

Quality of the United States Food Soybean Crop: 2020

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University of Minnesota

Soybean Outlook Conferences
November 17-19, 2020



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Outline

- 2020 Weather highlights
- Historical protein and oil variation
- 2020 Soybean Survey results
- 2020 Food Soybean Survey results



CRITICAL WEATHER EVENTS



2020 Soybean Production

- Record early planting in Iowa and Minnesota
 - Early in Illinois, Indiana, Nebraska, and Wisconsin
- Severe drought centered on western Iowa, but extending across much of the central Corn Belt
- Extreme winds (derecho) passed through this area on August 10, 2020
 - 110-140 mph winds

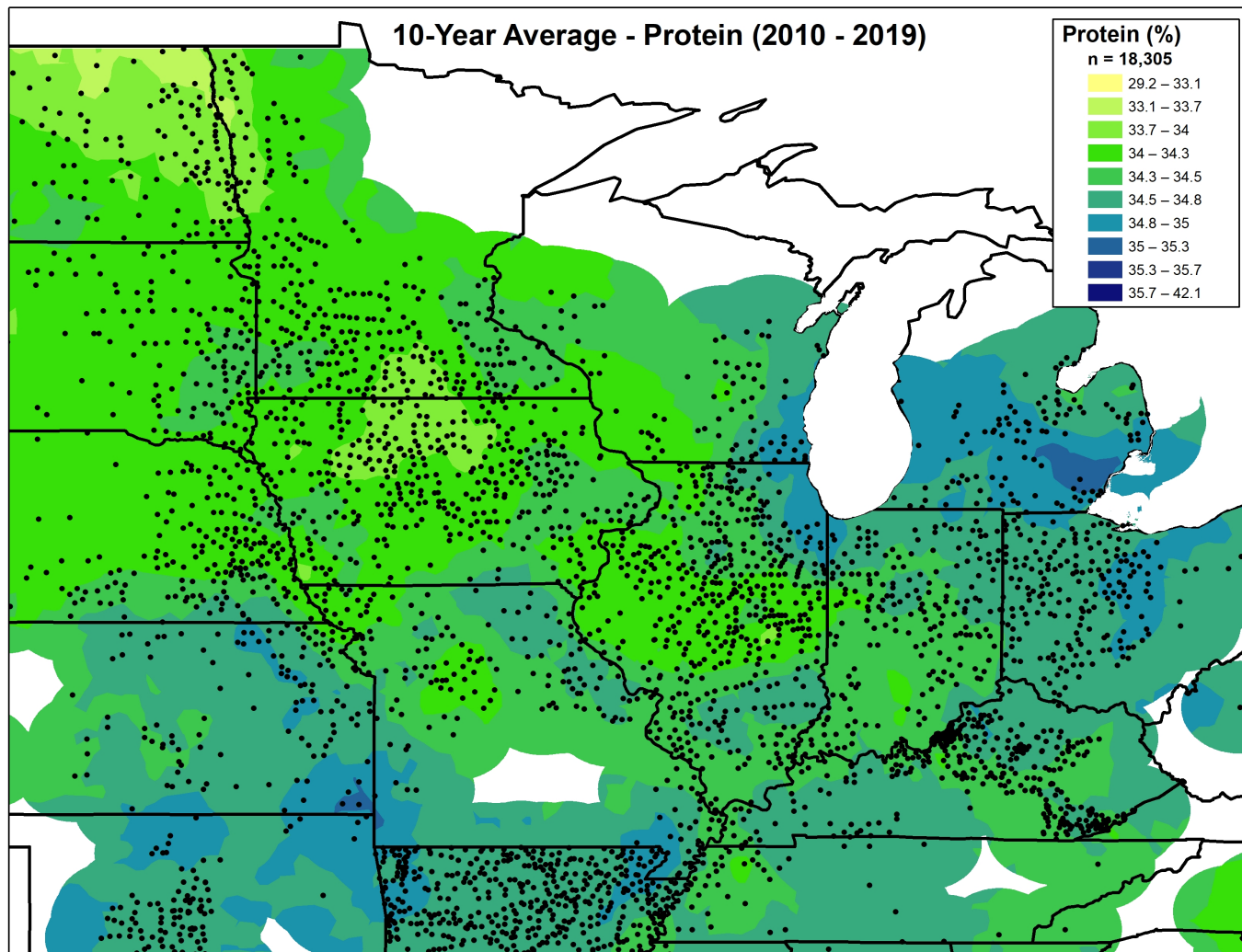




QUALITY OF THE UNITED STATES SOYBEAN CROP: 2020

A close-up photograph of several soybean pods hanging from a stem. The pods are brown and covered in fine, light-colored hairs. The background is a soft, out-of-focus brown. A dark grey rectangular box is overlaid in the center, containing the title text in white.

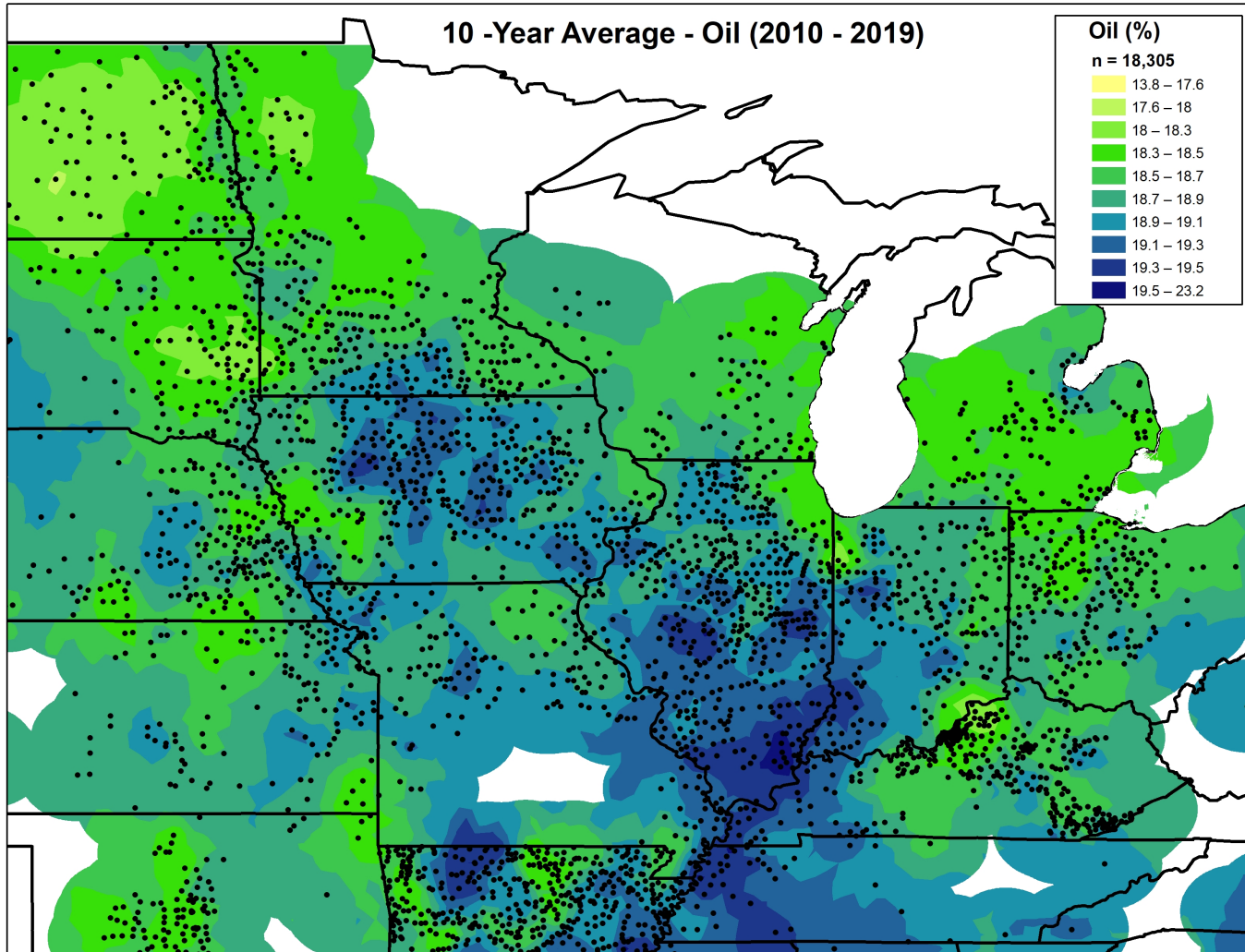
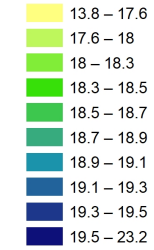
HISTORICAL PROTEIN AND OIL VARIATION



10 -Year Average - Oil (2010 - 2019)

Oil (%)

n = 18,305



2020 SURVEY RESULTS



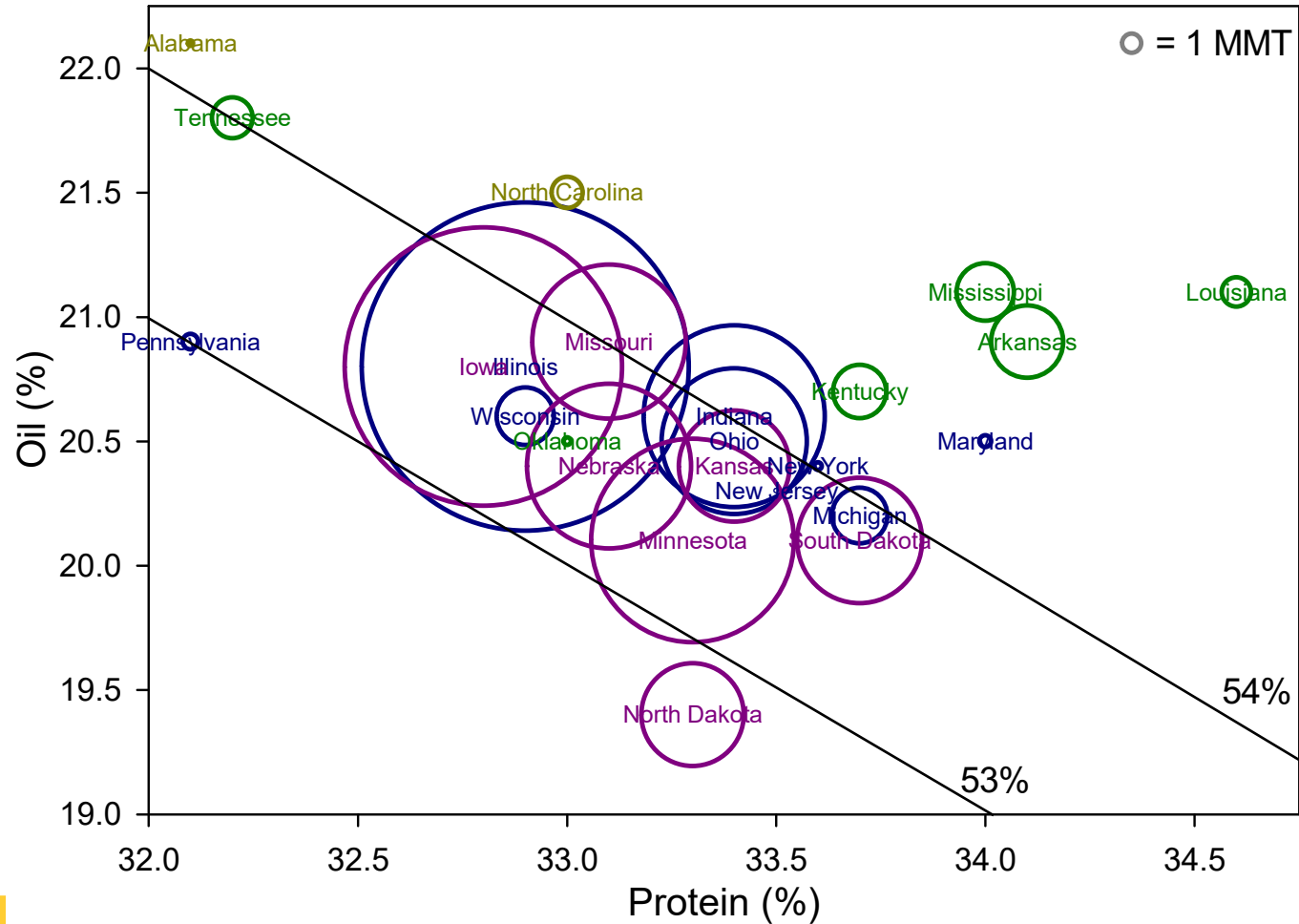
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Region	Number of Samples	Protein (13%)	Change from 2019	Oil (13%)	Change from 2019	Seed Weight (g/100 seeds)
US Average	1,285	33.2		20.4		16.1
Average of 2020 Crop [†]		33.2	-0.9	20.5	+1.5	15.8
US 2010-2019 Average [†]		34.4		18.9		

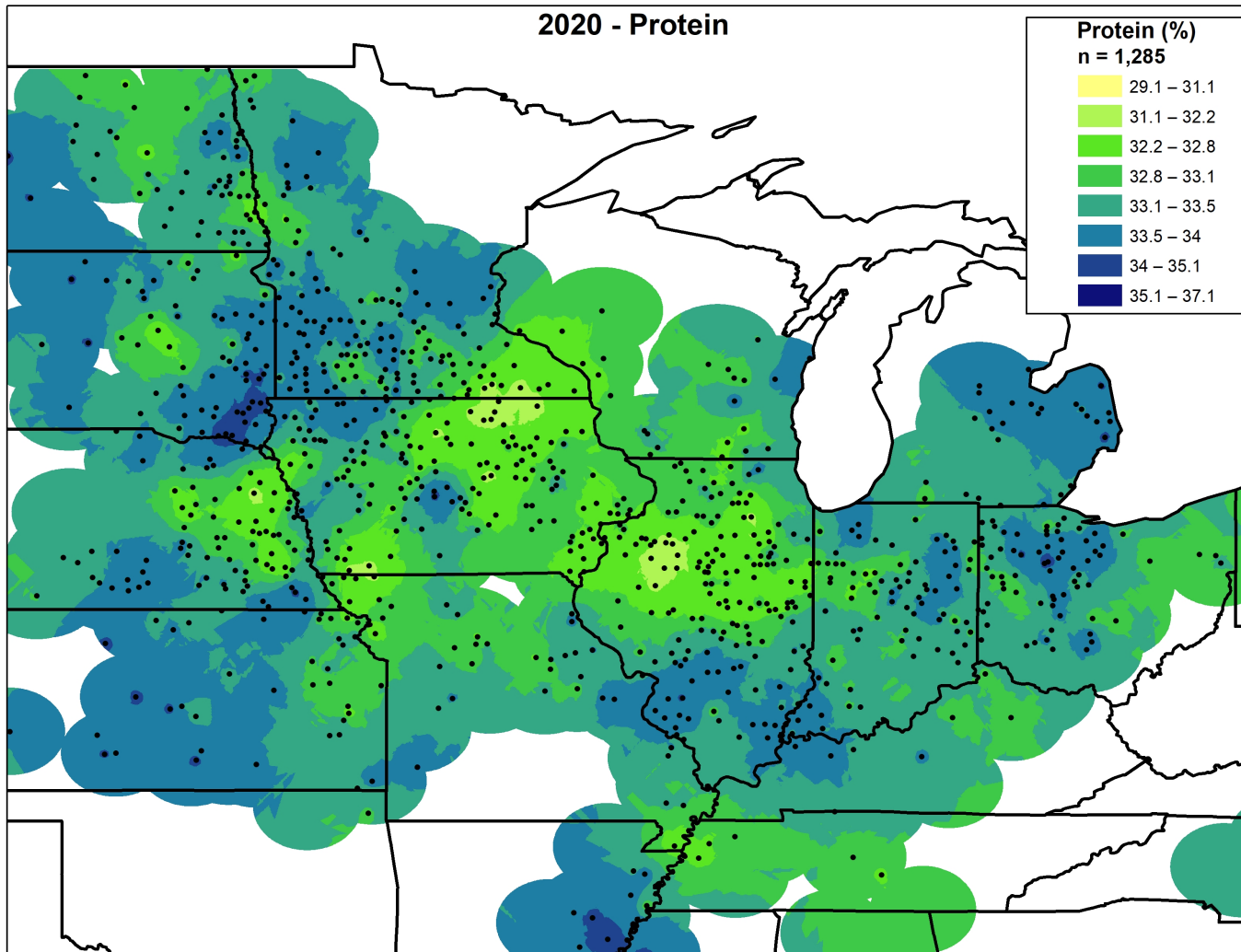
[†]US average values weighted based on estimated production by state, as estimated by USDA, NASS Crop Production Report (October, 2020)



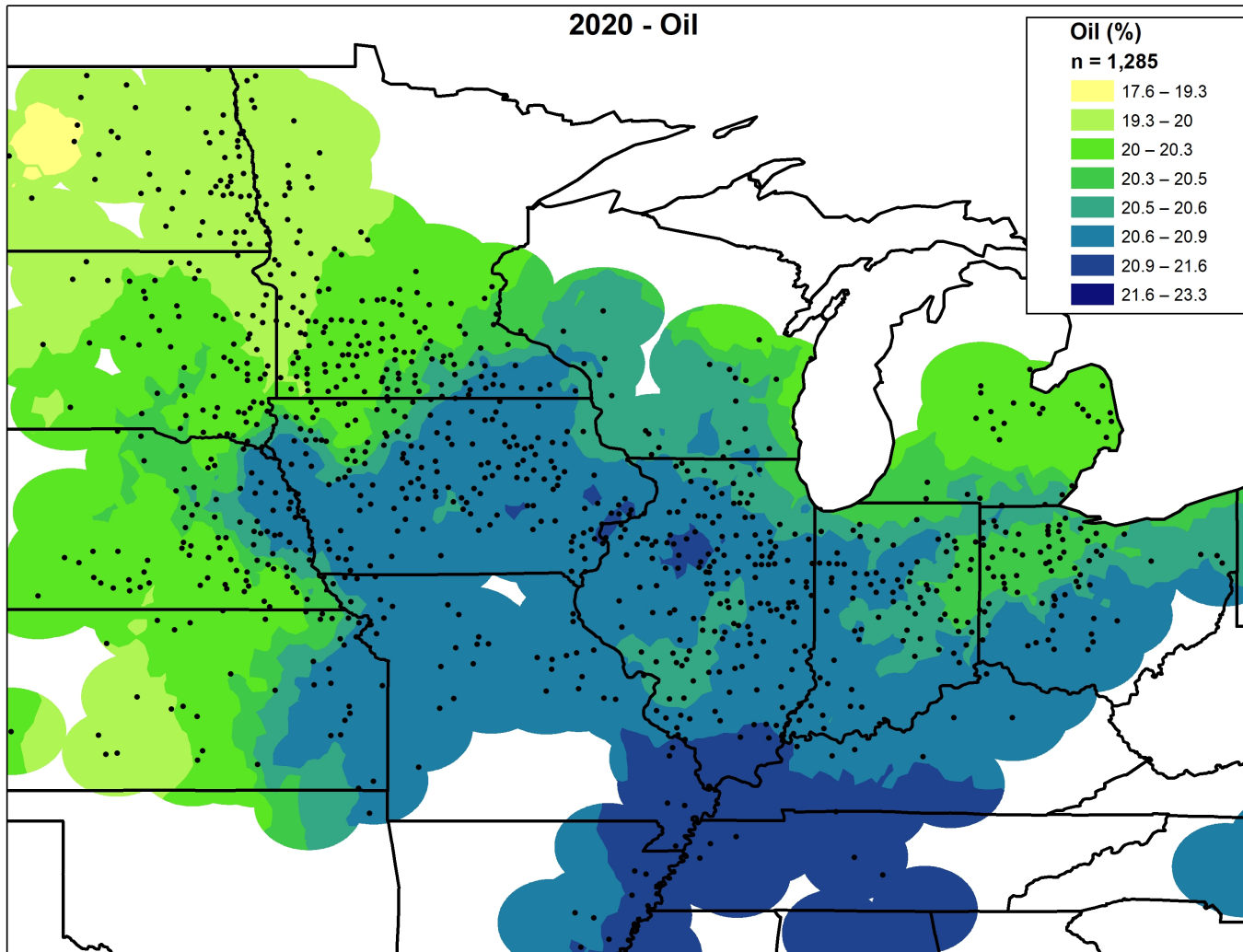
State Protein and Oil: Relative to Total Production

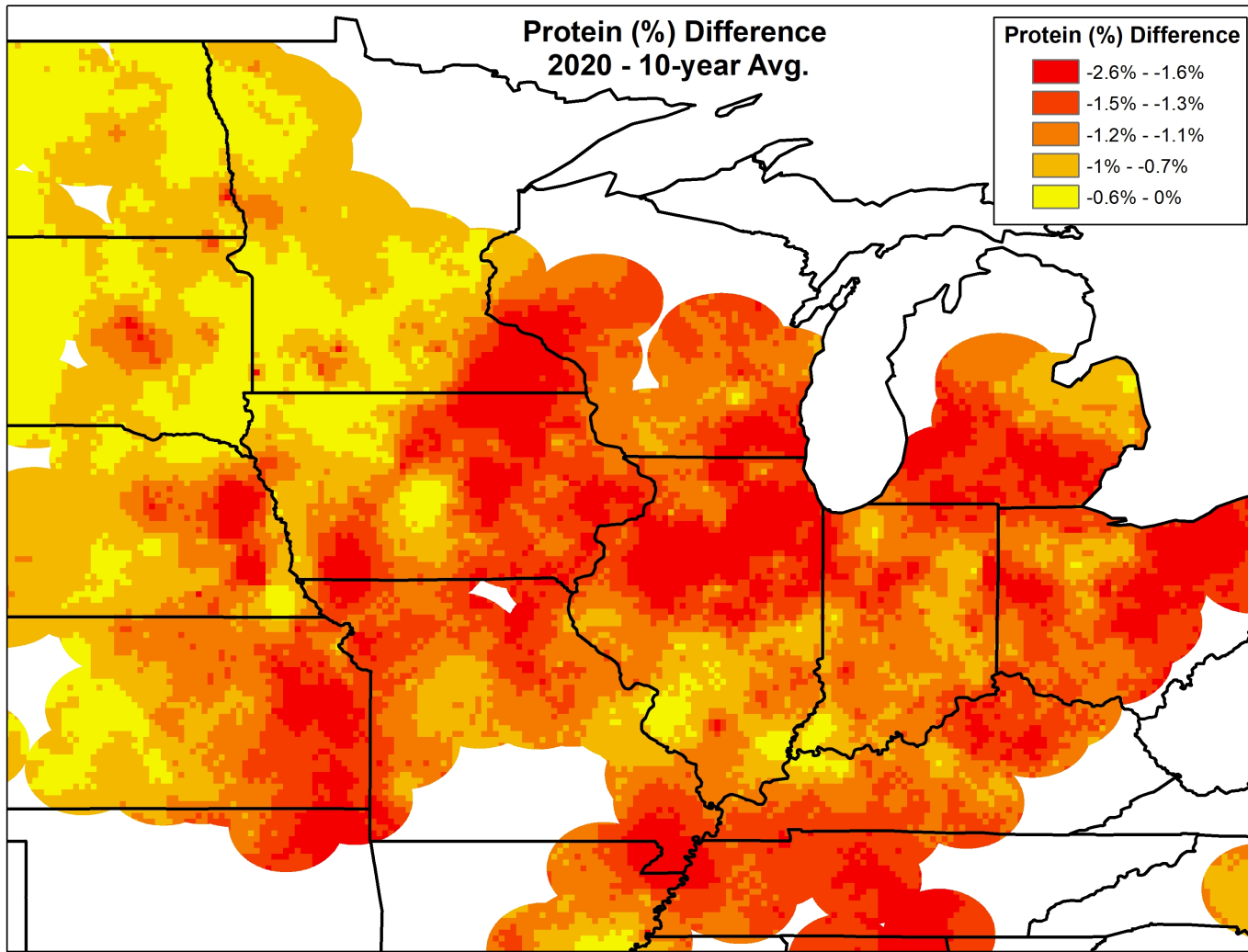


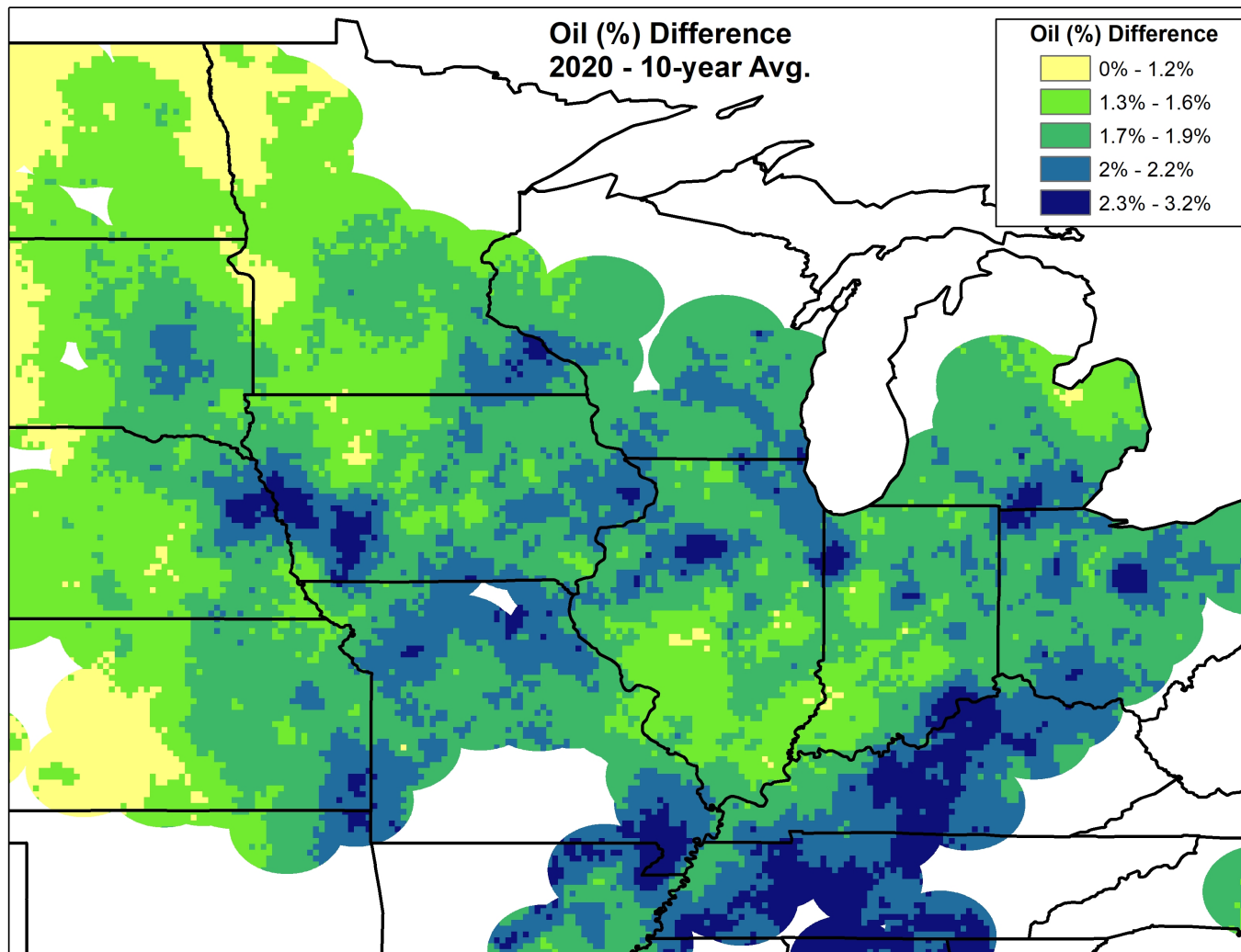
2020 - Protein



2020 - Oil



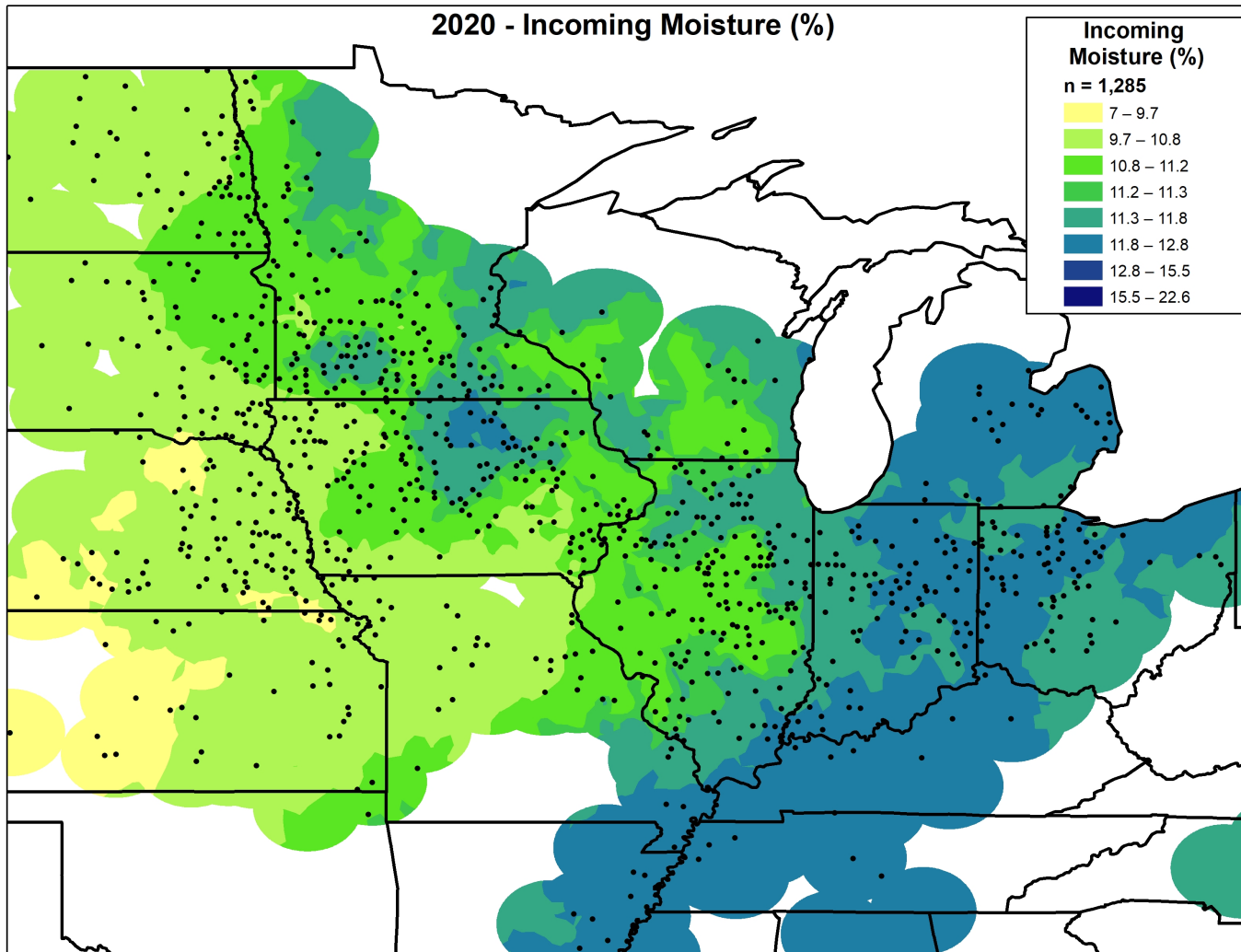






PHYSICAL CHARACTERISTICS

2020 - Incoming Moisture (%)



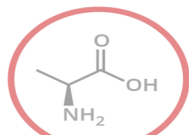
AMINO ACIDS

AMINO ACIDS ARE THE BUILDING BLOCKS OF PROTEINS IN LIVING ORGANISMS. THERE ARE OVER 500 AMINO ACIDS FOUND IN NATURE - HOWEVER, THE HUMAN GENETIC CODE ONLY DIRECTLY ENCODES 20. 'ESSENTIAL' AMINO ACIDS MUST BE OBTAINED FROM THE DIET, WHILST NON-ESSENTIAL AMINO ACIDS CAN BE SYNTHESISED IN THE BODY.

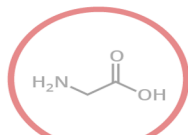
Chart Key: ● ALIPHATIC ● AROMATIC ● ACIDIC ● BASIC ● HYDROXYLIC ● SULFUR-CONTAINING ● AMIDIC ○ NON-ESSENTIAL ○ ESSENTIAL



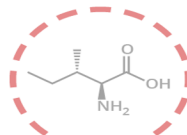
NAME **A**
three letter code
DNA codons



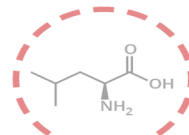
ALANINE **A**
Ala
GCT, GCC, GCA, GCG



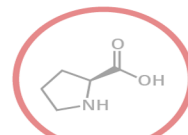
GLYCINE **G**
Gly
GGT, GGC, GGA, GGG



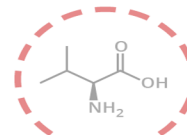
ISOLEUCINE **I**
Ile
ATT, ATC, ATA



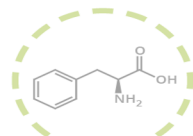
LEUCINE **L**
Leu
CTT, CTC, CTA, CTG, TTA, TTG



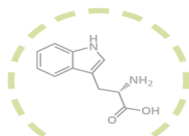
PROLINE **P**
Pro
CCT, CCC, CCA, CCG



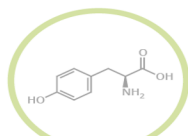
VALINE **V**
Val
GTT, GTC, GTA, GTG



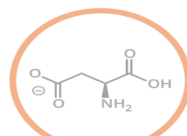
PHENYLALANINE **F**
Phe
TTT, TTC



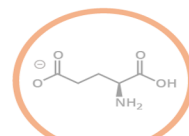
TRYPTOPHAN **W**
Trp
TGG



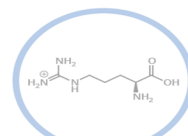
TYROSINE **Y**
Tyr
TAT, TAC



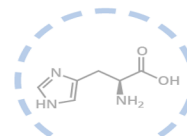
ASPARTIC ACID **D**
Asp
GAT, GAC



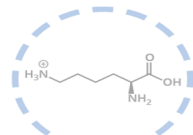
GLUTAMIC ACID **E**
Glu
GAA, GAG



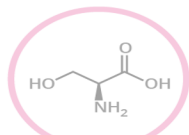
ARGININE **R**
Arg
CGT, CGC, CGA, CGG, AGA, AGG



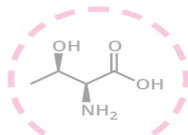
HISTIDINE **H**
His
CAT, CAC



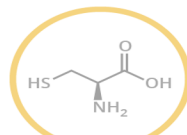
LYSINE **K**
Lys
AAA, AAG



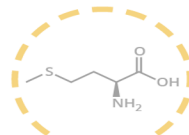
SERINE **S**
Ser
TCT, TCC, TCA, TCG, AGT, AGC



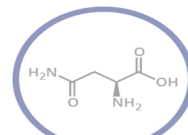
THREONINE **T**
Thr
ACT, ACC, ACA, ACG



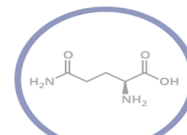
CYSTEINE **C**
Cys
TGT, TGC



METHIONINE **M**
Met
ATG



ASPARAGINE **N**
Asn
AAT, AAC

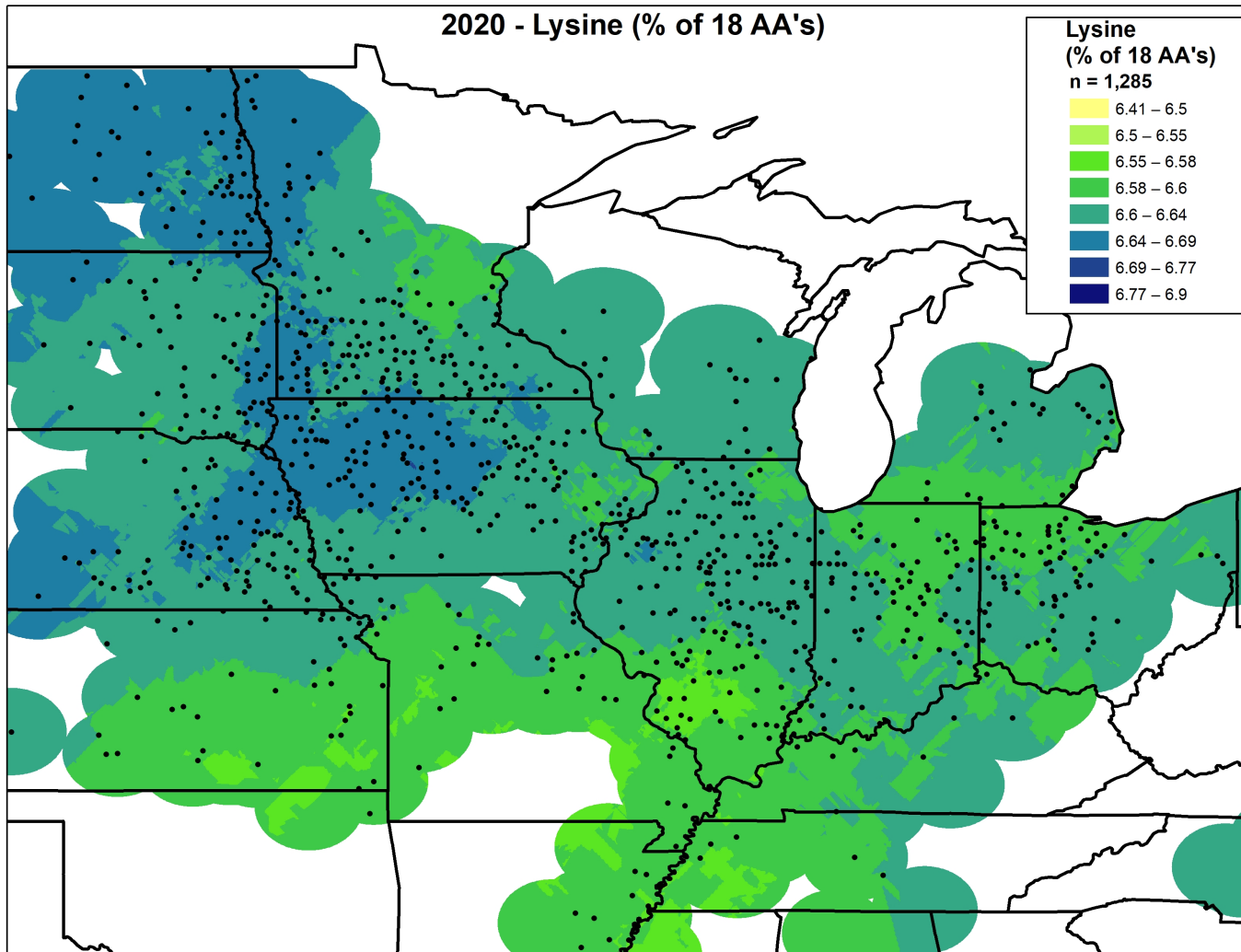


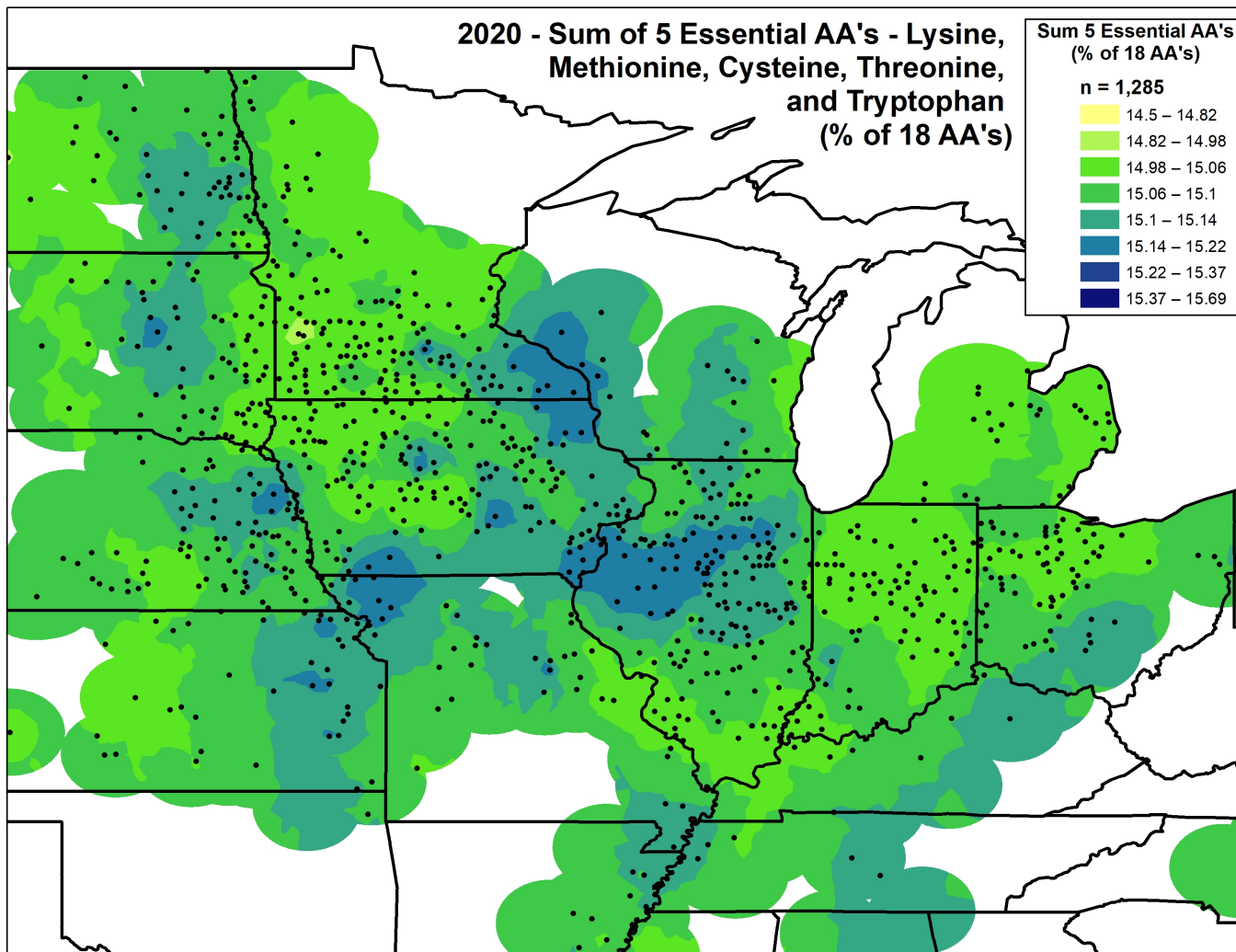
GLUTAMINE **Q**
Gln
CAA, CAG

Note: This chart only shows those amino acids for which the human genetic code directly codes for. Selenocysteine is often referred to as the 21st amino acid, but is encoded in a special manner. In some cases, distinguishing between asparagine/aspartic acid and glutamine/glutamic acid is difficult. In these cases, the codes asx (B) and glx (Z) are respectively used.

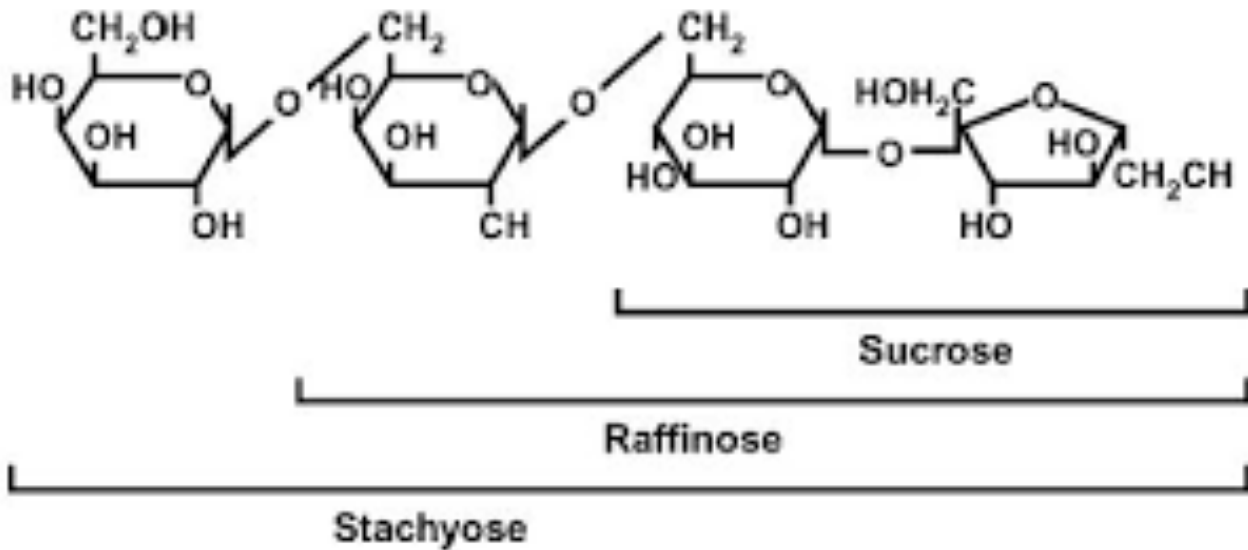


2020 - Lysine (% of 18 AA's)

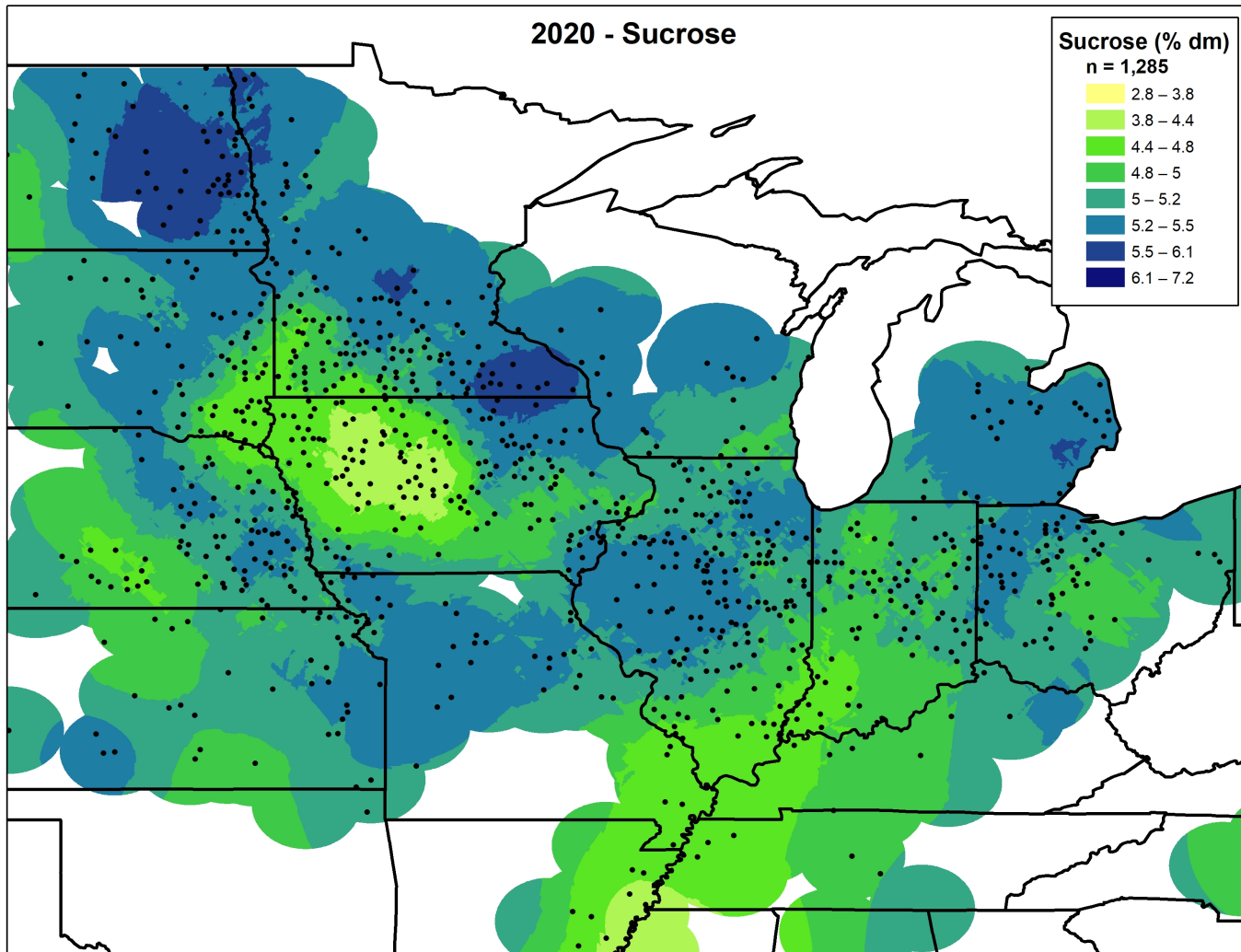




SOLUBLE SUGARS





2020 - Sucrose



2020 Food Soybean Survey Methods

- In September, 606 sample kits were mailed to 21 US soybean exporters
- By October 31, 267 samples were returned for analysis

PLEASE SEND SAMPLES BY OCTOBER 26		
	<div>2020 Food Soybean Quality Survey</div>	 202098001015
Contracting company: _____		
Field location (town, state): _____		Field ID: _____
Variety: _____		Maturity Group: _____
Intended use (please check all that apply):		
<input type="checkbox"/> Tofu	<input type="checkbox"/> Natto	<input type="checkbox"/> Miso
<input type="checkbox"/> Organic	<input type="checkbox"/> Non-GMO	
<input type="checkbox"/> Other _____		
Questions? Call Dr. Seth Naeve at (612) 819-2338		

The background of the image is composed of four rectangular sections, each filled with soybeans. The top-left, bottom-left, and bottom-right sections are filled with yellow soybeans. The top-right section is filled with black soybeans. A dark horizontal band with white text is centered across the middle of the image.

2020 FOOD SOYBEAN SURVEY RESULTS

State (# of samples)	Region	Protein * (%)	Regional Protein Average	Oil * (%)	Regional Oil Average
Iowa (14)	WCB	34.8		19.7	
Minnesota (25)	WCB	35.2		19.6	
North Dakota (1)	WCB	32.3		19.2	
Nebraska (4)	WCB	35.6		19.3	
South Dakota (1)	WCB	37.2	35.1	18.6	19.6
Illinois (69)	ECB	34.8		20.1	
Indiana (4)	ECB	36.9		19.1	
Michigan (26)	ECB	35.3		19.6	
Ohio (20)	ECB	36.2		19.7	
Wisconsin (102)	ECB	35.0	35.1	19.7	19.8
Maryland (1)	EC	36.2	36.2	20.5	20.5

Data as of October 31, 2020



Region	Seed Size	Number Samples	Seed Size (g/100 seeds)	Protein* (%)	Oil* (%)
WCB	Average	28	18.0	34.8	19.7
	Large	17	23.1	35.5	19.3
ECB	Small	3	7.6	34.1	19.2
	Average	172	18.4	35.0	19.8
	Large	46	23.2	35.4	19.6
EC	Average	1	20.0	36.2	20.5

Data as of October 31, 2020

‡ Small seed: ≤13.0 g/100 seeds; Average: 13.1-21.0 g/100 seeds; Large: >21 g/100 seeds (unofficial categories)

§ WCB: Western Corn Belt (Iowa, Minnesota, Nebraska, North Dakota, and South Dakota); ECB: Eastern Corn Belt (Illinois, Indiana, Michigan, Ohio, and Wisconsin); EC: East Coast (Maryland)

* 13% moisture basis



Region	Seed Size	Number Samples	Seed Size (g/100 seeds)	Sucrose (% DM)	Raffinose (% DM)	Stachyose (% DM)
WCB	Average	28	18.0	5.00	0.51	3.31
	Large	17	23.1	5.25	0.50	3.20
ECB	Small	3	7.6	6.10	0.49	2.95
	Average	172	18.4	4.72	0.48	3.42
	Large	46	23.2	4.84	0.46	3.39
EC	Average	1	20.0	4.10	0.59	3.22

Data as of October 31, 2020

* Small seed: ≤ 13.0 g/100 seeds; Average: 13.1-21.0 g/100 seeds; Large: > 21 g/100 seeds (unofficial categories)

§ WCB: Western Corn Belt (Iowa, Minnesota, Nebraska, North Dakota, and South Dakota); ECB: Eastern Corn Belt (Illinois, Indiana, Michigan, Ohio, and Wisconsin); EC: East Coast (Maryland)



Region	Seed Size	Number Samples	Seed Size (g/100 seeds)	Protein* (%)	Lysine (% of 18 AAs)	Five Limiting Essential [¶] Amino Acids (% of 18 AAs)
WCB	Average	28	18.0	34.8	6.5	14.9
	Large	17	23.1	35.5	6.5	14.8
ECB	Small	3	7.6	34.1	6.6	15.1
	Average	172	18.4	35.0	6.5	14.8
	Large	46	23.2	35.4	6.5	14.8
EC	Average	1	20.0	36.2	6.4	14.9

Data as of October 31, 2020

* Small seed: ≤13.0 g/100 seeds; Average: 13.1-21.0 g/100 seeds; Large: >21 g/100 seeds (unofficial categories)

§ WCB: Western Corn Belt (Iowa, Minnesota, Nebraska, North Dakota, and South Dakota); ECB: Eastern Corn Belt (Illinois, Indiana, Michigan, Ohio, and Wisconsin); EC: East Coast (Maryland)

* 13% moisture basis

¶ Five limiting essential amino acids: cysteine, lysine, methionine, threonine, and tryptophan



Summary - Protein

- Overall:
 - WCB: 35.1 = ECB 35.1
- Examined by seed size & region:
 - Average: ECB 35.0 \approx WCB 34.8
 - Large: WCB 35.5 \approx ECB 35.4
 - Small: ECB 34.1
- Sample numbers within the groups differed:
 - Average: WCB 28 ECB 172 EC 1
 - Large: WCB 17 ECB 46
 - Small: ECB 3



Summary - Oil

- Overall:
 - ECB 19.8 > WCB 19.6
- Examined by seed size & region:
 - Average: ECB 19.8 > WCB 19.7
 - Large: ECB 19.6 > WCB 19.3
 - Small: ECB 19.2



Summary – Soluble Sugars

- Usually WCB sucrose is higher than ECB
 - WCB AVERAGE (5.00) > ECB (4.72)
 - WCB LARGE (5.25) > ECB (4.84)
 - The ECB SMALL samples were lower (2.95) than ECB AVERAGE (3.42) and LARGE (3.39) samples for stachyose; lower sucrose & higher stachyose are desirable for making natto
- Sucrose concentrations in 2020 were very similar to those in 2019. Food soybeans were not sampled from drought-stricken regions where sucrose was low.





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