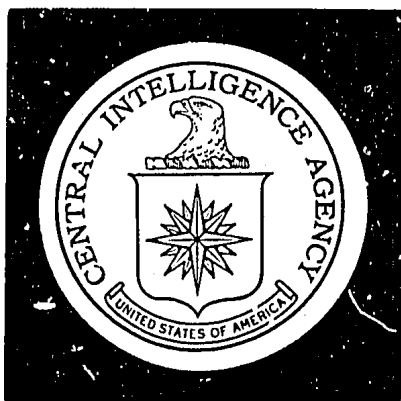


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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

The Soviet Grain Supply, 1971

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CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
September 1971

INTELLIGENCE MEMORANDUM

THE SOVIET GRAIN SUPPLY 1971

Conclusions

1. The preliminary estimate of 1971 grain production, subject to a more-than-normal degree of uncertainty, is some 140-145 million metric tons. This level of production falls between the record crop of 150 million tons of 1970 and the average for the last five years of 135 million tons. The highly tentative nature of the estimate is due largely to a 10- to 15-day delay in the ripening of spring grains in selected major producing areas. A compressed harvesting schedule in the event of a prolonged spell of bad weather in the last half of September and early October could result in losses sufficient to reduce total production to or below the average for 1966-70.

2. Even with a near record grain crop of 140-145 million tons the Soviet Union will be hard pressed in fiscal year (FY) 1972 to meet domestic needs and, at the same time, to continue supplying its client states at the level averaged in recent years. The surge in use of grain as livestock feed in the past year, a consequence of the official campaign initiated in 1969 to alleviate domestic meat shortages, is expected to continue. More importantly, wheat reserves suitable for consumption as food are believed to be currently near minimum levels. The drawdown of wheat stocks for use as feed, in conjunction with new information concerning the utilization and quality of grain in recent years, has resulted in a sharp downward revision in the estimated level of reserve stocks of bread grains suitable for human consumption.

3. Without attempting to be precise in making a revised estimate of carryover stocks of grain on the eve of the 1971 harvest, it appears likely that the USSR is in a shaky position. If, for example, there is a marked decline in grain production in 1971 - say, to a level less than 140 million tons - the regime will probably choose to import grain beyond the quantity already contracted for or to face the consequences of a

Note: This memorandum was prepared by the Office of Economic Research.

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deterioration in the quality of the daily diet, a result of the necessity of using available grain for bread instead of for livestock feed to produce meat.

4. As an indirect result of the official campaign markedly to raise output of meat and other livestock products in the short run, the USSR has already contracted for up to 4 million tons of wheat imports for FY 1972 from Free World suppliers. The heavy feeding of wheat in 1970 - three times the normal rate - has seriously reduced the buffer stocks available for use as bread grains. Although the amount of wheat scheduled for feeding during FY 1972 will probably be more in keeping with normal levels, the somewhat reduced availability of wheat from the 1971 crop compared with last year, in conjunction with a continued high level of commitments for exports to its client states, has prompted the Soviet Union to increase imports.

5. If, as expected, meat imports from Free World suppliers in FY 1972 reach the level of FY 1971, the total hard currency outlays for wheat and meat are expected to be at least \$315 million, an amount equivalent to 80% of 1970 Soviet earnings for petroleum - the number one hard currency earner from the Developed West.

DiscussionIntroduction

6. Despite prospects for an above-average grain crop, the internal supply position for the USSR is not favorable. An official campaign to effect a rapid increase in livestock production has led to a sharp rise in the use of grain, including wheat, for feeding livestock. This surge in domestic demand for grain, coupled with a relatively small carryover of stocks of wheat, much of which is of poor quality, has already resulted in large purchases of wheat from Free World suppliers.

7. The purposes of this memorandum are to describe the status of the grain harvest as of 1 September and to provide a preliminary estimate of 1971 grain production, to assess the internal supply position for grain, and to evaluate the purchase of grain and meat from abroad during FY 1971 and FY 1972.

Factors Affecting the 1971 Grain CropAcres Below Long-Term Average

8. The total area from which the USSR intends to harvest grain in 1971 comes to about 121 million hectares, roughly 2 million hectares

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above the area harvested in 1970 but about 2 million hectares below the average for 1966-69. However, the final garnered acreage depends on growing and harvesting conditions during the balance of the crop season. If the current delay in maturation of spring-seeded grain crops continues, inclement weather in the early fall may force the abandonment of some wheat acreage or the partial harvesting of corn acreage as green fodder instead of whole grain.

Output of Winter Grains Near Record High

9. A good winter grain crop was harvested in the USSR.⁽¹⁾ The outturn of fall-seeded wheat and rye - normally accounting for roughly one-half of total bread grain production - may have reached the record level of production posted in 1970. Slightly lower yields in 1971 were probably more than offset by a somewhat larger area of harvested acreage.

10. Early sowing and timely precipitation in the autumn of 1970 permitted good development of seedlings over most of the winter grain area. Winterkill did not exceed normal levels. Furthermore, favorable spring moisture conditions in major winter wheat growing areas, coupled with an increased application of fertilizer, were harbingers of record yields. However, late spring droughts in several relatively minor winter wheat growing areas - the Central Black Soil Zone, parts of the Volga Valley, and Central Asia - reduced yields in these areas to well below those of the previous year. In addition, after the winter wheat had ripened in portions of the major winter wheat growing areas of the Ukraine and Moldavia, heavy rains and wind resulted in an above-normal area of lodged grains⁽²⁾ leading to losses during harvesting. The harvesting of wet and flattened grain in these regions served to maintain yields at the 1970 level and, in addition, probably resulted in a lower quality product in comparison with last year. Despite these minor setbacks, the regime had reason to be pleased with the overall success of the winter grain harvest.

Production of Spring Grains Below Last Year

11. The seeding of spring grains⁽³⁾ was carried out under less than optimum conditions. Cool, wet weather delayed planting and retarded crop

1. *Winter grains normally account for about 28% of total harvested grain acreage and 36% of production. Harvesting is initiated in the southern areas in June and concludes in the northern areas in late August.*

2. *The term lodging describes the condition resulting when stalks break or bend and form a flattened or tangled mass which is difficult to cut.*

3. *Spring grains normally account for some 72% of total harvested grain acreage and 64% of production. Harvesting is initiated in the southern areas in July and normally is concluded in the northern and eastern areas by early October.*

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development in most major spring grain areas. More than one-fifth of all grain sowings had to be carried out after 25 May, a date considered to be well past the optimum time of planting for grain crops. Moreover, cool weather in June and July continued to retard growth and caused some delay in harvesting in selected areas. On the other hand, above-normal supplies of soil moisture tended to offset the ill effects of the late sowing. With the exception of parts of the small grain areas of the Volga Valley, the Central Black Soil Zone, and the corn growing regions of the North Caucasus and Moldavia, very favorable moisture conditions prevailed during the critical phases of crop development. These conditions, taken together with a further boost in fertilizer applications, suggested record yields in several major growing regions.

12. Time is growing short for carrying out the harvest. By 1 September only about 60% of the total grain acreage had been harvested compared with a long-run average of 70%. At the end of September or early in October, it is highly likely that harvest conditions will deteriorate rapidly. The onset of freezing temperatures before the grain has matured and the occurrence of rain or snow during harvesting can reduce quality as well as the amount of grain harvested. Already, the Soviet press reports that heavy rains and high winds have flattened large acreages of spring grains in the Urals and the New Lands regions.

Prospects for Total Grain Production in 1971

13. If September-October weather is normal, the outlook is for a total harvest of between 140 million and 145 million metric tons, somewhat below the record harvest of 150 million tons in 1970 but the second largest crop in Soviet history (see Table 1). If, on the other hand, the pace of the harvest slows further and fall is early, it is likely that above-normal losses of grain will result. Under such conditions, the outlook would be for a total harvest not in excess of 135 million tons, a level of production equal to the average for the last five years.⁽⁴⁾

Internal Supply Position for Grain

14. Even with a near record grain crop of 140-145 million tons the Soviet Union will be hard pressed in FY 1972 to meet domestic needs and export commitments to its client states. The current surge in use of grain as livestock feed, a consequence of the official campaign initiated

4. The estimate of 140-145 million tons is based on the assumption that all of the acreage intended to be cut as whole grain is threshed (121 million hectares). The lower estimate postulates that either some acreage is abandoned or used as green fodder for livestock and/or that grain yields per hectare are lower.

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Table 1

USSR: Production of Total Grains a/
Official Claims and CIA Estimates

Million Metric Tons

<u>Calen- dar Year</u>	<u>Official Claim <u>b/</u></u>	<u>CIA Estimate <u>c/</u></u>
1963	108	92
1964	152	120
1965	121	100
1966	171	140
1967	148	122
1968	170	135
1969	162	128
1970	186	150
1971	N.A.	140-145 <u>d/</u>

a. Including pulses.

b. Bunker weight (gross of excess moisture and foreign matter).

c. CIA estimate of usable grain. Net usable grain is estimated as the gross output minus excess moisture, unripe and broken kernels, weed seeds, and post-harvest losses incurred in loading and unloading of grain between the combine and storage facilities.

d. See discussion in text.

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in 1969 to alleviate meat shortages, is the principal source of Soviet grain problems and is expected to continue. The use of grain as livestock feed rose by roughly 50% between the 1968 and 1970 crop years. In addition to a marked rise in 1969 and 1970 in production of feed grains -- barley, oats, and corn -- there has been a spurt in the feeding of wheat. Recent press reports indicate that 15 million tons of wheat were fed in 1970, an amount equivalent to about one-fifth of the average estimated total wheat harvest in the two year period 1969-70.⁽⁵⁾ This was made possible in large part by the release of a considerable quantity of wheat reserves from government-held stocks.

15. A comparison for recent years of production with domestic requirements (food, feed for livestock, seed for succeeding crops, and industrial use) plus net exports had earlier suggested an accumulation of bread grain in reserves of 20-25 million tons of grain at the end of FY 1970.⁽⁶⁾ Reserves of this size would represent about one-half of the annual consumption of grain for food and would provide the Soviets with a hedge

5. Although Soviet sources in the past have been notably reticent in discussing the use of bread grains as feed, enough indirect indicators were available to suggest that on the average about 6% (roughly 4-1/2 million tons) of the annual wheat crop was fed to livestock. The figures on the use of wheat as feed may be partly inflated insofar as they refer to the official concept of gross weight -- that is, including moisture and dockage. In addition, some of the siftings from the combine may be included.

Wheat is a close substitute for feed grains, but in the United States, because of a normally higher price of wheat compared with that of corn and other feed grains, only a minor quantity is fed to livestock. For example, during the 1960s in the United States, the use of wheat for feeding fluctuated between one-half and two million tons annually, the upper limit equivalent to about 5% of annual production. Moreover, most of the wheat fed to livestock in the United States was below milling-quality standards.

6. Incomplete data are published on the utilization of grain in the Soviet Union, and statistics on stocks are closely guarded secrets. Given the structure and use of Soviet grain crops, it can be surmised that grain reserves are limited almost entirely to wheat. The known uses of rye, the other bread grain, for food or industrial purposes exhausted the total available and, hence, did not permit the setting aside of rye for feeding livestock or as carryover stocks.

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against major shortfalls in grain production.⁽⁷⁾ Now, it appears that these estimates of grain reserves suitable for human consumption were too high. New evidence has come to light indicating that in the last few years (1) considerably more grain (including wheat) has been utilized as seed than had been previously estimated, and (2) because of poor quality control, a sizable proportion of wheat stocks carried over from earlier crop years is probably unsuitable for human consumption.⁽⁸⁾

16. A drawdown of wheat stocks to supplement regular supplies of feed grains, coupled with a downward revision in the level of carryover stocks of wheat suitable for consumption as food, is believed to have brought grain stocks to near minimum levels.⁽⁹⁾ Without attempting to be precise in making a revised estimate of carryover stocks of grain on the eve of the 1971 harvest, it appears likely that the Soviets are in a shaky position. If, for example, production fell to a level below the lower end of the current estimated range of 140-145 million tons, the regime would probably be forced to import grain beyond the quantity already contracted for or face the consequences of a deterioration in the quality of the daily diet as a result of the available grain being used for bread instead of for livestock feed to produce meat.

17. In 1969 and 1970 the regime failed to sustain the considerable progress in per capita meat consumption made between 1965 and 1968. This stagnation of output in 1968 followed by a drop in 1969 of 3% in conjunction with the continued rise in personal money incomes since 1969, which added to the already existing and substantial unsatisfied demand for meat, led to a lengthening of queues for meat in state stores where prices are fixed, an increase in the number of reports of complete absence of

7. *Relative stagnation in grain production in the years prior to major crop failures of the mid-1960s (1963 and 1965) caused a drawdown of grain reserves to a low level, but it had been assumed that a series of good to excellent crop years (1966, 1968, and 1970) and the absence of severe crop failures had led to a substantial replenishment of grain reserves.*

8. *For a discussion of the evidence that led to a downward revision in the estimate of grain reserves, see the Appendix.*

9. *That is, inventories held as buffer stocks to minimize the effects of harvest shortfalls. In addition to stocks to cover normal requirements, some unknown quantity of inventories of grain is held by strategic purposes to supply the military forces and the economy with needed food in time of war. Presumably, at the point when total grain reserves are comprised solely of strategic stocks, the regime will feel compelled to authorize imports.*

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supplies of meat in selected urban centers, and rising prices in the collective farm market (CFM), where prices rise and fall according to demand and supply. In early 1970 the regime took steps to augment domestic supplies of meat by purchasing considerable quantities from the Free World. Purchases for hard currency last year came to roughly 85,000 tons (approximately \$50 million). However, a moderate improvement in per capita meat availabilities in 1970 - up 5-1/2% - noticeably failed to reduce the gap between supply and demand. Severe shortages in state retail outlets in provincial cities and rising CFM meat prices in Moscow continued to be reported throughout the year. But a further boost in meat output in the first half of 1971, supplemented by additional imports, led to a partial easing of the supply situation.⁽¹⁰⁾

18. Along with a moderate rise in meat output in 1970, official policy encouraged the expansion of livestock herds. During the first six months of 1971, livestock herds rose at an annual rate of 5-1/2%. More importantly, from the standpoint of grain supplies, the buildup of herds has been centered on grain-consuming types of meat producers - hogs and poultry - which respond relatively quickly to a step-up in feeding rates.⁽¹¹⁾

19. The boost in herd size, in conjunction with the estimated rise in meat output and total livestock products of 5% and 4-1/2%, respectively, is a modest response to the large increase in grain made available for feeding. Because of the relative inefficiency in converting feed units to liveweight in the Soviet setting, it requires a considerably larger quantity of grain to achieve a given production of meat than it does in North America or Western Europe.⁽¹²⁾

10. Confirmed and unconfirmed purchases of 90,000 tons (approximately \$50 million) from Free World suppliers have been made so far with deliveries nearly completed by mid-1971. Meanwhile, international meat trade circles expect new Soviet orders during FY 1972 to exceed those of the past two years.

11. All of the increase in meat output between 1968 and 1971 is attributable to a boost in production of pork and poultry.

12. The ratios for pounds of feed required per pound of gain in weight of hogs and poultry in the USSR are about double those in the United States. Broilers are raised from chicks to market weight in 8 weeks in the United States, compared with 12 to 14 weeks in the USSR; 6 months for marketable weight hogs in the United States, compared with about 10 months in the USSR. This difference in relative feeding efficiency between the two countries is in part due to the poor quality (low protein content) of Soviet feed rations, in part to relatively poor breeding stock, and, in the case of livestock in the socialized sector, to inefficient management practices.

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20. This and other inefficiencies in the production of meat and other livestock products not only leads to a relatively high cost compared to the cost of other farm products but also requires a high and sustained effort in accelerating grain supplies. In this context, as the official campaign continues over the next several years to effect large annual boosts in meat production, the regime will become painfully aware of the resource cost required. However, the regime has no better alternative.

Outlook for Grain Trade

21. If, as now expected, output of grain in 1971 falls below the record of 1970, the USSR will be hard pressed to meet its commitments to export grain to Eastern Europe and to its other client states in FY 1972. Nevertheless, unless overall production falls below the lower end of the range currently forecast - 140 million tons - the Soviet Union will probably continue to be a net exporter of grain.⁽¹³⁾

Marked Rise in Grain Imports Scheduled

22. Soviet imports of grain during FY 1972 will probably reach at least 4 million tons, nearly double the annual average for the period 1967-70 (see Table 2). During 1964-66 the USSR imported unusually large quantities of grain (averaging more than 8 million tons per year) because of the near disastrous harvests of 1963 and 1965. Exports in the same time period declined to an average annual level of about 4 million tons. But after the excellent harvests of 1966 and 1968, annual imports dropped to an average of about 2 million tons, and the Soviet Union resumed its traditional role of a net exporter.

23. However, in spite of the record grain crop of 1970 and the expectations to date of another above-average crop for 1971, the USSR has recently contracted for the delivery of about 4 million tons of wheat during FY 1972. On 4 June, before an accurate forecast by Soviet officials of the size of 1971 domestic wheat production was possible, the Canadian Wheat Board announced the sale of 3.27 million tons of wheat for delivery between June 1971 and "the early part of 1972." In addition to the above firm commitments, the Soviets have the option to purchase a further

13. This assumes that within the bread grain component of the total estimated production (supplemented by several million tons of imports) there will be enough milling-quality grain to meet needs for human consumption.

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Table 2

USSR: Exports, Imports, and Net Trade
in Total Grain and Wheat a/

	Thousand Metric Tons			
	Calendar Year			
	Annual Average			
	1964-66	1967-68	1969	1970
Exports				
Total grain	4,228	6,493	8,067	6,798
Of which:				
Wheat	2,579	5,473	6,824	5,773
Imports				
Total grain	8,275	2,564	1,345	2,841
Of which:				
Wheat	7,820	1,914	418	2,206
Net trade <u>b/</u>				
Total grain	+4,047	-3,929	-6,722	-3,957
Of which:				
Wheat	+5,241	-3,559	-6,406	-3,567

a. Including flour (converted into grain equivalents by using a 72% extraction rate), rice, and groats.

b. A plus sign denotes net imports; a minus sign, net exports.

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250,000 tons of Canadian wheat for delivery during the period May-July 1972.⁽¹⁴⁾ In mid-August, by which time Soviet officials had a firm forecast of the size of the 1971 grain harvest, the Australian Wheat Board announced the sale of 500,000 tons of wheat to the USSR for delivery in the first six months of 1972. The estimated cost of the recent purchases is approximately \$265 million, to be paid in hard currency at the time of delivery.

24. In keeping with the usual practice in recent years, the 350,000 tons of Canadian flour (wheat equivalent) will probably be shipped to Cuba on Soviet account. Although some of the balance of 3.67 million tons may be used to fulfill Soviet commitments to client states in Eastern Europe, the bulk of the purchases are scheduled for unloadings in Soviet ports.

Prospects for Grain Exports Remain Uncertain

25. During FY 1971, most of the USSR's grain exports of an estimated 7.5-8.0 million tons were to its client states in Eastern Europe. Although the figures remain incomplete, it appears that shipments to the East European clients may have reached an all time high of nearly 6 million tons. Moreover, on the basis of the outlook for grain production and domestic needs, East European requirements for grain imports from the USSR for FY 1972 will be only slightly below the past year. If the other major recipients of Soviet grain exports - Cuba, UAR, North Korea, and North Vietnam - continue to depend on the USSR for the same level of supplies as in recent years (roughly 1.5-2.0 million tons), total demands for Soviet supplies to its client states could exceed 7 million tons. On the other hand, if the projected shortfall in the Soviet grain harvest is at the lower end of the current estimate of 140-145 million tons, the USSR, reluctant to expend more hard currency, may force its client states to depend on the Free World for a larger share of their grain needs.

14. Shipping contracts between the two governments have been signed for 2.4 million tons and cover the balance of calendar year 1971. Contracts for the balance of 1.25 million tons of "firm commitments" and the optional 250,000 tons for calendar year 1972 have not been signed as yet.

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CONFIDENTIAL**APPENDIX**Revision in Estimate of Grain Reserves

As indicated in the text, recent evidence indicates that earlier estimates of the size of Soviet reserves of milling-quality wheat at the end of FY 1971 require a downward adjustment. It now appears that in the last few years (1) considerably more grain (including wheat) has been utilized as seed than had been previously estimated, and (2) because of poor quality control, a sizable proportion of wheat stocks carried over from earlier crop years is probably unsuitable for human consumption.

Use of Grain for Seed

Recent information indicates that the officially recommended seeding rates for various types of grain have been significantly raised in the latter half of the 1960s and are now nearly two-thirds above the rates promulgated in the latter part of the 1950s. As a result, the current seed norms imply the use of several million tons more of wheat each year for seeding than those implied by norms used in the late 1950s.

The seeding norms currently decreed by the USSR Ministry of Agriculture for wheat are roughly double those used for climatically analogous areas in the United States and Canada. If it is assumed that the higher seeding rates for the USSR were in use for the period 1966-70, the ratio of wheat yields to seeding rates in the United States and USSR were as follows:

	<u>United States</u>	<u>USSR</u>
Winter wheat	28 to 1	8 to 1
Spring wheat	21 to 1	4½ to 1

With specifications for quality of seed roughly the same in both countries (95% germination, 1% dockage) there is a presumption that the much higher Soviet seeding rates are primarily due to a poorer quality preparation of the seedbed leading to a low proportion of seeds developing into viable plants. Additional reasons may include a slightly shorter growing season compared with that in the United States and Canada and inherent differences in the grain varieties used. The higher seeding rates associated with a shorter growing season were of particular importance in 1969 and again in 1971 when a cool, wet spring delayed sowings by 10-15 days.

CONFIDENTIALProblems With Quality

A substantial decline in wheat quality, as measured by the quantity and quality of protein and gluten present, has a negative effect on the final baked product, especially bread. Although complaints in the Soviet press of declining wheat quality cite agronomic practices during both cultivation and harvesting as well as storage practices as casual factors, the quality problems that have been of most concern recently have been those associated with the latter.

Soviet press reports concerning major types of problems that have resulted in substandard grain suggest that the affected wheat can be reclaimed only for industrial use (e.g., alcohol production) or for livestock feed. The problem is further complicated by the fact that in most cases of deterioration the protein and gluten quality not quantity is affected. Therefore, since only quantitative measures are used in testing wheat for protein and gluten content, a baked product should be observed before the full extent of deterioration can be assessed.*

Recent press reports identify three major types of damage - insects, high moisture content, and smut. Official concern over insect damage is currently centered on the senn pest (*Eurygaster integriceps*), a pest not known in the United States but common in the Middle East, Turkey, and the USSR. This bug attacks the stem of the plant, sucking it dry and, therefore, reducing yields. Of more importance, however, it also attacks the grain kernel where its feeding processes lead to a deterioration in protein and gluten quality but not quantity. While infestation of more than 2% of the crop is reported to make the wheat unusable for a high-quality baked product, numerous reports of damage far exceeding this amount are cited in the Soviet press. For example, in the Tatar ASSR senn pest infested from 1.2% to 21% of the wheat from the 1970 harvest, with an average content of such kernels coming to 8.5%. The same source specifically identified senn pest damage to a "substantial part" of the 1970 wheat harvest in areas that accounted for more than one-tenth of the country's wheat harvest in 1970.

Because of a short growing season and the concentration of a relatively high proportion of annual precipitation in the spring wheat belt during the harvest period, the Soviets have had a perennial problem of reducing moisture in grain to acceptable levels for storage. The problem is exacerbated

* *In contrast to protein and gluten quantity which can be measured in the grain, protein and gluten quality can be determined only from the milled flour. Potential bread-baking strength can be estimated from the so-called "dough-ball test," but a baked product is the best quality test.*

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in "wet" years by the failure to provide enough modern high-capacity mechanical dryers to dry the grain before storage. As a rule, grain with 14%-15% moisture content can be safely stored as long as the temperature remains below 40°-50°F. If the temperature increases or the grain has a higher moisture content, the grain is likely to become moldy, turn color, produce a flour with a rancid flavor, and perhaps even ferment.* Recent evidence indicates that the problem of excess moisture and accompanying losses of grain was particularly acute after the harvests of 1969 and 1970. Because of poor harvesting conditions in the winter wheat belt (1969) and the spring wheat belt (1969 and 1970), including above-normal levels of precipitation, a large share of the wheat crop was harvested with a high moisture content. The case of grain procurements in Tselinograd Oblast, the country's tenth largest wheat growing oblast, in 1969 was apparently not too atypical. Nearly one-half million tons of wheat, equivalent to about one-third of total state procurements in the oblast, had an average moisture content of 45% when it arrived at the state elevators. "Under such conditions the grain-receiving facilities with only grain driers of the column type were practically paralyzed and were ineffective in saving such grain." The majority of the driers in the oblast are of the obsolescent column type.

Smutted wheat presents still another problem. Lightly smutted wheat is used in the United States after it has been washed prior to milling. However, the Soviets state that, "when 1% of the grain is smutted, it is classified as defective, and its purchase price is discounted by 25% ... the state is forced to use such grain for technical purposes only." This implies that washing capacity at milling points is severely limited or that the types of smut infecting Soviet wheat are not amenable to treatment. The problem is further complicated by the fact that, once again, the protein and gluten quality, not quantity, is affected.

The major portion of the wheat procured by the government from the 1969 and 1970 crops that is unfit for human consumption has probably been detected and, if salvageable, subsequently removed from storage and used as livestock feed. Nevertheless, given the difficulties in detecting grain with low protein and gluten quality - as opposed to quantity - a sizable share of the grain remaining in carryover stocks from those two crop years may be of substandard quality.

* *Most of the mold damage is associated with favorable moisture conditions for insect damage. The feeding insects create "heat pockets" in stored grain which, in turn, interact with moisture to create conditions favorable for the formation of mold.*

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