2018 US Soybean Quality EXECUTIVE SUMMARY

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2018 ACREAGE, YIELDS, AND TOTAL PRODUCTION

According to the November 2018 United States Department of Agriculture, National Agricultural Statistics Service (USDA-NASS) Crop Production report, the US is expected to produce another record soybean crop at 125.3 MMT. If realized, this will be a 4% increase over 2017 (120.1 MMT). The increased production is the result of 5.3% higher yields this year compared to last year (Table 1). An average yield of 3.5 MT/Ha, or 52.1 Bu/Acre, has been forecasted and area expected to be harvested is down just 1% to 35.8 M Ha from the record production area in 2017.

Weather conditions were quite challenging, both during the growing season and during harvest. Wet weather delayed harvest in many areas, especially in the Western Corn Belt; samples collection was delayed as a result, but once better weather conditions allowed field work to continue, growers quickly submitted soybean samples to the University of Minnesota for analysis. The following tables include data from 1,518 US soybean samples received by November 8, 2018.

QUALITY OF THE 2018 US SOYBEAN CROP

Samples were analyzed for protein, oil, and amino acid concentration by near-infrared spectroscopy (NIRS) using a Perten DA7250 diode array instrument (Huddinge, Sweden) equipped with calibration equations developed by the University of Minnesota in cooperation with Perten. A subset of samples was sent to two laboratories for assessment by AOCS-approved analytical chemical methods in order to validate NIR quality constituent predictions. Regional and national average quality values were determined by computing weighted averages using state and regional soybean production estimates, so that average values best represent the crop as a whole.

INTERPRETATION OF PROTEIN, OIL, AND AMINO ACID RESULTS (TABLES 2 AND 3)

Overall, the protein concentration of the 2018 crop was slightly better than in 2017. The US average protein was 34.2 which is 0.4 points lower than the previous ten-year average and 0.9 points below the long term (32-year) average. The average US oil concentration of 18.9% was identical to the previous ten-year average and 0.2 points above the long-term average. Compared with 2017, 2018 protein was slightly higher and oil was off 0.2 points. In 2018, all regions improved in protein from 2017, except the Western Corn Belt (WCB)

which remained at 34.0. Proteins in Nebraska, South Dakota, Minnesota, and North Dakota declined by 0.1, 0.6, 0.3, and 0.2 points, respectively. Kansas, Missouri, and Iowa improved in protein by 0.6, 0.5, and 0.1, respectively. Overall, protein remained at 34.0 in the WCB states in 2018, the same as in 2017. Oil decreased from 19.0 to 18.7; Kansas, Nebraska and Missouri declined in oil by 0.8, 0.5, and 0.4, respectively.

Eastern Corn Belt (ECB) states fared better in 2018. Together, their protein increased from 34.0 in 2017 to 34.3 in 2018. Average oil declined by 0.1. The more easterly states of Ohio and Indiana increased their proteins by 1.0 and 0.6 points, respectively, but Illinois decreased by 0.1 points. Oil increased in Michigan and Wisconsin by 0.2 and 0.1 points, respectively.

Protein and oil increased by 0.4 and 0.1 points, respectively, in the Midsouth (MDS) states. Arkansas saw protein increase by 0.9 and oil increase by 0.1 points over 2017. Kentucky and Tennessee saw protein increase by 0.6 and 0.7, but oil decreased slightly in those states compared to 2017.

In the Southeast (SE), protein increased 0.7 points but oil declined 0.3 relative to 2017. Excessive rain in the southeast likely led to fewer samples from that region compared to other years.

Samples from the East Coast (EC) states showed average protein increased by 0.4 points over 2017 (largely from Pennsylvania), and oil increased 0.2 points higher than in 2017. Again, very wet weather likely dampened sample numbers from the EC.

There was more variation in amino acid data (all data as percent of 18 amino acids) in 2018 compared to 2017, likely due to the wider variation in protein. All regions had lysine concentrations of 6.8 except the WCB which was 6.9. The sum of the five critical essential amino acids (5 EAAs; see Table 3 for list) was 15.5 in the WCB and 15.3 in the other regions. The sum of 7 EAAs was 25.5 in the WCB and 25.3 in all other regions, except the SE where it was 25.2. The US averages increased in 2018 relative to 2017: lysine 6.9 (up from 6.8), sum of 5 EAAs 15.4 (up from 15.1); the sum of 7 EAAs remained at 25.4.

Table 1. Soybean production data for the United States, 2018 crop

Region	State	Yield (MT ha^{-1})	Area Harvested (1000 ha)	Production (MMT)
Western Corn Belt (WCB)	Iowa	3.9	4,026	15.7
	Kansas	2.8	1,908	5.4
	Minnesota	3.4	3,123	10.5
	Missouri	3.1	2,341	7.2
	Nebraska	4.1	2,288	9.4
	North Dakota	2.4	2,774	6.7
	South Dakota	3.3	2,272	7.5
	Western Corn Belt	3.3	18,731	62.4
				49.8%
Eastern Corn Belt (ECB)	Illinois	4.3	4,354	18.7
	Indiana	4.0	2,402	9.7
	Michigan	3.2	927	3.0
	Ohio	4.0	2,021	8.0
	Wisconsin	3.3	887	2.9
	Eastern Corn Belt	3.8	10,591	42.4
				33.8%
Midsouth (MDS)	Arkansas	3.4	1,316	4.4
	Kentucky	3.6	806	2.9
	Louisiana	3.4	531	1.8
	Mississippi	3.6	891	3.2
	Oklahoma	2.1	251	0.5
	Tennessee	3.2	676	2.2
	Texas	2.0	63	0.1
	Midsouth	3.0	4,534	15.1
				12.1%
Southeast (SE)	Alabama	3.0	136	0.4
	Georgia	2.2	53	0.1
	North Carolina	2.4	636	1.5
	South Carolina	2.0	152	0.3
	Southeast	2.4	976	2.3
				1.9%
East Coast (EC)	Delaware	2.8	68	0.2
	Maryland	3.3	209	0.7
	New Jersey	2.8	42	0.1
	New York	3.6	131	0.5
	Pennsylvania	3.3	241	0.8
	Virginia	3.0	239	0.7
	East Coast	3.1	929	3.0
				2.4%
US 2018		3.5	35,779	125.3
US 2017		3.3	36,256	120.1

Source: United States Department of Agriculture, NASS 2018 Crop Production Report (November 2018)

Table 2. USSEC 2018 Soybean Quality Survey Data

Region	State	Number of Samples	Protein (%)*	Std. Dev.	Oil (%)*	Std. Dev.
Western Corn Belt (WCB)	Iowa	191	33.7	1.1	19.1	0.7
	Kansas	46	34.8	1.4	18.6	0.6
	Minnesota	221	34.0	1.1	18.6	0.6
	Missouri	67	34.5	1.2	19.2	0.7
	Nebraska	110	33.9	1.1	18.6	0.7
	North Dakota	86	33.5	1.4	18.3	0.8
	South Dakota	80	34.0	1.1	18.6	0.6
Averages†	Western Corn Belt	801	34.0	1.2	18.7	0.7
Eastern Corn Belt (ECB)	Illinois	276	33.8	1.1	19.2	0.7
	Indiana	100	34.5	1.1	19.1	0.6
	Michigan	65	34.7	1.3	18.8	0.8
	Ohio	102	35.0	1.0	18.7	0.7
	Wisconsin	33	34.4	1.0	18.7	0.7
Averages†	Eastern Corn Belt	576	34.3	1.1	19.0	0.7
Midsouth (MDS)	Arkansas	31	35.1	1.4	19.6	0.8
	Kentucky	16	34.6	1.5	19.5	0.7
	Louisiana	14	34.8	1.3	19.8	0.9
	Mississippi	19	34.8	1.4	19.6	0.8
	Oklahoma	1	37.0		18.1	
	Tennessee	12	34.5	1.2	19.5	0.6
	Texas	1	34.7		18.3	
Averages†	Midsouth	94	34.8	1.4	19.6	0.8
Southeast (SE)	Alabama	4	34.0	1.7	19.6	0.7
	Georgia	2	36.5	0.4	18.5	0.9
	North Carolina	13	35.5	1.7	19.4	0.9
	South Carolina	0				
Averages†	Southeast	19	35.3	1.6	19.4	0.9
East Coast (EC)	Delaware	3	34.7	0.3	19.4	0.3
	Maryland	8	35.3	0.9	18.7	0.6
	New Jersey	1	34.8		18.6	
	New York	6	34.4	0.8	18.6	0.5
	Pennsylvania	8	35.5	0.6	19.0	1.2
	Virginia	2	34.4	1.2	20.0	0.6
Averages†	East Coast	28	34.9	0.8	19.2	0.7
US	Averages	1,518	34.2		18.9	
	Average of 2018 Crop†		**34.2**	**1.2**	**18.9**	**0.7**
	US 2008-2017 avg.†		34.6	1.4	18.9	1.0

* 13% moisture basis

† Regional, US, and 10-year average values weighted based on estimated production by state as estimated by USDA, NASS Crop Production Report (November 2018)

Table 3. USSEC 2018 Soybean Quality Survey Amino Acid (AA) Data

Region	State	Number of Samples	Protein (%)*	Lysine (%18 AAs)	5 EAAs‡ (%18 AAs)	7 EAAs§ (%18 AAs)
Western Corn Belt (WCB)	Iowa	191	33.7	6.9	15.5	25.5
	Kansas	46	34.8	6.8	15.4	25.3
	Minnesota	221	34.0	6.9	15.4	25.4
	Missouri	67	34.5	6.8	15.4	25.4
	Nebraska	110	33.9	6.9	15.5	25.5
	North Dakota	86	33.5	6.9	15.5	25.5
	South Dakota	80	34.0	6.9	15.5	25.5
Averages†	Western Corn Belt	801	34.0	6.9	15.5	25.5
Eastern Corn Belt (ECB)	Illinois	276	33.8	6.9	15.4	25.4
	Indiana	100	34.5	6.8	15.3	25.3
	Michigan	65	34.7	6.8	15.3	25.3
	Ohio	102	35.0	6.8	15.3	25.3
	Wisconsin	33	34.4	6.9	15.4	25.4
Averages†	Eastern Corn Belt	576	34.3	6.8	15.3	25.3
Midsouth (MDS)	Arkansas	31	35.1	6.8	15.3	25.3
	Kentucky	16	34.6	6.9	15.4	25.4
	Louisiana	14	34.8	6.8	15.2	25.3
	Mississippi	19	34.8	6.8	15.3	25.3
	Oklahoma	1	37.0	6.8	15.2	25.0
	Tennessee	12	34.5	6.9	15.3	25.3
	Texas	1	34.7	6.8	15.5	25.5
Averages†	Midsouth	94	34.8	6.8	15.3	25.3
Southeast (SE)	Alabama	4	34.0	6.8	15.4	25.4
	Georgia	2	36.5	6.8	15.2	25.1
	North Carolina	13	35.5	6.8	15.3	25.2
	South Carolina	0				
Averages†	Southeast	19	35.3	6.8	15.3	25.2
East Coast (EC)	Delaware	3	34.7	6.8	15.3	25.3
	Maryland	8	35.3	6.8	15.3	25.2
	New Jersey	1	34.8	6.9	15.4	25.5
	New York	6	34.4	6.9	15.4	25.5
	Pennsylvania	8	35.5	6.8	15.3	25.3
	Virginia	2	34.4	6.9	15.4	25.3
Averages†	East Coast	28	34.9	6.8	15.3	25.3
US	Averages	1,518	34.2	6.9	15.4	25.4
	Average of 2018 Crop†		**34.2**	**6.9**	**15.4**	**25.4**

* 13% moisture basis

‡ Five essential amino acids (also known as CAAV): cysteine, lysine, methionine, threonine, and tryptophan

§ Seven essential amino acids: five listed above and isoleucine, valine

† Regional and US average values weighted based on estimated production by state as estimated by USDA, NASS Crop Production Report (November 2018)

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www.ussec.org/resources/statistics.html
www.soybeans.umn.edu (then choose 'Variety selection' then choose 'Seed quality')

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