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# Russian Federation

# Determinants of Corn Import Demand

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**Russian Federation: Determinants of Corn Import Demand.** By Sharon S. Sheffield and Roger Hoskin, Commercial Agriculture Division, Economic Research Service, U.S. Department of Agriculture. Staff Report No. AGES 9501.

## Abstract

This report provides an overview of the Russian domestic corn sector and the factors that affect corn import demand. Low domestic corn production and increasing demand for feed grains, the result of State policy to increase per capita consumption by expanding inventories, led to high levels of corn imports during the 1970's and 1980's. These imports were financed with hard currency export earnings and, later, through export assistance. Since the breakup of the USSR, most Russian corn imports continue to be centralized through the Government and distributed by the State company Roskhleboprodukt. Primary suppliers of corn to Russia (and the former Soviet Union) have included the United States, Argentina, China, Canada, Thailand, and Eastern Europe. However, since 1988, the United States has held 70-90 percent of the FSU corn import market share, largely due to available export supplies and, more recently, financial assistance. The most important determinants of import source are export financing and price. Quality characteristics could become more important when processors and livestock producers begin to make import decisions. Over the long run, Russian corn import demand could decline, given a smaller livestock sector and domestically produced feed substitutes.

**Keywords:** Former Soviet Union (FSU), Russian Federation (RF), Commonwealth of Independent States (CIS), corn, State procurement, utilization, export financing, import demand, quality characteristics.

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# Preface

This report is one of eight reports on the major corn-importing countries prepared by the Economic Research Service (ERS) in support of a comprehensive study of cleaning U.S. grain destined for export. Similar reports have been released for wheat and others are forthcoming for soybeans.

The Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA) required the Federal Grain Inspection Service (FGIS) to establish or amend grain grades and standards to include "...economically and commercially practical levels of cleanliness." The legislation required FGIS to determine if the benefits of cleaning exceeded the costs. FGIS subsequently asked ERS to conduct the study. The comprehensive study on corn included two major components: (1) economic-engineering studies of the cost of corn cleaning in the United States and estimates of domestic benefits from cleaning, and (2) in-country interviews of buyers in major corn-importing countries to determine the effects of cleaner U.S. corn on sales in these markets.

The results of this work have been prepared in a three-volume set:

"Economic Implications of Cleaning Corn in the United States," AER-686, by Chin-Zen Lin and William Lin.

"The Role of Quality in Corn Import Decisionmaking," AER-684, by Stephanie A. Mercier.

"The Costs and Benefits of Cleaning U.S. Corn: Overview and Implications," AER-688, by William Lin, Chin-Zen Lin, and Mack Leath.

The eight-country case studies form the foundation for the results of the international component of the corn-cleaning study. The eight countries studied accounted for roughly 60 percent of world corn imports and just over 70 percent of U.S. corn sales in 1992. Each report has two components: background on the corn-marketing policies, institutions, and distribution system in the corn-importing country and results of interviews of corn traders, processors, and government officials. All the interviews were completed during April-December 1992, and all followed a similar format. Each interview team consisted of both a commodity specialist and a country specialist. They attended a series of seminars on grain quality issues, data collection, and interview procedures before doing their interviews.

All the interviews followed a specific set of guidelines. An advisory panel of government officials, private traders, and trade association members helped develop the questions, which consisted of five topic areas:

- The most important factors in the choice of a supplier country;
- Quality factors most important to the importer's purchase decisions and the importer's perception of corn purchased from their suppliers;
- Contract specifications the importer uses to communicate preferences;
- The level of broken corn and foreign material in the shipments the importer receives and the costs of removing it; and
- If U.S. corn were cleaner, would the importer purchase more and/or be

willing to pay more?

The background information on the corn-importing country and the responses from the interviews provide a unique insight into the role of quality factors in the corn purchase decisions of the major importers of U.S. corn.

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## Summary

Since 1972, the **former Soviet Union (FSU)** has been a major corn importer, due to relatively low production and expansion of the livestock sector that significantly increased feed demand. FSU corn for grain production (1986-90) has averaged close to 14 million tons a year (less than 10 percent of total grain output), while average corn for grain production in the **Russian Federation (RF)** has been around 3 million tons a year. The region produces a significant amount of corn for silage. Poor growing conditions (weather, soils) have limited any significant increase in corn production in most of the FSU, despite attempts by the Government, most notably during the 1960's, to expand production. In addition, underdeveloped technology, lower quality inputs (seeds, fertilizers, pesticides), and a lack of incentives to increase corn for grain production have also mitigated yield improvement.

During the 1970's and 1980's, the Soviet Government goal to increase per capita consumption of meat was achieved through a subsidized expansion of the livestock sector that increased demand for mixed feed. Given insufficient domestic supply, the USSR began to import significant amounts of corn from the world market. These imports were initially financed with sizable export earnings that resulted from high energy prices in the 1970's and early 1980's. However, as oil and gas prices fell in the late 1980's, the USSR's grain-energy terms of trade deteriorated, and the country turned to commercial credits to finance imports, leading to significant external debt. While the terms of trade improved for a brief period in 1990, the USSR continued to rely on external financing which, given creditors' concerns over Soviet creditworthiness due to high debt and payment disruptions, by 1991 required direct governmental export credits or credit guarantees.

Nearly all Russian corn imports continue to be centralized through the RF Government and are negotiated by the former State trading organization, Exportkhleb. Given its assumption of the sizable Soviet-era external debt (estimated at over $100 billion), Russia has also had to rely on exporter assistance to finance its imports. Imported corn is distributed by the State company Roskhleboprodukt to State-owned processing enterprises, mainly mixed (compound) feed mills. Efforts to decentralize and liberalize grain marketing and distribution are progressing slowly, due to concern over disruptions in food supply.

The primary corn suppliers to the FSU (including **Russia**) have included the United States, Argentina, China, Canada, Thailand, and Eastern Europe. Since the late 1980's, the United States has held over 70 percent of the FSU corn market, with average exports of 10.6 million tons a year (fiscal 1989-1993), due to available amounts for export and provision of export financing. In terms of purchase decisions, Russian importers identified **availability of financing** and **price** as the most important elements in determining corn import source. End users were more concerned about **quality**. The quality characteristics identified as most important were **physical attributes** and **wholesomeness**. End users were particularly concerned with freshness, broken corn and foreign material (BCFM), dust, and toxic residues (such as aflatoxin). However, end users have little say in determining import source, and until mid-1993 paid highly subsidized prices for imported corn.

In the short run, the source of Russian corn imports will continue to be determined by the availability of financial assistance and price. However, corn import demand could remain low or fall further given successful agricultural reforms over the long term (10 years). Russian grain imports in 1993 were down sharply from 1992, and preliminary 1994 data indicate that Russian grain imports will fall even further. A smaller, but more productive, livestock sector is expected in a reformed Russian agriculture, which could lead to lower grain consumption by livestock. In addition, the composition of feed rations should become more dependent on relative costs and nutrient values of feed ingredients. While the importance of quality characteristics could increase if end users begin to contract for corn imports, it is expected that price and financing will continue to play the dominant role in determining import source.

# Russian Federation
## Determinants of Corn Import Demand

Sharon S. Sheffield and Roger Hoskin

### Introduction[1]

The Russian Federation, or Russia, is the largest republic of the former Soviet Union (FSU), comprising over 75 percent of total FSU land area and over half of total population. Russia's economy, while currently in transition from centrally planned to market-oriented, possesses immense natural resources and industrial capacity. Accounting for over half of the FSU's total industrial output, Russia is a major producer of crude oil, gas, coal, nonferrous metals, chemicals, machinery, and timber; the export of which provides Russia with 50-60 percent of its hard currency earnings. While Russia's agricultural output is also significant, the country has traditionally been a net importer of most agricultural products.

Economic indicators, such as Gross National Product (GNP), are now being estimated, using Western methodology, for the former Soviet republics. According to these estimates, Russian GNP, accounting for more than 60 percent of Soviet GNP, experienced positive growth until 1990, when it became negative (table 1). Russia's negative GNP growth has been the direct result of economic restructuring, which most FSU countries are experiencing. Primary agriculture in 1993 accounted for a relatively small share of Russia's GNP and workforce (both less than 15 percent). However, if the agroindustrial complex is included, agriculture's share of the Russian economy and employment is probably closer to 20 percent.

With the breakup of the Soviet Union at the end of 1991 and years of inconclusive economic reforms during the Gorbachev era, the outlook for Russia's economic performance in the short term is not encouraging. Despite abundant natural resources and a large, relatively well-skilled labor force, the transition to a market economy after over 70 years of central planning has proven difficult. Russia's GNP fell in 1993 by 12 percent from 1992, and positive GNP growth is not expected before 1996. While inflation (measured in terms of retail price increases) in 1993 remained high at 900 percent (averaging 20 percent a month), in the first half of 1994 the average monthly inflation rate was as low as 10 percent.

Industrial output declined 16 percent in 1993 and is projected to fall over 20 percent in 1994. Industrial output has been hurt by rising input costs, decreased consumer demand, lower military spending and conversion of the military industrial complex, and the breakdown in inter-republic trade. Some of this decline is inevitable given the market reorientation of the Russian economy and the likely omission in State statistics of increasing private sector activity.

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[1]With the collapse of the USSR and the creation of the Commonwealth of Independent States (CIS) in December 1991, it was decided that the scope of this study would be limited to the Russian Federation (RF). Unfortunately, in many cases specific data for the RF are unavailable, in which case data for the former Soviet Union (FSU) are provided. Every attempt has been made to present the data that are available for the RF, and to place them in the context of historical Soviet data.

The decline in agricultural production slowed in 1993, as output fell 2-3 percent compared with 1992. Agriculture could slowly improve as privatization of land and processing enterprises progresses and commodity markets are liberalized. Farmers may also benefit from recently introduced import tariffs on most agricultural commodities, most notably livestock, dairy, and sugar products. Opposition from urban regions, private traders, and the Ministry of Foreign Economic Relations delayed the implementation of these higher tariffs, which were introduced in March 1994. Reportedly, urban centers such as Moscow and St. Petersburg may be exempt from the tariffs, which would greatly reduce their effectiveness.

Table 1--Russia: Economic indicators

| Indicator | Unit | 1989 | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|---|---|
| Gross national product | | | | | | |
| Total[1] | Bil. dol. | 1,133.1 | 1,110.5 | 1,010.5 | 818.5 | 720.3 |
| Per capita | Dollars | 7,654.0 | 7,476.0 | 6,791.0 | 5,508.0 | 4,857.0 |
| Total[2] | Bil. rubles | 639.1 | 626.3 | 569.9 | 461.6 | 406.2 |
| Change | Percent | 2.5 | -2.0 | -9.0 | -19.0 | -12.0 |
| Domestic prices[3] | | | | | | |
| Producer prices | | | | | | |
| Industrial, total | % change | 1.7 | 3.0 | 138.0 | 3,497.0 | 1,200.0 |
| Agricultural, total | % change | 6.7 | 11.7 | 80.0 | 1,555.0 | 769.0 |
| Crops | % change | 7.8 | 30.4 | 60.0 | na | na |
| Livestock | % change | 5.7 | 4.7 | 88.5 | na | na |
| Retail price index | | | | | | |
| Total | % change | 1.9 | 4.7 | 93.6 | 1,414.0 | 881.0 |
| Balance of payments[4] | | | | | | |
| Imports | Bil. dol. | 98.3 | 105.4 | 75.7 | 61.8 | 45.6 |
| Change | Percent | 8.1 | 6.7 | -39.2 | -22.5 | -35.5 |
| Exports | Bil. dol. | 141.4 | 140.4 | 110.2 | 80.7 | 64.3 |
| Change | Percent | 4.8 | -0.7 | -27.4 | -36.6 | -25.5 |
| Exchange rate | | | | | | |
| Official, average | Rb/dol. | 0.630 | 0.585 | na | na | na |
| Commercial, average | Rb/dol. | 1.890 | 1.755 | 1.740 | 222.0 | 928.0 |
| Population[5] | Mil. | 148.0 | 148.5 | 148.8 | 148.6 | 148.3 |
| Change | Percent | 0.7 | 0.3 | 0.2 | -0.1 | -0.1 |

na=not available.
1 Calculated at purchasing parity rate, billion 1990 $.
2 Billion 1990 rubles.
3 Average price change, throughout year.
4 Calculated at world market prices, includes internal and external trade.
5 End-year.
Source: DRI/McGraw-Hill, World Markets Report, September 1994.

Since the breakup of the USSR, the Russian Federation has become the primary grain (including corn) importer in the region, accounting for an estimated 60-70 percent of total FSU grain purchases. The ability to finance grain (both State and private) imports will determine both import source and volume in the near term, given hard currency constraints and a sizable external debt. In addition, economic reforms have already had a profound effect on Russia's agricultural sector, and has led to significantly lower grain imports. Over the medium to long run, given that corn will continue to be predominately used for feed, import demand will depend largely on the rate at which real incomes rise and consumers increase consumption of livestock products, and to what extent this demand is met by domestic production or through imports.

## Corn Production and Consumption Trends

### Production

Corn has never been produced in significant quantities in either the USSR or in Russia, primarily due to climatic conditions. Barley, rye and oats are the dominant coarse grains grown in the FSU, while corn for grain production averages less than 10 percent of total grain output. Corn for grain production in the former USSR is also a fraction (5-10 percent) of U.S. corn output. FSU corn production is concentrated in Russia (mostly in the North Caucasus region), Ukraine, Moldova, and Kazakhstan and is defined as either *corn for grain* or *corn for silage*.[2] Corn for grain, otherwise known as ripe maize, is harvested when the plant has fully ripened. Corn for silage, an important livestock feed ingredient, is harvested prior to and during the milky-waxy stage.

[2]Unless otherwise stated, for the purposes of this report, the term "corn" will refer only to corn for grain.

Since the formation of the Soviet Union, corn for grain production has increased considerably. While corn production accounted for 2 percent of total bunkerweight production when the USSR was established, by the 1960's Soviet corn production had increased eight-fold and made up over 10 percent of total grain output. This increase primarily took place during Khrushchev's New Lands campaign to expand area under cultivation, especially to high yielding crops, with little regard to climatic or geographic conditions. Some of this area increase took place in the Russian Republic, where in 1961 corn for grain production accounted for 25 percent of total Soviet corn output.

After Khrushchev was removed from power in 1964, corn area began to decrease, bringing production down (figs. 1, 2). During 1986-90, corn production in the FSU averaged 13.7 million tons, with an average yield of 3.4 tons per hectare (table 2). Russia produced nearly a quarter of Soviet annual output during this period, with an average corn yield of 2.9 tons per hectare. International corn yields show Soviet yields comparable with Romania and Argentina, with Russian yields generally lowest (table 3).

Figure 1
FSU: Corn area

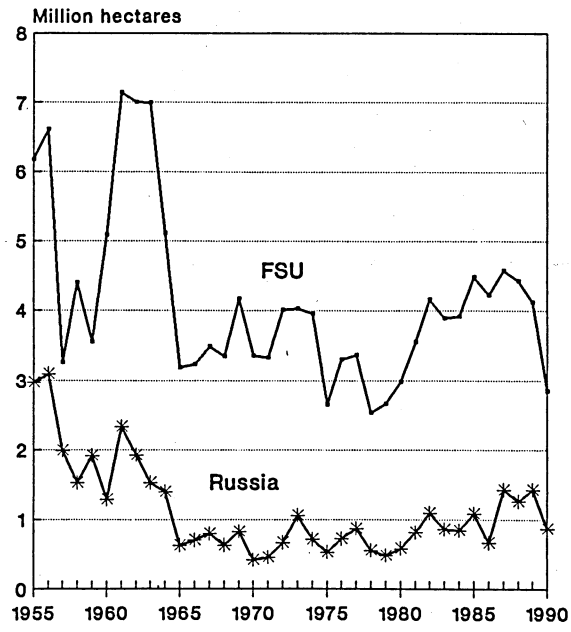
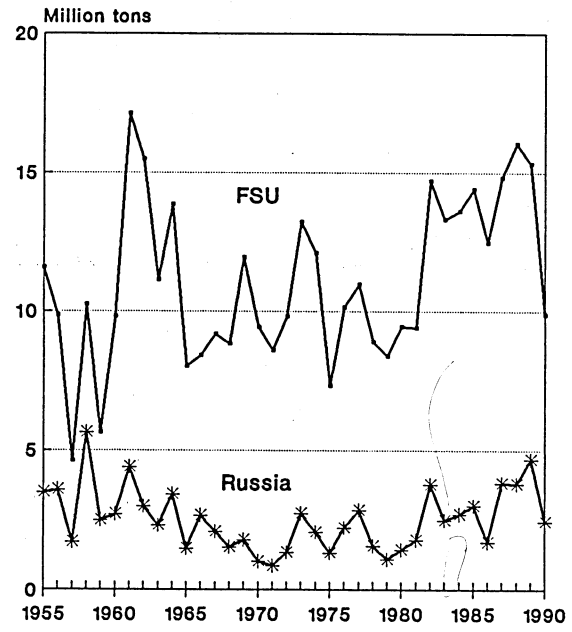



Figure 2
FSU: Corn production




In recent years, corn production has declined, in part due to decreased sown area and unfavorable weather. While corn area in Russia has remained steady since 1990, it is around 300,000 hectares lower than the 1986-90 average. No major expansion in Russian corn area is expected in the medium term. Total grain area continues to decline with the removal of marginal land from cultivation and farms favor less input-intensive crops, such as wheat and barley. However, the introduction of higher yielding hybrid corn seeds that are more suitable to Russia's climate could increase corn output without substantially expanding area.

The FSU is a significant producer of corn for silage, with average 1986-90 output of 350 million tons a year, including green chop. Area sown to corn for silage during this period averaged 17.5 million

hectares. Unlike area sown to corn for grain, which was expanded during the early 1960's and then reduced, corn for silage area has remained nearly constant over the last 20 years. Corn for silage production in Russia has averaged close to 200 million tons, or over half of total Soviet production. Corn for silage production in Russia during 1991-92 was somewhat lower, at 150 million tons a year, likely due to less favorable weather. Corn for silage produced in the FSU is at best of the same quality as average U.S. corn produced for silage.[3] Much of the corn for silage produced in the FSU is harvested too early, easily souring, and with a below-average nutrient content.

## Utilization

Corn for grain is used mostly for animal feed, with a small amount going for industrial use (starch, alcohol, syrup, and oil), food consumption, and seed use (table 4, appendix table 1). Waste and stocks make up the rest.

Corn is primarily used for livestock feed, accounting for 65-85 percent (not including residual) of total FSU and Russian corn use. FSU corn consumption in livestock feed averaged around 20 million tons a year during the 1980's. However, corn for feed consumption has been cut nearly in half, primarily due to the FSU's contracting livestock sector. The annual volume of corn used for feed in Russia in the late 1980's averaged nearly 11 million tons; current use has fallen to around half of former levels. Corn for grain is primarily used in concentrated feed (as corn, dried corn extract, milky-waxy corn, and fully mature corn on the cob), while corn for silage is used in succulent feeds. Nearly all imported corn is used for mixed feed production.

Total livestock feed consumption in the Russian Federation increased steadily during the 1980's, reaching 225.8 million tons (in feed unit equivalent) in 1990 before decreasing to 199.2 million tons in 1992. Concentrated feed, which includes mixed (compound) feed, makes up around 40 percent of this total. These feed

Table 2--FSU and Russia: Corn area, yield, production

| Country and year | Corn for grain | | | Corn for silage | | |
|---|---|---|---|---|---|---|
| | Area | Yield | Production | Area | Yield | Production |
| | Million ha | tons/ha | Million tons | Million ha | tons/ha | Million tons |
| FSU | | | | | | |
| 1980 | 3.0 | 3.18 | 9.5 | 16.9 | 15.74 | 266 |
| 1985 | 4.5 | 3.20 | 14.4 | 17.4 | 19.02 | 331 |
| 1986 | 4.2 | 2.96 | 12.5 | 17.5 | 18.11 | 317 |
| 1987 | 4.6 | 3.24 | 14.8 | 17.7 | 21.07 | 373 |
| 1988 | 4.4 | 3.62 | 16.0 | 16.4 | 21.16 | 347 |
| 1989 | 4.1 | 3.71 | 15.2 | 17.4 | 21.09 | 367 |
| 1990 | 2.8 | 3.47 | 9.9 | 18.5 | 19.51 | 361 |
| 1986-90 avg | 4.0 | 3.40 | 13.7 | 17.5 | 20.17 | 353 |
| 1991 | 3.0 | 3.27 | 9.8 | na | na | na |
| 1992 | 2.7 | 2.62 | 7.1 | na | na | na |
| 1993 1 | 2.9 | 2.99 | 8.7 | na | na | na |
| 1994 2 | 2.8 | 2.18 | 6.2 | na | na | na |
| Russia | | | | | | |
| 1980 | 0.6 | 2.45 | 1.4 | 9.7 | 14.85 | 144 |
| 1985 | 1.1 | 2.79 | 3.0 | 10.1 | 17.82 | 180 |
| 1986 | 0.7 | 2.54 | 1.7 | 10.0 | 16.80 | 168 |
| 1987 | 1.4 | 2.70 | 3.8 | 9.5 | 21.68 | 206 |
| 1988 | 1.3 | 3.03 | 3.8 | 9.3 | 20.54 | 191 |
| 1989 | 1.4 | 3.27 | 4.7 | 9.7 | 21.96 | 213 |
| 1990 | 0.9 | 2.82 | 2.5 | 10.1 | 18.71 | 189 |
| 1986-90 avg | 1.1 | 2.89 | 3.3 | 9.7 | 19.86 | 193 |
| 1991 | 0.7 | 2.69 | 2.0 | 9.6 | 15.73 | 151 |
| 1992 | 0.8 | 2.64 | 2.1 | 9.5 | 15.79 | 150 |
| 1993 1 | 0.8 | 3.04 | 2.5 | na | na | na |
| 1994 2 | 0.8 | 2.00 | 1.6 | na | na | na |

na = not available.
1 Estimated.
2 Projected (December 1994).
Sources: USDA, Goskomstat SSSR and Rossii, various years.

Table 3--Comparative corn yields

| Country | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 1 |
|---|---|---|---|---|---|---|---|
| | Tons/hectare | | | | | | |
| Argentina | 3.46 | 2.94 | 3.06 | 3.90 | 4.42 | 4.16 | 4.17 |
| U.S. | 7.52 | 5.31 | 7.30 | 7.44 | 6.82 | 8.25 | 6.32 |
| China | 3.92 | 3.93 | 3.88 | 4.52 | 4.58 | 4.53 | 4.96 |
| France | 7.71 | 7.31 | 7.02 | 5.94 | 7.29 | 7.98 | 8.12 |
| Hungary | 6.32 | 5.47 | 6.22 | 3.99 | 7.00 | 3.70 | 3.64 |
| Romania | 3.62 | 3.45 | 2.47 | 2.75 | 4.08 | 2.05 | 2.58 |
| FSU | 3.22 | 3.64 | 3.73 | 3.41 | 3.27 | 2.62 | 2.99 |
| Russia | 2.70 | 3.03 | 3.27 | 2.81 | 2.69 | 2.64 | 3.04 |

1 Projected (December 1994).
Source: USDA.

[3]Jasny, Khrushchev's Crop Policies, 1963.

rations are poorly balanced, as high levels of grain, estimated at 70-80 percent of the total, are fed without proper protein supplement. As a result, the consumption of manufactured feed per unit of livestock output averages almost twice the level in the West.[4] To a large extent, this imbalance can be attributed to the Soviet-era pricing system that led to irrational allocation of inputs and resources.

Table 4--Russia: Corn supply and utilization

| Year | Production | Trade[1] | | Supply | Use | | Stock change |
|---|---|---|---|---|---|---|---|
| | | Imports | Exports | | Total | Feed/resid. | |
| | | ---Million metric tons--- | | | | | |
| 1987/88 | 3.8 | 4.7 | 0.0 | 8.5 | 8.6 | 6.5 | -0.1 |
| 1988/89 | 3.8 | 12.3 | 0.3 | 15.8 | 15.8 | 12.0 | 0.0 |
| 1989/90 | 4.7 | 14.1 | 0.3 | 18.5 | 18.5 | 14.0 | 0.0 |
| 1990/91 | 2.5 | 4.7 | 0.9 | 6.3 | 6.6 | 5.0 | -0.3 |
| 1991/92 | 2.0 | 9.5 | 0.3 | 11.2 | 11.5 | 8.8 | -0.3 |
| 1992/93 | 2.1 | 4.4 | 0.5 | 6.0 | 6.6 | 5.5 | -0.6 |
| 1993/94[2] | 2.4 | 3.3 | 0.1 | 5.6 | 6.2 | 5.3 | -0.6 |
| 1994/95[3] | 1.9 | 2.0 | 0.0 | 3.9 | 3.7 | 2.9 | 0.2 |

1 Includes intra-FSU trade and is on a July/June basis.
2 Estimated.
3 Projected (December 1994).
Source: USDA.

Comparing Soviet statistics (table 5) to the estimated composition of U.S. feed concentrates provides some interesting differences.[5] While corn makes up over 60 percent of feed rations in the United States, it accounts for only 11 percent of FSU rations. Recommended levels for corn usually range between 20 and 50 percent, depending on the type of livestock. Conversely, in the FSU, wheat makes up 25 percent of the ration compared with 3 percent in the United States. Another Soviet source puts the share of wheat in mixed feed rations at 30 percent for cattle, 40 percent for swine, and as high as 70 percent for poultry.[6] In general, these differences in feed composition can be attributed to the domestic supply of these grains in each country, and in the United States, to the lower price of feeding corn relative to wheat. Even more striking is the estimated share of protein meal in U.S. rations, which is twice as high as that of FSU concentrates. Soviet estimates have put the level of this protein feed deficiency (difference between actual and optimal levels) at 10-15 million tons in soybean meal equivalent (sbme), although one Soviet source estimated the protein deficit as high as 25-27 million tons.[7]

Table 5--FSU: Composition of concentrated-feed rations, 1988

| Ingredient | Million tons | Percent |
|---|---|---|
| Total | 161.1 | 100 |
| Grain | 131.0 | 81 |
| of which: | | |
| Wheat | 40.0 | 25 |
| Barley | 36.9 | 23 |
| Corn | 18.0 | 11 |
| Oats | 10.0 | 6 |
| Other | 16.1 | 10 |
| Protein meals | 11.1 | 7 |
| Other ingredients | 19.0 | 12 |

Source: *Vestnik sel'skokhoziaistvennykh nauk*, 1991, No. 9.

Livestock consumption of grain has already begun to decrease as inventories are reduced due to high mixed-feed prices (relative to livestock farmgate prices) and decreased consumer meat and dairy demand resulting from price liberalization. In Russia, the largest decreases have occurred in pig and poultry inventories, which are more dependent (compared to ruminants) on mixed feed rations. Improved per animal coarse and succulent fodder supplies (and lower relative prices) could also lower animal consumption of

[4]World Bank, 1992.

[5]U.S. data from Ash, Mark S. Animal Feeds Compendium. USDA, 1992, p. 18.

[6]Zootekhniia, 1989.

[7]"Zernovye resursy i ikh izpol'zovanie," Ekonomist, 1992, p. 78. However, given the contraction in livestock inventories since the Soviet period, it is likely that the lower figure of 10-15 million tons sbme is a more reasonable estimate of the current deficiency.

grain. The reallocation of livestock herds from State to private holdings, which are more likely to utilize grazing, may also have contributed to lower animal consumption of grain.

As prices begin to transmit relative scarcities, Russian mixed-feed rations should become more balanced, probably by increasing protein content relative to that of grain, which in turn should lead to improved feeding efficiencies and a more productive livestock sector. However, it is likely that Russian feed rations will continue to contain sizable amounts of grain, as the demand for feed ingredients will be determined by the composition of animal inventories, relative nutrient values and requirements, proximity of feed supply to animals, and ease of substitution between competitively priced alternatives.

Approximately 2-3 million tons of corn a year are used for FSU industrial and food production.[8] Around 1 million tons of corn are used yearly for FSU starch production, while for alcohol less than 500,000 tons are used. FSU corn oil production, around 10,000 tons a year, uses 300,000-400,000 tons of corn. The FSU has had to import much of its starch supply, as domestic production has been hampered by shortages of raw materials and outdated technology. Most of the starch produced domestically comes from potatoes. According to the grain import company Exportkhleb, U.S. corn is not used for starch production. It is doubtful that much if any imported corn is used for food or industrial purposes, although one Russian government official stated that imported corn is being used for oil production.

While Khrushchev intended corn for human consumption, calling it "sausage on the stalk," it never became a part of the Soviet diet. Before the formation of the Soviet Union, corn could be found in the diets of Georgians and other indigenous people of the Transcaucasus region. Today, corn is consumed in Moldova, once part of neighboring Romania, where corn is a part of the national diet. A small amount of corn is also eaten in Ukraine and parts of Central Asia.

## Feed Subsector

### Composition of the Livestock Sector

The composition of the Russian livestock sector is somewhat similar to that in the United States. Both countries have historically produced more beef than any other meat, although U.S. poultry output has increased rapidly since the 1980's and recently surpassed beef production (table 6). While total FSU hog and cattle inventories exceeded those in the United States during part of the 1970's and the 1980's, Russian inventories have been lower than U.S. levels (fig. 3, table 7). Beginning in 1992, FSU livestock inventories began to contract, more than offsetting the expansion of the earlier decades, such that FSU herds are now below U.S. levels. The primary reason for this contraction was the liberalization of prices that led to higher mixed-feed prices relative to output prices and reduced consumer demand for livestock products. The largest drops occurred in hog and poultry inventories, which are relatively more dependent on mixed feed rations.

Incentives under the old system caused farm managers to maintain livestock populations with little regard for productivity, and the willingness of the government to defer or forgive debt removed any incentive to deviate from numerically based production goals. In addition, the State provided soft credits, input subsidies, and other forms of financial support to the livestock sector. As a result,

[8]Comparable data for Russia are not available. USDA estimates Russian food, industrial, and seed use of corn as high as 2-4 million tons in the late 1980's, with recent levels around 1 million.

increases in Soviet meat production were achieved for the most part through an expansion of animal inventories rather than increased productivity.

Livestock productivity in Russia is considerably lower than in the United States. By the mid-1980's, the United States produced 60 percent more beef and veal per head and 70 percent more pork per hog than Russia. Since 1965, increased U.S. milk production has come exclusively from improved yields per animal while expanded cow inventories have accounted for about one-third of the increase in Soviet milk production. Average birth-to-slaughter times for Russian cattle and hogs are longer than in the United States, and slaughter weights are lower.

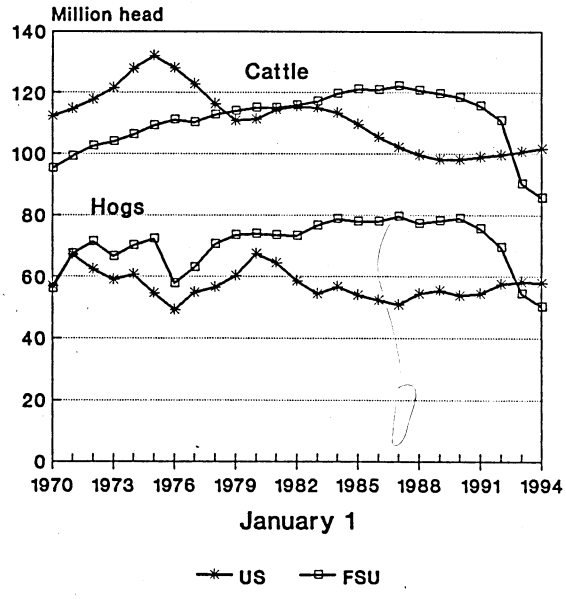
Table 6--Russia: Production of livestock products

| Year | Meat 1 | | | | | | Milk | Wool | Eggs |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Beef & veal | Pork | Mutton | Poultry | Other | | | |
| | 1,000 tons | | | | | | | | Million |
| 1980 | 7,427 | 3,274 | 2,579 | 338 | 1,134 | 102 | 46,823 | 213 | 39,539 |
| 1985 | 8,513 | 3,575 | 2,978 | 321 | 1,532 | 107 | 50,196 | 217 | 44,277 |
| 1988 | 9,813 | 4,150 | 3,399 | 371 | 1,776 | 117 | 54,534 | 227 | 49,144 |
| 1989 | 10,082 | 4,256 | 3,499 | 385 | 1,831 | 111 | 55,742 | 230 | 49,024 |
| 1990 | 10,112 | 4,329 | 3,480 | 395 | 1,801 | 107 | 55,715 | 227 | 47,470 |
| 1991 | 9,375 | 3,989 | 3,190 | 347 | 1,751 | 98 | 51,971 | 204 | 47,132 |
| 1992 | 8,260 | 3,632 | 2,787 | 329 | 1,428 | 84 | 47,236 | 179 | 42,902 |
| 1993 | 7,700 | 3,384 | 2,551 | 338 | 1,321 | 106 | 46,897 | 161 | 40,349 |

1 Carcass weight, including fat.
Sources: Statkom SNG, Goskomstat Rossii.

The reasons for Russia's relatively low livestock productivity are twofold. First, organizational and management shortcomings have limited development of modern high-productivity breeding stock. For example, breeding farms are expected to contribute to State production plans by delivering livestock products to the State, thus hindering their breeding task. Second, low feed quality and inappropriate ingredient mix contribute to poor productivity. Feed accounted for an estimated 60 percent of livestock production costs and about 40 percent of dairy costs in the FSU. In contrast, feed purchased in the United States accounts for less than 20 percent of total production expenses.[9]

Figure 3
FSU and US: Cattle and hog inventories




Source: USDA.

## Russian Per Capita Meat Consumption

Until recently, Russian meat consumption rivaled that of several Western European nations. In 1990, Russian per capita consumption at around 80 kg/year compared with France, 87 kg/year; Netherlands, 77 kg/year; and UK, 67 kg/year.[10] Yet Russian per capita incomes were substantially

[9]Agricultural Statistics, 1993, p. 381.

[10]Measuring and comparing Russian per capita meat consumption is difficult. These estimates were taken from Sedik, "A Note on Soviet Per Capita Meat Consumption," Comparative Economic Studies, v. 35, no. 3, pp. 39-48. For further discussion of Soviet per capita meat consumption, see Ken Gray, Sharon Sheffield, et al., "Food Consumption in the Former USSR and its Republics, 1980-91"; David Sedik, "Per Capita GDP and Meat Consumption in the Former USSR," Economies in Transition Agriculture Report, Nos. 3 and 4.

Table 7--Russia and U.S.: Livestock inventories, January 1

| Year | Cattle[1] | Cows | Hogs | Sheep & goats | Horses | Poultry |
|---|---|---|---|---|---|---|
| | | | Million head | | | |
| Russia | | | | | | |
| 1986 | 59.6 | 21.6 | 39.0 | 63.4 | 2.6 | 628.0 |
| 1987 | 60.5 | 21.3 | 40.2 | 64.1 | 2.6 | 632.0 |
| 1988 | 59.8 | 21.0 | 39.2 | 63.0 | 2.6 | 637.0 |
| 1989 | 59.3 | 20.8 | 39.8 | 62.7 | 2.6 | 646.0 |
| 1990 | 58.8 | 20.8 | 40.0 | 61.3 | 2.6 | 654.0 |
| 1991 | 57.0 | 20.5 | 38.3 | 58.2 | 2.6 | 660.0 |
| 1992 | 54.7 | 20.6 | 35.4 | 55.3 | 2.6 | 652.0 |
| 1993 | 52.2 | 20.2 | 31.9 | 51.4 | 2.6 | 568.0 |
| 1994 | 49.5 | 19.9 | 28.6 | 46.1 | 2.6 | 575.0 |
| U.S. | | | | | | |
| 1986 | 105.4 | 44.8 | 52.3 | 10.1 | na | 1,073.0 [2] |
| 1987 | 102.1 | 44.3 | 54.4 | 10.6 | na | 1,141.0 [2] |
| 1988 | 99.6 | 43.5 | 55.5 | 10.9 | na | 1,151.0 [2] |
| 1989 | 98.1 | 43.3 | 53.8 | 10.9 | na | 1,197.0 [2] |
| 1990 | 98.2 | 43.4 | 54.5 | 11.4 | na | 1,247.0 [2] |
| 1991 | 98.9 | 43.5 | 57.7 | 11.2 | na | 1,292.0 [2] |
| 1992 | 99.6 | 43.7 | 58.1 | 10.8 | na | 1,337.0 [2] |
| 1993 | 100.6 | 43.7 | 57.9 | 10.0 | na | 1,386.0 [2] |
| 1994 | 101.7 | 44.5 | 60.5 | 9.1 | na | 1,452.0 [2] |

1 Includes cows.
2 Estimate, including chickens, broilers, and turkeys.
Sources: USDA, Statkom SNG, and Goskomstat Rossii.

lower than in those Western European nations. During the Soviet era, government policy encouraged increased livestock product consumption by subsidizing both consumption and production. After the breakup of the USSR, Russian meat prices were liberalized in January 1992 and consumer subsidies were drastically curtailed, resulting in substantially lower meat consumption. Producer subsidies were also reduced, but to a lesser degree.

Despite government efforts to increase livestock and dairy production over the last 20 years, supply did not keep up with demand. Between 1970 and 1990, Russian meat and milk production rose at an average annual rate of 8 and 6 percent, growth rates higher than population growth. However, fixed prices and rising nominal incomes created excess demand for livestock products.

### Market Growth Projections

With the dissolution of the Soviet Union, the Russian Federation has embarked on significant economic reforms. The pace of reforms is uncertain, but the assumption made here is that movement toward a free-market economy will likely proceed at a slow pace. While Russian reforms will undoubtedly be unique to that country, some parallels can be drawn to the reform process underway in Eastern Europe (see discussion below). The following outlook for corn is likely:

•Corn for grain production in Russia could increase slightly through improved yields, largely by using higher quality corn hybrid seeds more suited to Russian climatic conditions, more efficient use of inputs, and reduced use of corn for silage. However, climatic conditions will continue to affect year-to-year yields.

•Corn for food or industrial uses could slightly increase, given new product development resulting from foreign investment.

•Corn may not figure prominently as a feed in a reformed Russian agricultural sector. Although corn is superior to its substitutes in energy content, it may be less economical to feed than locally produced grains when prices relative to energy and protein content are considered. While corn use for feed could continue and might even increase in regions where it is grown, the energy feed of choice in most of the country will probably be locally produced wheat or barley.

•In the near term, Russia will continue to rely heavily on export financing, concessional sales, and humanitarian assistance for corn imports. Import demand could remain low (relative to historical levels) if other feed ingredients are substituted for corn, or if rising consumer demand for livestock products is largely met by imports, rather than by domestic output.

## Reform Begins in Russia

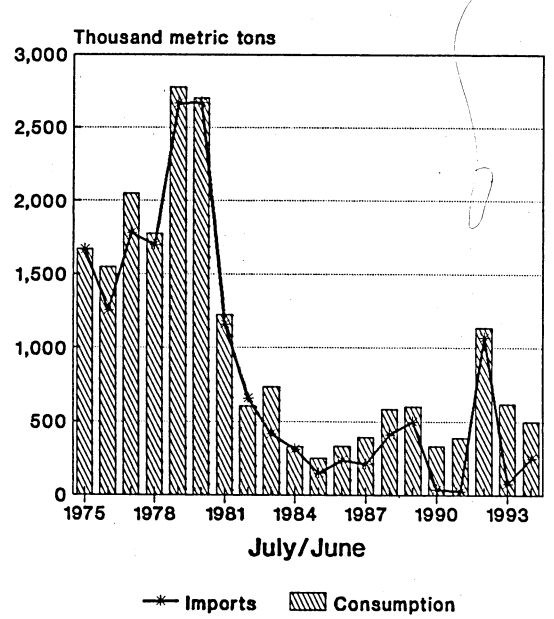
The freeing of prices in January 1992 set in motion a reform process like that begun in Poland in 1989. After the 1989 reform in Poland, rising food prices reduced consumer purchasing power, thus curtailing demand for certain goods. At the same time, agricultural production declined due to weakened consumer demand and a price-cost squeeze faced by producers as input price increases outstripped prices paid for farm output.

In Russia, liberalized prices led to a five- to seven-fold jump in farmgate prices. Retail prices rose even more as marketing margins widened. Under the Soviet system, margins for transportation, processing, and trade had been well below those in Western nations. Rising prices cut consumption and resulted in consumer shifts from meat and dairy products to grain products, potatoes, and vegetables. In early 1992, farm input prices were rising two to three times faster than farmgate prices.

As the contraction proceeds, consumer preferences will change as relative prices change. But at some point, incomes will likely rise again. In Poland, the turnaround is forecast by the mid-1990's, 5-7 years after the institution of reforms. The reform process in Russia may not proceed as quickly as in other Eastern European countries, but by the year 2000, rising incomes and lower costs, compared with other nations, could presage a rise in demand for feedstuffs.

However, if the Polish experience is any indication, an increase in feed demand will still likely result in corn consumption and import volumes that remain below historical levels. For example, Polish corn imports and consumption fell sharply during the 1980's, first due to severe hard currency constraints and later as a result of economic restructuring. While Polish corn imports and consumption increased somewhat in the early 1990's, the volume is still much lower than that of the mid-to-late 1970's (fig. 4).

Figure 4
Poland: Corn imports and consumption




Source: USDA.

## The Outlook for Feeding Practices

Currently, Russia feeds about half of domestically produced wheat. Much domestic wheat is not of millable quality. Improved quality would permit more wheat to command higher food-quality prices. Thus, more domestic wheat production would move to food consumption or exports, reducing wheat available for feed use. A reformed Russian feed-livestock sector could respond by substantially increasing productivity of the feed used. Grain use would likely decline relative to protein use. Despite lower grain use for feed, wheat will probably still figure prominently as a livestock feed in Russia, based on relative prices and higher availability.

A reformed Russian feed-livestock sector that responds to relative prices and is profit-driven will, like its U.S. counterpart, feed minimum-cost rations consistent with profit-maximizing weight gains. Feeds may be easily substituted for each

other when they are similar. Some substitution is possible even if composition differs widely.[11] For example, forage can be substituted for grain in dairy rations. Substitutability usually means feeding locally produced grains that are in abundance, rather than imported grains, because they are more economic. Barley and wheat are more suitable grains for cooler, drier climates and shorter growing seasons such as in Russia.

Table 8--Relative feed values of wheat, corn, and barley

| Animal | Wheat | | Barley | | Corn | |
|---|---|---|---|---|---|---|
| | Digest. energy | Crude protein | Digest. energy | Crude protein | Digest. energy | Crude protein |
| | Mcal/kg | Percent | Mcal/kg | Percent | Mcal/kg | Percent |
| Cattle | 3.88 | 16.0 | 3.70 | 13.5 | 3.97 | 10.1 |
| Swine | 3.66 | 14.1 | 3.08 | 11.6 | 3.53 | 8.5 |
| Poultry | 3.12 | 10.2 | 2.64 | 11.6 | 3.35 | 8.8 |

Source: Committee on Animal Nutrition, National Research Council, *Nutrient Requirements of Beef Cattle, Swine, and Poultry*, various years.

The feed value of barley and wheat is nearly as high as corn for cattle, swine, and poultry (table 8). Furthermore, the protein content of these grains is higher than corn, thus requiring less supplement. However, the quality of the proteins in all three of these cereals is such that some protein supplement is required.

Although 1986-90 Russian cleanweight yields for corn (2.9 tons/hectare) exceed those for wheat (1.8 tons) and barley (1.6 tons), corn is considerably more input-intensive in terms of fertilizer, pesticide, energy, and water use. If input subsidies are further reduced or eliminated, corn yields could fall relative to wheat and barley yields, making corn even less economical to produce in Russia. In 1992, for example, Russian corn yields were down around 8 percent from the 1986-90 average, while wheat and barley yields were 7-17 percent higher. Corn production is also unsuitable in much of Russia for climatic reasons.

Two other factors will likely reduce demand for total imported feed. First, Russian agriculture has made poor use of forages as feed. Yet, much of the country is suitable for pasture. Forages, particularly alfalfa, are high in protein relative to their cost and contain vitamins, particularly vitamin A, which is often shorted in feeding concentrate rations. Better use of forages could reduce the need for concentrate feeds in general and imported concentrates in particular. Second, much feed and feed value is lost in storage and transport. Improvements in handling and storage, which are largely a function of management, would improve feed availability apart from other reforms.

## Review of the Marketing and Distribution System

### Domestic Marketing

Most of the corn grown in Russia is located in the southern European region, around the North Caucasus region (Stavropol oblast and Krasnodar krai) and the Central Black Earth Zone. Neighboring areas in Ukraine and Moldova, along with corn-producing areas in Central Asia provided Russia with inter-republican corn deliveries during the Soviet era. Under this system, corn was delivered to central authorities as part of the State procurement system, in the form of mandatory deliveries and a tax-in-kind paid to the State. Because very little onfarm storage exists, farmers were expected to deliver their corn to State delivery points, where it was dried, cleaned, and then sent to State storage facilities or to mixed feed mills. The grain marketing and processing infrastructure was

[11]Jennings, Ralph D., Consumption of Feed by Livestock, 1909-1956, USDA, Production Research Report 21, 1958. Jennings' work was the basis of the GCAU (Grain Consuming Animal Unit) concept, which was used to compare the feed values of different feeds in different USDA publications.

controlled by the State Committee on Grain Products, later transformed into the "joint-stock" company (still controlled by the State) Roskhleboprodukt.

Even before the breakup of the Soviet Union, State procurement of corn had started to decline, as farms kept the grain to be fed directly on-farm, to barter or pay workers with, or to sell for a higher price on the commodity exchange. The disparity between the State procurement price and mixed-feed prices led farmers to withhold grain (including corn) from the State; livestock feed demand could not be met from internal supplies and demand for feedgrains imports increased.

Since the breakup of the Soviet Union, liberalization of grain production and marketing has progressed slowly in Russia. Grain trade and distribution remains heavily controlled by the State, largely because grain is still considered a "strategic commodity." However, during 1993-94, some attempts have been made to decentralize the State grain marketing system and to allow regions to take more responsibility in grain distribution and processing, as well as to begin privatizing downstream operations.

At the end of 1993, President Yeltsin signed a decree that outlined liberalization of grain marketing and distribution in 1994. Although weaker than its original draft form, the decree stated that in 1994 the federal government would procure only enough grain to supply deficit regions--such as northern nonagricultural oblasts, Moscow, and St. Petersburg--and the military, and to build strategic stocks. All other areas were made responsible for purchasing grain required for local needs, either through regional procurement or imports. However, according to the decree, all purchases are to be made at "market levels," not at prices set by the State, and barriers to free trade of grain were prohibited. Lastly, all downstream operations, such as elevators, mills, and baking enterprises, are to be fully privatized over the next 3 years. However, until then, the State continues to control the majority share in these enterprises.

While this decree represented a step forward in liberalizing Russia's grain market, the State will likely continue to control grain distribution and processing in the near term. Despite increased decentralization in 1994, there is little reason at this point to believe that governmental organizations at the regional level will allow any significant development of non-State marketing channels. Furthermore, in 1994 there were attempts to set minimum support prices for grain producers and to provide other forms of support and subsidies. In the summer of 1994, a published "agreement" between the Ministry of Agriculture and various regions proposed "recommended" grain purchase prices that were higher than those found on commodity exchanges at that time. However, given budget constraints, it is unlikely that these high prices were actually paid.

**Processing Sector**

According to a mixed-feed specialist at the State grain company Roskhleboprodukt, the FSU produced close to 80 million tons of mixed feed each year during the late 1980's, of which Russia produced nearly half. In addition, an average 20 million tons of feed was processed onfarm in the FSU. In 1992-93, Russian mixed-feed production fell 30-40 percent, largely due to decreased State grain procurement and lower demand from livestock products. In 1992, there were 315 State mixed feed plants in Russia, and an additional 1,000 processing plants on State and collective farms.

Russian milling technology generally lags behind that in most developed nations. While some mills have received Western technology, milling obsolescence is evidenced by lower yields, less efficient production, and higher requirements for corn cleanliness. Little is known about the industrial and food-processing sectors that use corn.

Privatization of processing enterprises is proceeding much more slowly than in other sectors of the economy. Many enterprises that are "privatized" are still largely State-owned, as the State remains

the primary share holder in these newly formed joint-stock companies. As a result, these enterprises continue to receive grain from the State-controlled company Roskhleboprodukt. While grain subsidies to processors, along with substantial import subsidies, were reportedly phased out during 1993, some level of support likely continues, particularly where prices continue to be controlled.

## Trade[12]

Since the late 1960's, the FSU has been a net importer of corn, with average yearly import levels of 13 million tons during the 1980's. It is estimated that Russia received half of this supply. Recent import data for the Russian Federation show calendar-year imports of 5.5 million metric tons until 1993 (table 9). The main corn suppliers to the FSU include Argentina, China, Canada, Thailand, Eastern Europe, and the United States, which has maintained 70-90 percent of the FSU market share in recent years (fig. 5). Corn suppliers to Russia in 1992 included China, Hungary, the former Yugoslavia, and the United States, which accounted for over 60 percent of Russian imports.

Table 9--Russia: Grain imports (calendar year)

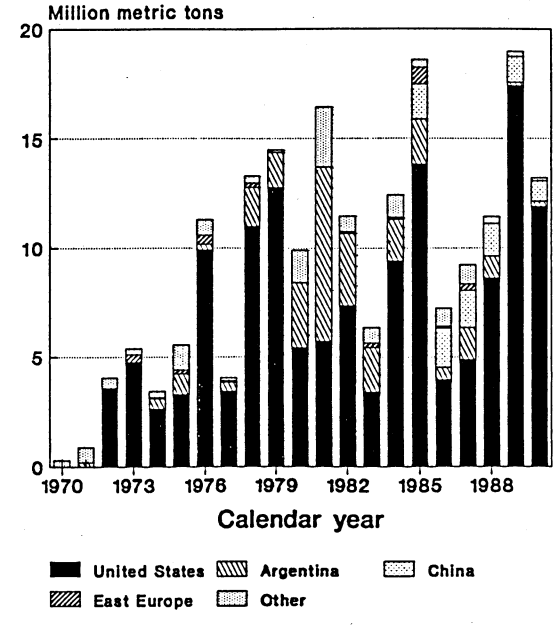
| Imports | 1990 | 1991 | 1992 | 1993 | 1994 [1] |
|---|---|---|---|---|---|
| | | | Million tons | | |
| Grain | 13.1 | 19.1 | 28.9 | 11.1 | 3.0 |
| of which: | | | | | |
| Corn | 5.5 | 5.5 | 5.5 | 4.1 | 1.5 |
| Share of total | 42% | 29% | 19% | 37% | 50% |

[1] Jan.-Nov.1994.
Source: Goskomstat Rossii.

The United States is the only major corn supplier able to offer export financing (either commercial or concessional) to use for purchases. However, financing availability cannot completely explain the sizable U.S. share, as U.S. exports in 1989, before GSM-102 credit guarantees were allocated, accounted for over 80 percent of FSU imports. Large supplies of corn for export and competitive prices also ensured a strong U.S. market share.

However, corn exports to the FSU, including Russia, are expected to fall in the short term as overall FSU agricultural imports decline. Calendar 1993 data for the Russian Federation show corn imports down 25 percent compared to 1992, while total grain imports fell over 60 percent. Several Russian officials have stated that 1994 grain imports will fall even further, while President Yeltsin claimed that Russia would not import grain in 1994. Grain imports in January-November 1994 were reported at 3.1 million tons, down nearly 70 percent from 1993.

Figure 5
FSU: Corn imports, by source




Source: Goskomstat SSSR.

[12]The authors assume that little if any corn is supplied to Russia through inter-republic trade. Therefore, trade data in this section generally refer to imports from non-FSU sources.

Imports are lower due to continued hard currency constraints and debt-financing difficulties, as well as the market-based contraction of the livestock sector. In addition, import demand for corn in the Russian Federation has declined as the result of improved 1992 and 1993 coarse grain and fodder supply, as well as the phasing out of processor import subsidies.

Most imported corn arrives in Russia by sea, except for corn from China, which usually arrives by rail, by barge (via the Amur River), and more recently by truck. From the United States, corn is primarily shipped from the Mississippi River, the St. Lawrence Seaway, and Atlantic ports. Corn is received at the Baltic, St. Petersburg, and Black Sea ports, as well as at some of the Far Eastern ports, such as Vladivostok.

Once the corn arrives at the port, it is inspected to verify contract standards, and then is sent by rail or by waterway to its final destination, most likely a processing facility such as a mixed-feed mill. The potential for damage (and losses) during distribution is great, as Russian transportation and storage facilities generally do not meet Western standards. Grain, including corn, is often exposed to the elements during transport and storage.

Almost all of Russia's corn imports are purchased by the former State trader, Exportkhleb, now a quasi-private joint stock company with the Russian Government holding over 50 percent of its shares.[13] Quality standards are determined by Exportkhleb, in conjunction with Roskhleboprodukt. Price and, more recently, exporter financing--not consumer or processor preferences--have determined import source and contract specifications.

The corn purchased by Exportkhleb for the Russian Government is allocated to State mixed-feed enterprises by Roskhleboprodukt. The mixed feed enterprises previously paid only a fraction of the actual cost of the imported corn, although this system was reportedly dismantled at the end of 1993. However, it is not known if implicit subsidies exist (preferential exchange rates) or if regional governments continue to subsidize processors. Most importantly, millers had very little influence in determining import source and contract specifications when they paid a fraction of the actual import cost.

Several factors will influence the outlook for Russian corn imports over the medium-to-long run: the ability to finance imports given unlikely easing of hard currency constraints, increased trade liberalization that might enable end users to play a greater role in import determination, relative costs between domestic and imported feed grains, and continued market reforms that are expected to increase feeding efficiencies and reduce waste. Increased protectionism could dampen import demand, while rising real incomes would likely stimulate per capita consumption of livestock products and hence feed demand, possibly resulting in higher corn imports if economically rational.

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[13]While there has been an increase in the level of private (non-State) agricultural trade in Russia, less progress has been made in private-sector grain imports, in part because of Exportkhleb's still-dominant role as the Russian Government's trade representative. In addition, all of the financial assistance provided by exporters was allocated to the Russian Government, further mitigating any increase in private trade. Increasingly, exporters, such as the United States, are looking into ways to provide credit to private importers, based on creditworthiness.

## Review of Survey Results

### Survey Implementation

The survey for this study was carried out in June 1992 by interviewing State mixed-feed millers, a Roskhleboprodukt official in charge of the mixed-feed sector, traders from Exportkhleb, and laboratory technicians at the St. Petersburg port and from Exportkhleb. While a very small percentage (less than 10 percent) of total mixed-feed millers were interviewed due to obvious logistical difficulties, the officials from Exportkhleb and Roskhleboprodukt represented the primary decision-makers who determined import source and specifications at that time.

### Factors Affecting Choice of Supplier and Supplier Performance

Since 1991, the most important criteria for determining corn suppliers have been the **availability of financing** (in the form of commercial or concessional credit, barter, or donation) from the supplier nation and **price**. Given these requirements, the United States has been able to maintain its dominant position in the FSU market through the use of GSM-102 export credit guarantees and more recently through concessional loan and food aid programs such as P.L. 480 Title I and Food for Progress. The other suppliers, such as Eastern Europe and China, are not in the position to provide credit packages on the scale of U.S. programs, and have generally utilized barter arrangements to maintain trade. Argentina, historically a significant corn exporter to the FSU, reportedly arranged a barter deal to export corn to Estonia, but according to official statistics, little if any Argentine corn has been exported to Russia since the breakup of the USSR. Canada and Thailand, historically important corn exporters to the USSR, left the Soviet market in the late 1980's.

### Quality Factors in Purchase Decisions and Supplier Performance

Although quality considerations ranked third or lower as a factor determining corn import source, most of the officials and millers interviewed for this study cited quality complaints about U.S. corn.

**Exportkhleb**: The trade specialists from Exportkhleb indicated that **physical attributes** (BCFM, damaged kernels, moisture content, mold-damaged kernels) and **wholesomeness** (insects, weed seeds, pesticide residue, aflatoxin, odor) were the most important quality factors. Of these, they ranked moisture level as most important, followed by BCFM, infestation, aflatoxin, and weed seeds.

Although less than 2 percent of U.S. corn did not comply with contract specifications (listed below), these traders indicated that U.S. corn does not rank near the top in terms of quality. Argentine flint corn, they felt, was superior in use for feed and starch production. Additionally, they said that Chinese corn was less damaged than U.S. corn, as the Chinese imports always fell under the 5-percent BCFM allowance.

The contract specifications for #3 U.S. corn that Exportkhleb provided were: 15-percent maximum moisture, 5-percent BCFM, and a grain admixture (including broken, eaten, undeveloped, heat-damaged, and sprouted kernels; seeds of other plants; and kernels with dark germ) allowance of 15 percent. Again, while U.S. corn usually fell within the indicated range listed in the contract specifications, Exportkhleb cited corn shipments with 8.3-percent BCFM and 17.3-percent grain admixture content. Exportkhleb analysts estimated that internal transportation can add 1-2 percent BCFM.

Technicians at Exportkhleb's laboratory (which is used to verify port inspections) described U.S. corn as dry, containing foreign material and insects, and generally unhealthy. They indicated that the corn needs to have higher moisture levels for better protection of the kernels during shipment. FGIS data

indicate that when U.S. corn is shipped, the average moisture level is around 14.2 percent. The Russians argued that the corn should be loaded at a higher moisture level. When asked about the use of screenings from cleaning corn, the officials at Exportkhleb did not see an alternative market for them.

**Roskhleboprodukt**: The mixed-feed official provided a more favorable impression of U.S. corn, ranking it first in terms of import source criteria (credit availability, price, quality, and government trade relationships). However, he did note that freshness and cleanliness were issues. **Physical attributes** (BCFM and damaged kernels) and **wholesomeness** (pesticide residue and aflatoxin/metals) were the most important characteristics. He also cited oil content, as Russia was just beginning to use imported corn for corn oil. He expressed the need for cleaner corn, as well as the perception that the corn they were receiving was old (that is, had been in storage long before it was shipped).

Contrary to what the Exportkhleb officials indicated, he said that all screenings (foreign material) are used in mixed-feed production. However, he did not indicate price and demand for corn screenings. Lastly, he indicated that they would pay more for cleaner corn, but could not quantify how much.

**Millers**: The manager of a Moscow area mill (which processes both wheat and corn) and the head of a milling association that includes 11 flour mills and 12 feed mills were interviewed for the corn study. The milling association also handles the distribution of grain and grain products in the region. The association of mixed-feed mills produces on average 3 million tons of mixed feed a year. The mill that was visited uses over 100,000 tons of corn per year, processed mostly as mixed feed for a nearby poultry plant.

The main complaints about U.S. corn centered around freshness, cleanliness, the presence of dust, low yields, and kernel damage due to low moisture levels. Most of the corn they receive is from the United States, the rest from Argentina and China. These quality complaints were not mentioned in conjunction with corn imported from these other sources.

The milling manager indicated that after corn is cleaned, the screenings are sold to other plants for use in mixed feed. They themselves do not use screenings in the mixed feed they produce. They receive 30 percent of the original price they paid for the corn for the screenings they sell to other mills.

Also interviewed was the director of Lenkhleboprodukt, the Leningrad oblast association of grain processors and distributors. There are 7 mixed-feed mills under his direction, which produce 1.6 million tons of mixed feed a year. Most of these mills were under reconstruction, and the director expected that the production level could increase to 2.2 million tons in the next 2-3 years. They purchased 250,000-300,000 tons of corn each year, all of which are used for feed. Additionally, they used almost a third of all wheat purchased (wheat purchases totaled over 1 million tons) for feed.

Unlike the other processors interviewed, this director had a much different interpretation of the problems facing the mixed-feed industry and the livestock sector in Russia. In his opinion, lower levels of milling technology and the overuse of grain in mixed feed lead to an inferior product, as opposed to the quality of the feed ingredient. He stated that while the FSU and the EC produced the same amount of mixed feed in 1987, FSU feeding efficiencies were more than two times lower than EC levels. Lenkhleboprodukt had started to work with Western firms to improve mixed-feed rations in terms of balanced ingredients for better feeding results, and the director also indicated that if he were able to make his own purchasing decisions, he would purchase less grain and increase oilseed meal imports, which are infrequently distributed during the year.

**St. Petersburg Port**: One of Russia's primary ports, the St. Petersburg (formerly Leningrad) port is located on the Gulf of Finland. In 1992, the port operated 7 days a week, receiving 18 ships each day

carrying grain. Each year the port receives 5-6 million tons of grain, although in 1985 it received a record 9 million tons. The St. Petersburg port has gained more prominence since the independence of Lithuania, Estonia, and Latvia, which has lowered Russia's use of the Baltic ports.

One of the top concerns of officials at the port was the increasing incidence of ships lacking the proper paperwork in order to deliver grain, including corn. While the problem can be attributed to both importers and exporters, it has led to delays in unloading the ships, and to a deterioration in the quality of the product on board. Port officials noted that sometimes U.S. corn is wet, indicating that the corn was loaded when moisture levels were high. This clearly contradicts the complaint by Exportkhleb and end-users that U.S. corn is too dry, and could indicate that moisture is lost during incountry transport. Officials also cited the presence of dust in the shipments, as well as BCFM and weed seeds.

## Conclusions

Russia's transition to a market economy is having a noticeable effect on supply and utilization of grain, including corn. Despite a 40 percent drop in projected 1994/95 Russian corn production compared to the 1986-90 average, imports have also fallen as output of other coarse grains has remained relatively stable and less grain overall is fed as herd numbers are reduced. Livestock inventories (in total animal units) have fallen over 10 percent since 1990, and are expected to further contract as consumer demand for meat remains low due to reduced purchasing power. Moreover, higher quality, competitively priced imported meat and dairy products have begun to displace some level of domestic output. Given successful agricultural reforms that should lead to more efficient production and use, import demand for corn could weaken over the long run as grain used for mixed feed decreases and domestically produced grains such as wheat and barley are substituted for corn.

Import source and specifications are still largely determined by the State, through the joint stock companies Exportkhleb and Roskhleboprodukt. The availability of export financing and competitive prices were identified as the most important determinants of import source. While Russia was almost completely dependent on credit and donations for import purchases during 1992-93, suspension from several exporter credit programs in 1993 and 1994 due to repayment difficulties lowered Russia's use of credit for corn purchases. Debt rescheduling in 1994 enabled Russia to become current on its debt repayment and theoretically eligible for export assistance, however, uncertainty over Russian creditworthiness and RF Government policy to minimize additional debt have resulted in continued low levels of assistance to date.

The most important corn quality considerations voiced by Russian importers and processors were **physical attributes** and **wholesomeness**. While there were numerous complaints concerning these characteristics, almost all of the U.S. corn imported by Russia fell within the contract specifications as designated by Exportkhleb for #3 corn. Additionally, these quality concerns seem to have little bearing on recent import source decisions, as U.S. share of the Russian corn market has remained above 60 percent over the last few years. The main question for the long term outlook is whether the United States can maintain its high share given that the Russian corn import market should become more competitive due to expected lower import volumes and reduced export assistance. Also, quality characteristics could become a more important determinant of Russian corn import source given that end-users, who are more quality conscious, will likely begin to effectively communicate their preferences.

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## Glossary

*Aflatoxin*--A toxic substance produced by the soil fungus Aspergillus flavus, which can infect corn and other crops (such as peanuts) when they are stressed during maturation. The infection can also spread under improper storage conditions. Scientists believe aflatoxin increases the chance of developing liver cancer when ingested by humans in concentrations of more than 20 parts per billion.

*Balanced (or complete) feed*--A nutritionally adequate feed for animals other than man. A specific formula is compounded to be fed as the sole ration and is capable of maintaining life and/or promoting growth without any additional substance except water.

*Breakage susceptibility*--The probability that a given corn kernel will crack during handling or transportation. It has been scientifically established that breakage susceptibility differs by corn genotype.

*Broken corn and foreign material*--A corn grade-determining factor that includes broken corn pieces that pass through a 12/64-inch sieve plus foreign material (defined below).

*C & f*--Cost and freight to the designated delivery point, paid by the seller.

*C.i.f.*--Cost, insurance, and freight to the designated delivery point, paid by the seller.

*Commodity Credit Corporation (CCC)*--An agency of the U.S. Department of Agriculture created in 1933 to carry out loan and storage operations as a means of supporting prices above the level that would have prevailed in a free market.

*Compound (or formula, mixed, or manufactured) feed*--A feed mixture containing two or more feed ingredients designed to satisfy the nutritional requirements of a given animal type.

*Concentrate*--A broad classification of feedstuffs that are high in energy and low in crude fiber content (less than 18 percent).

*Corn bran*--The pericarp or seed coat of the corn kernel that is removed during processing and used as an animal feed.

*Corn germ*--The embryo found in corn kernels and frequently separated from the bran and starch endosperm during milling. This part of the kernel contains most of the oil.

*Corn gluten*--The tough, viscid nitrogenous substance remaining when the flour of corn is washed to remove the starch.

*Corn gluten feed*--A byproduct of manufacturing of starch, high-fructose corn syrup, and corn oil (wet-milling of corn). Contains all fiber originally present in corn. Corn gluten feed is a medium energy, mid-level protein meal (21-23 percent protein), which competes with wheat bran, hominy feed, and brewers' dried grain in feed rations.

*Corn gluten meal*--Also a byproduct of corn wet-milling process. Corn gluten meal has 60 percent protein content, competes with soybean meal and other oilseed meals.

*Corn starch*--A key byproduct of corn processing, it is the carbohydrate component of a corn kernel. A typical corn kernel contains 65-70 percent starch on a dry product basis. The product that results from corn wet-milling contains 99.75 percent carbohydrates and only 0.25 percent protein.

*Damaged grain*--In U.S. grading standards, the term damage refers primarily to biological deterioration associated with discoloration. Physical damage (such as cut or broken kernels) is not included in U.S. grades but is included in the standards of some other countries.

*Defects*--Computed total amount of damaged kernels, foreign material, and shrunken and broken kernels.

*Denaturing*--A process that deprives a substance of certain of its natural properties. In this case, the corn that is denatured to prevent its diversion into industrial channels renders the corn unusable for wet-mill processing by adulterating it with other feed ingredients (such as soymeal) or altering its starch composition.

*Distillers' dried grain*--A byproduct of the alcohol distillation process (yielding grain alcohol and ethanol). It is a feed ingredient preferred in the rations of high-producing dairy cattle, feedlot cattle, and calf starters.

*Dry milling*--Process for milling of grain where no water is added--produces hominy, grits, and flour/meal.

*Endosperm*--The middle portion of the corn kernel, consisting of two parts, the soft endosperm, opposite the tip of the kernel, and the hard endosperm, which is the interior portion of the kernel. The endosperm contains both starch and gluten. The endosperm is ground intact in the dry-milling process but is separated into starch and gluten in the wet-milling process.

*Ethanol (or ethyl alcohol)*--a colorless and volatile liquid that is flammable. Ethanol is produced commercially from molasses, grain, sulfite waste liquor, or wood waste. It is derived from the industrial fermentation of simple sugars, which are the results of the hydrolyzation (by enzymes) of starch or cellulose. Ethanol for fuel in the United States is produced primarily from corn starch. In the product that is sold as fuel for automobiles, gasahol, the solution is typically 10-percent ethanol, 90-percent gasoline.

*Export (or terminal) elevator*--An establishment that operates facilities for receiving and shipping grains in large quantities at a terminal market. These locations were frequently the final destination of much of the grain because these were often important locations for processing, hence the designation terminal.

*Export Enhancement Program (EEP)*--Program to help U.S. exporters meet competitors' prices in subsidized markets: Exporters are awarded cash payments, enabling them to sell certain commodities to specified countries at prices below the U.S. market price.

*F.a.s.*--Free alongside ship specifies that the seller delivers goods to the port elevator or dock at a specified location and the buyer pays for loading the ship and ocean freight.

*Feedgrains*--A categorization of various grains which is intended largely for feed use. For example--corn, sorghum, barley, and oats.

*Feed milling*--Process of milling and mixing various feedstuffs such as corn, soybean meal, etc., producing a compound mixed, manufactured, or formula feed.

*Feed wheat*--Any type of low quality, low protein wheat used as feed--generally sold at a price discount to higher protein wheats.

*F.o.b.*--Free on board, specifies that the seller loads the ship or other conveyance at the specified delivery point, with the buyer paying freight charges.

*Foreign material*--Includes dirt, pieces of cob, other grains, etc., and finely broken corn that pass through a 12/64-inch sieve, plus material on top of a 6/64-inch sieve, according to FGIS definitions.

*Grade factor or grade-determining factor*--Those characteristics of grain used to determine the numerical grade. The grade factor is based on quantitative limits (either maximums or minimums) placed on each factor for each grade.

*Heating*--A portion of a corn shipment is overmoist, and has begun deteriorating or fermenting in transit.

*High-fructose corn syrup (HFCS)*--HFCS is made from a dextrose (glucose) syrup, fully converted from starch hydrolyzates by means of isomerizing glucose to fructose with the use of an enzyme xylose isomerase. HFCS is used as a substitute for sugar, particularly in industrial preparation of foods and beverages.

*Hominy feed*--A byproduct of the corn dry-milling process. It is a preferred ingredient for dairy cattle rations. It is the equivalent of corn grain in feed value, although with higher protein and fiber content.

*Hybrid corn*--Hybrid corn is the product of a controlled, systematic crossing of specially selected parental strains called `inbred lines.' Accompanying inbreeding is a rigid selection for the elimination of those inbreds carrying poor heredity and which fail to meet established standards.

*Identity preservation*--Segregation of a commodity from one point to the next in the marketing system. The initially identified commodity is delivered to the next point in the marketing system without being mixed with other units of the same commodity during handling and shipment.

*Intrinsic value (or end-use value)*--Characteristics critical to the end-use of grain. These are nonvisual and can be determined only by analytical tests. For example, the intrinsic quality of corn is determined by characteristics such as protein, oil, and starch content.

*Market channels*--The agencies and institutions through which products are moved from their original producers to the final consumers in the marketing of grain. The market channel includes all stages from the point of first delivery from the farm to the final consumer of raw or processed products.

*Mixed, manufactured, or formula feeds*--See *Compound feeds*.

*Metabolizable energy*--The level of energy from a given grain that can be absorbed in an animal's digestive tract. The metabolizable energy content for a given grain or feed ingredient differs between animal types because they have different digestive processes.

*Moisture content*--The amount of water in grain; measured by the weight of water as a percentage of the total weight of the grain including water.

*Nongrade determining factor*--Factors that influence the quality of grain but are not taken into account in the grading of grain. These factors must be reported as information whenever an official inspection is made.

*Nonmillable material*--All material that is not corn, includes shrunken and broken kernels.

*Physical quality*--Grain characteristics associated with the outward appearance of the grain kernel, including kernel size, shape, color, moisture, damage, and density.

*Premiums*--Prices that exceed the base price offered for grains with higher quality characteristics than specified. Generally calculated for factors that increase the value of the grain in market channels.

*Sanitary quality*--Grain characteristics associated with cleanliness. They include the presence of foreign material that detracts from the overall value and appearance of the grain, including the presence of dust, broken grain, rodent excreta, insects, residues, fungal infection, and nonmillable matter.

*Screenings*--The material removed from grain by means of mechanical sizing devices; generally include broken grain as well as nongrain material removed on the basis of density or particle size with mechanical cleaners.

*Test weight*--Weight per unit volume as measured in pounds per bushel as defined in the United States. Determined by weighing the quantity of grain required to fill a 1-quart container. The international equivalent measure is kilograms per hectoliter (conversion factor 0.77).

*Wet milling*--Process for milling of grain where water is added--produces starch, corn syrup, and HFCS.

*White corn*--A type of corn, lacking the carotene (yellowish) content of corn, used mostly for human consumption. White corn makes up only a small part of global corn production and trade.

*Yellow corn*--The most common type of corn produced, used largely as a feedgrain but also as a foodstuff in large parts of Sub-Saharan Africa and Latin America.

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Appendix Table 1--FSU: Corn supply and utilization

| Year [1] | Area | Yield | Production | Imports | Exports | Available supply | Total use | Feed and residual | Share of consumption | Stock Change |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1,000 ha | ton/ha | ----------1,000 tons---------- | | | | | | Percent | 1,000 tons |
| 1960 | 5,086 | 1.93 | 9,823 | 133 | 390 | 9,566 | 9,566 | 7,254 | 76 | 0 |
| 1961 | 7,145 | 2.40 | 17,113 | 24 | 1,129 | 16,008 | 16,008 | 12,585 | 79 | 0 |
| 1962 | 7,005 | 2.21 | 15,474 | 5 | 832 | 14,647 | 14,647 | 11,448 | 78 | 0 |
| 1963 | 6,995 | 1.59 | 11,143 | 127 | 712 | 10,558 | 10,558 | 8,436 | 80 | 0 |
| 1964 | 5,114 | 2.71 | 13,849 | 2 | 533 | 13,318 | 13,318 | 10,194 | 77 | 0 |
| 1965 | 3,177 | 2.53 | 8,030 | 23 | 227 | 7,826 | 7,826 | 5,475 | 70 | 0 |
| 1966 | 3,229 | 2.61 | 8,416 | 186 | 177 | 8,425 | 8,425 | 6,162 | 73 | 0 |
| 1967 | 3,485 | 2.63 | 9,163 | 361 | 201 | 9,323 | 9,323 | 7,001 | 75 | 0 |
| 1968 | 3,350 | 2.64 | 8,828 | 432 | 254 | 9,006 | 9,006 | 6,525 | 72 | 0 |
| 1969 | 4,167 | 2.87 | 11,954 | 110 | 129 | 11,935 | 11,935 | 8,639 | 72 | 0 |
| 1970 | 3,353 | 2.81 | 9,428 | 271 | 281 | 9,418 | 9,418 | 6,555 | 70 | 0 |
| 1971 | 3,332 | 2.58 | 8,597 | 2,106 | 128 | 10,575 | 10,575 | 8,206 | 78 | 0 |
| 1972 | 4,012 | 2.45 | 9,830 | 4,101 | 249 | 13,682 | 13,682 | 11,046 | 81 | 0 |
| 1973 | 4,031 | 3.28 | 13,216 | 4,797 | 365 | 17,648 | 17,648 | 13,890 | 79 | 0 |
| 1974 | 3,955 | 3.06 | 12,104 | 2,200 | 450 | 13,854 | 13,854 | 10,631 | 77 | 0 |
| 1975 | 2,652 | 2.76 | 7,328 | 12,300 | 0 | 19,628 | 19,628 | 17,062 | 87 | 0 |
| 1976 | 3,303 | 3.07 | 10,138 | 5,000 | 0 | 15,138 | 15,138 | 11,954 | 79 | 0 |
| 1977 | 3,362 | 3.27 | 10,979 | 10,857 | 0 | 21,836 | 21,836 | 18,352 | 84 | 0 |
| 1978 | 2,535 | 3.53 | 8,951 | 9,602 | 0 | 18,553 | 18,553 | 15,698 | 85 | 0 |
| 1979 | 2,667 | 3.15 | 8,400 | 14,550 | 0 | 22,950 | 22,950 | 20,050 | 87 | 0 |
| 1980 | 2,977 | 3.18 | 9,454 | 11,800 | 0 | 21,254 | 21,254 | 17,924 | 84 | 0 |
| 1981 | 3,545 | 2.65 | 9,400 | 17,700 | 0 | 27,100 | 27,100 | 22,800 | 84 | 0 |
| 1982 | 4,161 | 3.53 | 14,700 | 7,400 | 0 | 22,100 | 22,100 | 17,700 | 80 | 0 |
| 1983 | 3,900 | 3.41 | 13,300 | 8,700 | 0 | 22,000 | 22,000 | 17,250 | 78 | 0 |
| 1984 | 3,919 | 3.47 | 13,600 | 20,300 | 0 | 33,900 | 32,900 | 27,500 | 84 | 1,000 |
| 1985 | 4,482 | 3.21 | 14,400 | 10,400 | 0 | 24,800 | 24,800 | 20,750 | 84 | 0 |
| 1986 | 4,223 | 2.96 | 12,479 | 7,100 | 0 | 19,579 | 19,579 | 15,729 | 80 | 0 |
| 1987 | 4,573 | 3.24 | 14,827 | 8,800 | 1,500 | 22,127 | 21,969 | 17,501 | 80 | 158 |
| 1988 | 4,427 | 3.62 | 16,009 | 20,150 | 1,575 | 34,584 | 34,609 | 27,535 | 80 | (25) |
| 1989 | 4,109 | 3.71 | 15,225 | 20,150 | 1,550 | 33,825 | 33,775 | 26,588 | 79 | 50 |
| 1990 | 2,842 | 3.47 | 9,860 | 8,720 | 1,420 | 17,160 | 18,213 | 14,584 | 80 | (1,053) |
| 1991 | 2,982 | 3.27 | 9,761 | 12,550 | 350 | 21,961 | 22,566 | 17,676 | 78 | (605) |
| 1992 | 2,700 | 2.62 | 7,087 | 6,440 | 500 | 13,027 | 13,734 | 11,320 | 78 | (707) |
| 1993 | 2,914 | 2.99 | 8,722 | 4,195 | 150 | 12,767 | 13,015 | 10,915 | 82 | (248) |
| 1994 | 2,828 | 2.18 | 6,165 | 2,540 | 0 | 8,705 | 8,945 | 6,765 | 84 | (240) |

[1] Trade is on a July/June year. Marketing years 1960-86 do not include intra-FSU trade, while 1987-94 do include intra-FSU trade.
[2] Estimated.
[3] Projected (December 1994).
Source: USDA.