FISH AND MARINE ANIMAL CATCH

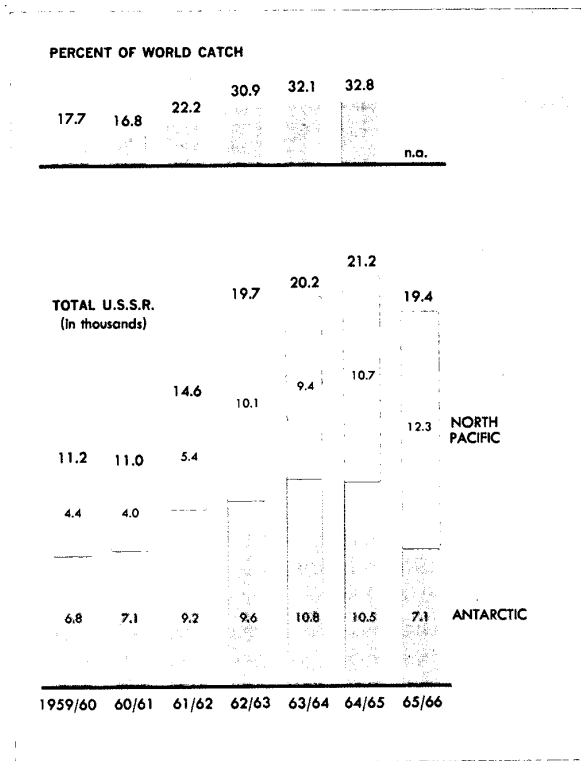


FIGURE 17. WHALE CATCH, BY AREA

catch of traditionally valuable fish—sturgeon, salmon, and white fish—as well as freshwater and semi-migratory fish such as European pike perch, carp, bream, and Caspian roach. Fishing grounds for these fish, except for salmon, frequently do not provide an adequate food supply or spawning grounds. Nonetheless, the U.S.S.R. catches about 90% of the world's sturgeon, maintains first place in the catch of large net fish (*chastik*), and is one of the leaders in salmon catch. The catch of mollusks and crustaceans remains relatively small, although the potential of these non-fish products is large. The single major fishery for shellfish is for the king, or kamchatka, crab, which is a major export product.

The whale is the most important of the marine mammals caught. Whaling operations take place in the Antarctic and North Pacific (Figure 17). During the 1966-70 Five Year Plan the Soviet whale catch will be decreasing as a result of the decreasing whale population.

3. Characteristics of major fishing areas

a. HIGH SEAS FISHING AREAS — In 1913, Russia fished predominately from internal waters. Fishing on the high seas represented only 17.3% of the catch. In 1965, the situation had been reversed to the point where 82% of the catch was obtained from international waters and almost all of the most productive fishing grounds lay adjacent to foreign coasts (Figure 18).

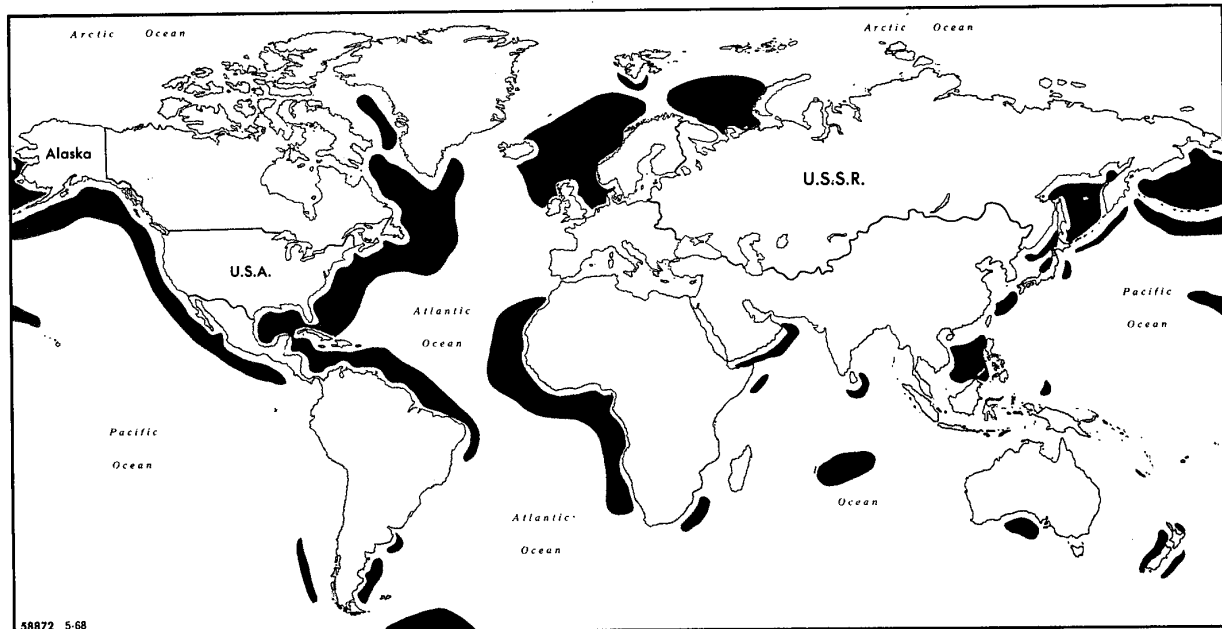


FIGURE 18. SOVIET FISHING GROUNDS IN THE HIGH SEAS

In the interim period, Soviet fishing on the high seas developed by stages. The first stage was the near shore fishing of the regions of the North Arctic and Pacific Oceans—the Barents Sea, the north part of the Sea of Japan, Okhotsk Sea and the offshore regions of the western Bering Sea. The second stage has been the fishing of waters more distant from shore, including the Northwest Atlantic, Equatorial and South Atlantic, North Sea, Eastern Bering Sea, and northeast Pacific Ocean. The introduction of large vessels with refrigeration and canning capabilities and floating bases has been largely instrumental in the extension of fishing operations.

As shown by the data in Figure 42, the Atlantic Ocean is the basic fishing ground of the U.S.S.R. In 1965, 2.4 million tons of fish, or 42% of the total catch was obtained from Atlantic waters.

(1) *Northeast Atlantic* — During the past 15 years, development of Soviet fishing in the Atlantic has been concentrated in the northeastern region—the Barents, the North, the Norwegian, and the Baltic Seas, and fisheries near the Faeroe Islands and Iceland. In recent years, the U.S.S.R. has begun to fish in the English Channel and along the shores of East Greenland.

The Soviet catch of fish and marine animals in the Northeast Atlantic in 1964, illustrating the relative importance of its component fishing grounds in recent years, was as follows:

	THOUSAND TONS	PERCENT
Barents Sea	317.2	29.3
Iceland	11.3	1.0
Faeroe Islands	7.6	0.6
Norwegian Sea	402.6	37.2
North Sea	144.5	13.4
English Channel	9.2	0.9
Baltic Sea	190.1	17.6
Total	1,082.5	100.0

Herring is the most important single species, with catch amounting to 566,000 tons in 1965 (54% of catch). The Norwegian Sea and the North Sea are fished almost exclusively for herring. The Baltic Sea yields about 70,000 tons of Baltic herring and about 65,000 tons of cod, while in the Barents Sea, about 80% of the Soviet catch is cod and haddock. The planned 1970 catch for these areas is as follows: Barents Sea—300,000 tons, with the catch of codfish down from recent years; Norwegian Sea—300,000-400,000 tons, almost exclusively herring; North Sea—150,000 tons of herring, 30,000-50,000 tons of other fish; Baltic Sea—190,000 tons of fish including 65,000 tons of cod, 70,000 tons of Baltic herring. Through 1970, therefore, the Soviet fish catch in the Northeast Atlantic apparently is planned to remain at approximately the 1965 level. During the winter months 500-700 fishing vessels are active, and during the summer months, their number drops to about 200 vessels.

(2) *Northwest Atlantic* — Since 1959, the Northwest Atlantic has become a significant fishing

ground for the U.S.S.R. Through aggressive expansion of fishing near Western Greenland, Labrador, Newfoundland, Nova Scotia, and the New England states, the Soviets have increased this catch from about 109,000 tons in 1958 to about 853,000 tons in 1965. More than half the 1965 catch was from off the New England states, as shown as follows:

	THOUSAND TONS	PERCENT
West Greenland	1.5	0.2
Labrador	67.0	7.9
Newfoundland	144.0	16.8
Subtotal	212.5	24.9
Nova Scotia	140.0	16.4
New England states	500.6	58.7
Subtotal	640.6	75.1
Total	853.1	100.0

In the New England and Nova Scotia fishing grounds, herring and silver hake made up the bulk of the 1965 catch, although in other years there have been significant catches of haddock, cod, pollock, and flounder. Annual catch is planned to remain at about 600,000 tons through 1970, including 200,000 tons of Atlantic herring and 250,000 tons of silver hake.

West Greenland, Labrador and Newfoundland are primarily sources of cod, sea perch, and herring. The planned 1970 catch for this area is 420,000 tons, including 320,000 tons of cod.

Since the Northwest Atlantic is a primary U.S. fishing ground, Soviet fishing interests have been in conflict with those of the United States at times. In recent years there have been over 400 Soviet vessels fishing at peak fishing periods.

(3) *Central and South Atlantic* — Although the catch of fish in these regions was 490,000 tons in 1965, the Central and South Atlantic fishing grounds have been fished by the Soviets only since 1954 and are viewed as potential areas for increased catch. Horse mackerel and sardines are the basic catch. The 1970 planned catch for this region amounts to 470,000 tons of horse mackerel, Atlantic mackerel, and sardines, and for the tropical zone of the East Atlantic (near Guinea) 25,000 tons of sardines, Atlantic mackerel and horse mackerel. Tuna fishing is expected to increase significantly with the increased use of trawlers specifically equipped for tuna fishing. Since 1965, the number of vessels operating in western African waters has increased rapidly to the point where some 130 and 70 vessels are in operation in the peak and slack periods, respectively. Many of the vessels are based at ports along the Black Sea.

(4) *North Pacific* — The North Pacific, the second most productive fishing ground of the U.S.S.R., encompasses the Sea of Okhotsk, the Sea of Japan, the Tatar Straits which connect them, the delta of the Amur River, the Bering Sea and the North Pacific Ocean.

During the last decade, Soviet Pacific fisheries have undergone a significant transformation. Up to 1950

the Soviet Pacific fishing industry caught about 300,000 tons of fish per year, principally along the shores of Kamchatka and Primorskiy Kray. Herring, sardines, and salmon were the principally species caught. By 1965 the catch in the North Pacific had increased to 1,826,000 tons. The use of powerful fishing vessels has led to fishing a considerable distance from shore. Now 75%-80% of the Far East catch is from the open sea and Pacific Ocean. In recent years, the U.S.S.R. has operated a large fleet of vessels in the Bering Sea and Gulf of Alaska (Figure 19) and has progressively shifted operations southward as far as California. At peak periods during the past 5 years, the Soviets have had as many as 400 vessels fishing in these waters. During the past 10 years, sea perch, *sayra*,⁵ tuna, and hake have appeared, and the significance of flat fish has increased in the composition of the North Pacific catch. According to the Five Year Plan, in 1970, the total catch of fish, crustaceans, mammals, and seaweed is to reach 3 million tons, or about one-third of the Soviet catch.

Herring and sea perch are quantitatively the most important catch of the Far East, amounting to 330,000 to 390,000 tons, respectively, in 1965. Herring are caught near the northeast shore of Kamchatka and since 1960, near the Pribilof Islands in the Bering Sea. The catch of *sayra* in 1965 was 42,500 tons, but plans call for annual catch to reach 250,000 tons in 1970.

Pacific hake, in the amount of 140,000 tons were caught near the coast of Washington and Oregon in 1966; the tuna catch, although currently insignificant,

⁵ *Cololabis sajra*, member of mackerel family.

is expected to increase as the Soviets expand fishing into the southern Pacific Ocean. The most valuable commercial fish are the Pacific salmon, including the pink salmon, chum salmon, and sockeye salmon. However in recent years, the supply of salmon has been decreasing. Salmon are taken mostly off the shore of Kamchatka. In 1966, 62,000 tons of salmon were caught in the North Pacific.

The crab catch in the Far East, the center for Soviet crab fishing, increased sharply from about 15,000 tons in 1948 to 39,000 tons in 1961 and 46,000 tons in 1966. Crabbing operations are conducted in both in-shore and offshore waters. Land based facilities as well as large cannery ships, which operate in conjunction with flotillas of small fishing vessels, are used.

Whaling operations also are conducted off Kamchatka, the Kuril Islands, and Sakhalin. As early as 1932, the whaling factory ship *Aleut* and attendant catcher vessels began to operate in the Far East. Since 1963, the whale bases *Vladivostok* and *Dalniy Vostok* have begun to work in this region, at times conducting whaling operations as far as the Gulf of Alaska. In addition, whaling operations from land stations are conducted in the waters off the Kuril Islands and Sakhalin. It is estimated that in 1965, these flotillas caught more than 10,000 whales of all types in this region.

(5) *Antarctic area* — The Antarctic is the principal whaling area exploited by the Soviets, providing about 50% of the whale catch in 1965. Soviet whaling operations in this area have developed since 1946, when operations were begun with only a single floating base, the *Slava*, and several attendant catchers.

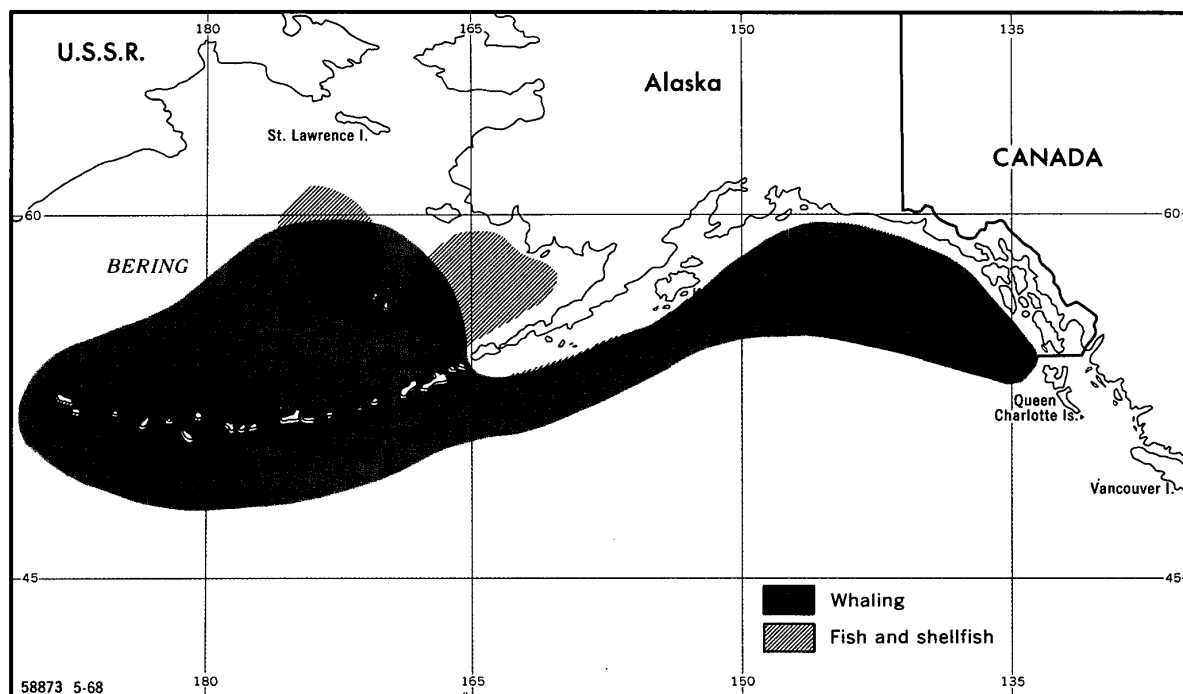


FIGURE 19. SOVIET FISHING AREAS OFF ALASKA, 1959-66

Subsequently 3 more factory ships built during 1959-60, the *Sovetskaya Rossiya*, *Sovetskaya Ukraina*, and the *Yuri Dolgorukiy*, as well as about 75 catchers, were added.

Antarctic whaling is conducted within seasonal limits and in areas established by the International Whaling Commission (IWC). From 1958 until 1966, the U.S.S.R. was allocated 20% of the total Antarctic catch, in terms of blue whale equivalents. Since the 1958/59 season, the Soviet catch has ranged from 17% to 24% of the total actual Antarctic catch. In 1966, the IWC allotted the U.S.S.R. 30% of the Antarctic catch, in terms of blue whale units. In view of the diminishing Antarctic whale population and the decrease in total catch sanctioned by the IWC from 4,500 to 3,500 blue whale units for 1966/67, and to 3,200 for 1967/68, the Soviet whale catch in the Antarctic will be decreasing in the 1966-70 Five Year Plan period.

(6) *Other high seas regions* — Soviet fishing operations in other high seas regions are of little importance at the present, but the U.S.S.R. is actively engaged in developing new fisheries. With the development of fishing port facilities in the Havana (Cuba) harbor, the Soviets have gained an excellent base for expanding their operations in Caribbean waters, the Gulf of Mexico, and along the east coast of the United States and Brazil. In 1965, 69,000 tons of fish were caught in these waters. Hake is quantitatively the most important species of the area. In recent years, the Soviets have extensively studied the Patagonian Shelf as a potential fishing ground. About 15 vessels operate near Cuba, and as many as 70 vessels have operated near South America.

The Indian Ocean currently is of little importance to Soviet fishing. The U.S.S.R. began fishing operations here only in the early 1960's. The catch in 1965 was 34,700, 40% of which was sparidae and horse mackerel. The tuna catch, which the Soviets plan to develop, was about 4,500 tons. The 1970 plan for the Indian Ocean calls for a fish catch of 190,000 tons, or 2% of the total Soviet catch. The Soviets have devoted considerable research to the Indian Ocean and have also initiated fishing agreements with countries having access to the waters of the Indian Ocean, including Ceylon, Egypt, Somalia, and India. Several of the agreements include provisions for building port facilities, which will provide bases for the Soviet fleet.

b. COASTAL AND INLAND WATERS

(1) *Caspian* — The historical center of Russian fishing, the Caspian area (Figure 20) produced an estimated 448,000 tons in 1965, which was about 8% of the total Soviet catch. Since 1930, the relative importance of the Caspian catch has declined sharply. The decreasing depth of the Caspian, in particular, has posed a major threat to the fishing industry. In recent years, the Caspian catch has stabilized at 350,000-450,000 tons, as a result of *kilka* (Caspian

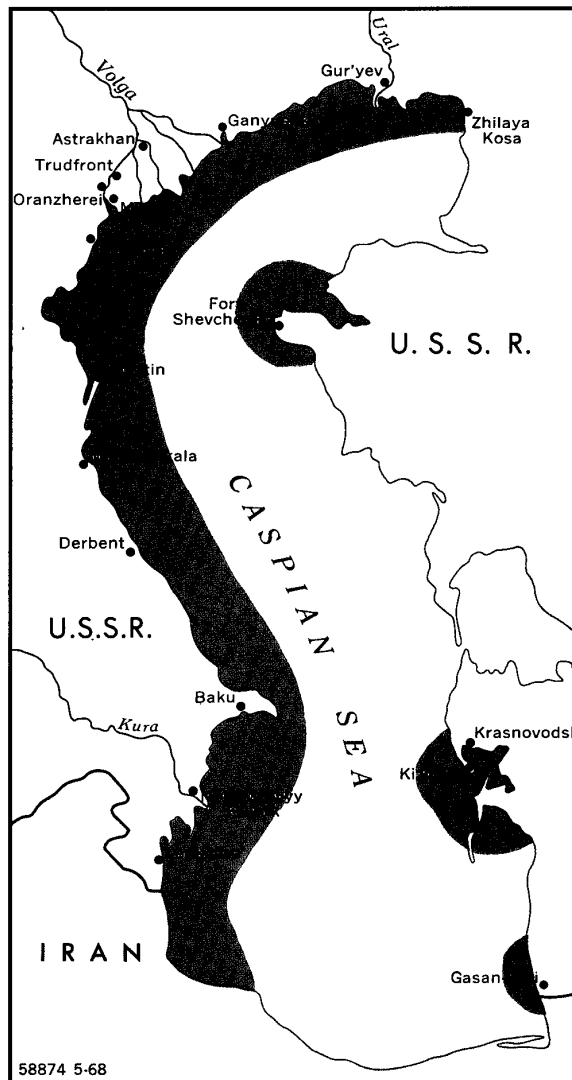


FIGURE 20. CASPIAN SEA FISHING GROUNDS AND PROCESSING CENTERS

sprat) fishing. *Kilka*, a herring fish, which is about 75% of the Caspian catch, is caught mainly along the western shore. Roach, second to *kilka*, in terms of quantity, are taken in the Volga delta during migration and in the open Caspian south of the delta.

The sturgeon catch is only about 3% of the Caspian tonnage, but ranks as one of the most valuable species primarily because of caviar production (sturgeon roughly 3% roe). As a result of conservation practices, the sturgeon catch in 1966 reached 14,000 tons, a quantity which is to be sustained through the Five Year Plan. The most important sturgeon fisheries are in the delta of the Volga and lower reaches of the Kura River.

(2) *Other coastal and inland waters* — Like the Caspian, the catch from the Azov-Black Sea region has been declining due, in part, to a poorer food supply for the fish and to a reduction of spawning grounds. The fish catch in the Azov and Black

Seas in 1965 was 226,000 tons (3.9% of the Soviet catch), including about 46,000 tons of gobies, 125,000 tons of anchovies, and 17,000 tons of bream.

The catch of the Aral Sea has been declining. The 1958 catch was 49,000 tons of fish, while in 1965, the catch was 30,560 tons, 50% of which was carp. Fishing is concentrated mainly along the southern, eastern and northern shores.

Many Soviet lakes, reservoirs, rivers, and streams have commercial fisheries. The river systems of the Volga, Don, Kuban, Ob, Yenisey, and others have extensive tributary networks which serve as fishing grounds, as well as spawning grounds for migratory fish, thus playing a large role in the reproduction of the fish supplies of the Caspian, Azov and other seas. Lakes Ladoga, Onega, Baikal, Il'men, and others are inhabited by valuable fish such as salmon, white fish, and cyprinoids, but the catch is small.

In 1965, the total catch of fresh water fish was about 330,000 tons, of which more than 50% were roach, perch and striped bass. Due to pollution of streams and limitation of water flow by hydrostations, fish catch in internal waters has been falling. Sturgeon particularly have suffered. Artificial reproduction of fish stocks in inland seas and stocking of reservoirs and lakes as well as intensive development of pond fisheries are the measures being taken to raise the catch of valuable fish. Planned 1970 catch from fresh water fisheries is as follows (in thousands of tons):

Reservoirs	69-70
Lake and river waters	200-205
Ponds of State fish farms	140
Total	409-415

4. Fishing operations

a. VESSELS — The current status of the Soviet fishing industry has largely been achieved by building the largest and most modern fishing fleet in the world. The fleet is responsible for 87% of the total Soviet catch. Large refrigerated trawlers, designated as BMRT's, account for more than 20% of the total fleet catch (Figure 21). In 1964, the fishing fleet of self-propelled vessels numbered some 20,000, which a total of 4 million gross register tons (GRT) and

FIGURE 21. FISH CATCH, BY TYPE OF VESSEL
(Percent of total fleet catch*)

DESIGNATION	TYPE	1960	1965
BMRT.....	Fish factory trawlers..	9.0	20.9
RTM.....	...do.....	0	5.1
RT.....	Refrigerated/freezing fishing trawlers.	14.9	7.1
SRTM.....	...do.....	30.4	22.7
Other large vessels..	...	22.1	18.5
SO, RS-300.....	Seiners.....	6.3	9.3
Small vessels.....	...	17.3	16.4
Total.....	.....	100.0	100.0

... Not pertinent.

*Total fleet catch in 1960 and 1965 amounted to 2.78 million tons and 5.11 million tons, respectively.

3.5 million horsepower. Included in this number were an estimated 3,266 trawlers and support ships (100 GRT and above), with about 3 million tons total GRT. Figure 43 illustrates the Soviet emphasis on acquisition of large fishing craft suitable for high seas fishing. Concurrent with the addition of large fishing vessels to the fleet, the Soviets have also begun to phase out many small, less efficient vessels. In the period 1959-64, the number of vessels in the fishing fleet decreased by 12%, while the total horsepower and total GRT increased 50% and 46%, respectively.

During the current Five Year Plan period, the Soviets plan to add about 1,500 vessels, nearly all of which are seagoing vessels. They include 150 large refrigerated trawlers, almost 100 *Atlantik* class vessels, 145 ordinary refrigerated vessels, and floating bases and seiners. Since the end of World War II, the Soviets have expanded their fleet through domestic construction as well as through purchases from abroad. Thus, they have gained the advantage of foreign technology in vessel construction and equipment which can be copied. As shown in Figure 22, about 42% of the gross registered tonnage in vessels of 100 GRT and above, added to the fishing fleet in 1965 was from Soviet shipyards. The most important foreign suppliers of fishing vessels have been East Germany, Poland, West Germany, Sweden, Denmark, Finland, United Kingdom, Netherlands, and recently, Japan and France.

The most important specialty in modern development of fishing has been the combining of processing with fishing on the vessels. As a consequence, since 1955, the construction of trawlers has been dominated by the fish-factory trawler program. The large freezing-canning trawlers, designed as BMRT's, catch and mechanically process the fish into frozen fillets, canned products, fishmeal, and oil. These large stern trawlers are in the *Pushkin*, *Mayakovskiy*, and *Leskov* series. Powered by at least 1,900 horsepower engines, they have endurance of over 2 months and capacities of about 600 tons of frozen fish and 100,000 cans of tinned products as well as storage facilities for fish oil and meal. The average catch of each of these vessels is about 7,300 tons of fish per year. The vessels are equipped with slipdecks and the most modern nautical and fishing equipment, including hydroacoustical devices for seeking out fish shoals.

FIGURE 22. ADDITIONS TO FLEET OF VESSELS 100 GRT AND ABOVE
(Gross register tons)

	1965	1966
Vessels 1,000 GRT and above.....	446,300	499,000
From U.S.S.R. shipyards.....	173,700	145,750
From other Communist shipyards.....	113,600	107,000
From rest of world shipyards.....	159,000	246,250
Vessels 100 to 1,000 GRT (from U.S.S.R. shipyards).....	24,700	95,000
Total additions.....	471,000	594,000

The *Natalya Kovskova*, the first of the new canning and freezing trawlers designed to operate in temperate or tropical regions, could supersede the *Mayakovskiy* and *Leskov* class trawlers. The *Tropik* and the more modern *Atlantik* are smaller versions of the fish-factory trawler.

There is also a large fishing fleet of medium sized vessels, which operate in conjunction with base and factory ships and other vessels. The SRT's, or medium sized trawlers, were originally designed to catch herring in the North Atlantic; more recently, they have been employed on the Newfoundland banks, as well as in the Far East for trawl fishing of sea perch. Since SRT's lack refrigerated holds necessary for autonomous voyages and sufficient motor power for extensive trawling, they have been superseded by the SRTR, *Okean* class, which has a refrigerated hold, and the SRTM, *Mayak*, which has freezing equipment.

Seiners are second in importance, after trawlers in the ranking of fish catching ships. In the Azov, Black, and Caspian seas, the large seiners (RS-300), equipped with purse nets, drifter nets, trawls, and electric lights, are employed. The RS-300's are used in fishing for *kilka*, grey mullet, horse mackerel, and belted bonita. The Soviets use smaller seiners for catching *sayra* in the Far East waters.

To facilitate fishing in remote fishing grounds, the expedition method of fishing is practiced. The functions of catching, processing and transport of fish are divided among fishing vessels, floating bases, and transport ships. The floating bases are an integral part of the expedition operation. The use of the *Severo Divinsk* and similar herring bases marked the beginning of modern fishing bases. Since 1960, there have been constructed new classes of floating bases—the *Pionersk*, *Rybat'skaya Slava*, and *Spassk*. These new classes are designed for serving fishing ships in the open sea. The floating bases are highly mechanized and are equipped to freeze fish as well as to process waste products into meal and oil. The *Andrey Zakharov* class of factory base ships is used for canning crab and the *Lenin Luch* and *Krasniy Luch* are used for canning tuna. The *Vostok*, a 43,000 GRT fishing base, to be launched in 1968, is equipped with 14 subordinate fishing boats and is designed for tropical fishing. This factory ship will be able to stay at sea for 125 days and freeze 10,000 tons of fish, as well as process 10 million cans of fish and several thousand tons of fishmeal per trip. This vessel could become the model for future fishing bases and alter the whole pattern for current fishing expeditions. With the adoption of the expedition method of fishing, many new processing refrigerated fish transports have been built. Since 1960, such new classes as the *Rembrandt*, *Skryplev*, *Sibir*, and *Yantarnyy*, processing vessels with trawling capabilities, and *Bratsk* and *Tavriya*, processing transport vessels, have begun to operate in the fishing expeditions.

The Soviet whaling fleet has remained static since 1963. The 7 whale factory ships in the Soviet whaling fleet include the *Aleut*, *Yuri Dolgorukiy*, and *Slava*, which were built in the 1920's, as well as the *Sovetskaya Ukraina* and *Sovetskaya Rossiya*, 32,024 GRT vessels built in 1955, which operate in the Antarctic whaling region. The *Vladivostok* and *Dalniy*, *Vostok*, each 17,000 GRT, were built in 1962 and 1963, respectively, to operate in the Far East as whale-factory/fish-factory vessels. The Soviets do not plan to build any additional whaling vessels and plan to alter existing whale factory ships for processing fish, since prospects for whale catches are declining.

b. FISHING GEAR AND TECHNIQUES — As shown in Figure 23, modernization of the fleet has been reflected in a shift of fishing methods with 88% of the catch resulting from "active" fishing in 1965 compared with only 36% in 1950. The types of gear most often used for fisheries in the high seas are trawls, drift nets, and purse seines. Trawling, which is mainly used for catching bottomfish such as cod, redfish, etc., accounted for nearly half of the 1965 catch. Drift net fishing, the second most important method, is widely used in the North Atlantic and in the Far East. The lifting of the drift nets has been mechanized and special machines for shaking out the fish from nets have been introduced. Purse seines, for the catch in the upper water layers, are widely used in the Far East and in the Black Sea. Coastal fishing is done mainly by means of set gill nets and drag seines.

The use of underwater electric light attraction in fishing has been developed by the Soviets. Fish pumps are the main type of gear for transferring the fish attracted by underwater lights directly into the ship. This method is used extensively in the *kilka* (herring family) fishery of the Caspian Sea. About 90% of the *kilka* tonnage is caught with the use of electric lights.

More than 90% of ocean fishing vessels are equipped with fish finding equipment. The number of completely mechanized lines for fishing and processing of fish on fishing vessels has increased rapidly

FIGURE 23. FISH CATCH, BY METHOD USED
(Percent)

METHOD	1940	1950	1955	1963	1965
Active fishing.....	26.3	35.8	57.5	77.4	88.3
Trawling.....	15.6	19.2	32.6	36.7	49.9
Drift netting.....	6.2	5.1	8.8	11.6	10.3
Purse seining.....	3.2	4.2	3.1	5.9	5.8
Use of electric lights....	0	0.1	4.2	6.6	6.7
Catching whales and sea animals.....	1.3	7.2	8.8	16.6	15.6
Passive fishing.....	73.7	64.2	42.5	22.6	11.7
Beach seine.....	18.7	16.4	9.7	5.9	na
Trap net.....	26.2	22.4	15.5	5.2	na
Fixed gill net.....	12.0	11.1	12.1	5.2	na
Other.....	16.8	14.3	5.2	6.3	na

na Data not available.

to the point that a majority of the oceangoing vessels have this equipment. Airplanes and helicopters are used in the search for fish shoals.

Despite the considerable growth in the fishing industry since World War II, the Soviets have been highly critical of the overall performance of the fishing fleet. The growth in the fish catch has been due primarily to the expanded fleet and not to its better utilization. As recently as 1965, the large fish factory trawlers (BMRT) and the medium trawlers (SRT) were occupied in fishing operations for only 44% and 38%, respectively, of the calendar year. Idle time, spent chiefly under repair or waiting for repair, took up 25%-30% of the total time. Also, considerable unproductive time is spent waiting to transfer fish catches to transport or base ships, a shortage of which has handicapped the industry.

C. PORTS AND VESSEL FACILITIES.— Soviet fishing is centered on about 20 ports, the most important of which are listed in Figure 24. The Far East's largest ports, Vladivostok and nearby Nakhoda in Primorskiy Kray, combined are the largest port in the whole U.S.S.R.; 1,023,000 tons of the Far East catch was caught by their fishermen in 1965, an amount 3 times their 1958 catch. The Far Eastern refrigerator fleet, which serves the entire Soviet Far East, and the crab and Pacific whaling fleets are based at Vladivostok. A majority of their fishermen work in the Bering Sea.

Murmansk is the principal port of the North Atlantic. Ice free Murmansk, with its superior transportation and port facilities is home port for virtually all northern trawlers, the principal means of catching herring and cod. Murmansk fishermen caught 884,000 metric tons of fish in 1965. Kaliningrad is the second largest base, after Murmansk, on the western side of the Eurasian continent. It controls fleets in the Baltic, North, and South Atlantic, and a whaling flotilla in the Antarctic. About 625,000 tons of fish were caught by the Kaliningrad fleets in 1965.

FIGURE 24. FISH CATCH,* BY SOVIET FISHING PORTS
(Thousand metric tons)

	1958	1965	1970 PLAN
Total U.S.S.R.....	2,936	5,774	8,500
Of which:			
Murmansk.....	509	884	1,200
Kaliningrad.....	140	625	850
Estonia: Tallin and others.....	59	178	na
Latvia: Riga and others.....	95	291	na
Lithuania: Klaipeda and others..	93	238	400
Leningrad.....	45	62	na
Primorskiy Kray: Vladivostok and Nakhodka.....	340	1,023	1,400
Kamchatka: Petropavlovsk and others.....	204	418	900
Sakhalin: Rybnovsk and others..	179	370	640

na Data not available.

*Includes whales and sea animals, crustaceans, and aquatic plants.

Odessa and Ilichevsk on the Black Sea are major ports for Central and South Atlantic fishing operations, while Sevastopol is home port for much of the South Atlantic and Indian Ocean fishing. The parent ship *Vostok* is to be based at Sevastopol, as are many of the tuna fishing vessels.

Lack of adequate port facilities, greatly neglected in the past, has been a distinct handicap to the Soviet fishing industry. In fact, the inadequacy of port facilities was an important factor in the decision to operate large fish factory trawlers and large factory ships which require fewer shore facilities. To accommodate the needs of the large trawlers and factory ships, however, the Soviets have found it expedient to improve virtually all of their ports in the 1960's. Large mechanized harbors with the associated canning factories, refrigeration and processing plants, and ship repair yards are being built.

All U.S.S.R. fishing ports are under the administrative control of the Ministry of Fisheries, and the ministry delegates authority to 5 directorates. These include the Directorate of the Far Eastern Fisheries, the Directorate of the Caspian Sea, Directorate of the Azov and Black Seas, Directorate for Western Fisheries, and Directorate for Northern Fisheries. The Directorate of the Far Eastern Fisheries, *Dalryba*, with headquarters in Vladivostok, administers the fisheries in the Pacific and freshwater fisheries in Siberia and Kamchatka. The ports of Kamchatka Oblast, Magadan Oblast, Sakhalin and Kuril Islands, Primorskiy Kray, and Khabarovsk Kray are subordinate to *Dalryba*. This includes about 35% of the Soviet fish catch, 17% of the units, and 34% of the horsepower of the fishing fleet.

The Directorate for Northern Fisheries, *Sevryba*, with headquarters at Murmansk, covers the fisheries in the Barents Sea, part of the herring fisheries in the Norwegian Sea, as well as the Western Atlantic, White Sea, and northern Russian freshwater fisheries. *Sevryba* in 1965 was responsible for 17% of the catch of fish and sea animals, 8% of the units, and 17% of the horsepower of the fishing fleet.

Riga is headquarters for *Zapryba*, or the Directorate for Western Fisheries, which covers fisheries in the Baltic, North Sea, and Atlantic Ocean. The ports of Kaliningrad and Klaipeda are subordinate to *Zapryba*. *Zapryba* is responsible for about 24% of the catch, 21% of the units, and 28% of the horsepower of the fleet.

The Directorate of the Caspian Sea, *Caspryba* of Astrakhan, covers the fisheries in the Caspian Sea, the Aral Sea, the Volga and Ural Rivers, which are the main producers of caviar. *Caspryba* is responsible for 8% of the catch, 17% of the units, and 6% of the horsepower of the fishing fleet.

Fisheries in the Black Sea, the Mediterranean Sea, and the Indian Ocean, are under the Directorate of the Azov and Black Seas, *Azcherryba*, located in Sevastopol. *Azcherryba* is responsible for 12% of the

catch, 10% of the units, and 12% of the horsepower of the fishing fleet.

5. Utilization of catch

The fish catch of the U.S.S.R. is marketed as fresh whole fish, fresh and frozen fillets, salted, pickled, smoked, and canned products (Figure 44). Among nonfood products derived from fishing are whale oil, sperm oil, fishmeal, fish body oils, and furs. In recent years the growth in numbers of fish-factory trawlers and factory ships has been such that today over 60% of the Soviet catch is processed at sea. This has led to a considerable change in the proportions of the components of the processed fish products, as well as a general upgrading of edible fish products in recent years. In 1965, nearly 3 million tons of edible fish products were produced, 1.4 million tons of which were frozen fish. The 1970 plan calls for the production of 4.3 million tons of edible fish products, 2.5 million tons of which will be frozen. At present, only a small amount of fish is processed into fresh and frozen fillets. The Soviets plan to increase fillet production to 150,000 tons by 1970, or, 18 times in comparison to 1965. The differential in marketing price between fish in the round and fish fillet is the impetus for developing this product.

The processing of canned fish has expanded in recent years. The Soviets processed 959.8 million standard cans of fish in 1965, as compared to 761.1 million standard cans in 1961. The fish canneries offer a wide assortment of canned fish, including fish *au naturel*, fish in tomato sauce, and fish in oil. The traditional species such as herring, sprat, sardines, salmon, tuna, and mackerel are canned, as well as other species which other countries usually do not can.

With the emphasis on fresh, frozen, and canned products, the share of salted fish, excluding salted herring, decreased to about 8% of the output of edible fish products by 1965, in comparison to 17% in 1961. Salted herring, a delicacy to the Soviets, represents about 19% of the edible fish products. To increase the palatability of salted fish, and herring in particular, the Soviets have been shifting from heavily salted to lightly and medium salted fish. According to Soviet plans, the output of slightly and medium salted herring will be at least 80% of the total volume of production of salted herring by 1970.

Production of inedible fish products has doubled in recent years and should continue to increase. Fish and whale meal production alone has increased from 100,600 tons in 1961 to 264,500 tons in 1966.

6. Foreign trade

Soviet trade in fish and fish products, which shifted in 1959 from net imports to net exports, had remained rather stable during the 1960's until 1965, when net exports rose from the 1961-64 average of \$28 million to \$35.9 million, increasing to \$55.5 million in 1966 (Figure 45). In 1965, the Soviets be-

came net exporters of fresh, chilled and frozen fish. Japan alone imported 43,000 tons of fresh, frozen, and chilled fish. Ghana and Cuba imported 20,000 and 12,500 tons, respectively, of this product.

Imports of fresh, chilled and frozen fish are nearly up to the levels of the late 1950's. Over 50% of the fresh, chilled and frozen fish imported are filleted. Iceland and Norway are the principal exporters, each having exported 10,000 tons of filleted fish to the U.S.S.R. in 1965. Continued imports of fish fillet are likely as long as domestic production fails to provide this highly desirable product in sufficient quantities.

Since 1964, the Soviets have shifted from net importers to net exporters of oil from aquatic animal sources. Net whale oil exports, 3,400 tons in 1964, reached 41,700 tons in 1966. Exports of whale oil to Holland alone have increased from negligible in 1962 to 35,900 tons in 1965. Canned crab, caviar and salmon are the most important individual fish product exports, and, combined, amounted to over 30% of fish export value in 1965.

D. Food supply

The average daily per capita caloric intake in the U.S.S.R. during 1966 is estimated to have been about 3,180 calories, which approximates the United States level of 3,160. The percent of total caloric intake supplied by the different foods in the U.S.S.R. and U.S. during 1966 was as follows:

	U.S.S.R.	U.S.A.
Meat and poultry	6.0	18.6
Slaughter fats	2.4	4.0
Milk and milk products	13.1	11.5
Fish .....	.5	.3
Vegetable oil	5.0	13.7
Potatoes	8.2	2.8
Sugar	10.6	16.3
Vegetables	1.0	2.7
Grains and pulses	48.2	24.0
Other	5.0	6.1
Total	100.0	100.0

In 1966 over one-half of the calories in the average Soviet diet were supplied by grains, potatoes and pulses, compared to about one-fourth in the U.S. Livestock products—meat, slaughter fats, and milk—and fish supplied 22% of the calories in the U.S.S.R. compared to over 34% in the U.S. Per capita consumption of vegetable oil and sugar in the U.S.S.R. is considerably below U.S. levels. The estimated quantities of principal foods consumed per capita in 1966 in the U.S.S.R. and the calories supplied by these foods are shown in Figure 25.

The absence of any sizable area climatically suitable for winter production of fruits and vegetables, plus the lack of refrigeration and rapid transport facilities, imposes a monotony in the diet during the winter season since fresh or frozen fruits and vegetables are practically absent. The lack of adequate refrigeration, transport and distribution facil-

FIGURE 25. PER CAPITA* AVAILABILITY OF FOODS, 1966

COMMODITY	KILOGRAMS PER YEAR	CALORIES PER DAY
Flour.....	165	1,535
Potatoes.....	136	260
Sugar.....	35	335
Fats and oils**.....	10	230
Vegetables.....	57	35
Meat and poultry.....	35	190
Milk.....	253	415
Fish.....	13	20
Other foods***.....	na	160
Total calories.....		3,180

na Data not available.

... Not pertinent.

*Based on a population count of 232.2 million.

**Includes vegetable oils and edible animal body fats but excludes butter.

***Other foods are estimated to account for 5% of the total available calories.

ities also adversely affect the regional distribution and ready availability of meat, fish and milk throughout the year.

The average diet of the Soviet people, while quite monotonous particularly in some of the less developed areas, is adequate in terms of calories and apparently is not grossly lacking in the other elements of adequate nutrition. There is no evidence of widespread nutritional deficiency diseases. The diet is, however, much lower in the proportion of the more desirable foods such as meat, sugar, vegetable oil, fruits and vegetables, than are the diets of other industrial countries of similar climate. No significant change in daily per capita caloric intake is expected during the next several years, but the quality of diet will probably continue to improve slowly.

E. Forests and forest products

The U.S.S.R. logs more timber and provides more lumber than any other country in the world; it is on a par with the United States in the production of industrial logs (Figure 26). From 1933 to 1937, the U.S.S.R. accounted for 20% of world wood exports, in terms of volume, and since 1956, has again ranked

FIGURE 26. PRODUCTION OF BASIC WOOD PRODUCTS, U.S.S.R., AND SELECTED COUNTRIES, 1966
(Million cubic meters)

COUNTRY	TOTAL LOG RE- MOVALS	INDUS- TRIAL LOGS	LUMBER	PLYWOOD
U.S.S.R.....	373	272	107	1.77
United States.....	324	293	*86	12.81
Canada.....	114	108	24	1.80
Europe.....	321	234	72	3.32
Other countries..	875	222	82	5.61
World total... ..	2,007	1,129	371	25.32

*Includes production of railroad ties.

as one of the principal wood-exporting countries of the world. The value of annual wood exports (including paper and paper products) in the period 1964-66 averaged about US\$573,500,000, an increase of about 44% compared with the 1961-63 annual average.

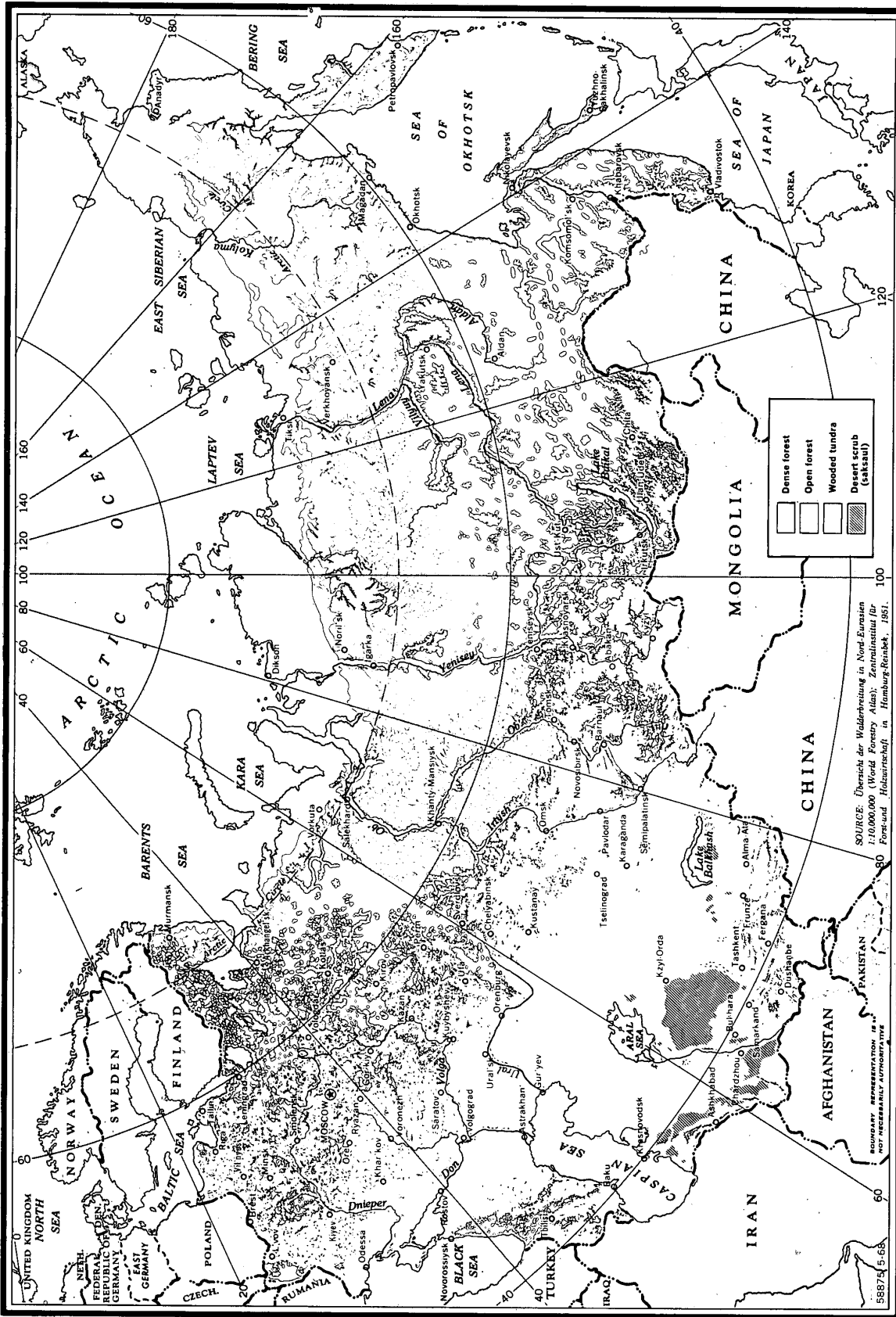
The logging, wood processing, and paper industries employed about 10% of the Soviet industrial labor force in 1965 compared with about 12% in 1960. Logging ranks first in terms of employment among the labor-consuming extractive industries and is therefore a primary target of the Soviet program to raise labor productivity in these industries. However, the 12% increase in labor productivity in logging in the period 1961-65 is significantly less than the 20% and 52% increases achieved in the same period in coal mining and petroleum extracting, respectively.

The movement of wood products involves a considerable portion of the Soviet transportation system. In terms of ton-kilometers, 12% of the total rail freight in 1965 was timber; and this commodity accounted for about 36% of the tonnage moved over the U.S.S.R. waterways. As a result of the relocation of the logging industry to more remote areas, the average rail haul for a ton of wood freight increased from 998 kilometers in 1950 to 1,519 kilometers in 1961 to 1,616 kilometers in 1965.

1. Forest resources

Forests cover almost 747,000,000 hectares, or one-third of the U.S.S.R.'s total land area. No other nation possesses forest resources approaching these in extent. Nearly one-fourth of the world's productive forest land capable of producing crops of industrial wood is in the Soviet Union. About one-half of the coniferous portion of the world's productive forests lies within the Soviet boundaries. This tremendous forest wealth has contributed substantially to the industrialization and overall economic development of the country. In broader perspective, the forests are of even greater importance by reason of their geographic position between the densely populated and timber deficient countries of Western Europe and the Far East.

The forest resources of the Soviet Union are so vast that log production could be doubled without damaging growing stock. Despite this enormous volume of standing timber, the country has not been able to satisfy its combined wood needs for home consumption and export. This failure is largely due to the unfavorable geographic location of the forests in relation to centers of wood consumption. Forests which contain the highest volume of timber lie in a belt from the northwest border to the southeast border (Figure 27). The major high-volume forests—in order of importance—are concentrated in the following river basins: The Angara-Yenisey in the Irkutsk region and in the southern part of the Krasnoyarsk region, the Ob' in the Tomsk region and in the central part of the Tyumen' region, the Bureya in the southern part



SOURCE: Übersicht der Waldverteilung in Nord-Eurasien
 1:10.000.000 (World Forestry Atlas); Zentralinstitut für
 Forst- und Holzwirtschaft, in Hamburg-Ranzbeck, 1951.

FIGURE 27. FOREST DISTRIBUTION

of the Khabarovsk region, the Upper Kama in the Urals, and the Northern Dvina-Vycheгда and the Pechora in the northwest. Karelia also has a high concentration of valuable timber.

Despite the large land area of the Soviet Union, forest types are relatively few and with the exception of those in the Caucasus mountains, simple in species composition. In forests of state significance, conifers occupy 74% of the total forest area (larch, 38%; pine, 16%; cedar, 6%; spruce, 12%; and other species, 2%). The principal broadleaf species are birch (13%) and aspen (3%). Spruce and Scotch pine are the dominant species in Karelia and in the Northern Dvina-Vycheгда, Pechora, and Kama basins. Fir becomes more important in the Kama basin. Pine and birch are the primary species in the Ob' basin, and larch and pine in the Angara-Yenisey basin. In the Bureya basin, larch, spruce, and fir are the dominant species.

Of the mountain forests, only those of the Caucasus are at present of great economic importance, although the roughness of the terrain and water conservation considerations impede their exploitation. In these predominantly broadleaf forests the principal species are oaks at the lower elevations and oriental beech at the higher elevations.

2. Primary processing and distribution of forest products

a. DEVELOPMENT OF THE TIMBER INDUSTRY — The 19th Party Congress in 1952 decreed a relocation of logging operations to the remote forest surplus areas of the North, Urals, and East and West Si-

beria. In spite of great difficulties, this relocation was accomplished. New areas accounted for 92% of the total increase in industrial wood production during 1951-65. The greatest production expansion took place in the Northwest, already the leading producer (Figure 28). The shift caused serious dislocations in transport, labor, and equipment distribution which, coupled with a decline in the production of logging tractors, were responsible for a temporary leveling-off of production and worker productivity in the early 1950's.

The relocation of the logging industry to remote areas required a vast resettlement of labor; inadequate housing caused almost continuous disruption of the worker resettlement program; and poor living conditions depressed labor morale and promoted inefficiency. Labor productivity also suffered from the use of seasonal labor as well as from inadequate equipment repair facilities in the areas of expanded operations. These problems continue to plague the logging industry, 15 years after the relocation began.

During the period 1960-62, the production of industrial wood leveled off at 5%-6% below the 1959 peak and leveled off again in the period 1964-66 at 1%-3% above 1959 production. These periods of slump and stagnation apparently were caused by a decline in labor productivity which, in turn, was the result of high labor turnover and inadequate and fluctuating investments in logging activities. Only 40% of the total investment funds allocated to the timber industry for the period 1959-65 was assigned to the logging sector compared to 70% for the pre-

FIGURE 28. FOREST RESOURCES, REMOVALS OF INDUSTRIAL LOGS, AND SAWMILLING, BY ECONOMIC REGIONS
(Million cubic meters)

REGION	FOREST RESOURCES*	REMOVALS OF INDUSTRIAL LOGS			SAWMILLING (LUMBER)	
		1950	1960	1965	1960	1965
Forest surplus areas:						
East Siberia.....	27,400	16.3	35.5	44.4	11.6	15.0
Far East.....	21,400	9.2	14.8	16.5	5.1	5.5
Urals.....	2,980	25.4	46.1	45.2	12.8	13.3
Northwest.....	7,600	34.5	69.2	73.1	16.6	18.3
West Siberia.....	8,740	11.4	17.0	20.8	7.2	8.2
Total.....	68,120	96.8	182.6	200.0	53.3	60.3
Sparsely forested areas:						
Central.....	1,570	14.5	19.6	18.1	9.9	9.6
Volga-Vyatsk.....	1,280	18.4	25.9	22.2	8.4	8.2
Volga.....	950	4.2	6.8	7.4	7.6	7.4
Ukraine.....	650	11.2	10.2	9.7	10.5	9.0
Belorussia.....	430	5.7	5.0	4.9	3.0	2.8
Baltic Republics.....	450	4.9	4.8	5.1	3.0	3.0
Other areas.....	1,390	5.2	6.6	6.2	9.8	10.5
Total.....	6,720	64.2	78.9	73.6	52.3	50.5
Total U.S.S.R.....	74,840	161.0	261.5	273.6	105.6	110.8

*Forest resources of state significance. Total forest resources, including the resources on land set aside for long-term utilization, amount to about 79 billion cubic meters.

vious 7-year period. Average annual investment in forestry as a whole follows (in millions of rubles):

1947-50	27.1
1951-55	23.9
1956-60	15.4
1961-65	37.1
1966-70 plan	58.6

The bulk of forestry investment in recent years (60% in 1959-65) has been allocated to the wood processing industries and has been spent primarily in the forest surplus areas. Thus, the wood processing industries are following the logging activities, which had previously been shifted in part to the forest surplus areas. These new wood processing centers are large integrated combines—primarily in the Ob', Yenisey, and Angara river basins. The construction of these combines has gradually increased total sawmill production as well as shifting a larger share of sawmilling to the forest surplus areas—54% in 1965 compared with 51% in 1960.

Although about two-thirds of the Soviet forest resources are located in East Siberia and the Far East, these areas accounted for only 22% of the industrial log removals and only 18% of the lumber produced in 1965. On the other hand, the sparsely forested areas, with only about 9% of the forest resources, produced almost 27% of the industrial wood and about 46% of the lumber. Many of the sawmills in the sparsely forested areas continue to rely heavily upon the forest surplus areas for their supply of sawlogs. A comparison of the removal of industrial logs and sawmilling in 1965 and 1960 in the forest surplus and sparsely forested areas is included in Figure 28.

b. PRODUCTS AND CONSUMPTION

(1) *Fuelwood* — The reported production of fuelwood⁶ increased after World War II to a peak of about 128 million cubic meters in 1959 (20% above 1945), but fluctuated within a narrow range of 97 million to 108 million cubic meters in the period 1960-66 (Figure 47). In the same period, the share of fuelwood in total wood removals from government forests has remained rather constant. However, the relative importance of fuelwood in the total energy balance declined from 18% in 1950 to an estimated 8%-10% in 1966. In Soviet industry, the share of fuelwood in the energy balance declined from 9% in 1950 to 3% in 1966.

The bulk of the fuelwood removed from government forests originated in the European U.S.S.R., the

⁶ Total fuelwood production is roughly divided at about one-third as removals from government forests (centrally planned, controlled and reported cuttings) and about two-thirds as removals from nongovernmental forests (self-suppliers, collective farm forests). Soviet forestry officials estimate total fuelwood production at roughly 300 million cubic meters annually, of which nearly 102 million cubic meters were from government forests in 1966.

Central and Urals regions being the most important producing areas.

(2) *Industrial wood* — Figure 46 gives the major end use categories of industrial wood removed from government forests.⁷ Sawlog removals, the raw wood used for the manufacture of lumber, is the most important category of industrial wood. In the period 1960-65, roughly 60% of total industrial wood removals was accounted for by sawlogs, the share of the latter decreasing from about 62%-63% in 1960-62 to about 59% in 1964-65 as other categories of end uses increased in importance.

Construction timber is the second largest category of industrial wood. Since most of the lumber produced from sawlogs is used in the construction industry, this industry is the principal consumer of industrial wood. The remainder of the sawlogs are processed for containers.

Pitprops and pulpwood are the next two most important categories of industrial wood. The production of pitprops has remained relatively constant. This has been accompanied by a reduction in the amount of pitprops used per 1,000 tons of coal mined by the coal industry (the coal industry accounts for about three-quarters of the total consumption of pitprops). The production of pulpwood has increased from approximately 10 million cubic meters in 1955 to approximately 21 million cubic meters in 1965. In recent years, the Soviet authorities have stressed the importance of increasing the production of pulpwood products (paper, cardboard, etc.). As a result, combined production of paper and cardboard increased from about 2.4 million metric tons in 1955 to about 4.7 million metric tons in 1965 and a further increase to about 8.6 million metric tons is scheduled for 1970. The pulp and paper industry has developed in closer proximity to the raw material base than has the sawmilling industry.

Railroad tie production accounts for the other important category of industrial wood; removals for this item have remained relatively constant in recent years. The railroad ties industry also has developed in closer proximity to the source of raw material than has the sawmilling industry. Most of the railroad ties in the U.S.S.R. are fabricated from conifers.

(3) *Lumber* — Lumber is the most important wood product. The U.S.S.R. ranks fifth behind the United States, Canada, Finland, and Sweden in per capita consumption of lumber and first in total lumber production—nearly one-third of the world total. Coniferous lumber accounts for 85% of the total pro-

⁷ There are no estimates of the quantity of industrial wood removed from nongovernmental forests, i.e., collective farm forests, since World War II. About 25 million cubic meters were removed from nongovernmental forests in 1928.

duction. Annual production of lumber has been as follows (in millions of cubic meters):

1950	49.5
1955	75.6
1958	93.7
1960	105.6
1961	104.3
1962	104.6
1963	106.4
1964	110.9
1965	110.8
1966	107.0

Fluctuations in industrial log output (Figure 47) generally are reflected in the production of lumber. For example, declines in the output of industrial logs in 1961 and 1965-66 resulted in declines also in the production of lumber in those years.

Figure 28 indicates the regional production of lumber and Figure 29 shows principal sawmilling and wood-processing centers. Actually, sawmilling and wood-processing facilities are much more widely distributed than indicated by the map of the major centers. For example, in 1962 there were 41,600 sawmills scattered throughout the U.S.S.R. employing 336,000 workers. Only 300 of the total, however, were considered major enterprises. These 300 sawmills employed 20% of the labor force, produced 30% of the lumber, and averaged 105,000 cubic meters of

lumber annually per mill. The 1,800 medium-sized sawmills produced another 53% of the lumber, while the 39,500 small sawmills produced the remaining 17% of the output, but averaged only 450 cubic meters of lumber annually per mill.

c. FOREIGN TRADE — Although an important exporter of wood and wood products (including pulp and paper products) in the period before World War II, the U.S.S.R.'s exports of these commodities declined after the war and the country became a temporary net importer of wood. Since 1955, however, net exports of these products have risen steadily and by 1965 the U.S.S.R. was in fifth place, behind Canada, Sweden, Finland and the U.S. Value data for total exports and imports of wood and wood products (Figures 48 and 49) indicate that net exports have increased from about US\$82 million in 1955 to about US\$470 million in 1966.

Lumber is the most important wood product exported, accounting in 1965-66 for 51% of the value of exports of wood and wood products. During the period 1955-66, exports of lumber more than tripled while the level of imports dropped 44% from 36% of the level of exports in 1955 to 6% of the level of exports in 1966. Although the industrial West remains the major consumer of Soviet lumber, there have been substantial gains in sales to East Europe

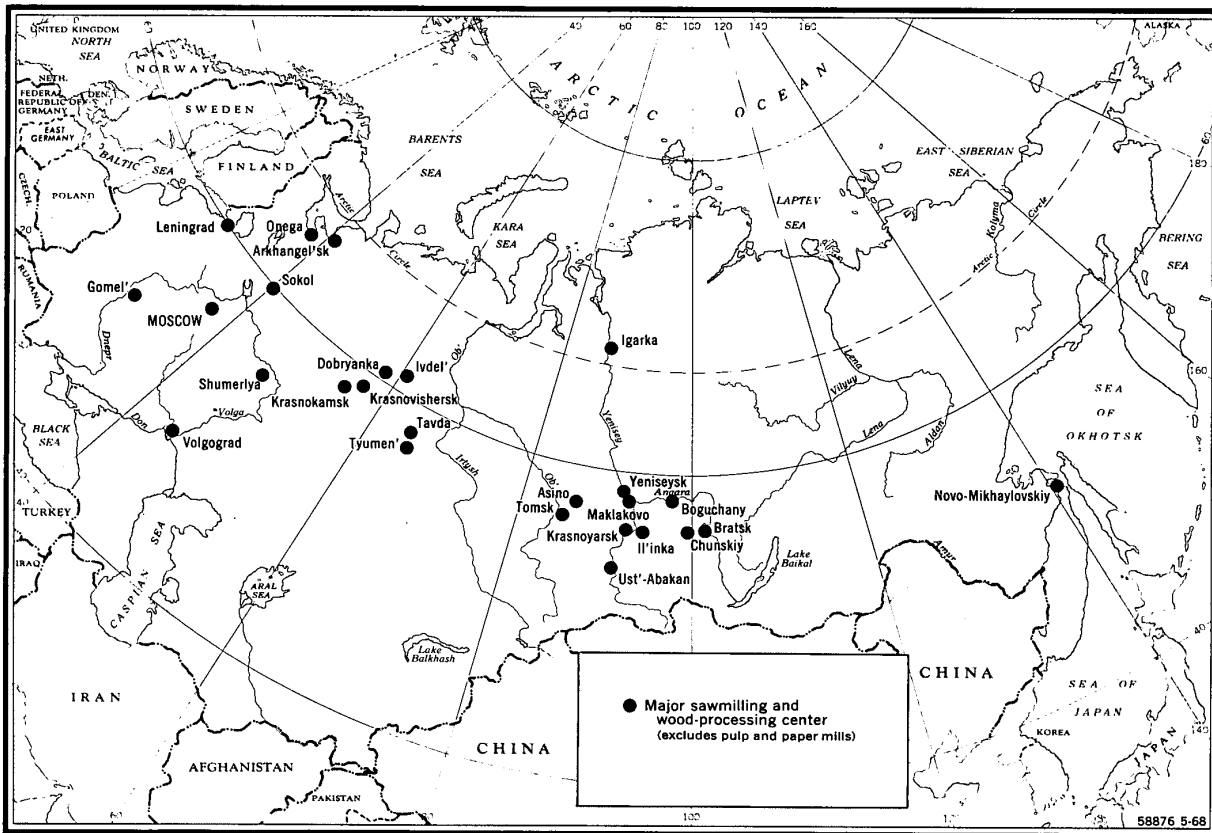


FIGURE 29. MAJOR SAWMILLING AND WOOD-PROCESSING CENTERS

and the less developed countries. Value data for Soviet exports and imports of lumber are given in Figures 50 and 51, respectively.

Exports to East Germany and Hungary, which have ranked second and third, respectively, to the United Kingdom for the past decade as a consumer of Soviet lumber, increased sharply in the period 1955-63 but leveled off in the period 1964-66 to about 10% above 1963. The U.S.S.R. has been using lumber as a means of payment for the growing imports of agricultural commodities from the timber-deficit less developed countries. The U.A.R., which has steadily increased its imports since 1955, was the largest importer of Soviet lumber within this group in the period 1955-66.

In terms of world conifer lumber exports, the U.S.S.R. has risen from an insignificant position in 1954 to a place second only to Canada in 1961, and to third place behind Canada and Sweden in 1964-66. Yet Soviet lumber exports remain small in relation to production and could be increased significantly without having much of an impact upon internal consumption. Furthermore, some of the major production capacity areas are situated more conveniently for foreign trade than for the internal market.

F. Statistical data

This subsection presents detailed information in tabular form in the general order of reference in the text.

FIGURE 30. RYE: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	23.7	7.6	18
1955.....	19.1	8.6	16
1960.....	16.2	8.0	13
1963.....	15.0	7.3	11
1964.....	16.8	7.7	13
1965.....	16.0	8.7	14
1966.....	13.6	8.3	11
1967.....	12.4	8.9	11

FIGURE 31. BARLEY: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	8.6	7.0	6
1955.....	9.9	10.1	10
1960.....	12.1	7.4	9
1963.....	20.4	8.8	18
1964.....	21.7	9.7	21
1965.....	19.7	9.1	18
1966.....	19.4	11.5	22
1967.....	19.1	10.6	20

FIGURE 32. CORN:* SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	4.8	13.8	7
1955.....	6.2	18.7	12
1960.....	5.1	15.7	8
1963.....	7.0	14.3	10
1964.....	5.1	25.4	13
1965.....	3.2	20.9	7
1966.....	3.2	21.9	7
1967.....	3.5	21.4	8

*Corn as mature grain—does not include immature ears.

FIGURE 33. MISCELLANEOUS GRAINS:* SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	ESTIMATED PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	27.3	7.0	19
1955.....	27.8	6.8	19
1960.....	21.8	7.8	17
1963.....	22.9	5.7	13
1964.....	21.8	6.9	15
1965.....	18.9	7.0	13
1966.....	18.6	9.7	18
1967.....	20.2	9.9	20

*Including oats, millet, buckwheat, pulses, rice, etc.

FIGURE 34. OTHER VEGETABLES: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	1.3	72	9.3
1955.....	1.5	94	14.1
1960.....	1.5	111	16.6
1963.....	1.4	104	15.2
1964.....	1.5	130	19.5
1965.....	1.4	123	17.6
1966.....	1.4	125	17.9
1967.....	1.4	137	19.8

FIGURE 35. RAW COTTON: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	2.32	15.3	3.54
1955.....	2.20	17.6	3.88
1960.....	2.19	19.6	4.29
1963.....	2.48	21.0	5.21
1964.....	2.46	21.5	5.29
1965.....	2.44	23.2	5.66
1966.....	2.46	24.3	5.98
1967.....	2.44	24.8	5.97

FIGURE 36. FIBER FLAX: SOWN AREA AND PRODUCTION

	SOWN AREA	YIELD PER HECTARE	PRODUCTION
	<i>Million hectares</i>	<i>Quintals</i>	<i>Million metric tons</i>
1950.....	1.90	1.3	.25
1955.....	1.48	2.6	.38
1960.....	1.62	2.6	.42
1963.....	1.46	2.6	.38
1964.....	1.57	2.2	.35
1965.....	1.48	3.3	.48
1966.....	1.40	3.3	.46
1967.....	1.38	3.3	.46

FIGURE 37. NUMBER OF LIVESTOCK
(Millions)

YEAR*	CATTLE (INCLUDING COWS)	COWS	HOGS	SHEEP AND GOATS	HORSES
1928**.....	66.8	33.2	27.7	114.6	36.1
1940**.....	47.8	22.8	22.5	76.7	17.7
1950.....	58.1	24.6	22.2	93.6	12.7
1953.....	56.6	24.3	28.5	109.9	15.3
1958.....	66.8	31.4	44.3	130.1	11.9
1960.....	74.2	33.9	53.4	144.0	11.0
1963.....	86.9	37.9	69.9	146.3	9.1
1964.....	85.4	38.3	40.9	139.5	8.5
1965.....	87.2	38.8	52.8	130.7	7.9
1966.....	93.4	40.1	59.6	135.3	8.0
1967.....	97.1	41.2	58.0	141.0	8.0
1968.....	97.1	41.6	50.8	143.9	8.0

*1 January census.

**Present boundaries.

FIGURE 38. RELATIVE VALUE OF AGRICULTURAL EXPORTS
(Percent)

ITEM	1962	1963	1964	1965	1966
Grain and grain products.....	43.8	36.7	29.0	28.4	21.4
Cotton.....	20.0	19.5	31.8	31.8	29.7
Livestock and livestock products.....	16.7	19.8	15.2	14.0	17.9
Oilseeds and oilseed products.....	6.8	8.1	7.7	9.1	14.8
Sugar.....	4.8	8.4	6.0	4.6	5.4
Other agricultural products.....	7.9	7.5	10.3	12.1	10.8
Total agricultural products.....	100.0	100.0	100.0	100.0	100.0
Agricultural as percent of total exports.....	18.4	17.1	12.2	12.9	14.0

FIGURE 39. RELATIVE VALUE OF AGRICULTURAL IMPORTS
(Percent)

ITEM	1962	1963	1964	1965	1966
Sugar.....	18.4	10.4	12.3	13.9	11.5
Livestock and livestock products.....	16.3	10.4	13.9	18.1	16.3
Rubber.....	16.3	11.1	4.6	6.3	7.0
Fruits and vegetables.....	13.1	13.8	11.0	10.0	10.3
Cotton.....	9.4	11.6	5.9	7.4	6.5
Coffee, cocoa, and tea.....	4.9	5.2	5.2	5.7	3.7
Grain and grain products.....	4.3	18.2	31.1	21.2	25.8
Tobacco.....	3.8	6.6	7.7	8.1	9.1
Oilseeds and oilseed products.....	2.0	2.0	1.7	2.3	1.5
Other agricultural products.....	11.5	10.7	6.6	7.0	8.3
Total agricultural products.....	100.0	100.0	100.0	100.0	100.0
Agricultural as percent of total imports.....	19.6	20.7	26.1	27.1	27.4

FIGURE 40. FISH AND MARINE ANIMAL CATCH
(Thousand metric tons)

	FISH*	MARINE** ANIMALS	TOTAL CATCH
1958.....	2,611	325	2,936
1959.....	2,743	332	3,075
1960.....	3,019	522	3,541
1961.....	3,250	474	3,724
1962.....	3,617	550	4,167
1963.....	3,977	704	4,681
1964.....	4,476	695	5,171
1965.....	5,100	674	5,774
1966.....	5,349	744	6,093
1967.....	5,777	***738	6,515
1968 (plan).....	na	na	6,720
1970 (plan).....	na	na	8,500

na Data not available.

*Includes crustaceans and aquatic plants.

**Includes whales, seals, sea lions, polar bears, dolphins, etc.

***Residual.

FIGURE 41. FISH CATCH, BY SPECIES
(Thousand metric tons)

	1961	1966	1967
Freshwater fish.....	420.4	424.0	460.4
Salmon, trout, smelt, etc.....	128.2	157.0	140.6
Herring, sardine, anchovy, etc.	1,075.6	1,731.6	1,677.1
Flounder, halibut, sole, etc....	273.1	206.7	293.2
Cod, hake, haddock, etc.....	767.3	1,693.7	2,045.2
Sea perch, bass, mullet, jack, etc.....	259.3	762.9	759.0
Crustaceans.....	39.4	58.9	58.9
Other fish.....	286.8	249.8	268.0
Aquatic plants.....	...	64.6	74.8
Total fish and aquatic plants.	3,250.1	5,349.2	5,777.2

... Not pertinent.

FIGURE 42. ESTIMATED CATCH,* BY MAJOR FISHING AREAS
(Thousand metric tons and percent of total)

REGION OF FISHING	1950		1955		1960		1965		1966
North East Atlantic.....	402.3	24.3	1,075.1	40.2	1,134.0	32.3	1,041.0	18.2	1,147.7
North West Atlantic.....	0	0	0	0	285.0	8.1	853.1	14.9	711.2
West Central Atlantic.....	0	0	0	0	0	0	56.7	1.0	168.5
East Central Atlantic.....	0	0	0	0	47.0	1.3	69.5	1.2	79.3
South East Atlantic.....	0	0	0	0	0	0	367.1	6.4	361.2
South West Atlantic.....	0	0	0	0	0	0	0	0	73.3
North Pacific Ocean.....	483.8	29.2	639.9	23.9	835.5	24.4	1,826.0	31.9	1,635.2
North West Indian Ocean.....	0	0	0	0	0	0	34.7	0.6	75.7
Caspian Sea.....	319.1	19.3	447.0	16.8	366.9	10.5	448.0	7.8	375.8
Azov-Black Seas.....	234.3	14.3	170.5	6.4	152.6	4.3	226.5	3.9	307.7
Other waters.....	214.9	13.0	341.3	12.7	672.9	19.1	802.7	14.1	na
Total.....	1,654.4	100	2,673.8	100	3,513.9	100	5,725.3	100	na

na Data not available.

*Catch of Ministry of Fisheries. Excludes catch of agricultural *kolkhozes* and consumer cooperatives.

FIGURE 43. ESTIMATED STRENGTH OF SOVIET FISHING FLEET*

DESIGNATION	FUNCTIONAL TYPE	NUMBER OF VESSELS		TOTAL GROSS REGISTER TONS	
		1964	1967	1964	1967
BMRT, BRKT, RRT, RTM.	Fish factory trawlers.....	182	348	537,491	1,027,185
BRT, MRTR, RMS, RT, SRTM, SRTR.	Refrigerated/freezing fishing trawlers.....	625	790	372,069	479,619
SRT.....	Medium fishing trawlers.....	**998	**998	**225,794	**255,794
RS.....	Ocean-going seiners.....	555	646	70,604	84,838
PR.....	Processing refrigerated fish transports.....	29	65	124,303	330,281
RR.....	Refrigerated fish transports.....	269	279	179,161	214,721
FAC.....	Factory ships (crab and fish).....	19	51	194,879	712,701
KB.....	Whale factory ships.....	7	7	143,375	143,375
KS, KU.....	Whale catchers/killers.....	130	136	99,518	104,582
KV.....	Sealers.....	27	27	8,728	8,728
TB.....	Tuna factory base and catcher ships.....	4	11	16,403	30,137
TR.....	Refrigerator transports.....	82	85	367,077	389,997
BSE.....	Base ships (fishery).....	63	63	326,087	326,087
CGF.....	Cargo support ships.....	19	19	59,447	59,447
PL, PM.....	Repair ships (large, medium, small)***.....	25	30	23,506	25,506
FWC, TM.....	Fuel and water carriers/tankers.....	94	109	123,311	165,764
MB, SMB.....	Seagoing/salvage tugs.....	58	70	31,615	33,595
TRN.....	Fishery training vessels.....	8	8	20,345	20,345
AA, NIS.....	Research vessels (fishery, hydrographic, oceanographic, scientific).....	72	74	64,398	75,318
Total.....		3,266	3,816	3,018,111	4,488,020

*Vessels 100 GRT and above.

**These figures, based on data appearing in the "Register of Shipping of the U.S.S.R., 1964-65," are significantly less than those for 1961, previously published.

***Nonself-propelled vessels.

FIGURE 44. UTILIZATION OF THE FISH CATCH
(Thousand metric tons)

PRODUCT	1961	1963	1965	1966	1970 PLAN
Total edible fish products.....	2,018.5	2,586.5	2,876.1	3,018.2	4,300
Canned.....	269.8	294.3	348.3	365.0	460-495
Fish products.....	262.9	286.0	338.2	355.8	na
King crab.....	3.5	4.0	6.1	6.3	na
Caviar.....	3.4	4.3	4.0	2.9	na
Other edible fish products:					
Live, chilled, frozen, and fillet.....	797.1	1,132.1	1,578.7	1,766.1	3,040
Live.....	na	na	na	na	120
Chilled.....	na	na	na	na	270
Frozen.....	na	na	1,430.0	na	2,500
Fillet.....	na	na	8.7	na	150
Smoked, dried, <i>balik</i>	90.1	85.3	100.7	104.5	na
Salted herring.....	461.5	614.7	534.4	523.6	na
Salted, other.....	349.9	372.4	229.2	165.4	na
Spiced and marinated.....	50.1	87.7	84.8	93.6	na
Selected nonfood fish products.....	206.1	262.9	354.2	373.6	na
Whale oil.....	59.5	73.6	41.2	27.3	na
Sperm oil.....	25.3	48.5	76.0	81.8	na
Fish body oils.....	20.7	0	0	0	0
Fish and whale meals and solubles.....	100.6	140.8	237.0	264.5	520
Whale meal.....	16.5	28.1	34.4	26.0	na
Fishmeal and solubles.....	84.1	112.7	202.6	238.5	na

na Data not available.

FIGURE 45. FOREIGN TRADE

	1962				1964	
	Imports		Exports		Imports	
	<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>
Fish, other than canned.....	54.3	12,924	40.5	6,638	66.3	15,621
Fresh, chilled or frozen fish.....	37.6	9,646	0	0	49.8	12,443
Of which: Fish fillets.....	23.0	7,849	0	0	27.4	9,438
Dried, salted or smoked fish.....	16.7	3,278	40.5	6,638	16.5	3,178
Of which: Salted herring.....	16.7	3,278	0	0	16.5	3,178
Canned fish and fish products.....	.04	627	24.4	26,323	.05	811
Salmon.....	0	0	4.2	5,206	0	0
Caviar.....	.04	627	0.2	1,803	.05	811
King crab.....	0	0	3.0	6,799	0	0
Miscellaneous.....	0	0	17.0	12,515	0	0
Other fish and fish products for food.....	...	937	...	4,233	...	425
Total fish and fish products for food.....	...	14,488	...	37,194	...	16,857
Whale oil.....	24.7	4,280	14.2	3,164	35.0	8,584
Fish oil, medicinal.....	0	0	0.6	210	0	0
Fishmeal.....	0	0	3.7	430	0	0
Total, all fish and fish products.....	...	18,768	...	40,998	...	25,441
Net exports.....	...	...	...	22,230	...	...
Net exports (1,000 dollars*).....	...	...	...	...	...	...

... Not pertinent.

*At the official exchange rate (1 ruble=US\$1.111).

FIGURE 46. END USE OF INDUSTRIAL LOGS
REMOVED FROM GOVERNMENT FORESTS
(Million cubic meters)

	1955	1960	1962	1965
Sawlogs.....	114.5	161.2	160.9	160.6
Construction timber and con- tainer logs.....	16.9	37.7	33.5	39.9
Pulpwood.....	9.9	14.4	16.3	20.9
Pitprops.....	20.7	24.0	21.4	20.7
Railroad ties.....	9.9	12.0	11.7	10.6
Raw material for plywood....	2.6	4.0	4.7	5.6
Telegraph and other special poles.....	1.7	3.5	3.5	4.7
Shipbuilding and hydrotech- nical timber.....	2.4	2.4	2.4	2.3
Other*.....	33.5	2.3	1.3	8.3
Total.....	212.1	261.5	255.7	273.6

*Includes match fitches, chemical wood, etc.

FIGURE 47. LOG REMOVALS FROM GOVERNMENT
FORESTS
(Million cubic meters)

	INDUSTRIAL LOGS	FUELWOOD	TOTAL
1950.....	161.0	105.0	266.0
1955.....	212.1	121.8	333.9
1958.....	250.9	124.1	375.0
1960.....	261.5	108.0	369.5
1961.....	253.3	97.7	351.0
1962.....	255.7	97.0	352.7
1963.....	267.3	102.3	369.6
1964.....	276.9	108.4	385.3
1965.....	273.6	104.5	378.1
1966.....	271.7	101.7	373.4

IN FISH AND FISH PRODUCTS

1964		1965				1966			
Exports		Imports		Exports		Imports		Exports	
<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>	<i>Thousand metric tons</i>	<i>Thousand rubles</i>
114.9	17,510	47.4	12,287	184.8	17,492	41.8	13,190	229.8	27,804
79.9	11,248	41.4	11,133	154.4	11,760	40.4	12,948	204.6	22,597
0	0	23.3	8,315	0	0	22.9	9,301	0	0
35.0	6,262	6.0	1,154	30.4	5,732	1.4	242	25.2	5,207
0	0	6.0	1,154	0	0	1.4	242	0	0
20.6	25,541	.3	1,081	20.0	26,178	.1	994	21.5	28,872
3.2	3,402	0	0	3.6	3,689	0	0	4.1	4,241
0.5	2,604	.3	1,081	.7	3,425	.1	994	.7	4,962
5.3	10,770	0	0	4.9	10,487	0	0	5.5	11,299
11.6	8,765	0	0	10.8	8,577	0	0	11.2	8,370
...	305	...	553	...	334	...	493	...	2,330
...	43,356	...	13,921	...	44,004	...	14,677	...	59,006
38.4	6,448	31.2	7,983	56.0	8,990	28.8	7,367	70.5	11,248
0.5	152	0	0	0.7	219	0	0	0.6	191
4.2	495	0	0	7.2	993	0	0	11.5	1,547
...	50,451	...	21,904	...	54,206	...	22,044	...	71,992
...	25,010	...	...	...	32,302	...	...	...	49,948
...	27,789	...	...	...	35,891	...	...	...	55,497

FIGURE 48. VALUE OF WOOD AND WOOD PRODUCTS EXPORTS INCLUDING PULP AND PAPER PRODUCTS, BY DESTINATION
(Million U.S. dollars)

	1955	1960	1964	1965	1966
Developed countries.....	115.7	158.4	272.6	296.7	297.8
Of which					
United Kingdom.....	68.6	83.3	119.8	118.6	107.7
Japan.....	0.2	10.8	39.3	44.3	57.9
Finland.....	0.6	2.4	17.6	30.1	26.9
West Germany.....	8.2	16.5	23.0	27.9	25.1
Communist countries.....	42.9	107.7	192.4	241.2	258.7
Of which:					
East European countries.....	20.4	100.0	162.7	186.0	198.9
Of which					
East Germany.....	2.8	39.8	72.4	86.0	89.8
Hungary.....	10.4	31.8	51.8	56.9	62.2
Less developed countries.....	13.8	38.0	39.8	54.2	61.7
Unspecified.....	2.1	0.9	1.5	1.5	3.9
Total.....	174.5	305.1	506.3	593.6	622.1

FIGURE 49. VALUE OF WOOD AND WOOD PRODUCTS IMPORTS INCLUDING PULP
AND PAPER PRODUCTS, BY ORIGIN
(Million U.S. dollars)

	1955	1960	1964	1965	1966
Developed countries.....	48.9	52.4	78.8	100.4	103.5
Of which:					
Finland.....	41.3	39.9	66.3	83.5	84.8
Communist countries.....	38.1	48.8	46.8	44.5	42.2
Of which:					
Rumania.....	31.0	37.0	39.3	36.4	36.2
Less developed countries.....	3.4	3.1	2.9	2.5	2.4
Unspecified.....	2.4	0.5	2.7	2.9	4.1
Total.....	92.8	104.8	131.2	150.3	152.2

FIGURE 50. VALUE OF LUMBER EXPORTS, BY DESTINATION
(Million U.S. dollars)

	1955	1960	1964	1965	1966
Developed countries.....	74.8	100.1	158.8	164.7	154.2
Of which:					
United Kingdom.....	44.6	60.2	88.7	87.0	81.0
West Germany.....	3.6	9.7	17.0	20.0	17.1
Communist countries.....	7.7	59.0	96.9	112.0	114.6
Of which:					
East European countries.....	4.0	58.6	91.3	100.5	100.1
Of which:					
East Germany.....	0.3	29.7	50.1	55.9	56.9
Hungary.....	3.7	14.7	24.8	25.6	26.9
Less developed countries.....	7.0	23.6	25.2	34.0	37.5
Unspecified.....	4.8	0.05	0.9	1.5	1.2
Total.....	94.3	182.8	281.8	312.2	307.5

FIGURE 51. VALUE OF LUMBER IMPORTS,
BY ORIGIN
(Million U.S. dollars)

	1955	1960	1964	1965	1966
Communist countries.....	22.0	27.7	22.5	20.1	19.2
Of which:					
Rumania.....	22.0	23.2	21.1	18.8	17.9
Finland.....	12.0	3.5	0.7	0	0
Unspecified.....	0	0.2	0	0	0.02
Total.....	34.0	31.4	23.2	20.1	19.2

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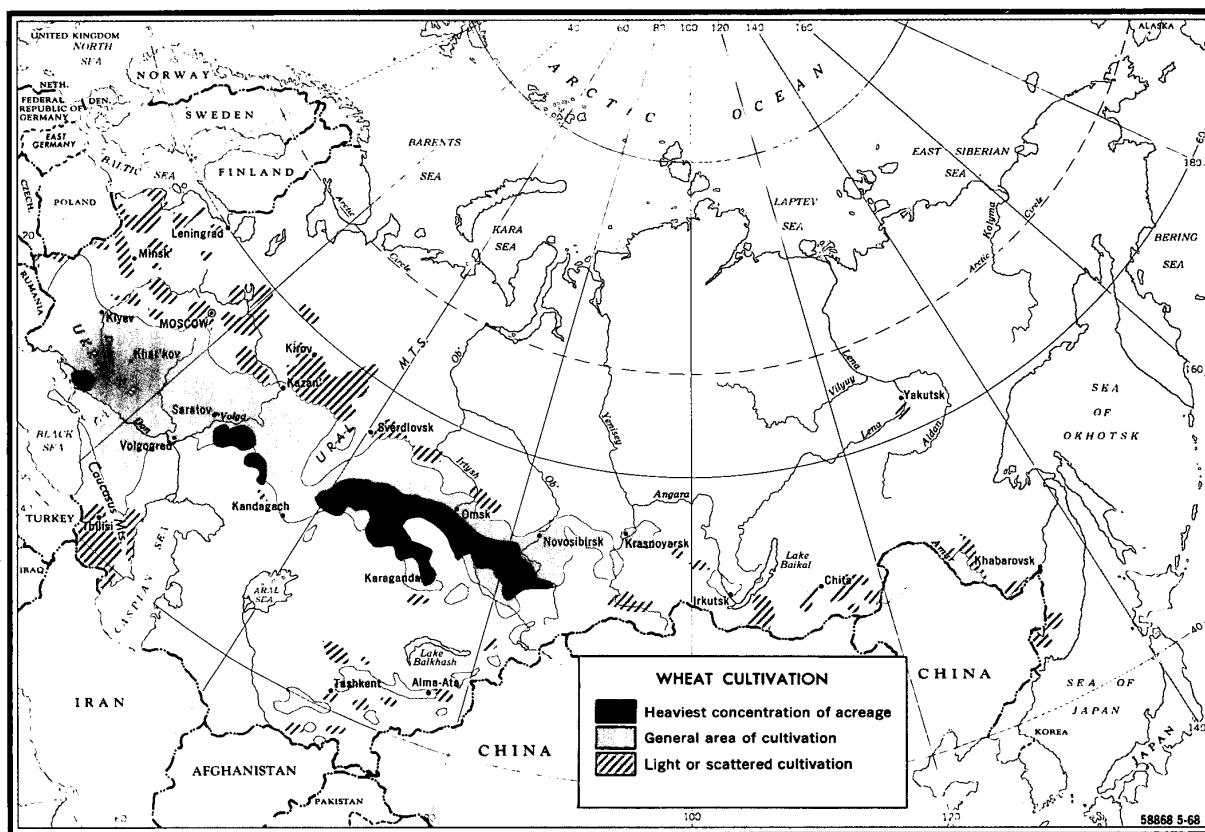


FIGURE 52. DISTRIBUTION OF WHEAT ACREAGE

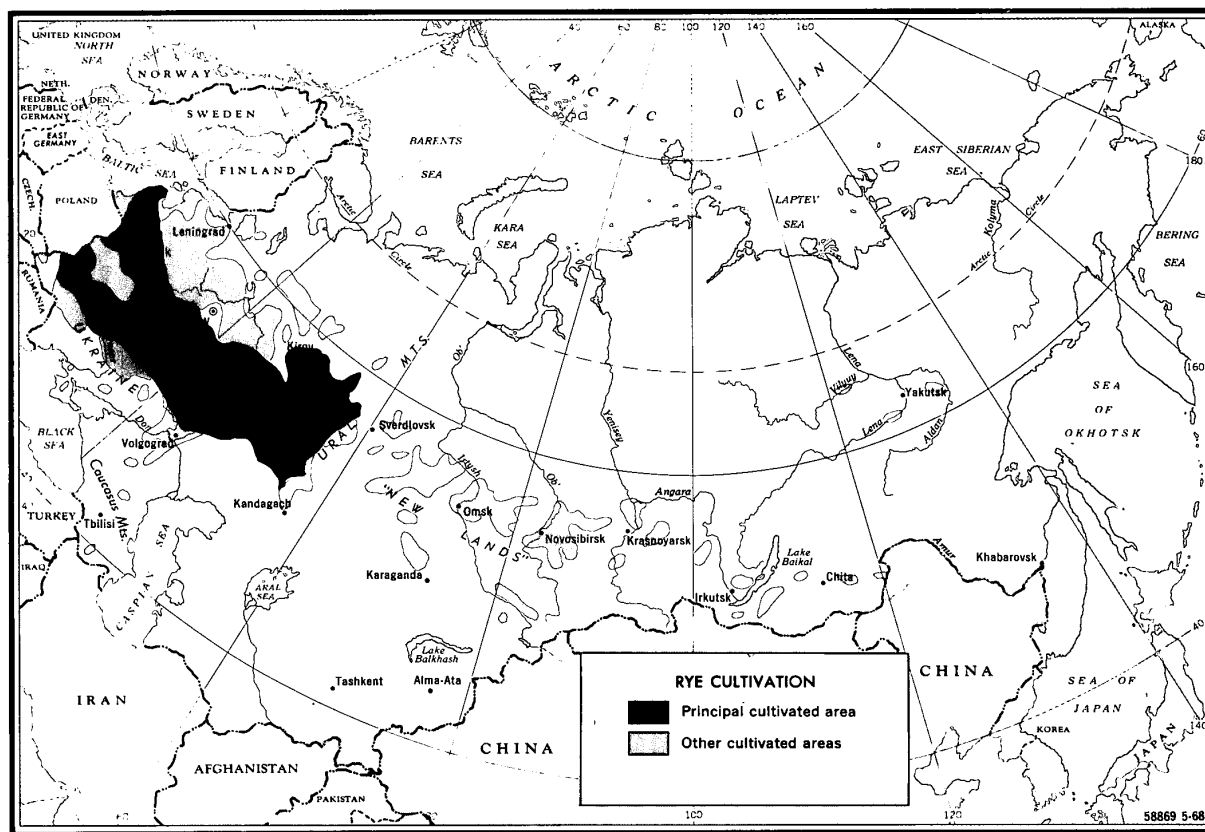


FIGURE 53. DISTRIBUTION OF RYE ACREAGE

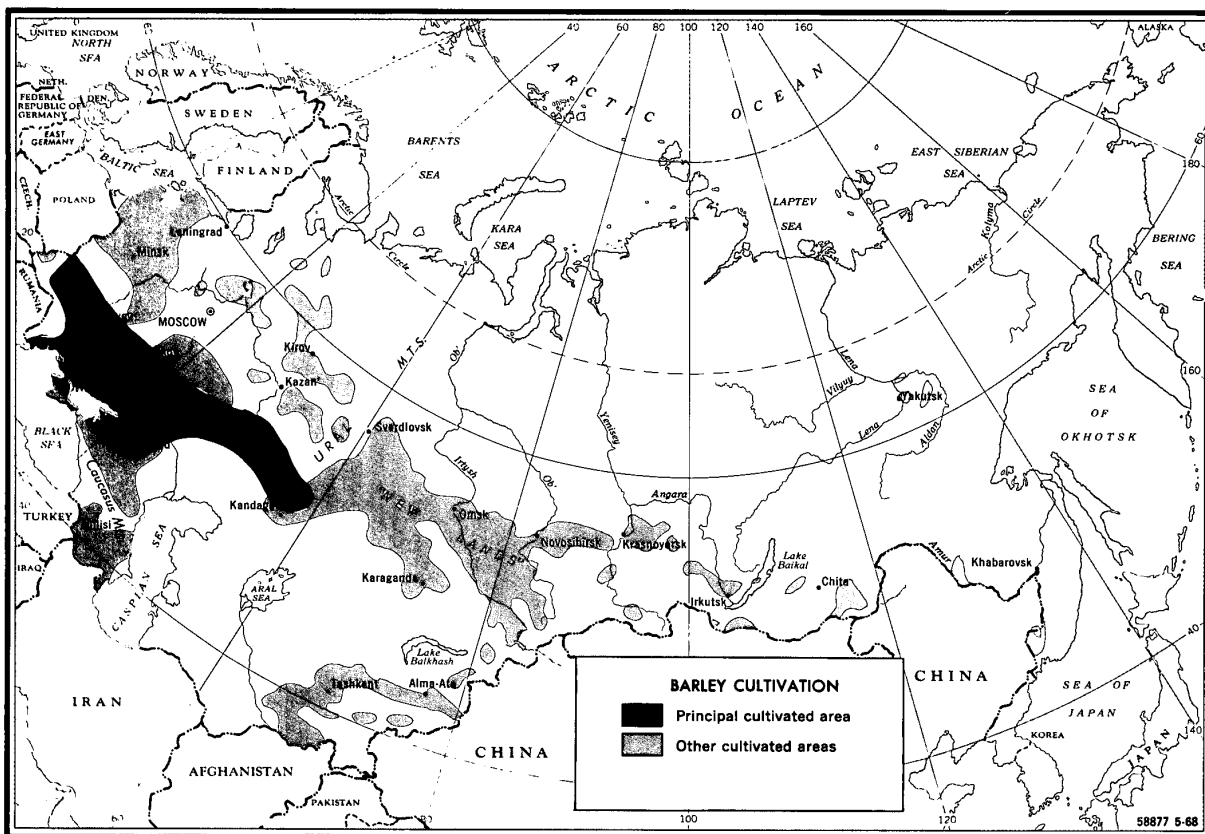


FIGURE 54. DISTRIBUTION OF BARLEY ACREAGE

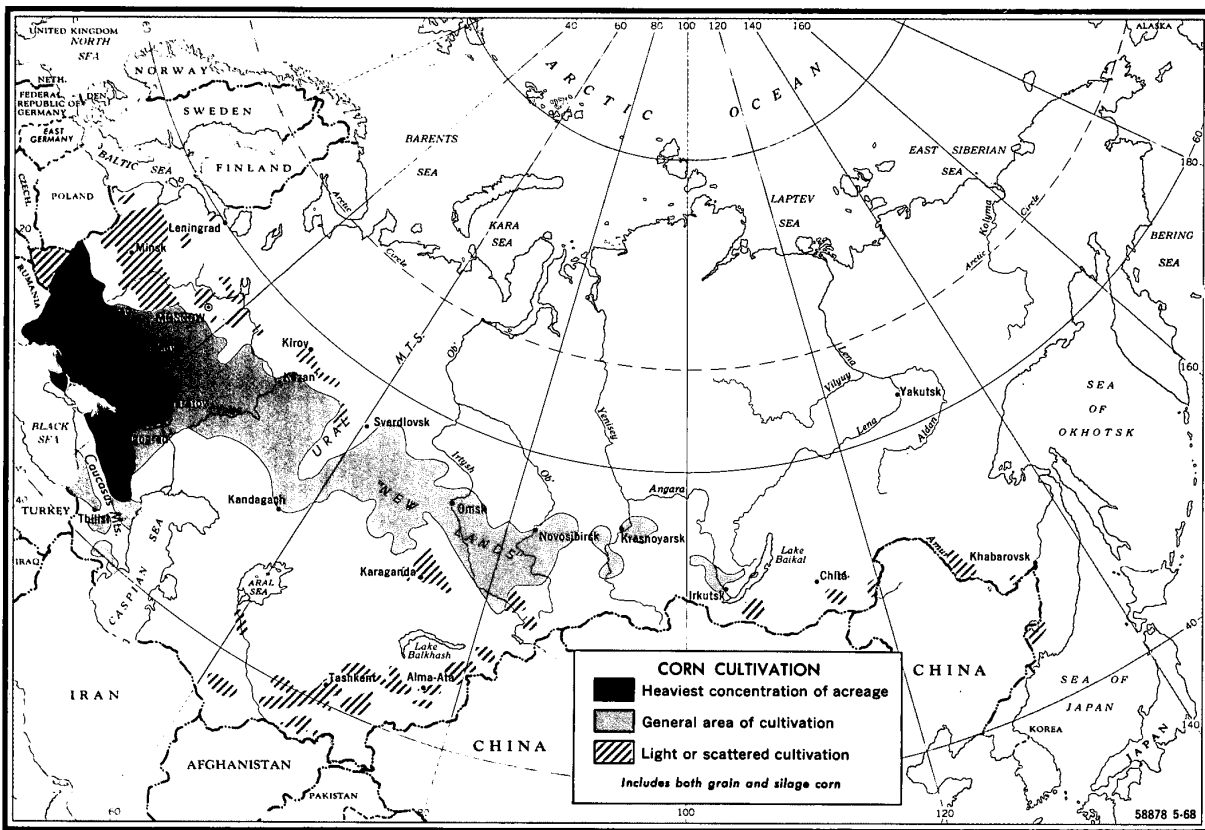


FIGURE 55. DISTRIBUTION OF CORN ACREAGE

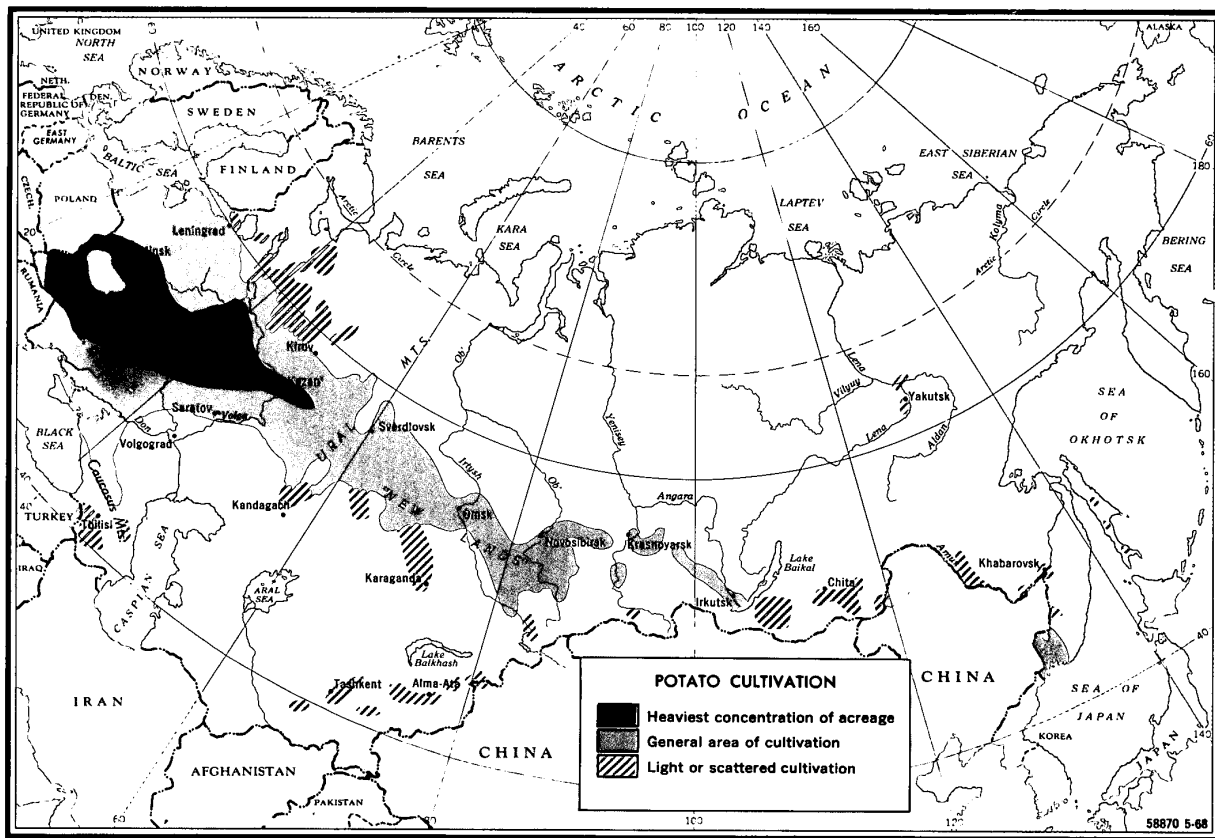


FIGURE 56. DISTRIBUTION OF POTATO ACREAGE

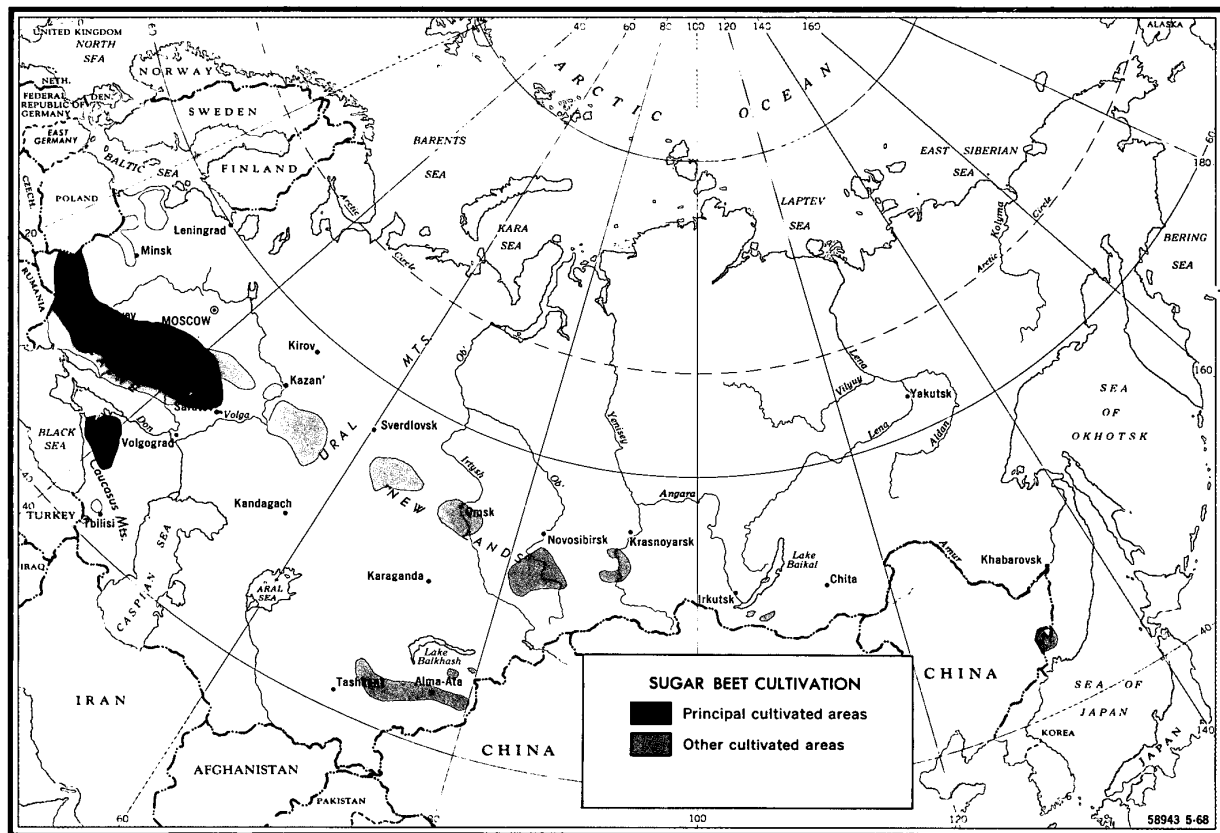


FIGURE 57. DISTRIBUTION OF SUGAR BEET ACREAGE

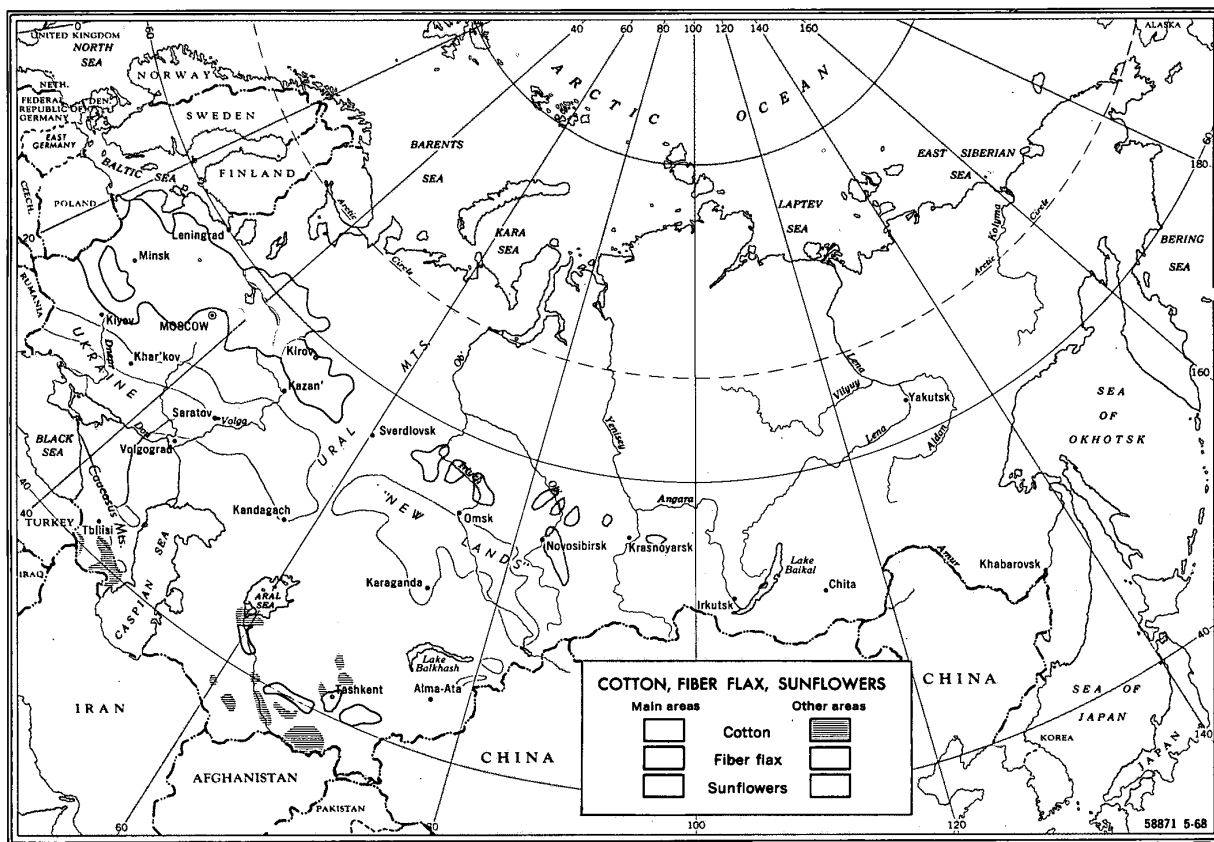


FIGURE 58. DISTRIBUTION OF INDUSTRIAL CROPS ACREAGE

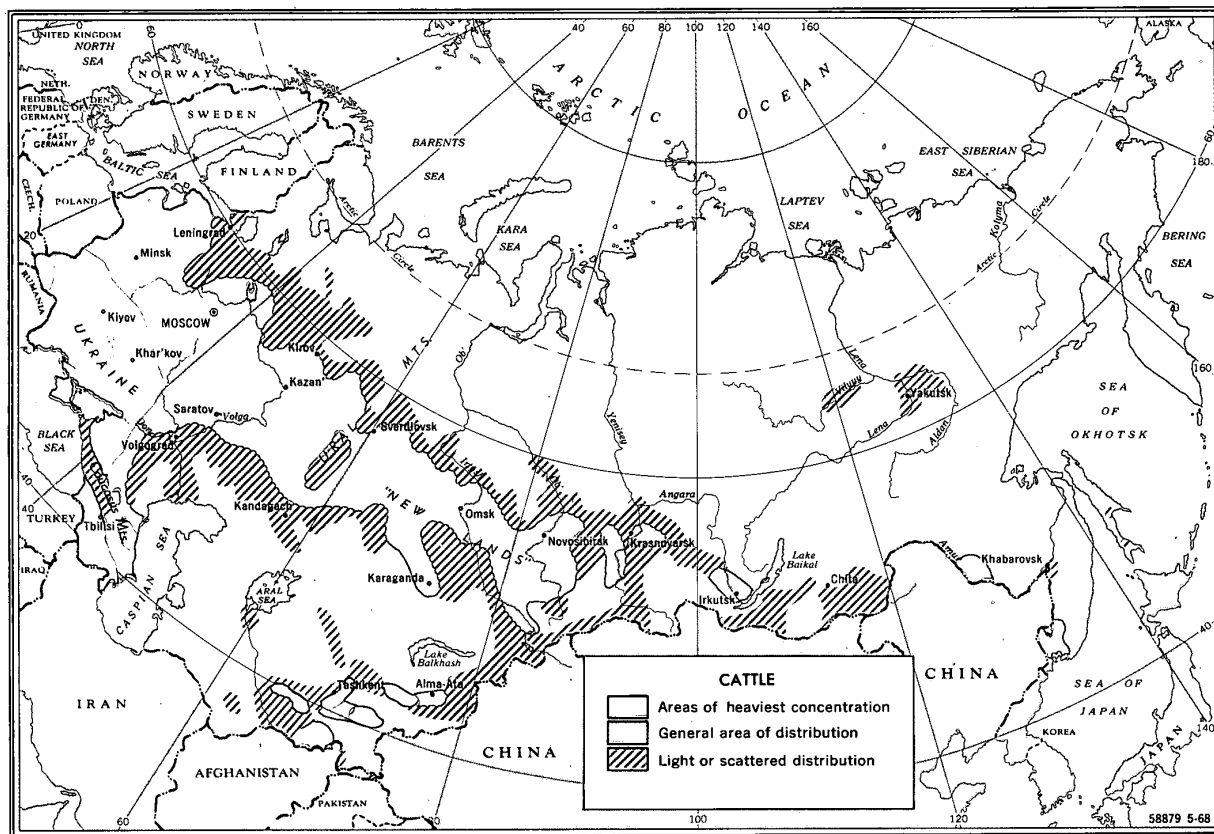


FIGURE 59. DISTRIBUTION OF CATTLE

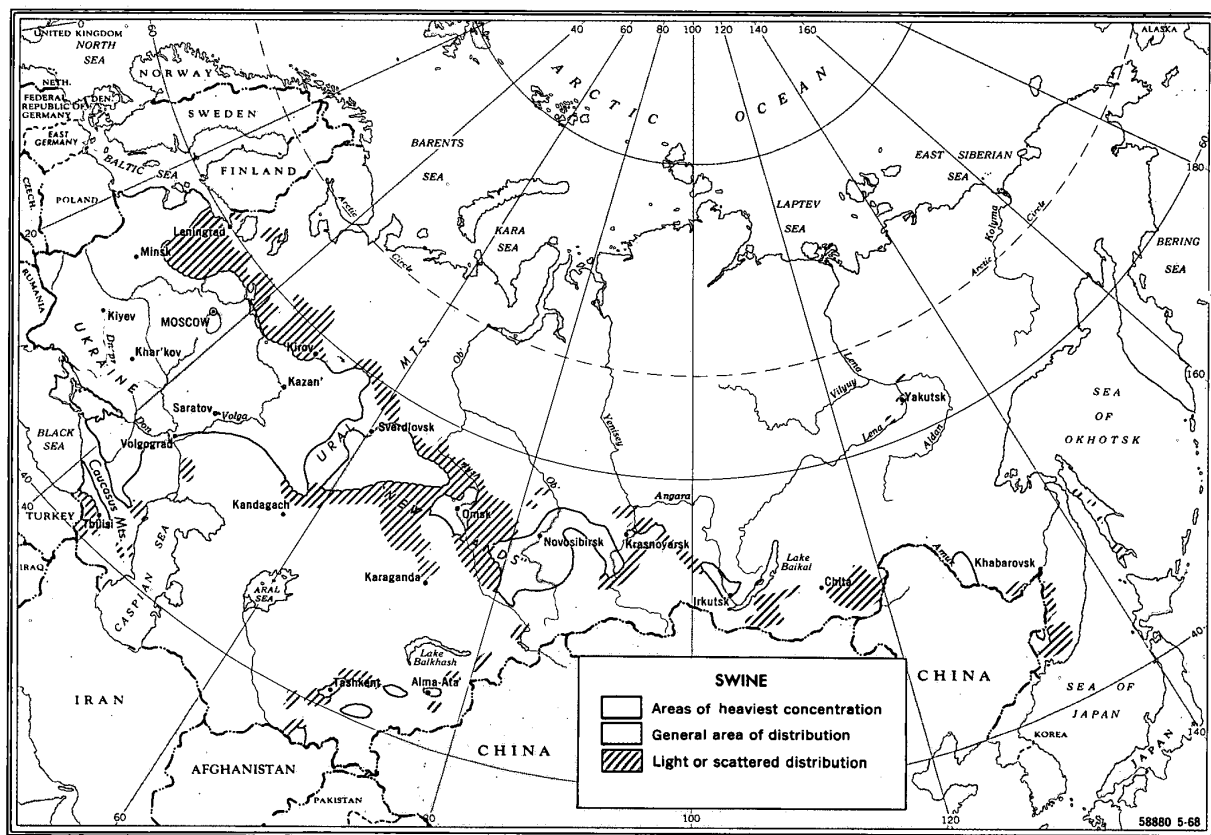


FIGURE 60. DISTRIBUTION OF SWINE

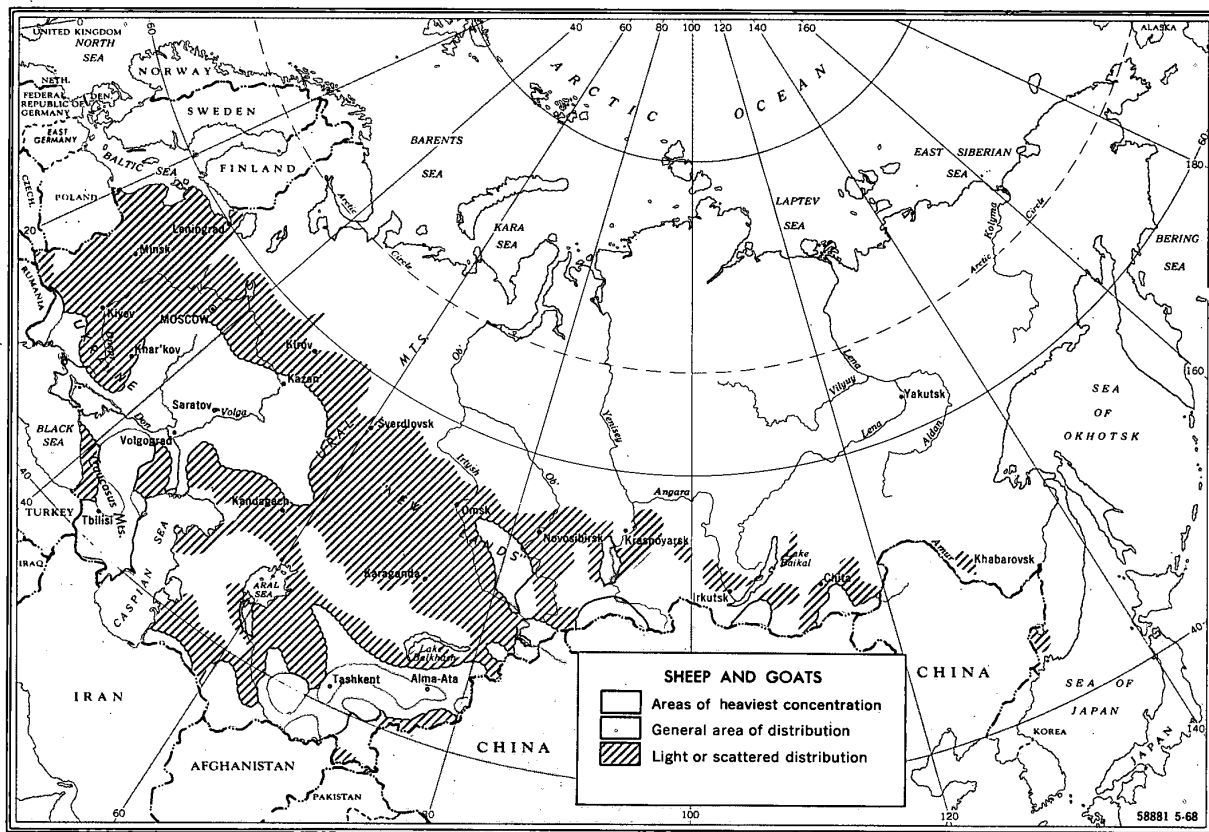


FIGURE 61. DISTRIBUTION OF SHEEP AND GOATS

SECRET

SECRET