



Impact of Climate Change on Food Safety

Aflatoxin and the Midwest drought of 2012

Tim Herrman

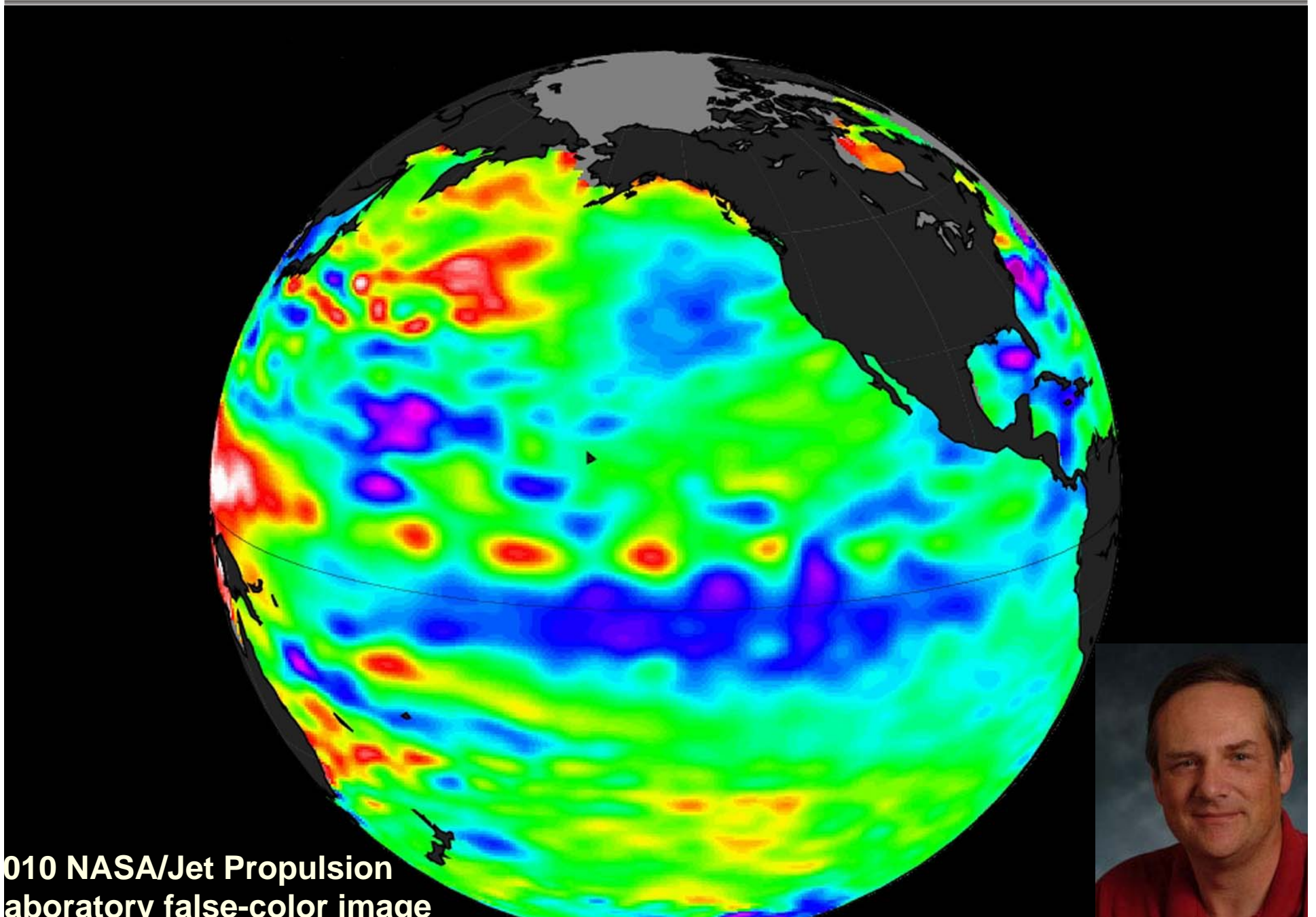
Professor, State Chemist, and Director

OFFICE OF THE TEXAS STATE CHEMIST

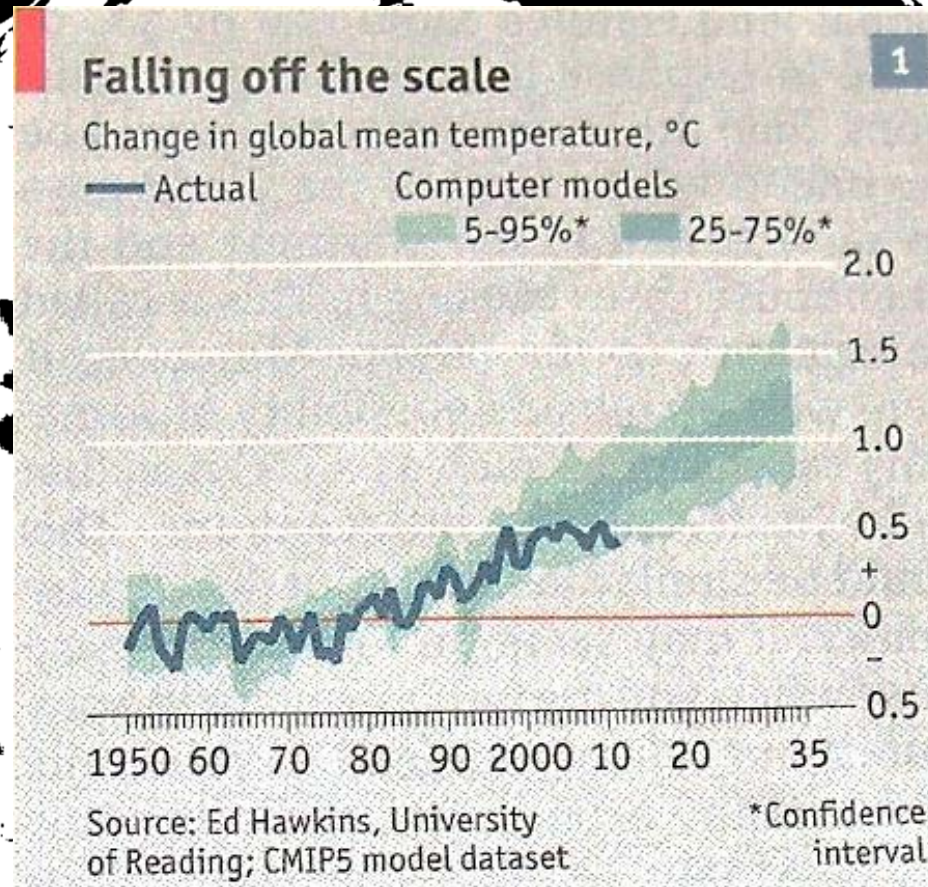
Texas Feed and Fertilizer Control Service • Agriculture Analytical Service

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RESEARCH

State Climatologist: Global surface temperatures likely to set a new record this year



State Climatologist: Global surface temperatures likely to set a new record this year



Texas
Extension Disaster Education Network (EDEN)

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Floods

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Thunderstorms,
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Tornadoes

Winter Storms



Home > Disaster Information > By the Type of Disaster > Naturally Occurring >

Droughts

A drought is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance. Droughts have wide-ranging adverse economic, environmental, and social impacts as rivers, reservoirs, groundwater levels, and soil moisture all drop.

Drought resources collected by Texas AgriLife Extension Service and organized by department:

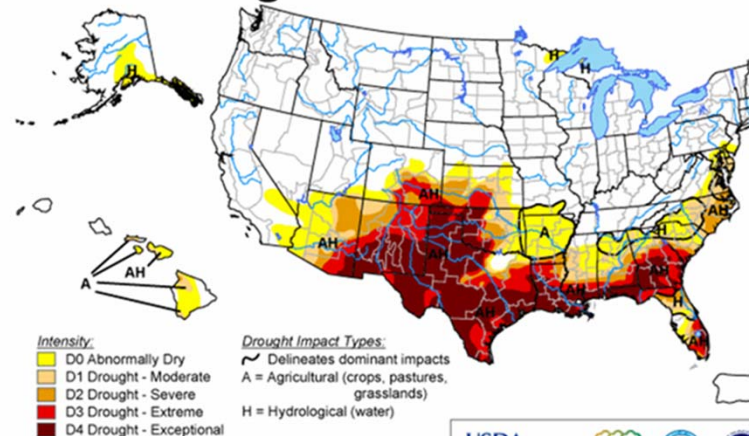
1. [Agricultural Economics](#)
2. [Animal Science](#)
3. [Ag Engineering](#)
4. [Ecosystem Science and Management \(Range & Forestry\)](#)
5. [Horticulture](#)
6. [Home Water Conservation](#)
7. [Soil & Crop Sciences](#)
8. [Veterinary Medicine](#)

Additional Resources by Texas AgriLife Extension Service:

1. [Water Education Network](#)
Texas AgriLife Extension Service
2. [Agricultural Drought Task Force](#)
Texas AgriLife Extension Service

U.S. Drought Monitor

June 28, 2011
Valid 8 a.m. EDT



Intensity:
 D0 Abnormally Dry
 D1 Drought - Moderate
 D2 Drought - Severe
 D3 Drought - Extreme
 D4 Drought - Exceptional

Drought Impact Types:
 ~ Delineates dominant impacts
 A = Agricultural (crops, pastures, grasslands)
 H = Hydrological (water)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



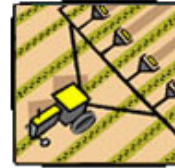
Released Thursday, June 30, 2

Author: Richard Heim/Liz Love-Brotak, NOAA/NESDIS/N

BEST MANAGEMENT PRACTICES TO Prevent or Reduce Mycotoxin Contamination in Texas

MANAGEMENT PRACTICES

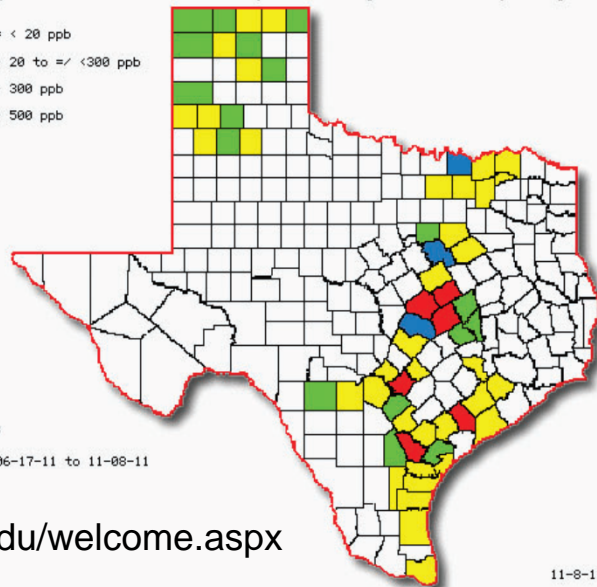
- Introduction
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Highest Level of Aflatoxin in Corn Sampled & Tested by OTSC - 2011 Crop Year By County

- - < 20 ppb
- - > 20 to <= 300 ppb
- - > 300 ppb
- - > 500 ppb

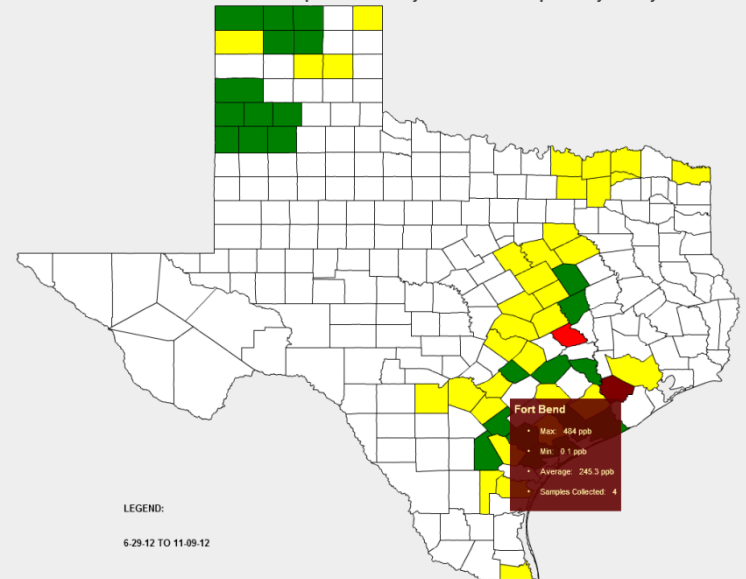
LEGEND:
06-17-11 to 11-08-11



11-8-11

Level of Aflatoxin in Corn Sampled & Tested by OTSC - 2012 Crop Year by County

LEGEND:
6.29.12 TO 11.09.12





UNITED STATES DEPARTMENT OF LABOR

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION

www.OSHA.gov

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Search OSHA



Chemical Sampling Information

Aflatoxin(B₁)

General Description

OSHA IMIS Code Number: A165

Chemical Abstracts Service (CAS) Registry Number: 1162-65-8

Health Factors

International Agency for Research on Cancer (IARC) carcinogenic classification: [Group 1, carcinogenic to humans](#)

Health Effects: LD50 (oral, rat) 5 mg/kg

Monitoring Methods used by OSHA

Laboratory Sampling/Analytical Method:

- **note:** Call SLTC for sampling instructions for all Aflatoxins.
article: Goto, Tetsuhisa; Journal of Chromatography, 447 (1988) 410-4.
analytical condition: GC/FID, column- 15m 0.25µm DB-5, temperature 50-300°C at 15° C/min. "When the initial temperature of the column and injector was higher than 60°C, all

Safety and Health Topics

Chemical Sampling Information:

Aflatoxin(B₁)

- [General Description](#)
- [Health Factors](#)
- [Monitoring](#)

Page last updated:
02/17/2006

Aflatoxicosis

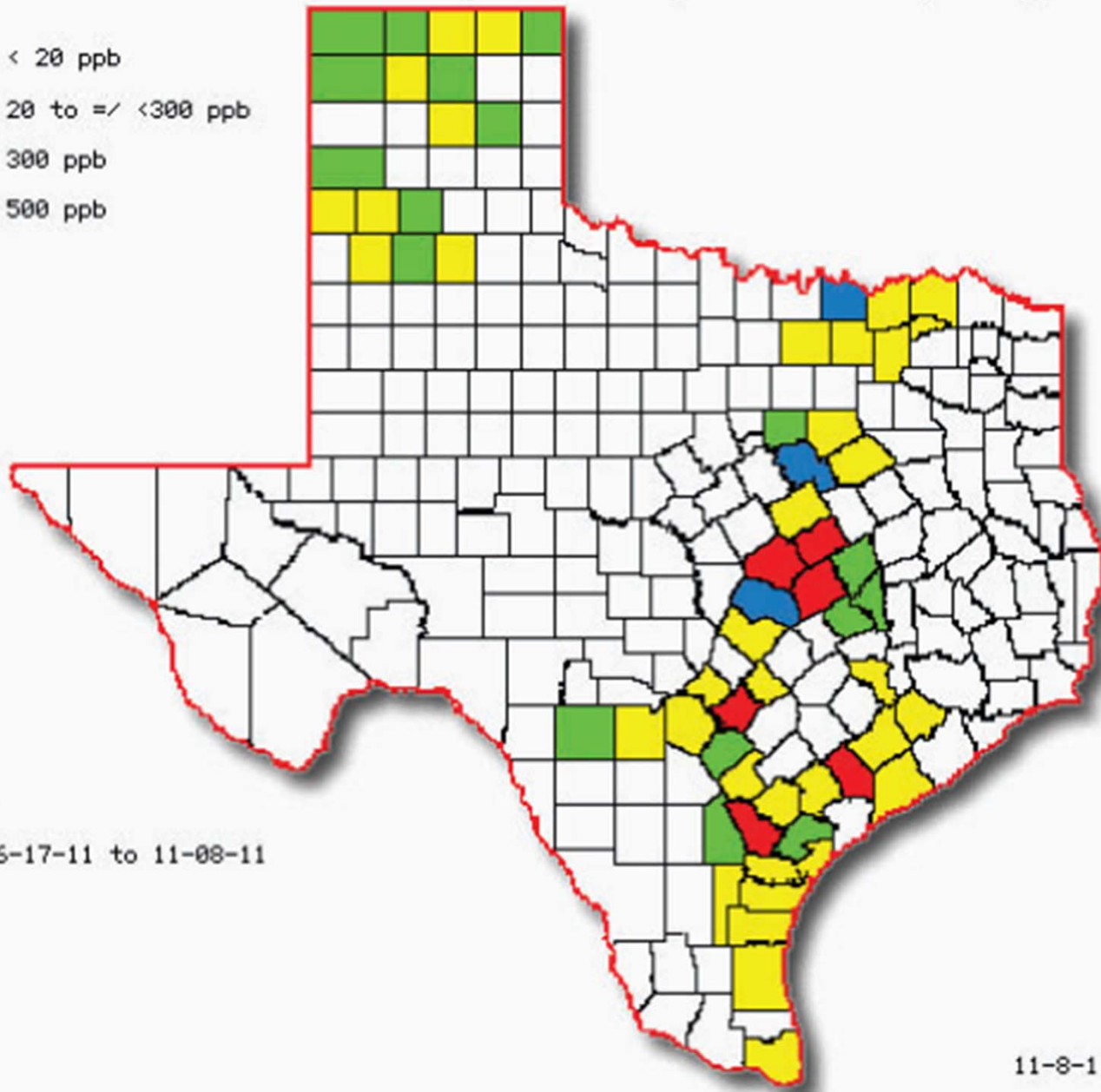


FDA Aflatoxin Action Levels

ppb	Product Description
20	Corn, peanut products, cottonseed meal, and other animal feeds and feed ingredients intended for dairy animals, for animal species or uses not specified above, or when the intended use is not known
20	Corn, peanut products, and other animal feeds and feed ingredients, but excluding cottonseed meal, intended for immature animals
100	Corn and peanut products intended for breeding beef cattle, breeding swine, or mature poultry
200	Corn or peanut products intended for finishing swine of 100 pounds or greater
300	Corn and peanut products intended for finishing (i.e., feedlot) beef cattle

Highest Level of Aflatoxin in Corn Sampled & Tested by OTSC - 2011 Crop Year By County

- - = < 20 ppb
- - > 20 to =/ < 300 ppb
- - > 300 ppb
- - > 500 ppb

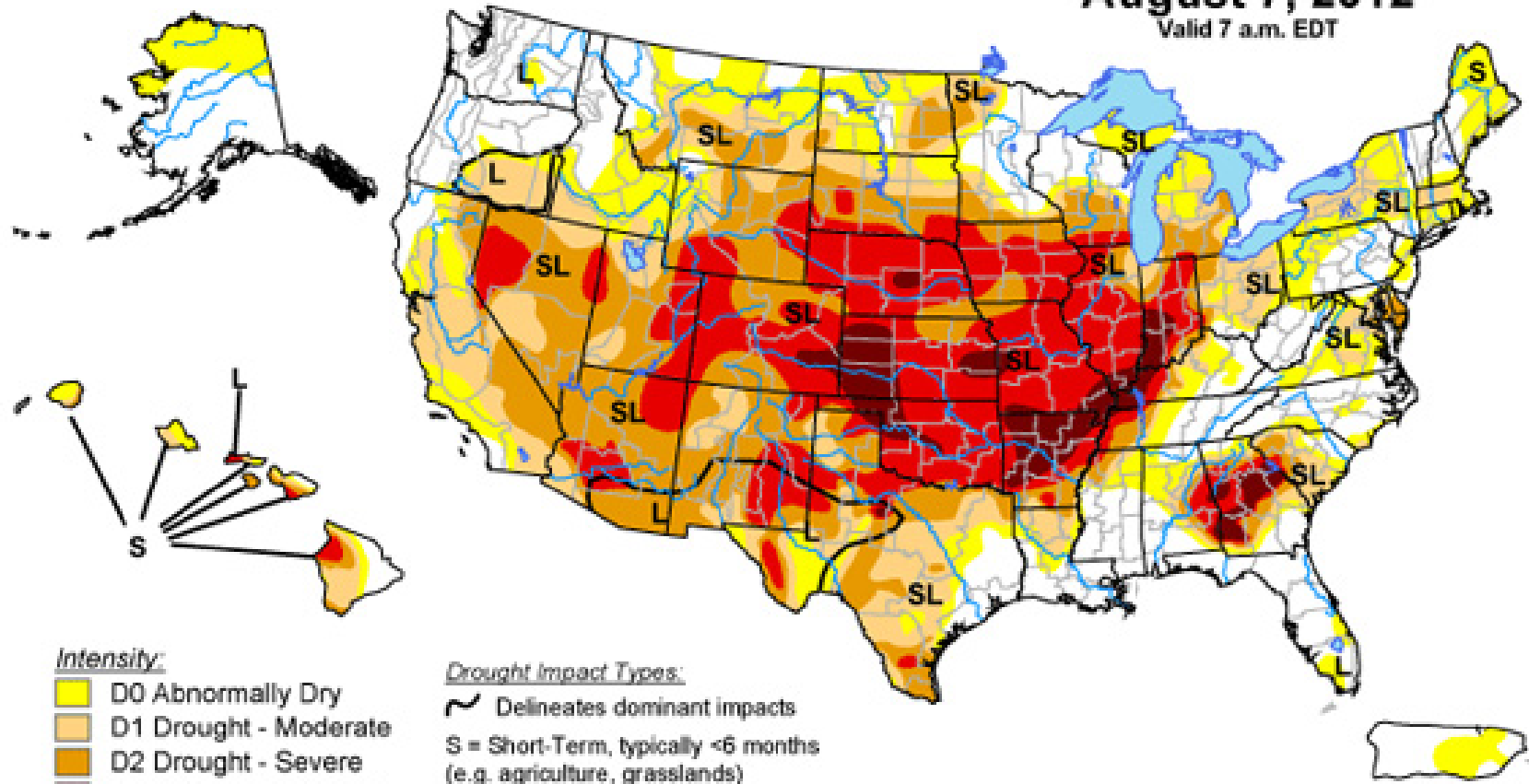


LEGEND:

06-17-11 to 11-08-11

11-8-11

August 7, 2012
Valid 7 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- Delineates dominant impacts
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



2012 Blending Waivers for Aflatoxin Contaminated Corn

[Home](#) |
 [Blending Agreements](#) |
 [Risk Assessment](#) |
 [Aflatoxin Levels](#) |
 [Aflatoxin Binders](#)

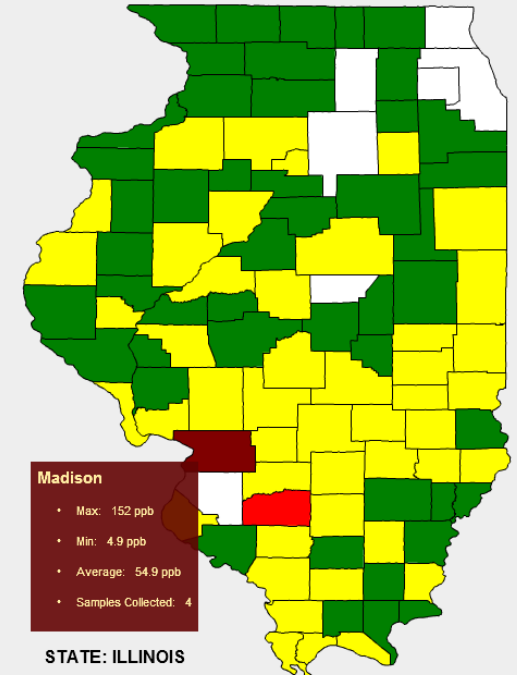
Aflatoxin Blending Agreements

Updated 10/8/12

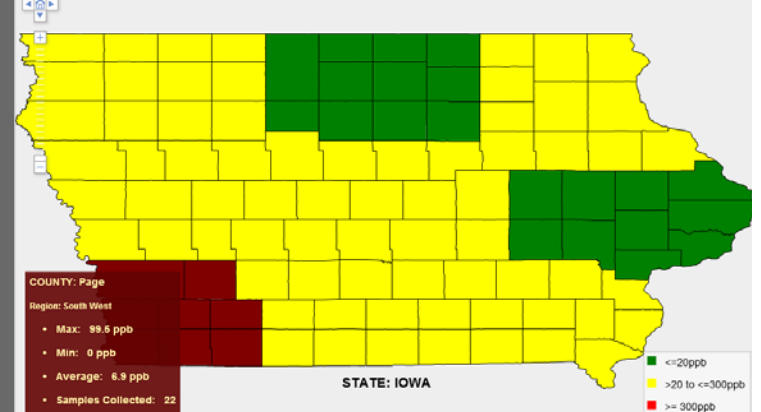
Comparison of Agreements

State	Contact	Agreements & Supporting Documents	Expires	Number of Certified Blending Locations	Aflatoxin Data
Illinois	Robert Flider Illinois Department of Agriculture (217) 782-3817 agr.pio@illinois.gov	Waiver Approval Compliance Agreement	12/31/12		10/12/12
Indiana	Joseph Kelsay Indiana State Department of Agriculture (317) 232-8870 jkelsay@isda.in.gov	Waiver Approval Compliance Agreement	9/30/13		
Iowa	Richard Wahl Iowa Department of Agriculture and Land Stewardship (515) 281-5324 Richard.Wahl@IowaAgriculture.gov	Waiver Request Industry Memorandum Compliance Agreement	10/31/12		
Kansas	Dale Rodman Kansas Department of Agriculture (785) 296-3556 ksag@kda.ks.gov	Announcement Compliance Agreement Sample Form Instructions for Compliance	12/31/12		
	Darrell Johnson	Waiver Approval			

Level of Aflatoxin in Corn Sampled & Tested by IL Dept. of Ag - 2012 C



Level of Aflatoxin in Corn Sampled & Tested by IA Dept. of Ag - 2012 Crop Year by Region





IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP

Bill Northey, Secretary of Agriculture

MEMEORANDUM

DATE: September 17, 2012

TO: Entities seeking a 2012 Aflatoxin FDA Blending Waiver Compliance Agreement

FROM: Iowa Department of Agriculture and Land Stewardship (IDALS)

On September 17, 2012, the US Food and Drug Administration (FDA) granted IDALS' request to allow blending corn containing aflatoxin levels of more than 20 ppb with corn containing aflatoxin levels of less than 20 ppb for use in appropriate animal feed. The FDA's waiver requires entities to enter a Compliance Agreement (CA) with IDALS **before** they begin to utilize the terms of the Waiver. The procedure developed by IDALS to facilitate the distribution and execution of the CA is as follows:

- 1. Each legal entity utilizing the FDA Blending Waiver will need to obtain a CA.**
- IDALS will post the CA on the www.iowaAgriculture.gov, and IDALS' Grain Warehouse Bureau (GWB) will email a CA form to all Iowa licensed grain dealers for whom the GWB has an email address. The GWB will mail via US mail a CA form to all other Iowa licensed grain dealers.

FDA Blending Provisions

The above-referenced Blending Firm hereby agrees that it shall comply with following conditions when blending corn containing aflatoxin in concentrations of higher than 20 ppb (parts per billion) and less than 500 ppb with corn containing aflatoxin in concentrations of less than 20 ppb:

a. Corn contaminated with aflatoxin above 20 ppb may be blended with other corn to the extent that the resulting product is below the appropriate aflatoxin action level in corn used as or in animal feed. The blended corn will be shipped in interstate commerce or for use as or in feed for mature poultry, breeding swine, and finishing swine over 100 pounds, breeding cattle and finishing (feedlot) cattle as long as the aflatoxin levels are below the action levels set forth in FDA Guidance Document, Compliance Policy Guide- Section 683.100, "Action Levels for Aflatoxin in Animal Feeds."

b. Once the blending operation is completed, each batch of blended corn will be analyzed to determine its aflatoxin level. The analysis shall be performed using US Department of Agriculture Grain Inspection, Packers & Stockyards Administration (GIPSA) approved sampling and analysis protocols and testing procedures. Prior to the use of the blended corn, and before shipment in interstate commerce, the seller will certify that the aflatoxin level of the blended batch does not exceed the action level for the appropriate intended species.

c. The Seller of corn blended pursuant to this process will provide the purchaser with a copy of the analytical results generated from the process described in subparagraph "b". In addition, the seller will obtain written assurance from the purchaser that blended corn will be used as or in feed for mature poultry, breeding swine, finishing swine over 100 pounds, breeding cattle and finishing (feedlot) cattle pursuant to the terms of Compliance Policy Guide-Section 683.100.

d. The blended corn will be clearly identified and labeled for animal feed use only.

e. Corn containing aflatoxin levels greater than 500 ppb cannot be blended.

Risk Analysis

- There are no "knowns." There are things we know that we know. There are known unknowns. That is to say there are things that we now know we don't know. But there are also unknown unknowns. There are things we do not know we don't know.

*Donald Rumsfeld, United States Secretary of Defense
Press Conference at NATO Headquarters, Brussels, Belgium, June 6,
2002*

Aflatoxin Testing Proficiency

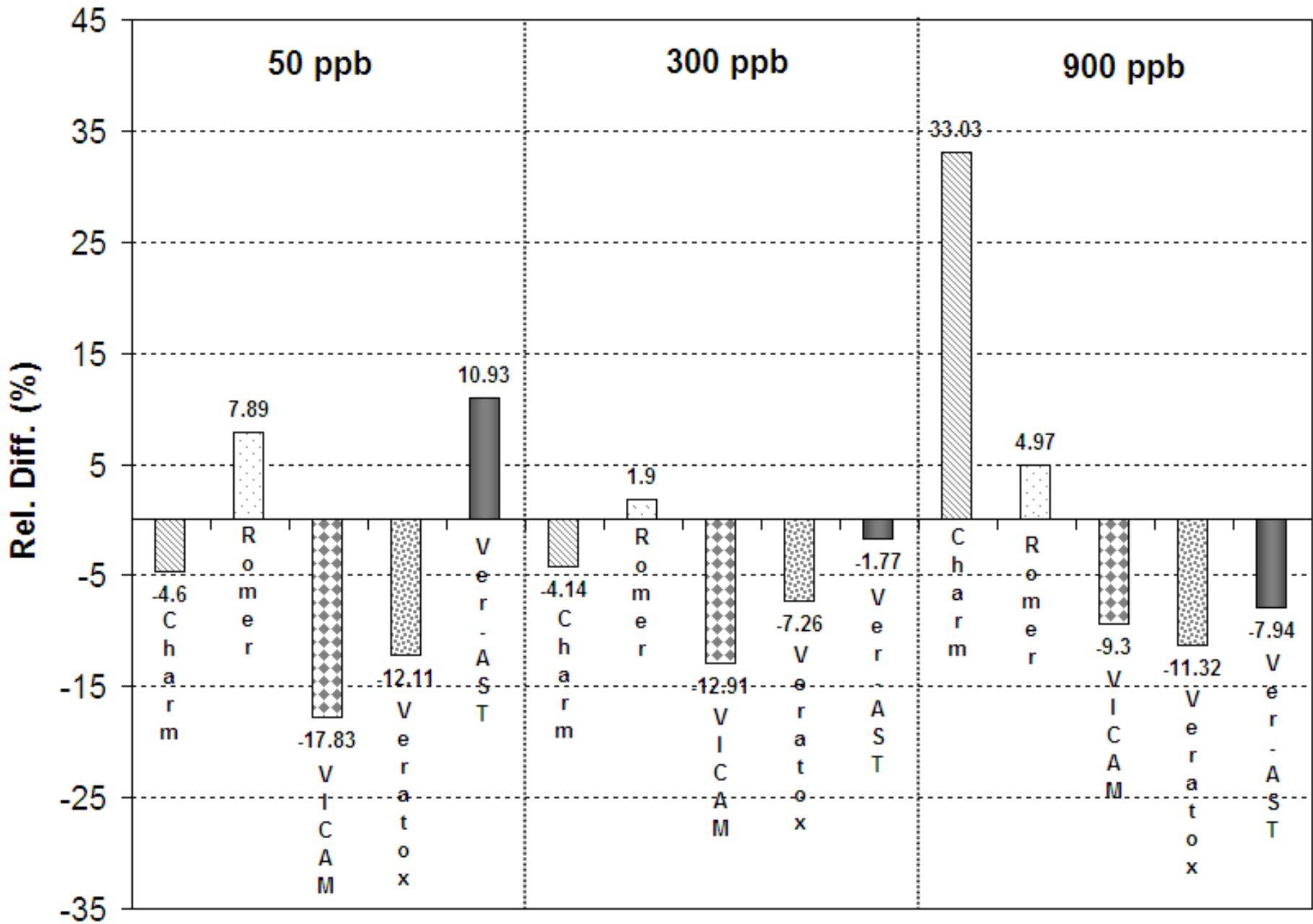
Official Average
= 50 ppb

Official Average
= 340 ppb

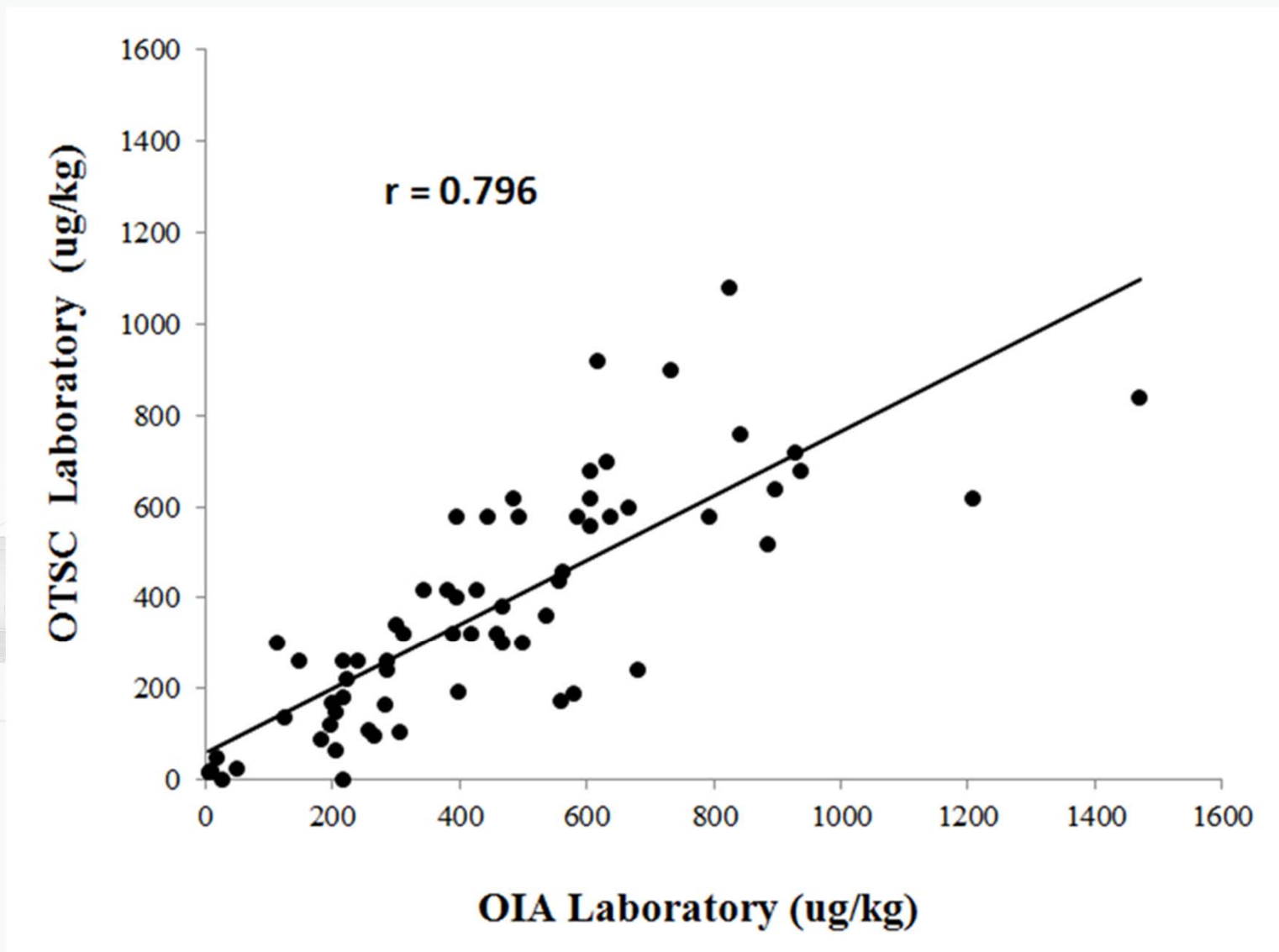
Official Average
= 520 ppb

	AVG	STD	CV	AVG	STD	CV	AVG	STD	CV
Total	61	65	105	265	129	49	410	215	52

Performance of test kits on samples with different levels of mycotoxins



FGIS – OTSC comparison of 64 trucks using GIPSA sampling procedures



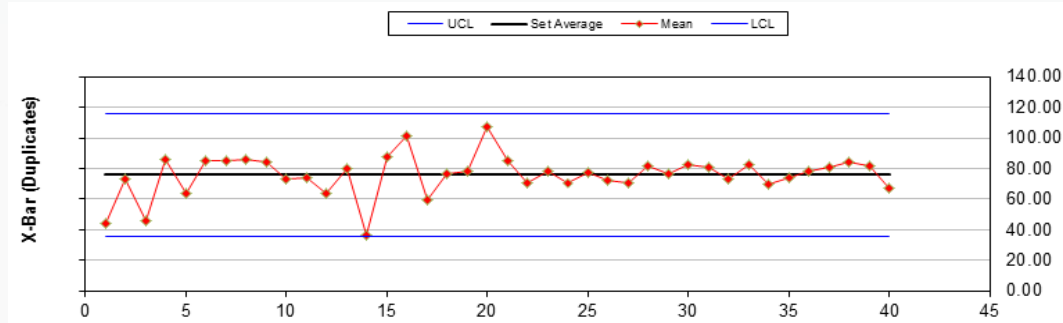
If Global Warming Continues?

Could the Midwest Corn Belt experience similar aflatoxin levels as Texas

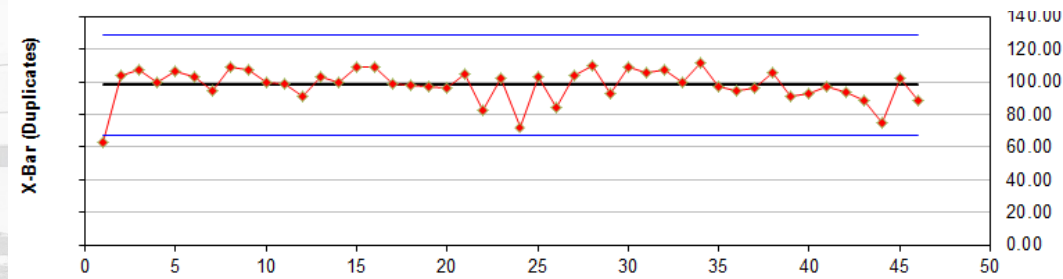


2012 Control Chart Comparison

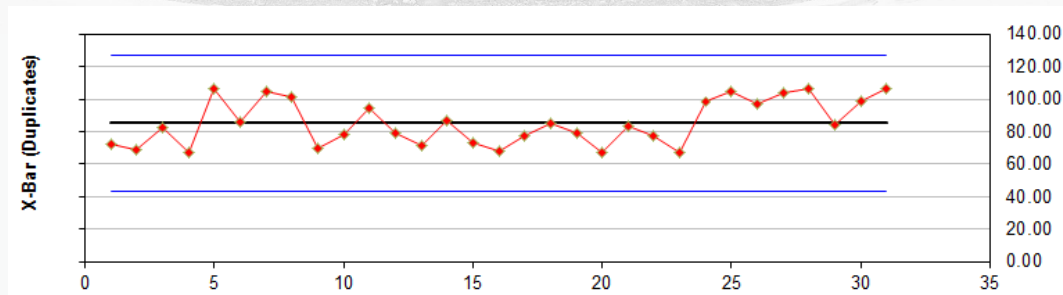
Participant
A



Participant
B



Participant
C



Reduce Market & Food Safety Risk



Purchasing

Crop Insurance

Regulatory monitoring

Comparison of Retained File Sample Results

Year	Average rapid test kit results	Average HPLC results	Average Deviation	Correlation Coefficients
2011	84 ppb	93 ppb	23%	0.79
2012	59 ppb	45 ppb	33%	0.76



A Preventive Approach to Aflatoxin Risk Management cont.

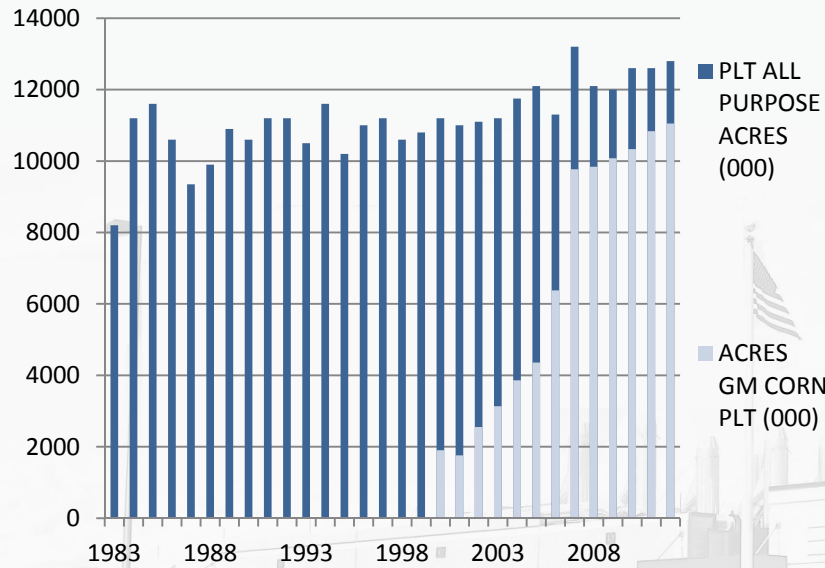
- ❑ Corn hybrid testing for aflatoxin susceptibility
- ❑ Crop rotation
- ❑ Monitoring
- ❑ Transparency and teamwork
- ❑ Planned response
- ❑ Risk assessment
- ❑ National feed inventory
- ❑ Avoid deliberate adulteration

Sec. 402 [21 U.S.C. 343]. Adulterated Food

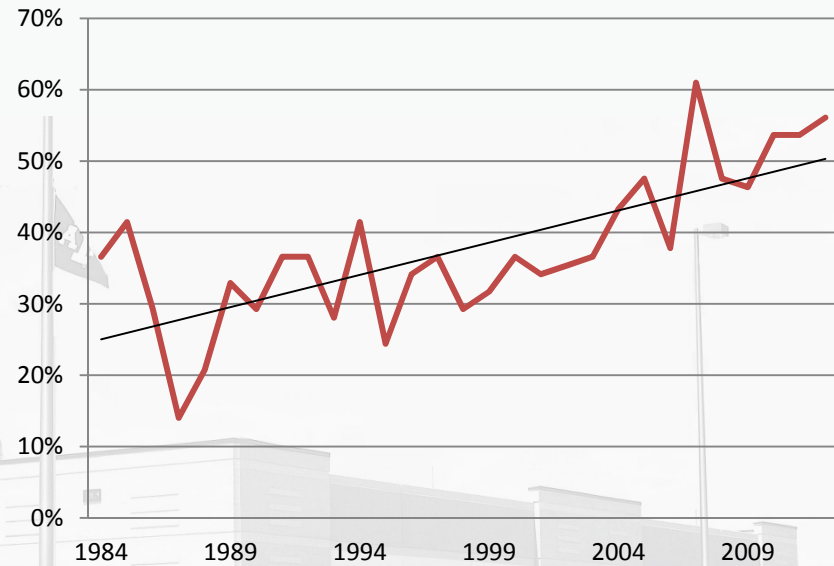
A food shall be deemed to be adulterated –

(a)(1) If it bears or contains any poisonous or deleterious substance which may render it injurious to health; but in case the substance is not an added substance such food shall not be considered adulterated under this clause if the quantity of such substance in such food does not ordinarily render it injurious to health.

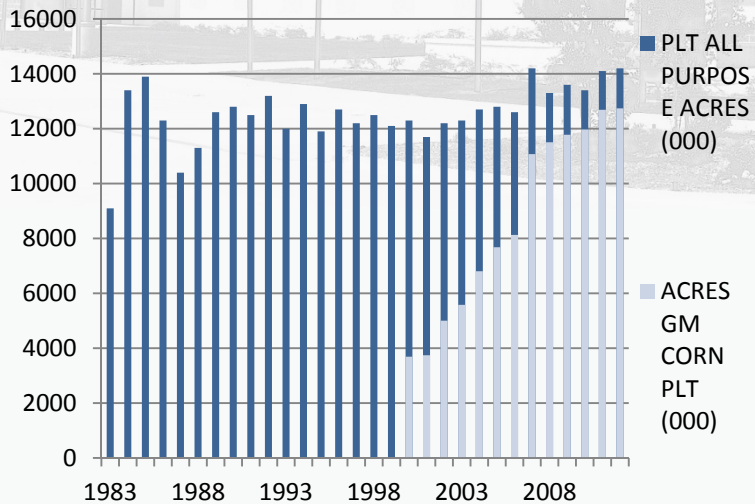
Acres of Planted Corn in Illinois



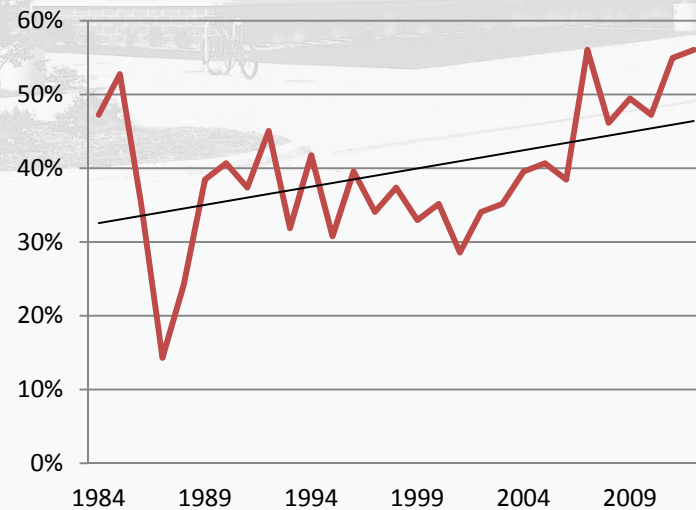
% Change of Planted Corn in Illinois



Acres of Planted Corn in Iowa



% Change of Planted Corn in Iowa



Corn Planting Intensity in Iowa

2003-2007

Delaware County

5 years in a row planted to corn: **15%**
 4 out of 5 years planted to corn: **27%**

Hamilton County

5 years in a row planted to corn: **6%**
 4 out of 5 years planted to corn: **13%**

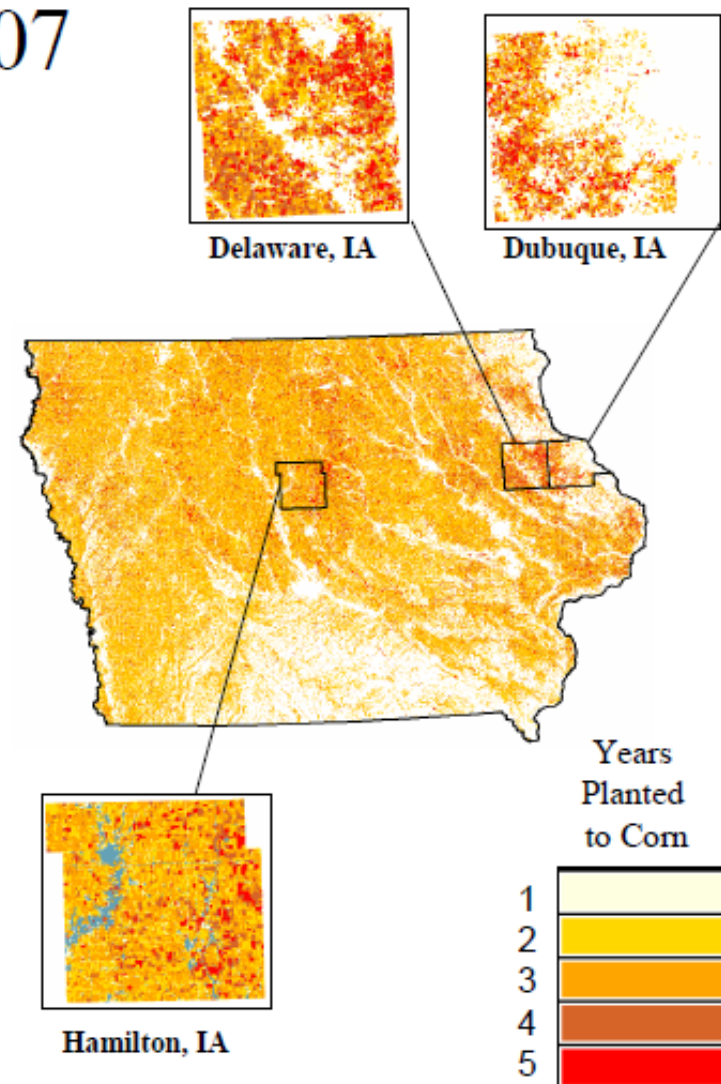
Dubuque County

5 years in a row planted to corn: **13%**
 4 out of 5 years planted to corn: **17%**

Iowa State Totals

5 years in a row planted to corn: **2%**
 4 out of 5 years planted to corn: **8%**

Percentages derived from total acreage in corn production



Boryan et al. 2008



Impact of Climate Change on Food Safety

Aflatoxin and the Midwest drought of 2012

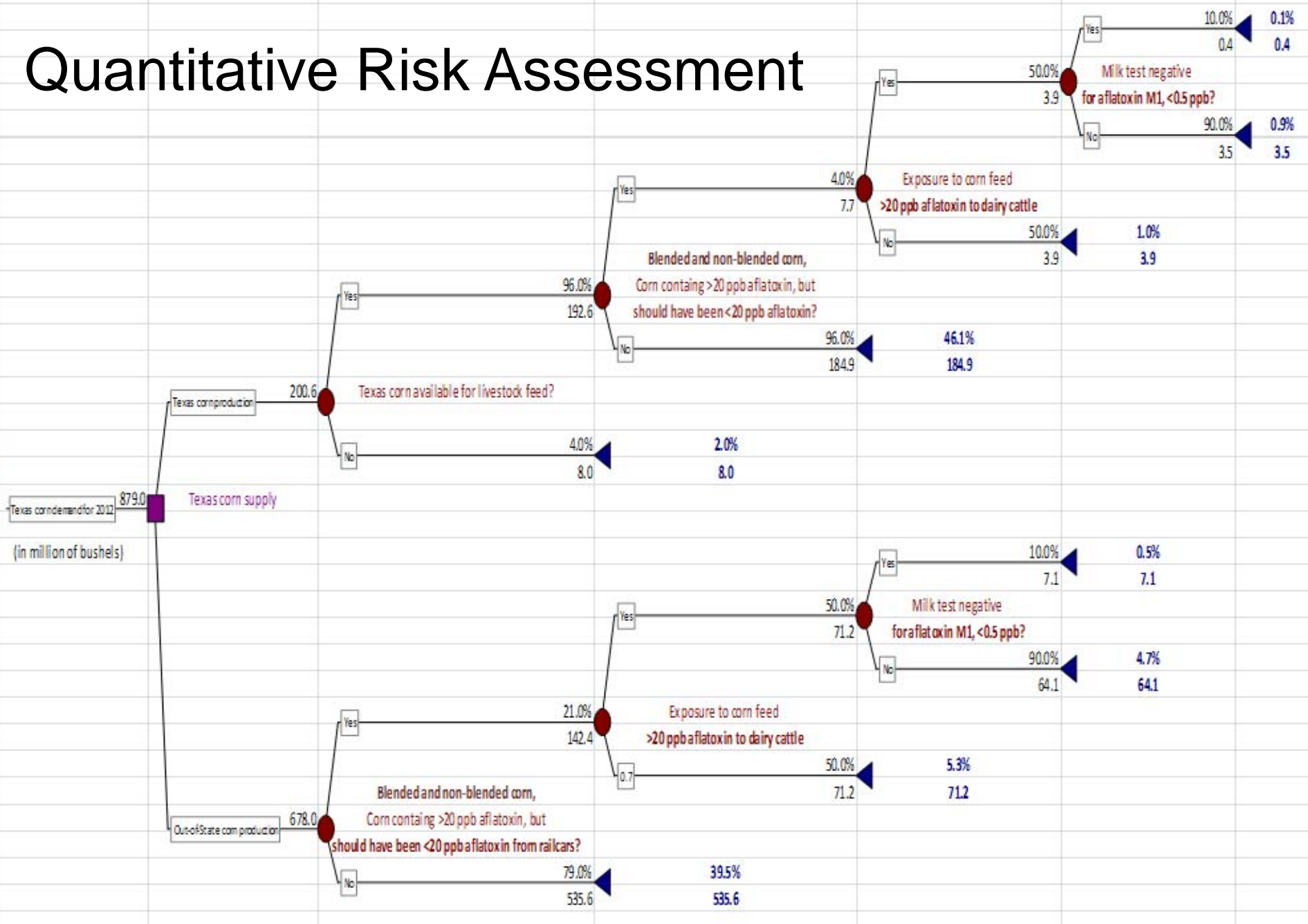
A Preventive Approach to Food Safety

OFFICE OF THE TEXAS STATE CHEMIST

Texas Feed and Fertilizer Control Service • Agriculture Analytical Service

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Quantitative Risk Assessment





TEXAS A&M
UNIVERSITY

Regulatory Science in Food Systems Graduate Program

Advancing the science of creating tools, standards, and practices to improve the protection and compliance of food systems

<p>Summer (May - August)</p>	<p>Fall (August - December)</p>	<p>Spring (January - May)</p>
<p><u>VTMI/SCSC 629</u> <u>Laboratory Quality Systems</u> (3 SCH)</p>	<p><u>AGEC/SCSC 635</u> <u>Comparative Global Standards in Food Systems</u> (3 SCH)</p>	<p><u>SCSC 634</u> <u>Regulatory Science: Principles & Practices in Food Systems</u> (3 SCH)</p>
	<p><u>SCSC 636</u> <u>Regulatory Science Methodology in Food Systems</u> (3 SCH)</p>	<p><u>AGEC 689</u> <u>Managerial Economics for Regulatory Science</u> (3 SCH)</p>



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Texas A&M University
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& Pharmacology

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Gulf Country Grain Grading