

U.S. Grains Council **2019/2020** **Corn Export Cargo** **Quality Report**

Developing Markets • Enabling Trade • Improving Lives

- [Insert Date]
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U.S. GRAINS
COUNCIL



Quality, Reliability, Transparency



*Building partnerships
based on trust*

*Bridge to world's
largest, most reliable
grain supply*

Corn Quality Report

*Systematic survey of
corn quality at harvest
and of early exports*

*Transparent and
Consistent Methodology*

*Reliable and
Comparable Data*



Harvest Quality Report



**HARVEST
QUALITY
REPORT**

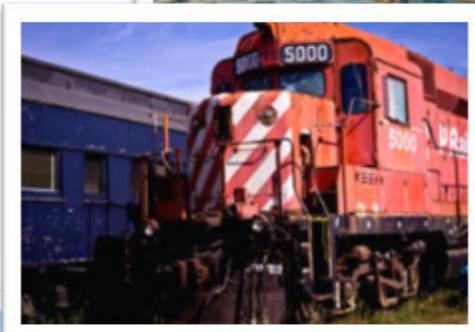
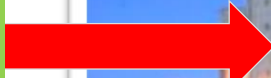




Export Cargo Quality Report



EXPORT
CARGO
REPORT



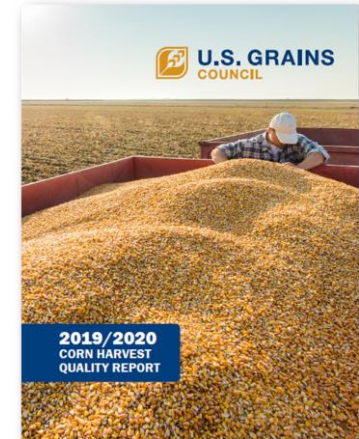
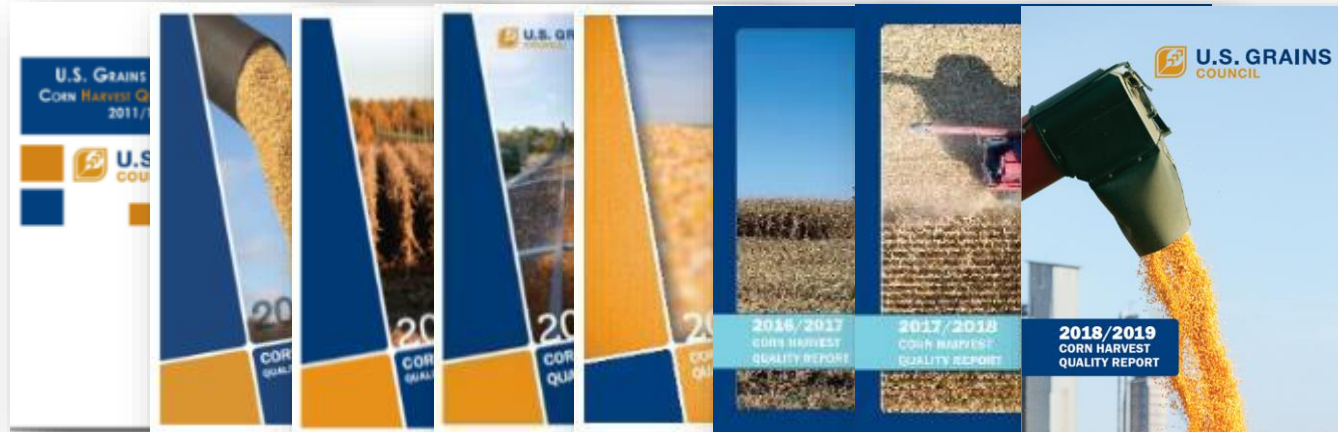


USGC Corn Quality Reports

2011/2012 through 2019/2020

2019/2020

Harvest

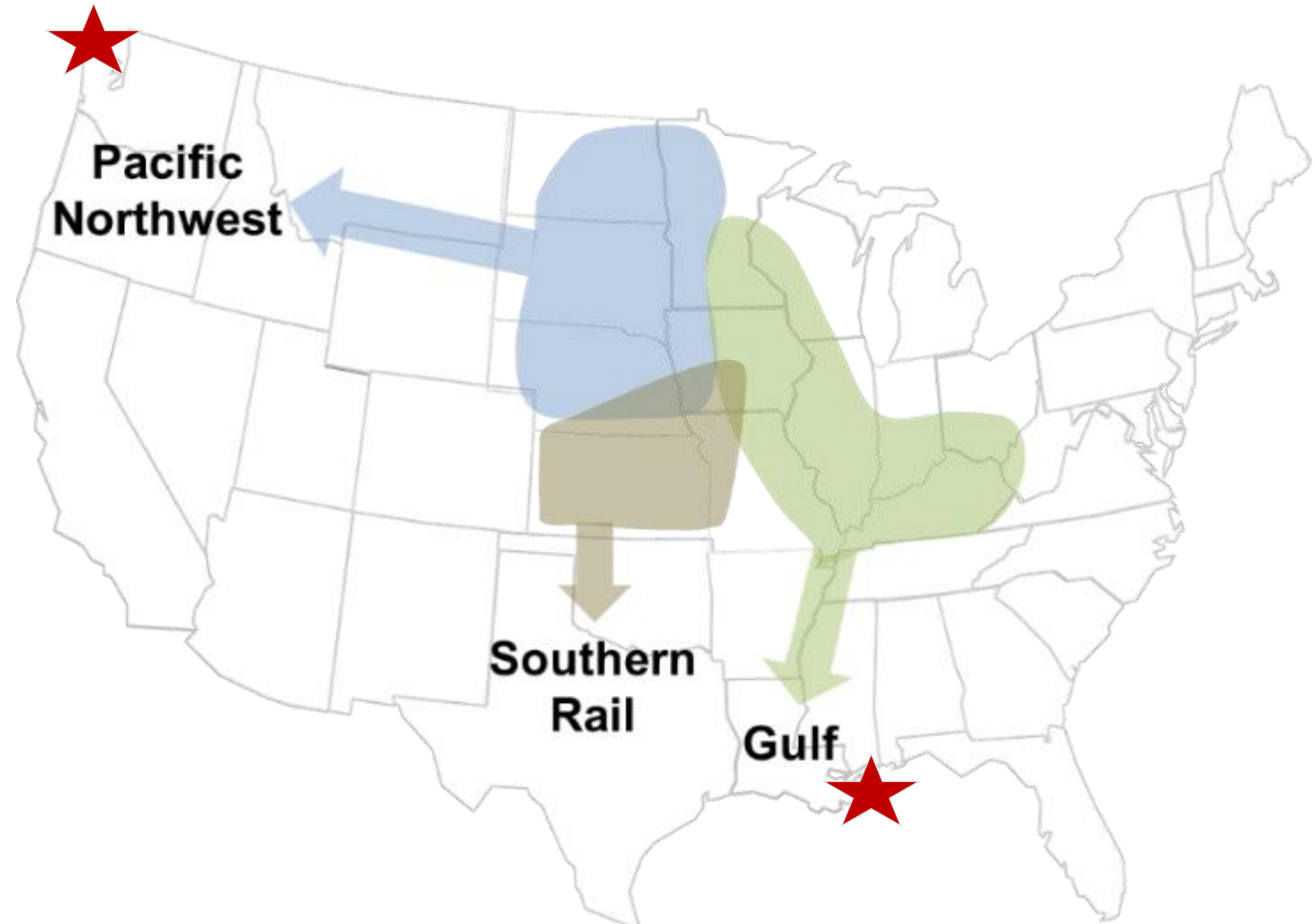


Export
Cargo





“Export Catchment Areas” (ECA)



430 export samples
targeted from ECAs
representing approximately
90% of U.S. Corn Exports



Quality Factors Tested

Grading Factors

- Test weight
- Broken corn/foreign material
- Total damage
- Heat damage

Physical Factors

- Stress cracks
- 100-kernel weight
- Kernel volume
- True density
- Whole kernels
- Horneous (hard) endosperm

Moisture

Chemical Composition

- Protein
- Starch
- Oil

Mycotoxins

- Aflatoxin
- DON
- Fumonisin





2019/2020 Corn Export Cargo Quality Report Highlights

Overall Crop	Grade Factors/ Moisture vs. 5YA	Chemical Composition vs. 5YA	Physical Factors vs. 5YA	Mycotoxins
<p>Aggregate average BCFM slightly exceeded maximum requirement for U.S. No. 2</p> <p>Aggregate averages for other grade factors rated U.S. No. 1 or better</p>	<p>Test Weight Lower</p> <p>BCFM Higher</p> <p>Total Damage Higher</p> <p>Moisture Similar</p>	<p>Protein Slightly Lower</p> <p>Starch Slightly Lower</p> <p>Oil Same</p>	<p>Stress Cracks Higher</p> <p>100-Kernel Weight Slightly Lower</p> <p>True Density Lower</p> <p>Whole Kernels Lower</p>	<p>99.8% of samples \leq FDA action level for Aflatoxin[‡]</p> <p>100.0% of samples below FDA advisory level for DON of 5.0 ppm[‡]</p> <p>93.3% of samples \leq FDA Fumonisin guidance level of 5 ppm[‡]</p>

[†]5YA = Marketing years 2014/2015 through 2018/2019

[‡]Action, advisory and guidance levels for corn intended for feed use



Grade Factors and Moisture



Grades and Grade Requirements

Grade	Minimum Test Weight		Maximum Limits of Damaged Kernels		
	lb/bu	kg/hl	Heat Damage (%)	Total (%)	BCFM (%)
U.S. No. 1	56.0	72.1	0.1	3.0	2.0
U.S. No. 2	54.0	69.5	0.2	5.0	3.0
U.S. No. 3	52.0	66.9	0.5	7.0	4.0
U.S. No. 4	49.0	63.1	1.0	10.0	5.0
U.S. No. 5	46.0	59.2	3.0	15.0	7.0



Grade Factors and Moisture

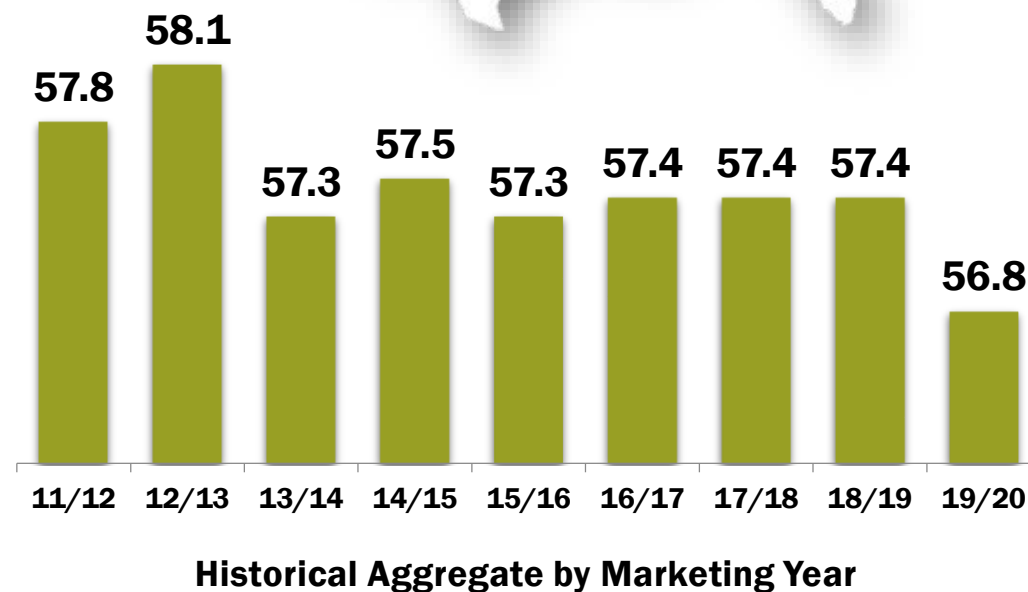
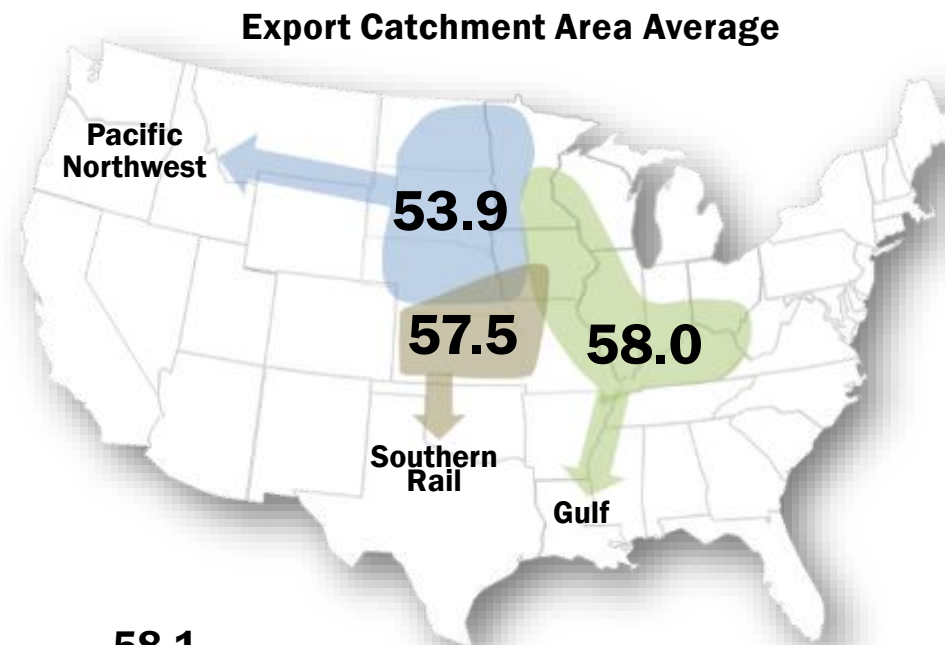
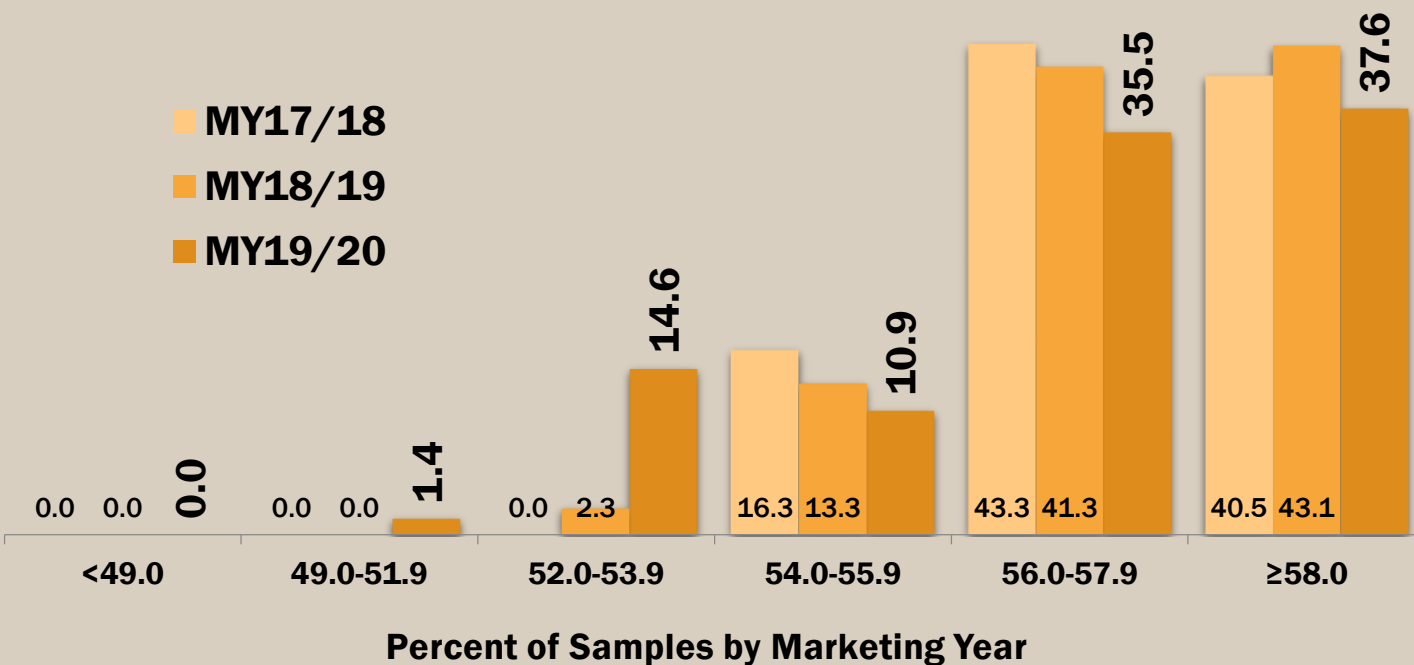
	No. of Samples	Avg.	Std. Dev.	Min.	Max.
Test Weight (lb/bu)	431	56.8	1.00	50.4	60.1
Test Weight (kg/hl)	431	73.1	1.29	64.9	77.4
BCFM (%)	431	3.1	0.79	0.9	7.0
Total Damage (%)	430	2.9	1.37	0.1	10.8
Heat Damage (%)	431	0.0	0.01	0.0	0.2
Moisture (%)	431	14.5	0.39	12.4	15.6



Test Weight – U.S. Units (lb/bu)

U.S. Aggregate: 56.8 lb/bu

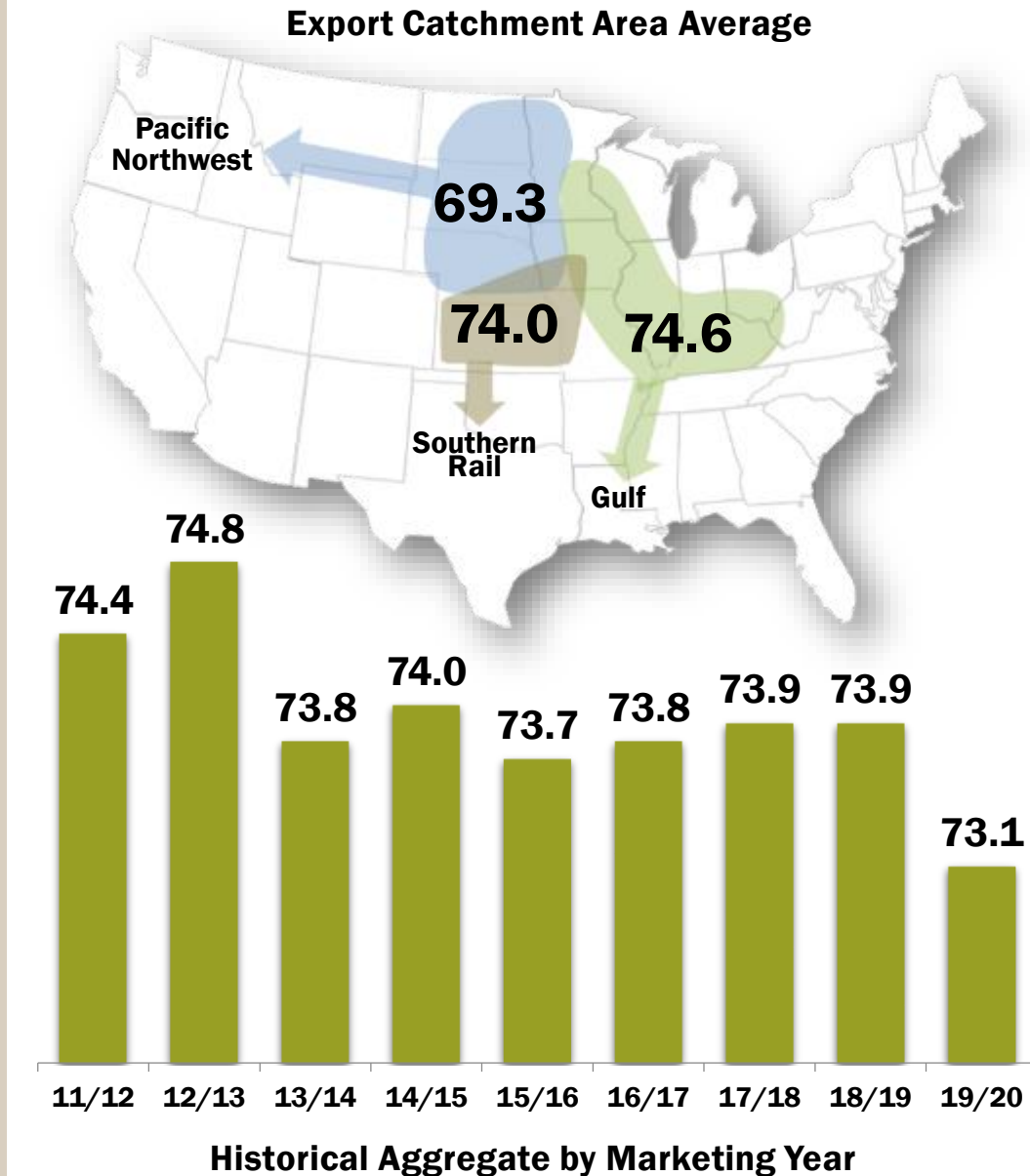
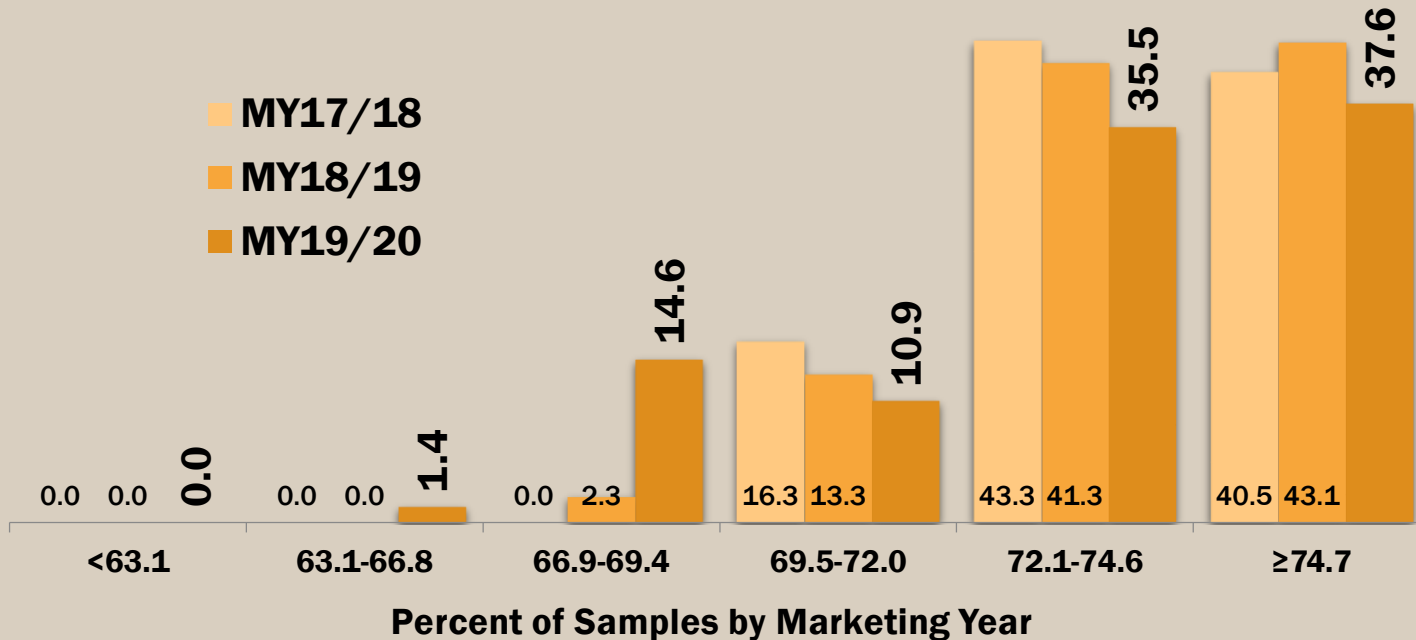
- Average **lower** than 5YA (57.4 lb/bu)
- **73.1%** No. 1 grade



Test Weight – Metric (kg/hl)

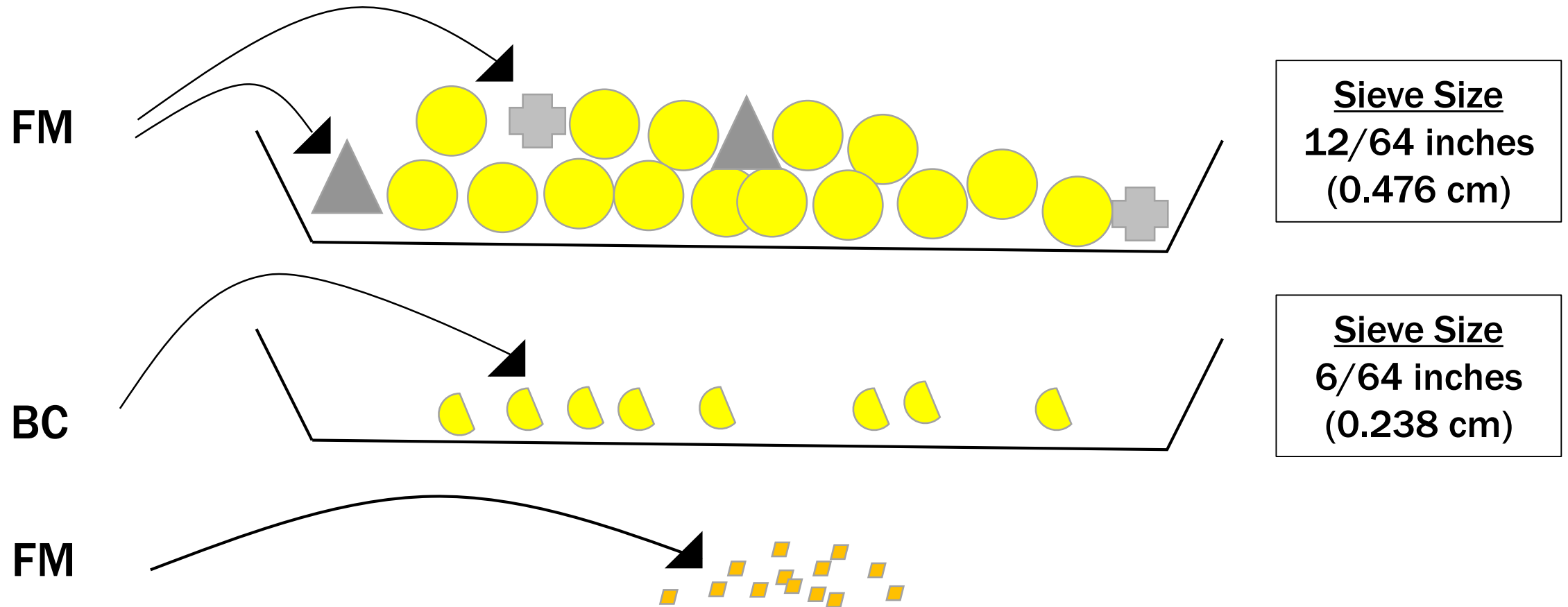
U.S. Aggregate: 73.1 kg/hl

- Average **lower** than 5YA (73.9 lb/bu)
- **73.1%** No. 1 grade





Broken Corn and Foreign Material*



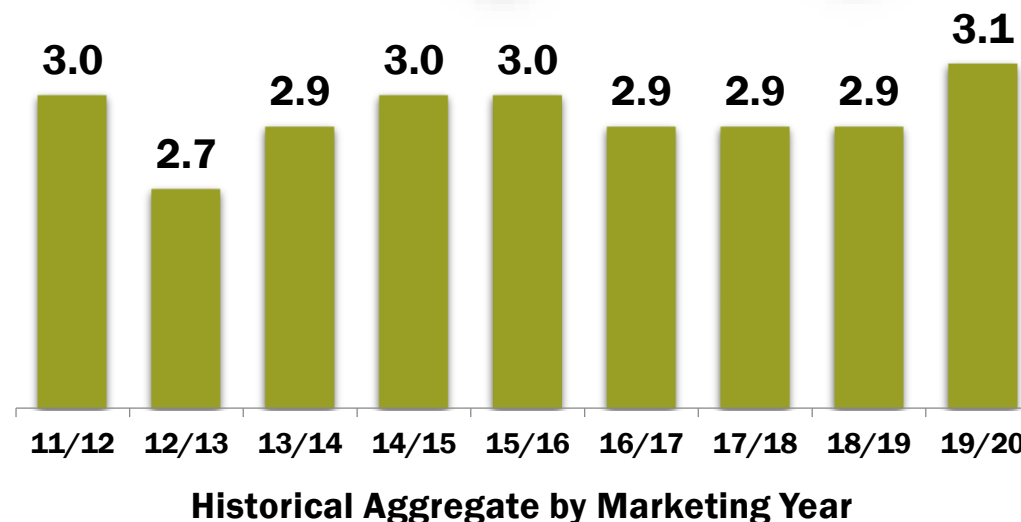
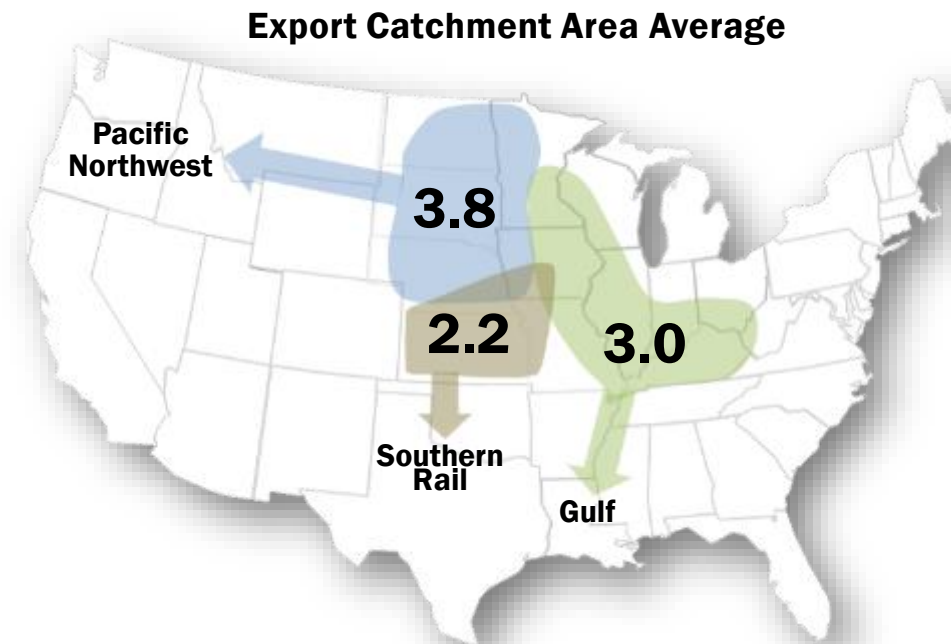
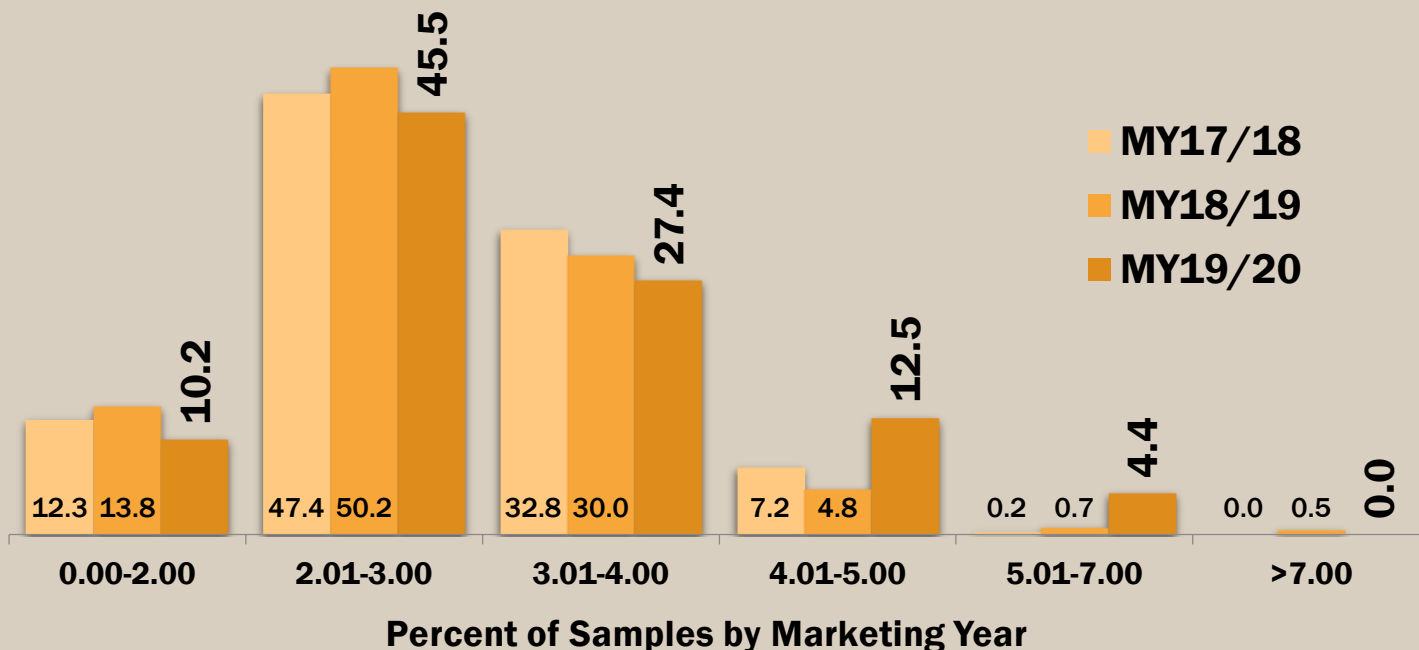
* Measured as % of weight



Broken Corn & Foreign Material (%)

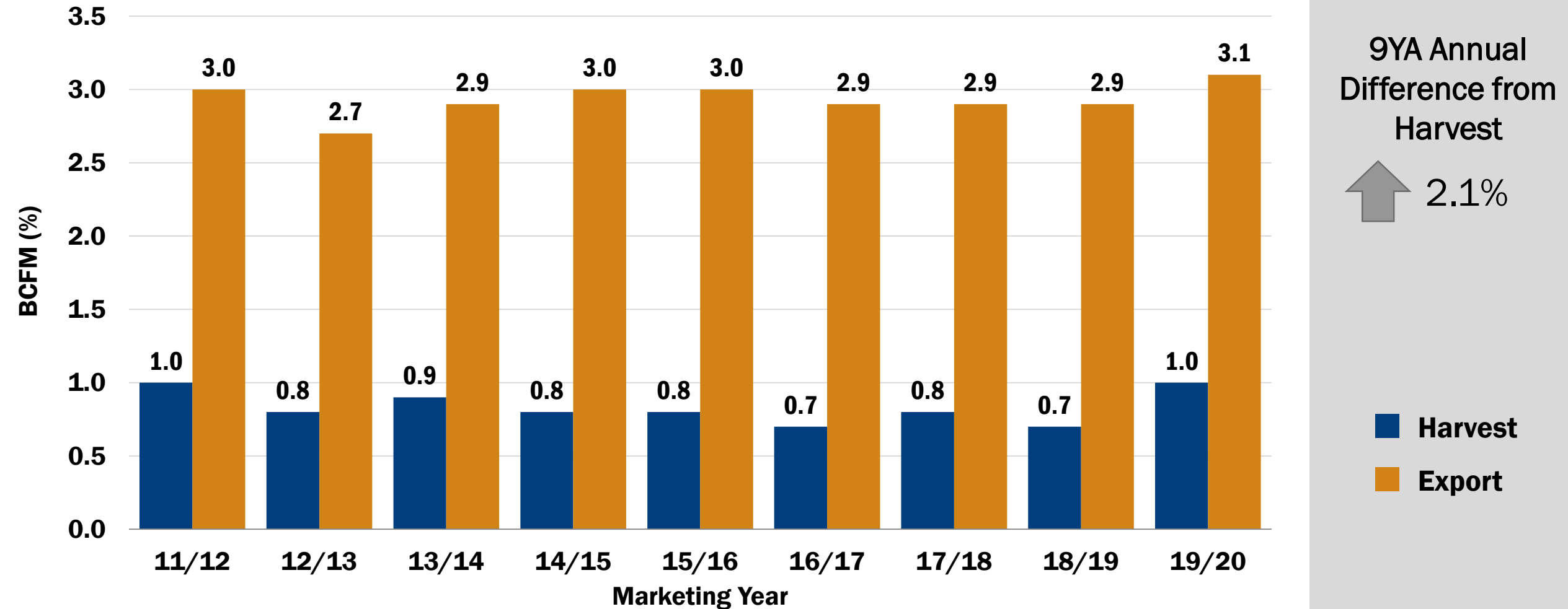
U.S. Aggregate: 3.1%

- 55.7% No. 2 grade
- Average **slightly higher** than 5YA (2.9%)



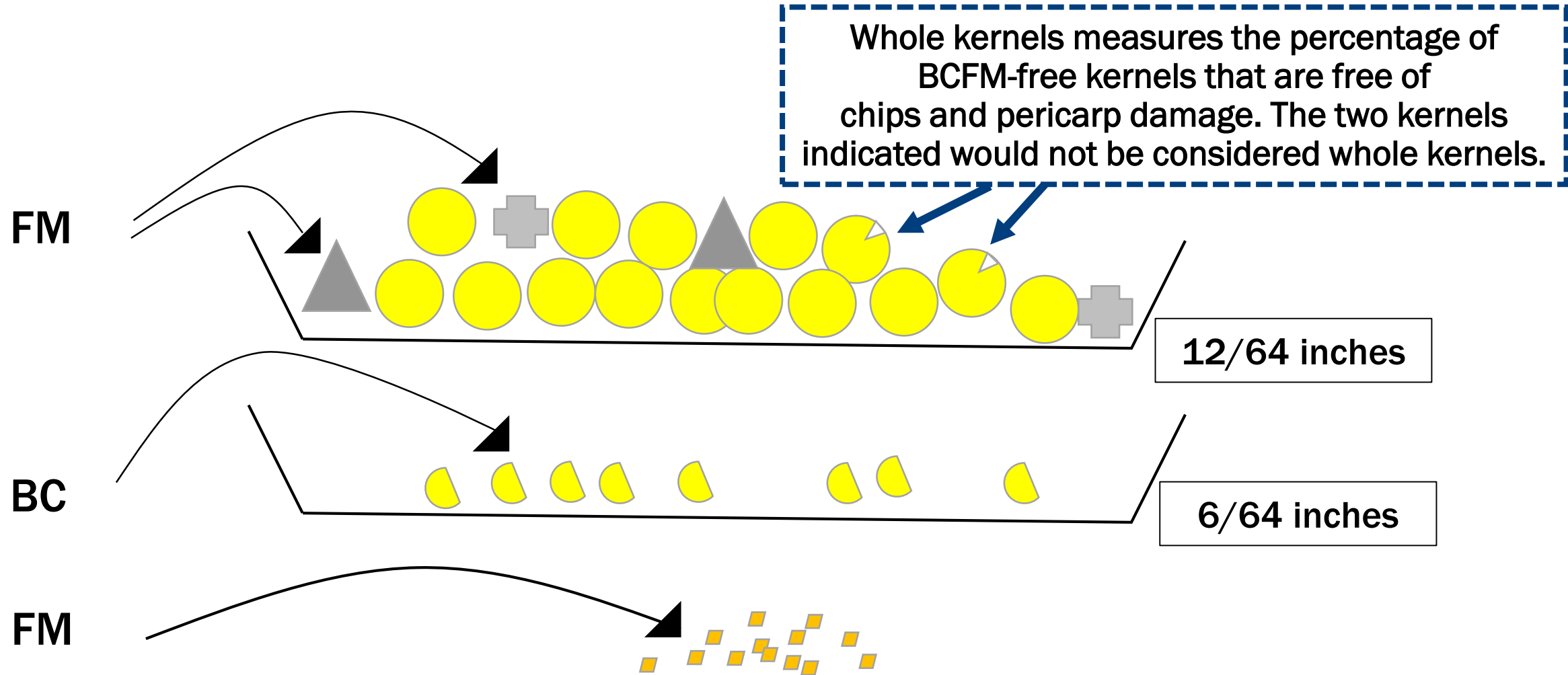


Harvest vs. Export Cargo Broken Corn & Foreign Material (%)





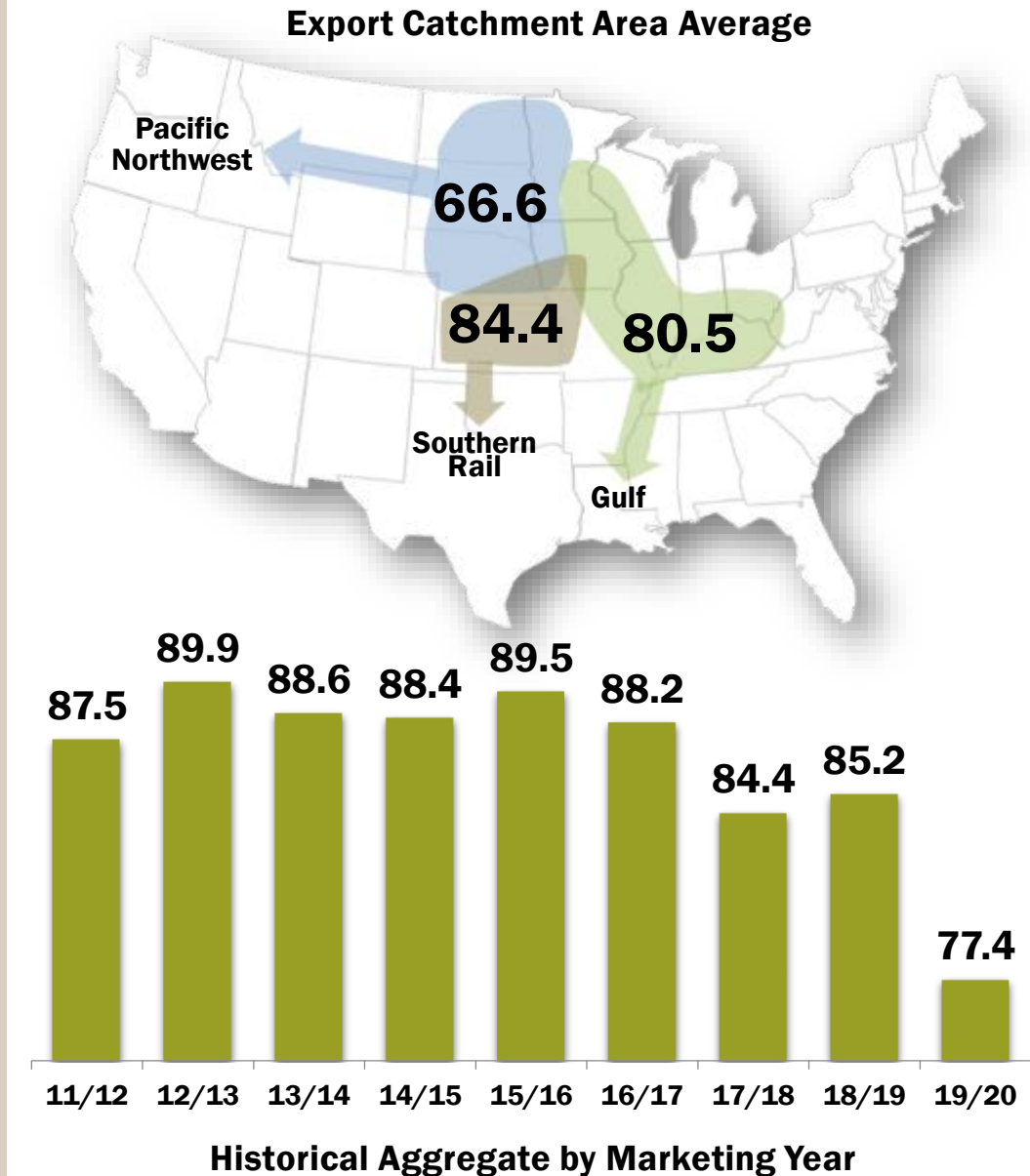
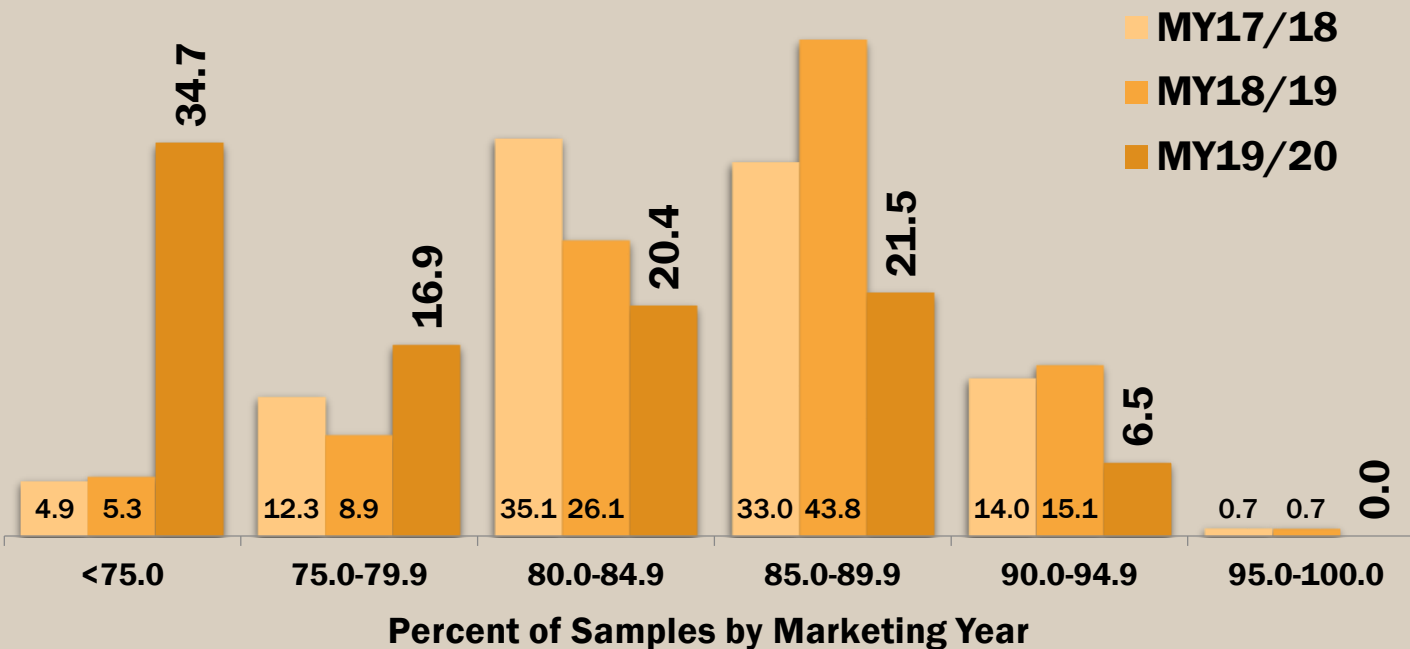
Whole Kernels (%)



Whole Kernels (%)

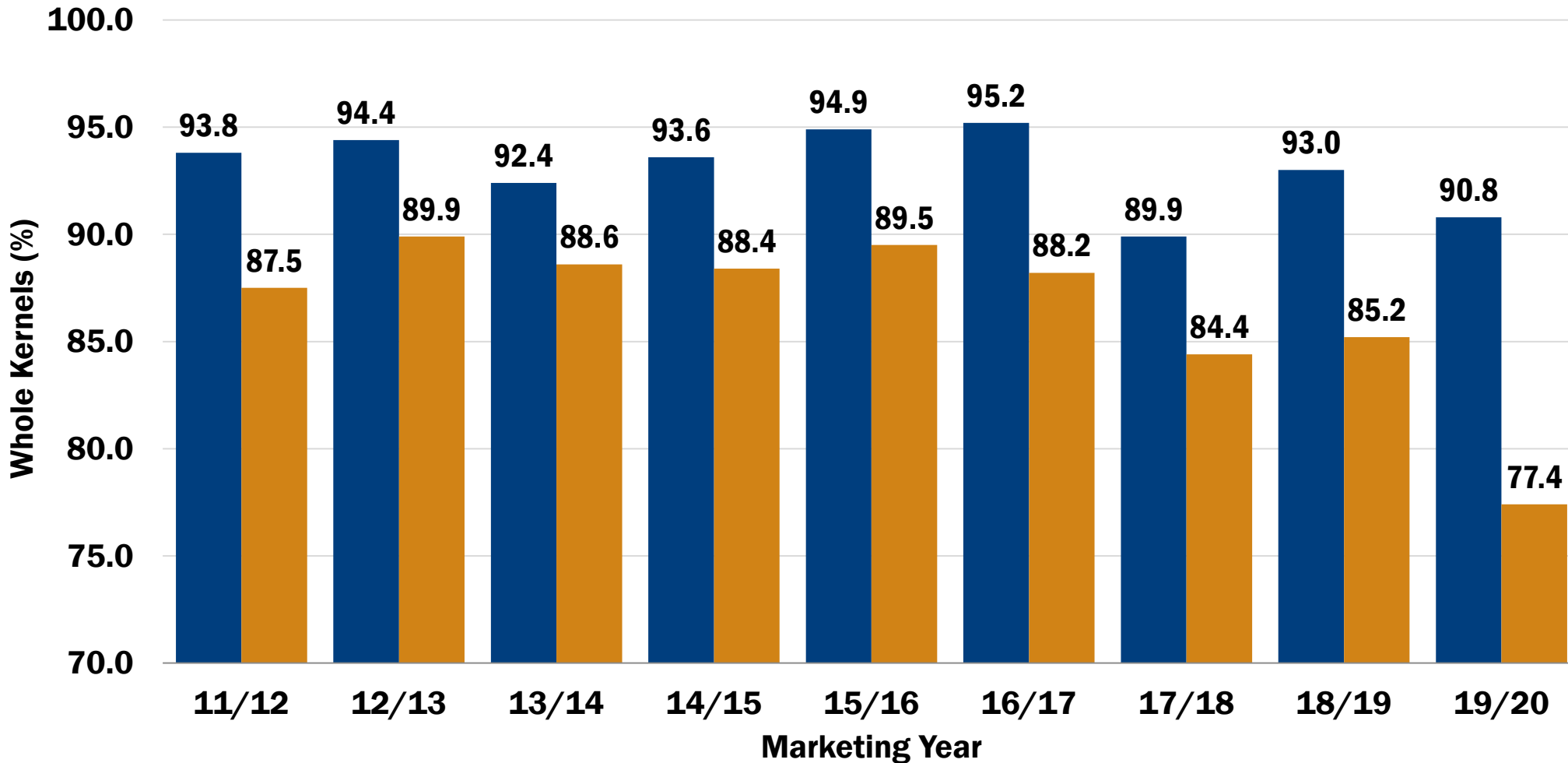
U.S. Aggregate: 77.4%

➤ Average **lower** than 5YA (87.1%)





Harvest vs. Export Cargo Whole Kernels (%)



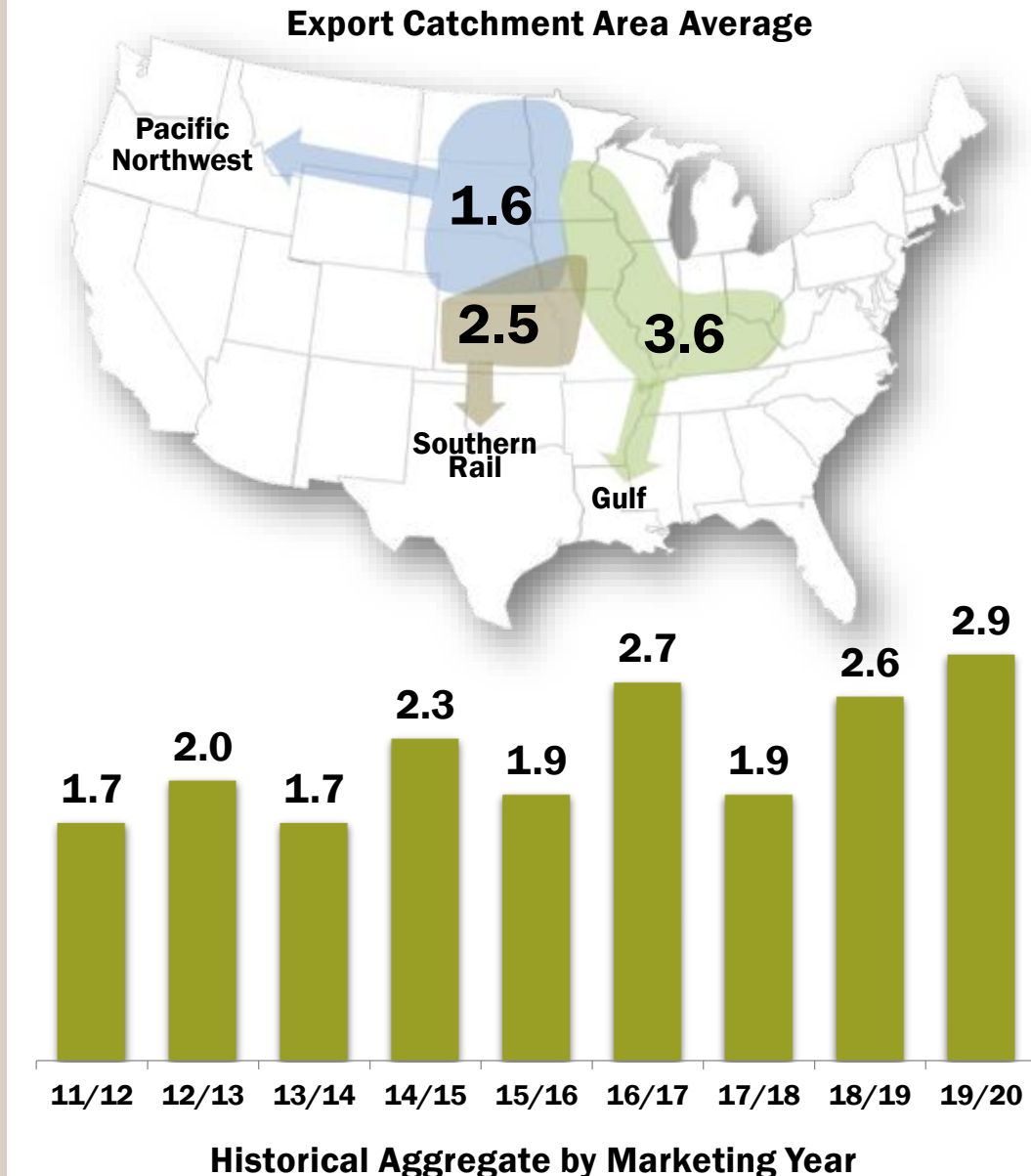
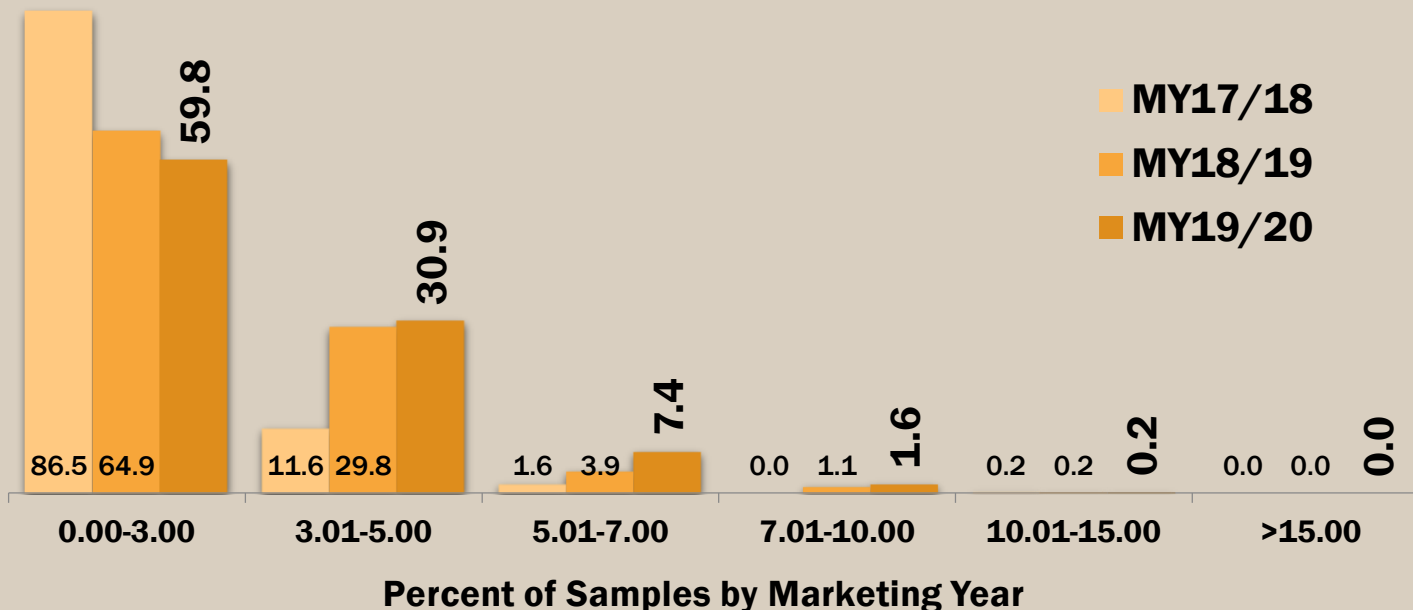
9YA Annual
Difference from
Harvest
↓ -6.5%

 Harvest
 Export

Total Damage (%)

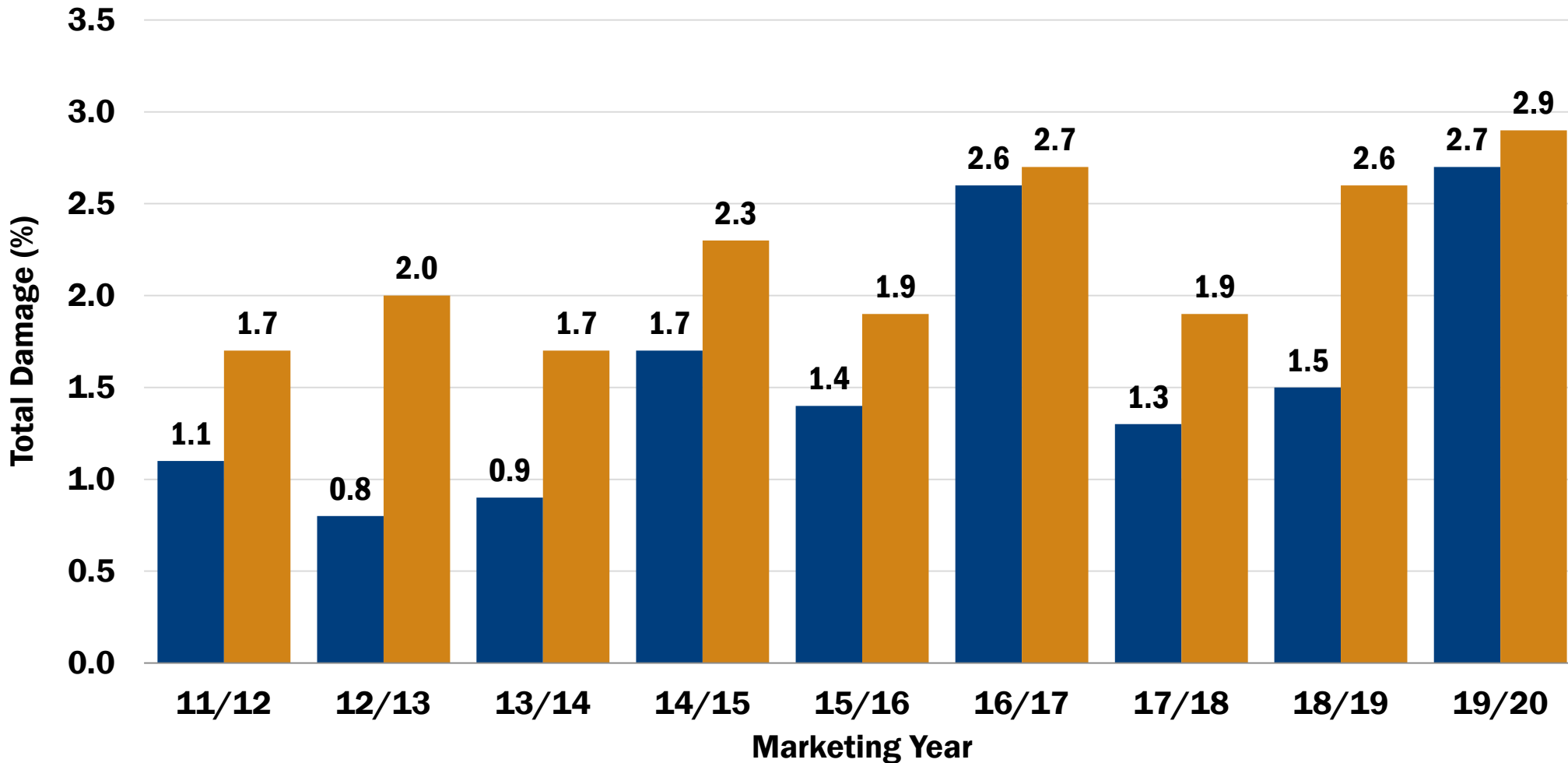
U.S. Aggregate: 2.9%

- Average **higher** than 5YA (2.3%)
- **90.7%** No. 2 grade






Harvest vs. Export Cargo Total Damage (%)



9YA Annual
Difference from
Harvest

 0.6%

 Harvest
 Export



Heat Damage (%)

U.S. Aggregate: 0.0%

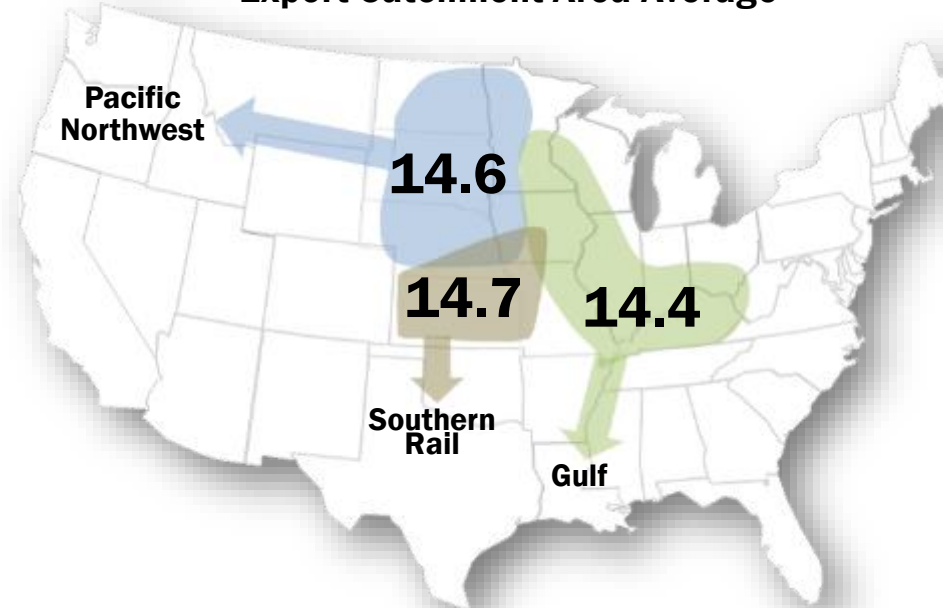
- Only **five** samples in the entire sample set showed any heat damage (all either 0.1% or 0.2%).
- Average **below** the limit for U.S. No. 1 Grade
- Indicates **good management** of the drying and storage of corn



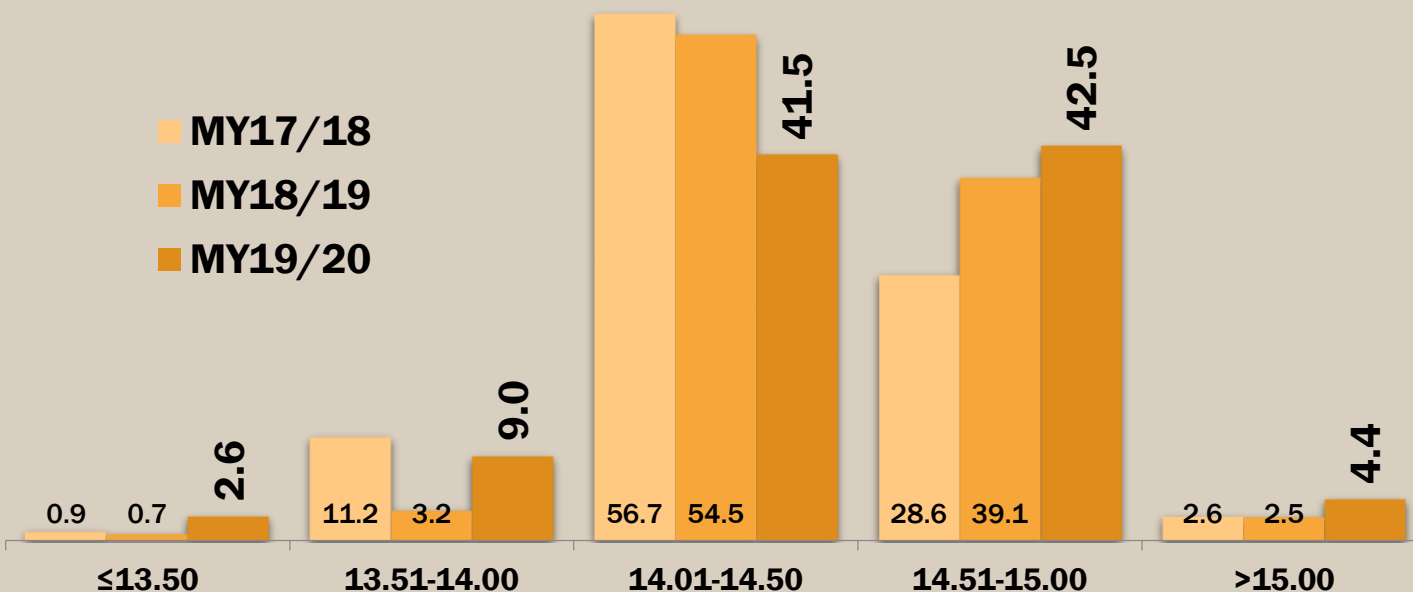
U.S. Aggregate: 14.5%

➤ Average **similar** to 5YA (14.4%)

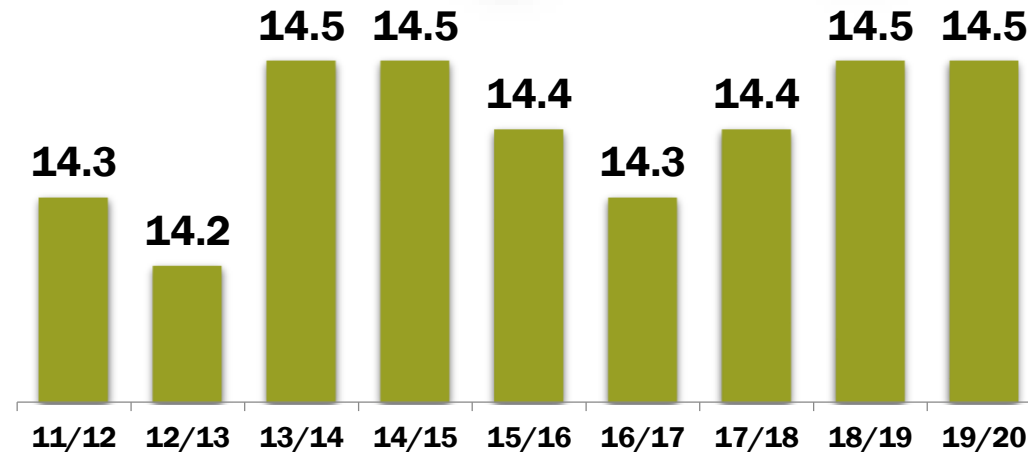
Export Catchment Area Average



■ MY17/18
■ MY18/19
■ MY19/20



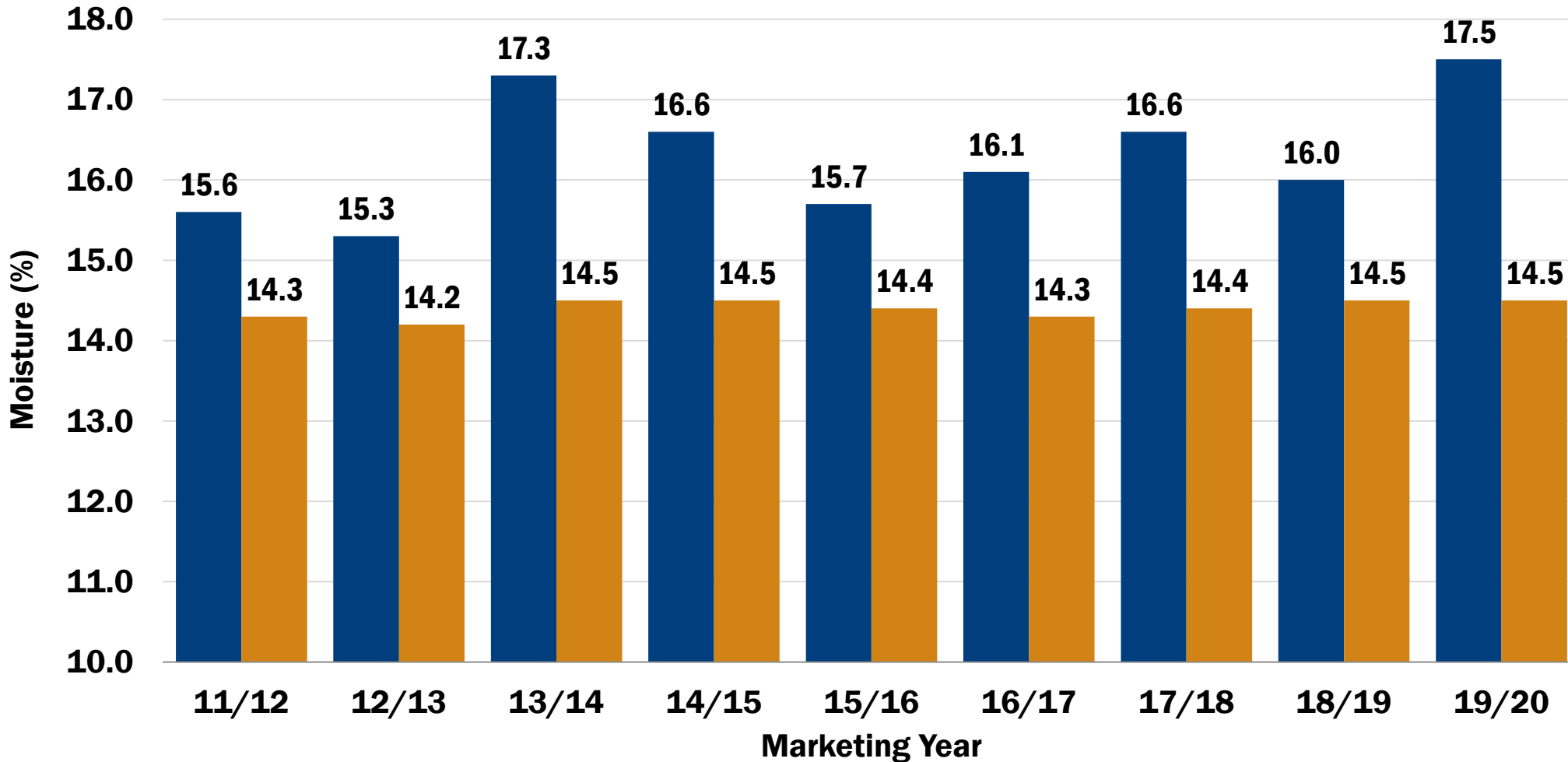
Percent of Samples by Marketing Year



Historical Aggregate by Marketing Year



Harvest vs. Export Cargo Moisture (%)



9YA Annual
Difference from
Harvest

↓ -1.9%

 Harvest
 Export



Chemical Composition



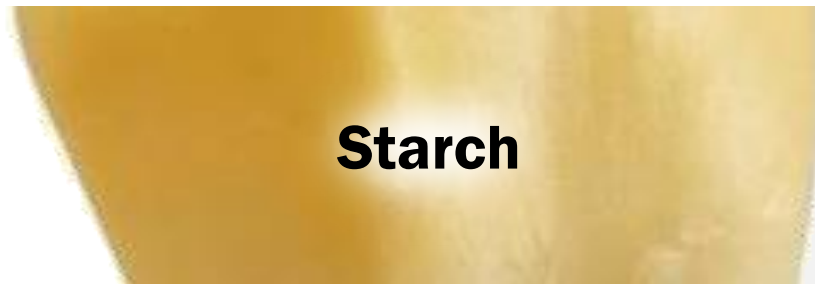
Chemical Composition



Important for poultry and livestock feeding
Supplies essential amino acids

Influenced by

Genetics, weather, crop yields and available nitrogen during the growing season



Important for wet millers and dry-grind ethanol manufacturers

Influenced by

Genetics, weather and crop yields



Important by-product of wet and dry milling
Essential feed component



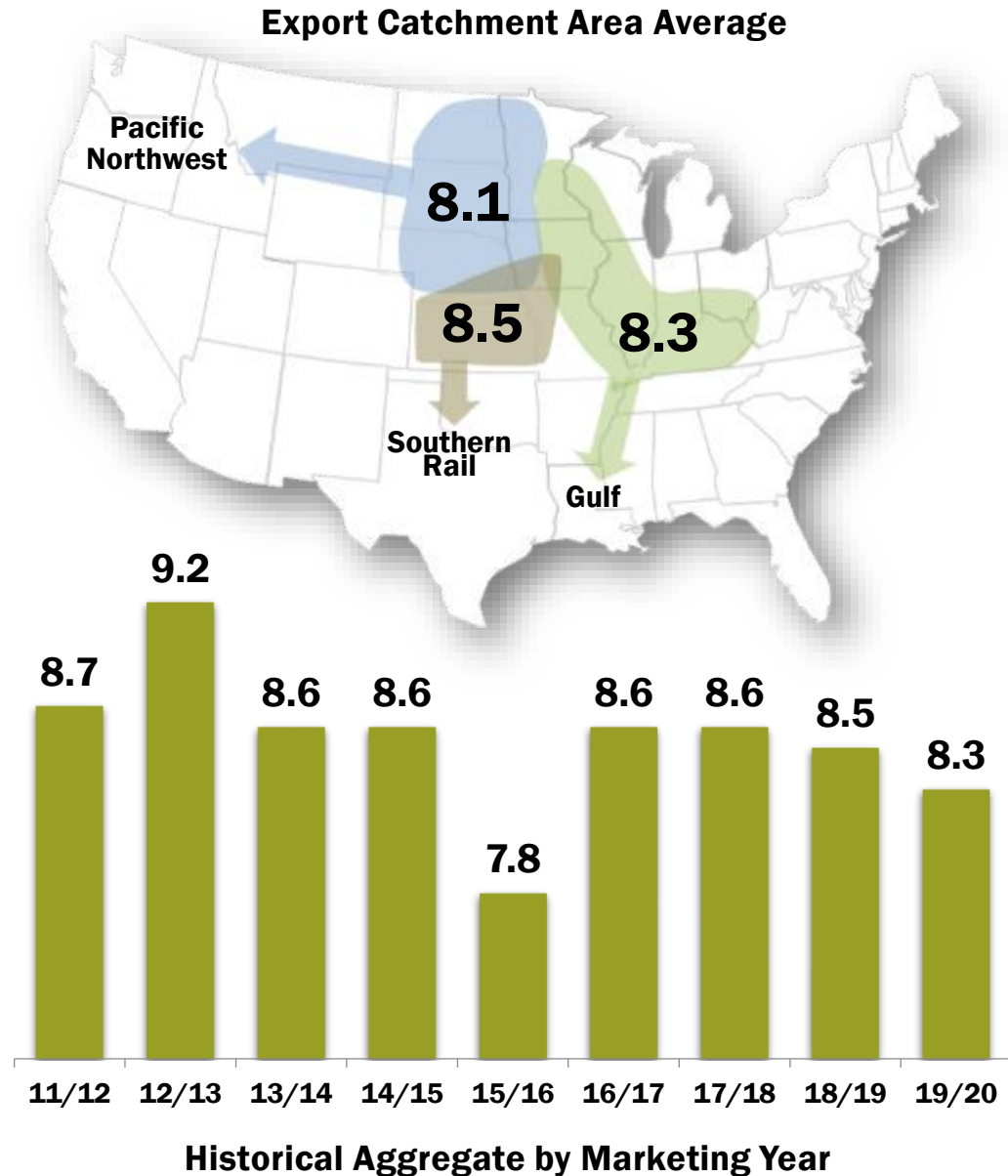
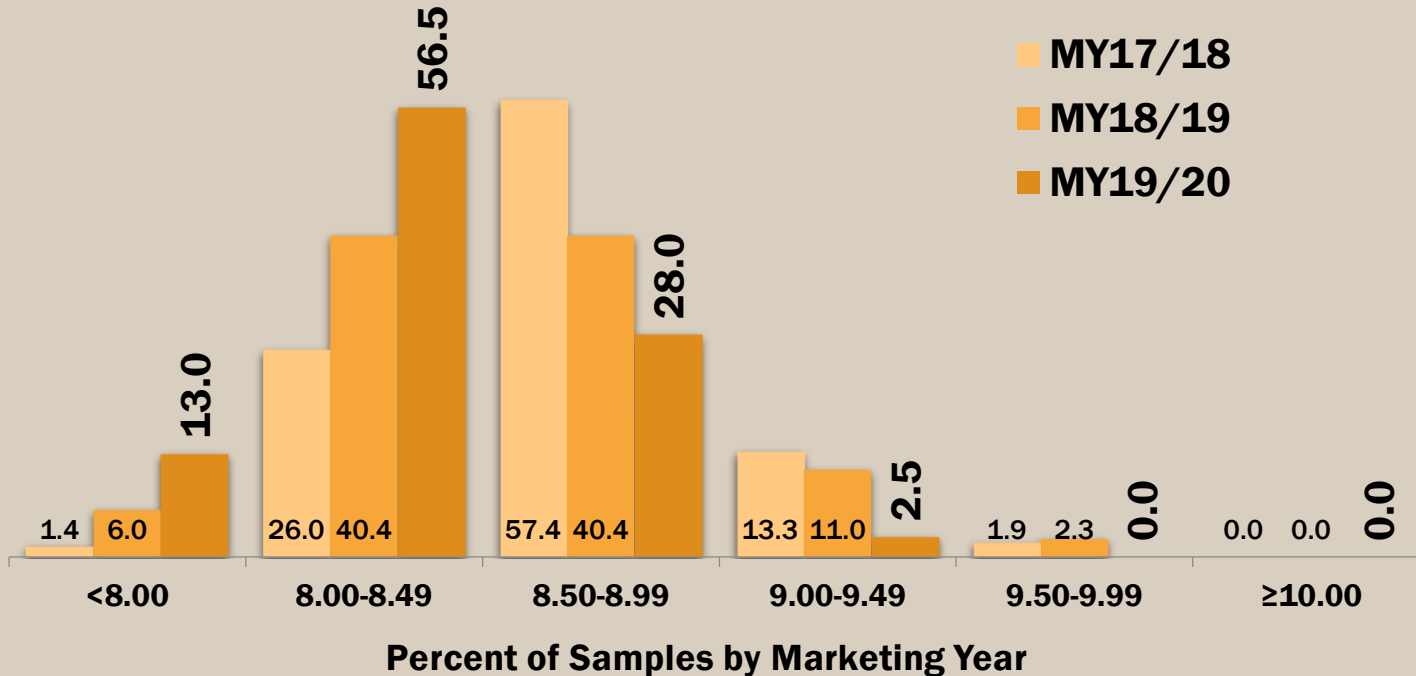
Chemical Composition

	No. of Samples	Avg.	Std. Dev.	Min.	Max.
Protein (Dry Basis %)	432	8.3	0.29	7.1	9.3
Starch (Dry Basis %)	432	72.2	0.38	70.2	73.4
Oil (Dry Basis %)	432	4.0	0.15	3.6	4.6

Protein (Dry Basis %)

U.S. Aggregate: 8.3%

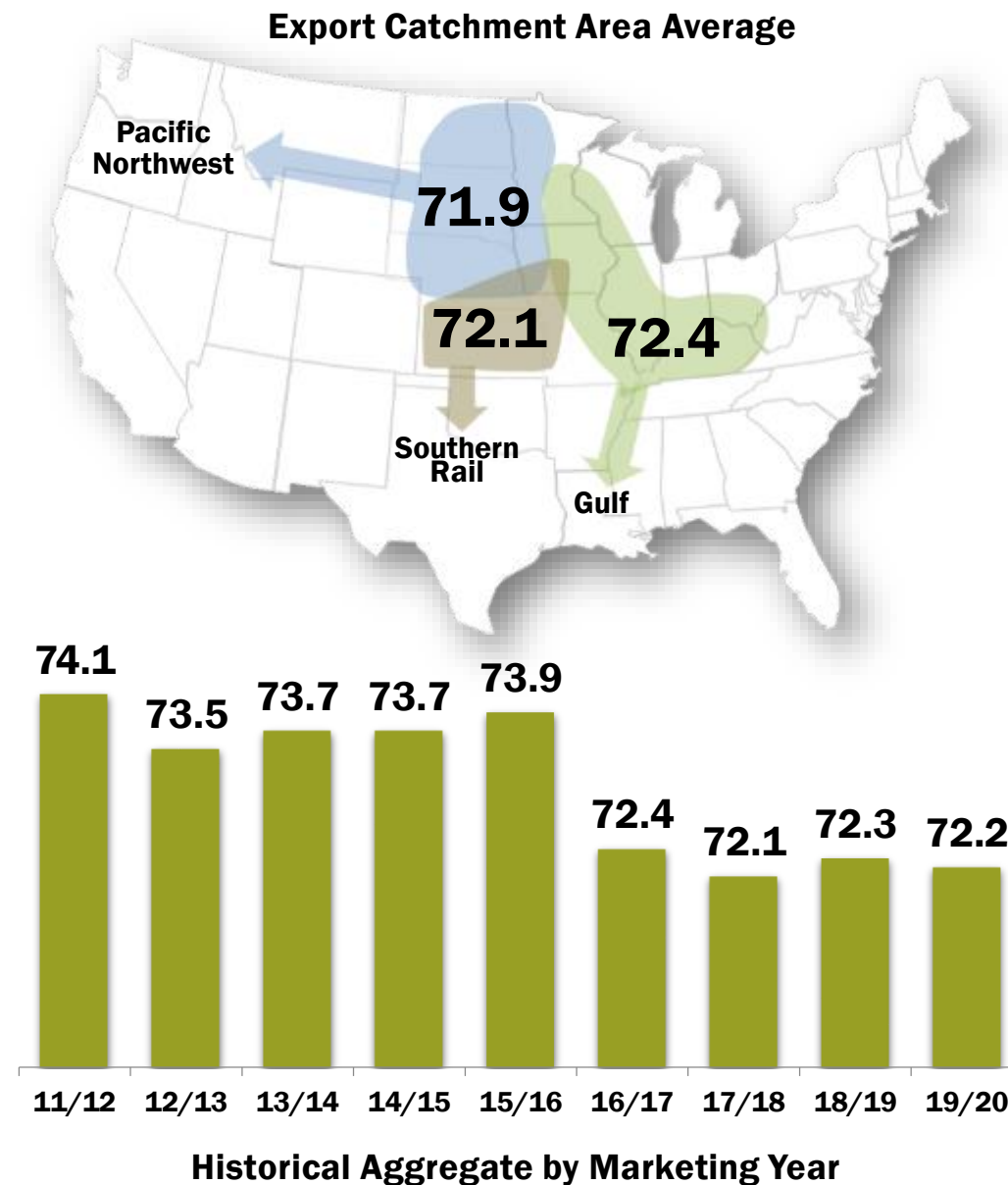
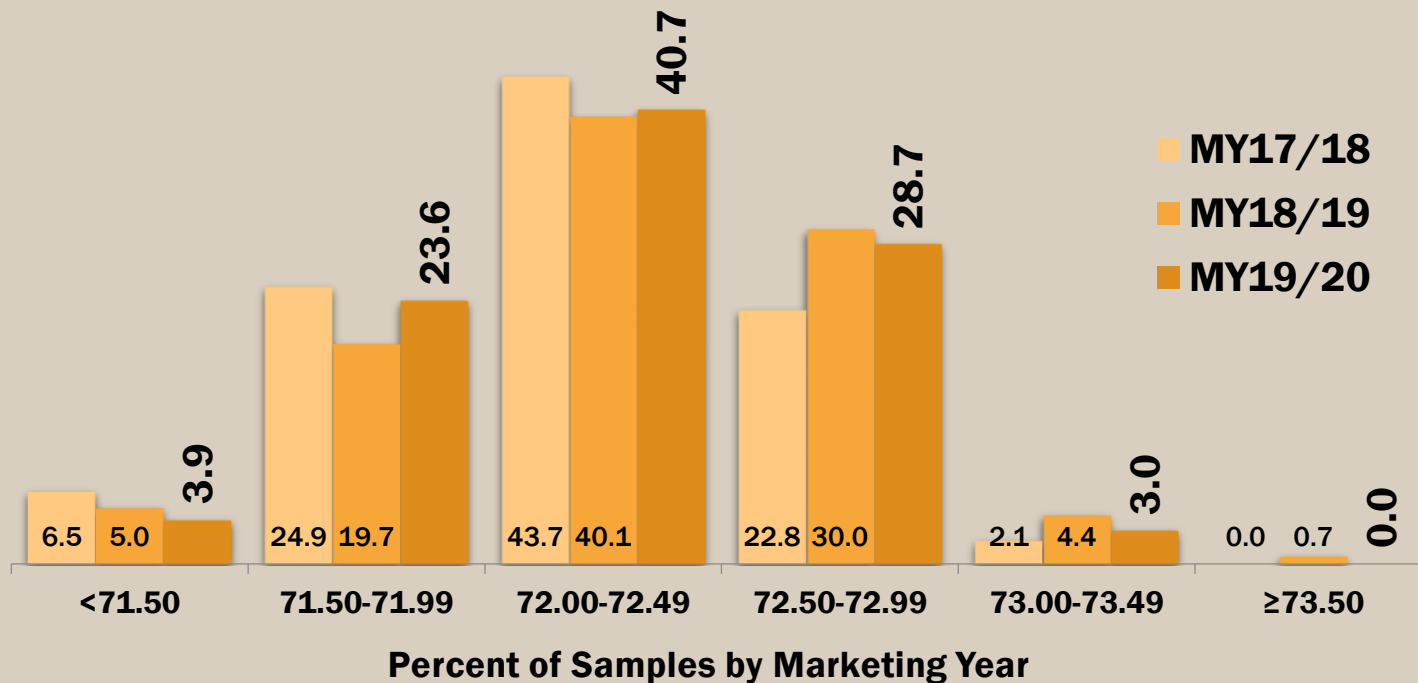
- Average **similar** to 5YA (8.4%)
- **Higher** percentage with <8% protein



Starch (Dry Basis %)

U.S. Aggregate: 72.2%

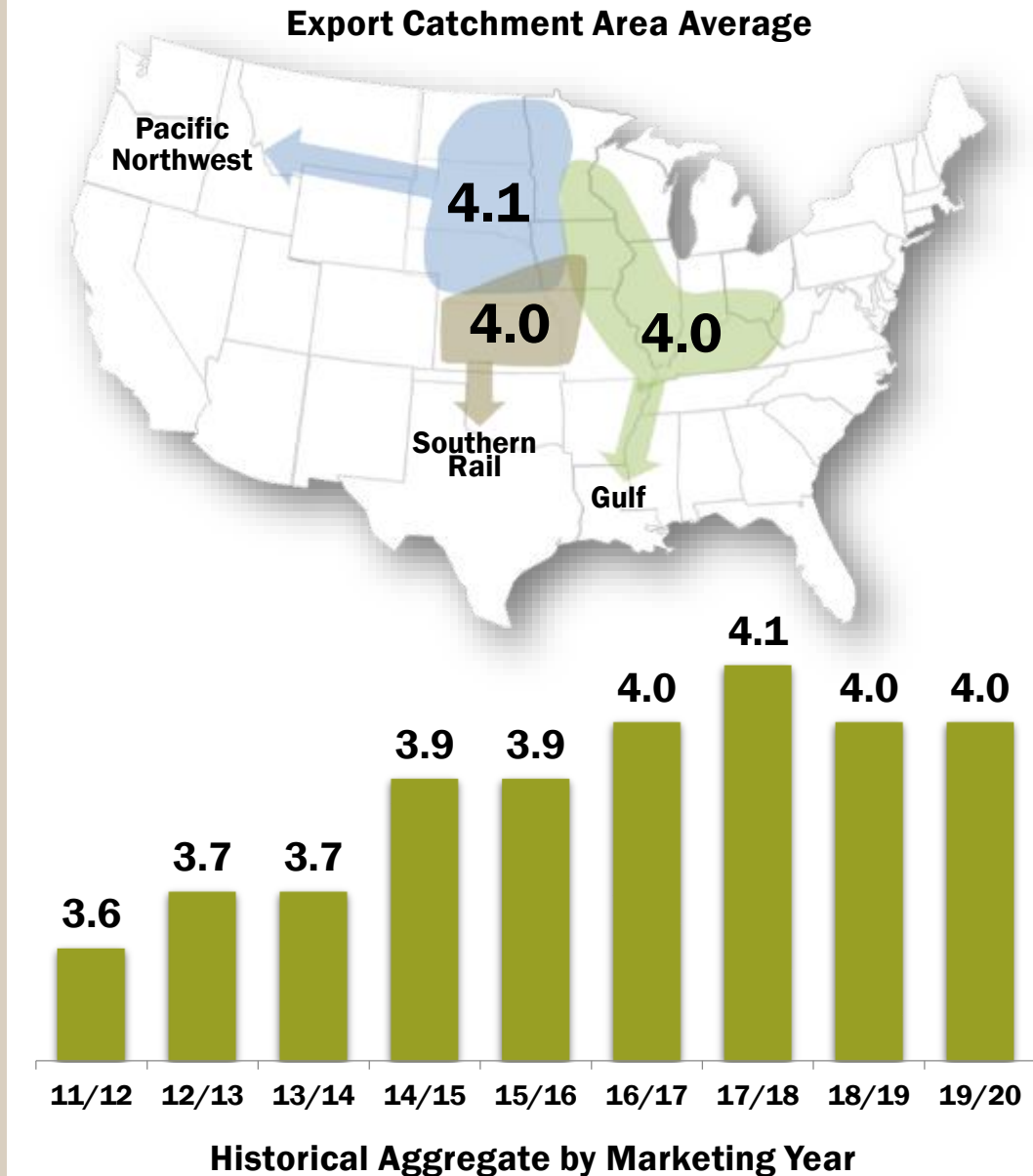
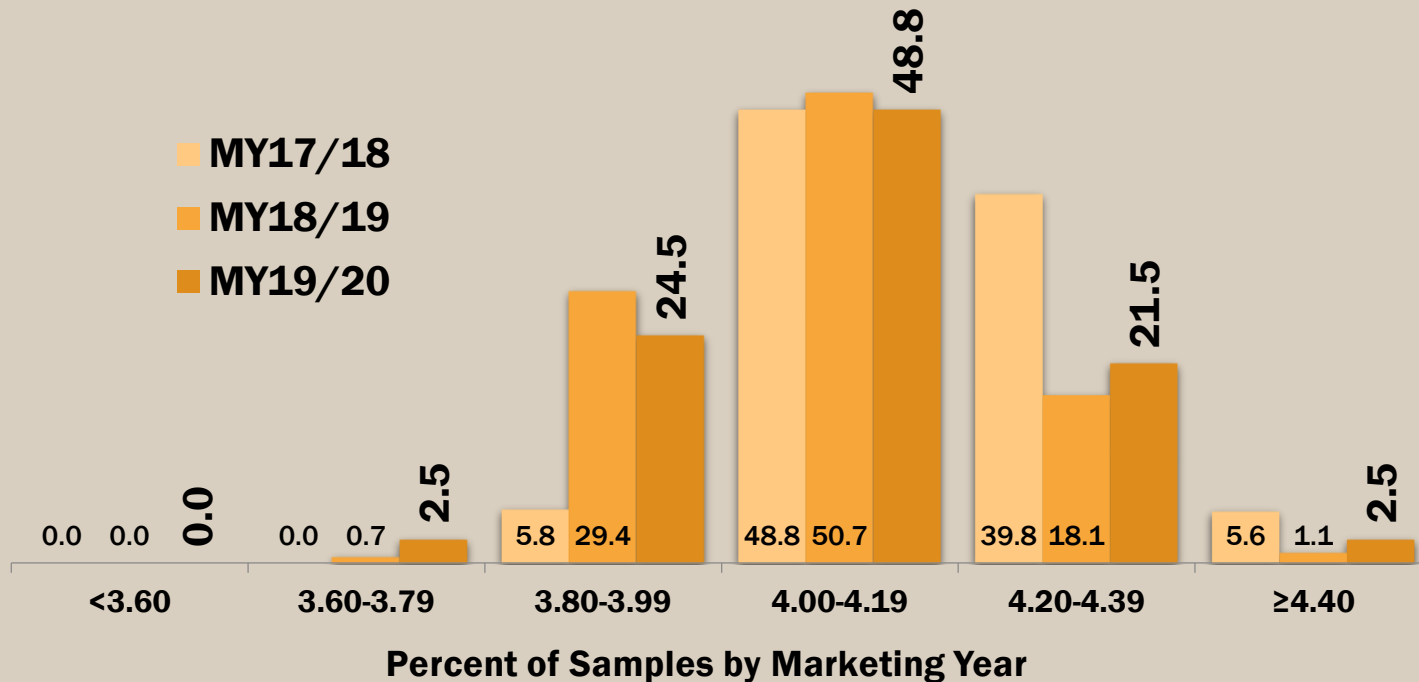
- **Similar** to previous two years
- **Gulf** ECA tends to have highest average starch



Oil (Dry Basis %)

U.S. Aggregate: 4.0%

➤ Only 2017/2018 had higher average oil

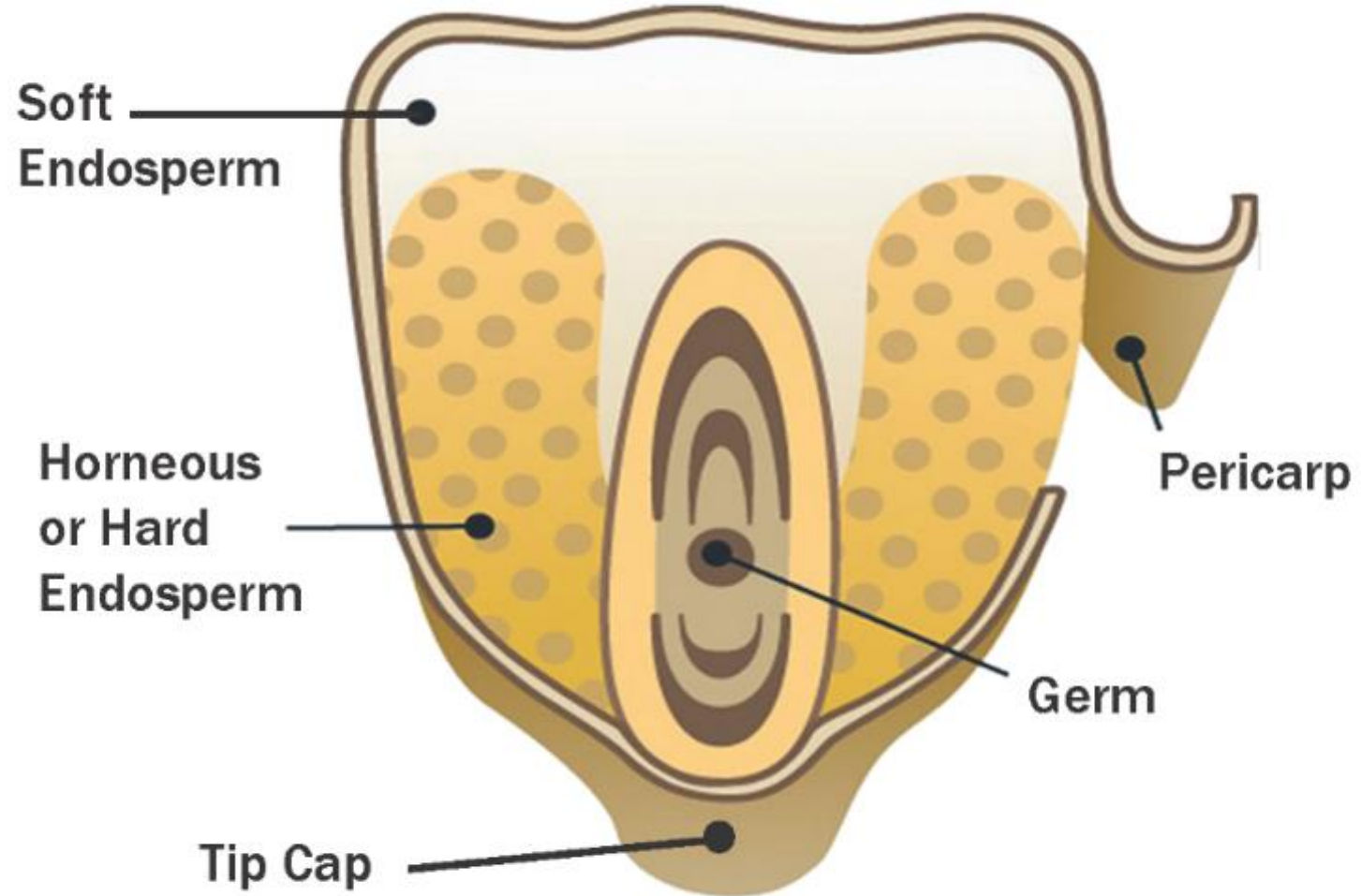




Physical Factors



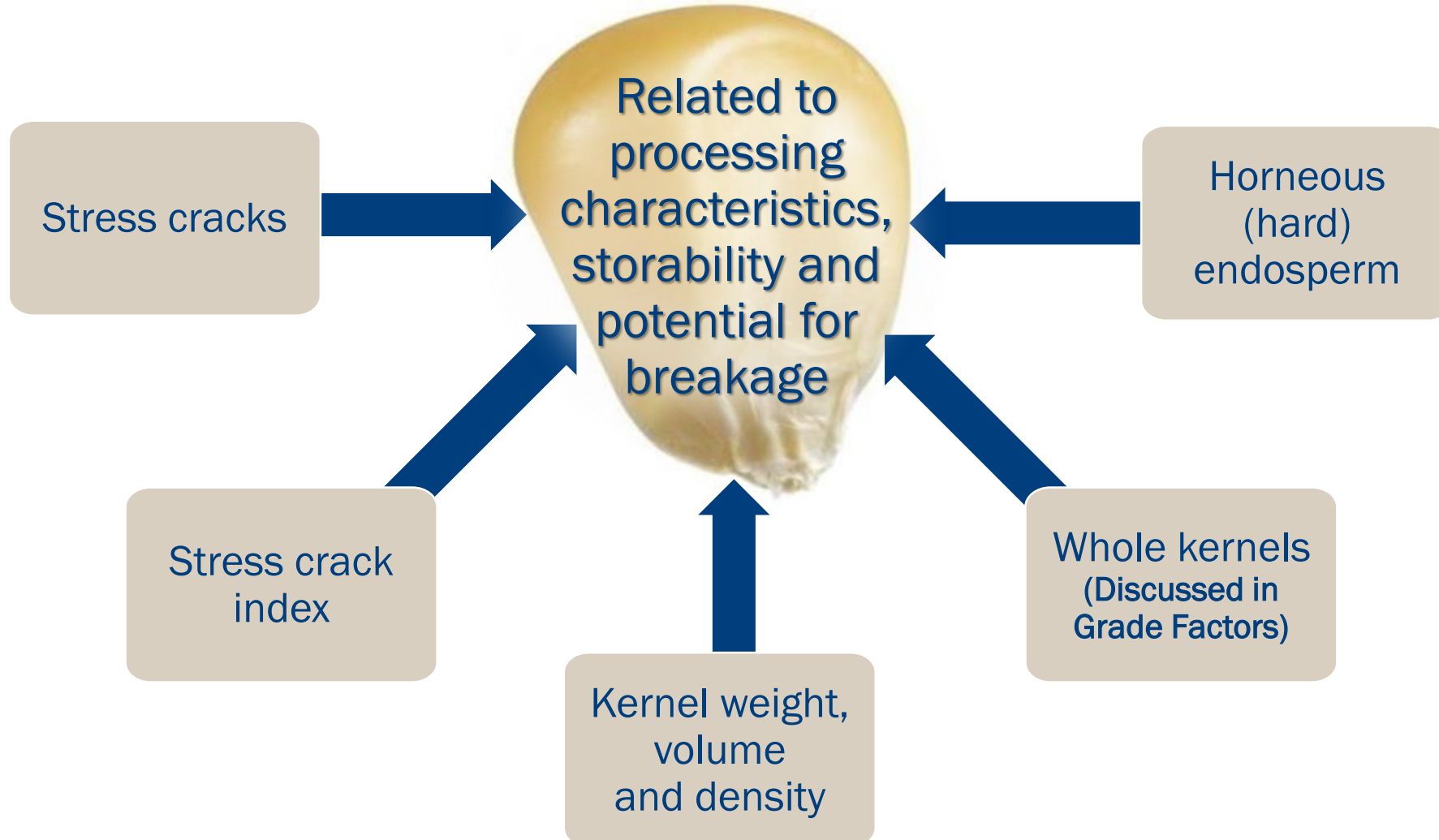
Corn Morphology



Source: Adapted from Corn Refiners Association, 2011



Physical Factors – Overview





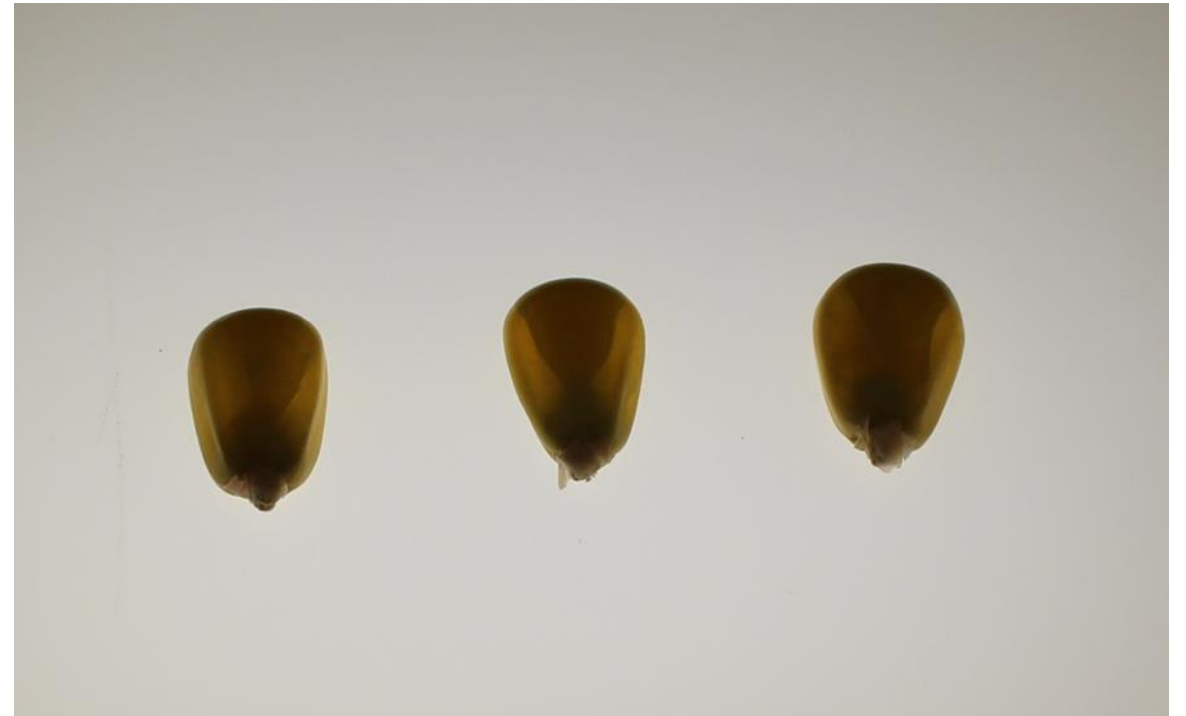
Physical Factors

	No. of Samples	Avg.	Std. Dev.	Min.	Max.
Stress Cracks (%)	432	11	7	0	47
100-Kernel Weight (g)	432	35.50	1.37	28.54	40.79
Kernel Volume (cm ³)	432	0.28	0.01	0.23	0.32
True Density (g/cm ³)	432	1.278	0.012	1.205	1.314
Whole Kernels (%)	432	77.4	8.0	32.2	93.8
Horneous Endosperm (%)	180	81	2	74	87



Stress Cracks (%)

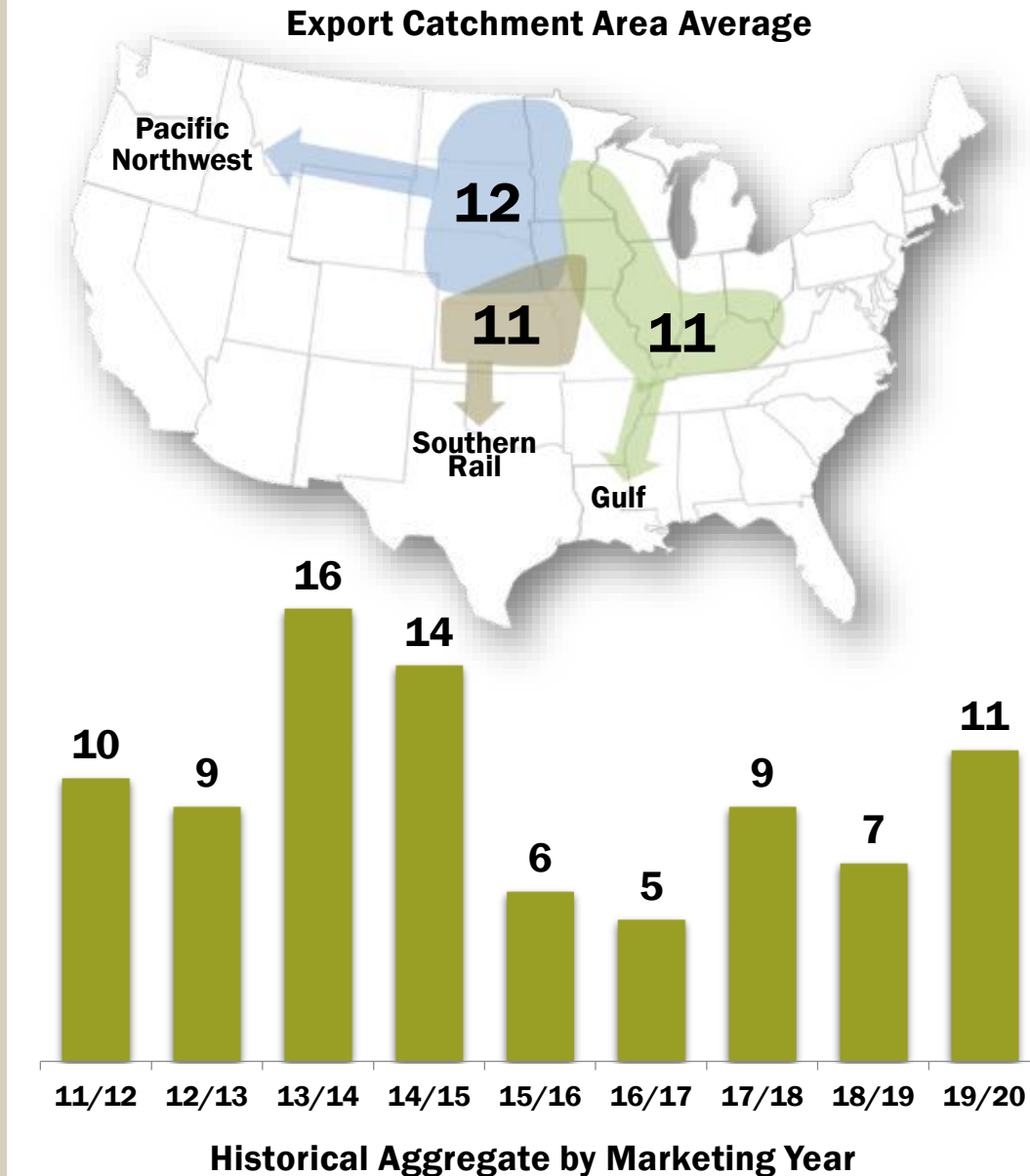
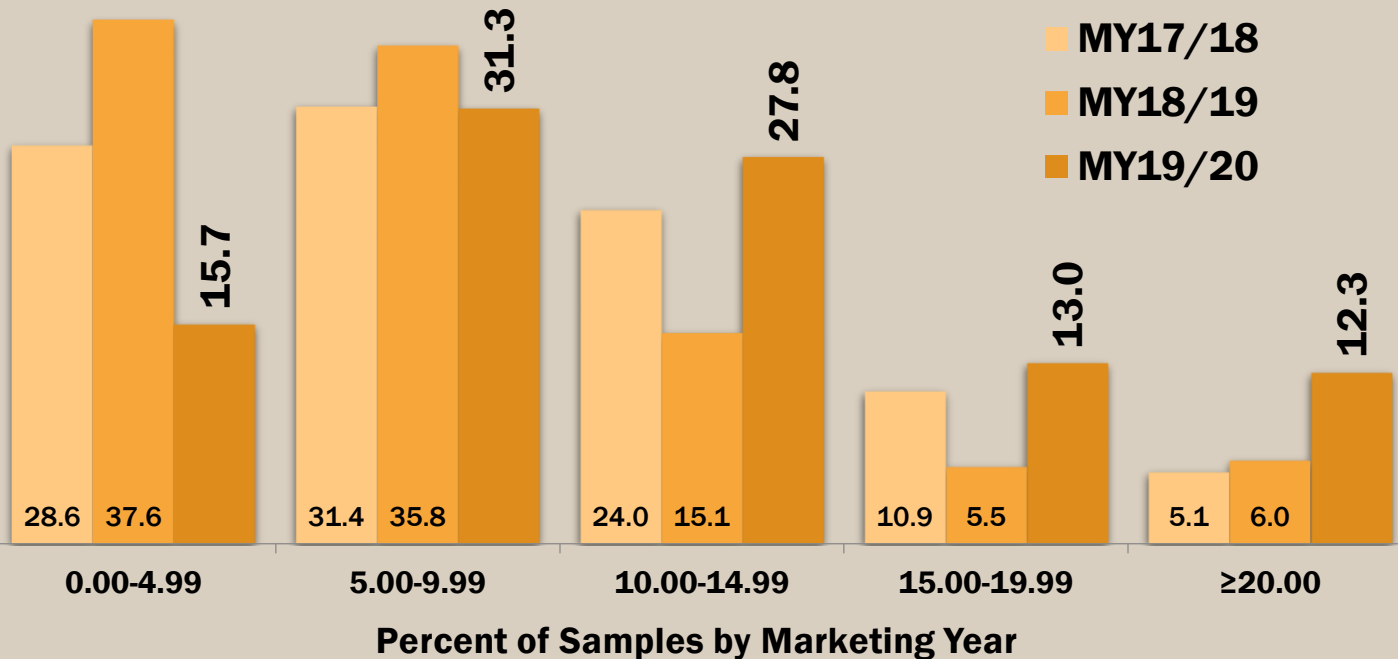
- Internal cracks in the horneous (hard) endosperm
- Most common cause is artificial drying
- Impacts breakage susceptibility, milling and alkaline cooking



Stress Cracks (%)

U.S. Aggregate: 11%

- Higher than 5YA (8%)
- Breakage susceptibility higher than 5YA



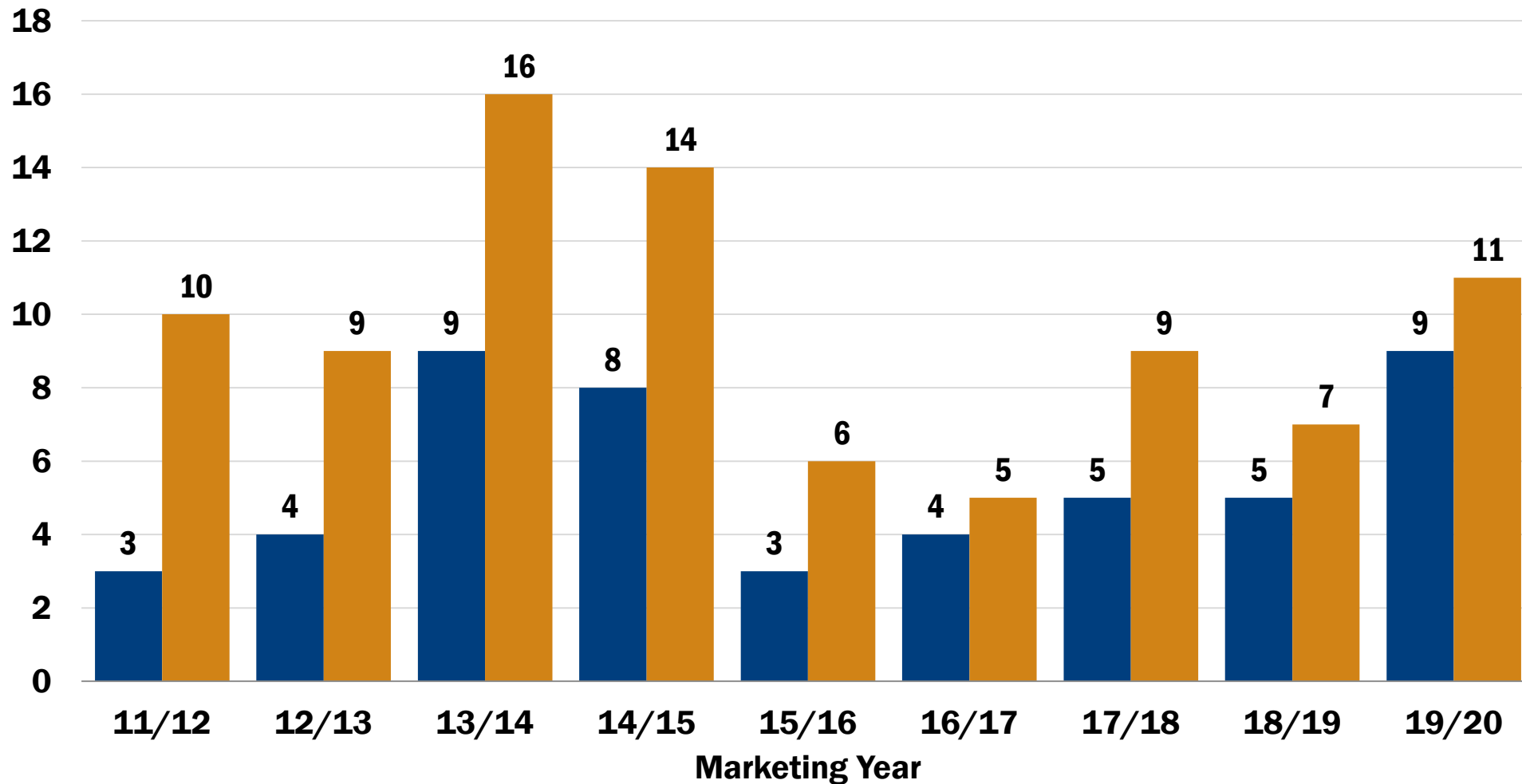


Harvest vs. Export Cargo Stress Cracks (%)

9YA Annual
Difference from
Harvest

↑ 4%

■ Harvest
■ Export





Stress Crack Index



**% kernels with
1 stress crack**

× 1

+



**% kernels with
2 stress cracks**

× 3

+



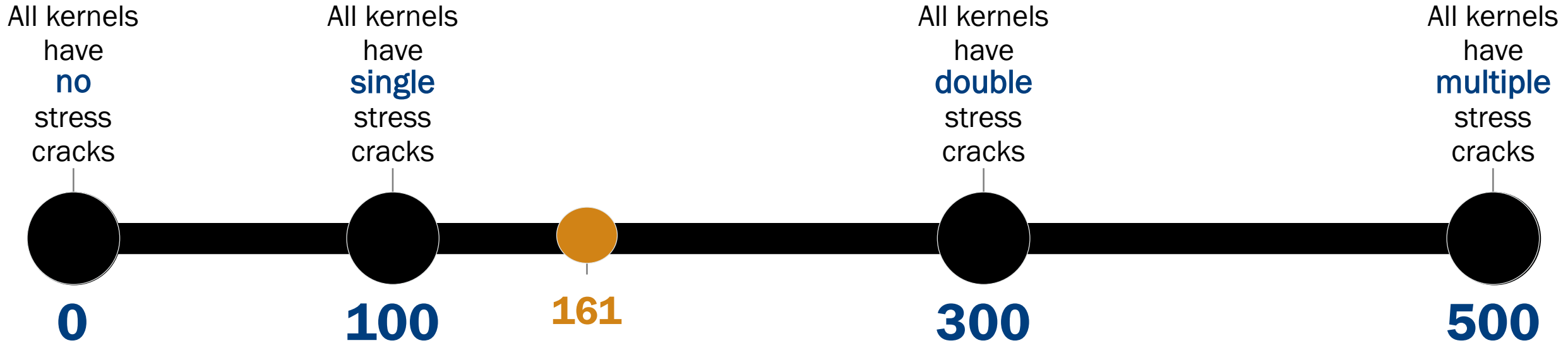
**% kernels with
> 2 stress cracks**

× 5

= SCI



Magnitude of Stress Crack Index



Example: **SC% = 43%**

SCI Calculation

$$(4\%^a \times 1) + (19\%^b \times 3) + (20\%^c \times 5) = 161$$

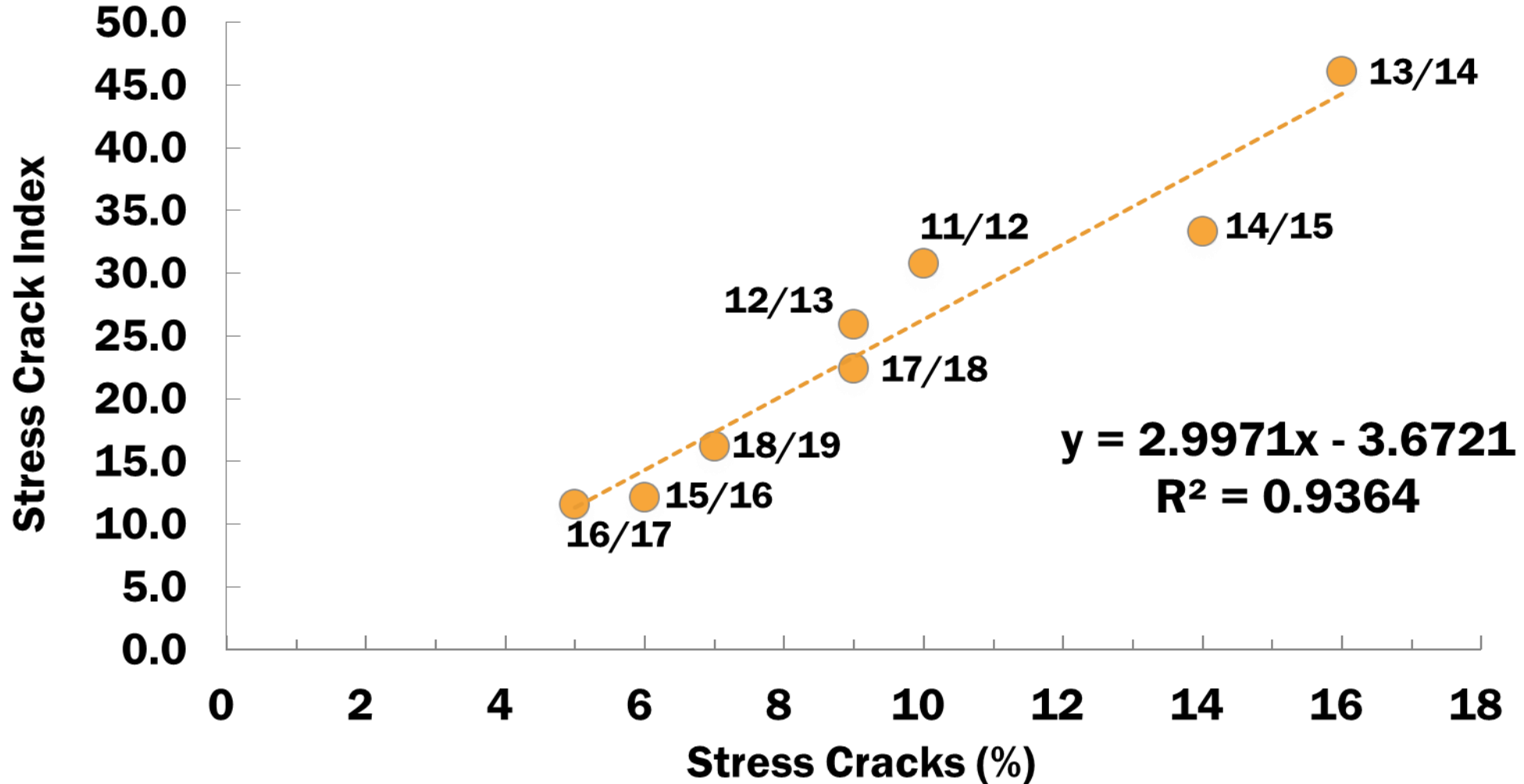
a: 4 kernels

b: 19 kernels

c: 20 kernels



Stress Cracks (%) vs. Stress Crack Index



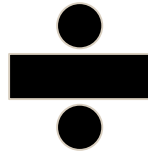


Kernel Weight, Volume and Density

100-Kernel Weight (grams)

Indicates kernel size which affects

- Drying rates
- Flaking grit yields in dry milling



Kernel Volume (cubic centimeters)

Kernel volume is influenced by growing conditions and genetics



True Density (grams per cubic centimeter)

True density reflects kernel hardness

Higher density – harder kernels, less susceptible to breakage, more desirable for dry milling and alkaline processing

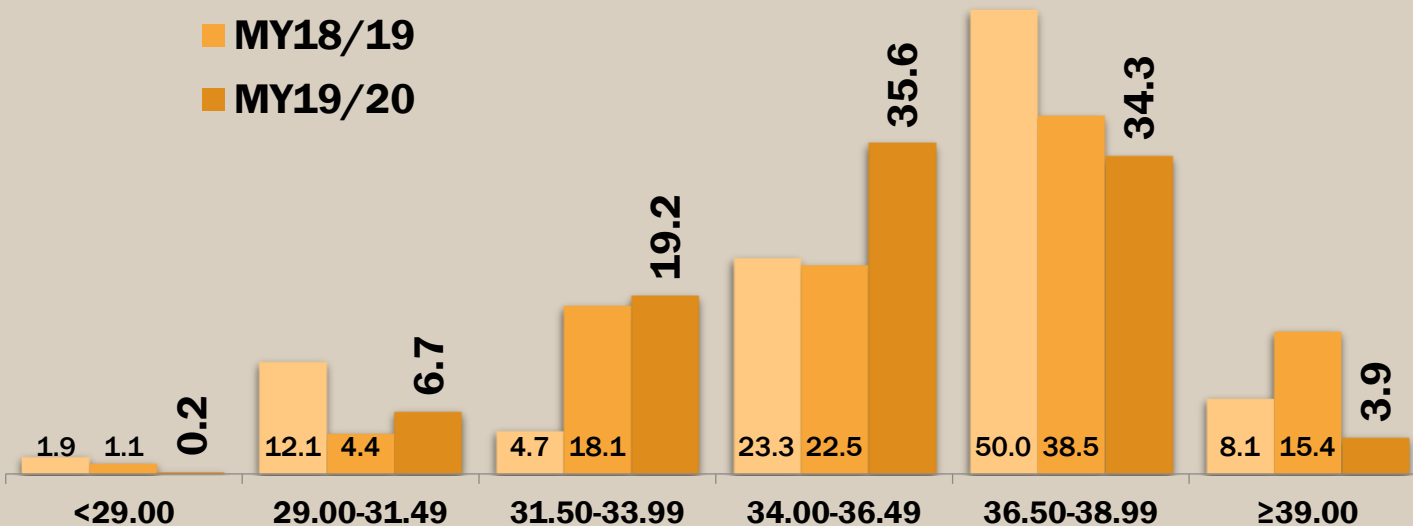
Lower density – softer kernels, less at risk for development of stress cracks if high temperature drying is employed, good for wet milling and feed use

100-Kernel Weight (grams)

U.S. Aggregate: 35.50 grams

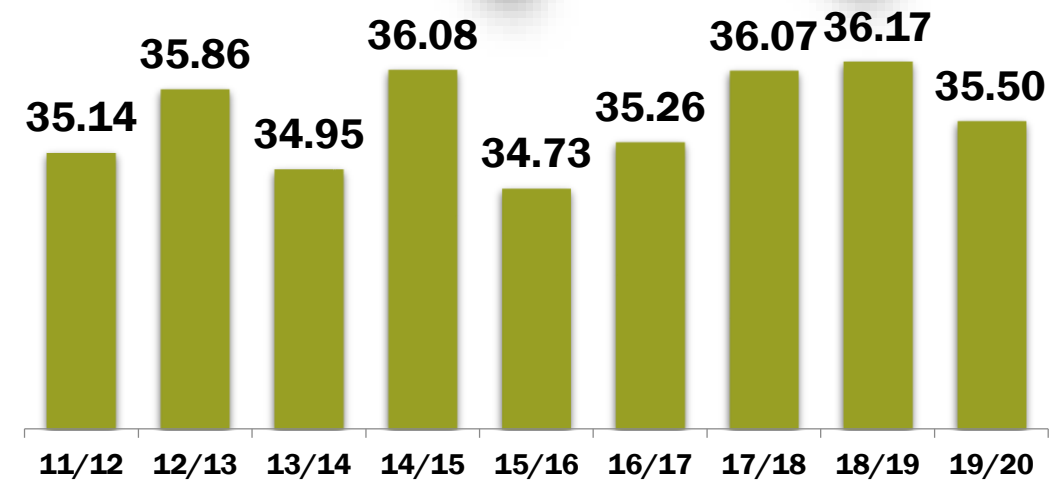
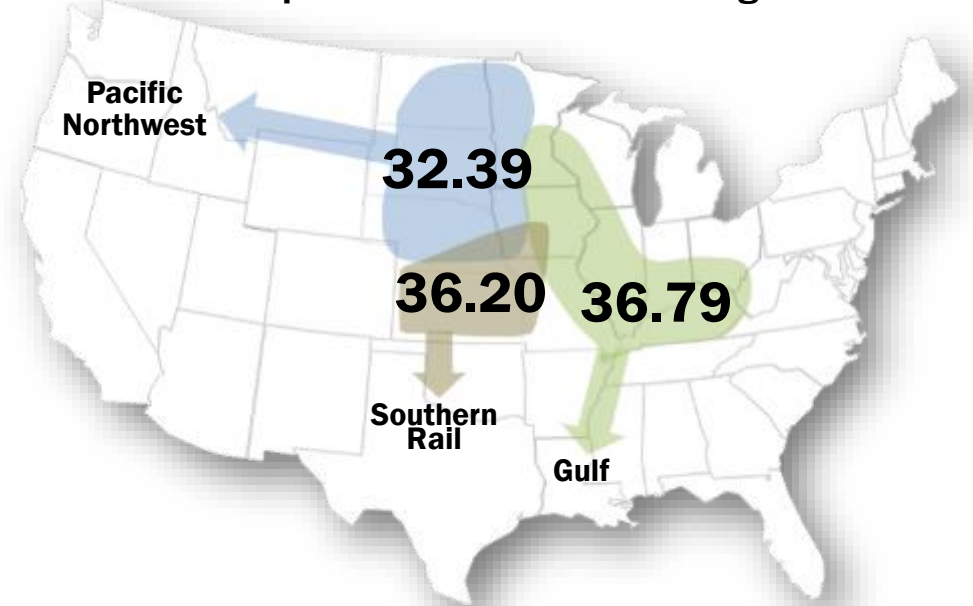
➤ Average **similar** to 5YA (35.66 grams)

■ MY17/18
■ MY18/19
■ MY19/20



Percent of Samples by Marketing Year

Export Catchment Area Average

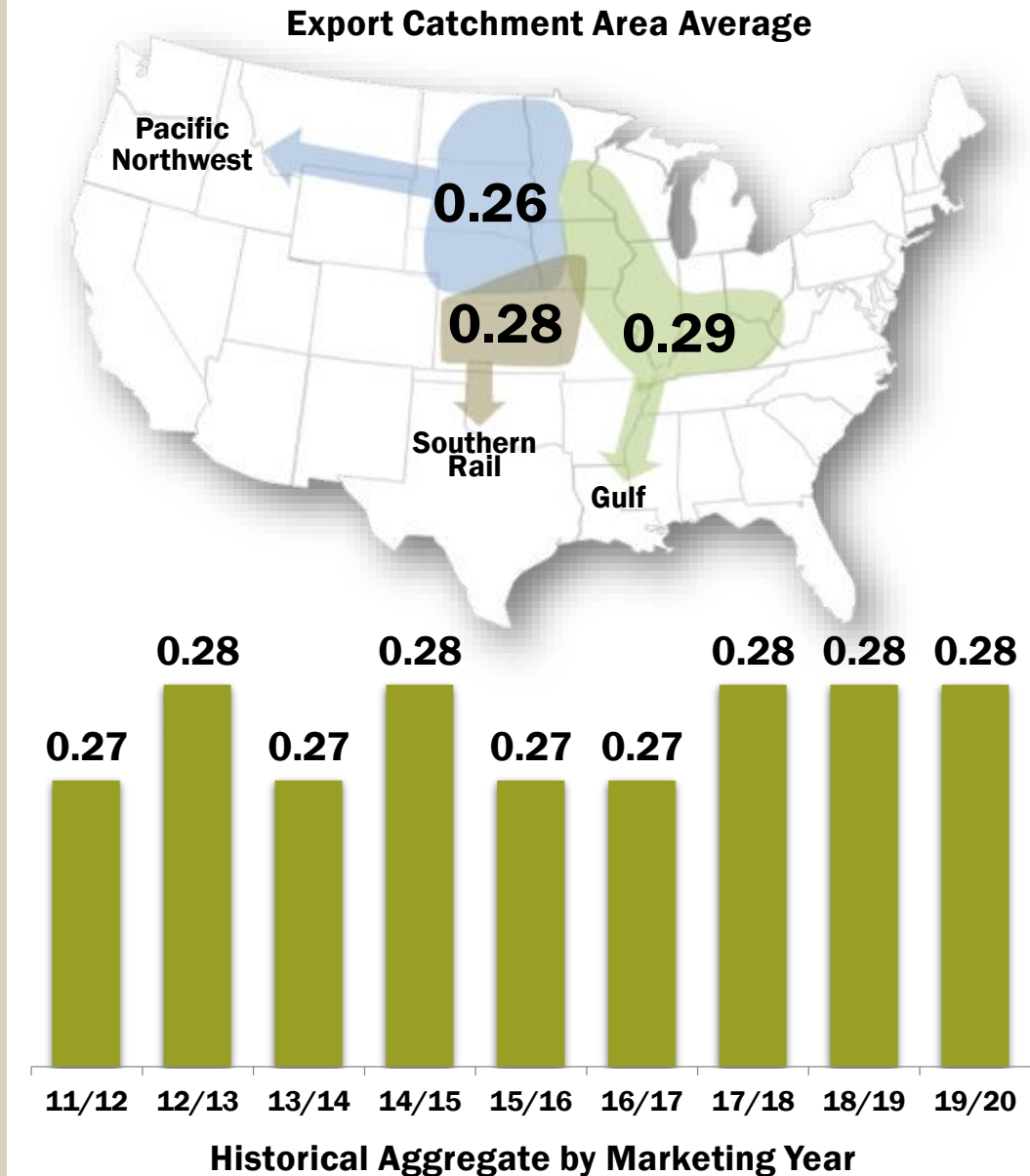
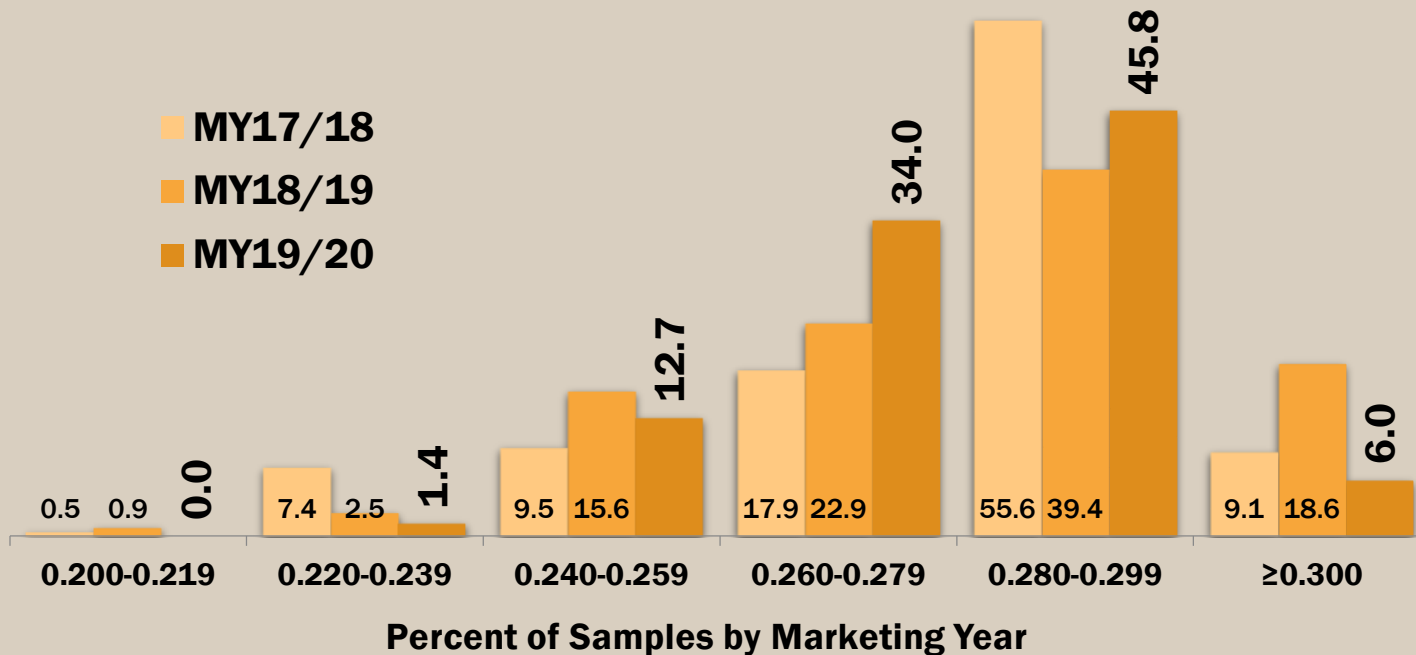


Historical Aggregate by Marketing Year

Kernel Volume (cm³)

U.S. Aggregate: 0.28 cm³

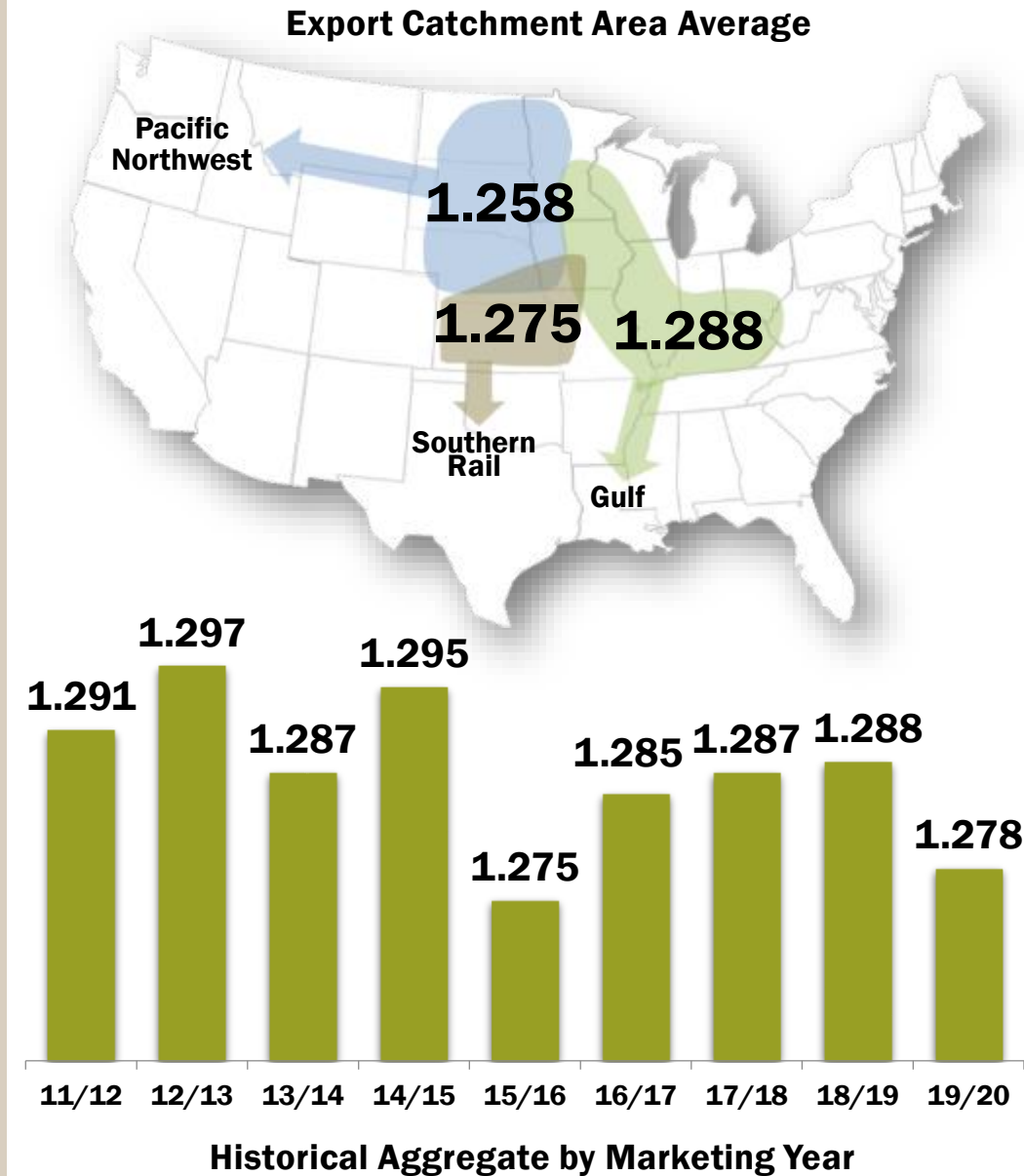
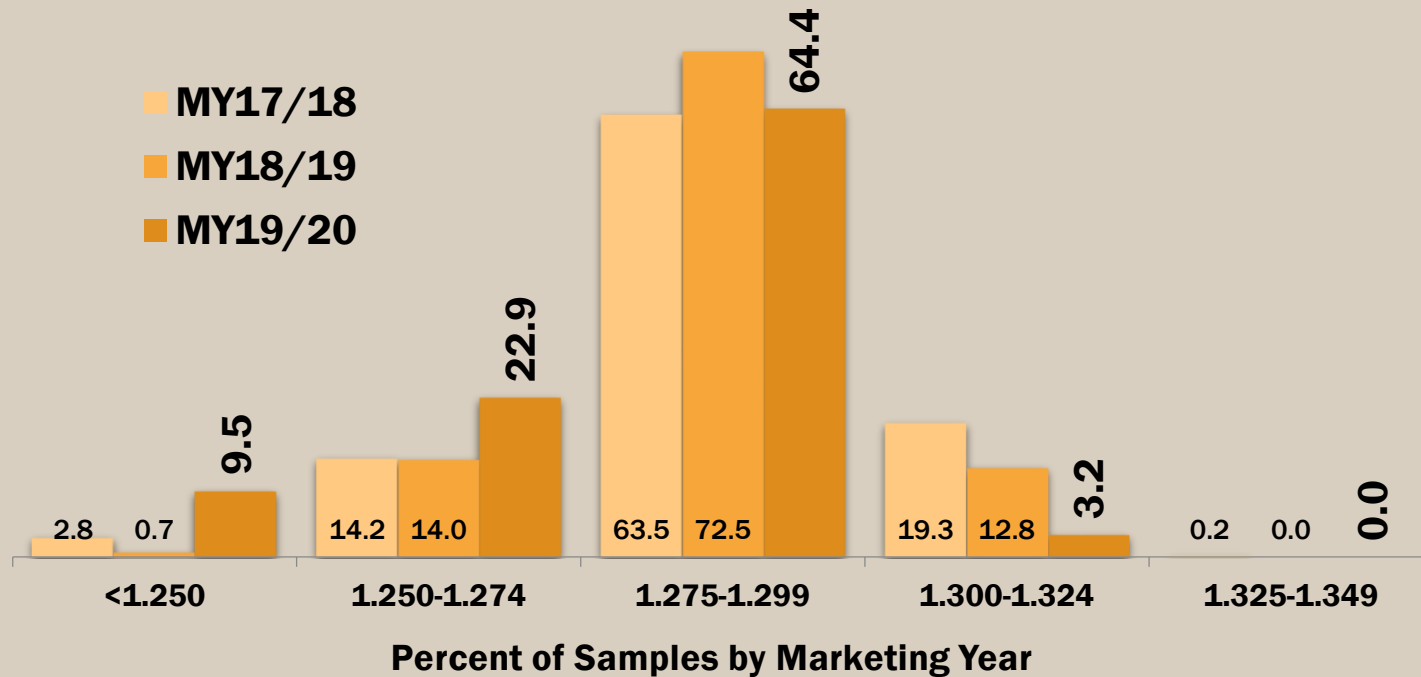
➤ Average **same** as 5YA (0.28 cm³)



Kernel True Density (g/cm³)

U.S. Aggregate: 1.278 g/cm³

- Average **lower** than 5YA (1.286 g/cm³)
- **Lowest** annual average since 2015/2016

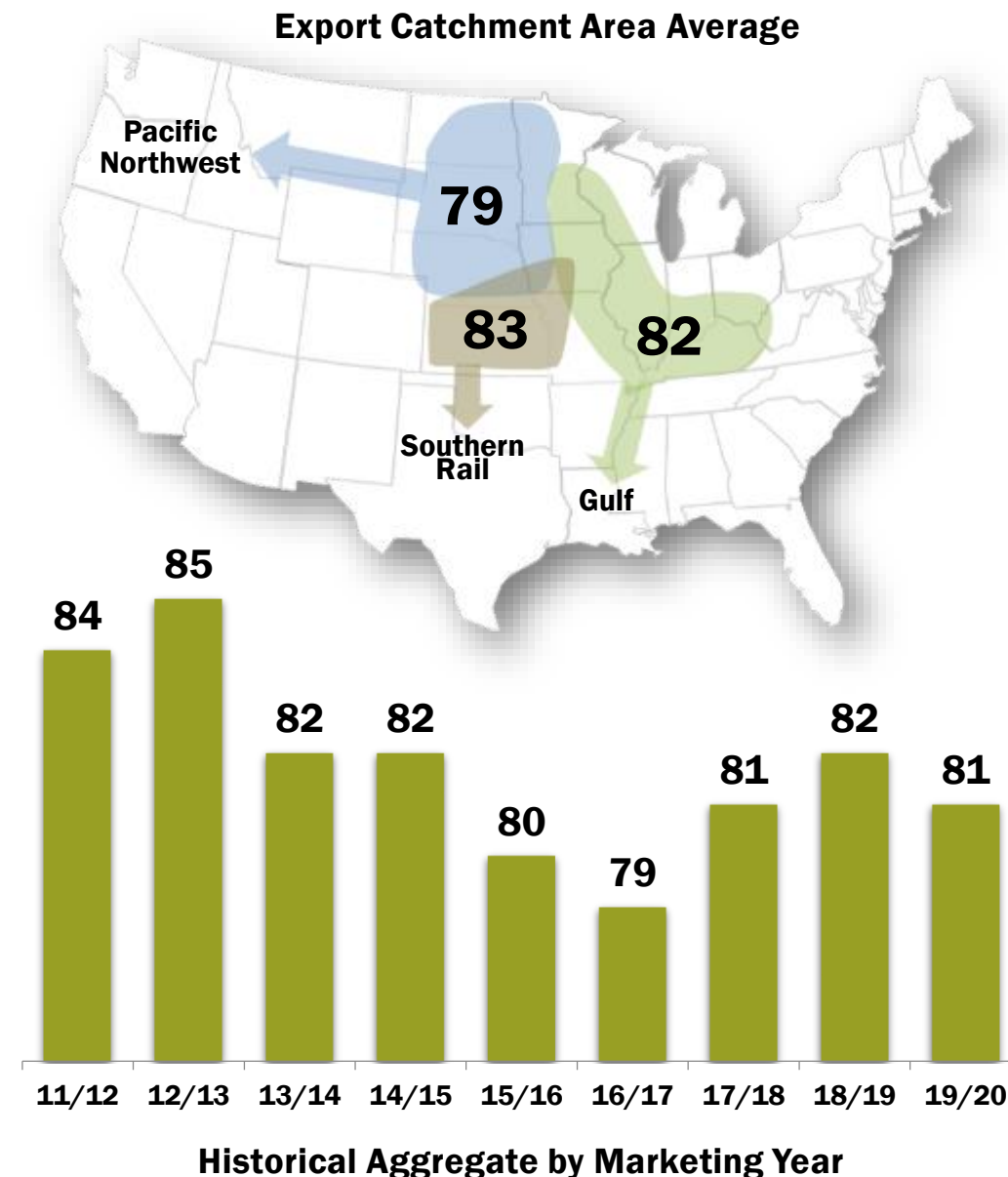
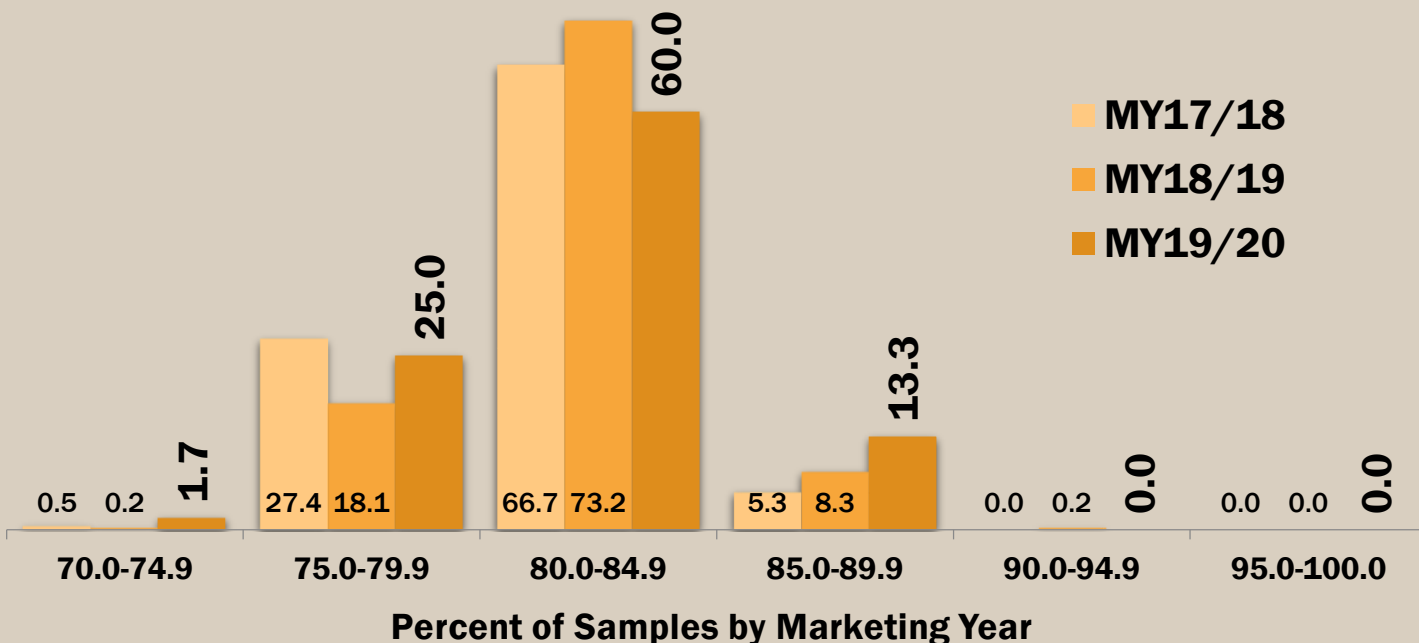





Horneous (Hard) Endosperm (%)

U.S. Aggregate: 81%

- Same as 5YA
- Generally little variation among the ECAs
- Average is higher when true density is high





Mycotoxins: Aflatoxin, DON (Vomitoxin) and Fumonisin

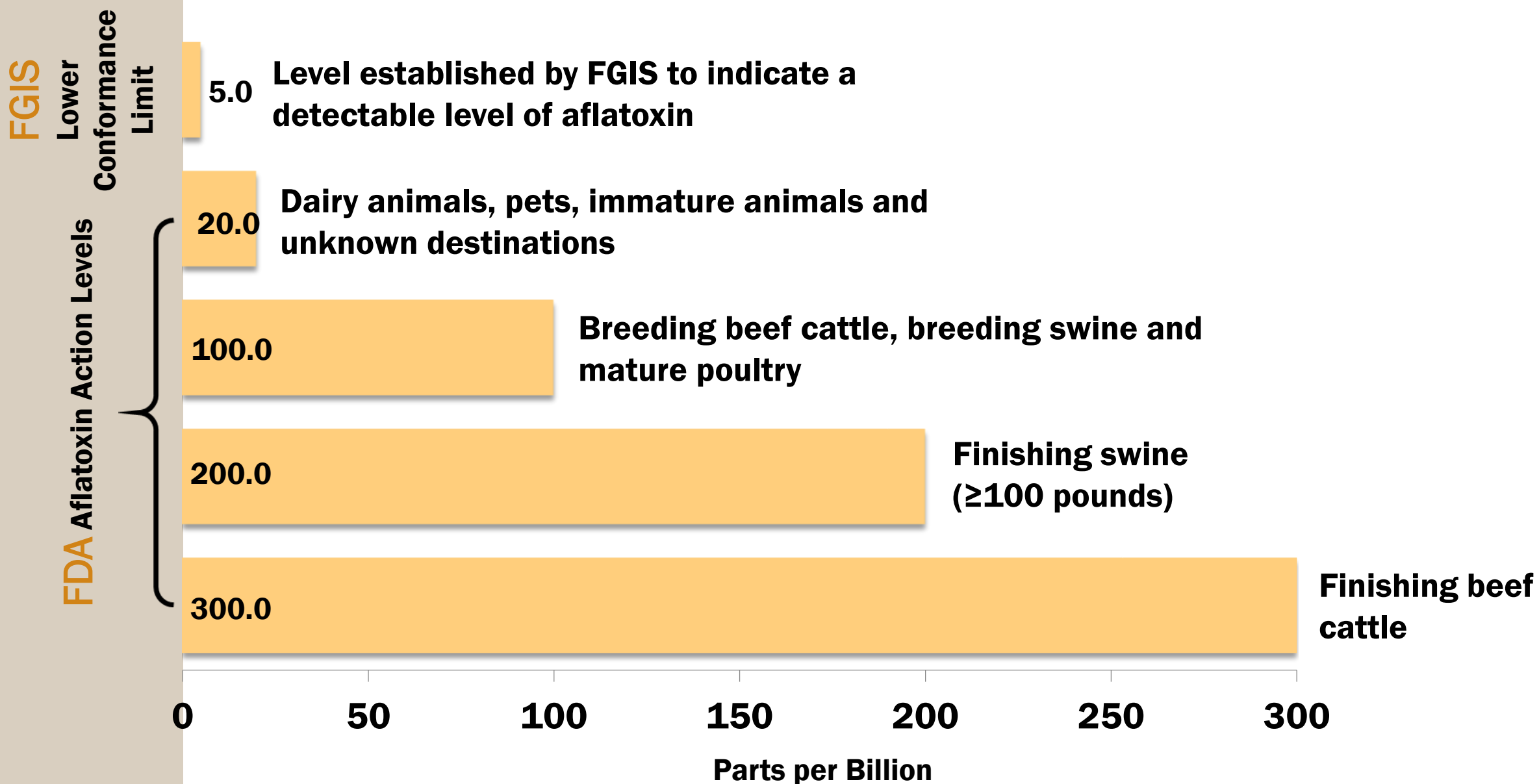


Export Cargo Mycotoxin Testing

- Provides an assessment of the presence of **aflatoxin, DON and fumonisin** in U.S. corn as it reaches export points early in the marketing year
- **431** export cargo samples were tested for aflatoxin, 180 samples tested for DON and fumonisin
- Reports **ONLY** the frequency of detected elevated levels of the mycotoxins in export samples
- Positive results **if above** Lower Conformance Level (LCL)
 - Aflatoxin: 5.0 ppb
 - DON: 0.5 ppm



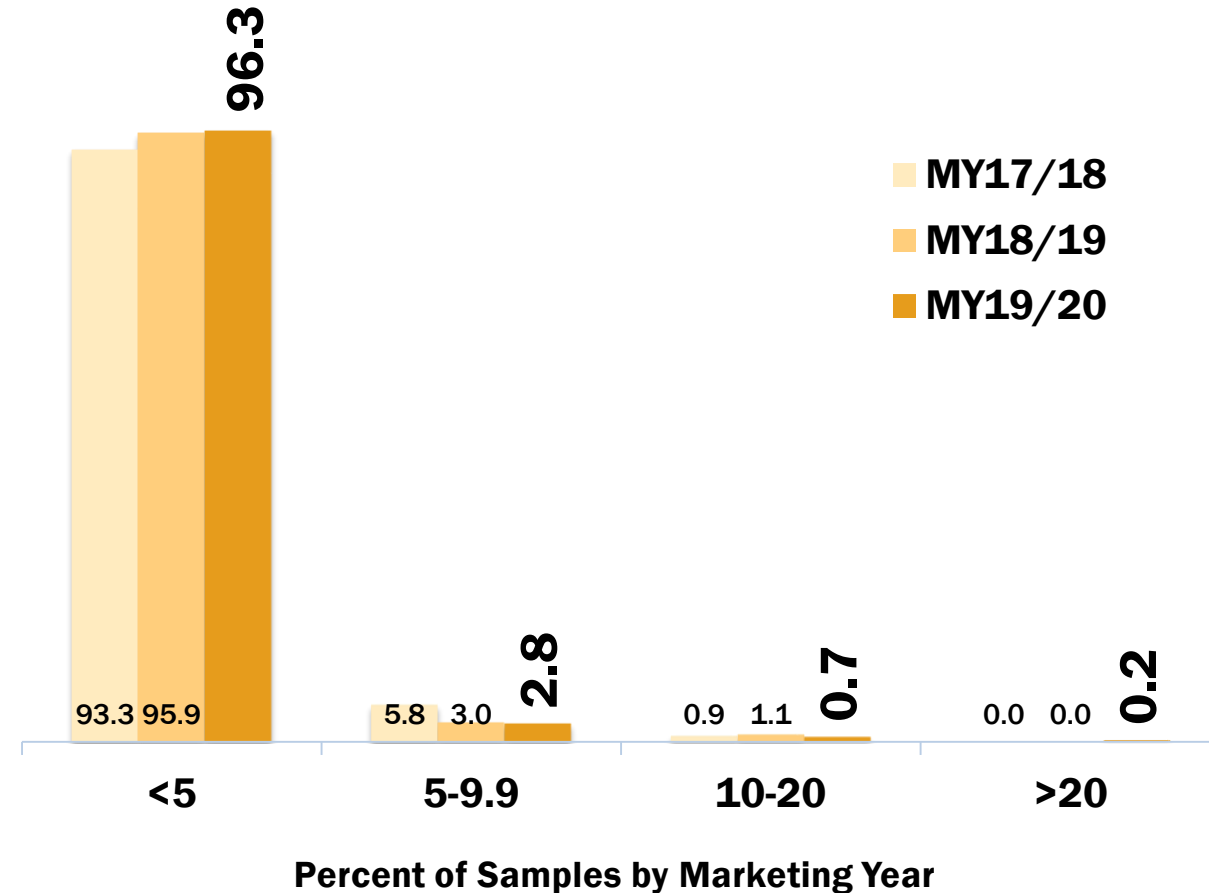
Key Aflatoxin Levels (ppb)





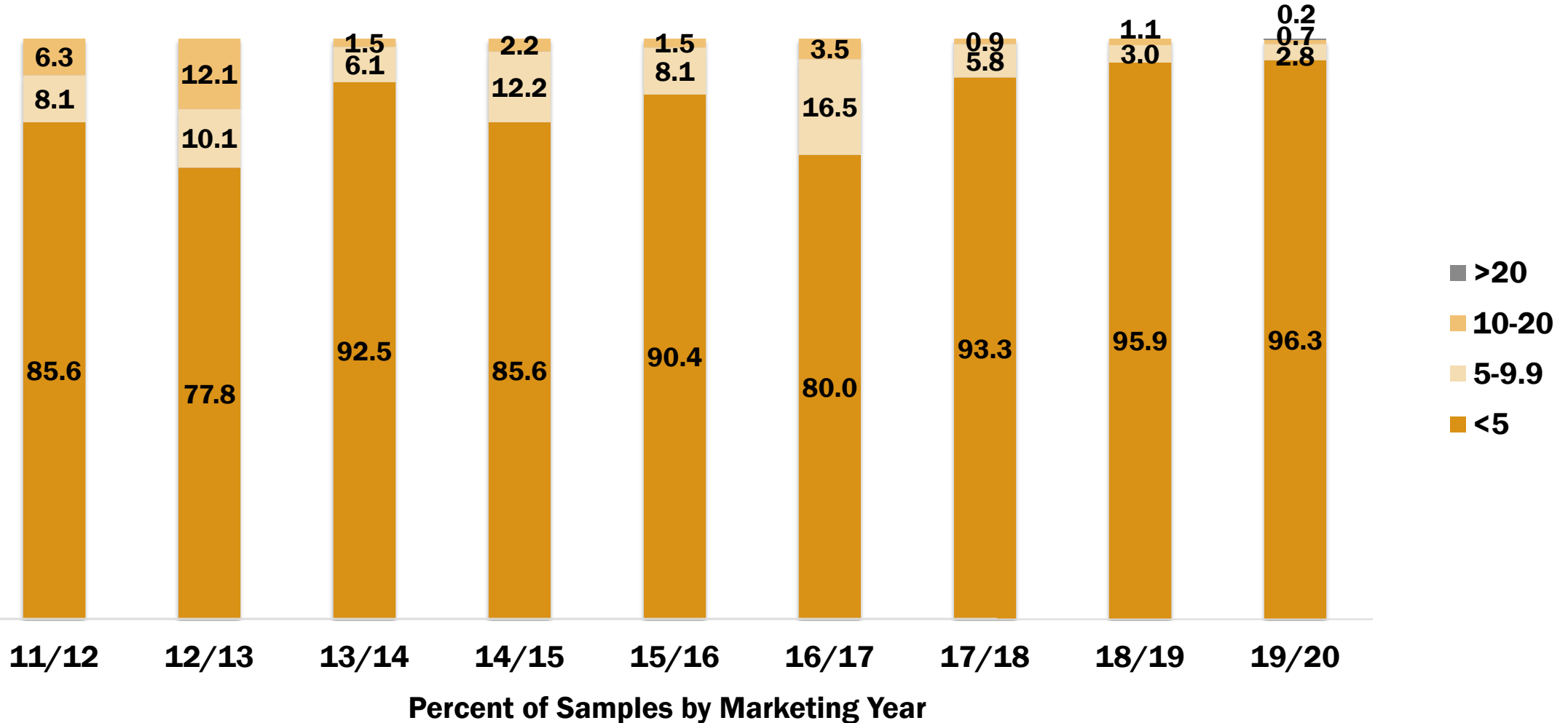
Aflatoxin Testing Results (ppb)

- A slightly higher proportion of the export samples had **no detectable** levels of aflatoxin than 2018/2019 and 2017/2018
- All but one sample tested below the FDA action level of 20 ppb.
 - The one sample above 20 ppb was the final sample tested in the survey.





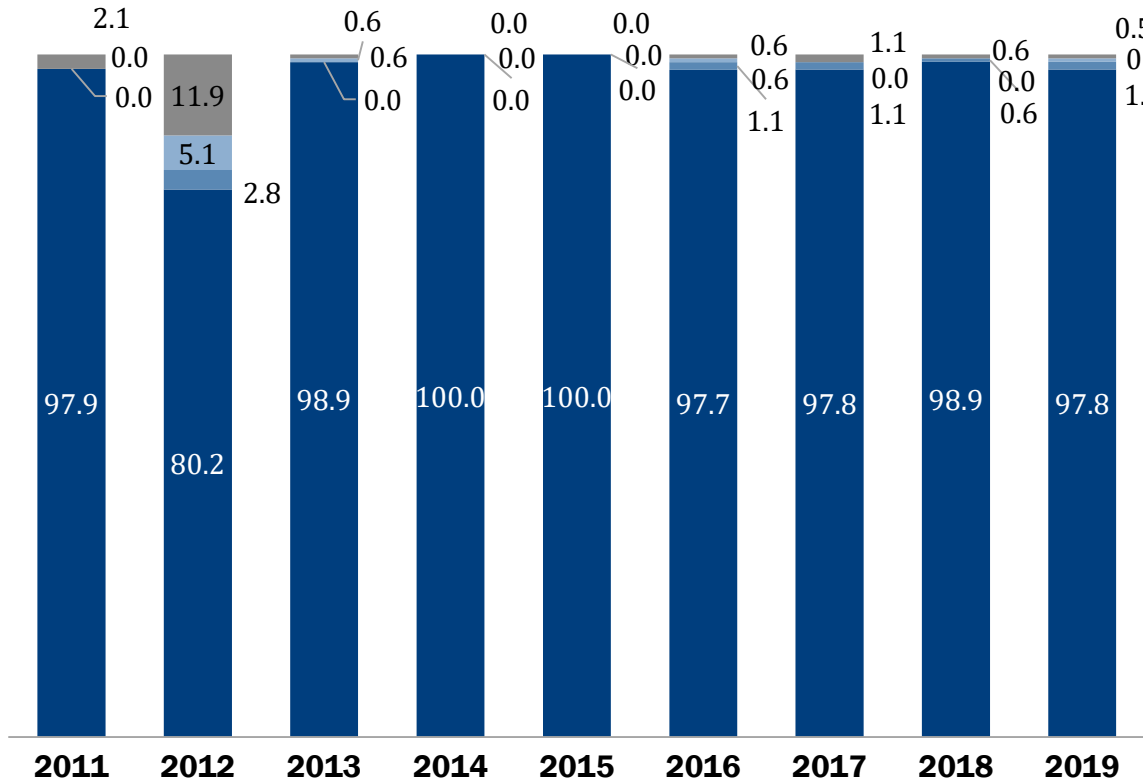
Historical Aflatoxin Results





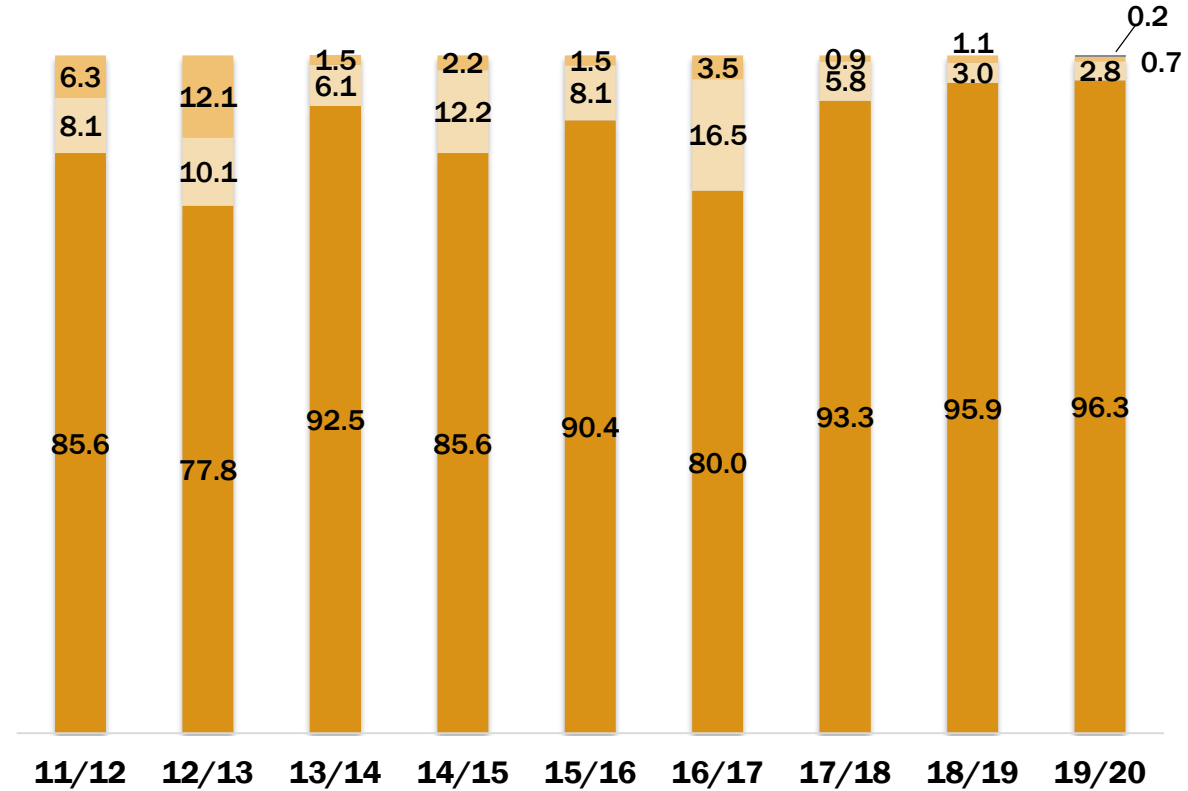
Harvest vs. Export Cargo Historical Aflatoxin Results (ppb)

Harvest Report



Percent of Samples by Crop Year

Export Cargo Report

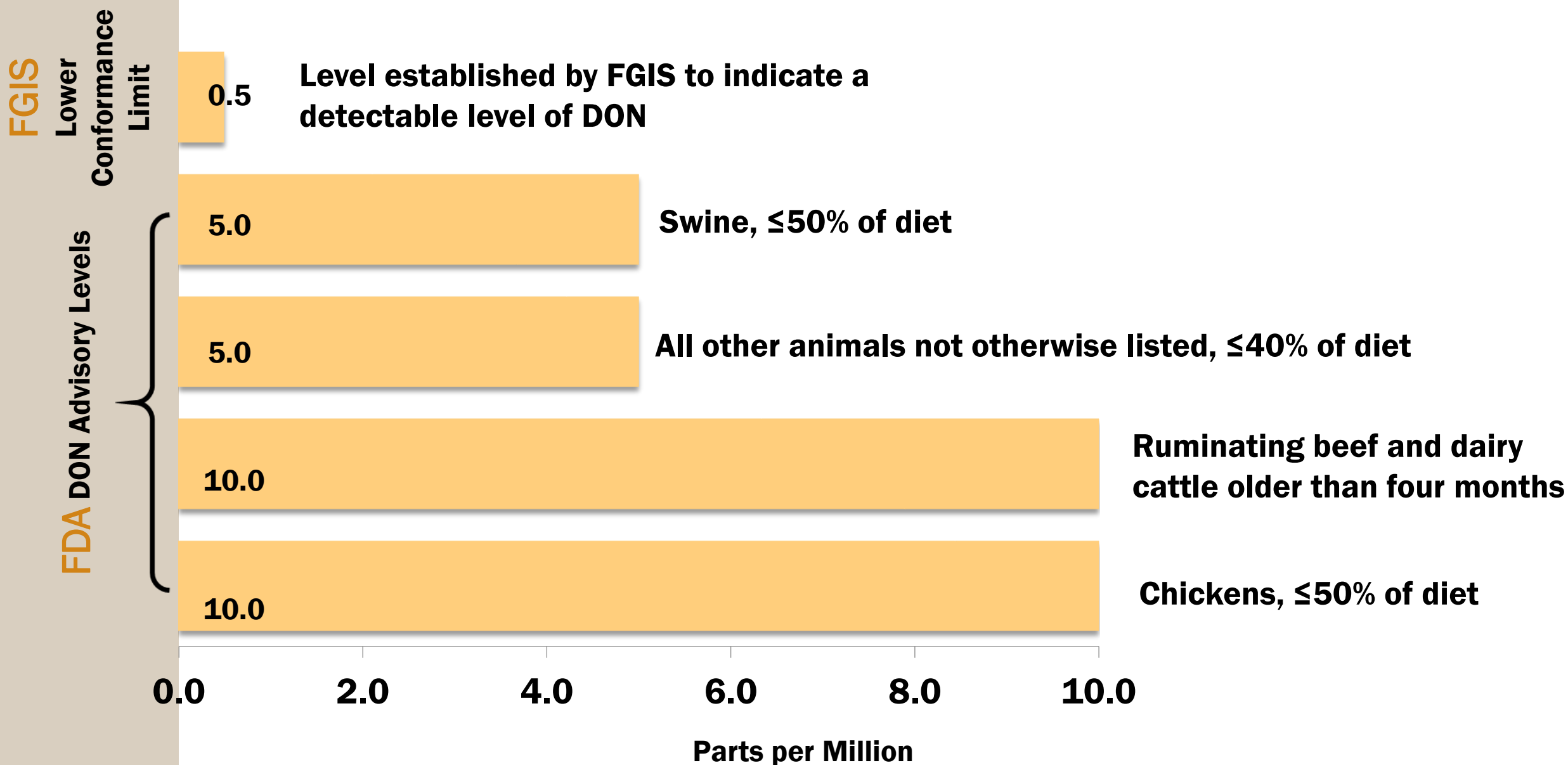


Percent of Samples by Marketing Year

■ <5
 ■ 5-9.9
 ■ 10-20
 ■ >20



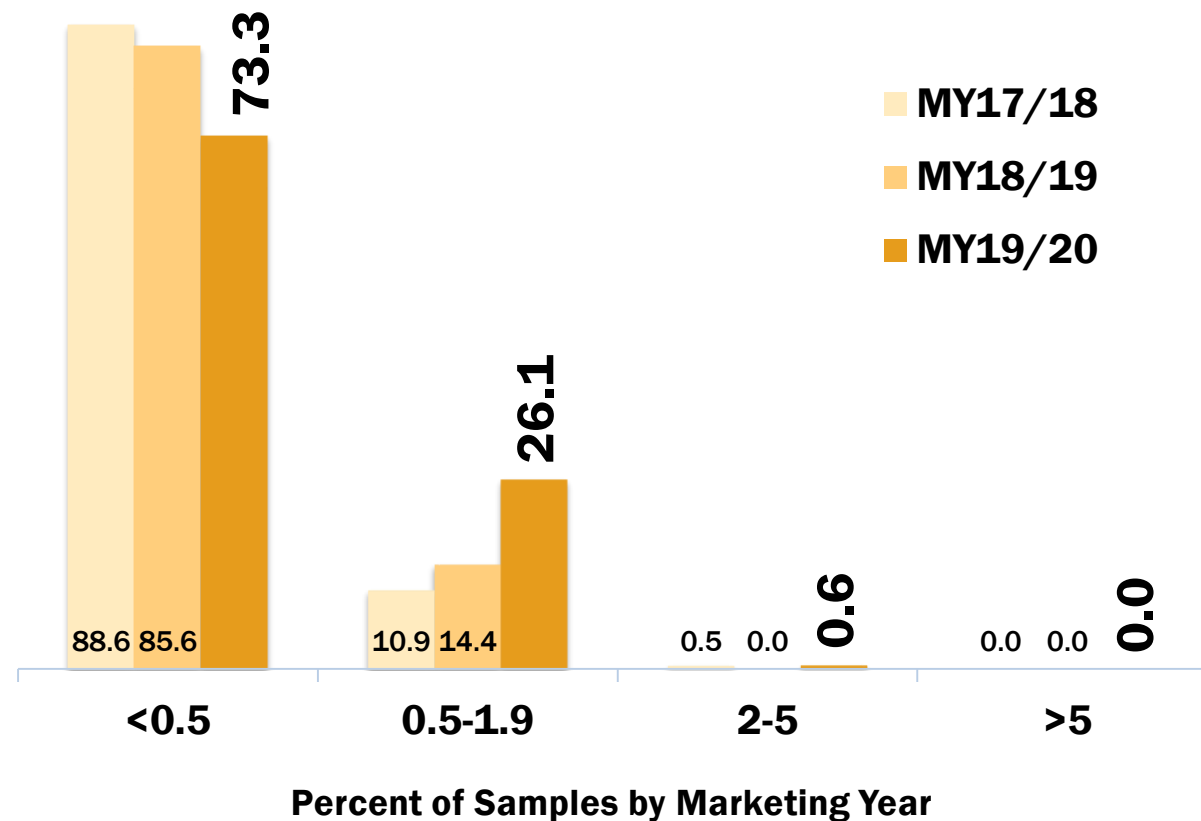
Key DON Levels (ppm)





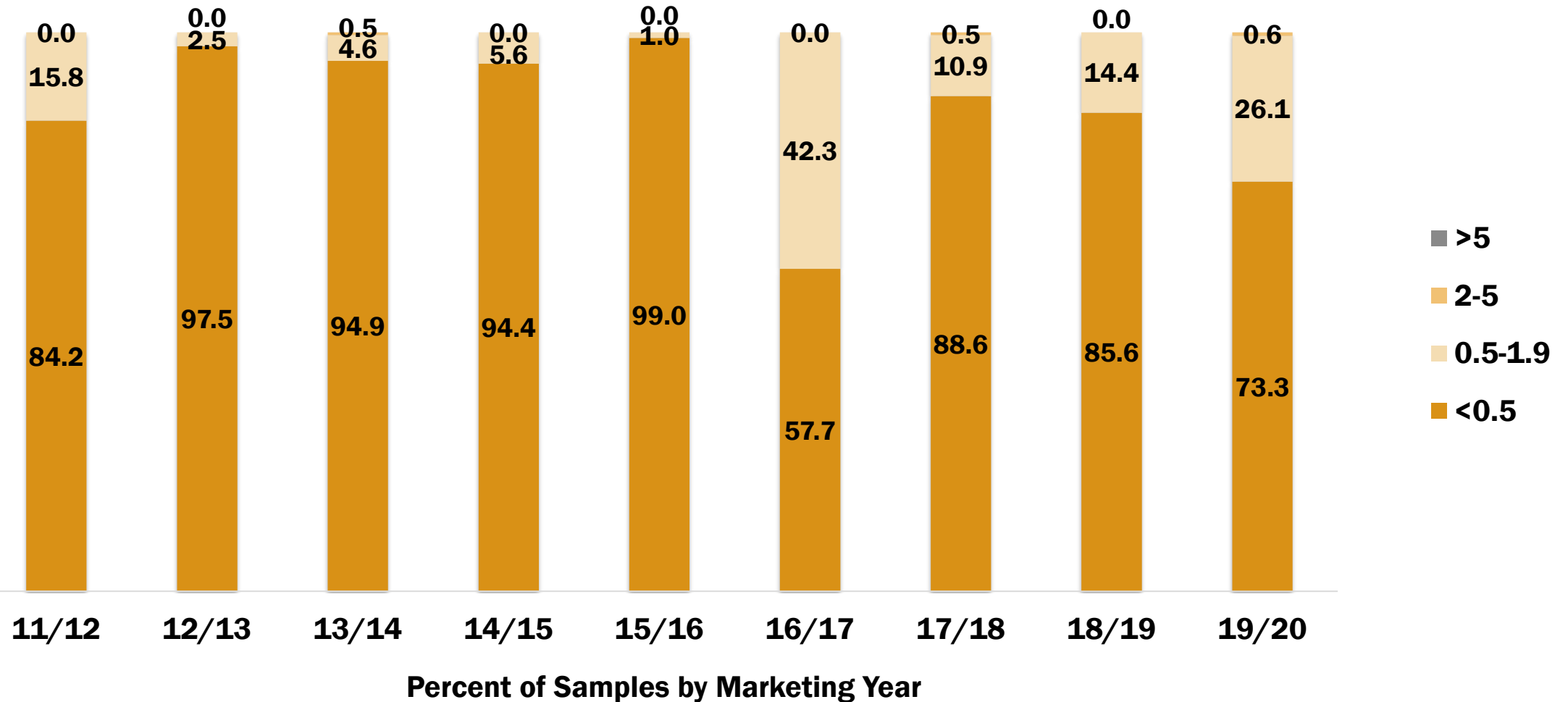
DON (Vomitoxin) Testing Results (ppm)

- The proportion of export samples with **no detectable** levels of DON was slightly lower than 2018/2019
- All samples had DON results **below** the 5.0 ppm FDA advisory level





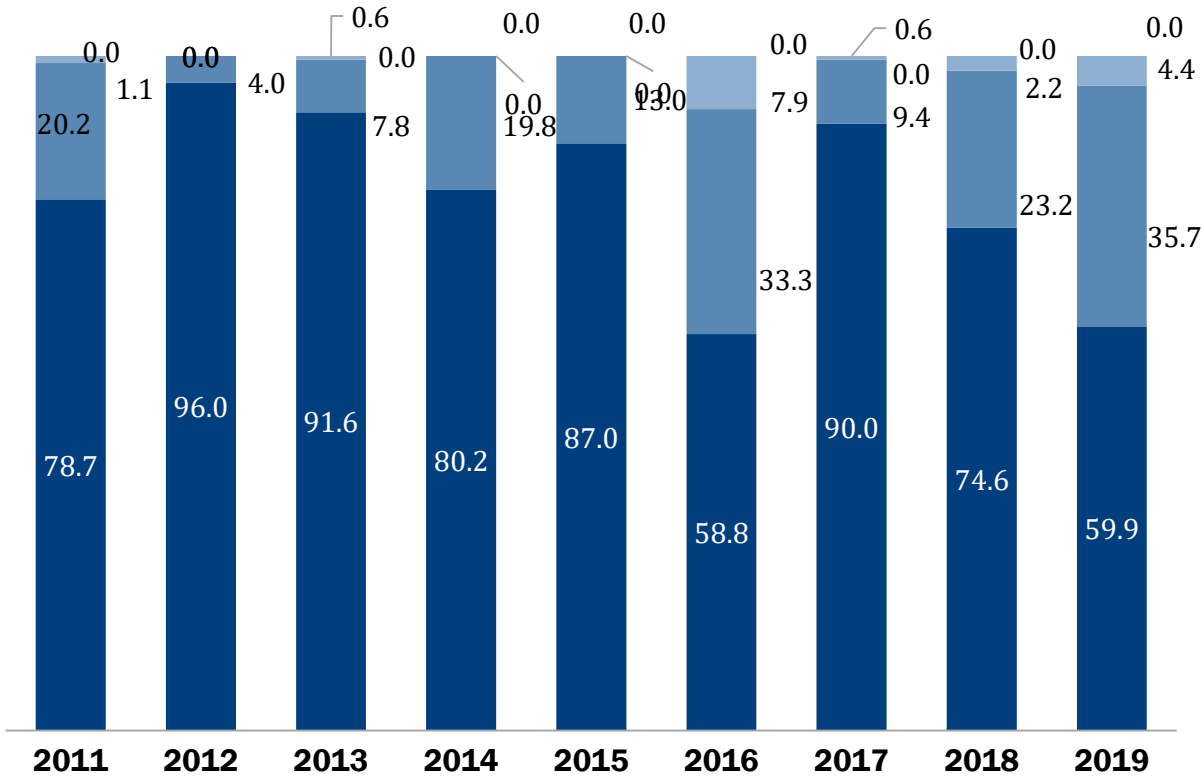
Historical DON (Vomitoxin) Results





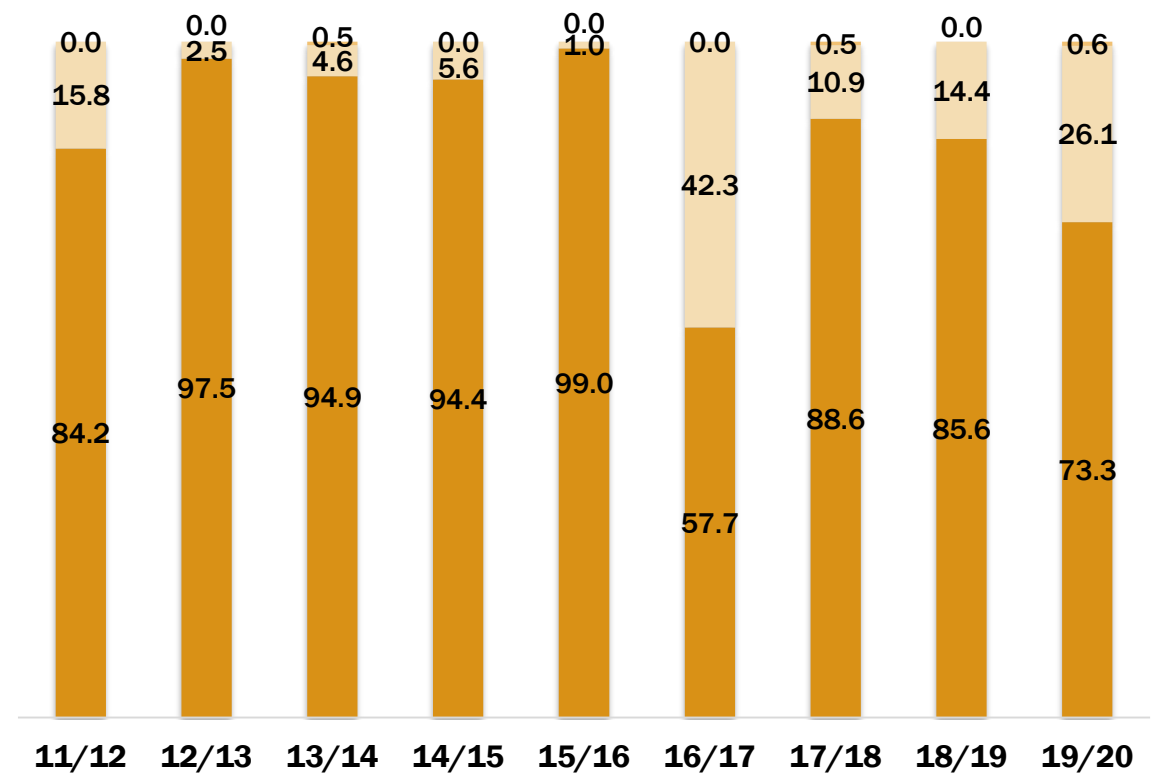
Harvest vs. Export Cargo Historical DON Results (ppm)

Harvest Report



Percent of Samples by Crop Year

Export Cargo Report



Percent of Samples by Marketing Year

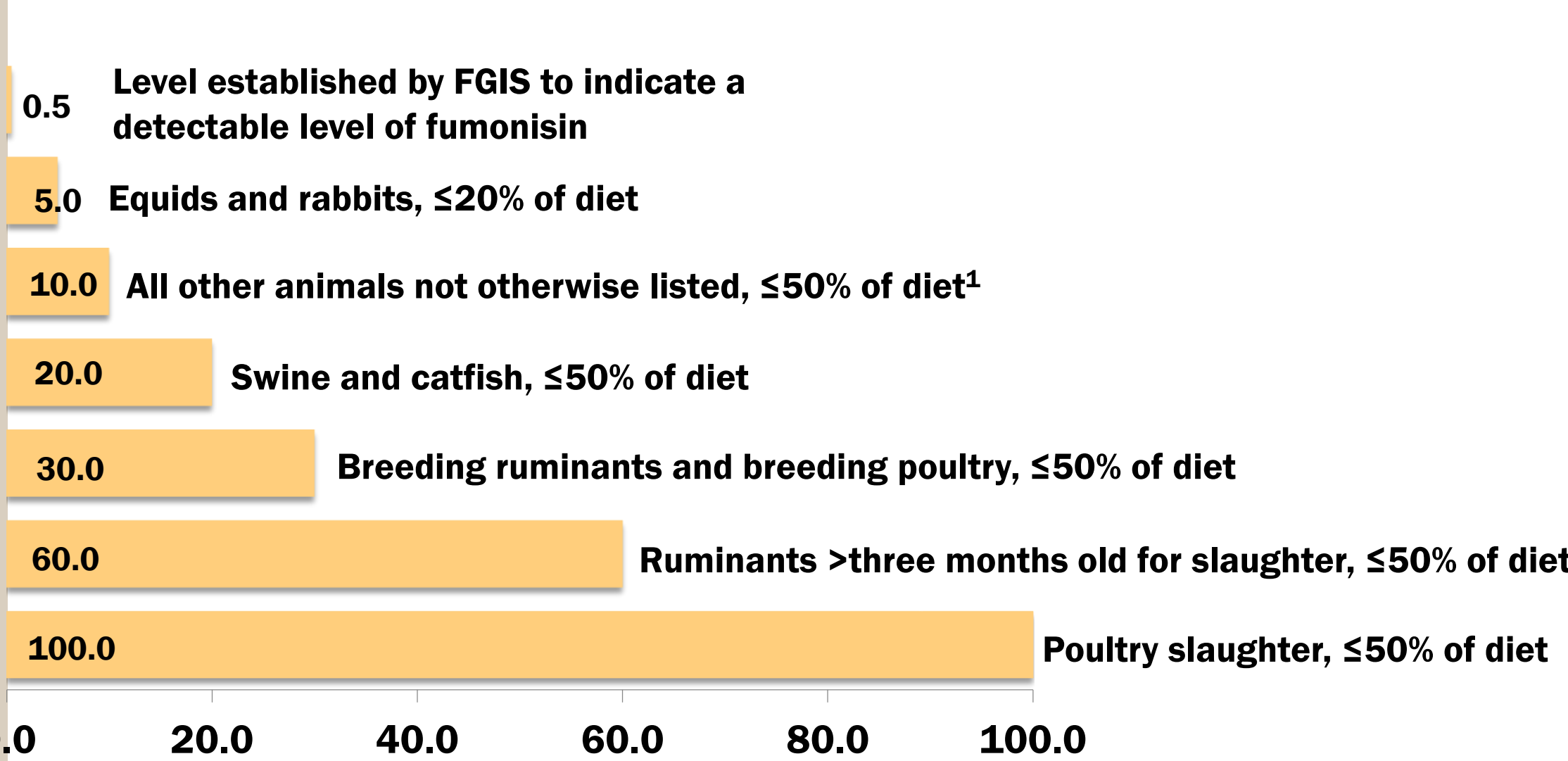
■ <0.5
 ■ 0.5-1.99
 ■ 2-5
 ■ >5



Key Fumonisin Levels (ppm)

FGIS
Lower
Conformance
Limit

FDA
Guidance
Level Levels



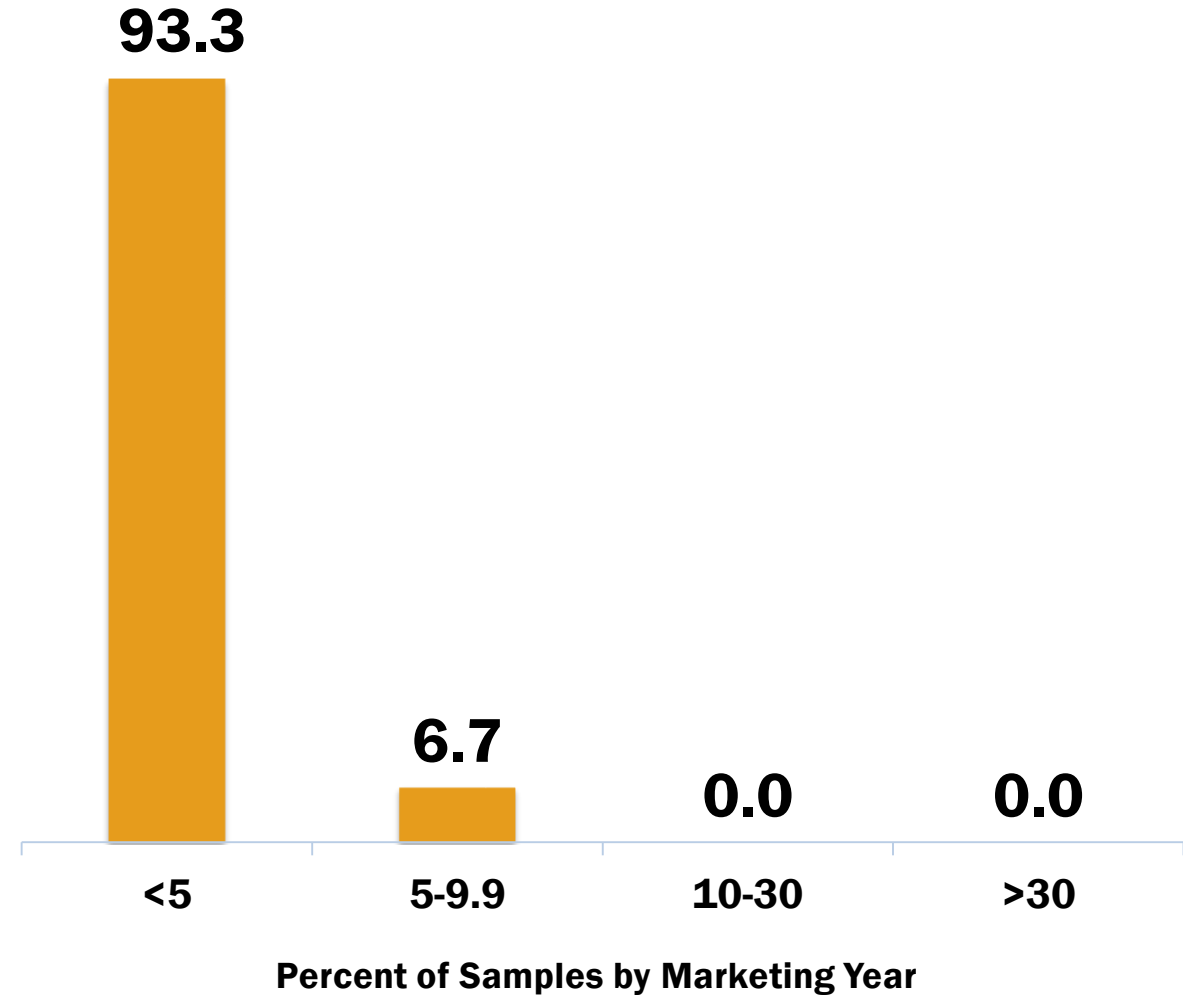
¹Does not include mink.

Parts per Million



Fumonisin Testing Results (ppm)

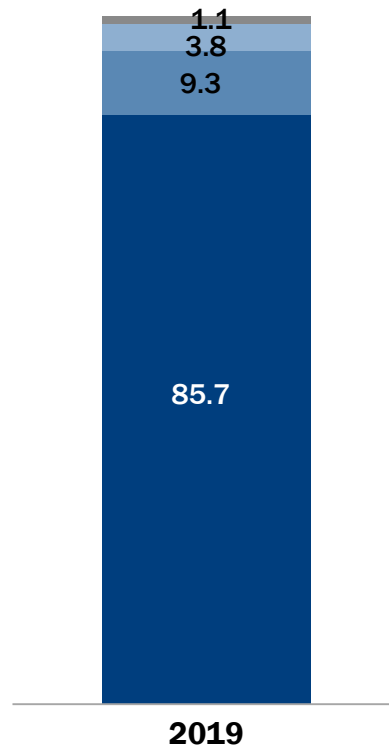
- First year of fumonisin testing
- 93.3% of samples **below** the 5.0 ppm FDA guidance level





Harvest vs. Export Cargo Fumonisin Results (ppm)

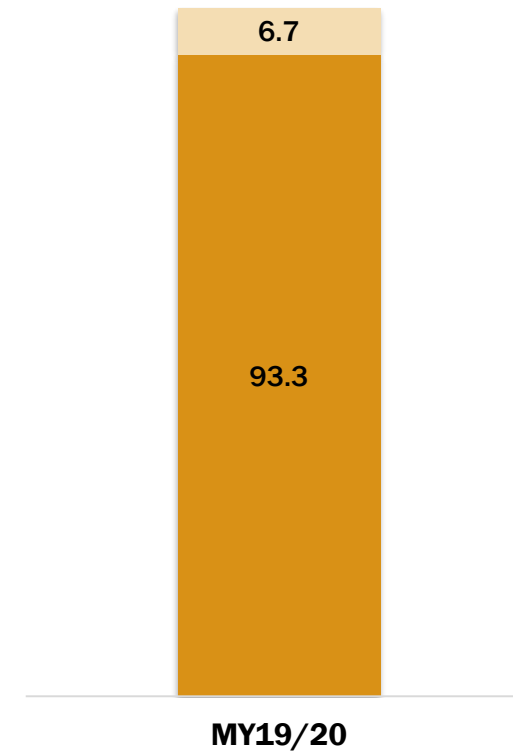
Harvest Report



Percent of Samples by Crop Year

■ <5 ■ 5-9.9 ■ 10-30 ■ >30

Export Cargo Report



Percent of Samples by Marketing Year



Export Cargo Report: Conclusions

- Early 2019/2020 U.S. corn exports were, on average, **better than or equal to** U.S. No. 1 on **Test Weight** and **Total Damage** but slighted above the maximum standard for U.S. No. 2 for **BCFM**
- **Stress Cracks** and **whole kernels** higher and lower than the 5YA, respectively
- Samples reflective of a growing season **not conducive to aflatoxin** development
- Slightly higher prevalence of **DON** in the 2019/2020 export samples compared to 2018/2019 samples, but **100% of samples were lower than 5 ppm**



Other Components of the Report



Quality Test Results

U.S. Corn Export System

Survey and Statistical Analysis Methods

Testing Analysis Methods

Historical Perspective

**Building a Tradition:
Thank You!**



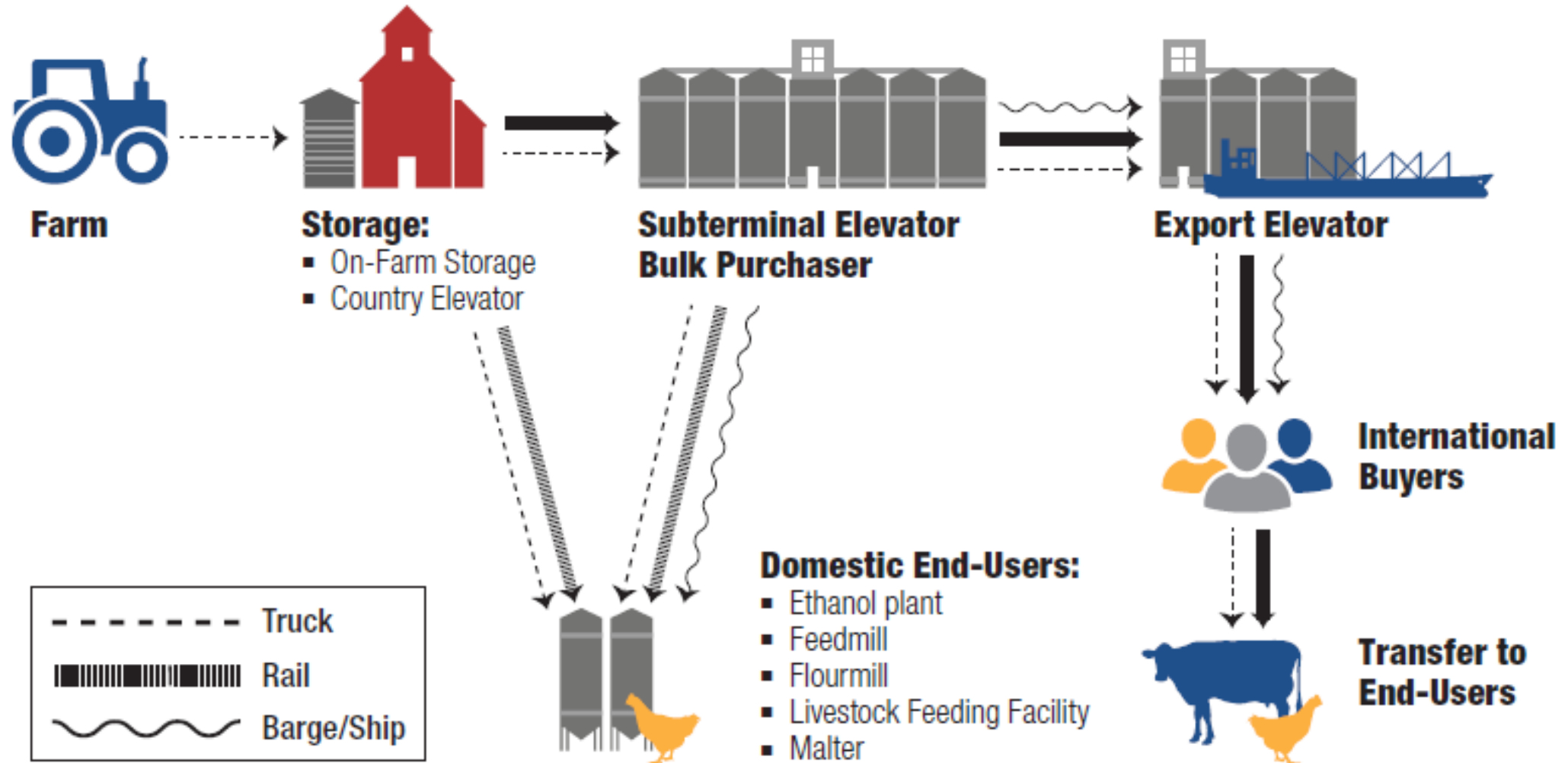


SUPPLEMENTAL SLIDES

U.S. Grains Council 2019/2020 Corn Export Cargo Quality Report

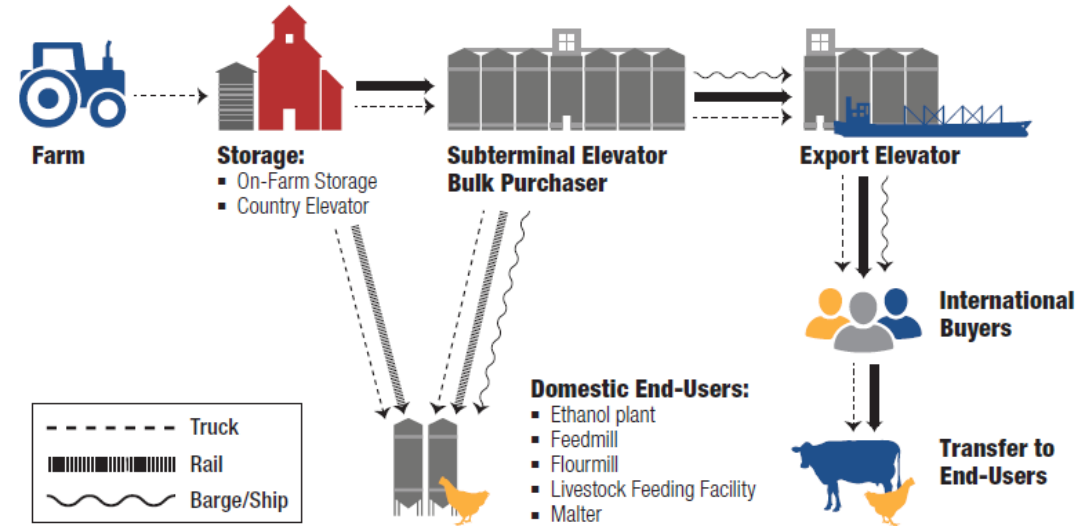


How Does U.S. Grain Move?





How Does U.S. Grain Move?



Grain movement to final domestic users¹:



Grain movement to international buyers¹:



The United States has:

1.25 million
km of highways (enough to go around the equator 31 times)

225,000
km of railways (more than any other country in the world)

15,800
km of waterways (twice the length of the Nile River)

Source: ¹Transportation of U.S. Grains A Modal Share Analysis
ams.usda.gov/sites/default/files/media/ModalJune2015.pdf