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The 1982 Soviet Grain Crop: Reassessing the CIA Estimate

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A Technical Intelligence Report

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GI 82-10269
December 1982

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A Technical Intelligence Report

This report was prepared by the Agricultural Assessment Branch, Office of Global Issues. Comments and queries are welcome and may be directed to the Chief, Agricultural Assessments Branch, Strategic Resources Division, OGI, on

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Soviet Union: Major Grain Growing Regions

[redacted]

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The 1982 Soviet Grain Crop: Reassessing the CIA Estimate [redacted] 25X1

Overview

Information available as of 10 November 1982 was used in this report.

Several months ago, we estimated that the 1982 Soviet grain crop would approximate 165 million tons, somewhat above last year's crop but well below what Moscow was expecting. Although the USSR has not announced the size of this year's grain harvest, remarks by Soviet officials can be interpreted as implying an output as low as 140 million tons or as high as 190 million tons. In view of this wide range and the slow pace of Soviet grain purchases, we reexamined our grain crop estimate—taking another look at the evidence [redacted] 25X1

[redacted] 25X1 The review helped us refine our assessment, but we found no reason for altering our view on the size of this year's crop. Because of the many variables involved, the 165-million-ton figure should be considered our best estimate, but one that is subject to error. The maximum range of error in our grain crop estimate over the past four years has been ± 8 percent.

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CIA monitors Soviet agriculture year round.

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we have reviewed our analysis of this year's grain crop. The review included an evaluation of what we know about other Soviet grain crop estimates, and the assessment of postharvest indicators.

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To cross-check our estimate, we also used an alternative methodology that looks at grain production in six key areas.

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A Survey of 1982 Soviet Grain Crop Estimates

Recent estimates of 1982 Soviet grain production range from about 140 tons to about 190 million tons (table 1). Estimates attributable to Soviet officials privy to internal information about the size of this year's crop cover the entire range of forecasts, thus providing little conclusive insight regarding the likely outcome of the harvest.

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Table 3
USSR: Preliminary Procurement Data, 1982

Economic Region	Estimated Percent of Total Grain Production (1971-80 Average)	Percent of Oblasts Reporting	Date of Procurement Reporting [a]	Amount of Procurements [a]
Baltics	3	100	Normal	Above average
Belorussia	3	100	Normal	Above average
Central	6	92	Normal	Above average
Central Black Earth	6	80	Normal	Average
Volga	11	66	Late	Average
Volga-Vyatka	3	100	Normal	Average
North Caucasus	9	43	Normal	Below average
Ukraine	22	48	Late	Average
Urals	6	67	Normal	Average
Kazakhstan [b]	14	26	Normal	[c]
West Siberia	7	14	Normal	[c]

[a] Compared with the 1976-80 period.
[b] Kustanay is the only major grain-producing oblast in Kazakhstan that has reported as of 2 November. The relationship between yield and procurements is in agreement when comparing 1981 with 1982. Our 1981 estimate for yield in Kustanay was 11 c/ha while procurements were about 3 million tons. A recent Soviet press report placed this year's yield at 13 c/ha and procurements at 4 million tons. The record amount of grain sold to the state from Kustanay is 4.7 million tons.
[c] Insufficient data available to make a valid determination.

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Grain Procurements

We have completed an analysis of all grain procurements reported in the Soviet press through 2 November. Although the level of state procurements does not necessarily relate directly to total production, it can indicate whether a region has experienced a comparatively good, average, or bad year. The procurement data analyzed reflects reporting primarily at the oblast level. We have aggregated it by region/republic in table 3. We believe the procurement data, or in some cases the lack of it, tend to support our current production estimate:

- Procurement reports from the Ukraine and the southern Volga valley are sparse; we believe that this indicates lower-than-average sales to the state In years when production was better than average in these major winter grain–producing areas, we had seen more procurement reporting by now. The lack of reporting from the Ukraine is of particular interest in that this area typically produces about 40 percent of the total winter grain crop.

- Conversely, press reports indicate that the level of procurements in the northern regions of European Russia (Baltic Republics, Central, Central Black Earth, and Volga-Vyatka) is much closer to average, and in some areas even above average. Our analysis indicates that grain production in these areas will be near average or slightly above average.

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Table 4
USSR: Computations for Six Key Oblasts/Republic Methodology [a]

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982 [b]
Oblast/Republic													
Average yield *(centners per hectare)*	**16.4**	**16.4**	**13.2**	**18.9**	**17.1**	**10.8**	**19.1**	**17.6**	**20.8**	**14.7**	**16.4**	**12.9**	**13.2**
Altay	13.4	15.8	19.9	12.5	5.7	13.0	16.0	14.0	16.0 [b]	13.5	11.9 [b]	6.0	8.0
Severo-Kazakhstan	14.3	11.5	13.7	17.5	10.9	7.8	18.0	14.3	14.2	18.5	17.0 [b]	14.1	12.0
Orenburg	13.9	11.5	8.6	12.7	12.7	2.5	15.7	9.0	16.3	13.5	11.0 [b]	7.0	5.0
Volgograd	17.6	10.8	4.5	17.1	16.0	3.9	19.2	12.0 [b]	19.7	9.5 [b]	15.0 [b]	7.0	9.0
Dnepropetrovsk	22.6	27.1	15.3	31.7	30.7	18.1	NA	33.0	33.0	18.1 [b]	27.8	23.0	23.0
Belorussia	16.9	21.4	17.3	21.9	26.6	19.7	26.8	23.2	25.5	15.1	16.0	20.3	21.4 [c]
USSR													
Harvested area *(million hectares)*	**119.3**	**117.9**	**120.2**	**126.7**	**127.2**	**127.9**	**127.8**	**130.3**	**128.5**	**126.4**	**126.6**	**125.5**	**122.0**
Implied production [d] *(million metric tons)*	**184.5**	**182.3**	**149.6**	**225.8**	**205.1**	**130.3**	**230.2**	**216.3**	**252.0**	**175.2**	**195.8**	**152.7**	**151.9**
Actual production	**186.8**	**181.2**	**168.2**	**222.5**	**195.7**	**140.1**	**223.7**	**195.7**	**237.4**	**179.2**	**189.1**	**158.0**	
Percent of error	−1.2	0.6	−11.1	1.5	4.8	−7.0	2.9	10.5	6.2	−2.2	3.5	−3.4	

[a] The average yield for all grains grown in these areas correlates closely with the average all-grain yield for the USSR.
[b] Estimate.
[c] In late October the Soviet press reported a yield of 19.8 c/ha for 1982.
[d] Implied production = average yield (oblasts/republic) × harvested area (USSR) × 0.943 correction factor.

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- Procurement information for the regions east of the Volga River—normally published by late October—is still largely unavailable. [redacted] 25X1

Oblasts/Republic Methodology

As a check on our current estimating methodology, we used an alternate method to obtain a total grain production figure for the USSR. The "Six Key Oblasts/Republic Methodology" suggests a total crop of about 152 million tons for this year (table 4). The five oblasts (Altay Kray, Severo-Kazakhstan, Orenburg, Volgograd, and Dnepropetrovsk) and one republic (Belorussia) used in this methodology were selected because they generally experience the types of weather problems and growing conditions that exist in the principal winter and spring grain regions. The total average yield for all grains grown in the oblasts/republic correlates closely each year with the national average yield. [redacted] 25X1

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Table 5
USSR: Growth Environment in Six Key Oblasts/Republic

Oblast/Republic	Key Month	1981 Precipitation [a]	1981 ETP [b]	1981 Soil Moisture [c] Beginning of Month	1981 Soil Moisture [c] End of Month	1981 Estimated Yield (c/ha)	1982 Precipitation	1982 ETP	1982 Soil Moisture Beginning of Month	1982 Soil Moisture End of Month	1982 Estimated Yield (c/ha)
Spring grains											
Orenburg	July	10	202	7	1	7.0	24	227	5	1	5.0
Severo-Kazakhstan	July	67	180	34	28	14.1	44	180	17	13	12.0
Altay	July	66	168	4	12	6.0	38	160	17	10	8.0
Volgograd East	July	20	215	3	1	7.0	17	205	4	2	9.0
Winter grains											
Dnepropetrovsk	June	34	154	57	28	23.0	37	153	40	16	23.0
Volgograd West	June	56	187	41	24	18.0	69	162	42	27	18.0
Winter and spring grains											
Belorussia	June	75	121	36	35	20.3	57	113	53	27	21.4
	July	62	146	35	30		62	111	27	7	

[a] Precipitation (measured in millimeters of rainfall). Rainfall during the critical months of June and July are vital to plant growth and development. At this time of year low precipitation usually results in reduced yields. This year, precipitation was low in all spring grain areas.

[b] ETP (Evaporation Transpiration Potential). A measurement of demand placed upon the total plant system. Included in this parameter are temperature and wind movement. The higher the ETP values, the more stress the plant endures.

[c] Soil moisture (expressed as a percent of the soil's water-retention capacity). A calculated value that incorporates precipitation and ETP. The lower the soil moisture, the less water available to the plant's root system. Severe stress usually occurs when soil moisture is less than 25 percent of total available soil moisture.

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We also have conducted a detailed 1981-82 comparison of the growing environment in the key oblasts/republic during June and July, the critical months during which winter and spring grains flower and yield potential is determined (table 5). In general, the comparison shows that overall growing conditions, as indicated by the combination of soil moisture, evapotranspiration and precipitation, were only slightly improved this year. In the areas where growing conditions were better this year, our published estimate of yields shows commensurate improvement. [redacted]

Probability of Error Analysis

Based on our track record over the past eight years, probability analysis shows that CIA estimates are within 9 percent of actual Soviet grain production two out of three times (see graph). We are within 12 percent of the reported figure 90 percent of the time. However, the number of data points represented by an eight-year period are statistically too few to generate a true error probability curve. If applied to this year's estimate, probability analysis suggests that there is one chance out of three that we could be off by 15 million tons, and one chance out of 10 that we could be off by 20 million tons. This is overly pessimistic in that errors in the early years [redacted]

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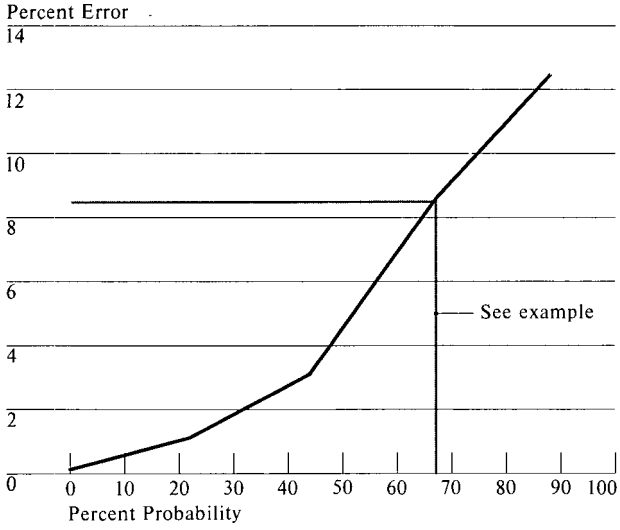
USSR Grain Production: Probabilities of Error in CIA Forecasts



Example: 67 percent of the forecasts have an error of 8.5 percent.

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were considerably higher than those in recent years. Improvements

have enabled us, on the average, to come within 4 percent of actual Soviet grain production over the past four years (assuming that the 1981 crop was 158 million tons). Errors during this period ranged from −5.6 percent to about 8 percent. A similar range of error suggests that 1982 Soviet grain production could fall between 156 and 178 million tons.

Historical Yield and Acreage Data

A strong case can be made that this year's grain crop is not likely to be much larger than 165 million tons, a figure reached by analyzing historical harvested acreage data and average national yields (table 6). This year's harvested area—estimated to be about 122 million hectares—is the smallest in a decade, and that constraint alone places upper limits on the amount of grain that could possibly be produced, given this year's poor weather. Analysis of three possible cases—that is, if the crop comes in at 170 million, 180 million, or 190 million tons—indicates the following:

Table 6
USSR: Grain Production, Area, and Yield Analysis

Year	Production (*million tons*)	Area (*million hectares*)	Yield (*centners/ hectare*)
1976	223.7	127.8	17.5
1977	195.7	130.3	15.0
1978	237.4	128.5	18.5
1979	179.2	126.4	14.2
1980	189.1	126.6	14.9
1976-80 (average)	205.0	127.9	16.0
1981 [a]	158.0	125.5	12.6
1982 Scenarios			
Highly unlikely	190	122	15.6
Unlikely	180	122	14.8
Possible	170	122	13.9
Likely	165	122	13.5

[a] Production is the unofficially reported Soviet figure for the 1981 crop.

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- A crop of 190 million tons harvested from an area of only 122 million hectares would give a nationwide yield of 15.6 centners per hectare (c/ha)—the fourth-highest yield ever. This case is highly unlikely. 25X1
- A crop of 180 million tons would require a yield of 14.8 c/ha—possible but also unlikely in our judgment. 25X1
- At 170 million tons, the yield becomes 13.9 c/ha—a possible achievement. 25X1

Assuming that last year's crop was only 158 million tons, a yield of 12.6 c/ha was obtained from a total harvested area of 125.5 million hectares. Our published estimate of 165 million tons implies a 1982 yield of 13.5 c/ha, which is consistent with the opinion of most Western experts on Soviet agriculture that this year's crop is somewhat better than last year's. The average all-grain nationwide yield during 1979-81 was 13.9 c/ha. 25X1