2025/2026 Corn Harvest Quality Report

November 28, 2025

U.S. GRAINS & BIOPRODUCTS COUNCIL

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Corn Harvest Quality Report
Quality, Reliability, Transparency

Building partnerships based on trust

Bridge to world's largest, most reliable grain supply

Reliable and Comparable Data

Transparent and Consistent Methodology

Early Look at General Harvest Quality

Tools for Better Decision Making

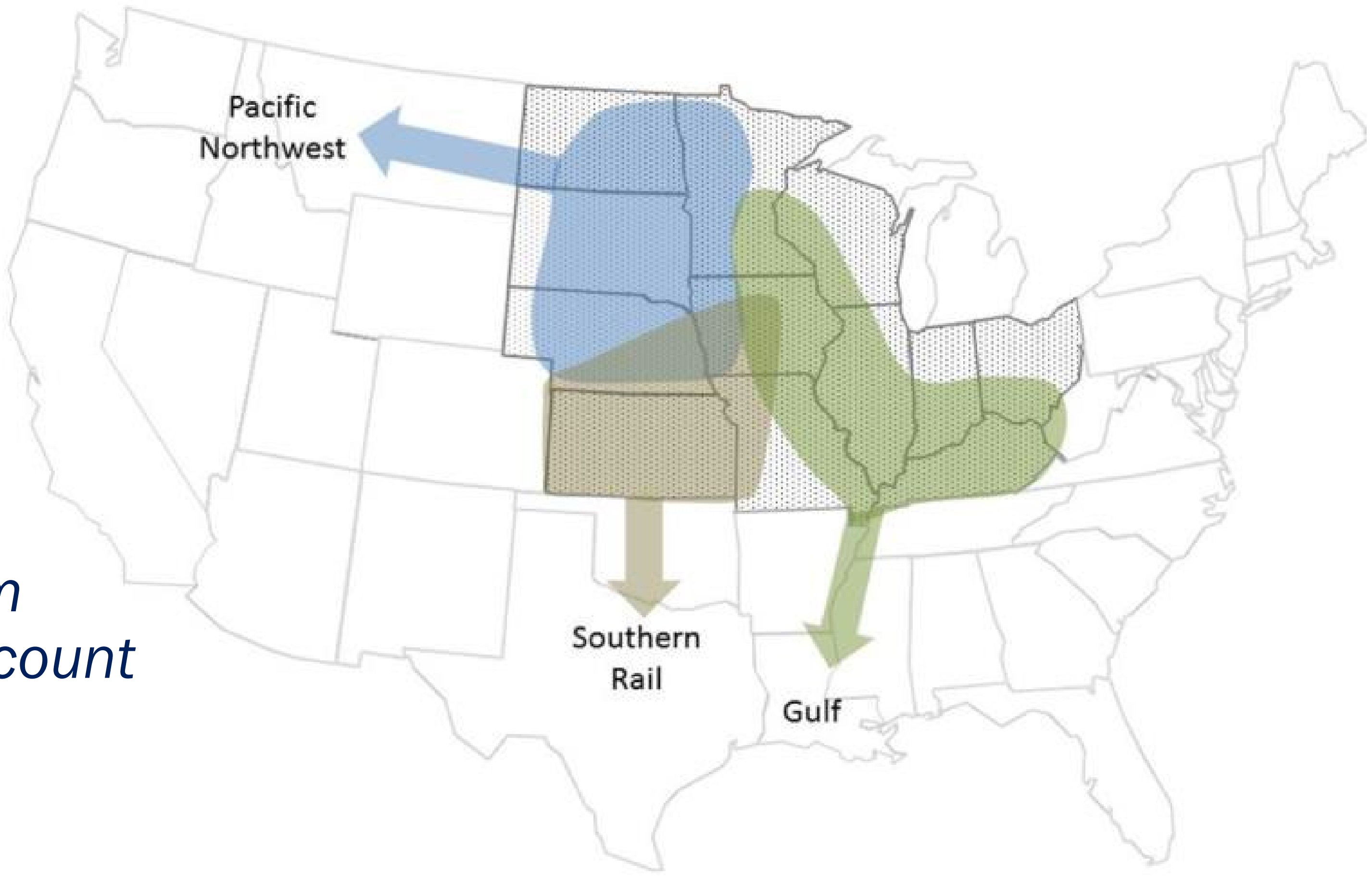
Evaluating trends and factors that impact corn quality

Annual Series: Enhancing knowledge over time

Quality at export affected by many factors in the U.S. grain marketing system

Corn Export Cargo Quality Report in March 2026 will report U.S. corn quality from samples at export points

Export Catchment Areas (ECAs)



*621 samples from
12 states that account
for over 90% of
U.S. corn exports*

Quality Factors Tested

Grading Factors
- Test weight
- Broken corn
- Foreign material
- Total damage
- Heat damage

Moisture

Chemical Composition
- Protein
- Starch
- Oil

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

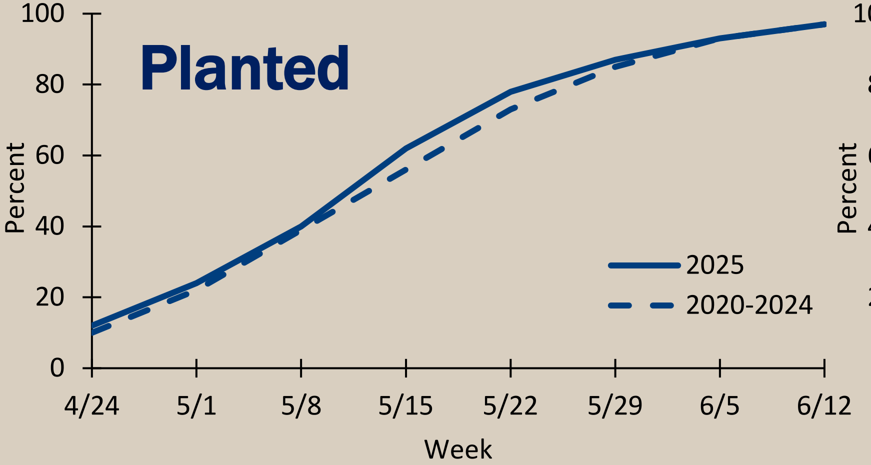
Mycotoxins
- Aflatoxin
- DON (Vomitoxin)
- Fumonisin
- Ochratoxin A
- T-2
- Zearalenone

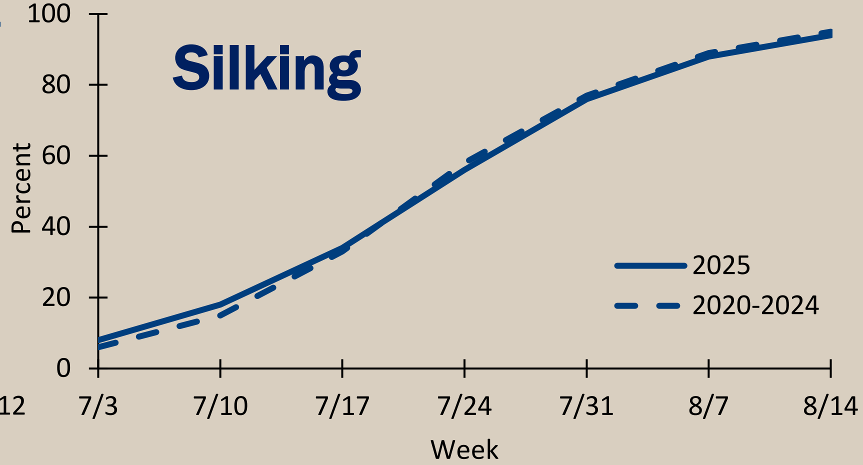
2025 Growing Conditions Impact

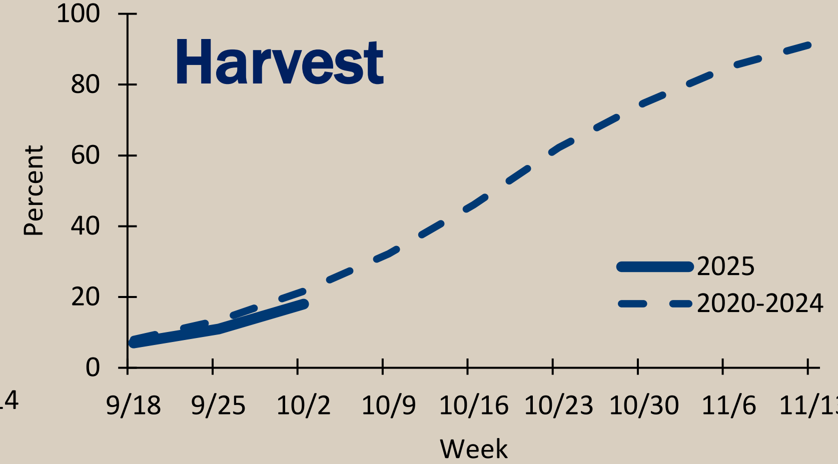
Planting progress similar to the 5YA despite variable progress in the Gulf ECA

Pollination occurred at a pace similar to the 5YA under mostly wet and warm conditions

Rains in September delayed dry-down in western areas but dry conditions in eastern areas led to timely harvest







Dry conditions in May during early growth fostered deep rooting and healthy plants

Pollination concerns were eased by deeper roots but conditions promoted leaf diseases in some areas

Sufficiently dry weather prevented serious delays and allowed for a careful harvest, keeping BCFM low

2025/2026 Corn Harvest Quality Highlights

Overall Crop	Grade Factors/Moisture vs. 5YA	Chemical Composition vs. 5YA	Physical Factors vs. 5YA	Mycotoxins
71% of crop rated good or excellent condition & **highest yields** on record projected Harvest about **91%** complete as of November 16, lower than 2024 (98%) and the 5YA† (94%)	Test Weight **Same** BCFM **Lower** Total Damage **Higher** Moisture **Same**	Protein **Lower** Starch **Higher** Oil **Lower**	Stress Cracks **Similar** 100-Kernel Weight **Lower** True Density **Similar** Whole Kernels **Lower**	**100.0%** of samples ≤ FDA action level for Aflatoxin‡ **98.8%** of samples below FDA advisory level for DON of 5.0 ppm‡ **87.2%** of samples ≤ FDA Fumonisin guidance level of 5 ppm‡

†5YA = 2020-2024 crop years ‡Action, advisory and guidance levels for corn intended for feed use

Grade Factors and Moisture

Test Weight
BCFM
Total Damage
Heat Damage
Moisture

Grades and Grade Requirements

Grade	Minimum Test Weight: Pounds per Bushel	Minimum Test Weight: Kilogram per Hectoliter	Maximum Limits of Damaged Kernels: Heat Damage (%)	Maximum Limits of Damaged Kernels: 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

USDA Corn Quality Grades

The U.S. has a reliable and transparent quality grading system.

U.S. No. 1	U.S. No. 2	U.S. No. 3	U.S. No. 4	U.S. No. 5
Minimum test weight per bushel: 56 pounds (25.4 kg)	**Minimum test weight per bushel:** 54 pounds (24.5 kg)	**Minimum test weight per bushel:** 52 pounds (23.6 kg)	**Minimum test weight per bushel:** 49 pounds (22.2 kg)	**Minimum test weight per bushel:** 46 pounds (20.9 kg)
Maximum limits: 0.1% heat damaged; 3% total damaged; 2% BCFM	**Maximum limits:** 0.2% heat damaged; 5% total damaged; 3% BCFM	**Maximum limits:** 0.5% heat damaged; 7% total damaged; 4% BCFM	**Maximum limits:** 1% heat damaged; 10% total damaged; 5% BCFM	**Maximum limits:** 3% heat damaged; 15% total damaged; 7% BCFM

Grade Factors and Moisture

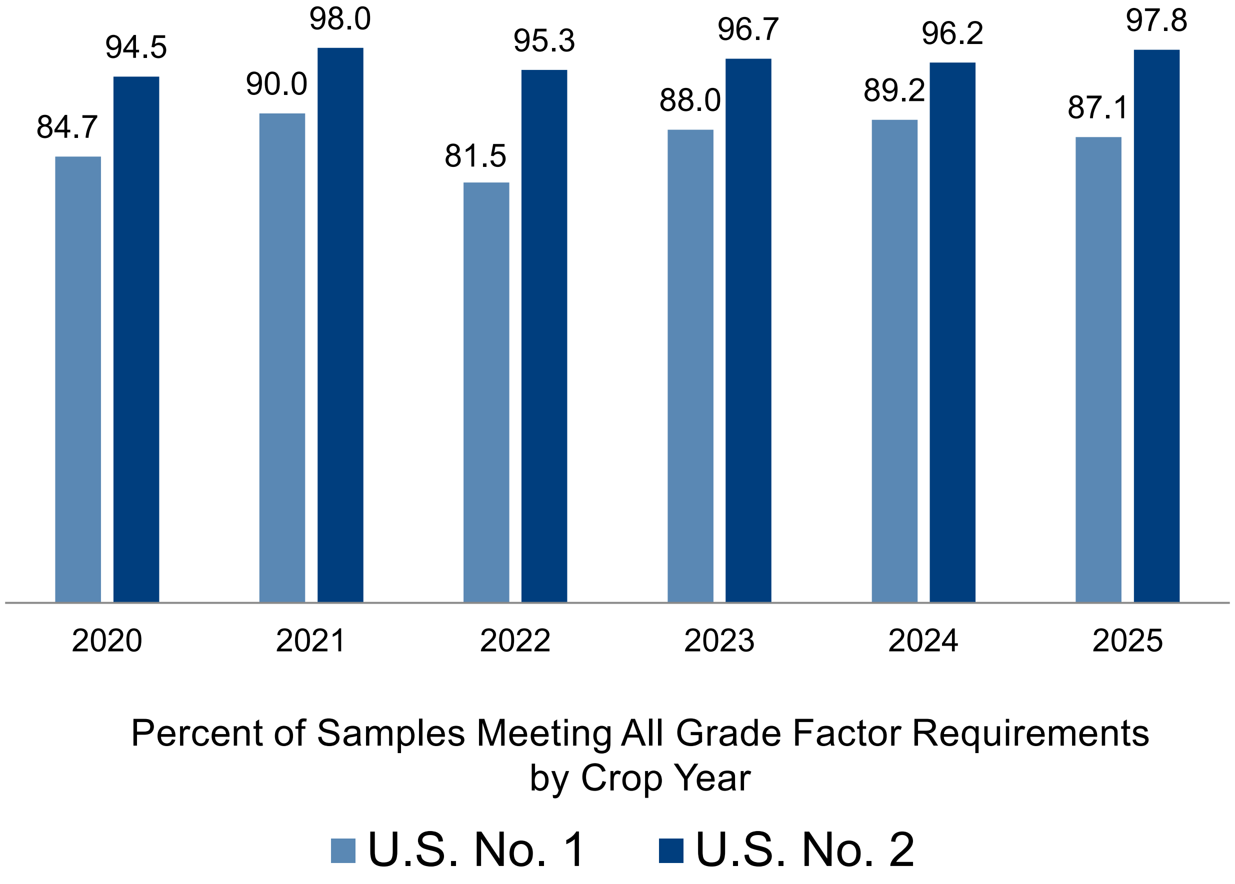
	Number of Samples	Average	Standard Deviation	Minimum	Maximum
Test Weight (lb/bu)	599	58.6	1.37	52.6	63.6
Test Weight (kg/hl)	599	75.4	1.77	67.7	81.9
BCFM (%)	599	0.3	0.21	0.0	2.6
Broken Corn (%)	599	0.3	0.15	0.0	1.6
Foreign Material (%)	599	0.1	0.12	0.0	1.9
Total Damage (%)	599	1.1	0.89	0.0	11.4
Heat Damage (%)	599	0.0	0.00	0.0	0.0
Moisture (%)	609	16.0	1.65	11.4	27.8

Grade Factors Summary

87.1% of samples No. 1 grade (89.2% in 2024)

97.8% of samples No. 2 grade (96.2% in 2024)

Average aggregate quality of the samples tested was better than all grade factor requirements for U.S. No. 1 grade

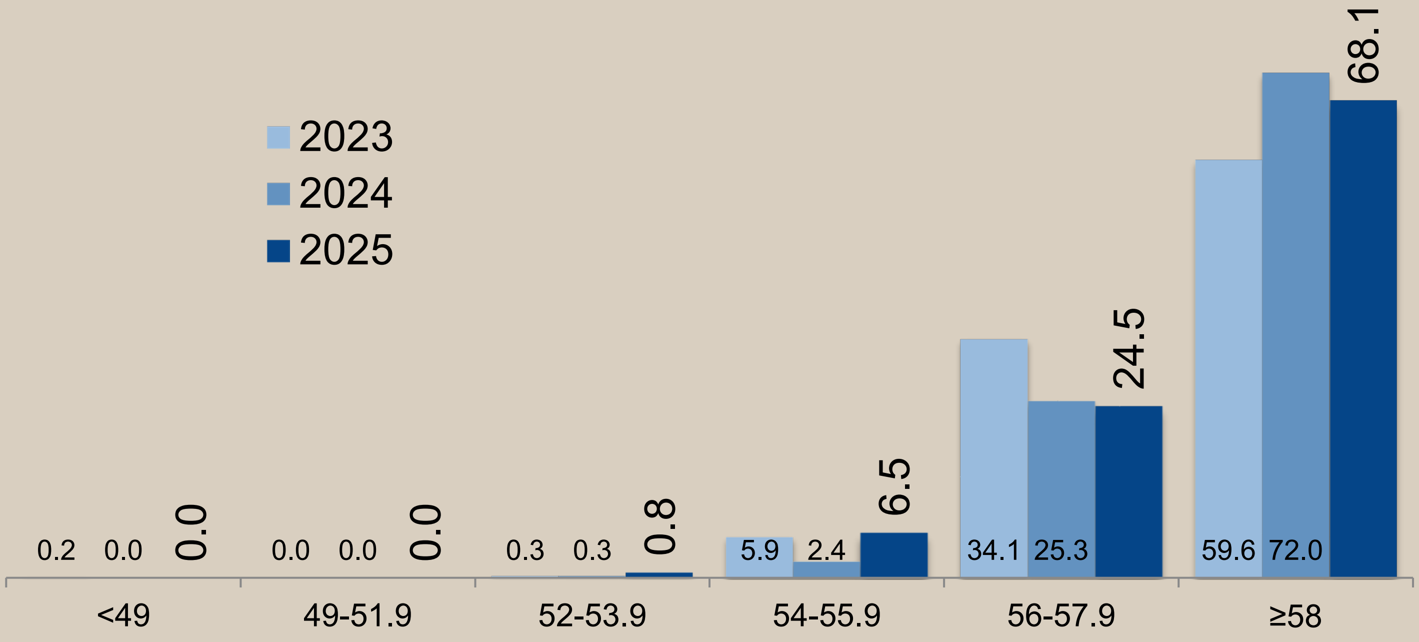


Percent of Samples Meeting All Grade Factor Requirements by Crop Year

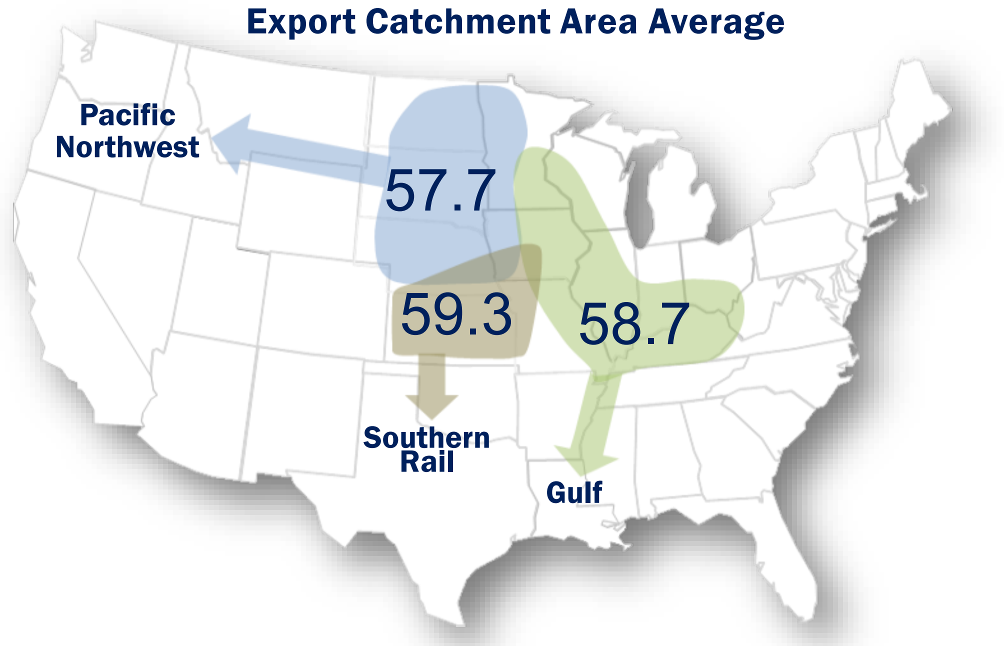
Test Weight — U.S. Units

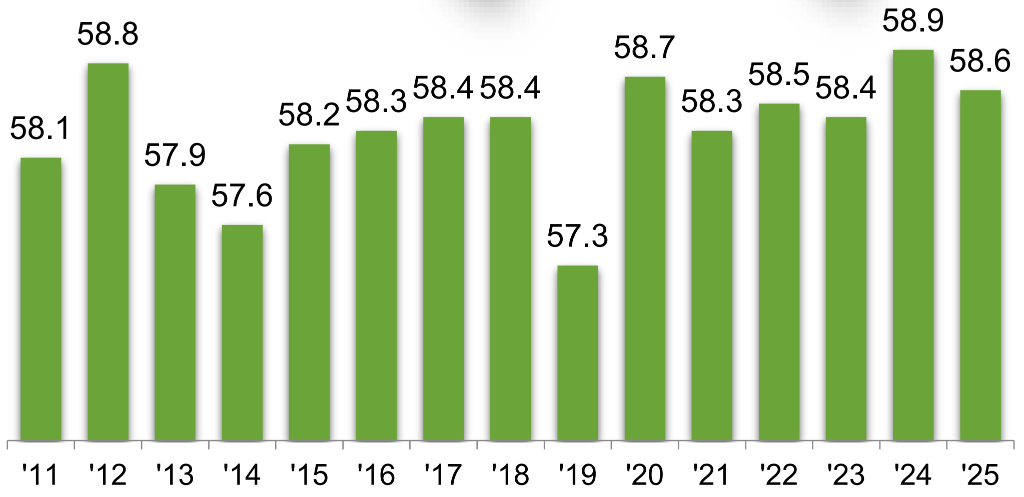
U.S. Aggregate: 58.6 lb/bu

- Average **same** as the the 5YA (58.6 lb/bu)
- **92.6%** No. 1 grade (97.3% in 2024)



Percent of Samples by Crop Year



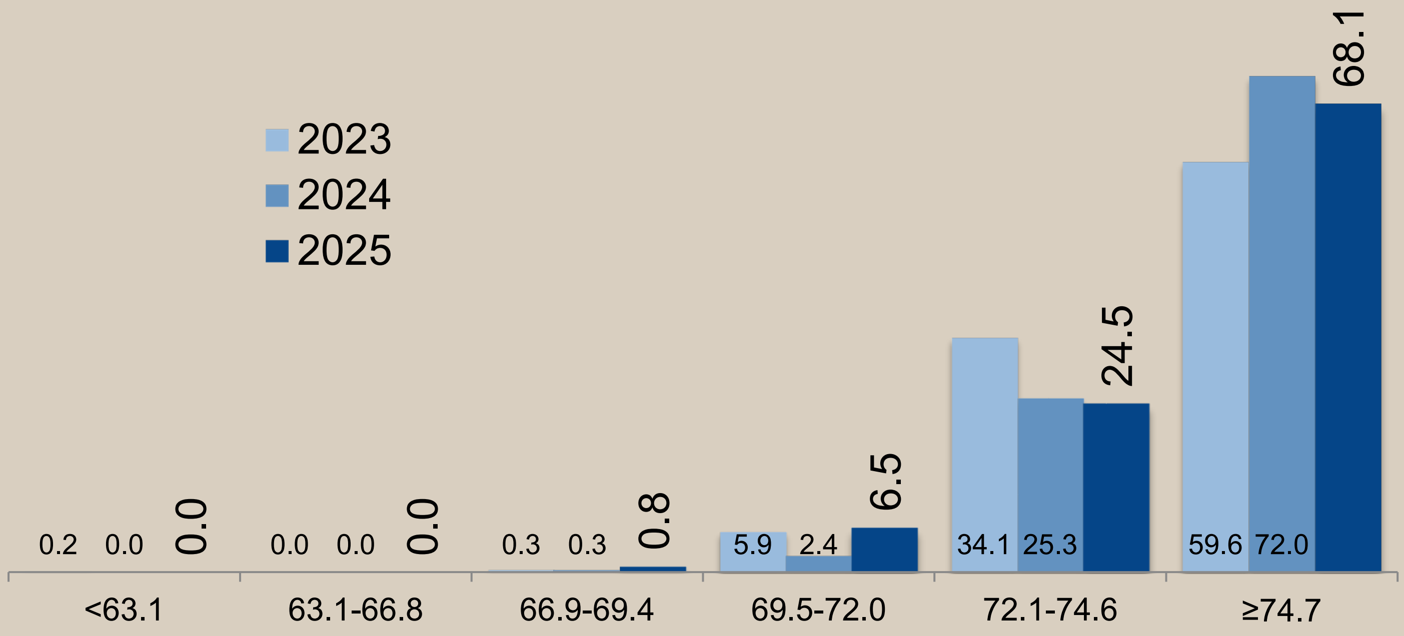


Historical Aggregate by Crop Year

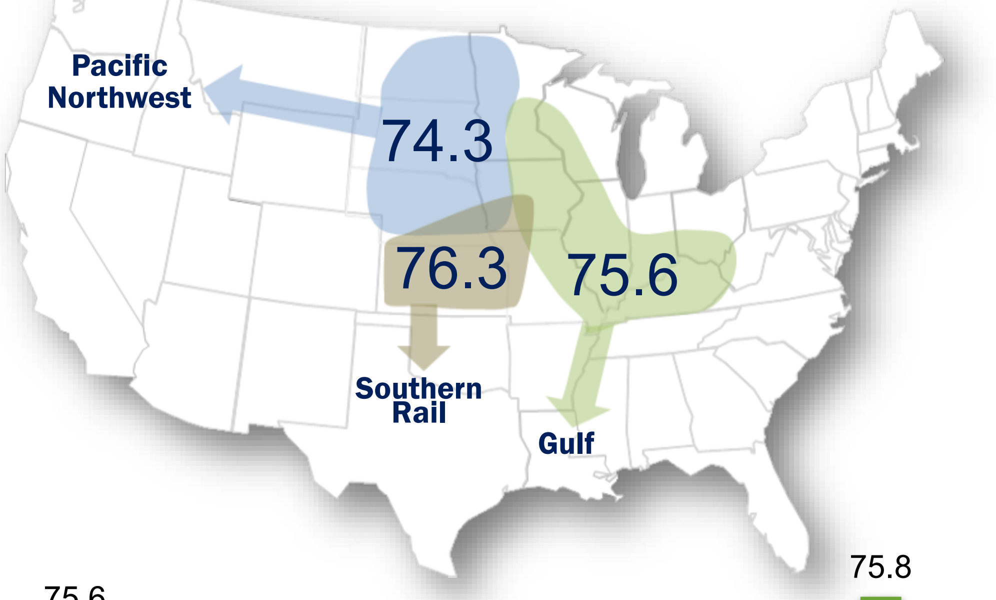
Test Weight — Metric

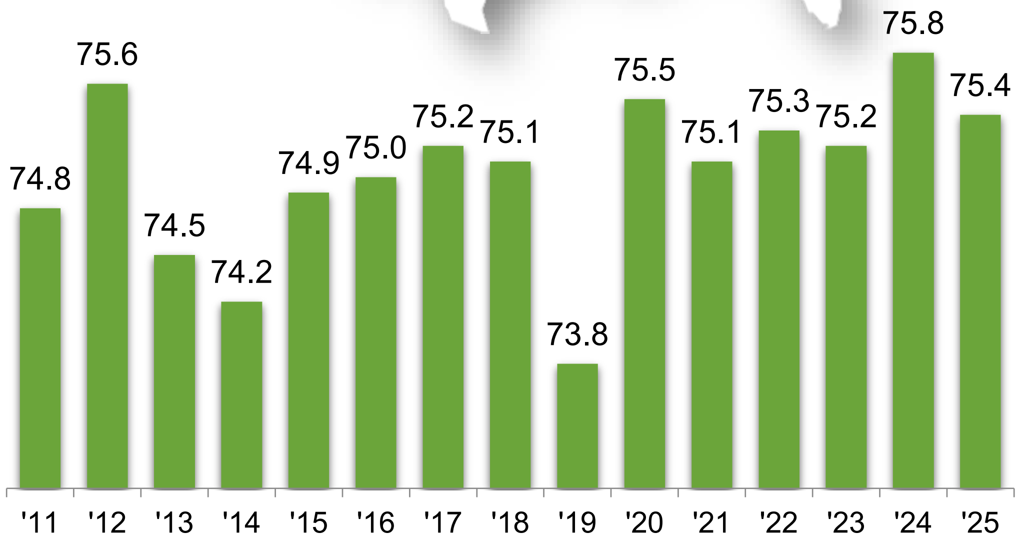
U.S. Aggregate: 75.4 kg/hl

- Average **same** as the 5YA (75.4 kg/hl)
- **92.6%** No. 1 grade (97.3% in 2024)



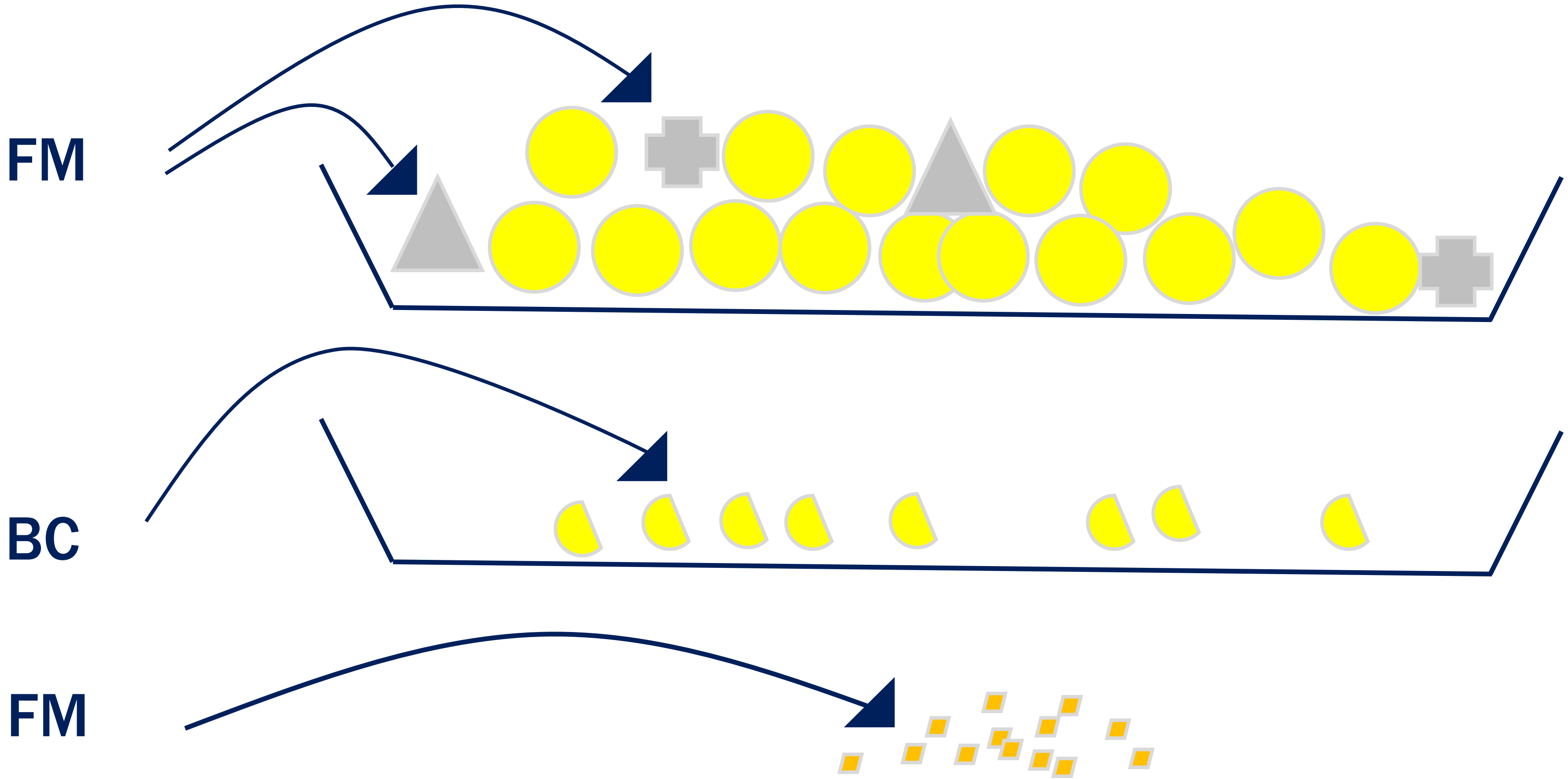
Percent of Samples by Crop Year





Historical Aggregate by Crop Year

Broken Corn and Foreign Material*



Sieve Size
12/64 inches
(0.476 cm)

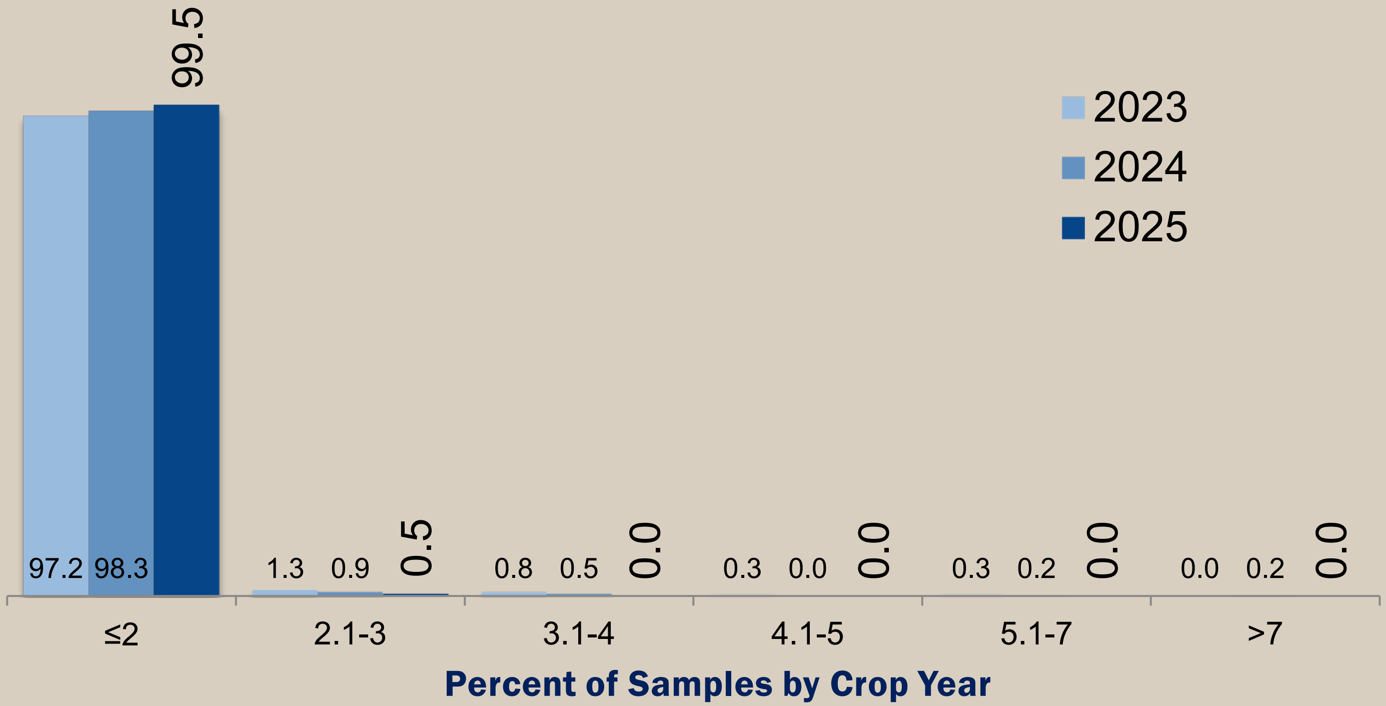
Sieve Size
6/64 inches
(0.238 cm)

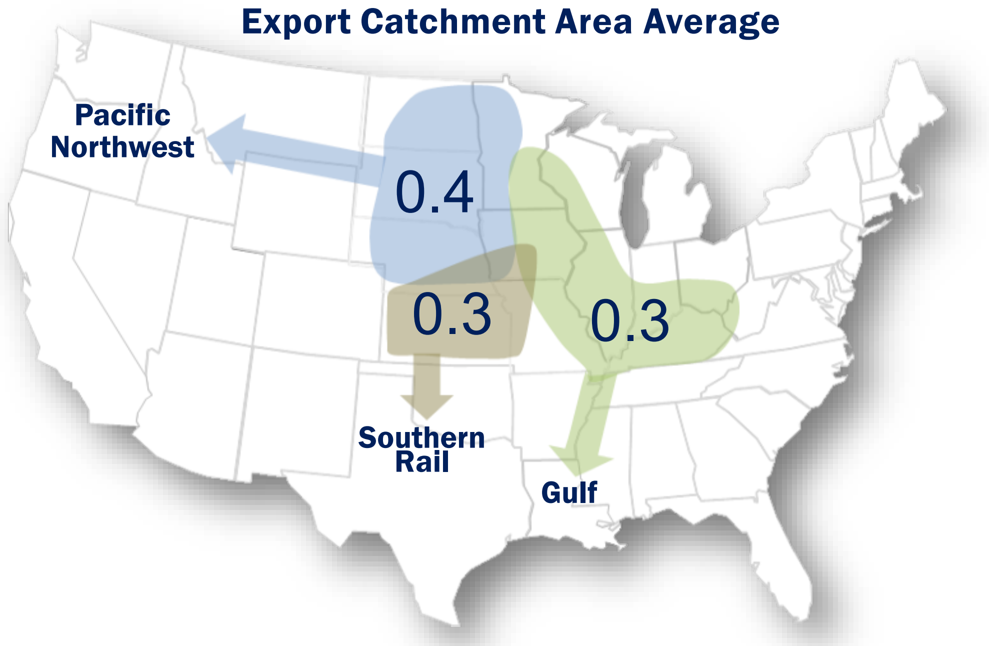
*Measured as percent of weight

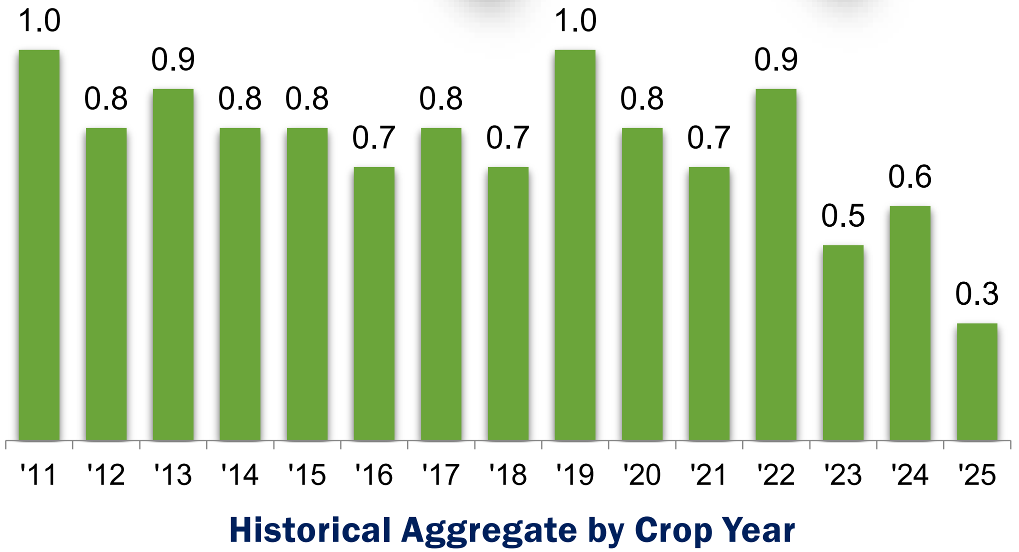
Broken Corn and Foreign Material (%)

U.S. Aggregate: 0.3%

- Average **lower** than the 5YA (0.7%)
- **99.3%** No. 1 grade (98.3% in 2024)



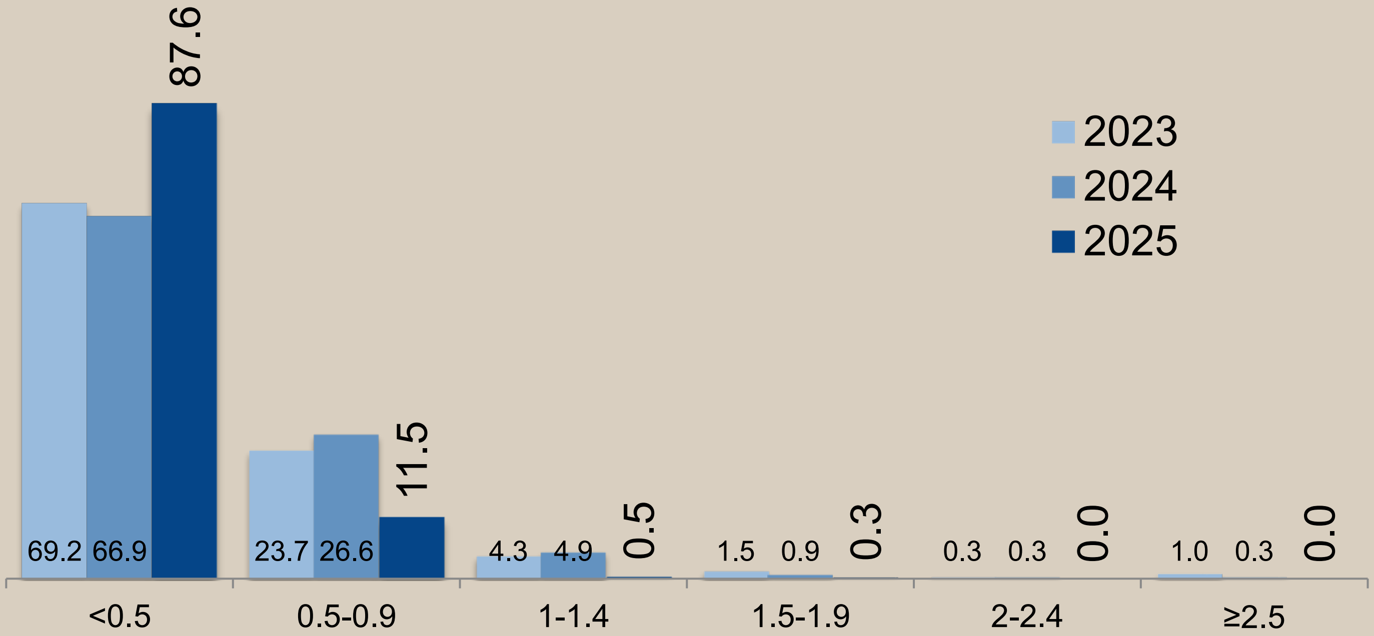




Broken Corn (%)

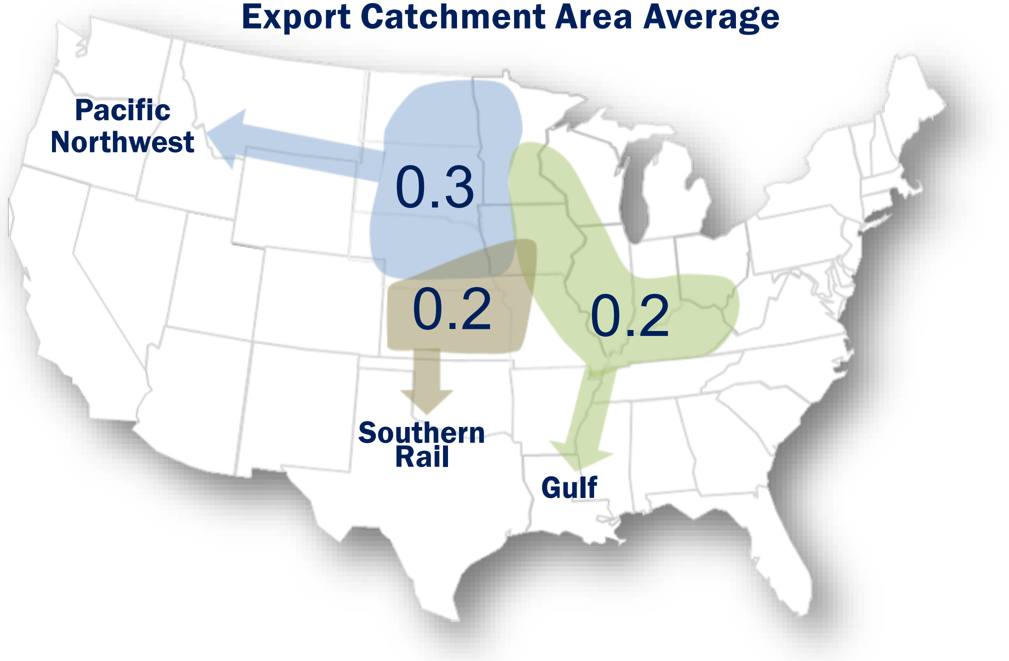
U.S. Aggregate: 0.3%

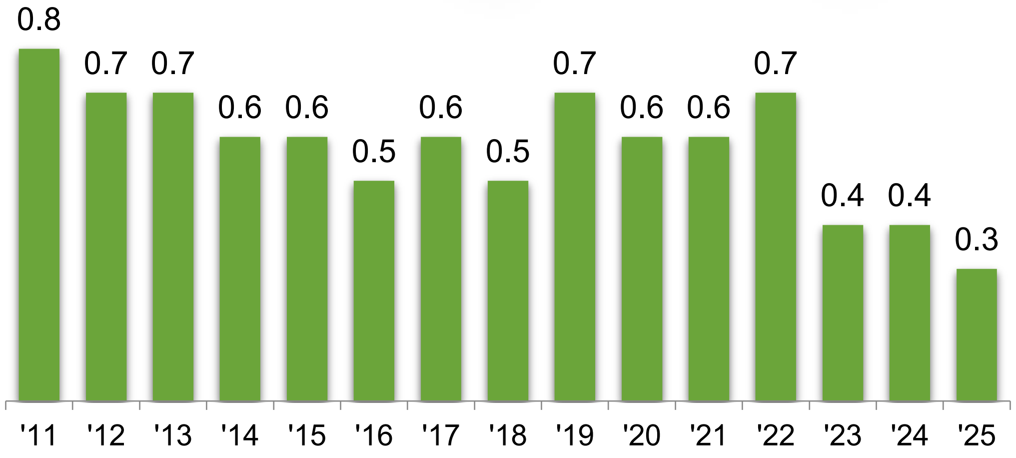
- Average **lower** than the 5YA (0.7%)



Percent of Samples by Crop Year

Export Catchment Area Average



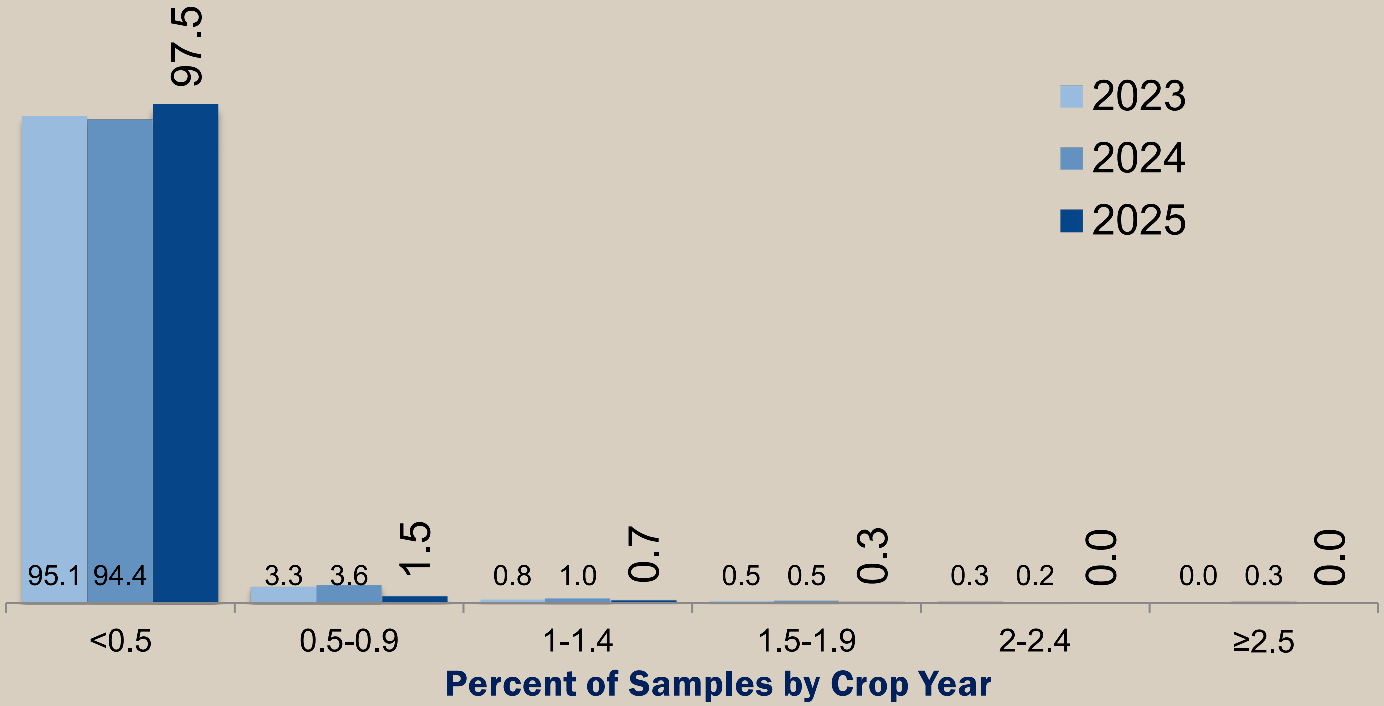


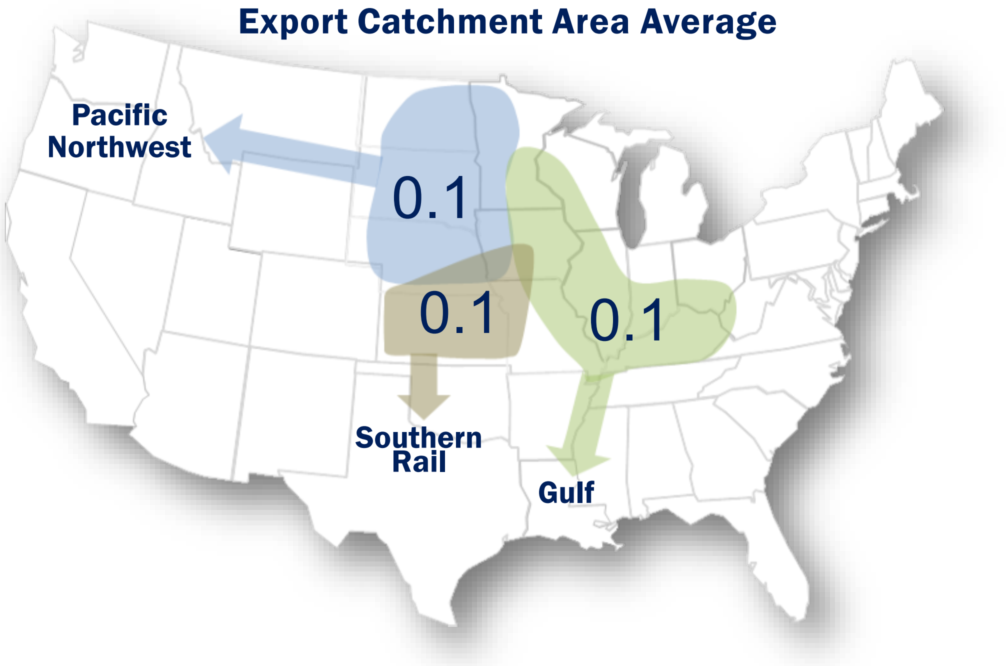
Historical Aggregate by Crop Year

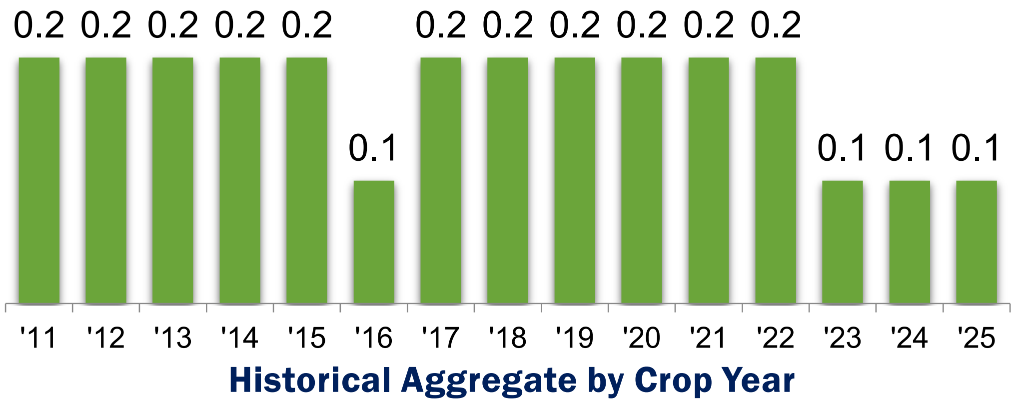
Foreign Material (%)

U.S. Aggregate: 0.1%

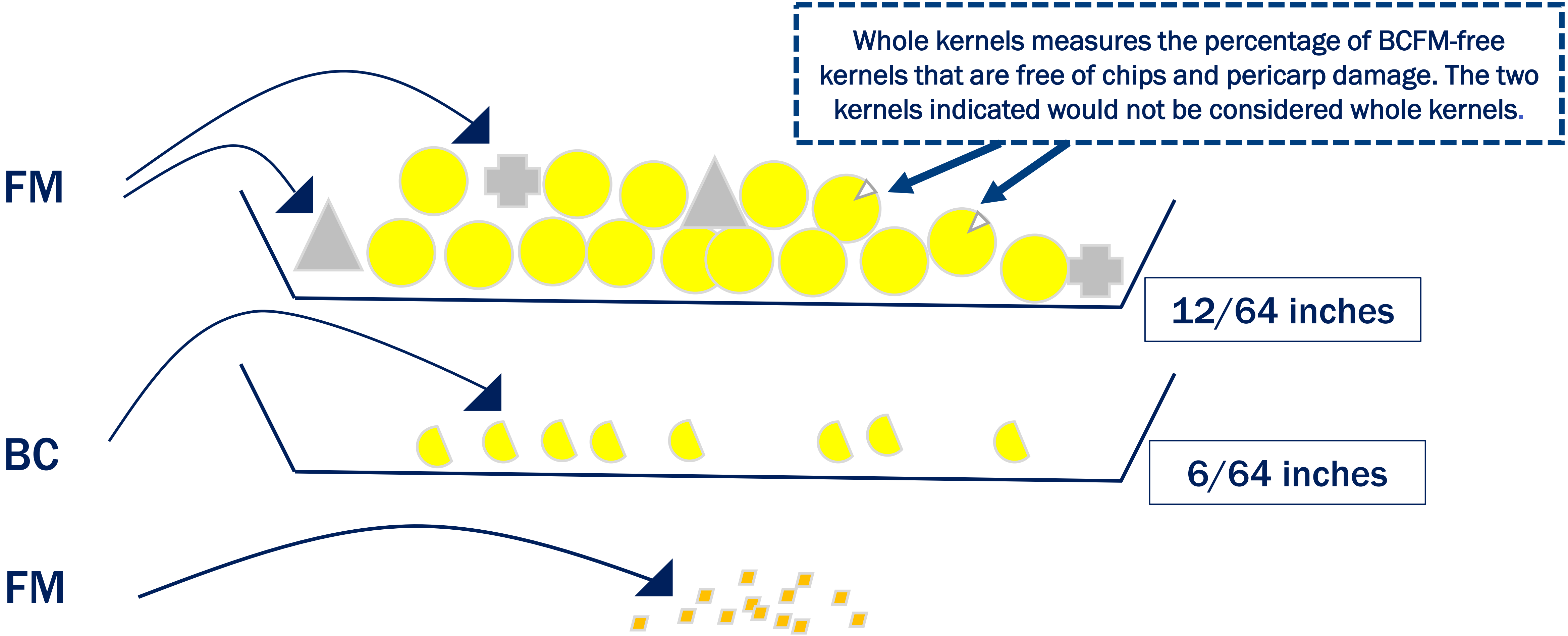
- Average **lower** than the 5YA (0.2%)
- **97.5%** contained less than 0.5% FM







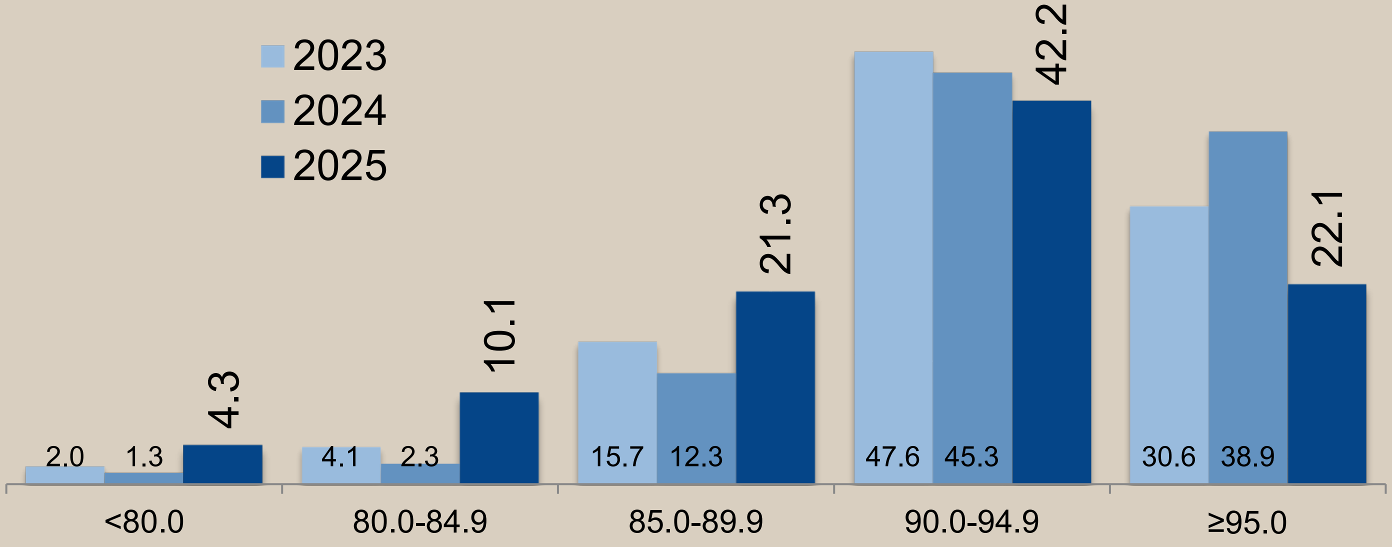
Whole Kernels (%)



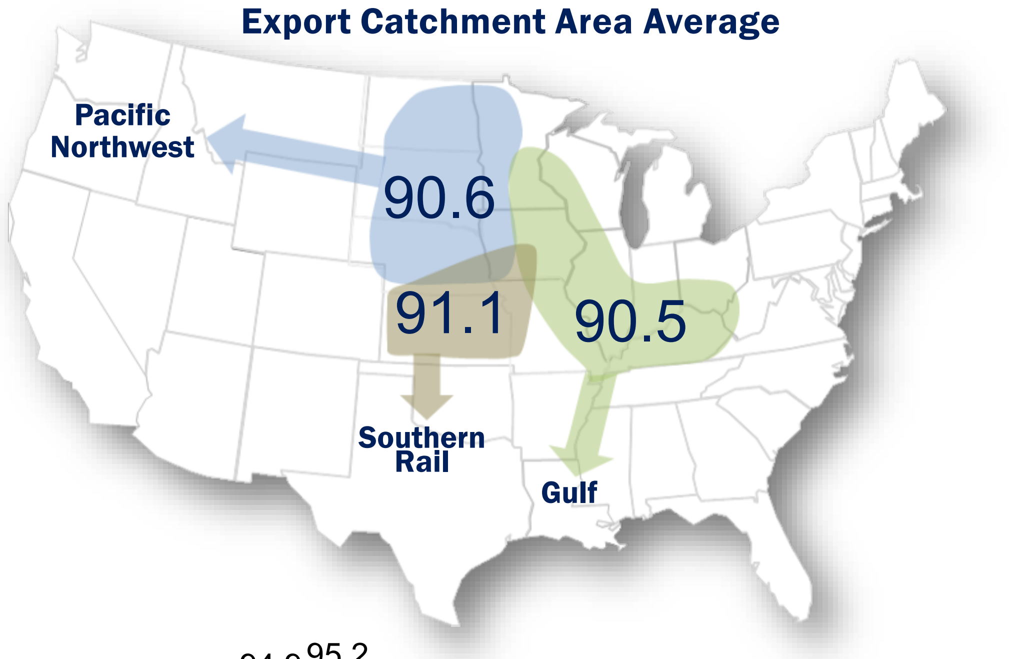
Whole Kernels (%)

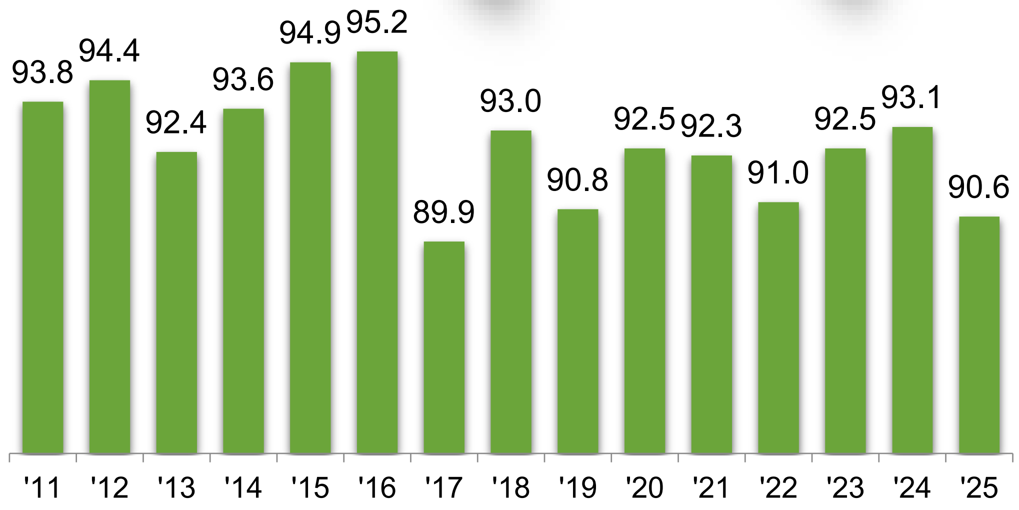
U.S. Aggregate: 90.6%

- Not a grade factor
- Average **lower** than the 5YA (92.3%)



Percent of Samples by Crop Year



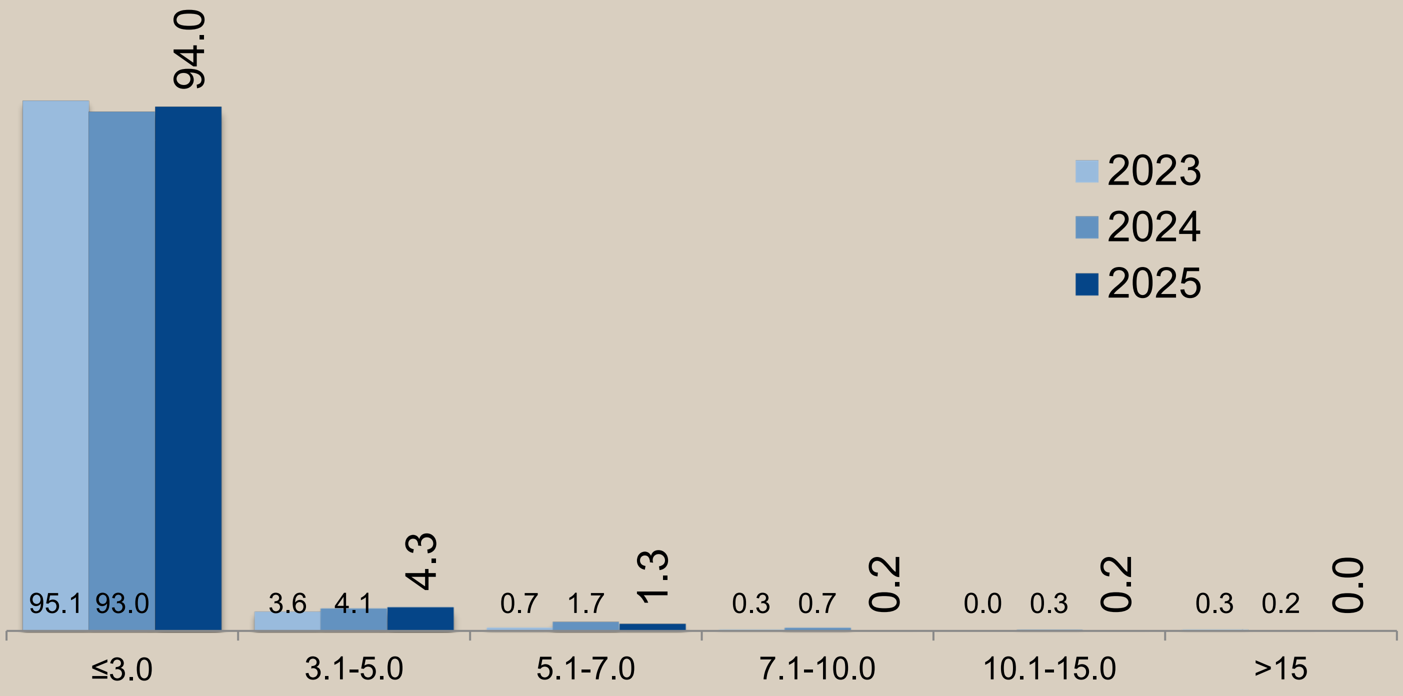


Historical Aggregate by Crop Year

Total Damage and Heat Damage (%)

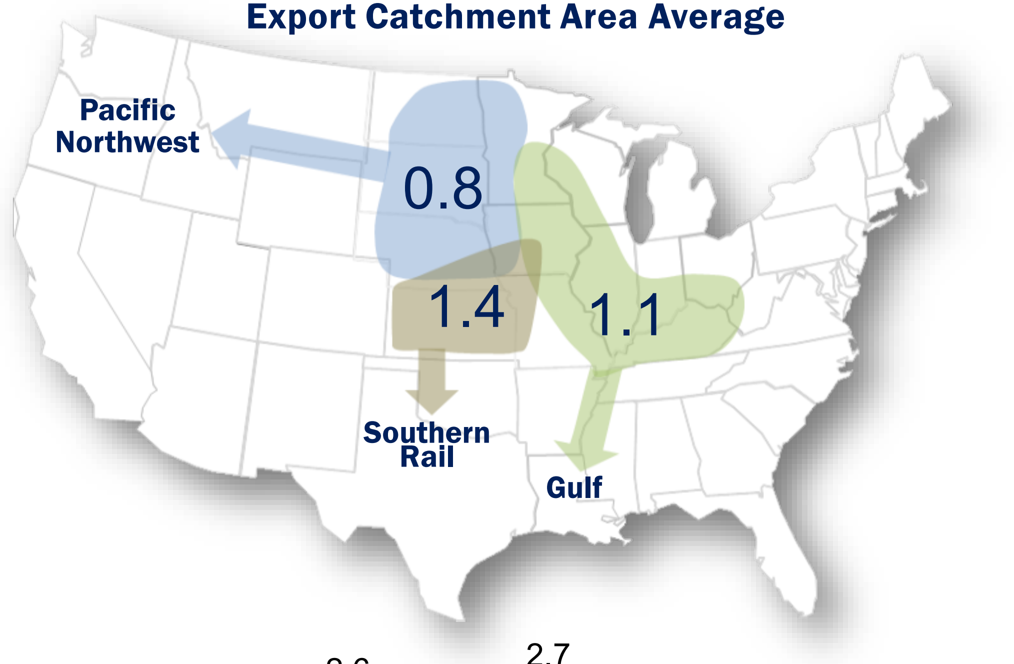
U.S. Aggregate: 1.1%

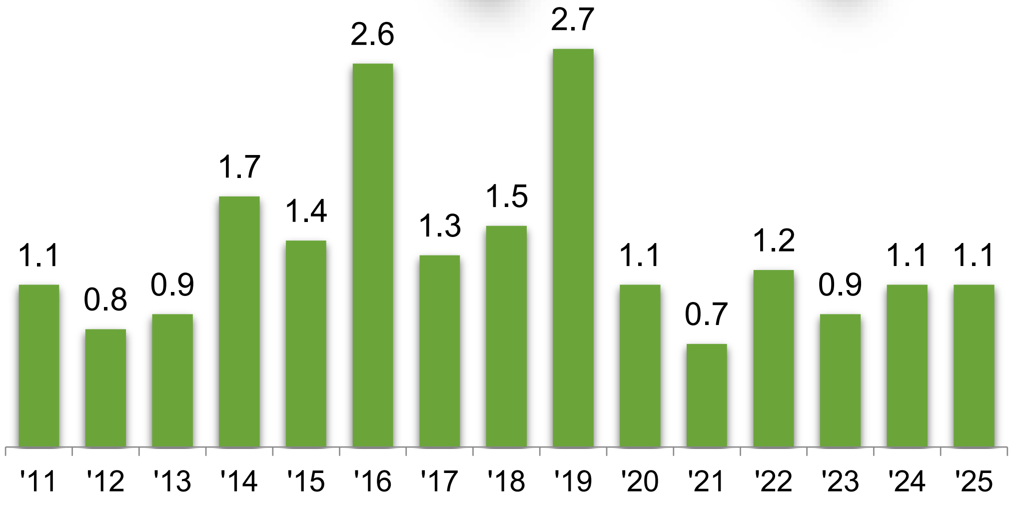
- Average **higher** than the 5YA (1.0%)
- **94.0%** No. 1 grade (93.0% in 2024)
- Average heat damage of **0.0%**



Percent of Samples by Crop Year

Export Catchment Area Average



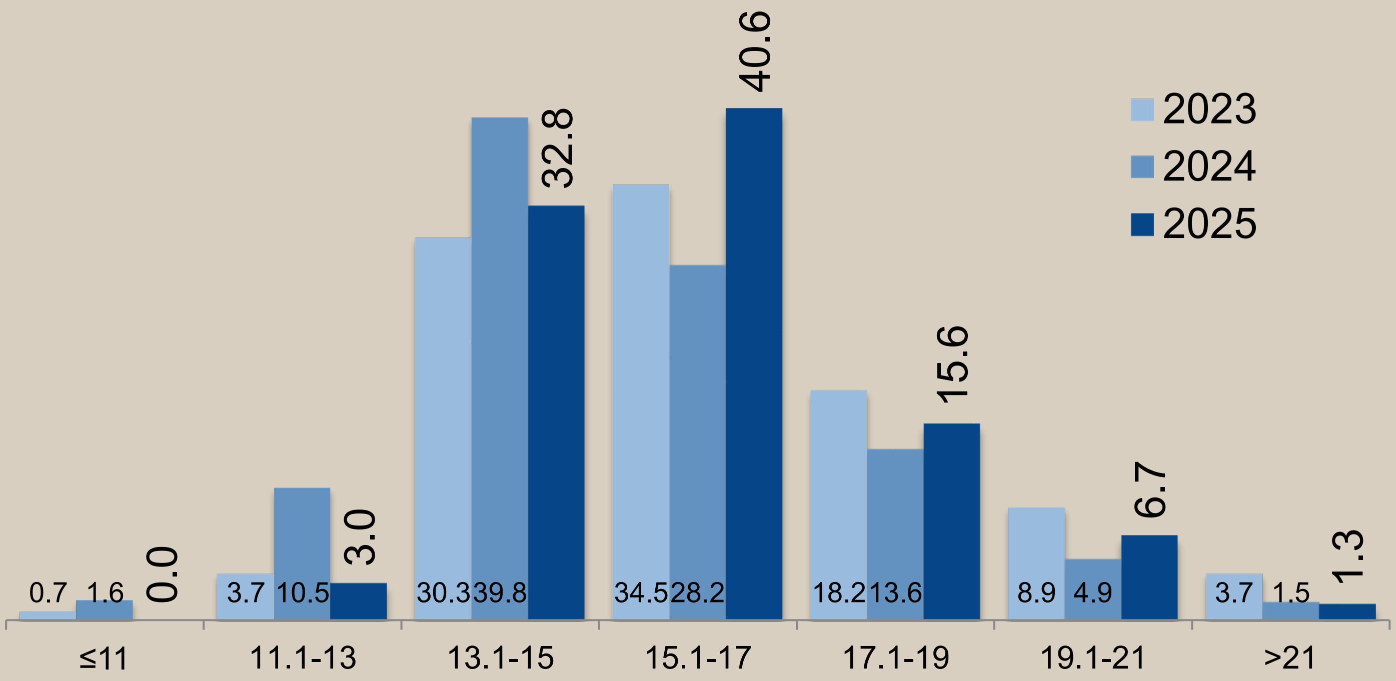


Historical Aggregate by Crop Year

Moisture (%)

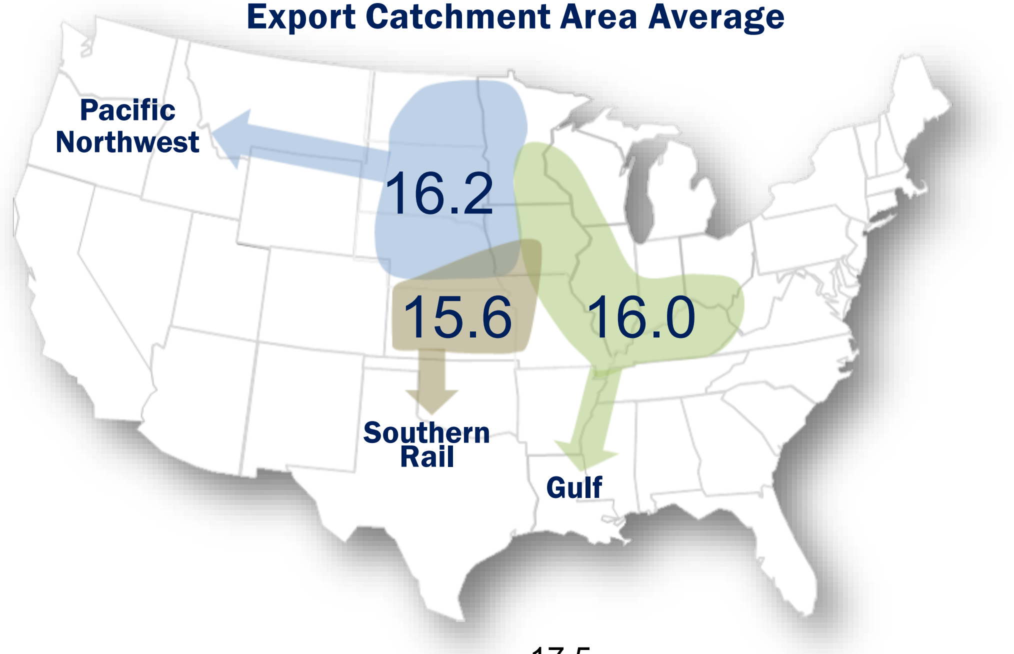
U.S. Aggregate: 16.0%

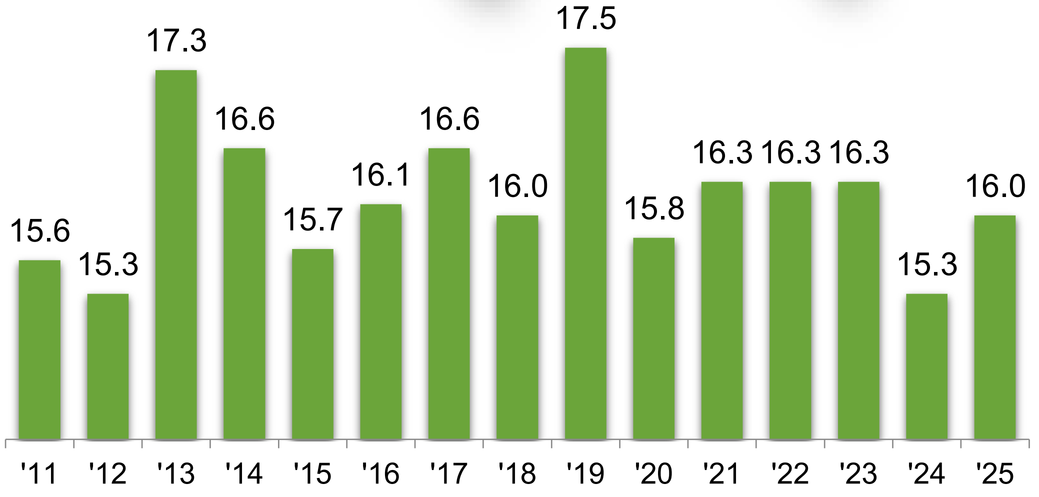
- Average **same** as the 5YA



Percent of Samples by Crop Year

Export Catchment Area Average



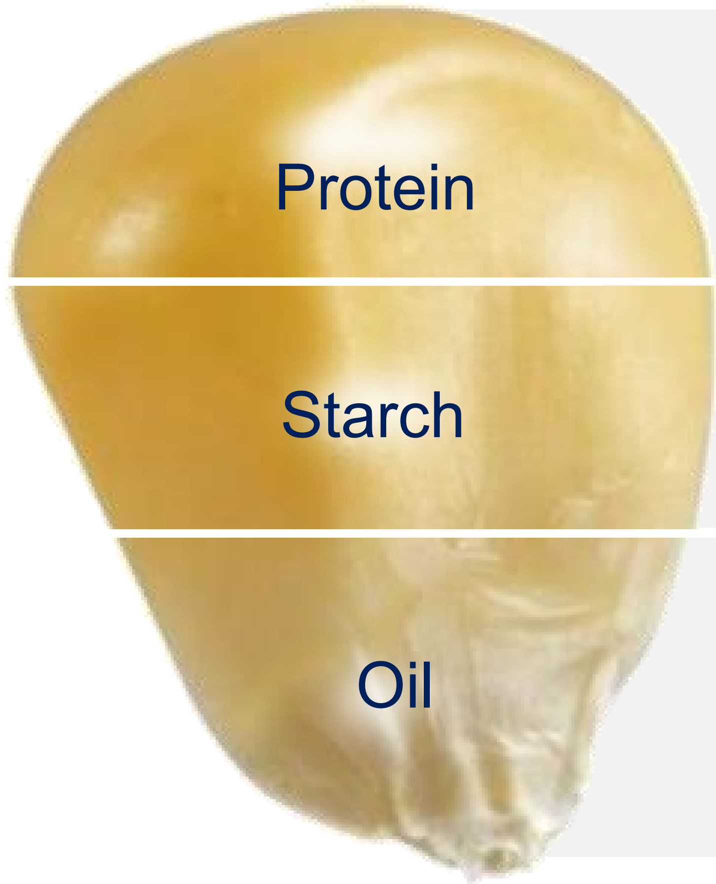


Historical Aggregate by Crop Year

Chemical Composition

Protein
Starch
Oil

Chemical Composition



Protein	Important for poultry and livestock feeding Supplies essential amino acids	Influenced by	Genetics, weather, crop yields and available nitrogen during the growing season
Starch	Important for wet millers and dry-grind ethanol manufacturers	Influenced by	Genetics, weather and crop yields
Oil	Important by-product of wet and dry milling Essential feed component		

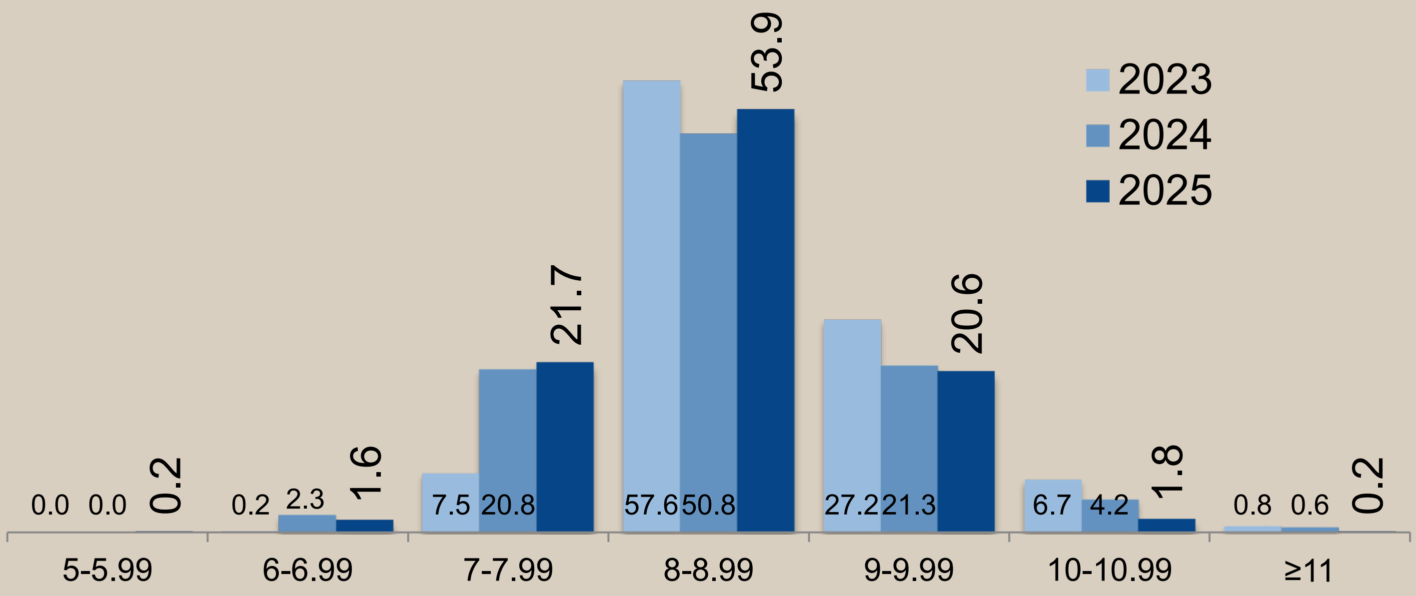
Chemical Composition

	Number of Samples	Average	Standard Deviation	Minimum	Maximum
Protein (Dry Basis %)	621	8.4	0.53	5.4	11.1
Starch (Dry Basis %)	621	72.3	0.55	70.2	74.1
Oil (Dry Basis %)	621	3.8	0.23	2.9	5.0

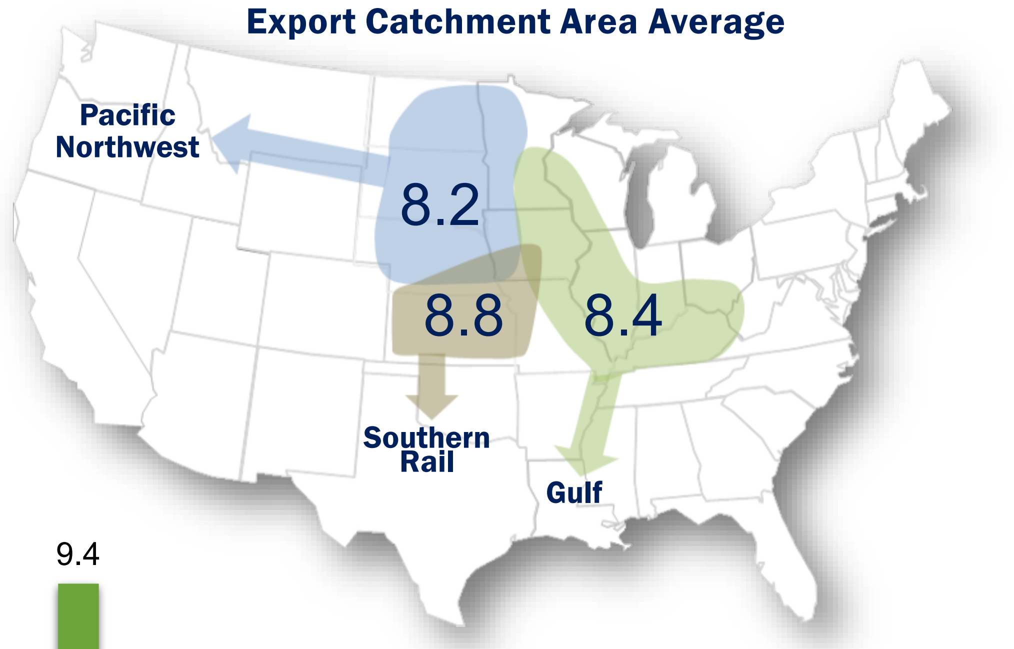
Protein (Dry Basis %)

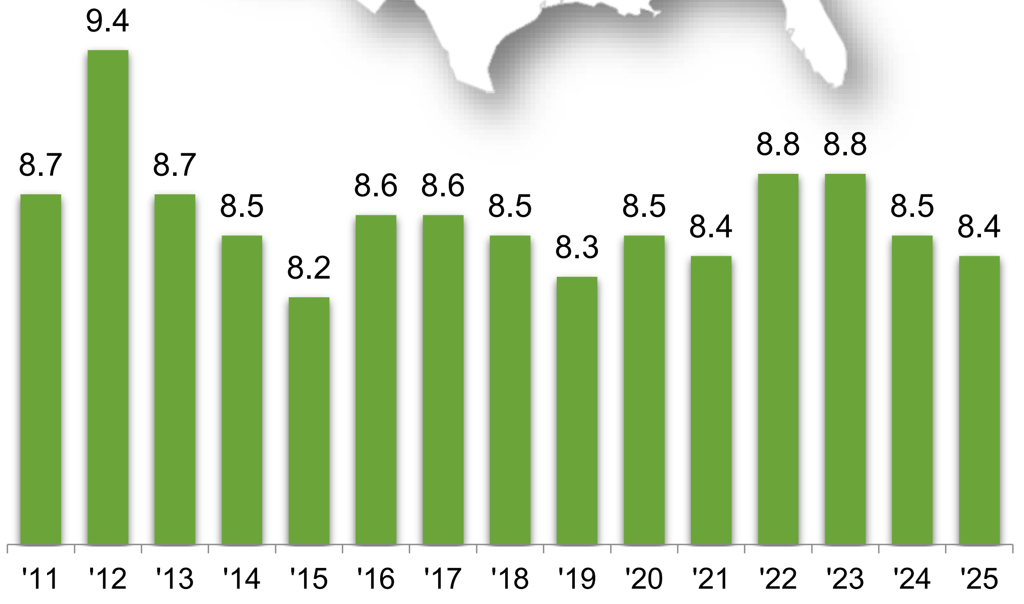
U.S. Aggregate: 8.4%

- Average **lower** than the 5YA (8.6%)



Percent of Samples by Crop Year



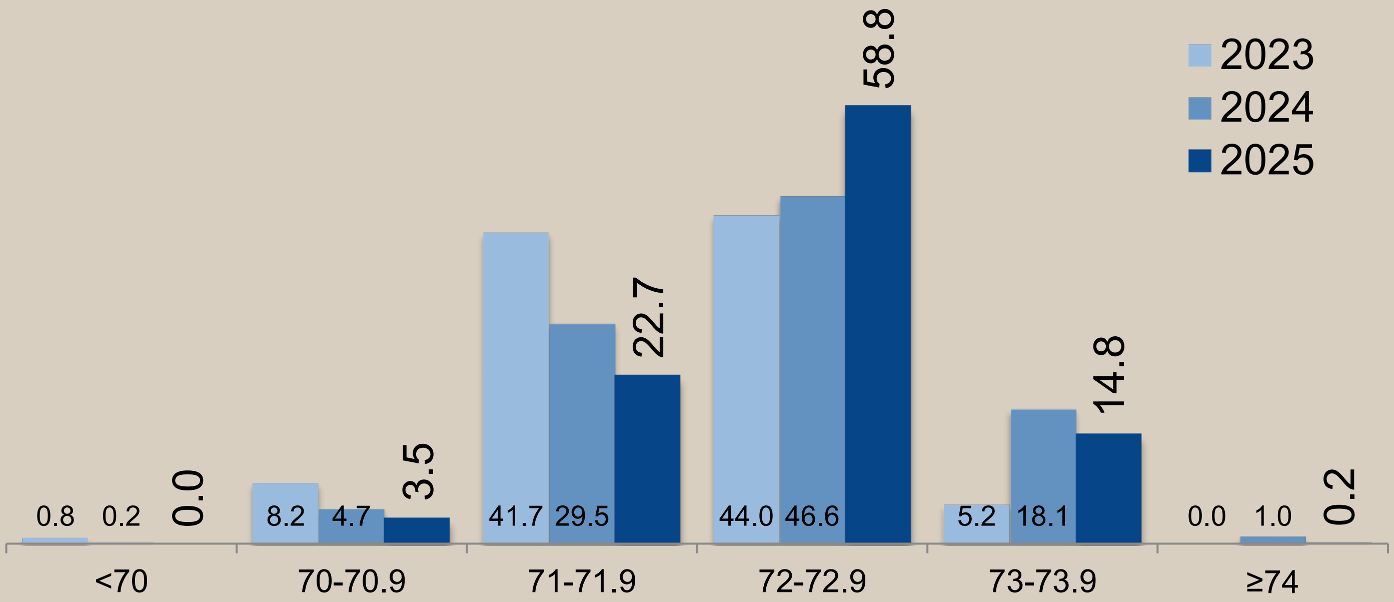


Historical Aggregate by Crop Year

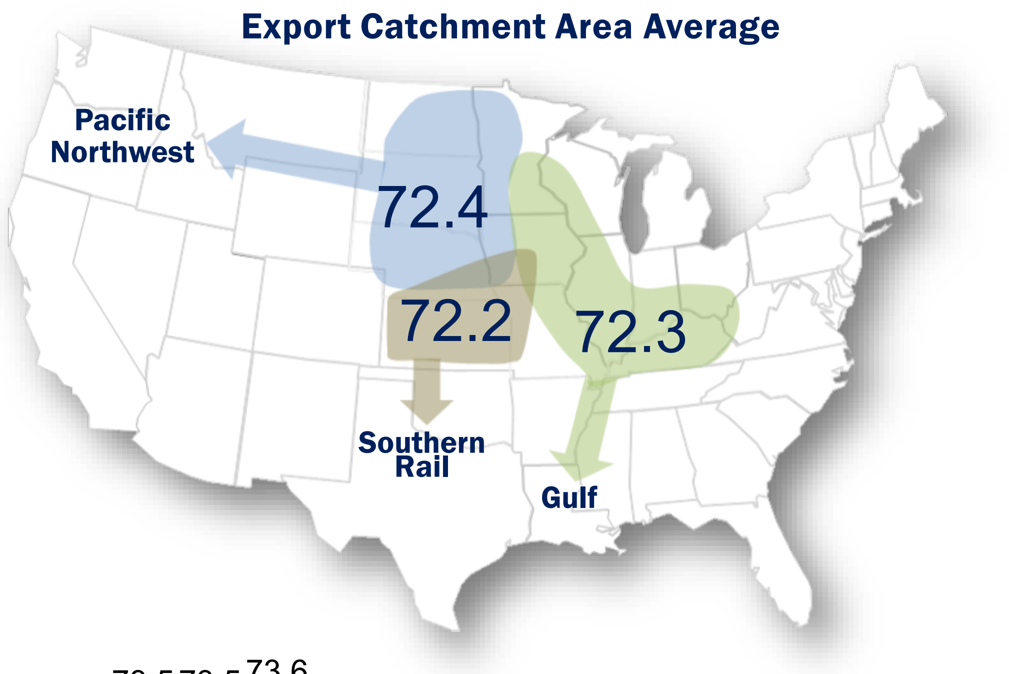
Starch (Dry Basis %)

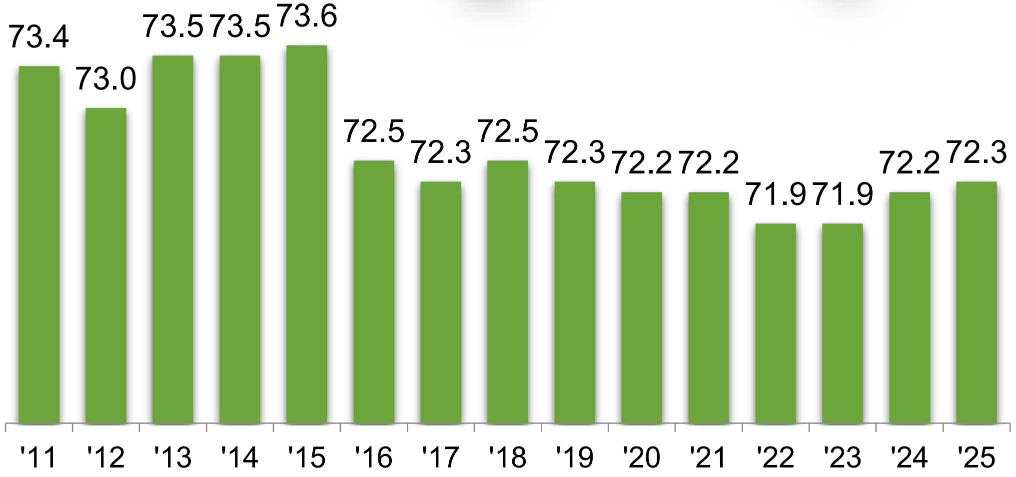
U.S. Aggregate: 72.3%

- Average **higher** than the 5YA (72.1%)
- **Gulf** ECA tends to have the highest average starch



Percent of Samples by Crop Year



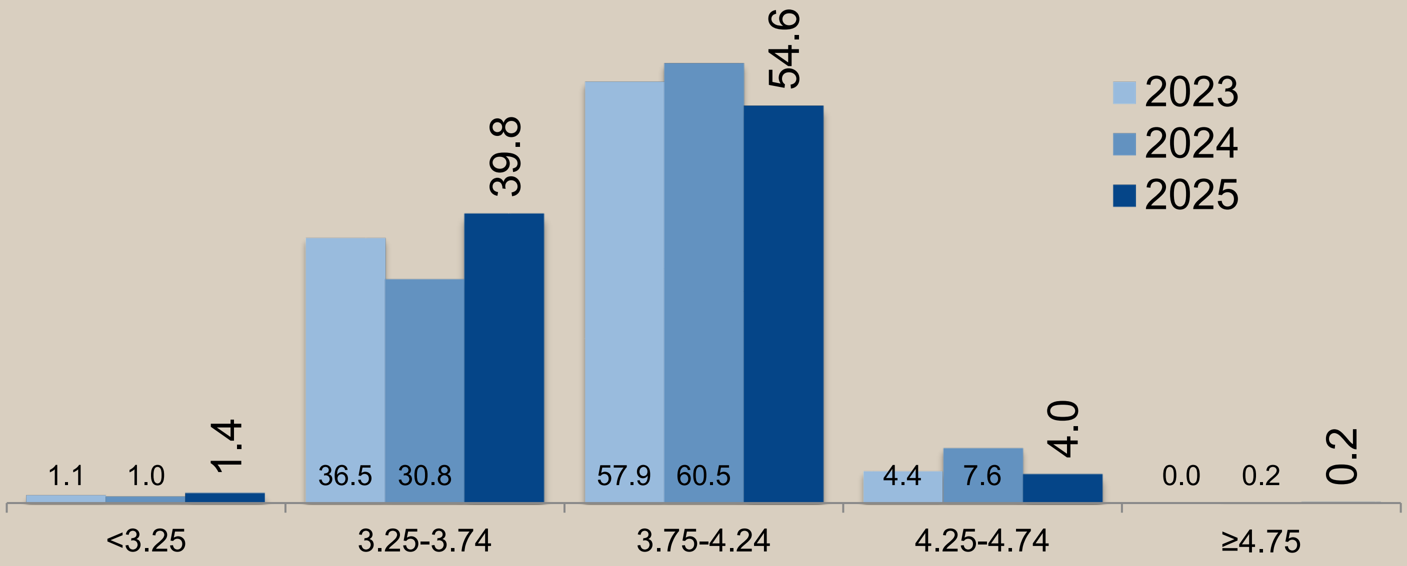


Historical Aggregate by Crop Year

Oil (Dry Basis %)

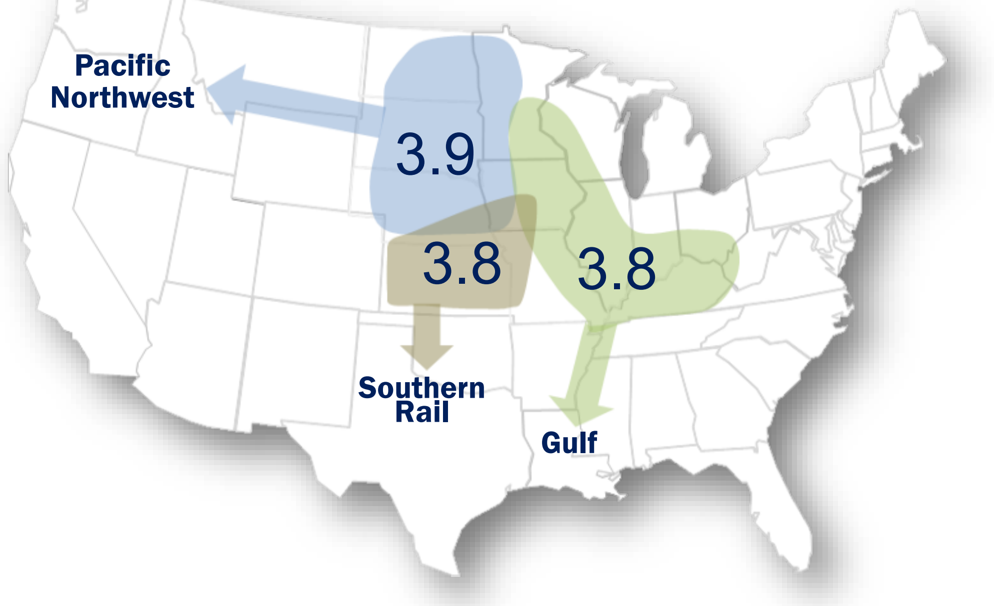
U.S. Aggregate: 3.8%

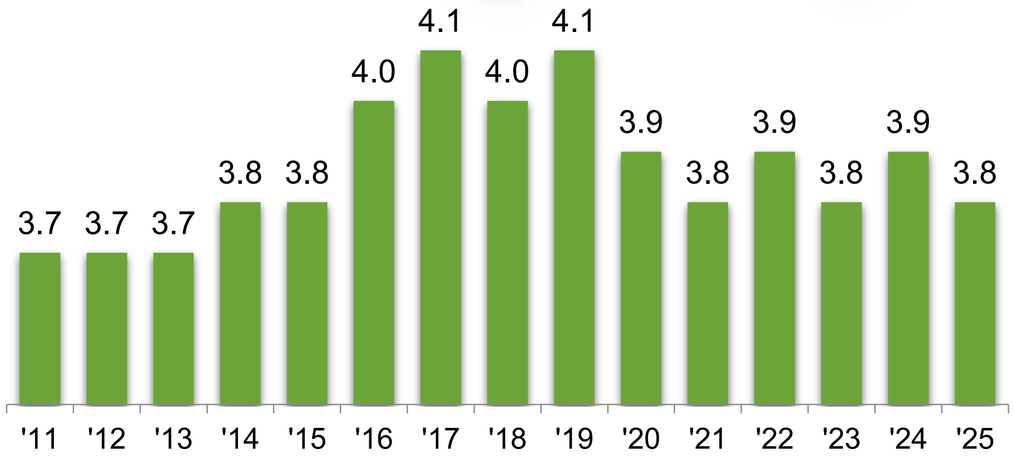
- Average **lower** than the 5YA (3.9%)



Percent of Samples by Crop Year

Export Catchment Area Average



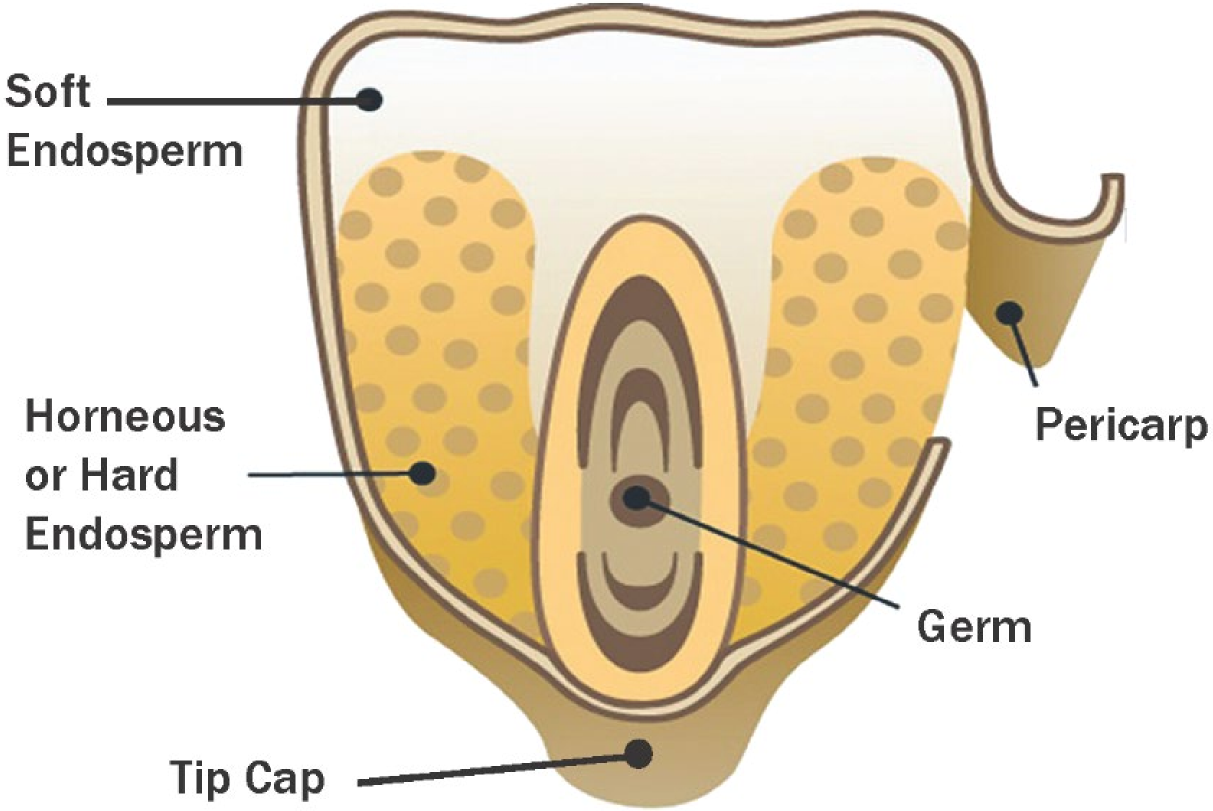


Historical Aggregate by Crop Year

Physical Factors

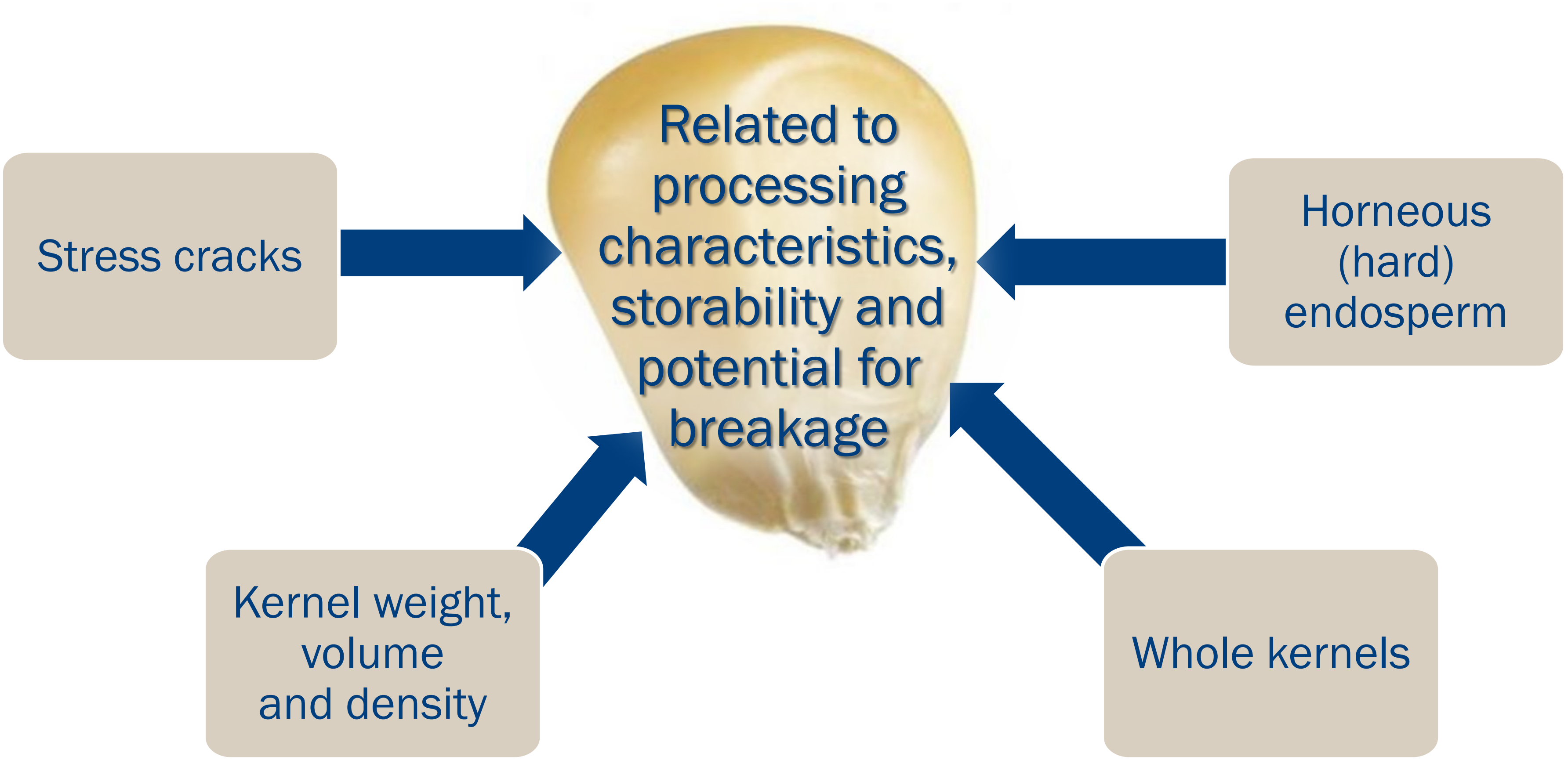
Stress Cracks
100-Kernel Weight
Kernel Volume
True Density
Whole Kernels
Horneous Endosperm

Corn Morphology



Source: Adapted from Corn Refiners Association, 2011

Physical Factors – Overview



Physical Factors

	Number of Samples	Average	Standard Deviation	Minimum	Maximum
Stress Cracks (%)	621	9.5	8.3	0	96
100-Kernel Weight (g)	182	34.04	3.54	25.50	41.90
Kernel Volume (cm^3)	182	0.27	0.03	0.21	0.33
True Density (g/cm^3)	182	1.258	0.025	1.194	1.323
Whole Kernels (%)	621	90.6	4.9	66.4	99.4
Horneous Endosperm (%)	182	83	3	74	92

Stress Cracks

Internal cracks in the horneous (hard) endosperm

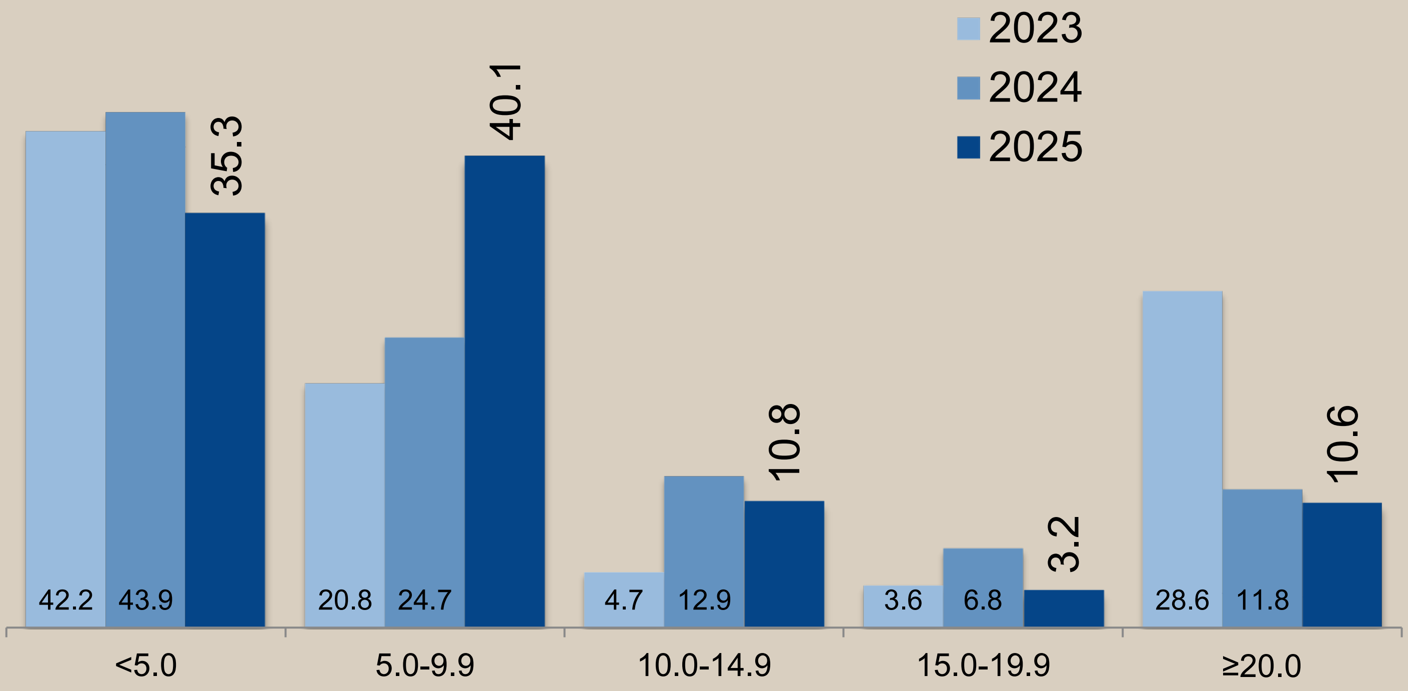
Most common cause is artificial drying

Impacts breakage susceptibility, milling and alkaline cooking

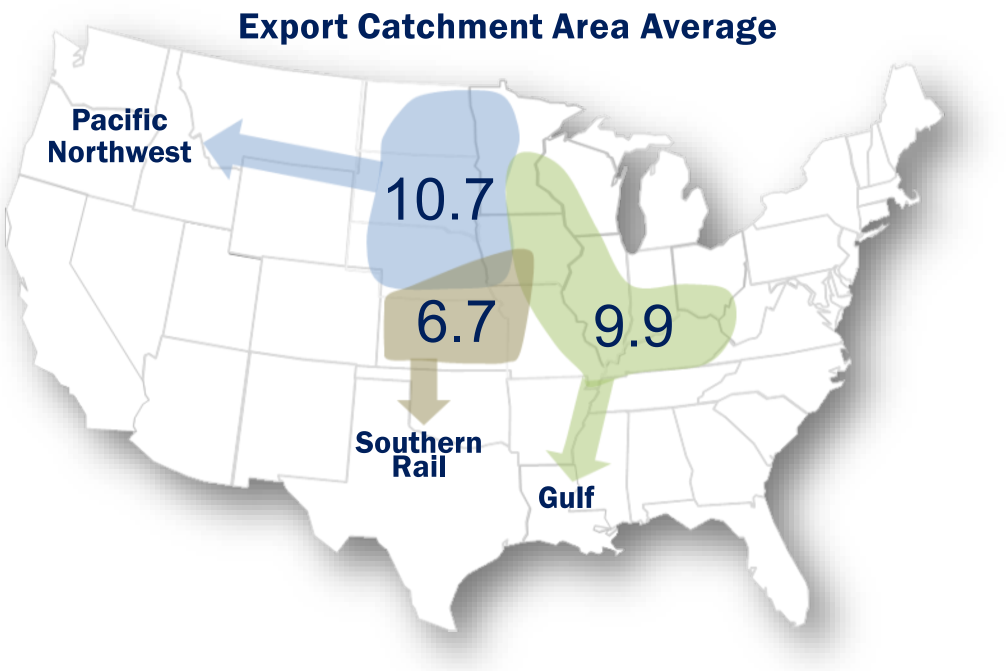
Stress Cracks (%)

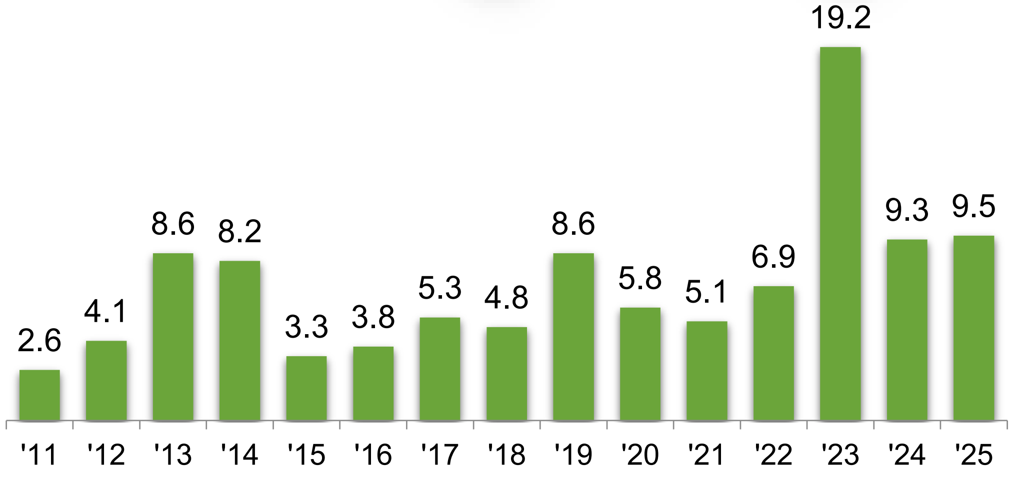
U.S. Aggregate: 9.5%

- Average **similar** to the report's 5YA (9.3%)



Percent of Samples by Crop Year





Historical Aggregate by Crop Year

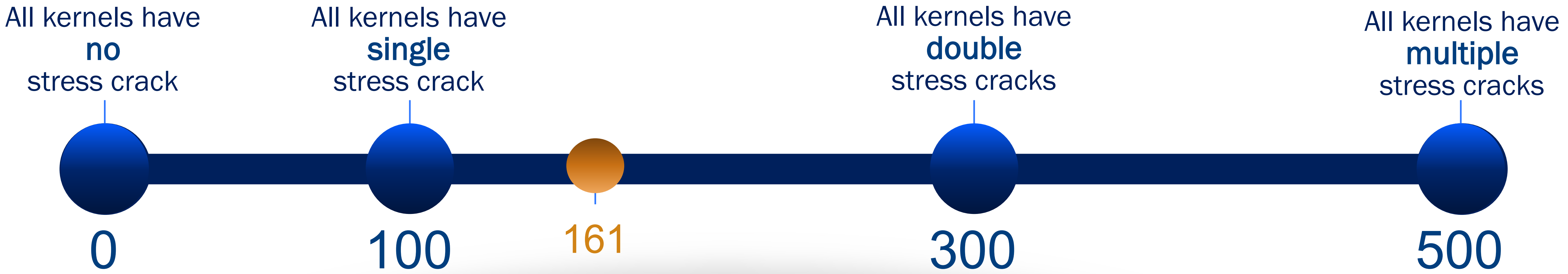
Stress Crack Index

[% kernels with 1 stress crack × 1] +

[% kernels with 2 stress cracks × 3] +

[% kernels with > 2 stress cracks × 5] = SCI

Magnitude of Stress Crack Index



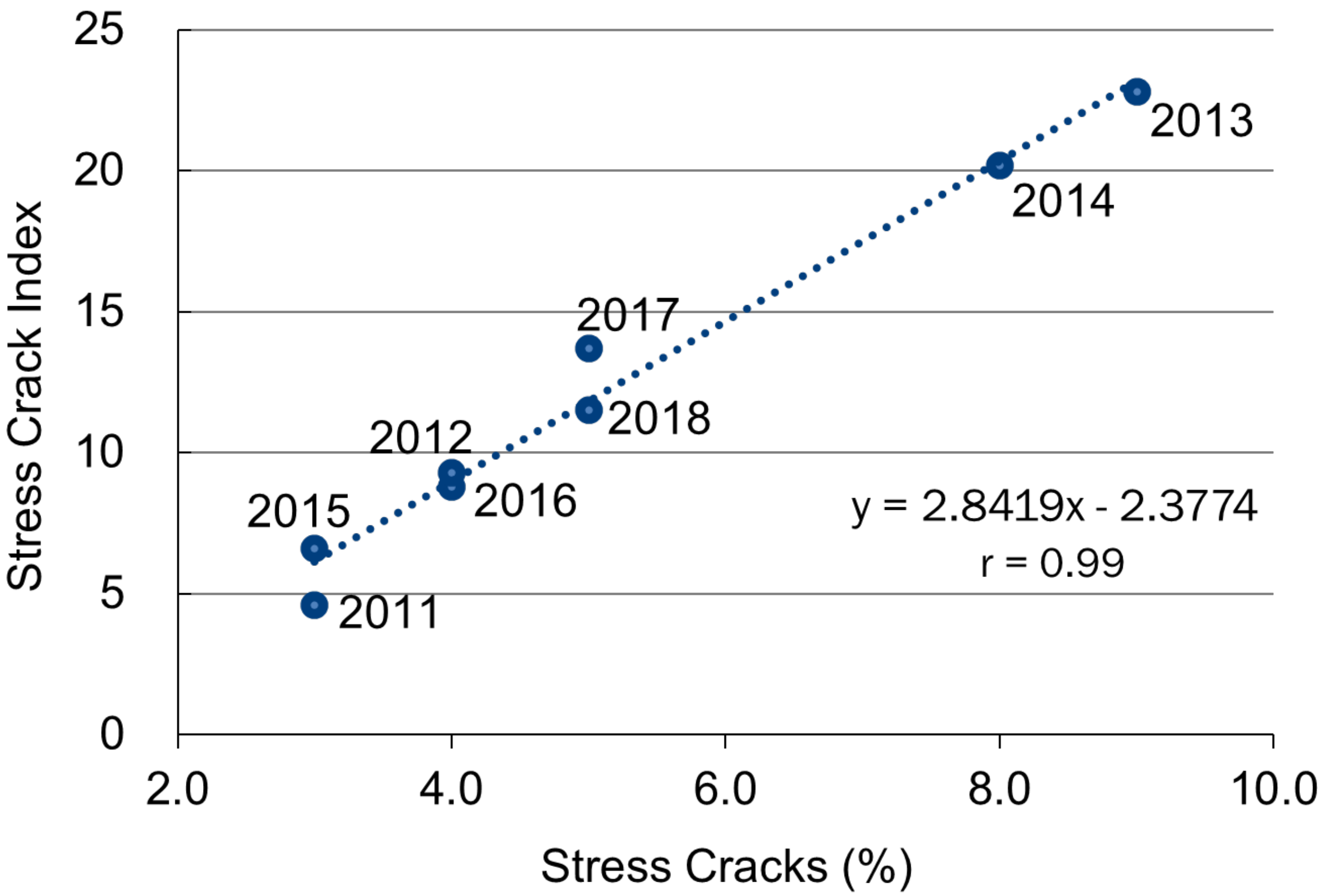
Example: SC% = 43%

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 indicative of growing conditions and genetics

=

True Density
(grams per cubic centimeters)

True density reflects kernel hardness

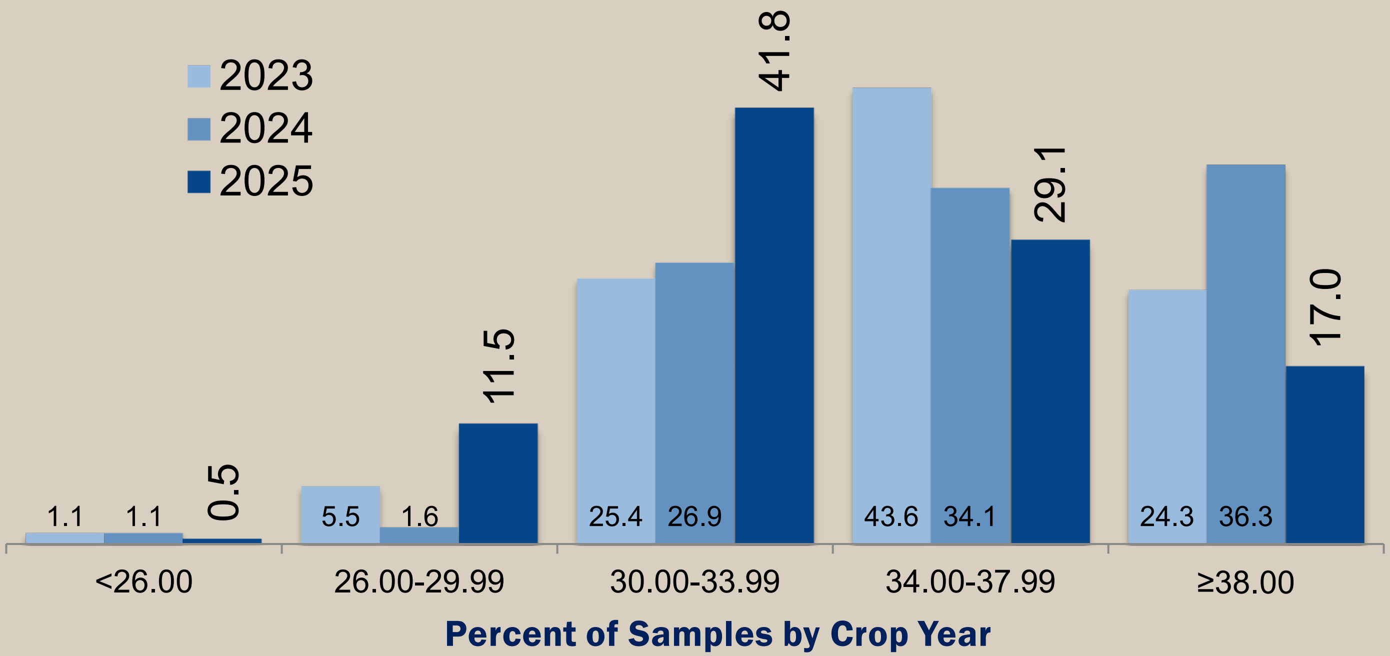
Higher density – harder kernels, less susceptible to breakage, more desirable for dry milling and alkaline processing

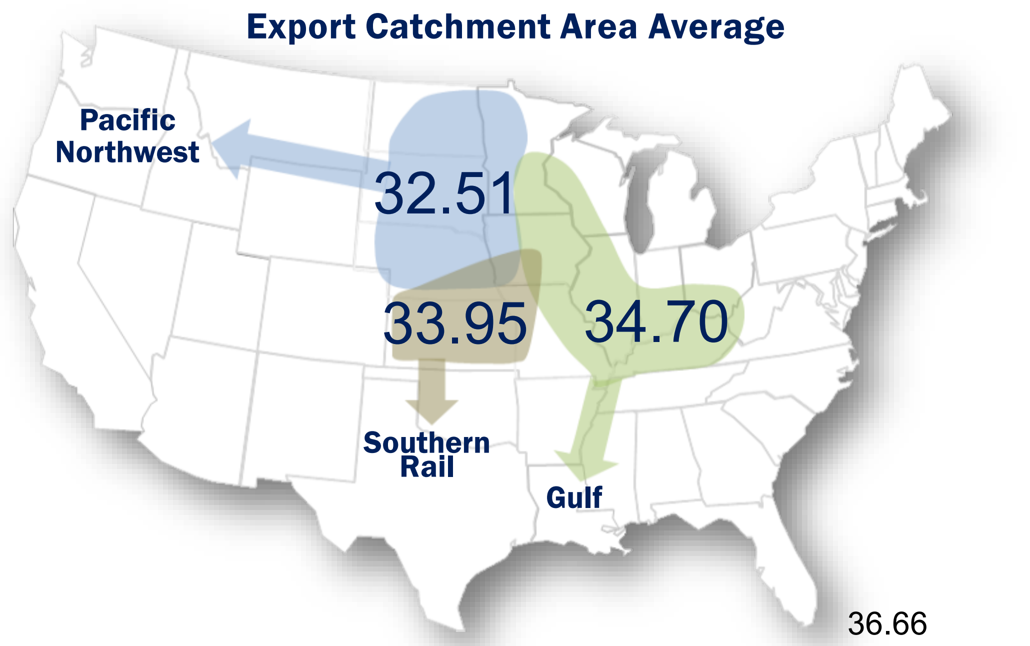
Lower density – softer kernels, less at risk for development of stress cracks if high temperature drying is employed, good for wet milling and feed use

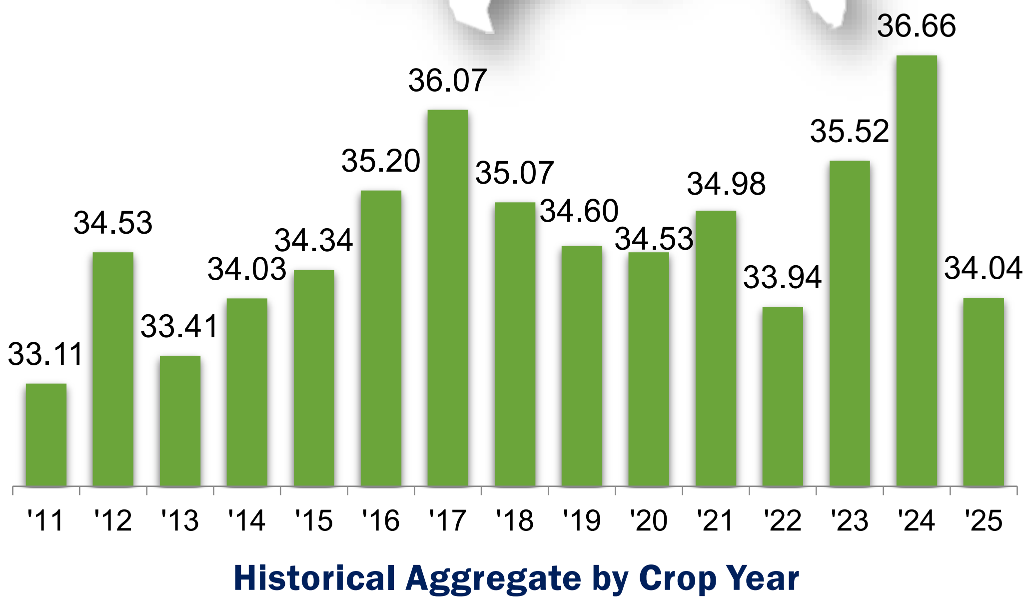
100-Kernel Weight (grams)

U.S. Aggregate: 34.04 grams

- Average **lower** than the report's 5YA (35.12 grams)



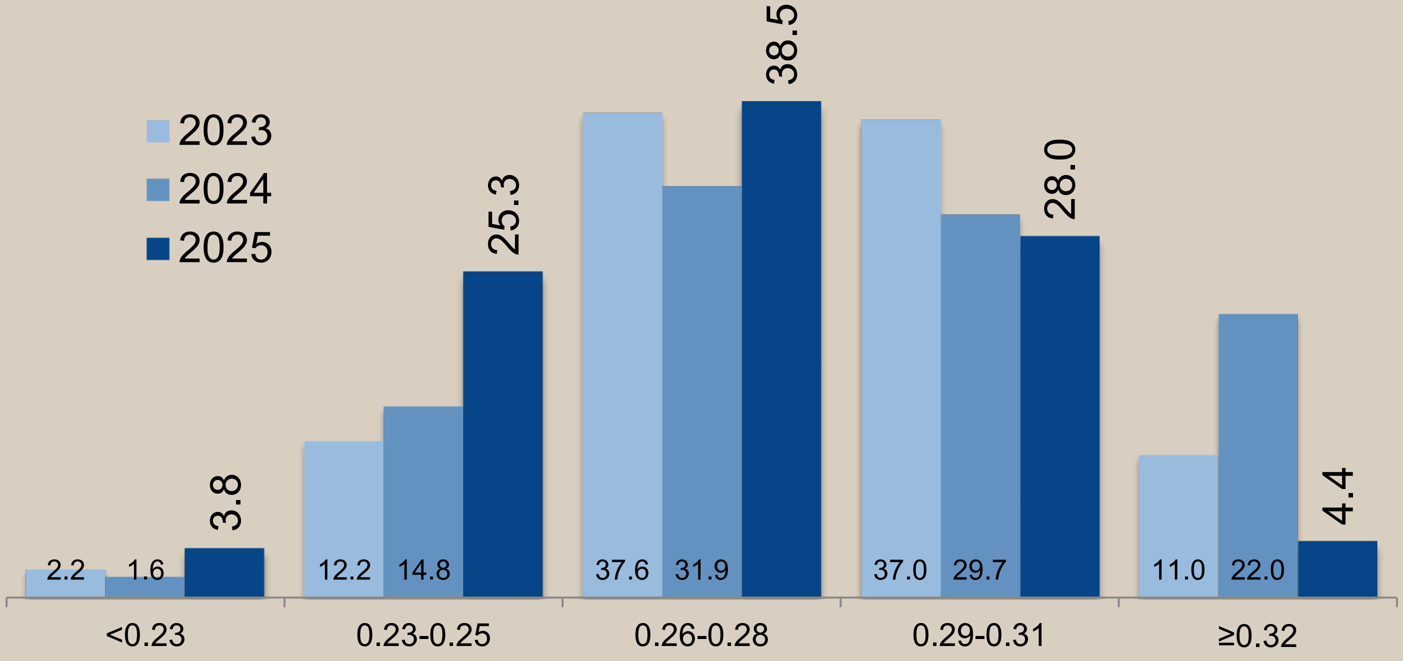




Kernel Volume (cm^3)

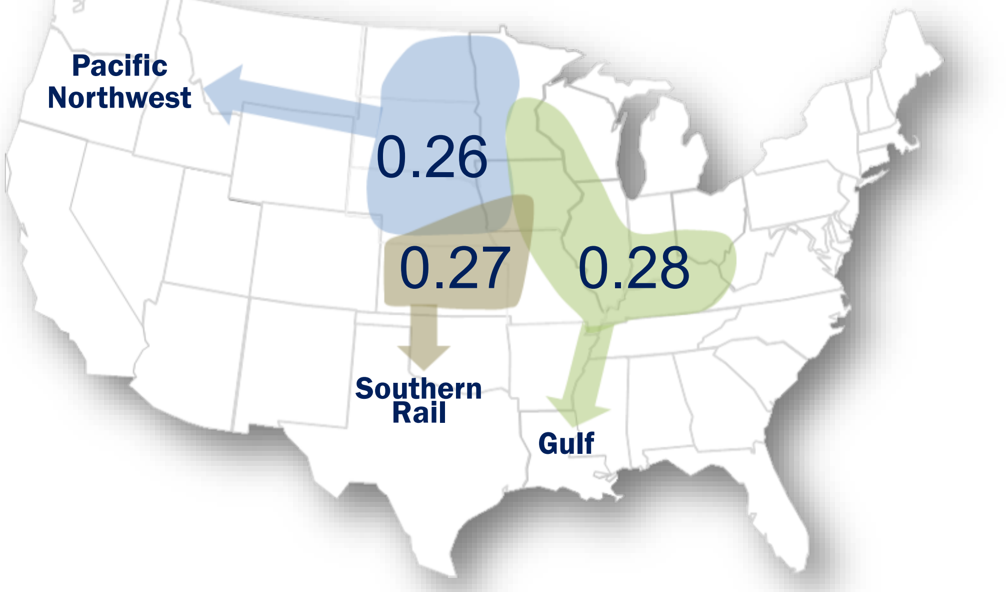
U.S. Aggregate: 0.27 cm^3

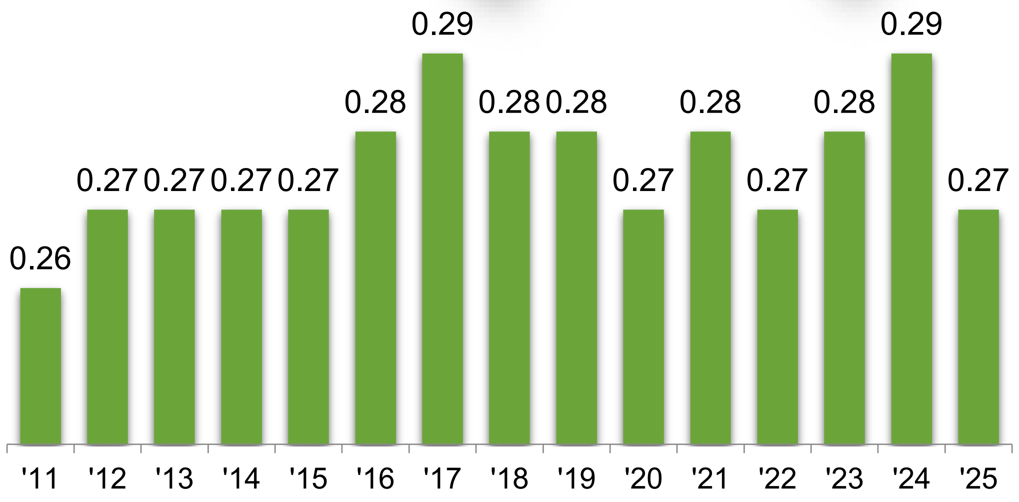
- Average **lower** than the report's 5YA (0.28 cm^3)



Percent of Samples by Crop Year

Export Catchment Area Average



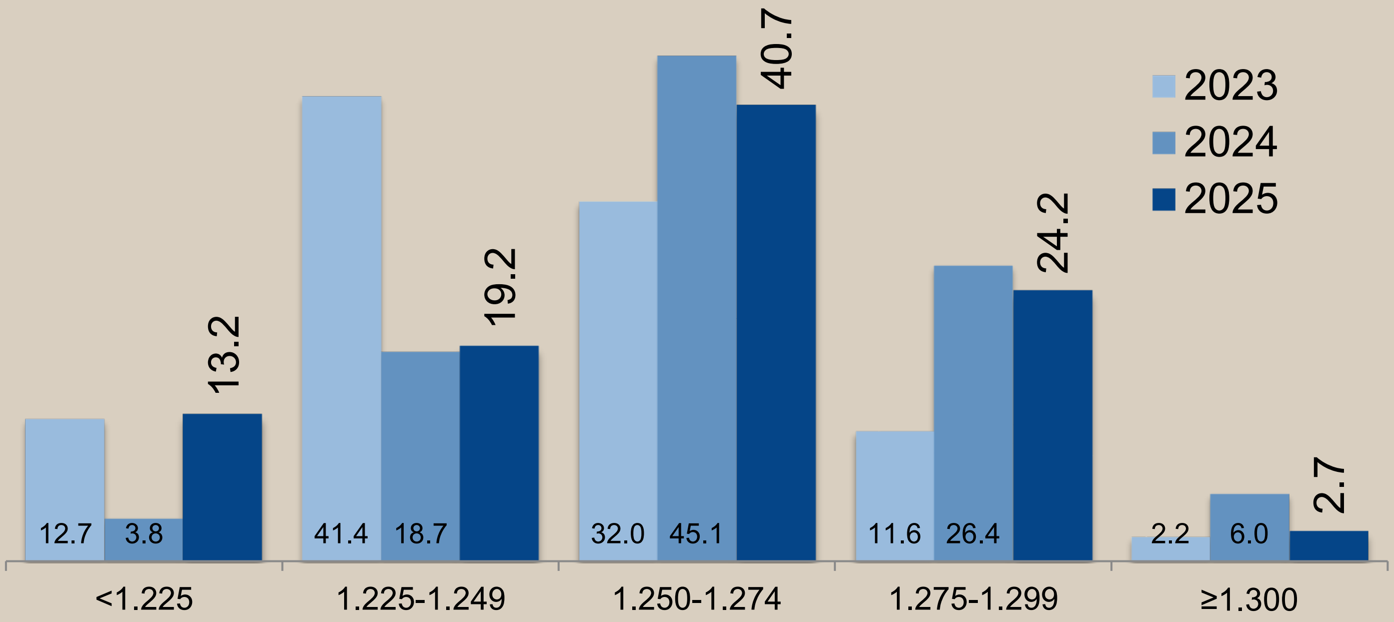


Historical Aggregate by Crop Year

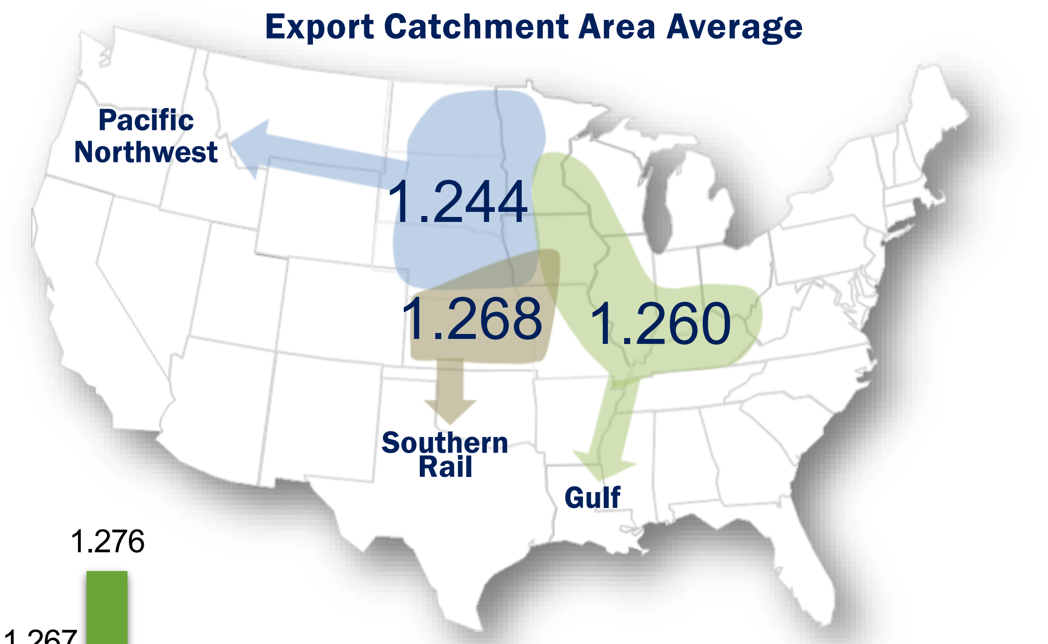
Kernel True Density (g/cm^3)

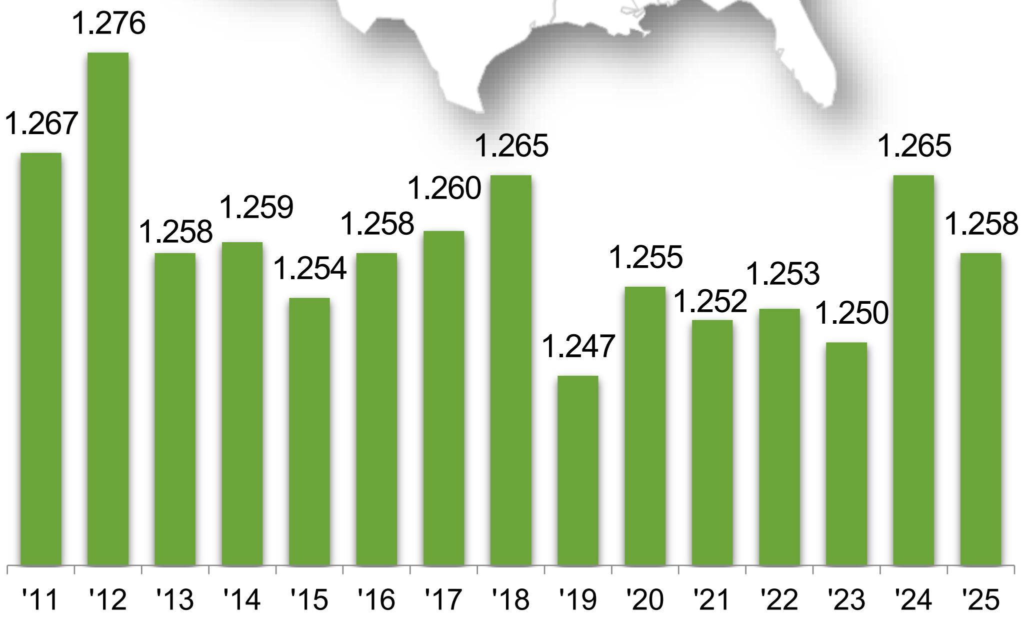
U.S. Aggregate: 1.258 g/cm^3

- Average **similar** to the 5YA (1.255 g/cm^3)



Percent of Samples by Crop Year





Historical Aggregate by Crop Year

Other Physical Properties

Whole Kernel (%)

Percentage of whole kernels of a 50-gram sample

Broken Corn in BCFM measures only kernel size, not whether it is broken or whole

< 90%	≥ 90%
More susceptible to storage molds and breakage	Desirable, especially for alkaline cookers

Horneous (Hard) Endosperm (%)

Measures the percent of the endosperm that is horneous or hard within a range from 70 – 100%

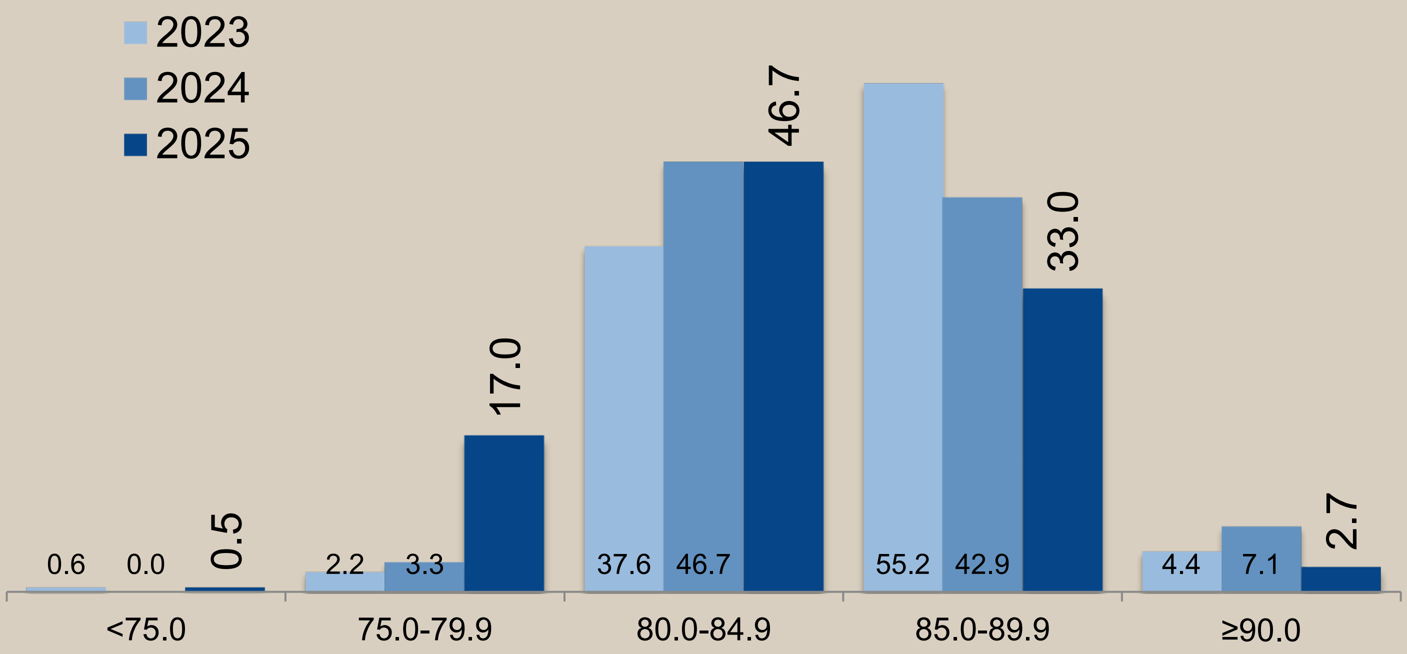
The higher the value, the harder the corn kernel

≤ 85%	> 85%
Good for wet millers and feeders	Good for dry millers and alkaline cookers

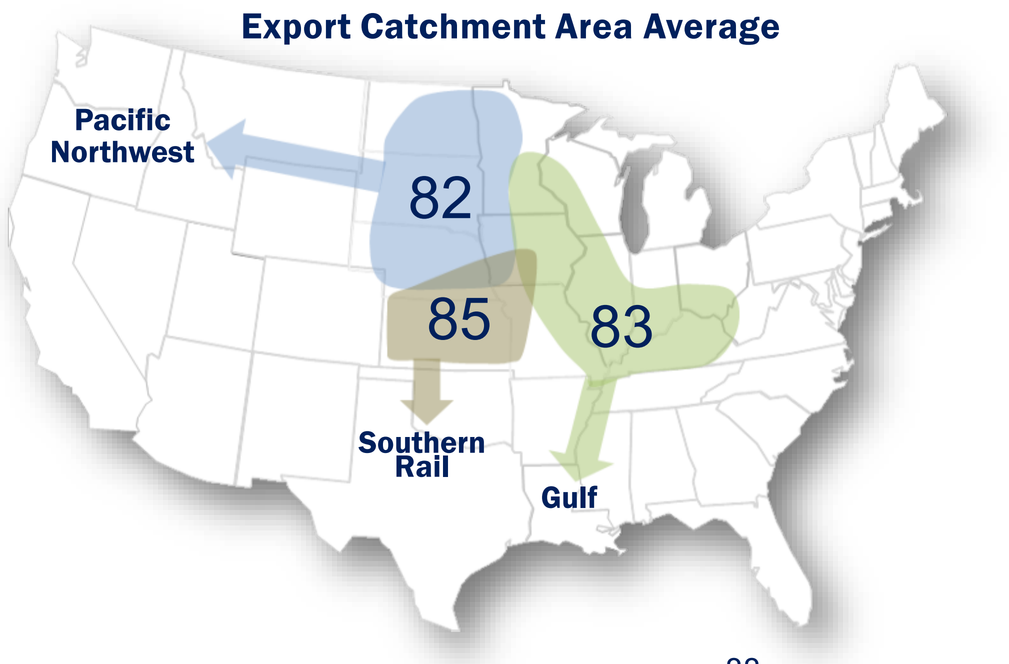
Horneous (Hard) Endosperm (%)

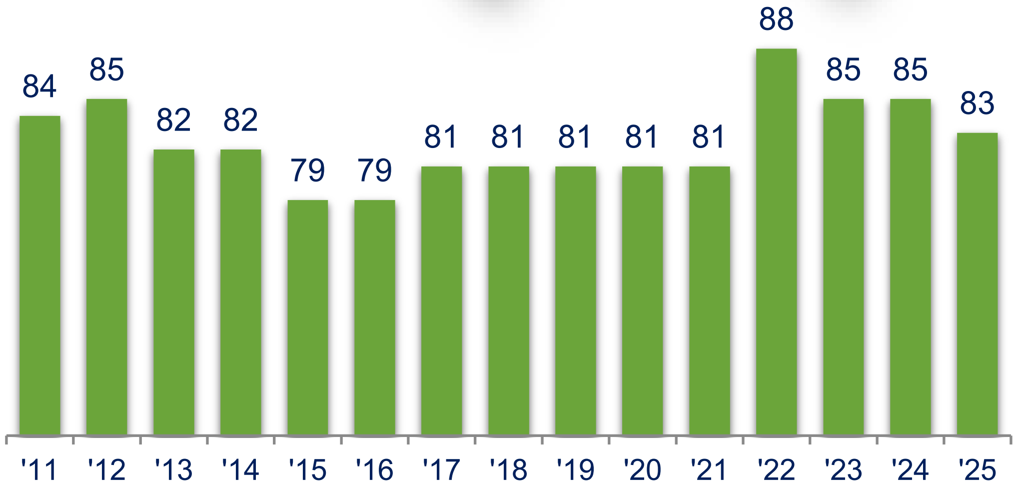
U.S. Aggregate: 83%

- Average **lower** than the 5YA (84%)



Percent of Samples by Crop Year





Historical Aggregate by Crop Year

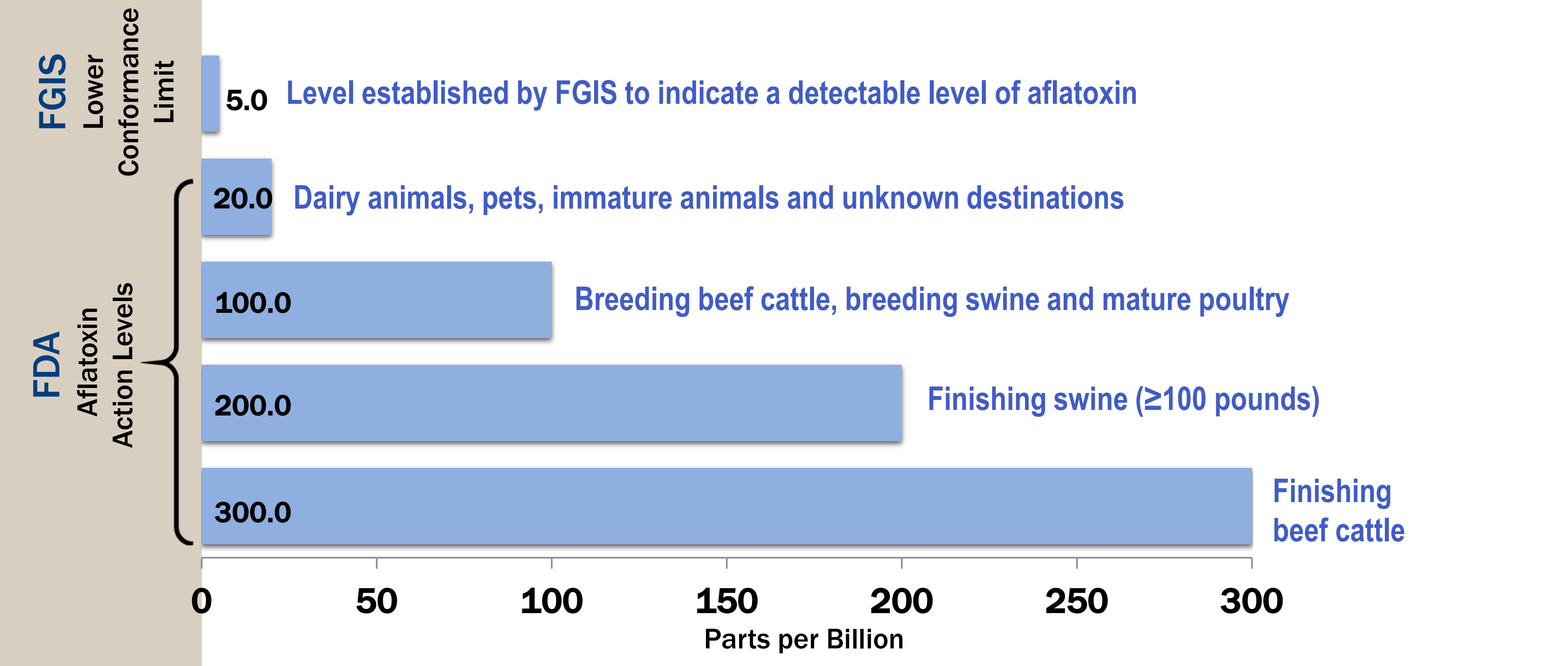
Mycotoxins

Aflatoxin,
Deoxynivalenol (DON or Vomitoxin)
Fumonisin
Ochratoxin A
Trichothecenes (T-2)
and Zearalenone

Mycotoxin Testing

- *Corn Harvest Quality Report* shows **ONLY** the frequency of detection in harvest samples
- *Corn Harvest Quality Report* does **NOT** predict the presence or levels of mycotoxins in U.S. corn exports
- **Targeting a minimum of 25%** of collected samples, the same as in 2023 and 2022 (Target of 180 samples)
- The *Corn Harvest Quality Report* contains the results from 180 samples.

Key Aflatoxin Levels (ppb)

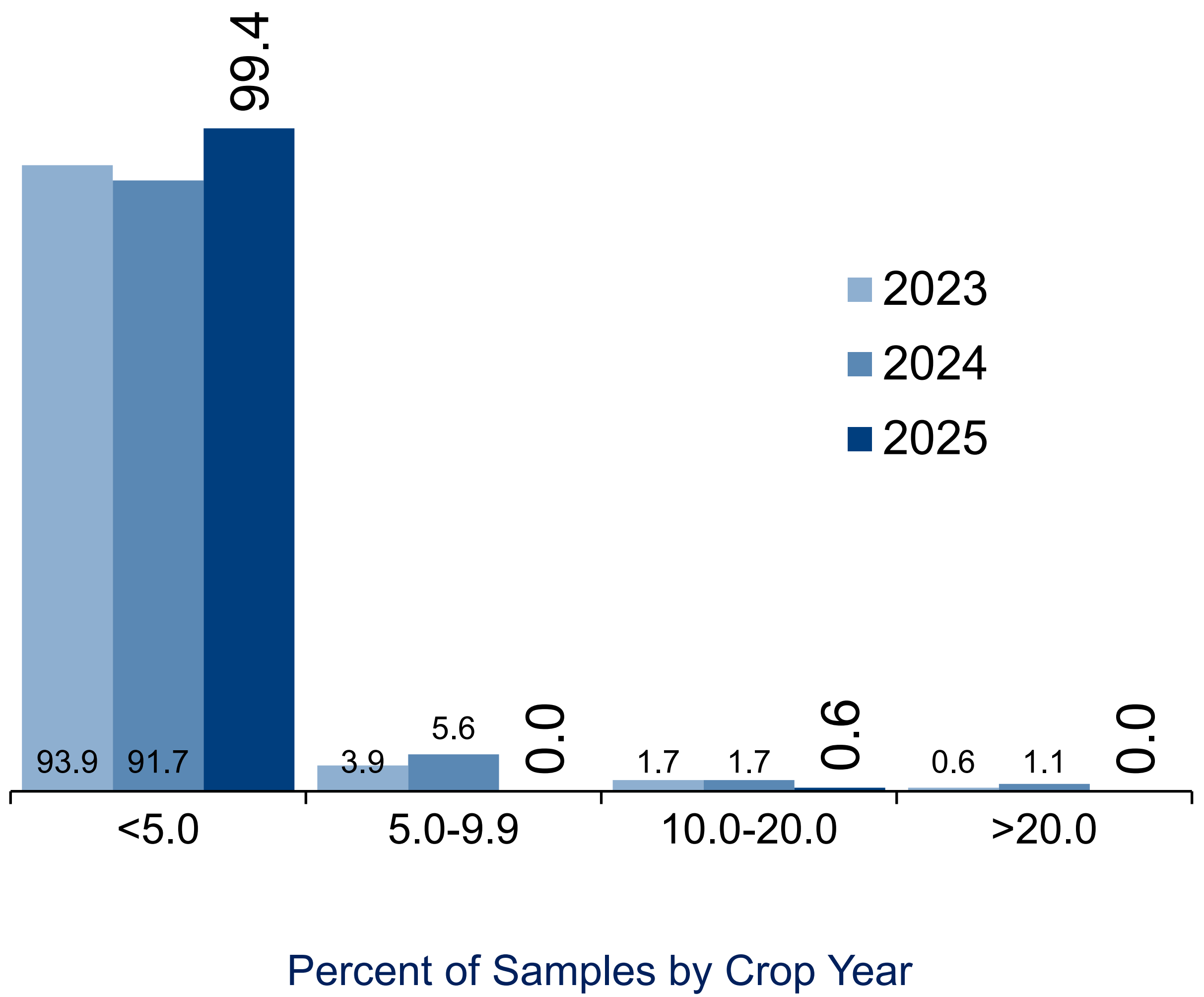


Aflatoxin Testing Results (ppb)

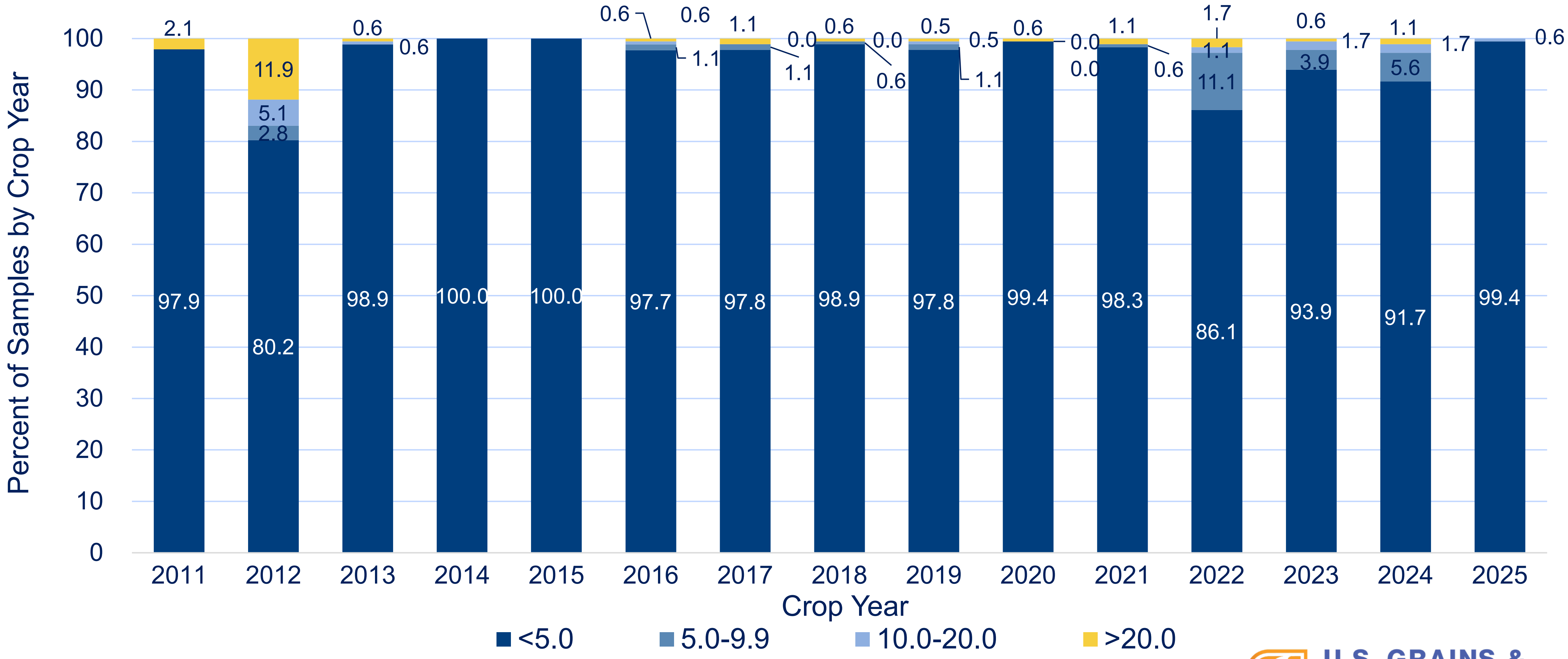
Percentage of samples with no detectable levels of aflatoxin in 2025 was **99.4%**

100.0% of samples tested below the FDA action level of 20.0 ppb

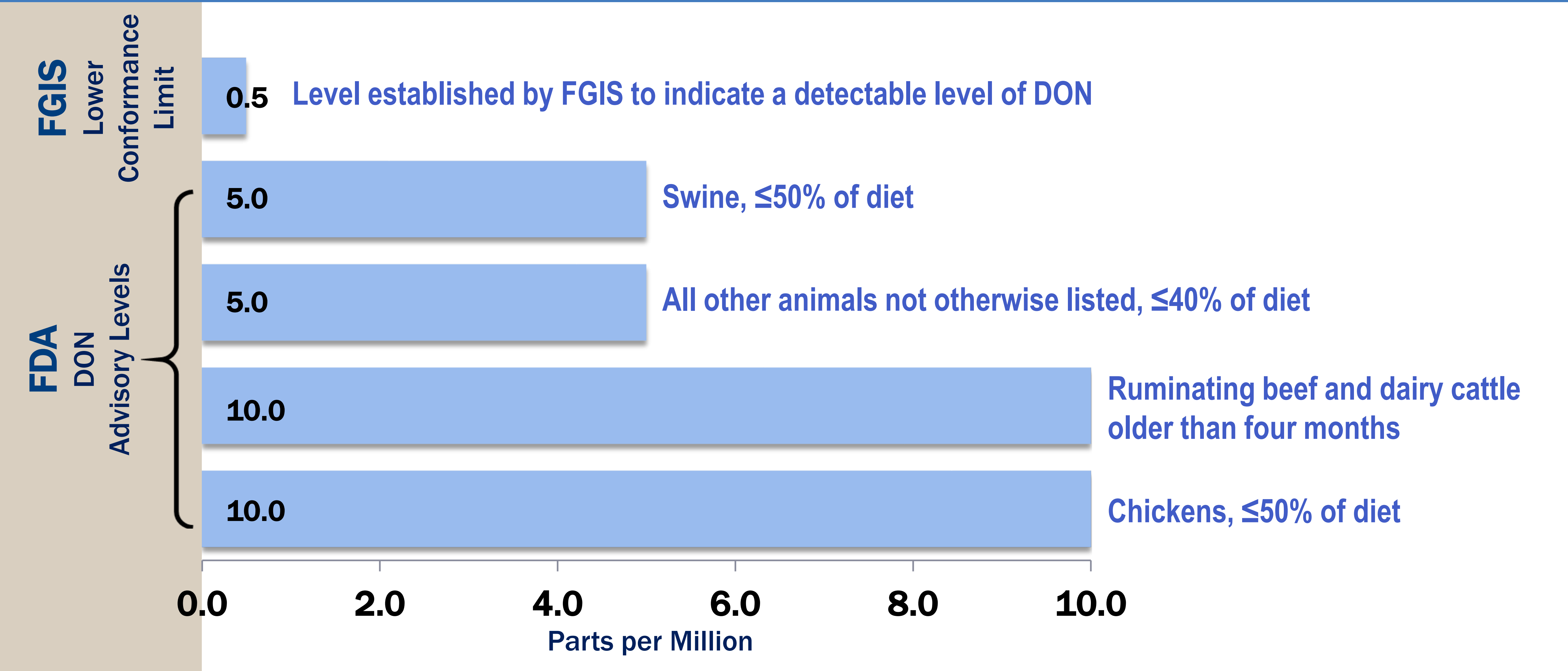
Growing season conditions not conducive to aflatoxin development in most areas



Aflatoxin Testing Results (ppb)



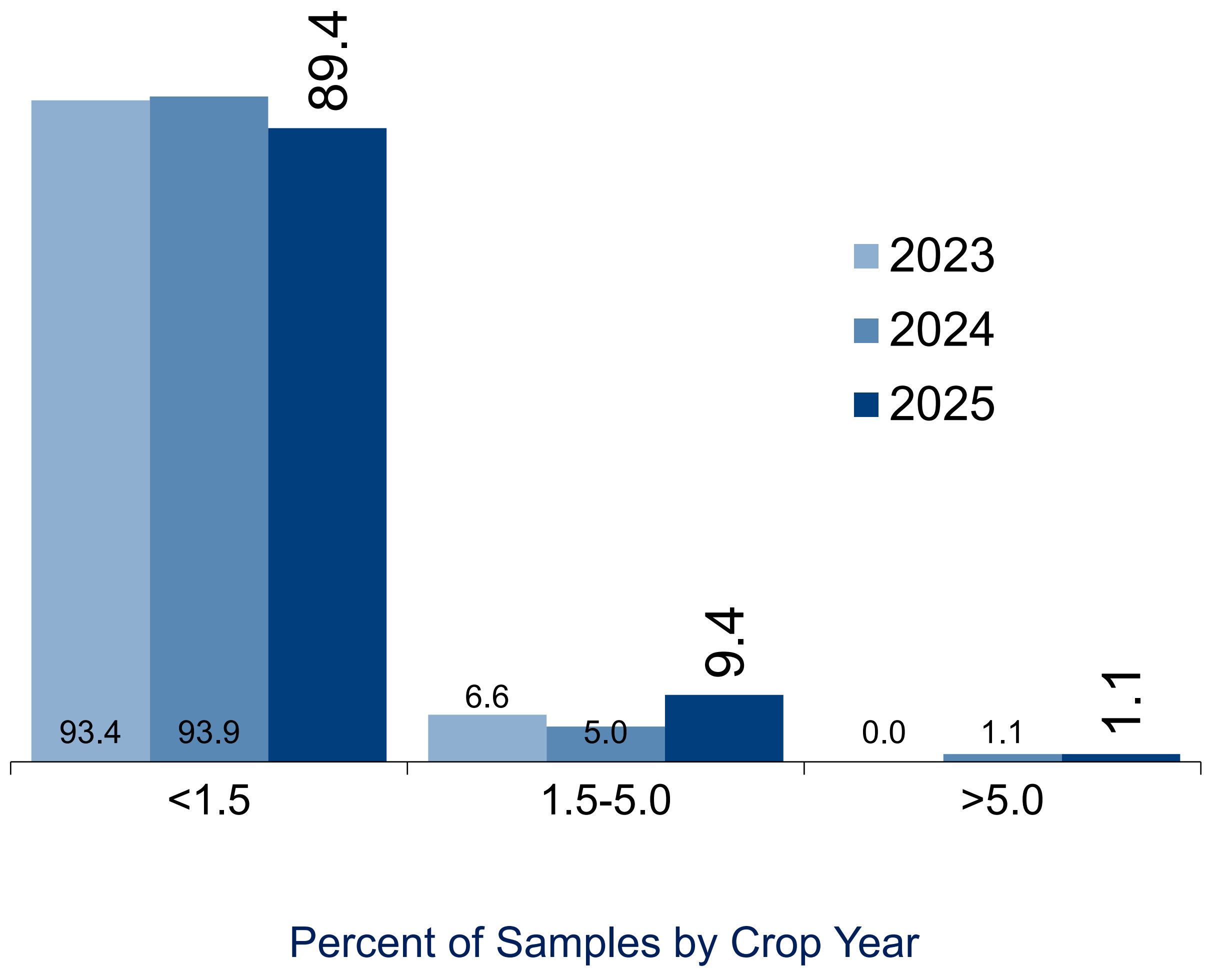
Key DON Levels (ppm)



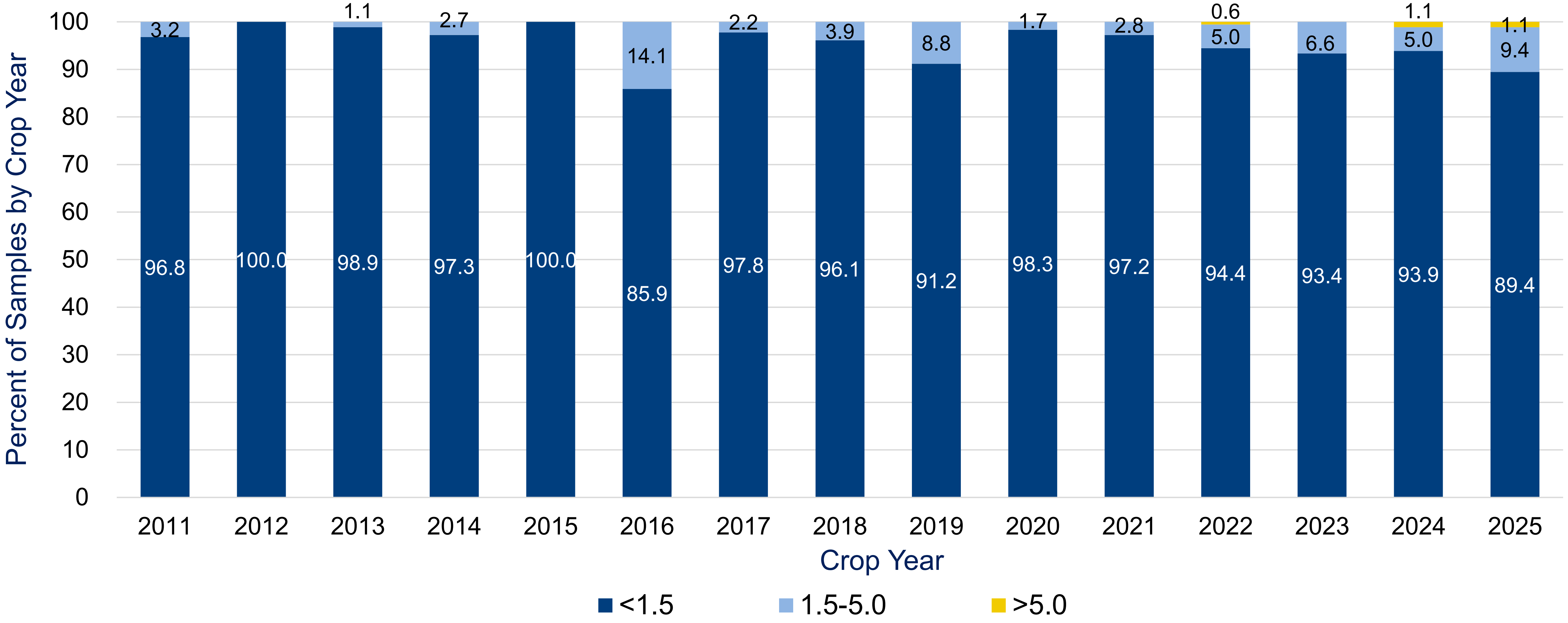
DON (Vomitoxin) Testing Results (ppm)

Percentage of samples below 1.5 ppm (89.4%) **lower** than 2024 and 2023

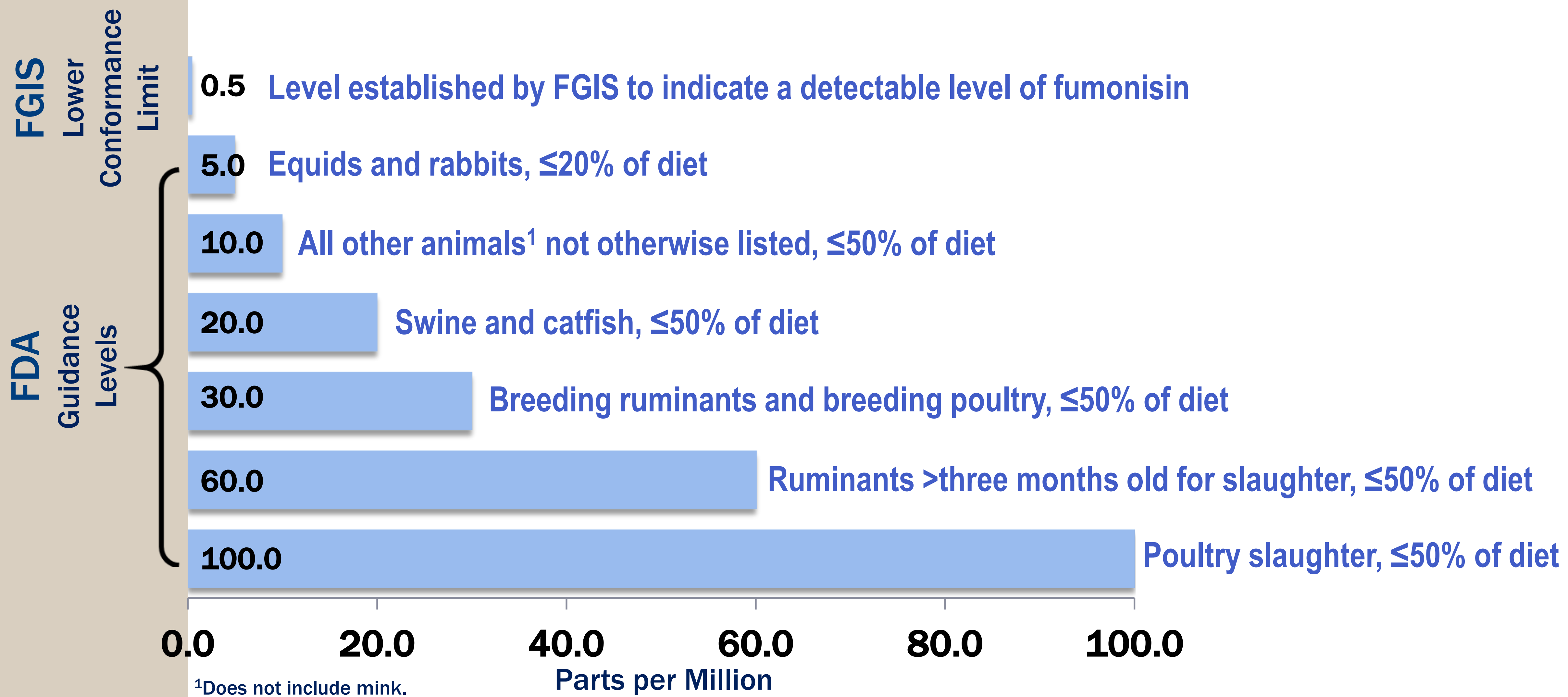
98.8% of samples did not exceed the FDA advisory level for DON of 5.0 ppm



DON (Vomitoxin) Testing Results (ppm)



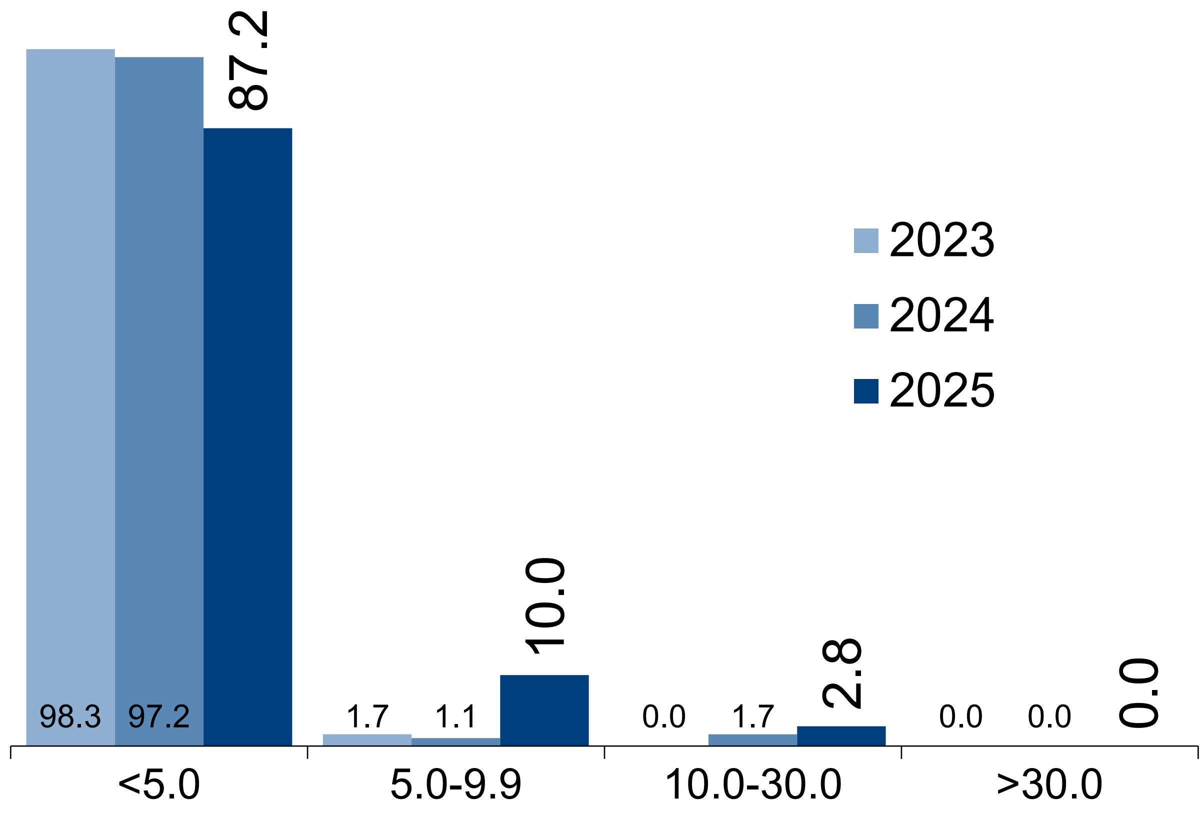
Key Fumonisin Levels (ppm)



[1]Does not include mink.

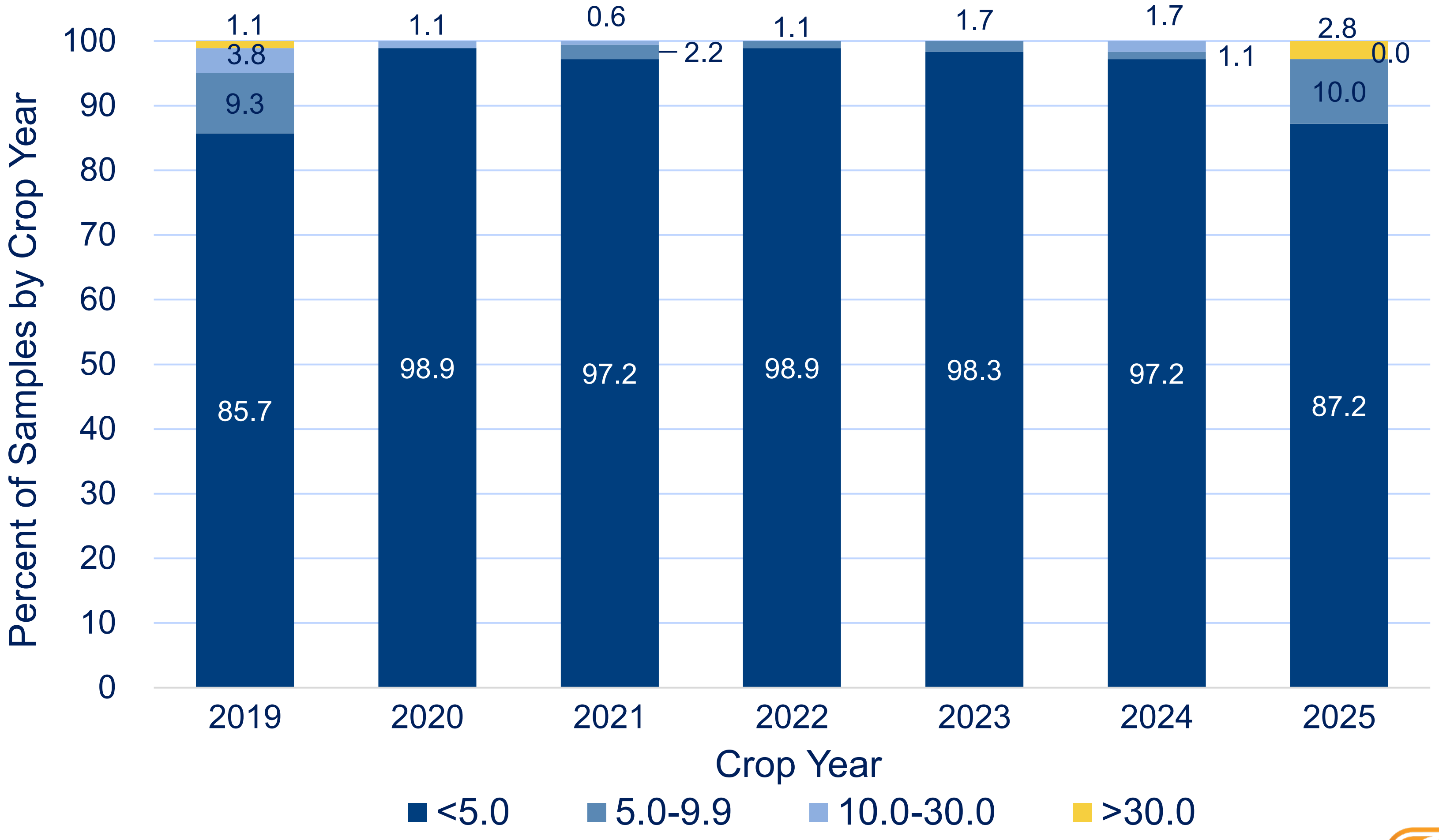
Fumonisin Testing Results (ppm)

Percentage of samples below 5.0 ppm (87.2%) **lower** than 2024 and 2023



Percent of Samples by Crop Year

Fumonisin Testing Results (ppm)



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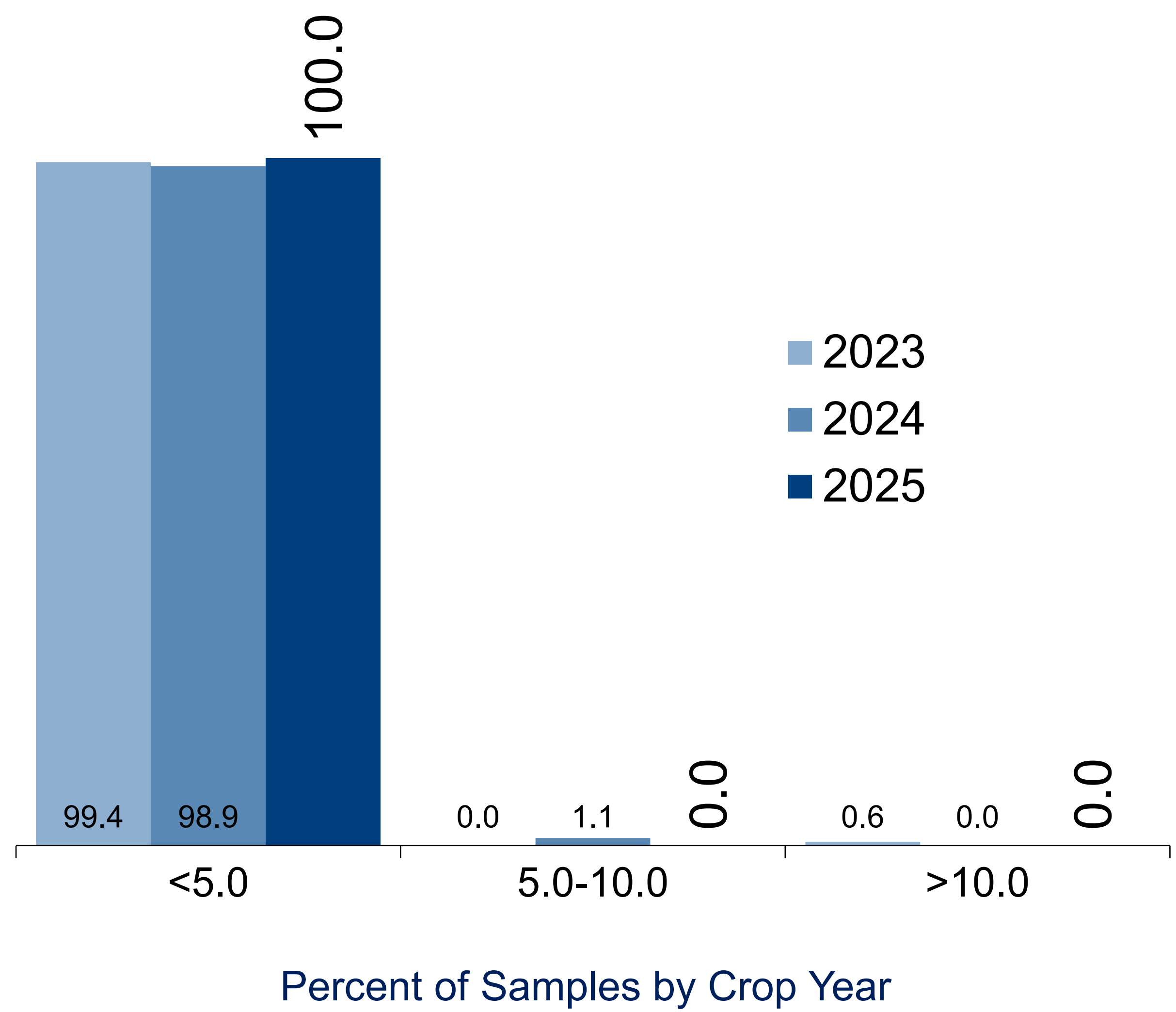
Ochratoxin A Testing Results (ppb)

Sixth year of
Ochratoxin A testing

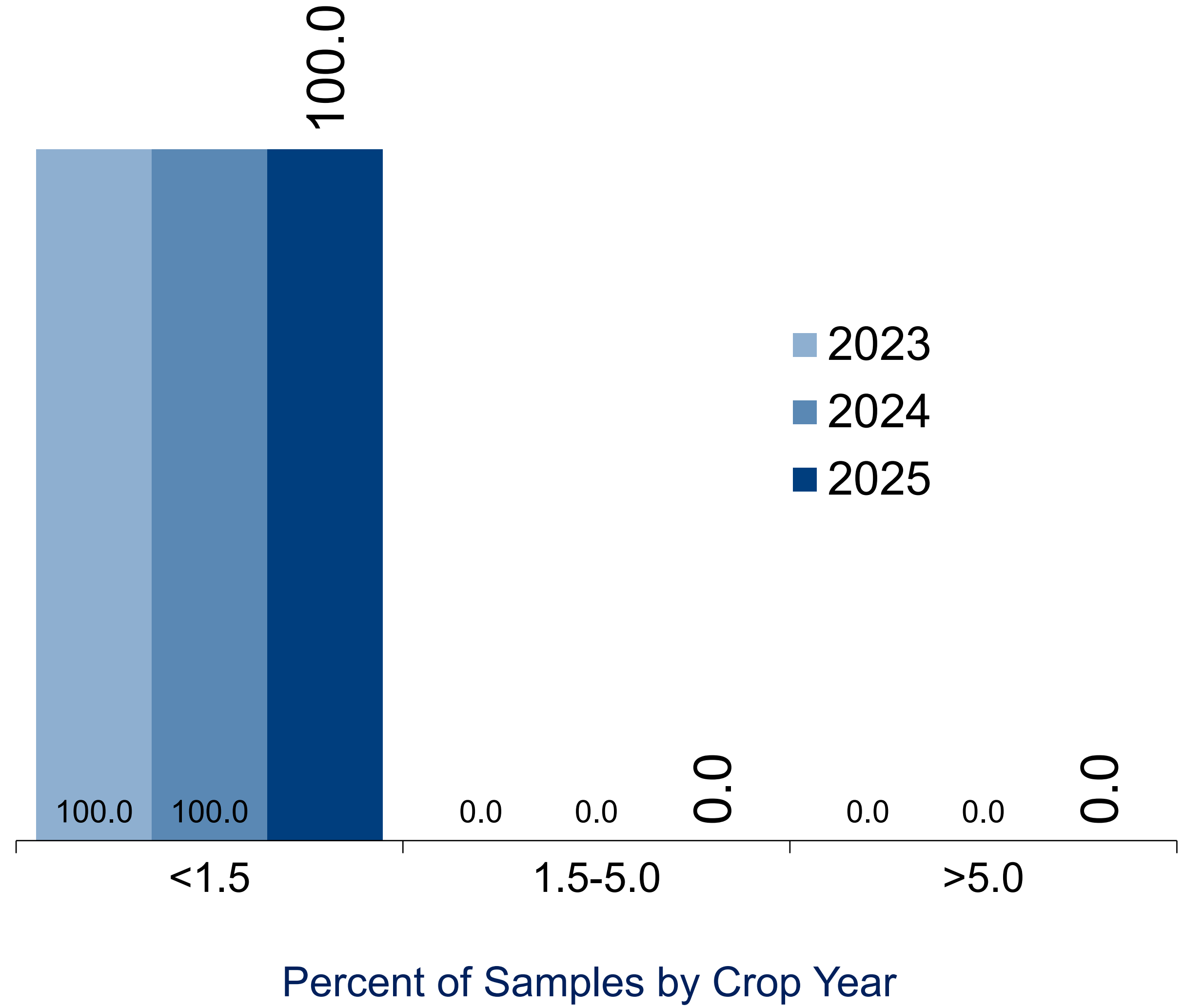
100.0% of samples
below 5.0 ppb
(European Commission's
established maximum level for
Ochratoxin A
in raw cereals.)



T-2 Testing Results (ppm)

Sixth year of T-2 testing

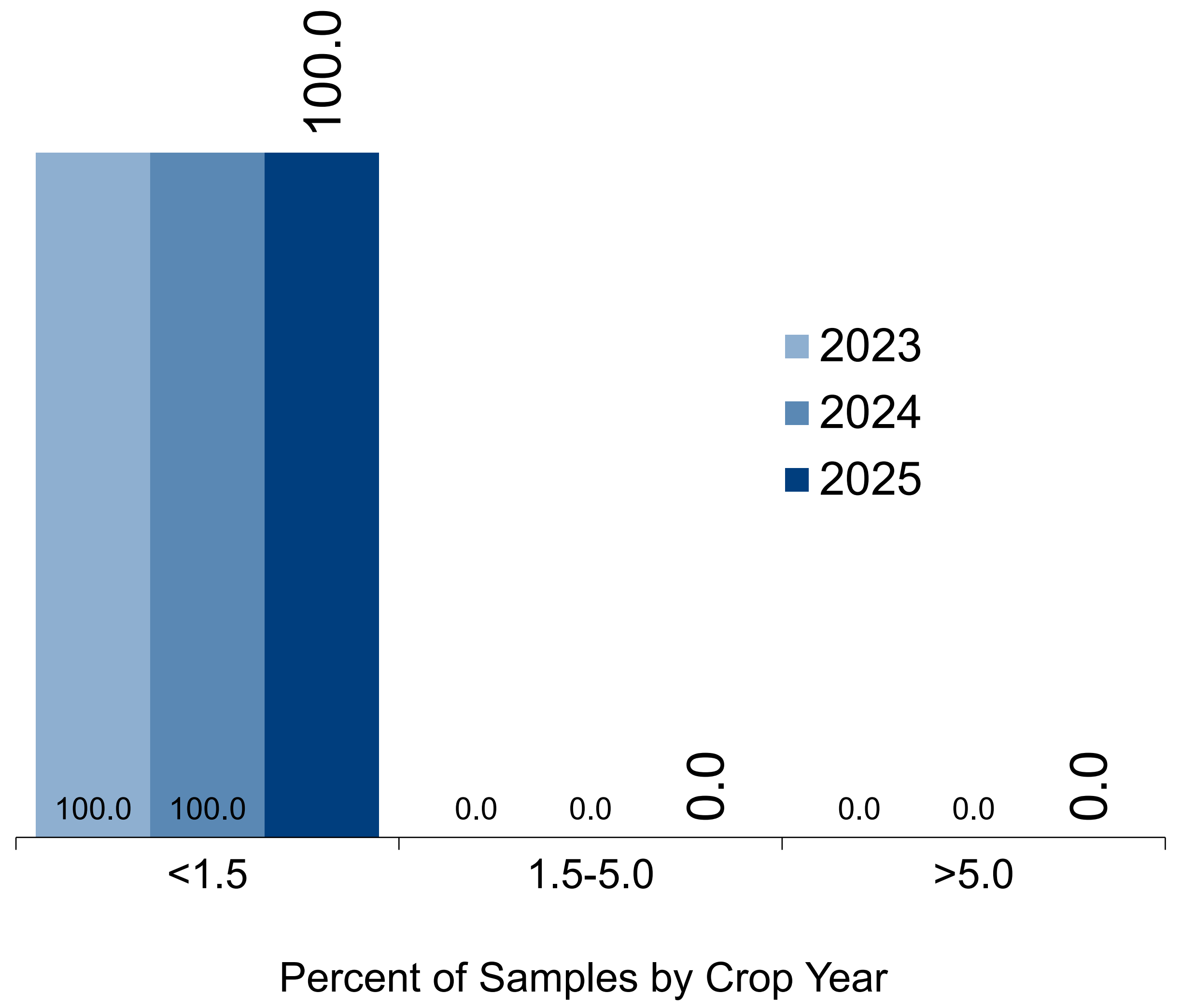
100% of samples
below 1.5 ppm



Zearalenone Testing Results (ppm)

Sixth year of Zearalenone testing

100% of samples below 1.5 ppm



Other Components of the Corn Harvest Quality Report

Other Components of the Report

- Quality Test Results
- Crop and Weather Conditions
- U.S. Corn Production, Usage and Outlook
- Survey and Statistical Analysis Methods
- Testing Analysis Methods
- Historical Perspective

Harvest Report: Conclusions

- 2025 harvest samples were, on average, good with **87.1%** of samples grading No. 1 or better, compared to **89.2%** in 2024 and **88.0%** in 2023.
- Average **BCFM** was the lowest value observed in the report's 15-year history, reflecting growing and harvesting conditions.
- **Test Weight, Moisture and Stress Cracks** were similar to or the same as the 5YA.
- **100-Kernel Weight** and **Kernel Volume** were both lower than the 5YA.
- The growing season was generally not conducive to **Aflatoxin** development, but some portions of the crop were susceptible to **DON** and **Fumonisin** development.

Building a Tradition

Thank You!

U.S. GRAINS & BIOPRODUCTS COUNCIL

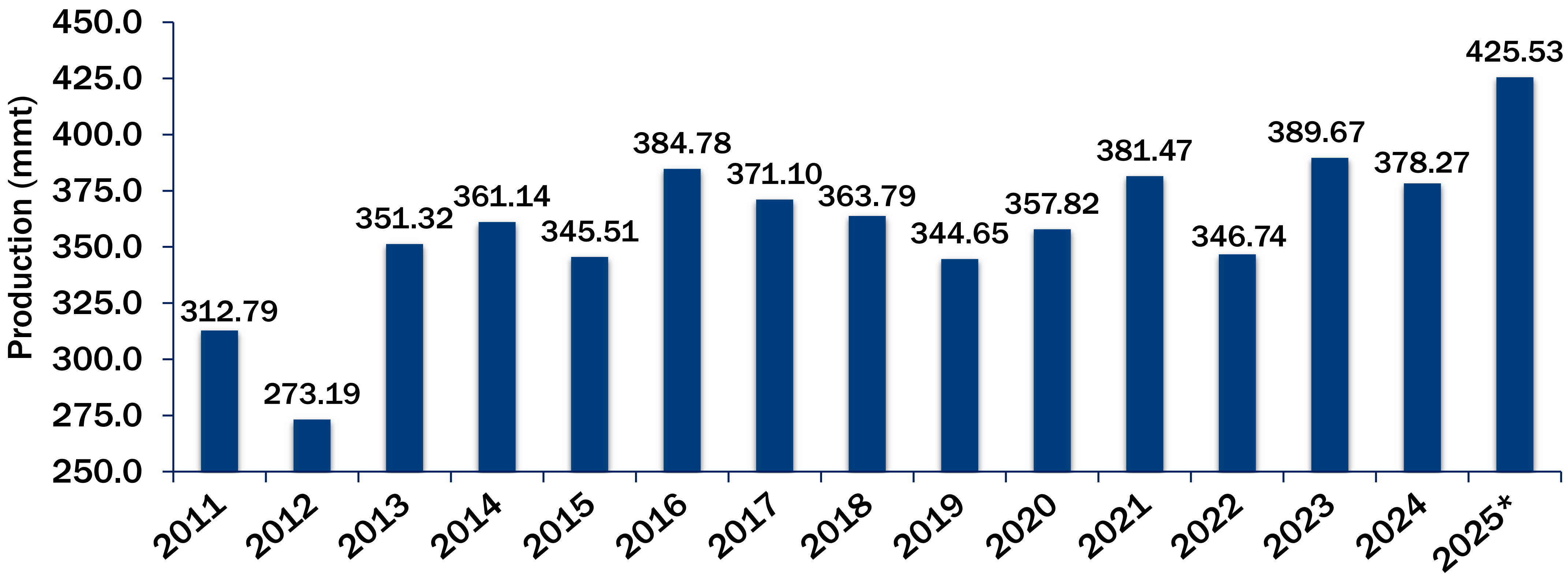
U.S. Grains Council 2025/2026 Corn Harvest Quality Report

SUPPLEMENTAL SLIDES

U.S. GRAINS & BIOPRODUCTS COUNCIL

U.S. Corn Production Supply & Demand Outlook

U.S. Corn Production (mmt)

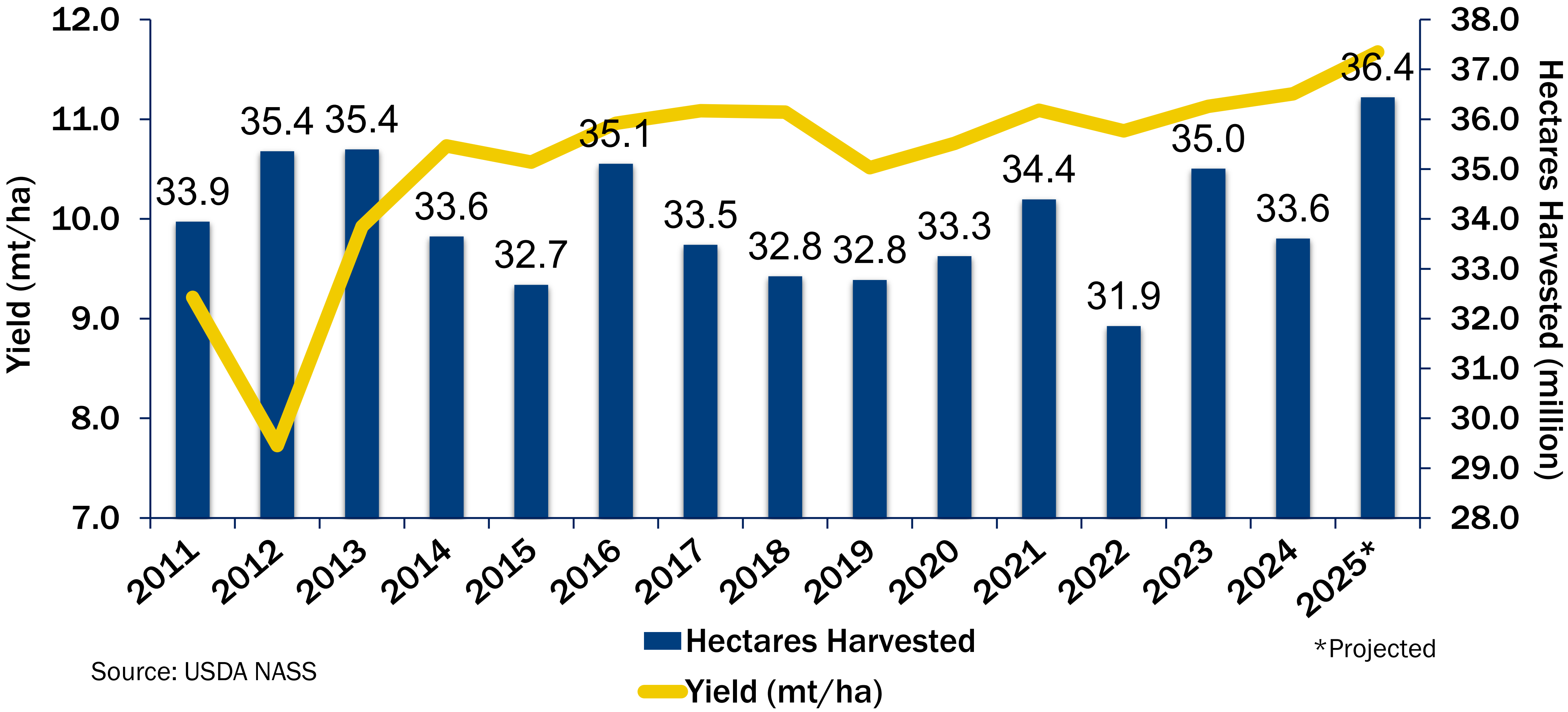


*Projected

Source: USDA NASS

Source: USDA NASS

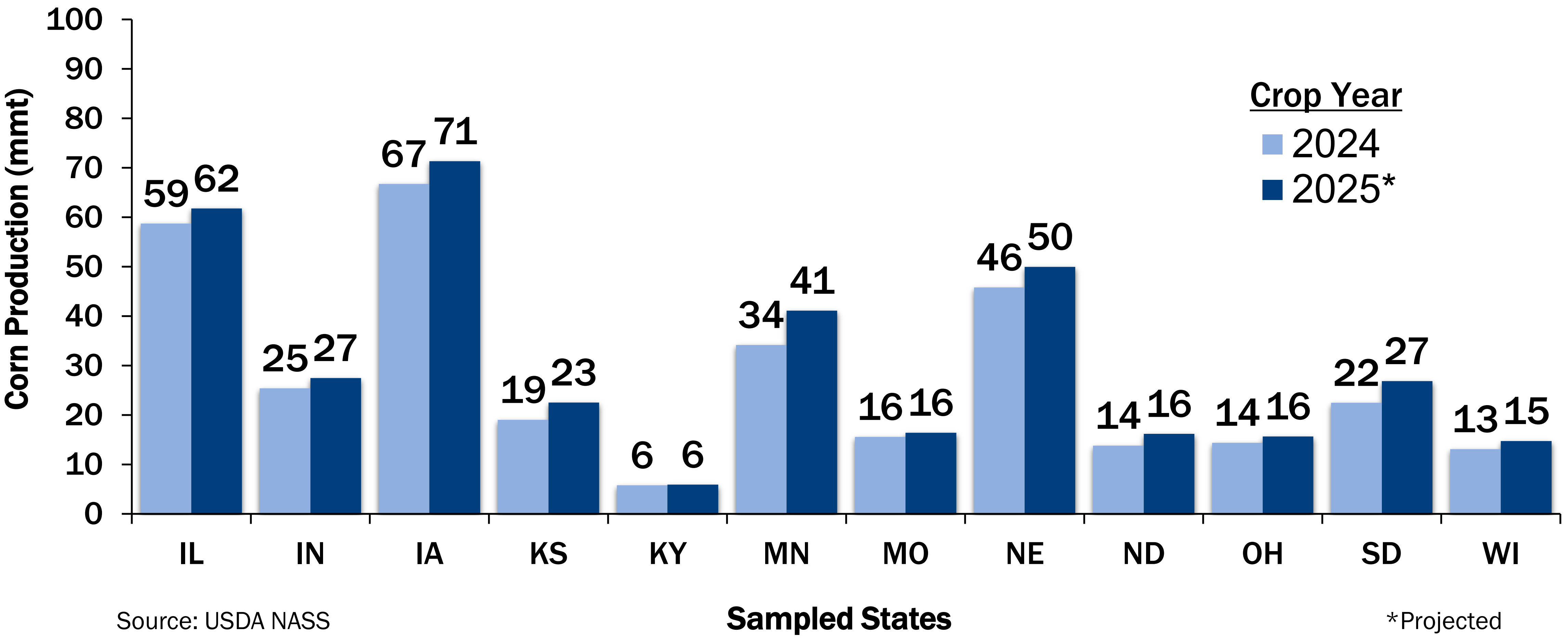
U.S. Production and Yield



Source: USDA NASS

*Projected

U.S. Production by State



Source: USDA NASS

*Projected

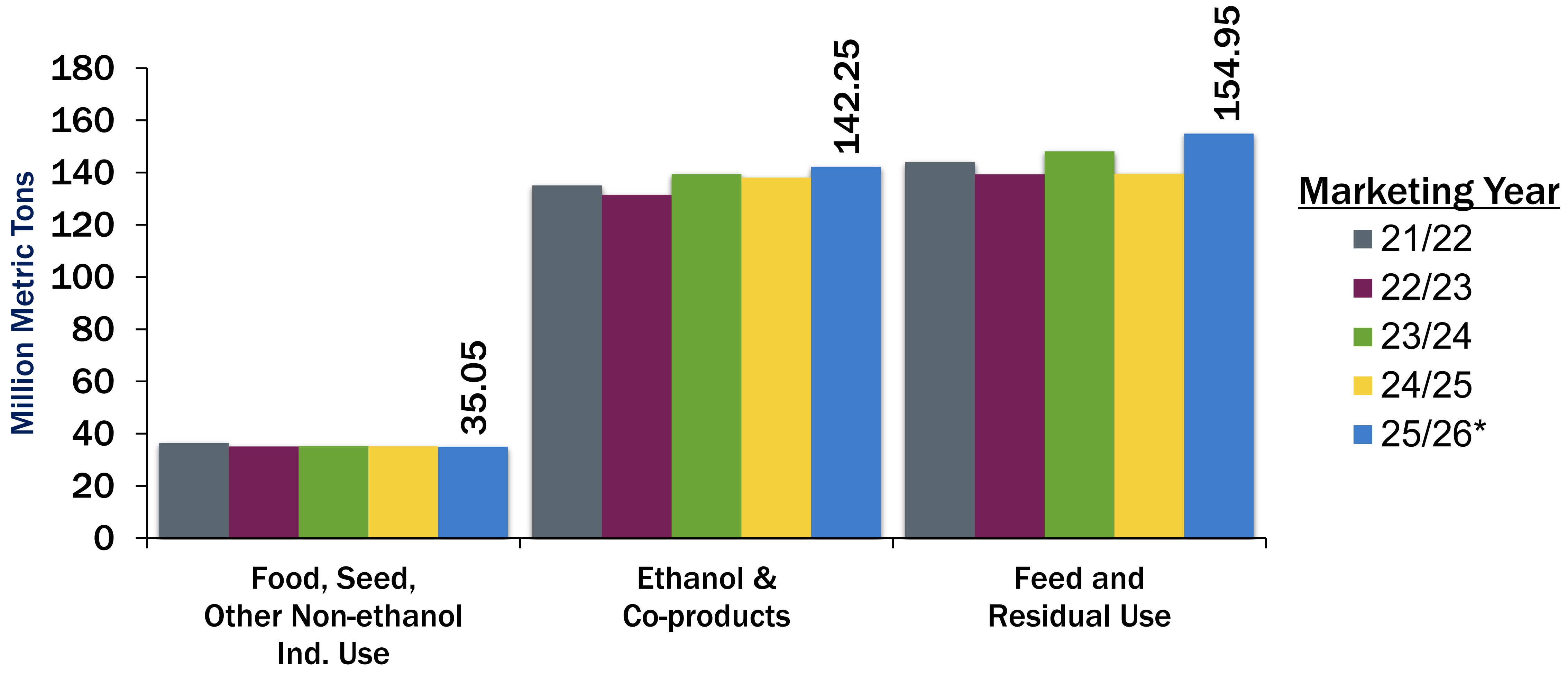
Surveyed State Production (MMT)

State	2024 (mmt)	2025 (mmt)*	Difference mmt	Difference Percent	Relative % Change† Acres	Relative % Change† Yield
Illinois	58.70	61.75	3.05	5.2%		
Indiana	25.40	27.47	2.07	8.2%		
Iowa	66.72	71.32	4.60	6.9%		
Kansas	19.00	22.53	3.52	18.5%		
Kentucky	5.79	5.92	0.13	2.2%		
Minnesota	34.16	41.08	6.92	20.2%		
Missouri	15.57	16.41	0.84	5.4%		
Nebraska	45.79	49.97	4.18	9.1%		
North Dakota	13.78	16.17	2.39	17.4%		
Ohio	14.39	15.67	1.28	8.9%		
South Dakota	22.45	26.85	4.40	19.6%		
Wisconsin	13.08	14.73	1.65	12.6%		
Total U.S.	**378.27**	**425.52**	**47.25**	**12.5%**		

†Green indicates 2025 is higher than in 2024; red indicates 2025 is lower than in 2024; bar height indicates the relative amount.
*Projected

Source: USDA NASS

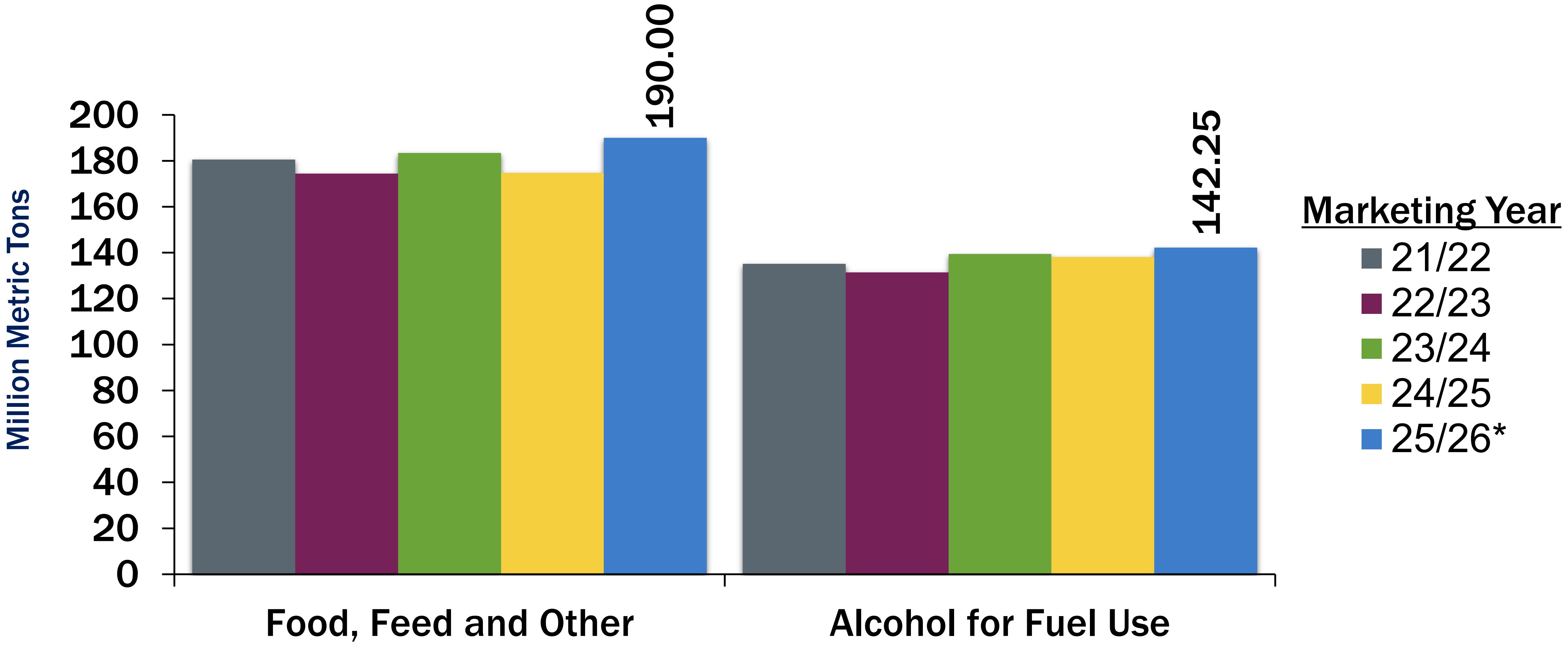
U.S. Production and Use



Source: USDA NASS

*Projected

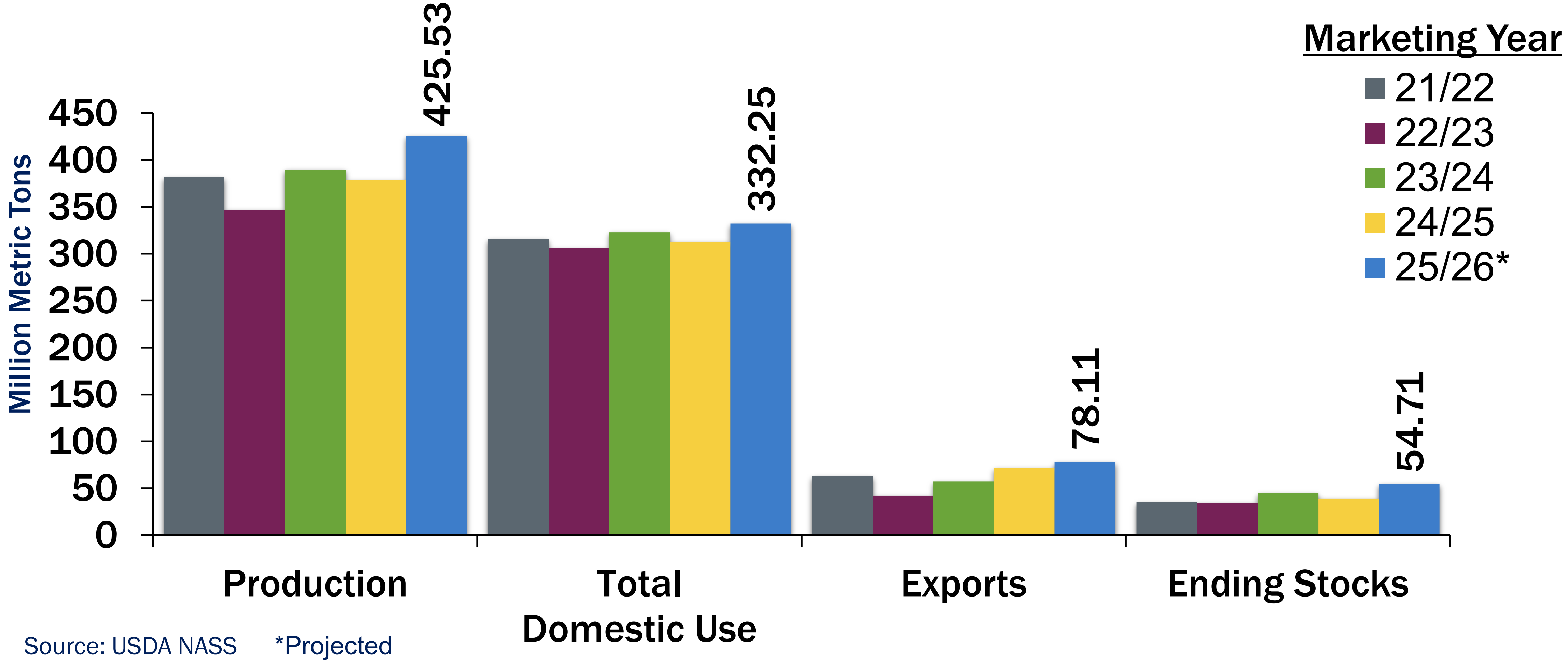
U.S. Domestic Corn Use



Source: USDA NASS

*Projected

U.S. Production and Disappearance



Source: USDA NASS *Projected

U.S. Corn Supply & Usage Summary (MMT)

	20/21	21/22	22/23	23/24	24/25	25/26*
Supply (million metric tons)						
Beginning Stocks	50.91	31.36	34.97	34.55	44.79	38.91
Production	357.82	381.47	346.74	389.67	378.27	425.53
Imports	0.62	0.62	0.98	0.72	0.51	0.64
Total Supply	409.35	413.44	382.70	424.94	423.58	465.08
Usage (million metric tons)						
Food, seed, other non-ethanol ind. use	36.55	36.50	35.12	35.32	35.18	35.05
Ethanol and co-products	127.71	135.12	131.47	139.42	138.08	142.25
Feed and residual	143.96	144.04	139.35	148.13	139.50	154.95
Exports	69.78	62.80	42.21	57.28	71.89	78.11
Total Use	377.99	378.47	348.15	380.15	384.65	410.36
Ending Stocks	31.36	34.97	34.55	44.79	38.91	54.71
Average farm price (dollar per metric ton†)	178.34	236.21	257.47	179.13	166.92	157.47

*Projected
†The average farm price for 25/26 based on WASDE November projected price

Source: USDA WASDE, November 2025

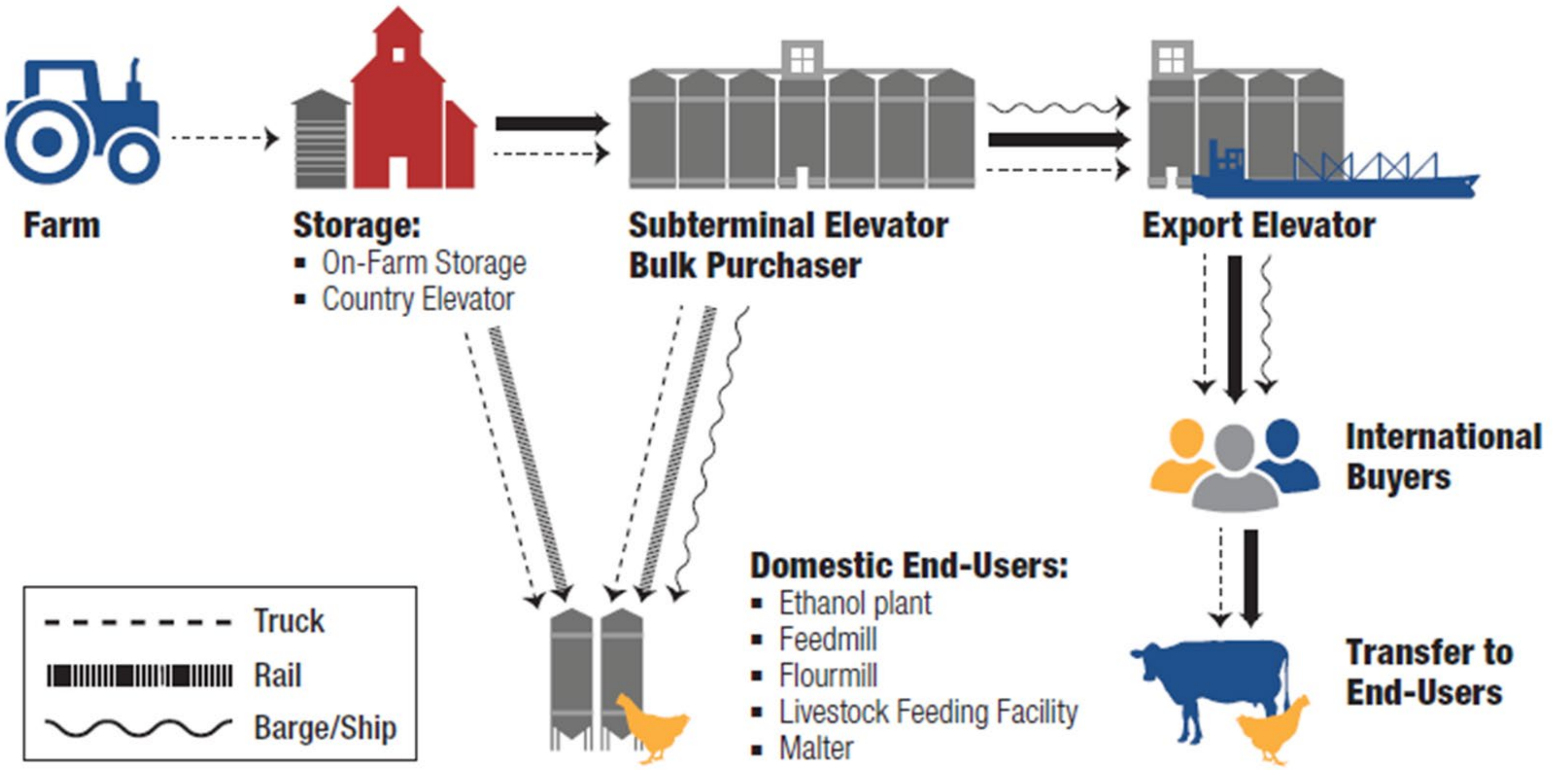
U.S. Corn Supply & Usage Summary (Bushels)

	20/21	21/22	22/23	23/24	24/25	25/26*
Supply (million metric tons)						
Beginning Stocks	2,004	1,235	1,377	1,360	1,763	1,532
Production	14,087	15,018	13,651	15,341	14,892	16,752
Imports	24	24	39	28	20	25
Total Supply	16,115	16,277	15,066	16,729	16,675	18,309
Usage (million metric tons)						
Food, seed, other non-ethanol ind. use	1,439	1,437	1,382	1,391	1,385	1,380
Ethanol and co-products	5,028	5,320	5,176	5,489	5,436	5,600
Feed and residual	5,667	5,67	5,486	5,832	5,492	6,100
Exports	2,747	2,472	1,662	2,255	2,830	3,075
Total Use	14,881	14,900	13,706	14,966	15,143	16,155
Ending Stocks	1,235	1,377	1,360	1,763	1,532	2,154
Average farm price (dollar per metric ton†)	4.53	6.00	6.54	4.55	4.24	4.00

*Projected
†The average farm price for 25/26 based on WASDE November projected price

Source: USDA WASDE, November 2025

How Does U.S. Grain Move?



Testing Analysis Methods

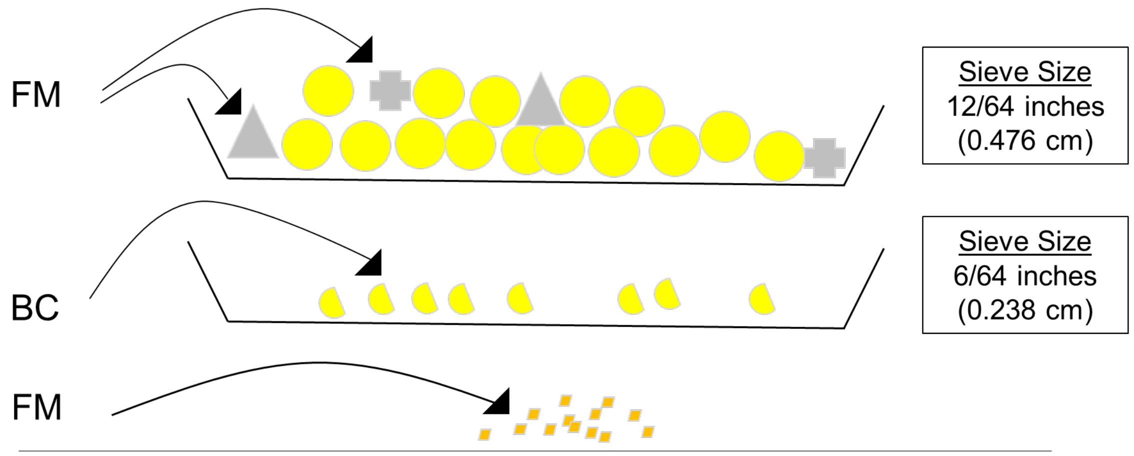
Test Weight (lb/bu or kg/hl)

Test weight is a measure of the volume of grain required to fill a Winchester bushel (2,150.42 cubic inches). Test weight is a part of the FGIS Official U.S. Standards for Corn grading criteria.

The test involves filling a test cup of known volume through a funnel held at a specific height above the test cup to the point where grain begins to pour over the test cup's sides. A strike-off stick is used to level the grain in the test cup, and the grain remaining in the cup is weighed. The weight is then converted to and reported in the traditional U.S. unit, pounds per bushel (lb/bu).

Broken Corn & Foreign Material (%)

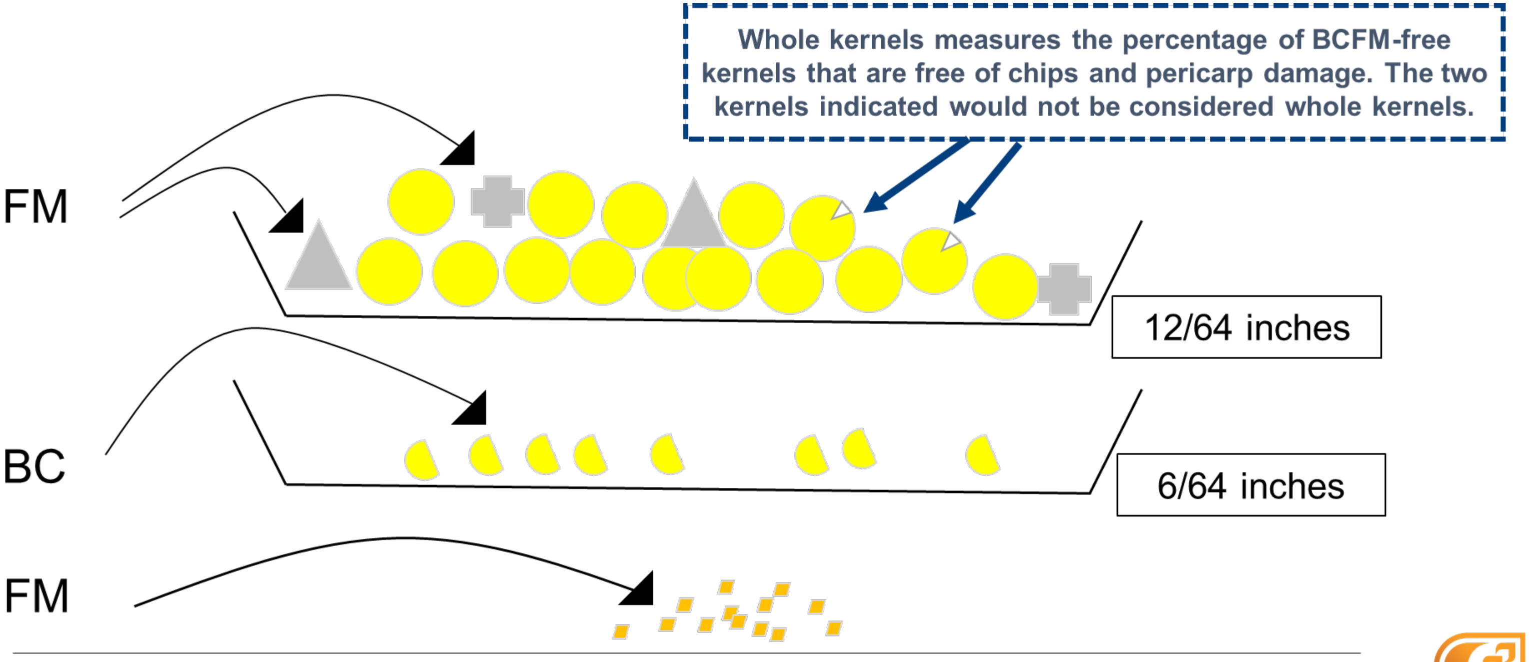
The BCFM test determines the amount of all matter that passes through a 12/64th-inch round-hole sieve and all matter other than corn that remains on the top of the sieve. BCFM measurement can be separated into broken corn and foreign material. Broken corn is defined as all material passing through a 12/64th-inch round-hole sieve and retained on a 6/64th-inch round-hole sieve. The definition of foreign material is all material passing through the 6/64th-inch round-hole sieve and the coarse non-corn material retained on top of the 12/64th-inch round-hole sieve. BCFM is part of the FGIS Official U.S. Standards for Grain and grading criteria and is reported as a percentage of the initial sample by weight.



*Measured as percent of weight

Whole Kernels (%)

In the whole kernels test, 50 grams of cleaned (BCFM-free) corn are inspected by the kernel. Cracked, broken or chipped grain, along with any kernels showing significant pericarp damage, are removed. The whole kernels are then weighed, and the result is reported as a percentage of the original 50-gram sample. Some companies perform the same test but report the "cracked & broken" percentage. A whole kernel score of 97.0% equates to a cracked & broken rating of 3.0%.



Total Damage and Heat Damage (%)

Total damage is part of the FGIS Official U.S. Standards for Grain grading criteria.

A trained and licensed inspector visually examines a representative working sample of 250 grams of BCFM-free corn for damaged kernels. Types of damage include blue-eye mold, cob rot, dryer-damaged kernels (different from heat-damaged kernels), germ-damaged kernels, heat-damaged kernels, insect-bored kernels, mold-damaged kernels, mold-like substance, silk-cut kernels, surface mold (blight), mold (pink Epicoccum) and sprout-damaged kernels. Total damage is reported as the weight percentage of the working sample that is total damaged grain.

Heat damage is a subset of total damage and consists of kernels and pieces of corn kernels that are materially discolored and damaged by heat. Heat-damaged kernels are determined by a trained and licensed inspector visually inspecting a 250-gram sample of BCFM-free corn. Heat damage, if found, is reported separately from total damage.

Moisture (%)

The moisture recorded by the elevators' electronic moisture meters at the time of delivery is reported. Electronic moisture meters sense an electrical property of grains called the dielectric constant that varies with moisture—the dielectric constant rises as moisture content increases.

Moisture is reported as a percent of total wet weight.

Chemical Composition

Protein, starch and oil (dry basis %) were determined using near-infrared transmission spectroscopy (NIR) proximate analysis. The technology uses unique interactions of specific wavelengths of light with each sample. It is calibrated to traditional chemistry methods to predict protein, oil and starch concentrations in the sample. This procedure is nondestructive to the corn.

Chemical composition tests for protein, oil and starch were conducted using a 550 to 600-gram sample in a whole-kernel Foss Infratec 1241 NIR instrument. The NIR was calibrated to chemical tests, and the standard errors of predictions for protein, oil and starch were about 0.22%, 0.26% and 0.65%, respectively.

Comparisons of the Foss Infratec 1229 used in Harvest Reports before 2016 to the Foss Infratec 1241 on 21 laboratory check samples showed the instruments averaged within 0.25%, 0.26% and 0.25% points of each other for protein, oil and starch, respectively. Results are reported on a dry basis percentage (percent of non-water material).

Stress Cracks (%)

Stress cracks are evaluated by using a backlit viewing board to accentuate the cracks. A sample of 100 intact kernels with no external damage is examined kernel by kernel. The light passes through the horneous or hard endosperm, so each kernel's stress crack damage can be evaluated. Kernels are sorted into two categories: (1) no cracks; (2) one or more cracks. Stress cracks, expressed as a percent, are all kernels containing one or more cracks divided by 100 kernels.

Lower levels of stress cracks are always better since higher stress cracks lead to more breakage in handling. Some end-users will specify by contract the acceptable level of cracks based on the intended use.

100-Kernel Weight (grams)

The 100-kernel weight is determined from the average weight of two 100-kernel replicates using an analytical balance that measures to the nearest 0.1 milligrams. The averaged 100-kernel weight is reported in grams.

Kernel Volume (cm^3)

The kernel volume for each 100-kernel replicate is calculated using a helium pycnometer and is expressed in cubic centimeters (cm^3) per kernel. Kernel volumes usually range from 0.14 cubic centimeters to 0.36 cubic centimeters per kernel for small and large kernels, respectively.

Kernel True Density (g/cm^3)

True density of each 100-kernel sample is calculated by dividing the mass (or weight) of the 100 externally sound kernels by the volume (displacement) of the same 100 kernels. The two replicate results are averaged. True density is reported in grams per cubic centimeter (g/cm^3). True densities typically range from 1.20 grams per cubic centimeter to 1.30 grams per cubic centimeter at "as is" moisture contents of about 12 to 15%.

Horneous (Hard) Endosperm (%)

The horneous (or hard) endosperm test is performed by visually rating 20 externally sound kernels, placed germ facing up, on a backlit viewing board. Each kernel is rated for the estimated portion of the kernel's total endosperm that is horneous endosperm. The soft endosperm is opaque and will block light, while the horneous endosperm is translucent. The rating is made from standard guidelines based on the degree to which the soft endosperm at the crown of the kernel extends down toward the germ.

The average of horneous endosperm ratings for the 20 externally sound kernels is reported. Ratings of horneous endosperm are made on a scale of 70 to 100%, though most individual kernels fall in the 70 to 90% range.

Mycotoxins

For this study, a 1,000-gram laboratory sample was subdivided from the two-kilogram survey sample of shelled kernels for the mycotoxin analysis. The one-kilogram survey sample was ground in a Romer Model 2A mill so that 60 to 75% would pass through a 20-mesh screen. From this well-mixed ground material, a 50-gram test portion was removed for each mycotoxin tested.

Extracts were tested using the EnviroLogix QuickTox lateral flow strips, and the QuickScan system quantified the mycotoxins.

The limit of detection is defined as the lowest concentration level that can be measured with an analytical method that is statistically different from measuring an analytical blank (absence of a mycotoxin). The limit of detection will vary among different types of mycotoxins, test kits and commodity combinations.

Mycotoxins (continued)

The EnviroLogix AQ 309 BG quantitative test kit used for the aflatoxin tests has a limit of detection of 2.7 parts per billion. Aflatoxin was extracted with buffered water (3:1).

For the DON tests, the AQ 304 BG quantitative test kit has a limit of detection of 0.1 parts per million. DON was extracted with water (5:1).

The EnviroLogix AQ 411 BG quantitative test kit used for the fumonisin tests has a limit of detection of 0.1 parts per million. Fumonisin was extracted with water (5:1).

Mycotoxins (continued)

The EnviroLogix AQ 113 BG quantitative test kit used for the ochratoxin A tests has a limit of detection of 1.5 parts per billion. The ochratoxin A was extracted with a grain buffer (five milliliters per gram).

For the T-2 tests, the AQ 314 BG quantitative test kit has a limit of detection of 50 parts per billion. T-2 was extracted with water (five milliliters per gram).

The EnviroLogix AQ 412 BG quantitative test kit used for the zearalenone tests has a limit of detection of 50 parts per billion. The zearalenone test uses a 25-gram test portion of corn. The zearalenone was extracted using a reagent of EB17 extraction powder and a water buffer of 75 milliliters per sample.

Other Supplemental Slides