QUALITY OF THE 2005 SOYBEAN CROP FROM THE UNITED STATES [1/]

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Quality continues to be an important soybean marketing issue. This report summarizes current knowledge on the following soybean quality topics:

- protein and oil composition of the 2005 US soybean crop,
- the 2005 crop in historical perspective,
- weather conditions affecting the 2005 crop,
- the connection between protein content and amino acid levels,
- the initial results of a study funded by USB to examine foreign material in soybean shipments, and
- the adoption of AOCS reference methods by GIPSA.

The data and analyses in this report are intended to assist customers in the purchase and use of US soybeans.

The Quality Survey

Since 1986, Iowa State University (ISU) and the American Soybean Association (ASA) have been surveying the quality of new crop soybean harvests. US soybean producers, representing 30 soybean production states, in response to a mailed request, provided samples of 2005 crop soybeans for analysis. Samples received by November 4, 2005 were analyzed for protein and oil contents using an Infratec near-infrared instrument (Foss North America, Eden Prairie, Minn.). The standard deviation of the Infratec instrument using Iowa State University calibrations relative to wet chemistry is 0.33% points for protein and 0.32% points for oil, on commodity soybean samples. From other sources, data on the yield and physical quality (US Grade factors) of US soybeans have been collected. Data were organized by state and region (groups of states). Weather data for the 2005 growing season were collected to demonstrate the impact on soybean composition.

The 2005 US Soybean Crop

The United States produced 3.040 billion bushels (83.7 million metric tons) of soybeans in 2005, according to the October 12, 2005 USDA production estimates (USDA, 2005). This is a decrease of three percent from 2004, the largest US soybean crop on record. The average soybean yield was 42.7 bushels per acre, higher than the 42.2 bushels per acre in 2004. An

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estimated 71.3 million acres (28.8 million hectares) of soybeans were harvested, a 3.6% decrease from 2004. Table 1 summarizes production statistics for the 2005 crop, by state and growing region. Production decreases occurred in every soybean growing region, except the Western Corn Belt.

Composition data are given in Table 2. Average US protein and oil contents for 2005 were 34.92% and 19.41% respectively (on a 13% moisture basis). The protein content is approximately 0.5 percentage points below, and the oil approximately 0.8 percentage points above, the long-term US averages of 35.38 % protein and 18.65 % oil. The soybeans from the 2005 crop will produce, on average, 42.5 lbs of 48% protein meal and 11.4 lbs of oil per bushel from soybeans at 13% moisture. (This yield of meal and oil assumes that the meal is formulated following the National Oilseed Processors Association (NOPA) trading rules with a residual oil content of 0.5%.) The variability (standard deviation) within states, regions, and the US was approximately equal to the long-term averages for variability.

Weather Conditions in 2005

Weather conditions varied from ideal to droughty across the major soybean growing regions. Planting and emergence were ahead of schedule in the dry areas, somewhat behind average in the wetter areas. The darker areas on the drought map (Figure 1) show the concentration of dry weather in Eastern Iowa and Central Illinois.

Beginning in late September, there were rains across all growing regions, accompanied by abnormally warm conditions for the season. There was an abundance of light and heat to continue photosynthesis at a very high rate late into the season. Protein production (on an acre basis) was established by midseason by production of vegetative tissues, but continued plant metabolism in late fall resulted in more oil and greater yield. Thus on a percentage basis, the protein content was lower. Harvest moisture contents were generally low, with the possible exception of the far eastern growing areas that were extremely wet late in the year.

Historical Performance

Soybean yields, which increased steadily in the 1990s, appeared to have stabilized in recent years. The 2004 and 2005 crops, however, returned to the 1990s trend, due to improved genetics and good growing conditions across many soybean growing regions.

Table 3 shows a combination of USDA production and survey composition data. The yield, and protein and oil data is shown graphically in Figure 2. In the 1990s, yields increased by 0.5 bushels/acre/year, with little change in average protein and oil content. In 2005, there was a yield increase and protein and oil levels were not out of the range of previous data. Breeding programs continue to emphasize yield, apparently without creating quality loss. The net result is a steady increase in the production of protein and oil per unit of area (Figure 3). From a consumer perspective, this has meant a steadier, more abundant supply from the same inputs.

Figure 4 shows the long-term variability (standard deviation) of the protein and oil results in the survey. The average long-term standard deviation for protein is 1.50 percentage points, 0.88 for oil. In 2005, the standard deviations for protein and oil were 1.46 and 0.87 percentage points, respectively. The ratio of the standard deviations of protein to oil did not change significantly from 2004 – the relative variability of the two components remained about the same.

GIPSA collects results from Official soybean export inspections (GIPSA, 2005a). Official inspections establish Grade based on a set of physical factors and, on request, will report protein and oil contents. Historical data is given in Table 4. The majority of inspections (>94%) were for US No. 2 soybeans in 2005. There is some evidence to suggest that the average foreign material (FM) content of US exports has decreased – an average level of under 1.5% since 2002, compared to over 1.6% in the eight years previous to 2002. The GIPSA composition measurements (protein and oil) agree with the ASA-USB-ISU Quality Survey data. This means that exports are generally an average of the US production.

The GIPSA data is not separated by export location. The Gulf South ports are generally served by states along the Mississippi-Ohio-Illinois-Missouri river system. Pacific Northwest ports are more likely to receive grain from the states classified as Western Corn Belt in the survey. Export quality at any port will tend to mirror the quality of production areas that serve it. Over the 19 years of the survey, the percentage of US crop produced in the Western Corn Belt has gradually increased from about 40% to over 50%. This shift is toward areas of potentially lower protein content. The previous data showing a constant level of US average protein and oil continues to be a real credit to the US soybean genetics industry when viewed in the context of this geographic shift in production.

The processing chart in Figure 5 shows the combinations of protein and oil content that will produce 47.5% to 48.5% protein soybean meal. Only once (1997) did US soybeans fall to the left of the optimal area, shown by the shading. Soybeans from individual states and regions often fall to the far right, above 48.5% meal, and the US averages are regularly in the middle of this area.

Some soybean processors do not dehull and therefore produce a lower protein meal (e.g., 44%). The processing chart in Figure 6 shows the combinations of protein and oil content that will produce 43.5% to 44.5% protein soybean meal.

Interpretation of 2005 data

It is clear that the oil and protein contents of the 2005 crop were at the high and low edges, respectively, of the historical data. The protein was the next to lowest, but the oil was the highest of the 20 year history. The sum (total of oil and protein) is the third highest in the record. This means that, in terms of total outputs, meal and oil, the soybean value, on average, is quite good.

In the early years of the survey, we developed the concept of estimated processed value to track the combined output of all products in economic terms. In the US, the pricing of meal and oil actually favors oil somewhat (a per pound price ratio – oil/meal – of 2.6 compared to the long term average of 2.3). In total value, therefore, the crop conditions that favored oil development

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likely created a gain over the value that would have occurred had the oil and protein contents been at their long term averages.

On average, the US crop will easily make 48% meal, although, because of the higher oil and lower protein, there will be less meal per bushel than average. Despite the relatively lower protein content, processors that do not dehull should still be able to make acceptable low-protein meal (44%), while enjoying the benefit of higher oil yields. Included in Figure 6 are the values from three states: Minnesota, Iowa and Illinois. Soybeans shipped through the Pacific Northwest (e.g., Minnesota and Iowa) should still be able to make soybean meal with sufficient protein content. Processors, whether dehulling or not, will benefit from increased oil yield without sacrificing meal quality.

Over the last 10 years, Iowa State has been studying amino acid profiles as well as crude protein and oil. There are 5 major essential amino acids that US nutritionists use to balance feed rations; lysine, methionine, cysteine, threonine and tryptophan. These are amino acids that swine and poultry need but cannot make for themselves. Figure 7 charts the combined amount of these amino acids, both as a percent by weight of soybeans and as a percent of the total protein. The percent of protein data is an effective measure of protein quality.

The total amount of essential amino acids did not fall sharply in lower protein soybeans; and the percent of protein data show that the protein quality was actually better in the lower protein soybeans. This means that if rations are balanced on amino acids rather than crude protein, meal from lower protein soybeans can be at least as good if not better than meal from higher protein soybeans. The amino acid to protein ratio is not changed by the processing of soybean meal; protein is just concentrated by the removal of oil.

Grain shipping patterns will interact with the composition data in 2005. Soybeans shipped from US West Coast ports are likely from Western Corn Belt states. Freight rates have changed to favor the Pacific Northwest for grain shipments to Asia. At the same time, several processors in the Western Corn Belt have begun programs to give premiums for soybeans that are above average in protein, oil, or the combination of the two. Specifics of these programs have been given in the 2003 and 2004 survey reports. The impact of these programs is to create natural sorting of soybeans; those most likely to receive premiums tend to go to the local processors offering the incentives, and the rest are available for sales to other buyers (including exporters) that are not offering incentives. Western Corn Belt processors began these programs because of the historic patterns of lower protein. From an import buyer's perspective, the likely trend will be a very gradual shift in export soybean quality away from those traits that are being given premiums domestically. Similar incentives at export may be needed to send a unified signal to plant breeders and producers that all soybeans need improvement in composition as expectations in domestic and world markets rise.

Foreign Material Study

The United Soybean Board is funding a study at Iowa State University to examine the amount and type of foreign material (FM) in US soybeans. Some anecdotal evidence suggests that the composition of FM has changed in the last ten years due to the advent of Roundup Ready®

soybeans. Similar studies have been conducted in the past, most recently in 1991. This study is designed to build on those studies, updating them for current market conditions. Final results are expected in December of 2005.

The project objective is to analyze the level and composition of foreign material at various stages in the soybean market channel, from farms to export elevator, to determine if there are cost efficiencies that could be captured by exporting a more competitive (lower foreign material) product. While there are some samples yet to analyze, some trends are becoming evident.

1. The broken beans component changes the most of all the FM components. If soybeans are more broken (more splits) they also have more broken beans in the FM and therefore less of other things in the FM. At the same time, the overall FM percentage was not related to the splits percentage, showing that the total FM percentages are probably being managed by the handler.
2. Other grains were the second most variable component, followed by weed seed and other components. The weed seed and other components tended to be a more constant share of the FM, and of the total sample, probably being more fixed at the first point of handling. This is consistent with the inbound elevator data, where the major share of FM is material found in the field (dirt, plant parts, weed seeds), with less other grains and broken soybeans in the FM.
3. The 2003-2004 export samples had a larger proportion of the FM as other grains and as pods than did the 1991 study samples. Weed seeds dropped as a contributor to FM, and the other components (dirt, plant parts, and other) remained about the same share of the total FM.

USDA Adoption of AOCS Reference Methods

The United States Department of Agriculture, Grain Inspection Packers and Stockyards Administration offers protein and oil testing for export soybeans. The GIPSA test is done on every sublot portion (50,000 bushels) of each hold of a ship, and the averages are reported on the certificate, if requested by the buyer.

GIPSA uses an Infratec near infrared analyzer, as does Iowa State University for the ASA Soybean Quality Survey. The GIPSA calibrations were developed for blended export samples to a greater extent than were the Iowa State calibrations. GIPSA's calibration statistics are given in Table 5. The Iowa State calibrations were intended to measure individual samples, such as variety trials or grain lots delivered by producers to the first point of sale. The equivalence of the GIPSA and survey averages indicates that performance of the two NIR calibrations is quite similar in their respective application areas.

NIR instruments must be calibrated to match a reference standard. In world trade, the methods of the American Oil Chemists Society (AOCS) are generally considered universal. The Iowa State calibrations are based on the following methods and labs:

- Moisture: AOCS Ac 2-41, Iowa State (whole grain oven)
- Protein: AOAC 990.03, Eurofins, Des Moines (combustion)

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- Oil: AOCS Ac 3-44, Eurofins, Des Moines (ether extract)

The published reproducibility of the protein and oil reference methods is 0.2 % points when done by AOCS-certified analysts (in the AOCS sample proficiency program).

The GIPSA calibrations are based on in-house adaptations of published methods. The following short descriptions are from the GIPSA website (GIPSA, 2005b):

Moisture Reference Method

Air Oven is the reference method for moisture in grains and oilseeds. The moisture value is used to adjust the protein and/or oil and/or starch content to a constant moisture basis. A representative sample is weighed and placed in a standardized, forced-draft oven according to the GIPSA standard operating procedures. After the required drying time, the sample is re-weighed and the moisture content of the sample is calculated. The Air Oven reference laboratory supports the moisture meter instruments used for rapid inspection at field locations performing official testing. GIPSA's Air Oven laboratory is ISO 9001:2000 registered. ISO's worldwide acceptance gives customers of GIPSA increased confidence that our analytical results are accurate and reproducible.

Protein Content Reference Method

The reference method for analyzing the protein content of grains and oilseeds is combustion nitrogen analysis (CNA). A representative ground sample is weighed and the CNA uses heat and pure oxygen to completely combust (burn) the sample. From the resulting gases, the CNA measures the amount of nitrogen and calculates the "as is" protein content of the ground sample. GIPSA's standard operating procedure follows the AOAC International Method 992.23. The CNA laboratory supports the NIRT instruments used for rapid inspection at field locations performing official testing. GIPSA's CNA laboratory is ISO 9001:2000 registered. ISO's worldwide acceptance gives customers of GIPSA increased confidence that our analytical results are accurate and reproducible.

Solvent Oil Reference Method

The reference method for analyzing the oil content of corn, soybeans, and sunflower seeds utilizes the Soxtec solvent oil extraction method. A representative ground sample is weighed and the oil is extracted using petroleum ether according to the GIPSA standard operating procedures. Upon completion of the extraction process, the "as is" oil content of the ground sample is calculated. This method is a modification of the American Oil Chemists Society Official Method Ac 3-44. The Solvent Oil Extraction laboratory supports the NMR and NIRT instruments used for rapid inspection at field locations performing official testing. GIPSA’s Solvent Oil Extraction laboratory is ISO 9001:2000 registered. ISO’s worldwide acceptance gives customers of GIPSA increased confidence that our analytical results are accurate and reproducible.

The AOCS is now running a harmonization project to verify the alignment of reference laboratories used to create NIR calibrations. Through the first year of sample exchange, the GIPSA laboratory has been in excellent agreement with AOCS-recognized labs. One possible result of this project is the submission of the GIPSA lab protocols as permissible and equivalent method modifications in the AOCS methods book.

It is our view that GIPSA protein and oil tests could be used to enforce contracts and premiums at the time of ship loading with the expectation that these results will be consistent with those in markets where the standard is an AOCS method done by proficient analysts using documented quality control techniques. The accuracy of NIR instruments is within the expected variation of the chemical methods across different laboratories and operating conditions.

Summary

- The total US soybean production in 2005 was nearly three billion bushels, despite isolated areas of drought. This was 5% lower than last year's record production.
- The 2005 US soybean crop is lower in protein (34.9%) and significantly higher in oil (19.4%) than previous years. The variability in protein and oil content was similar to the long-term average variability. Processors should be able to meet target meal protein levels and benefit from higher oil yields.
- The US soybean crop, while lower in protein quantity than soybeans from other countries, has better protein quality, as measured by the amount of five essential amino acids.
- The composition of foreign material (FM) in US soybeans has changed since a 1991 study. The percentage of weed seed and dirt has decreased while the percentage of other crops has increased.
- Work is being done to align GIPSA and AOCS methods for the determination of moisture, protein and oil content in soybeans.

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Table 1. Soybean production data for the United States, 2005 crop

Region	State	Yield (bu/a)	Area Harvested (1000 acres)	Production (1000 bu)
Western Corn Belt (WCB)	Iowa	51.0	10,050	512,550
	Kansas	36.0	2,800	100,800
	Minnesota	42.0	6,800	285,600
	Missouri	35.0	4,950	173,250
	Nebraska	49.0	4,650	227,850
	North Dakota	36.0	2,950	106,200
	South Dakota	36.0	3,850	138,600
	Western Corn Belt	42.9	36,050	1,544,850
				52.1%
Eastern Corn Belt (ECB)	Illinois	45	9,450	425,250
	Indiana	46	5,370	247,020
	Michigan	40	1,990	79,600
	Ohio	44	4,470	196,680
	Wisconsin	38	1,580	60,040
	Eastern Corn Belt	44.1	22,860	1,008,590
				34.0%
Midsouth (MDS)	Arkansas	34	3,000	102,000
	Kentucky	40	1,250	50,000
	Louisiana	34	840	28,560
	Mississippi	35	1,570	54,950
	Oklahoma	25	290	7,250
	Tennessee	38	1,100	41,800
	Texas	30	240	7,200
	Midsouth	35.2	8,290	291,760
				9.8%
Southeast (SE)	Alabama	30	140	4,200
	Florida	n/a	n/a	n/a
	Georgia	26	170	4,420
	North Carolina	27	1,430	38,610
	South Carolina	21	420	8,820
	Southeast	25.9	2,160	56,050
				1.9%
East Coast (EC)	Delaware	31	182	5,642
	Maryland	35	470	16,450
	New Jersey	32	93	2,976
	New York	35	187	6,545
	Pennsylvania	41	430	17,630
	Virginia	30	520	15,600
	East Coast	34.5	1,882	64,843
				2.2%
USA		41.6	71,270	2,967,075
USA 2004		42.2	73,958	3,123,686

Source: United States Department of Agriculture (12-Oct-05)
n/a = not available

Table 2. United Soybean Board/American Soybean Association 2005 Soybean Quality Survey Data.

Region	State	Number of Samples	Protein Percent Average	Protein Std. dev.	Oil Percent Average	Oil Std. dev.
Western	Iowa	317	34.42	1.11	19.56	0.71
Corn	Kansas	35	35.33	1.50	19.49	0.73
Belt	Minnesota	108	33.93	1.07	19.19	0.68
(WCB)	Missouri	96	35.69	1.65	19.43	0.87
	Nebraska	146	34.24	1.08	19.63	0.80
	North Dakota	46	34.05	1.27	18.25	0.70
	South Dakota	66	33.91	1.43	19.37	0.83
Averages	Western Corn Belt	814	34.45	1.34	19.41	0.81
Ranges	Western Corn Belt		(28.9 - 40.5)		(16.6 - 21.8)	
Eastern	Illinois	284	34.99	1.23	19.73	0.85
Corn	Indiana	153	35.79	1.26	19.09	0.89
Belt	Michigan	40	35.97	1.36	18.66	0.99
(ECB)	Ohio	113	35.00	1.34	19.50	0.88
	Wisconsin	34	34.22	1.52	19.31	0.75
Averages	Eastern Corn Belt	624	35.21	1.35	19.44	0.93
Ranges	Eastern Corn Belt		(29.9 - 41.7)		(14.6 - 22.0)	
Midsouth	Arkansas	42	35.87	1.21	19.56	0.59
(MDS)	Kentucky	9	36.01	1.51	19.53	0.74
	Louisiana	9	36.46	2.03	19.37	0.99
	Mississippi	24	36.06	1.50	19.40	1.18
	Oklahoma	9	36.10	1.25	19.07	1.03
	Tennessee	14	36.48	0.76	19.39	0.83
	Texas	2	34.85	1.06	18.85	0.21
Averages	Midsouth	109	36.05	1.33	19.43	0.85
Ranges	Midsouth		(33.3 - 39.8)		(17.2 - 21.8)	
Southeast	Alabama	4	35.88	1.18	20.08	0.13
(SE)	Florida	1	33.60	-	20.50	-
	Georgia	1	36.40	-	19.00	-
	North Carolina	5	35.80	0.54	19.42	0.95
	South Carolina	3	36.33	0.42	19.23	0.12
Averages	Southeast	14	35.82	0.95	19.61	0.70
Ranges	Southeast		(33.6 - 37.4)		(18.6 - 20.8)	
East	Delaware	3	36.30	0.95	18.93	0.67
Coast	Maryland	8	36.09	0.78	19.46	0.44
(EC)	New Jersey	8	37.19	1.32	18.03	1.11
	New York	5	37.62	3.21	17.98	1.34
	Pennsylvania	10	36.24	1.13	18.96	0.64
	Virginia	5	36.60	1.47	19.68	0.71
Averages	East Coast	39	36.63	1.55	18.84	1.02
Ranges	East Coast		(33.6 - 41.2)		(16.4 - 20.4)	
USA	Averages	1600	34.92	1.46	19.41	0.87
	Ranges		(28.9 - 41.7)		(14.6 - 22.0)	
	US 1986-2005 avg.		35.38		18.65	

Basis 13% moisture

Data as of November 4, 2005

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Table 3. Historical Summary of Yield and Quality Data for US Soybeans.

Year	Yield (bu/a)	Protein (%)	Oil (%)	Sum (%)	Harvested (000 acres)	Production (000 bu)	Protein Std. Dev.	Oil Std. Dev.	lb Protein per acre	lb Oil per acre	Protein (1000 MT)	Oil (1000 MT)
1986	33.3	35.76	18.54	54.30	58,312	1,941,790	1.39	0.70	714	370	18.89	9.80
1987	33.9	35.46	19.11	54.57	57,172	1,938,131	1.59	0.71	721	389	18.70	10.08
1988	27.0	35.13	19.27	54.40	57,373	1,549,071	1.50	0.83	569	312	14.81	8.12
1989	32.3	35.18	18.73	53.91	59,538	1,923,077	1.51	0.82	682	363	18.41	9.80
1990	34.1	35.40	19.18	54.58	56,512	1,927,059	1.22	0.66	724	392	18.56	10.06
1991	34.2	35.48	18.66	54.14	58,011	1,983,976	1.38	0.86	728	383	19.15	10.07
1992	37.6	35.56	17.27	52.83	58,233	2,189,561	1.38	0.97	802	390	21.19	10.29
1993	32.6	35.73	18.03	53.76	57,307	1,868,208	1.24	0.87	699	353	18.16	9.17
1994	41.4	35.39	18.20	53.59	60,809	2,517,493	1.36	0.93	879	452	24.24	12.47
1995	35.3	35.45	18.19	53.64	61,544	2,172,503	1.39	0.86	751	385	20.96	10.75
1996	37.6	35.57	17.90	53.47	63,349	2,381,922	1.25	0.87	802	404	23.05	11.60
1997	38.9	34.55	18.47	53.02	69,110	2,688,379	1.51	0.96	806	431	25.27	13.51
1998	38.9	36.13	19.14	55.27	70,441	2,740,155	1.50	0.81	843	447	26.94	14.27
1999	36.5	34.55	18.61	53.16	72,476	2,645,374	1.88	1.05	757	408	24.87	13.40
2000	38.0	36.22	18.65	54.87	73,024	2,774,912	1.68	0.94	826	425	27.35	14.08
2001	39.4	34.98	18.97	53.95	74,100	2,922,914	1.95	1.07	827	448	27.79	15.07
2002	37.0	35.42	19.38	54.80	71,800	2,650,000	1.58	0.93	786	430	25.60	14.01
2003	34.0	35.65	18.66	54.31	72,538	2,468,390	1.71	1.19	727	381	23.92	12.52
2004	42.0	35.06	18.61	53.67	73,990	3,106,861	1.47	0.90	884	469	29.65	15.74
2005	41.6	34.92	19.41	54.33	71,270	2,967,075	1.46	0.87	872	484	28.17	15.66
Averages	36.3	35.38	18.65	54.03	64,845	2,367,843	1.50	0.89	770	406	22.79	12.02
Std. Dev.	3.7	0.44	0.55	0.65	6,975	441,608	0.19	0.13	78	43	4.19	2.34

Sources: United States Department of Agriculture and Iowa State University
Protein and oil contents basis 13% moisture
Yield Data for 2005 estimated October 12, 2005
Protein and oil data for 2005 as of Nov 5, 2005

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Table 4. Summary of GIPSA Grain Inspection Data for Soybeans.

		GIPSA Export Inspection Data						ISU Survey Results	
Calendar Year	Crop Years	Percent No. 2YSB	Moisture (%)	Foreign Material (%)	Damaged Kernels (%)	Protein (%)	Oil (%)	Protein (%)	Oil (%)
1994	93,94	90.3	12.6	1.7	1.1	35.5	18.4	35.5	18.1
1995	94,95	92.3	12.2	1.7	1.0	35.2	18.5	35.4	18.2
1996	95,96	92.2	12.1	1.7	1.1	35.1	18.5	35.5	18.0
1997	96,97	90.9	12.6	1.6	0.8	35.3	18.4	35.0	18.2
1998	97,98	90.0	12.2	1.6	1.0	35.5	18.8	35.3	18.8
1999	98,99	89.4	12.0	1.6	0.9	35.3	18.8	35.3	18.9
2000	99,00	90.0	11.4	1.7	1.0	35.0	18.5	35.4	18.6
2001	00,01	89.5	11.5	1.7	1.3	35.8	18.5	35.6	18.8
2002	01,02	93.1	12.1	1.5	1.4	35.2	18.8	35.5	19.0
2003	02,03	92.6	12.2	1.4	1.5	35.3	18.9	35.5	19.0
2004	03,04	94.1	12.1	1.5	1.4	35.2	18.8	35.2	18.7
2005	04,05							34.9	19.5
Averages		91.3	12.1	1.6	1.1	35.3	18.6	35.3	18.6

Source: USDA Grain Inspection Packers and Stockyards Administration, Iowa State University
Protein and oil basis 13.0% moisture

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Table 5. GIPSA performance statistics for soybean protein and oil calibrations (calibration identifier SB081401, released August 14, 2001)

Factor	Range of Data (percentage points)	Standard Deviation vs. Reference Method (percentage points)	Published Standard Deviation of Reference Method (percentage points)
Protein	27.0 to 41.5	0.52	0.47
Oil	14.0 to 21.5	0.35	0.39

All data basis 13% moisture. Ranges expanded to the nearest 0.5 percentage point.

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Figure 1. US drought conditions as of September 27, 2005. (UNL, 2005)

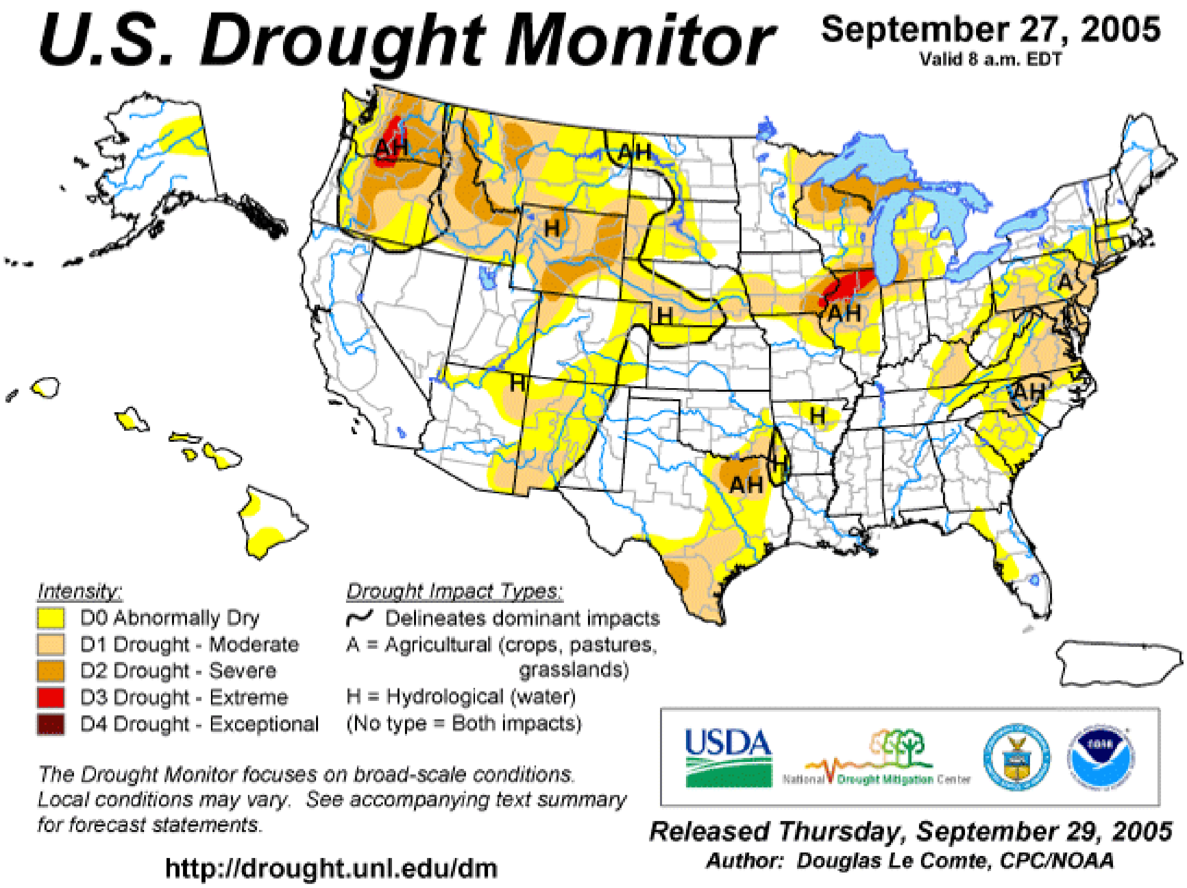

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Figure 2. Historical Summary of Yield and Quality Data for US Soybeans.

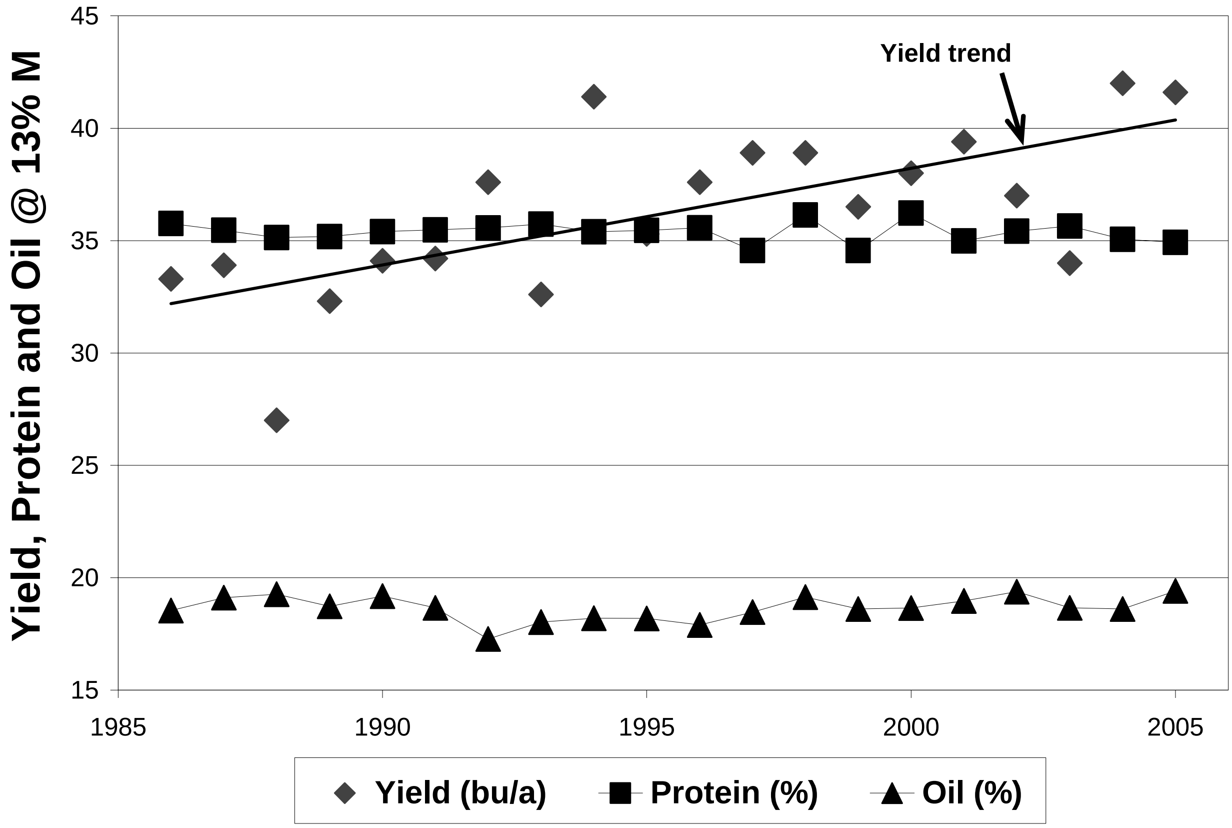

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Figure 3. US Production of Soybean Protein and Oil per unit area.

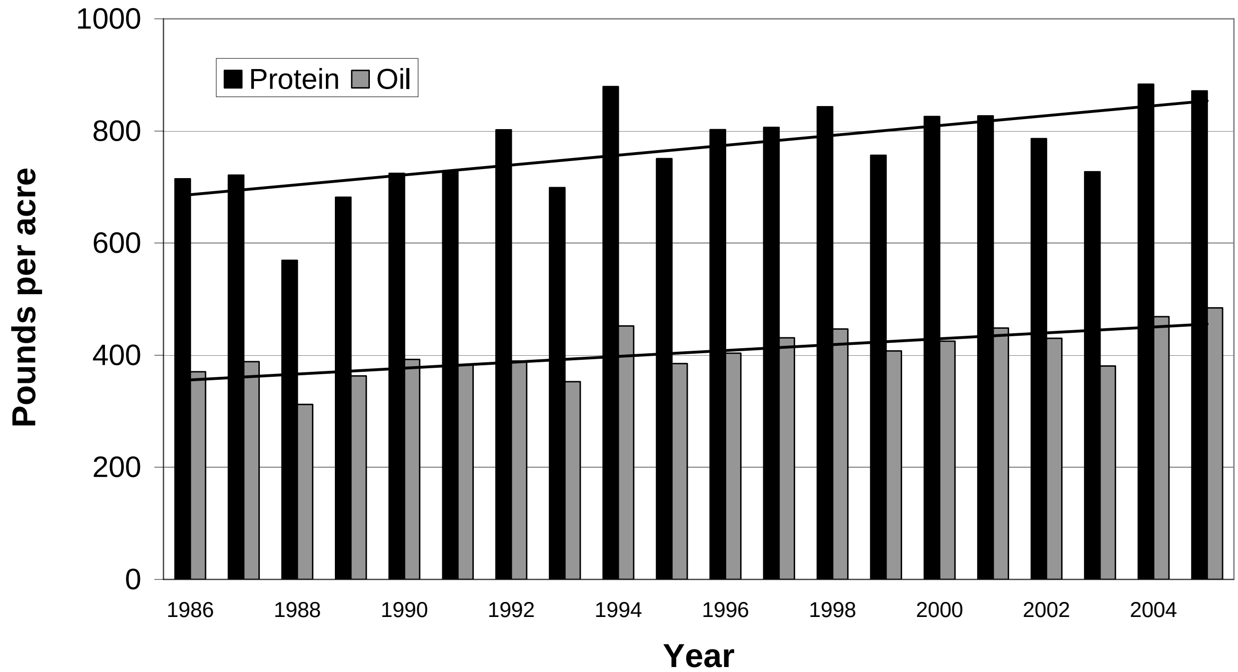

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Figure 4. Historical Summary of Protein and Oil Variability in the Survey.

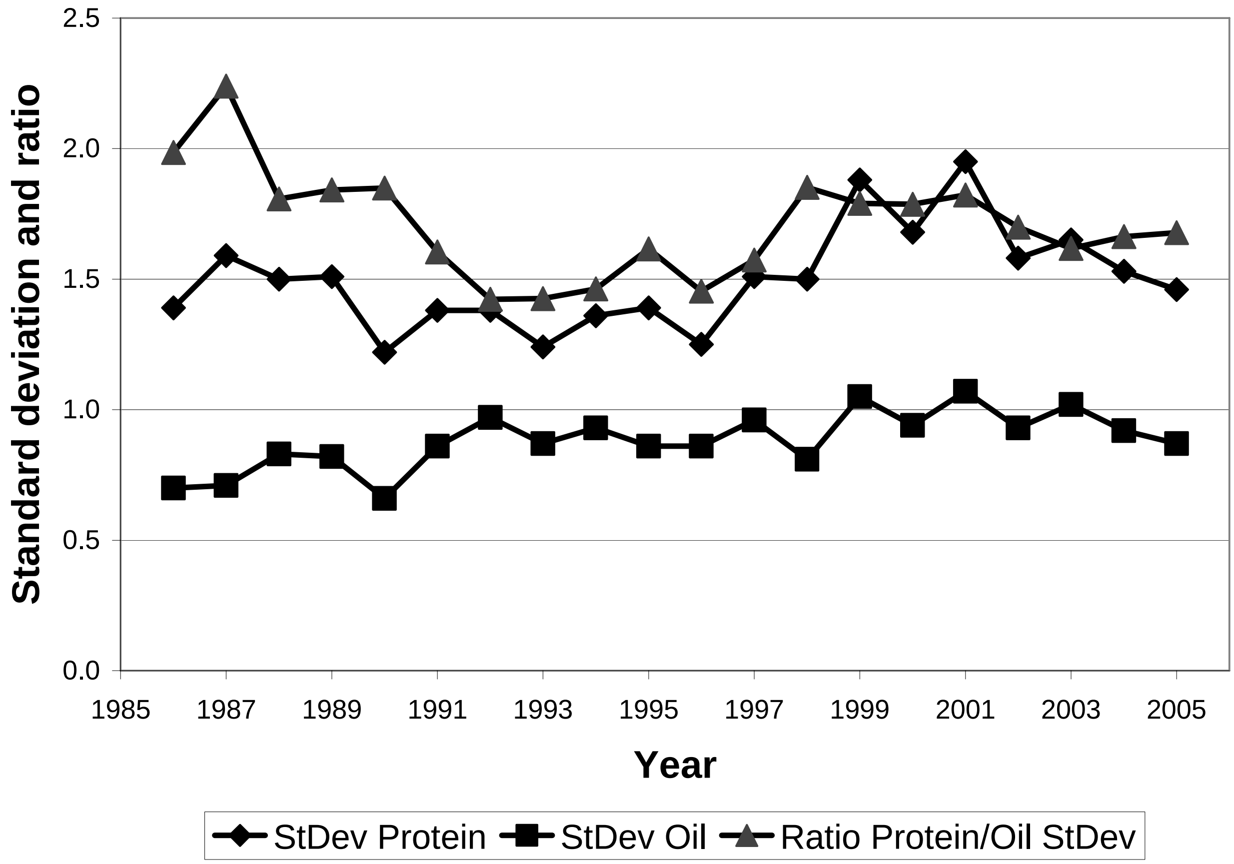

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Figure 5. Protein and oil combinations that will produce 47.5% to 48.5% protein meal.

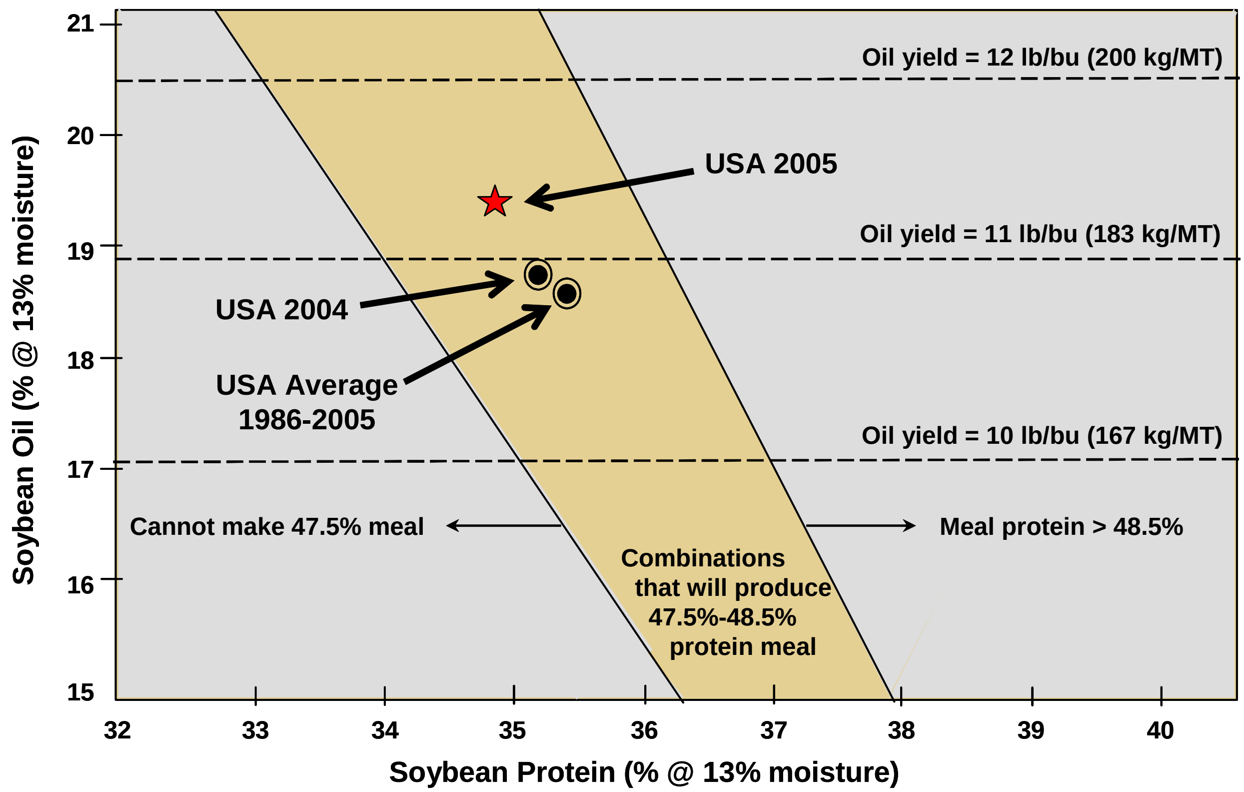

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Figure 6. Protein and oil combinations that will produce 43.5% to 44.5% protein meal.

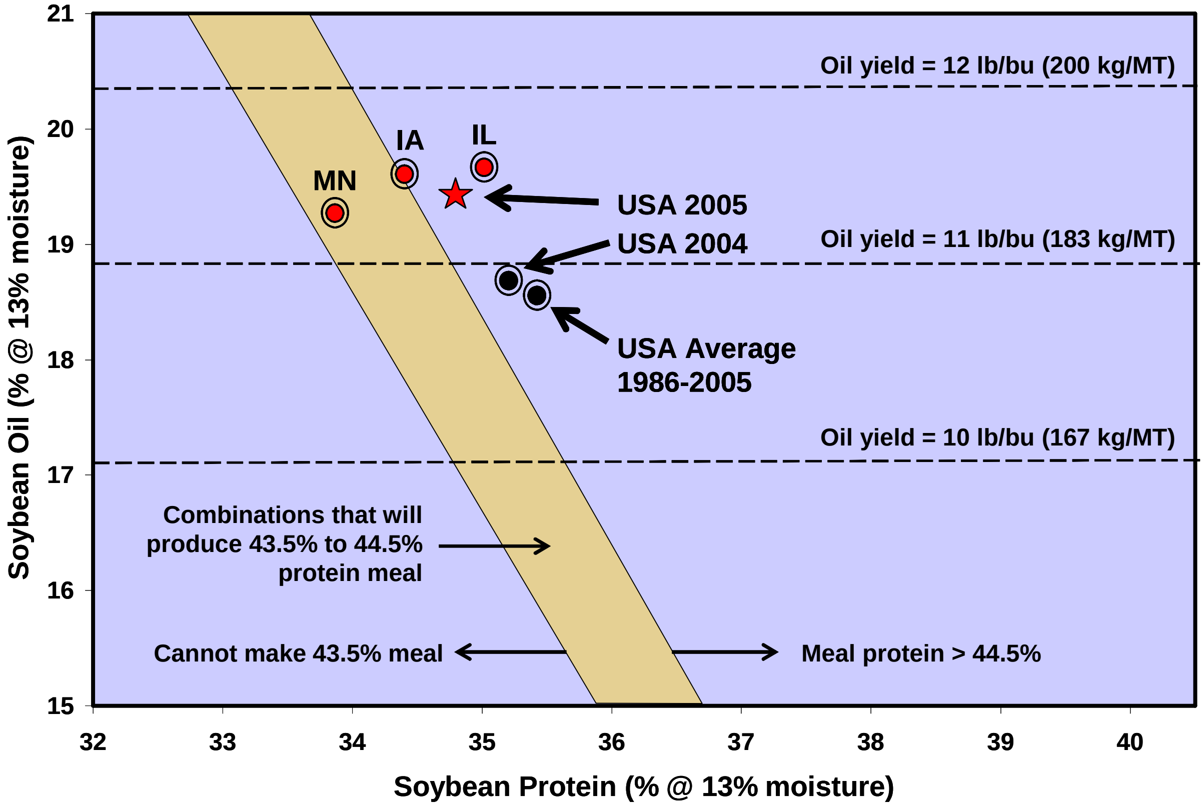

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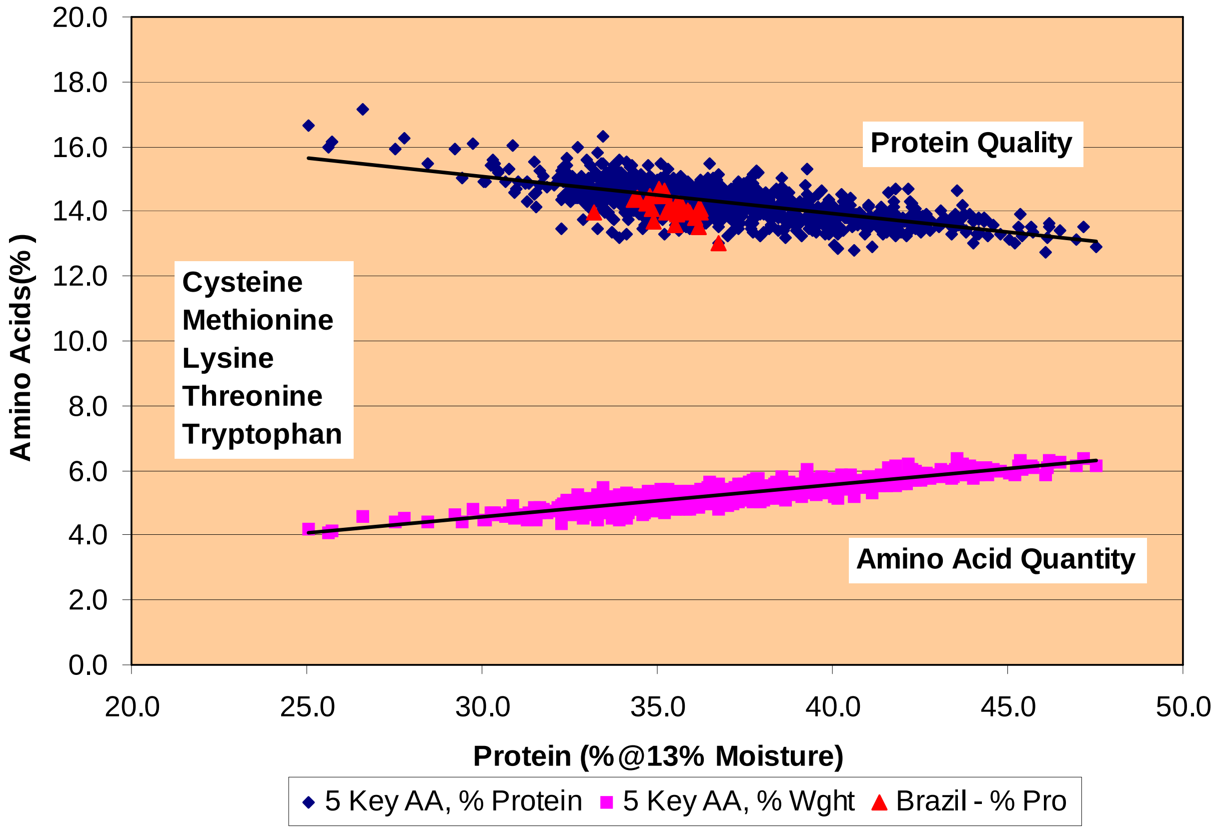
Figure 7. Soybean essential amino acids in relation to crude protein.



Source: ISU Soybean Quality Database, 03 Nov 2005, n = 1243.

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