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Updating the Carbon Market Landscape

Sarah Sellars

University of Illinois

Updating the Carbon Market Landscape

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Agricultural &
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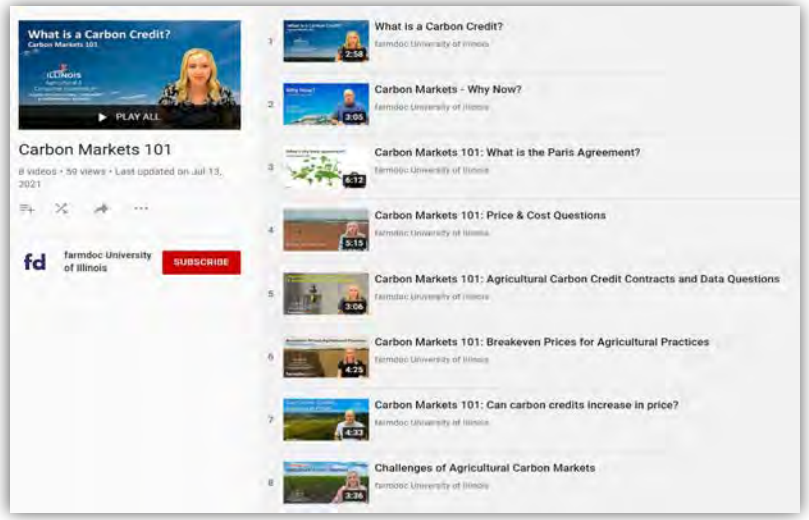
Sarah C. Sellars
Farm Assets Conference
November 21, 2022

Introduction

Carbon Markets 101 Extension Program



YouTube

Carbon Markets 101 YouTube Playlist

https://www.YouTube.com/farmdocVideo

farmdocDAILY.Illinois.edu

- **What Questions Should Farmers Ask about Selling Carbon Credits?**
- **Growing Climate Solutions Act Impact on Farmers**
- **Agricultural Carbon Markets: A Case Study of Alberta**

Carbon Markets 101: What Questions Farmers Should Ask?
September 9, 2021 @ 11:00 am - 12:00 pm CDT

Watch Video Download Slides

With growing concerns about climate change, policy markers are looking for solutions to reduce greenhouse gas emissions. One solution is a market for carbon credits. Here we will describe the latest on carbon markets, with an emphasis on definitions of carbon markets and an analysis of current carbon markets.

Topics

1. **Background**
2. **How Agricultural Carbon Markets Work**
3. **Economics of Carbon Markets**
4. **Farmer Participation in Carbon Markets**
5. **Resources for Carbon Market Information**


Background

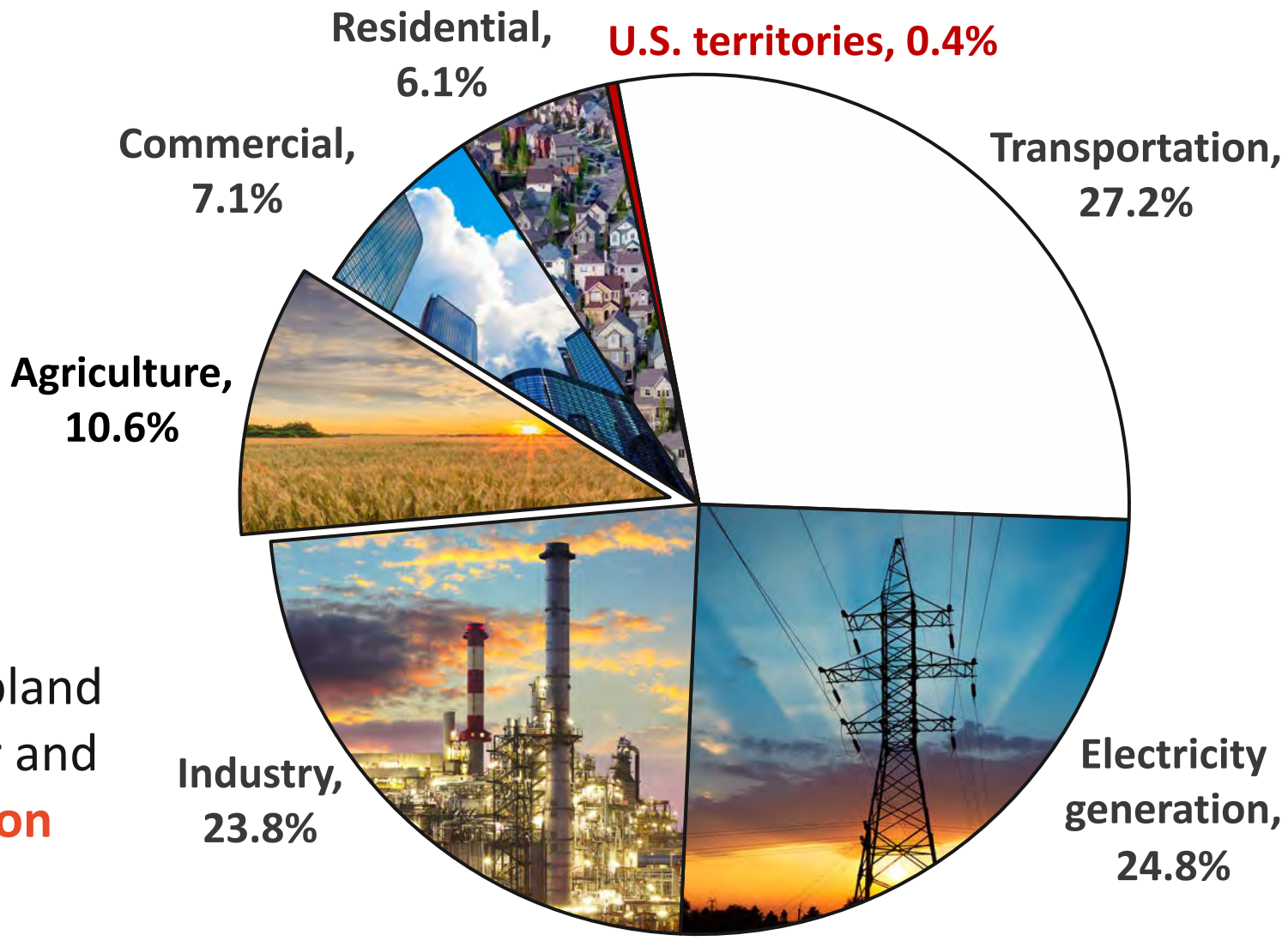
Background

Agricultural activities are looked at as a sink for carbon

Current sequestration on U.S. cropland is 8.4 millions mt/CO2-eq per year and the annual potential is **100 million mt/CO2-eq per year**

Emissions by Economic Sector, 2020

Million Metric Tons CO_2 Equivalent



Data Source: United States EPA

Two efforts simultaneously

Government Policy

- Congressional action
- Administrative activities

"Private Carbon Markets"

Why is This Time Different?

- Stock exchange for emission sources and offset projects
- Traded from 2003 to 2010
- Ceased trading at the end of 2010
- Effective final price was between 5 and 10 cents

Why is This Time Different?

- Increased demand
  - One-fifth of world's largest publicly listed companies have net-zero emissions targets
  - U.S. and companies have made promises to reach net-zero and need to deliver
- Different policy environment
  - Partnerships for Climate-Smart Commodities: $3 billion from USDA for pilot projects

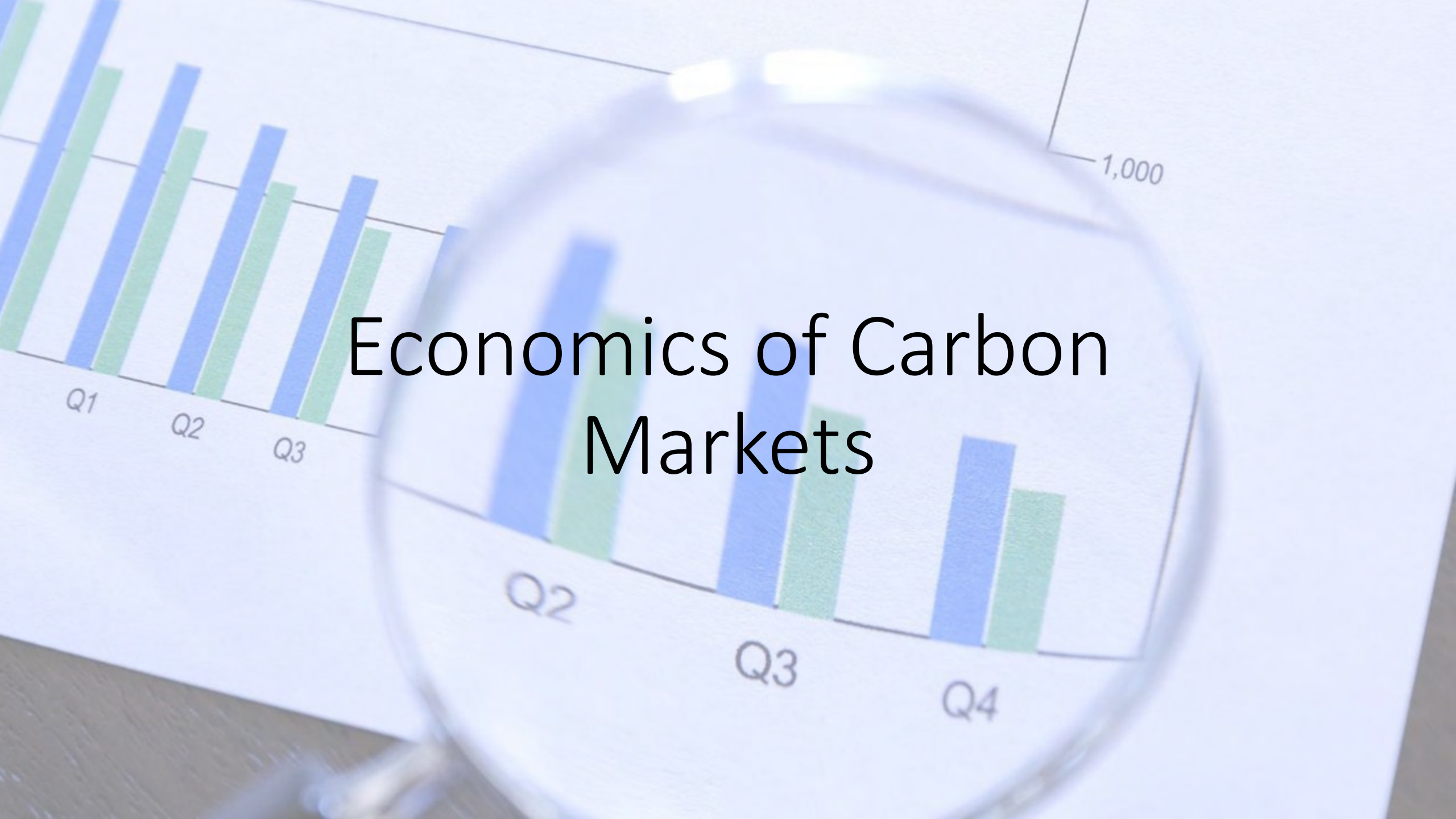
How Agricultural Carbon Markets Work

Most Common Eligible Practices

- Cover crops
- Changing nitrogen practices
- Diversifying crop rotation
- Reducing tillage
- Grazing livestock

Private Carbon Markets

- Markets will exist as long as private entities want to buy credits
- Currently many companies want “new” carbon



Economics of Carbon Markets

Payment amount and basis

Per acre

Bayer: $3/acre for reduced tillage, $6/acre for cover crops, $9/acre for both in 2021, now at $12 per acre for both in 2022 and new partnership with Nori

Per credit

Corteva Granular: $15/credit in 2021, $20/credit in 2022, projected up to $30/credit

Indigo Ag: $10/credit in 2020, $15/credit in 2021, $20/credit in 2022

Per credit or per acre

TruTerra (Land 0'Lakes): $10 per credit in 2021, $20/credit in 2022, or $2/acre

Current guaranteed minimum carbon price: around $20/credit

Data requirements

- Most require entry of information by farmer into software
  - Climate view, Bayer
  - Granular Insights, Corteva Granular
  - Gradable, Farmer Business Network
- Many require **three years** of previous information
- Likely require boundaries and practices for the coming year

Can early adopters participate

Practices have to be adopted since 2011

Gradable™

Farmer Business Network

Practices must be adopted in last two years

Other Opportunities to Watch

- USDA Partnerships for Climate-Smart Commodities
  - $2.8 billion invested in 70 projects
  - 15 projects available in Illinois
    - 9 for corn and soybeans
    - Other relevant commodities include beef, dairy, pork, wheat, specialty crops

RIPE PILOTS STEWARDSHIP PROGRAM AT $100 PER ACRE OR ANIMAL UNIT

FARMER-LED POLICY BENEFITS THE BOTTOM LINE.

By Megan Schilling
10/26/2022

Listen to article 7 minutes

Climate policy programs need to work for farmers' bottom lines. That is the foundation of the Rural Investment to Protect our Environment (RIPE) organization, led by executive director Aliza Drewes.

USDA

"In regard to climate policy, there hasn't been a significant reason for rural stakeholders to commit because there was the negative downside of potential costs, potential regulations, and to date, carbon farming programs have been designed to only compensate producers for greenhouse gas value, which, in most cases, is less than the cost of the practice," Drewes says.

What PCM

Precision Conservation Management

- Field-level data to understand how conservation practices impact farmer net returns
- 6 years of data
- 16 Illinois counties
- 10 Kentucky counties

Illinois Corn Growers Association

ILLINOIS SOYBEAN ASSOCIATION

CHECKOFF & MEMBERSHIP PROGRAMS

PCM Cover Crops Data, High SPR, No-Till

	Corn			Soybeans		
	# of Obs.	Average CO2-eq per Acre	Per Acre Income at $20/credit	# of Obs.	Average CO2-eq per Acre	Per Acre Income at $20/credit
Cover Crops	124	-0.91	$18.20	432	-1.72	$34
No Cover Crops	466	-0.17	$3.40	1307	-0.90	$18

PCM Tillage Data, High SPR, No Cover Crops

	Corn			Soybeans		
	# of Obs.	Average CO2-eq per Acre	Per Acre Income at $20/credit	# of Obs.	Average CO2-eq per Acre	Per Acre Income at $20/credit
No-Till	466	-0.17	$3.40	1307	-0.90	$18.00
Strip-Till	615	0.48	$0	64	-0.29	$5.80
1-Pass Light	1222	0.28	$0	425	-0.42	$8.40
2-Pass Light	432	0.42	$0	172	0.32	$0
2-Pass Medium	629	0.22	$0	619	0.32	$0
3+ Pass	87	1.14	$0	408	0.29	$0

Farmer Participation in Carbon Markets

How many farmers are participating?

- Indigo: 175 farmers across the country were paid in first credit issuance
  - Now 2,000 farmers and 5 million acres enrolled
- Bayer: As of August 2022, more than 2,600 farmers from 10 countries enrolled covering 1.4 million acres
- TruTerra: More than 1,900 farmers since 2016; 29,000 fields
- Nori: As of early 2022, paid $1.6 million to 15 farmers

Resources for Carbon Market Information

IL Sustainable Ag Partnership

E. Bruner and J. Brokish, "Ecosystem Market Information: Opportunity and Program Comparison"

https://ilsustainableag.org/ecomarkets/

TABLE 1: MARKET ENTITIES *As of February 2021*

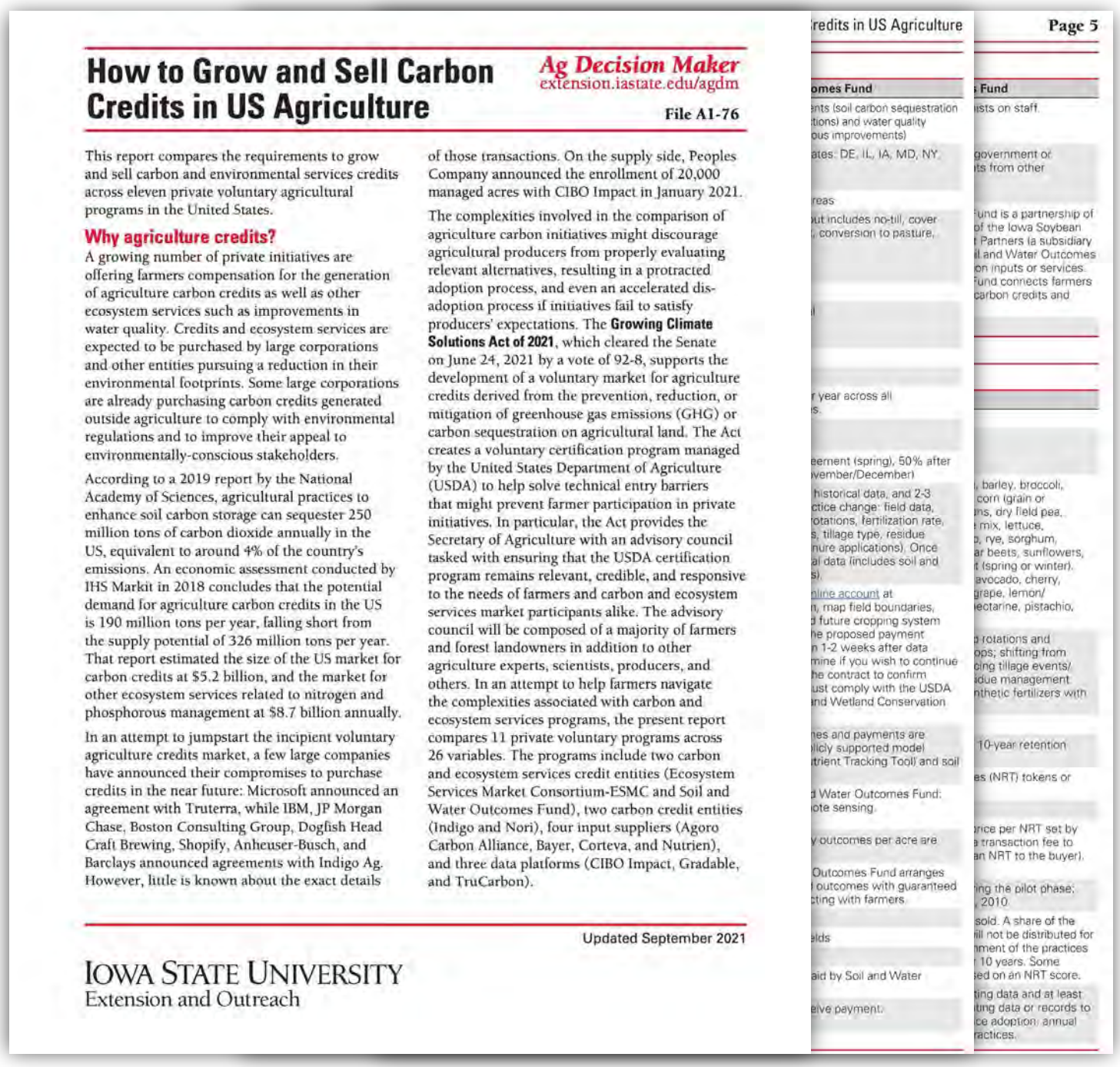
	Nori	Indigo Ag	Soil & Water Outcomes	ESMC
Acreage Min/Max	None	One-field min, no max	None	None
Contract Length	10 yrs	5 yrs	Annual with yearly renewal	Pilot – Annual Market Launch – Scope 1: 10 yrs; Scope 3: TBD
New Practice Requirement	Yes, with a look-back of up to 5 years during pilot phase	Yes, with a look-back of 2 growing seasons	Yes	Yes, but investigating potential of payments to producers already implementing conservation practices for Scope 3
Payment Schedule	End of month when offset credit is sold	50% yr 1, 20% yr 2, 10% yrs 3, 4, 5	Annually, split 50/50–1 shortly after signing, 1 after verification	Pilot – Annual Market- Launch - Annual to every 5 yrs depending on Scope for carbon 1 vs 3, respectively; annual for water quality.
Ability to Enroll Same Fields in Gov't Programs/ Other Markets	Designed to stack with both	Designed to stack with both, but other incentives cannot include payments for carbon credits or related assets (financing is okay)	No Note – payment for water quality and carbon outcomes	Designed to stack with gov't programs; individual fields cannot be in two market programs. Note – ESMC internally stacks carbon with GHG reductions, water quality, and water quantity.
Outcome Estimation	Soil sample reference network-based modeling (Soil Metrics) - cost incurred by Nori. Farmer has option to true-up via soil sampling - farmer incurs sampling cost.	Modeling (biogeochemical and statistical) + soil sampling, Indigo assumes cost (Indigo does not charge growers for anything)	Modeling, with 10% of fields subject to in-field soil and water sampling at no cost to farmer	Modeling (peer reviewed biogeochemical model) + soil sampling. ESMC assumes costs and includes in asset price to buyers.

Comparison of 11 Private Voluntary Carbon Programs

How to Grow and Sell Carbon Credits in U.S. Agriculture

Alejandro Plastina and
Oranuch Wongpiyabovorn
Iowa State University

https://www.extension.iastate.edu/agdm/crops/pdf/a1-76.pdf



How to Grow and Sell Carbon Credits in US Agriculture

Ag Decision Maker
extension.iastate.edu/agdm

File A1-76

This report compares the requirements to grow and sell carbon and environmental services credits across eleven private voluntary agricultural programs in the United States.

Why agriculture credits?

A growing number of private initiatives are offering farmers compensation for the generation of agriculture carbon credits as well as other ecosystem services such as improvements in water quality. Credits and ecosystem services are expected to be purchased by large corporations and other entities pursuing a reduction in their environmental footprints. Some large corporations are already purchasing carbon credits generated outside agriculture to comply with environmental regulations and to improve their appeal to environmentally-conscious stakeholders.

According to a 2019 report by the National Academy of Sciences, agricultural practices to enhance soil carbon storage can sequester 250 million tons of carbon dioxide annually in the US, equivalent to around 4% of the country's emissions. An economic assessment conducted by IHS Markit in 2018 concludes that the potential demand for agriculture carbon credits in the US is 190 million tons per year, falling short from the supply potential of 326 million tons per year. That report estimated the size of the US market for carbon credits at $5.2 billion, and the market for other ecosystem services related to nitrogen and phosphorous management at $8.7 billion annually.

In an attempt to jumpstart the incipient voluntary agriculture credits market, a few large companies have announced their compromises to purchase credits in the near future: Microsoft announced an agreement with Truterra, while IBM, JP Morgan Chase, Boston Consulting Group, Dogfish Head Craft Brewing, Shopify, Anheuser-Busch, and Barclays announced agreements with Indigo Ag. However, little is known about the exact details of those transactions. On the supply side, Peoples Company announced the enrollment of 20,000 managed acres with CIBO Impact in January 2021.

The complexities involved in the comparison of agriculture carbon initiatives might discourage agricultural producers from properly evaluating relevant alternatives, resulting in a protracted adoption process, and even an accelerated dis-adoption process if initiatives fail to satisfy producers' expectations. The **Growing Climate Solutions Act of 2021**, which cleared the Senate on June 24, 2021 by a vote of 92-8, supports the development of a voluntary market for agriculture credits derived from the prevention, reduction, or mitigation of greenhouse gas emissions (GHG) or carbon sequestration on agricultural land. The Act creates a voluntary certification program managed by the United States Department of Agriculture (USDA) to help solve technical entry barriers that might prevent farmer participation in private initiatives. In particular, the Act provides the Secretary of Agriculture with an advisory council tasked with ensuring that the USDA certification program remains relevant, credible, and responsive to the needs of farmers and carbon and ecosystem services market participants alike. The advisory council will be composed of a majority of farmers and forest landowners in addition to other agriculture experts, scientists, producers, and others. In an attempt to help farmers navigate the complexities associated with carbon and ecosystem services programs, the present report compares 11 private voluntary programs across 26 variables. The programs include two carbon and ecosystem services credit entities (Ecosystem Services Market Consortium-ESMC and Soil and Water Outcomes Fund), two carbon credit entities (Indigo and Nori), four input suppliers (Agoro Carbon Alliance, Bayer, Corteva, and Nutrien), and three data platforms (CIBO Impact, Gradable, and TruCarbon).

Updated September 2021

IOWA STATE UNIVERSITY
Extension and Outreach

redits in US Agriculture

Page 5

Recommendations for Farmers

- Stackability
  - Covers adoption costs
- Protection of upside potential
- Modeling capabilities
- Topics to Watch
  - USDA Partnerships for Climate-Smart Commodities Programs
  - Other ecosystems market opportunities

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Crop Prospects in Brazil & Argentina

Joana Colussi

University of Illinois

Crop Prospects in Brazil & Argentina

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& ENVIRONMENTAL SCIENCES

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Joana Colussi, Ph.D.

Image by Diogo Zanatta

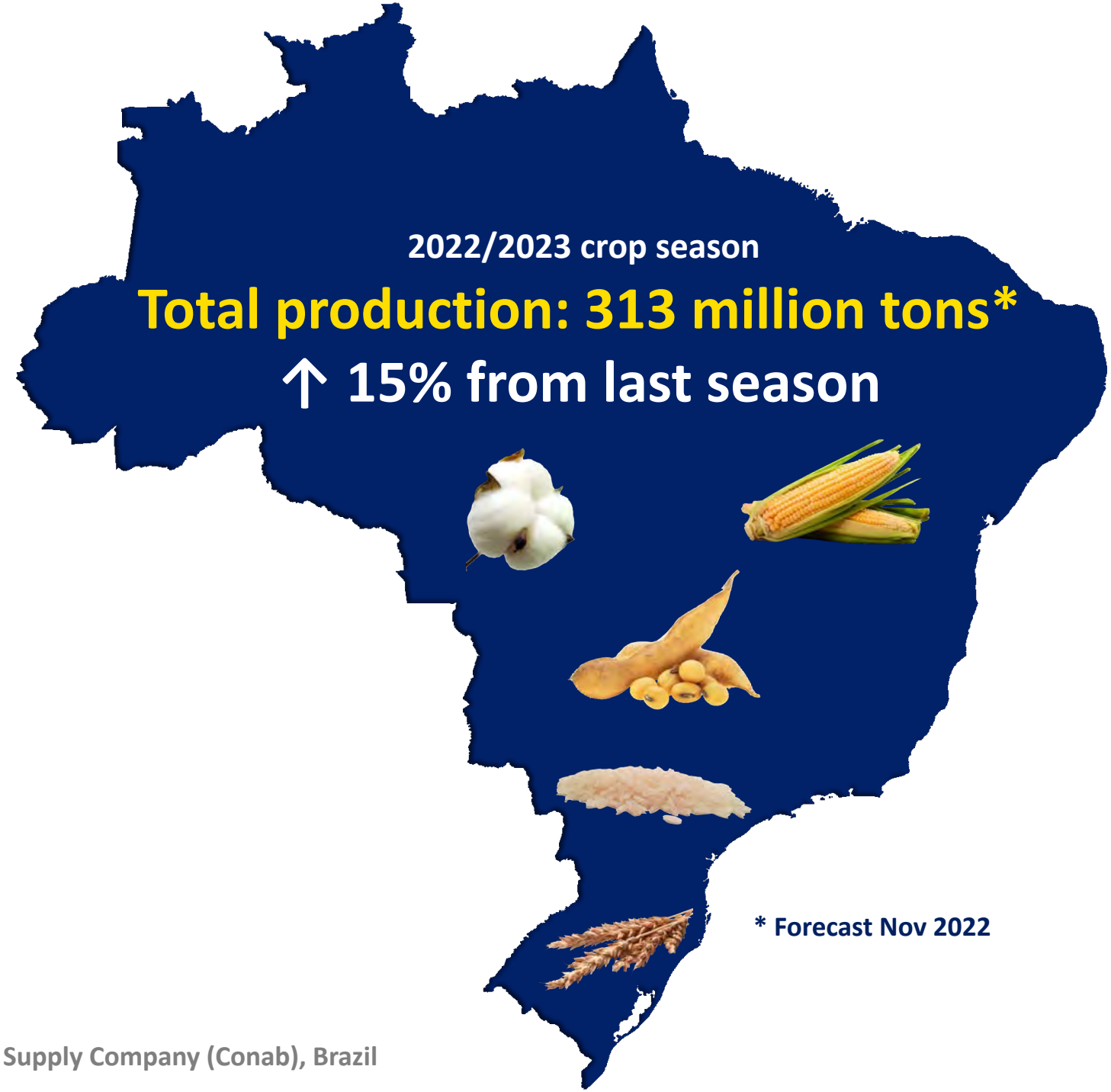
South America Overview

- **Brazil and Argentina** are the main agricultural producers and exporters in South America.
- South America makes up **54% of the world's soybean crop**: divided into 37% for Brazil and 13% for Argentina.
- Global shares of **corn production are 15% for South America**: 9% for Brazil and 5% for Argentina.
- The region can produce enough crops to help ease **global food inflation**.

Largest projected grain harvest in Brazilian history

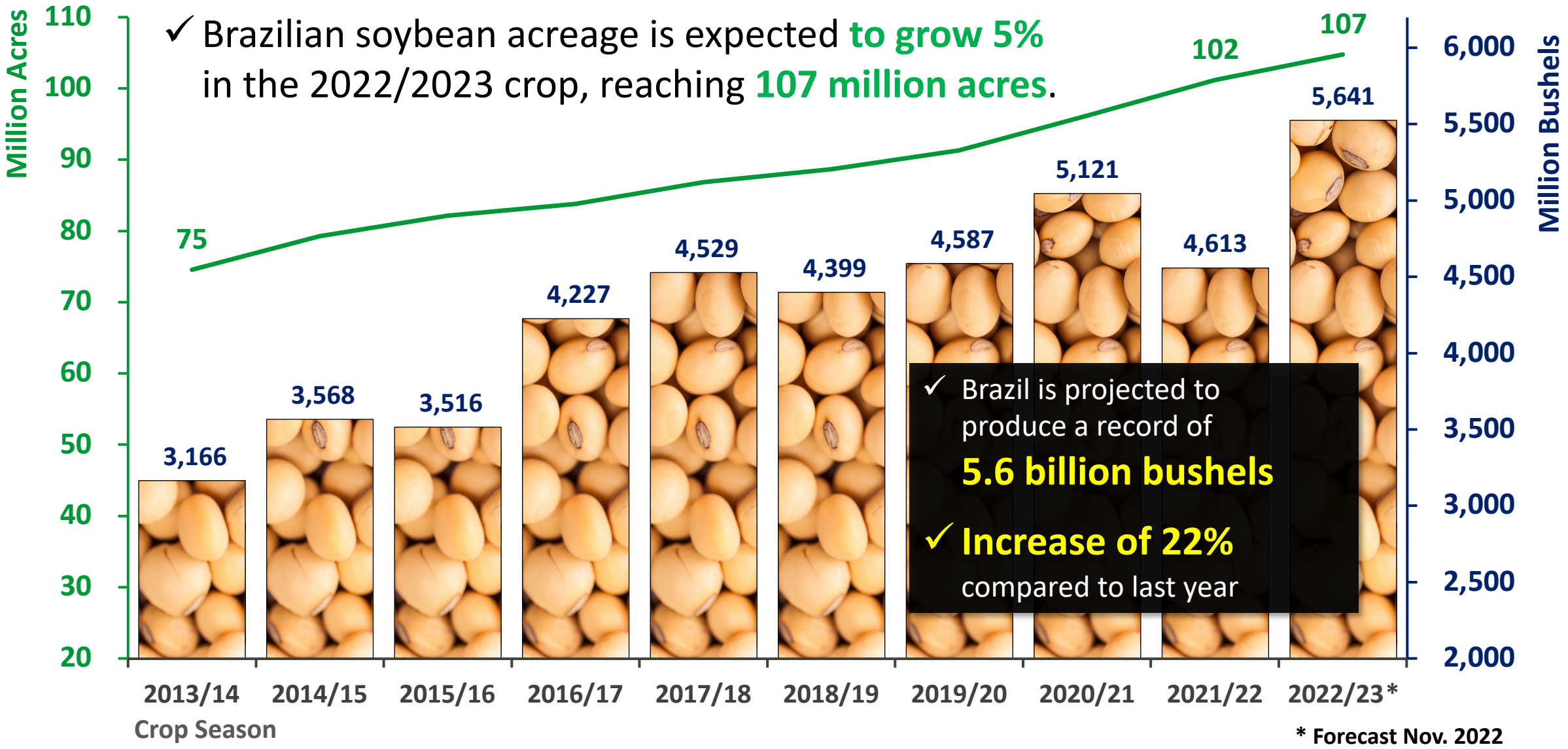
Two main drivers:

- **↑ 3% increase in planted area**
- **↑ 12% higher yields**



Source: National Supply Company (Conab), Brazil

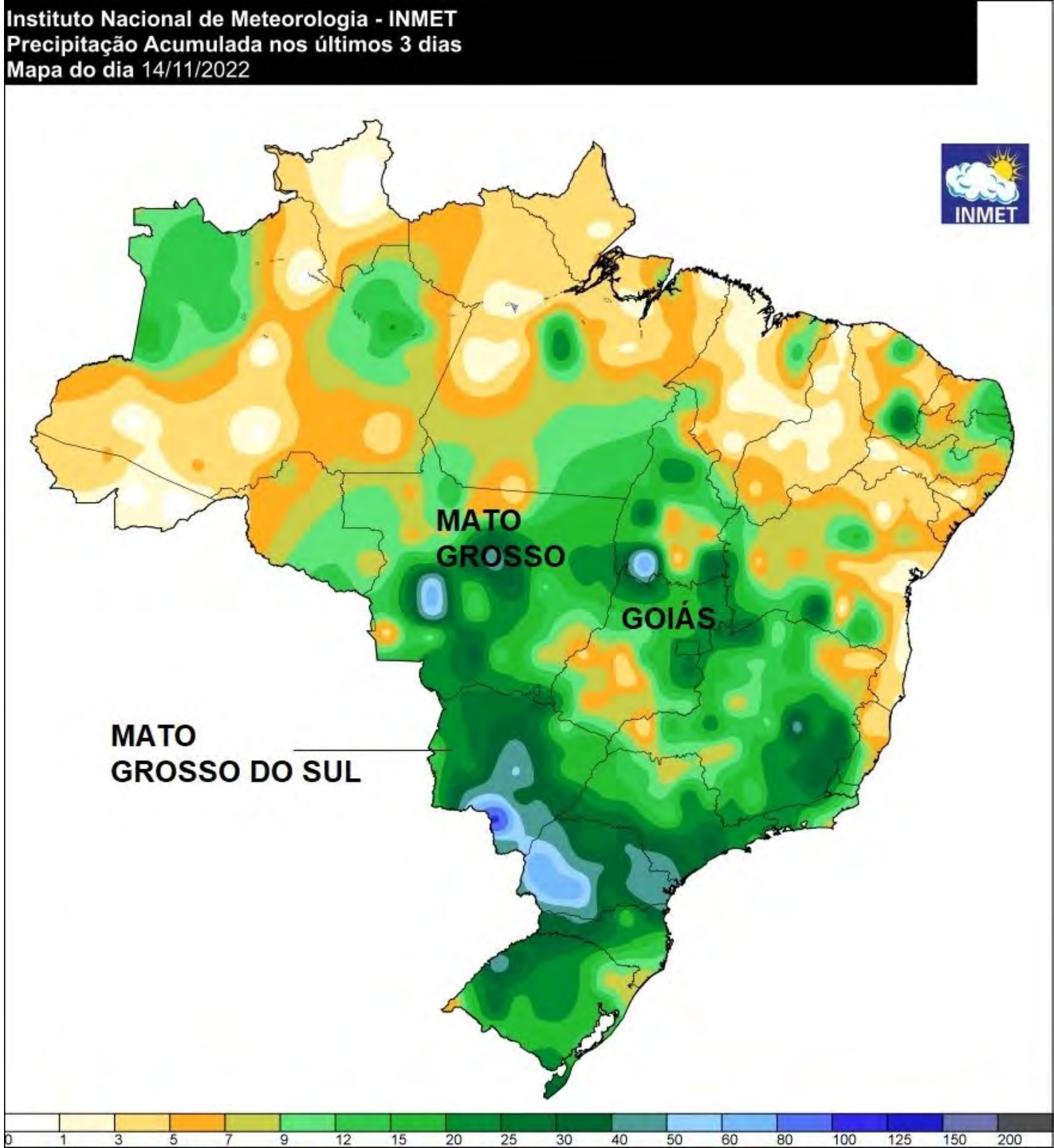
Soybean Acreage and Production in Brazil



Source: National Supply Company (Conab), Brazil

Planting Progress

- Rains were seen over the last weeks, but some areas still **need moisture**.
- The 2022/23 soybean planting was **66% complete** as of Nov 12 versus 77% at the same time last year.
- The 2022/23 corn planting was **54% complete** as of Nov 12 versus 63% at the same time last year.



Soybean Market Outlook in Brazil

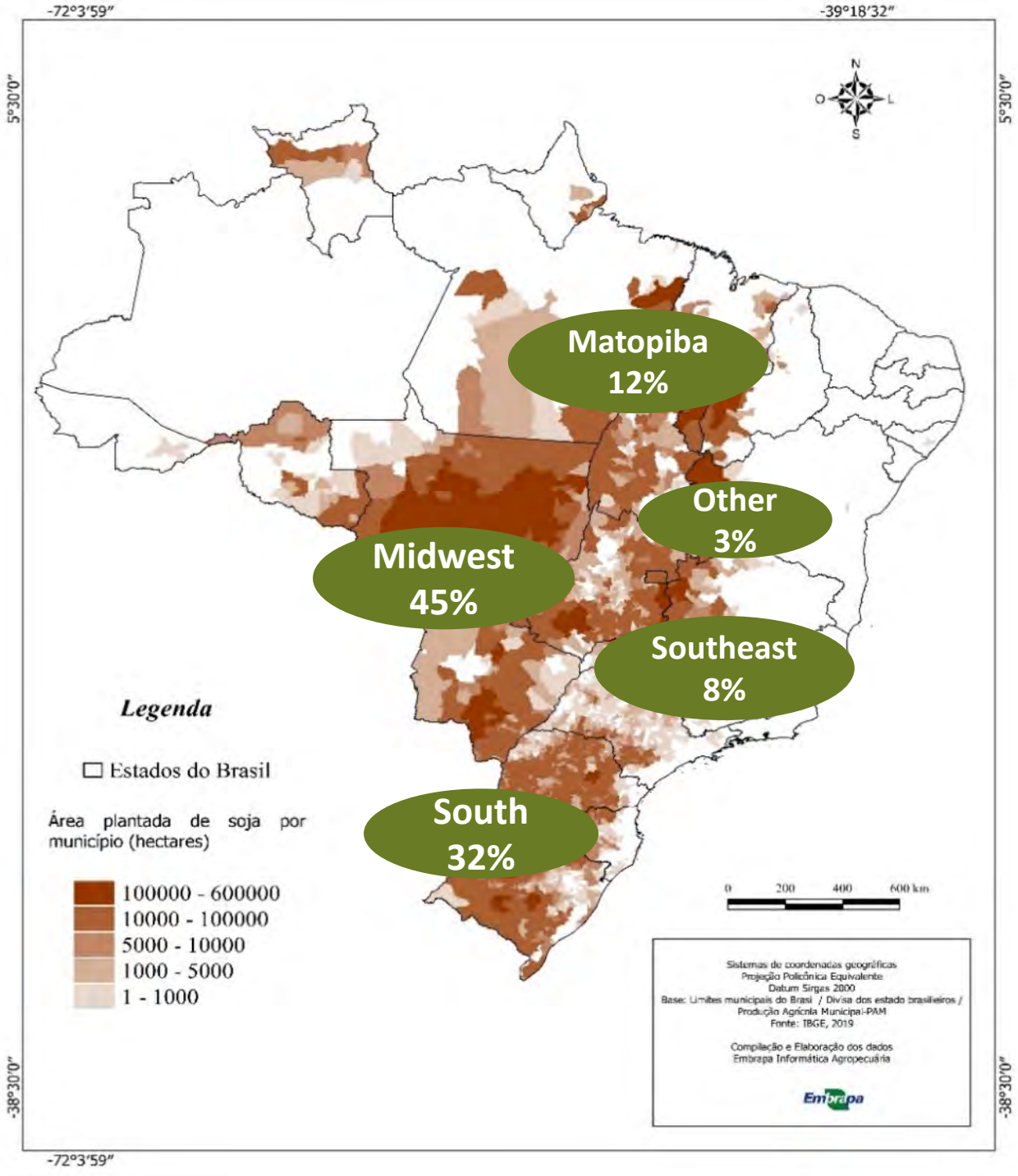
Brazilian farmers are motivated to plant more acreage especially because:

- **High prices** and **record profits last season**
- Depreciation of the **Brazilian currency** relative to the dollar (1 USD = 5.40 BRL)
- The expected **margins for soybean remain positive**, despite the rise in production costs.

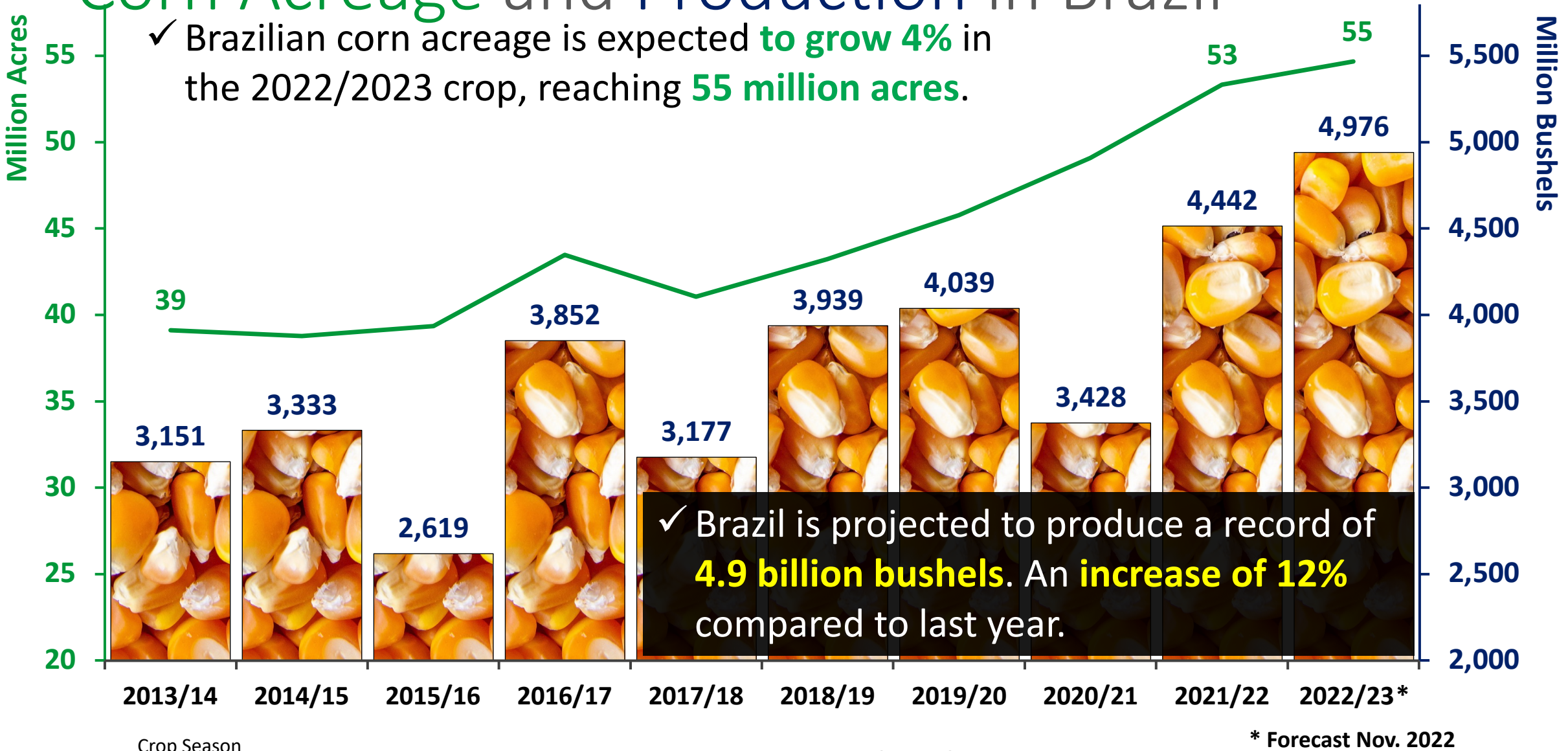
Soybeans by region

- **Three states in the Midwest** (Mato Grosso, Goiás, and Mato Grosso do Sul) and **two southern states** (Paraná and Rio Grande do Sul) represent **75% of soybean** production in Brazil.

- The Matopiba, in the North and Northeast, is considered the **new agricultural frontier in Brazil**, representing 12% of soybean production.



Corn Acreage and Production in Brazil



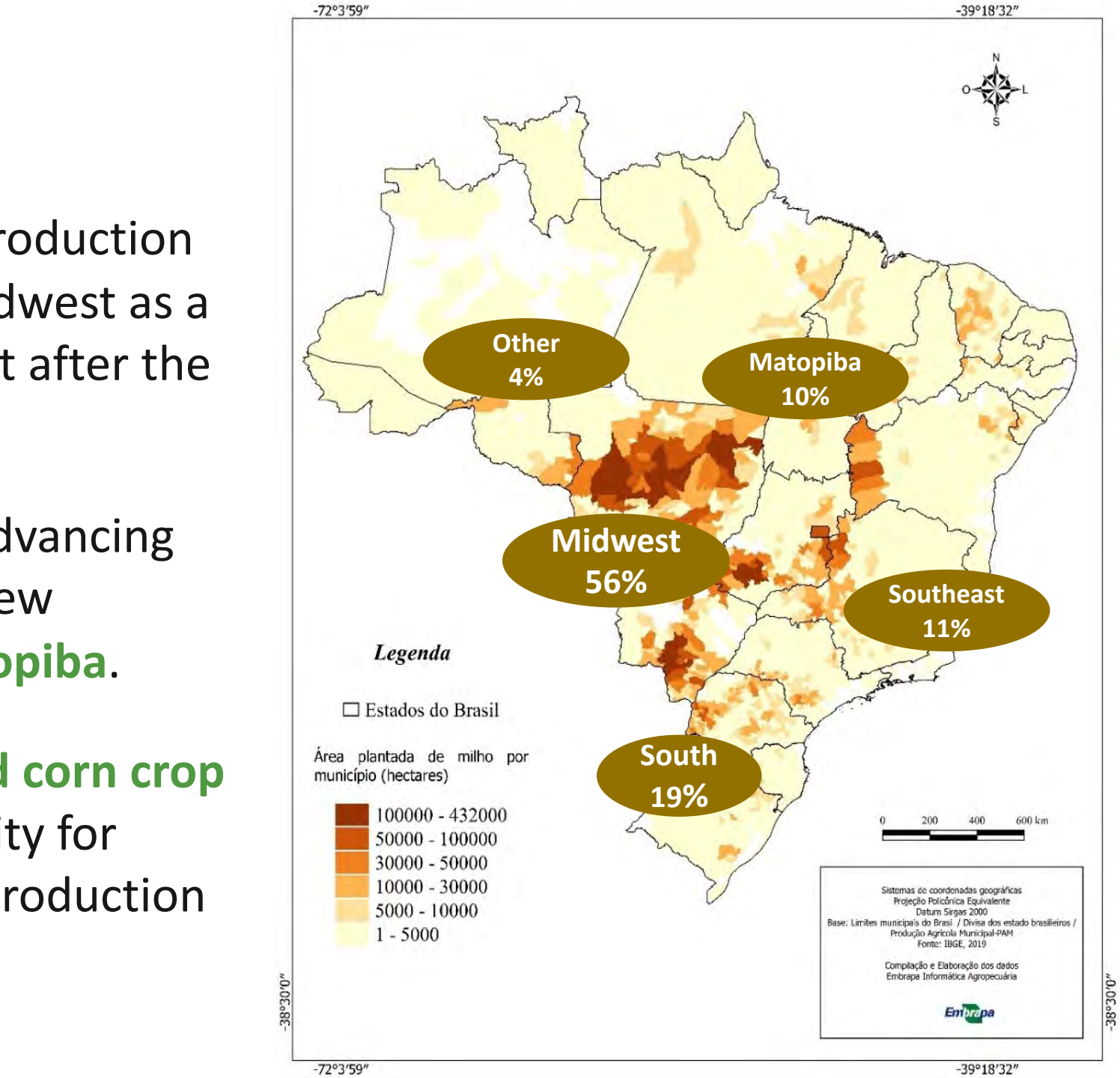
Source: National Supply Company (Conab), Brazil

Corn Market Outlook in Brazil

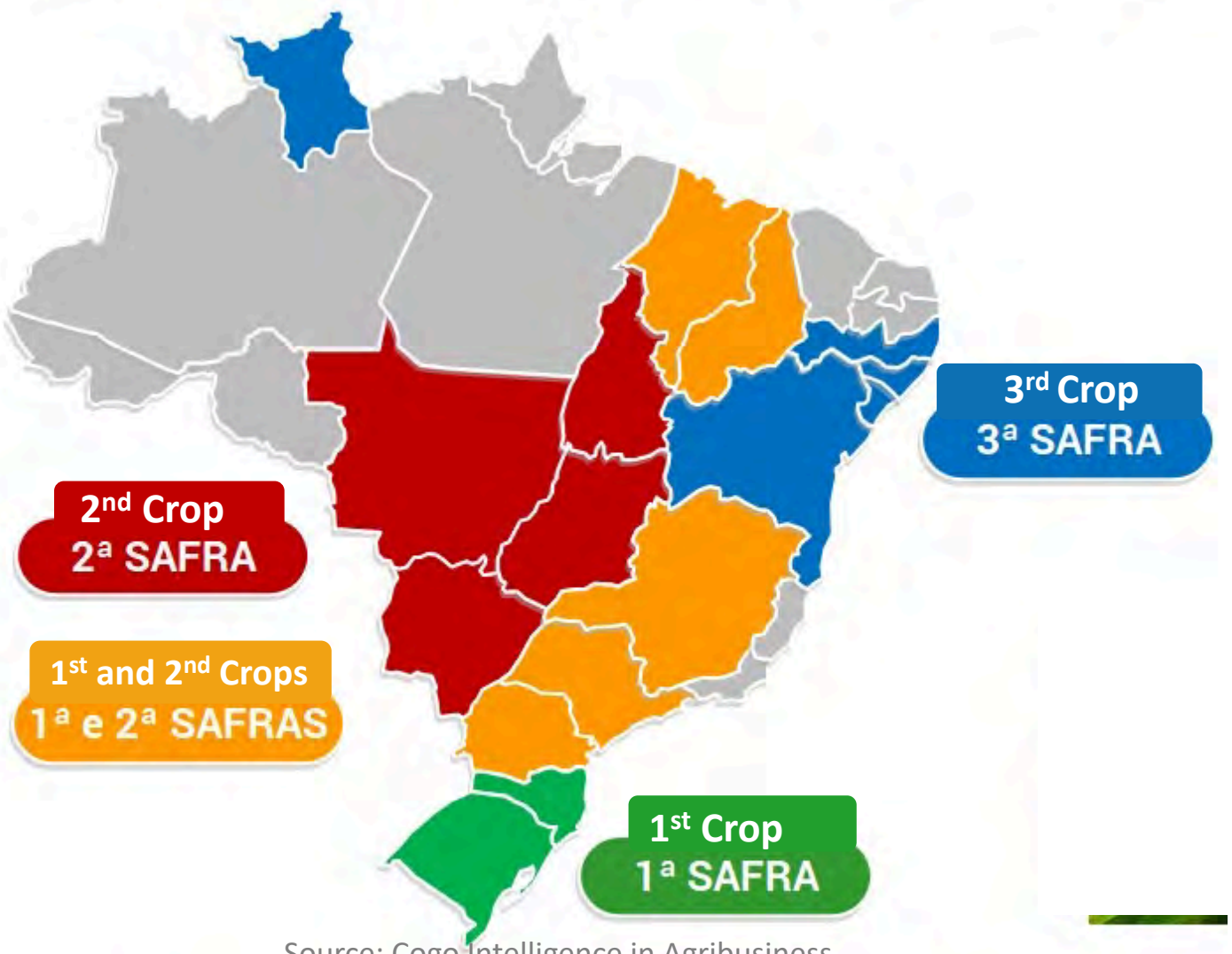
- **High domestic and global corn prices** are the primary drivers for the expanded corn planting area.
- The expected **margins for corn remain positive**, despite the rise in production costs.
- Brazil is expanding its **ethanol production**. Currently, 17 corn ethanol plants are in operation.

Corn by region

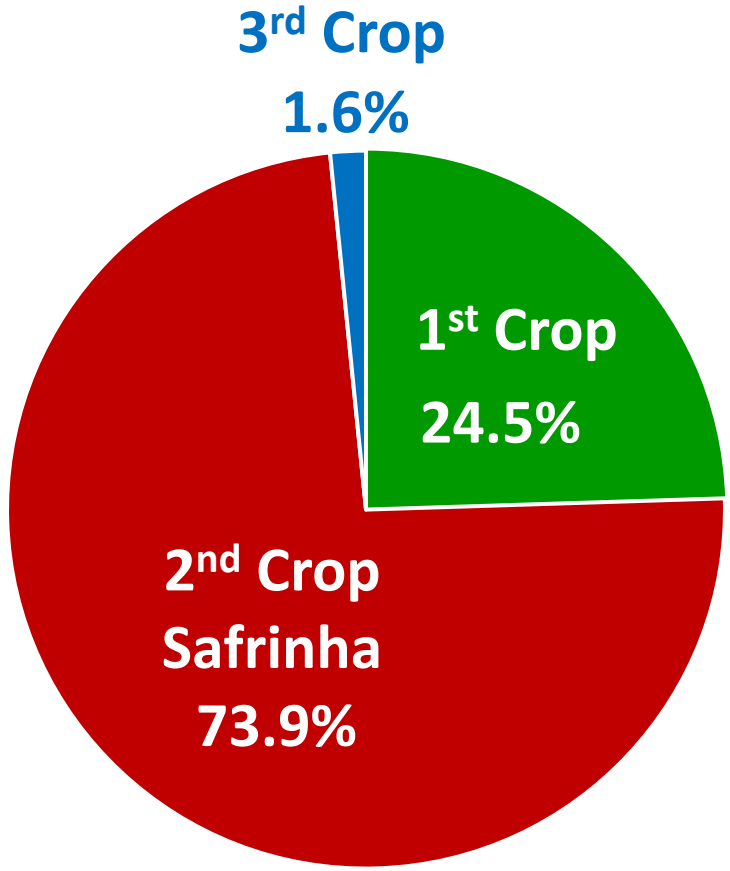
- **More than half** of corn production is concentrated in the Midwest as a second crop, planted right after the soybean harvest.
- Corn production is also advancing as a second crop to the new agricultural frontier, **Matopiba**.
- The **growth in the second corn crop (safrinha)** is an opportunity for Brazil to double its corn production in the coming years.



Corn Production: 3 Crops per Year



Source: Cogo Intelligence in Agribusiness



Source: National Supply Company (Conab), Brazil

Crop Prospects in Argentina

Image by Diogo Zanatta

RM CREDIT
LLINOIS
ping Farm Families Succeed

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The third straight La Niña year

Consequences so far:

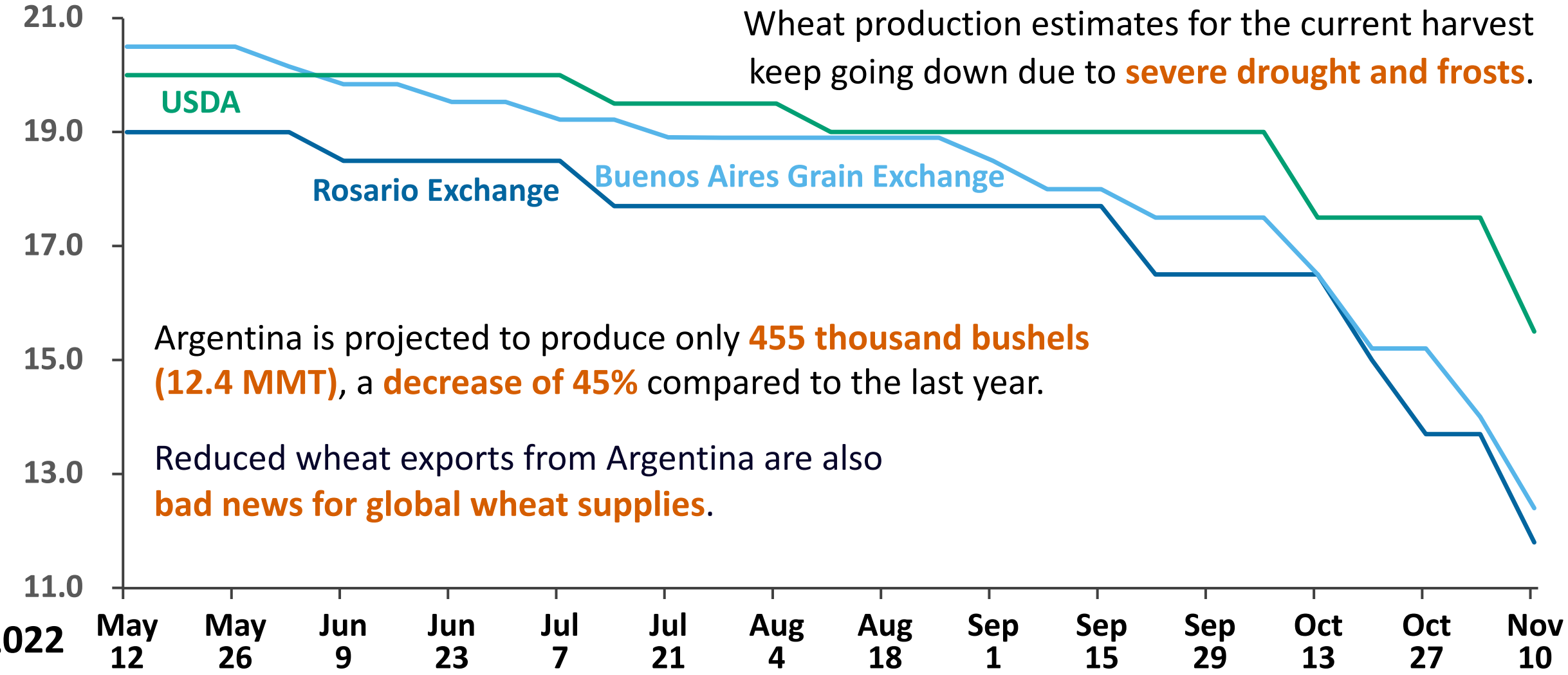
- The August through December period of the past two years has been among the **driest in over 30 years** for Argentina with 2022 on track to follow this trend.

- Yields of soybean and corn **crops are at risk**.

- Argentina's 2022/23 wheat harvest is set to be the **lowest in seven years**.

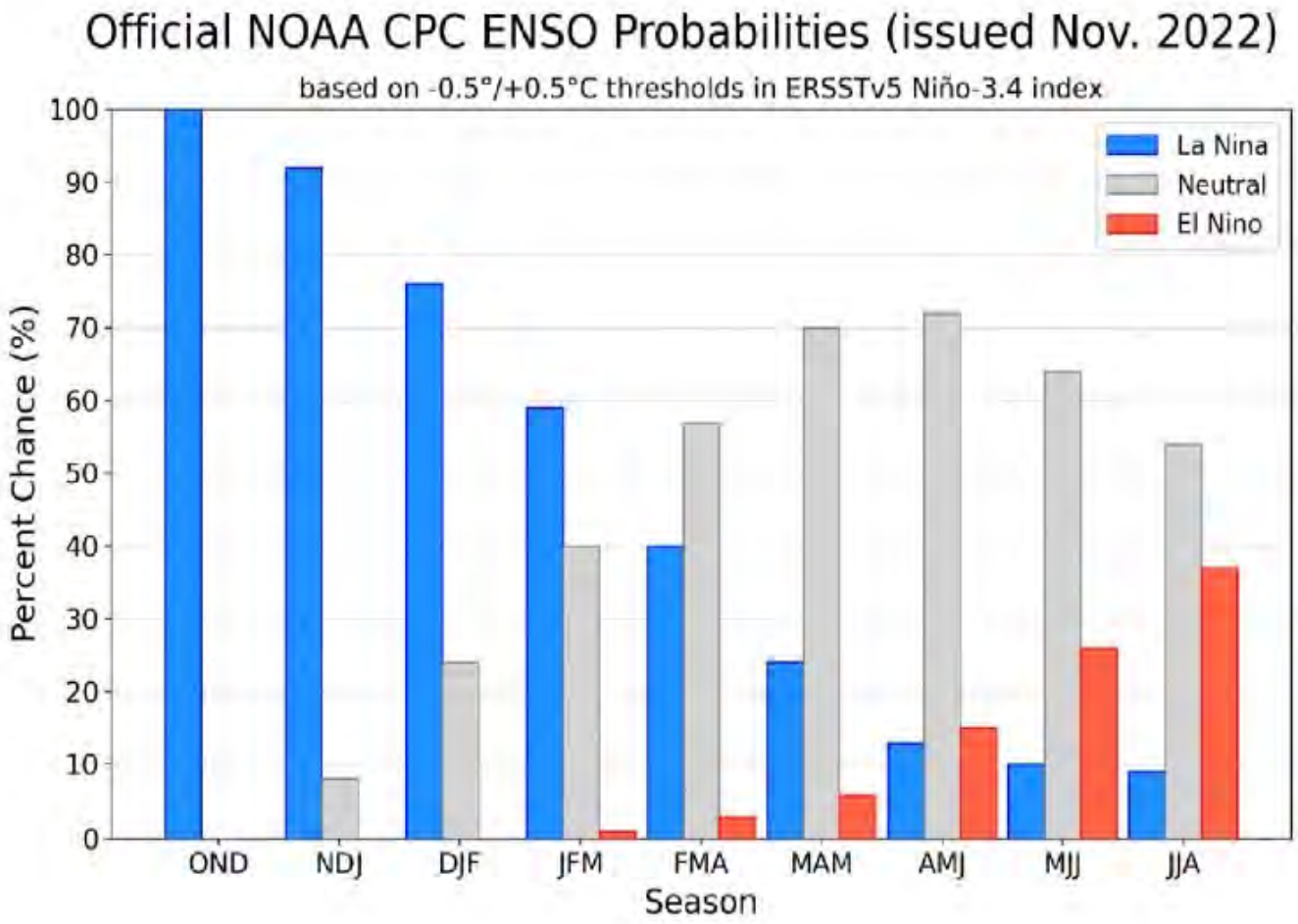
Argentina Wheat Production Cut Almost in Half

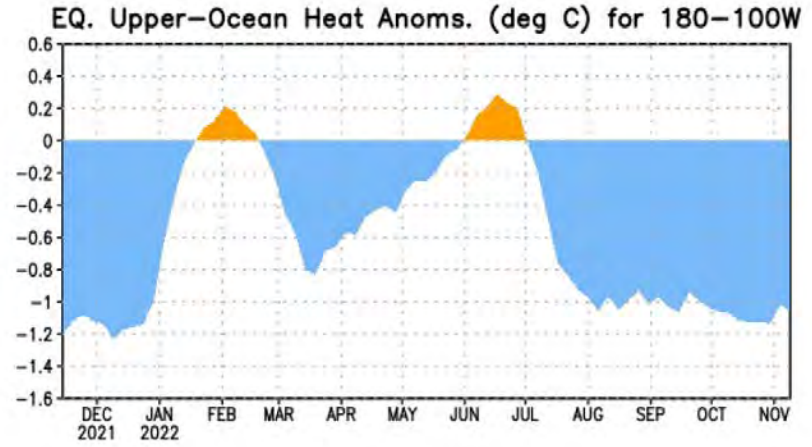
Wheat Production Forecasts for 2022/23 crop in MMT



CPC Probabilistic ENSO Outlook

Updated: 10 November 2022

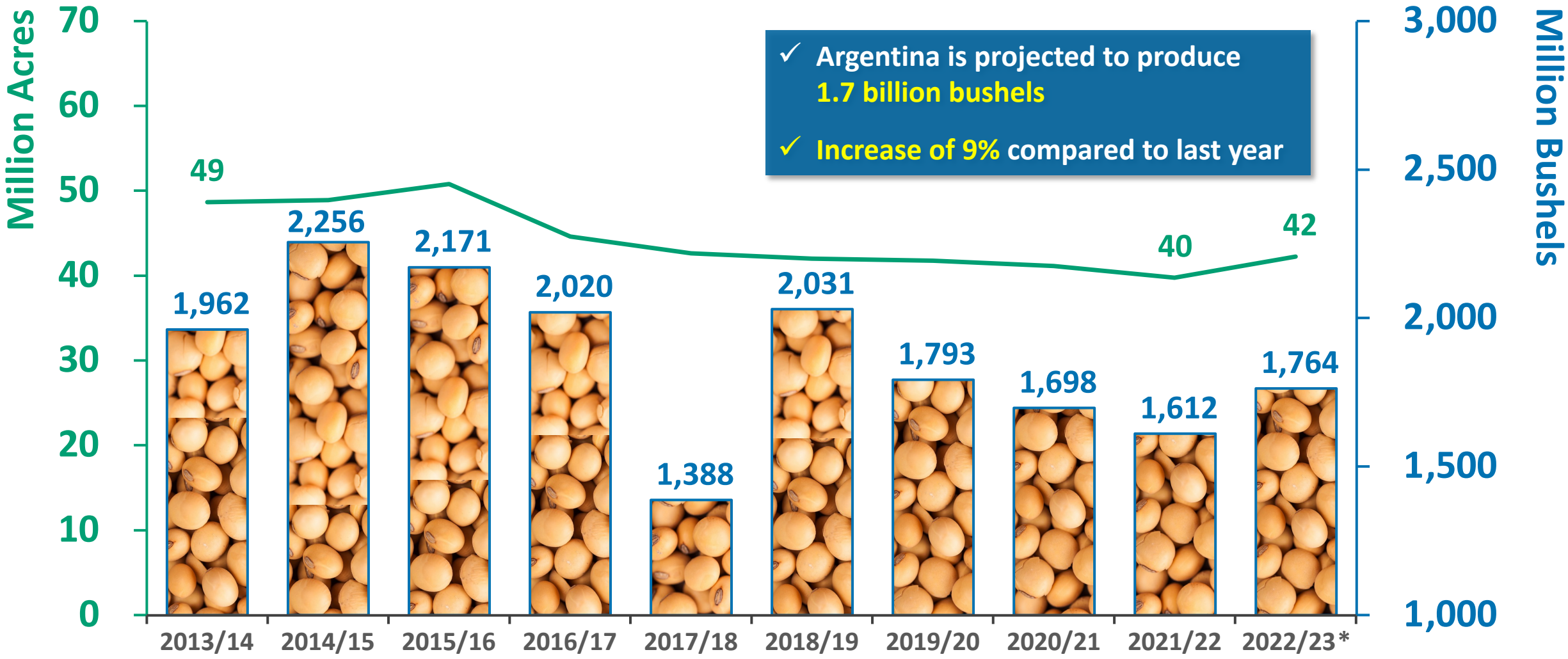




- Equatorial sea surface temperatures are **below average** across most of the Pacific Ocean.
- The tropical Pacific atmosphere is consistent with **La Niña**.
- There is a 76% chance of La Niña during the Northern Hemisphere winter (December-February) 2022-23, with a transition to **ENSO-neutral favored in February-April 2023** (57% chance).

Soybean Acreage and Production in Argentina

Acreage expected **to grow 5%** in the 2022/2023 crop, reaching **42 million acres**



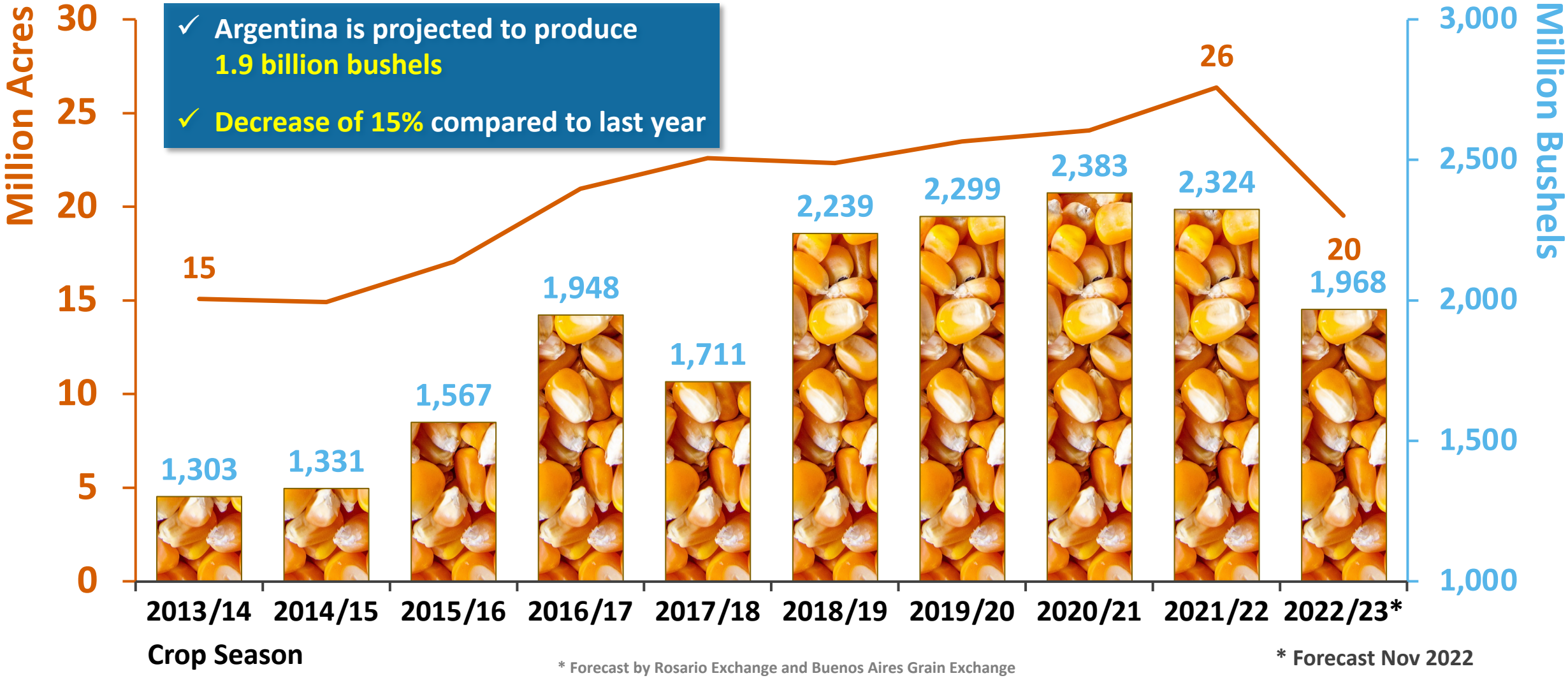
* Forecast by Rosario Exchange and Buenos Aires Grain Exchange

Source: Ministry of Agriculture, Livestock and Fisheries of Argentina (MAGyP)

* Forecast Nov. 2022

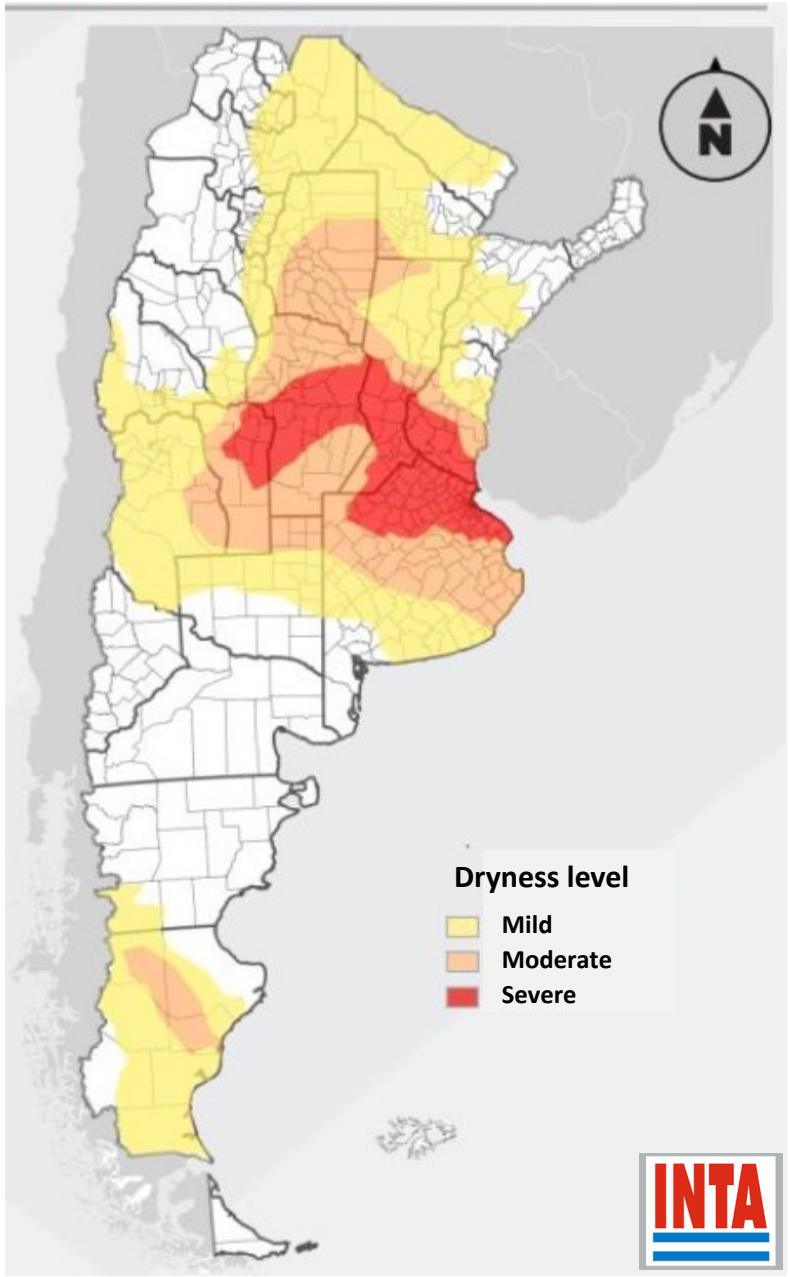
Corn Acreage and Production in Argentina

Corn acreage expected to decrease 23% in 2022/2023 to 20 million acres.



* Forecast by Rosario Exchange and Buenos Aires Grain Exchange
Source: Ministry of Agriculture, Livestock and Fisheries of Argentina (MAGyP)

Drought Status – Nov. 2022



Ideal planting date at risk

- ✓ Rain finally fell in Argentina over the last week and soybean farmers started to accelerate tractors to make up for **lost planting time**.
- ✓ **Corn planting** on Nov. 17 was **32% complete**, compared to 48% at the same time last year.
- ✓ **Soybean planting** on Nov. 17 was **17% complete**, compared to 31% at the same time last year.
- ✓ According to Rosario Exchange, around **70% of soybeans** will be planted outside the period when the maximum potentials are reached (from October 20 to November 15).

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Crop Budgets
Fertilizer Prices

Gary Schnitkey

University of Illinois

Fertilizer and Crop Budgets

Gary Schnitkey
University of Illinois

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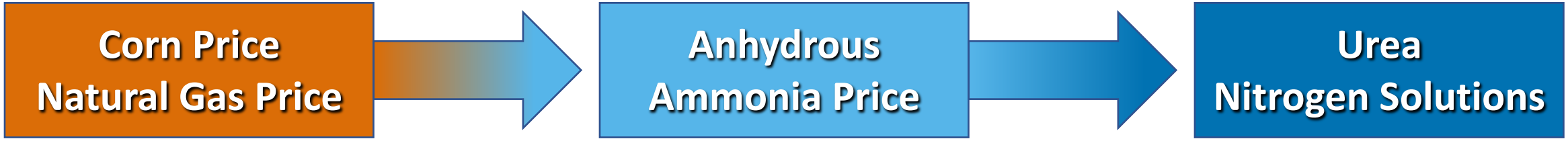
Price impacts



Corn price and natural gas price
impact positively anhydrous ammonia price

Anhydrous ammonia, urea, and nitrogen solution prices
are very highly correlated

Wholesale and retail nitrogen prices are highly correlated

Worst risk situation: Buy high priced nitrogen and corn/wheat prices fall

I will show Illinois retail prices, but are highly correlated
with other wholesale, retail and sources prices

Context of decisions

Nutrients

Nitrogen

- Needed by non-legume (corn & wheat)
- Yield response

Phosphorus

- Replacement
- Applications not as critical

Potassium

- Replacement
- Applications not as critical

Nitrogen price impact on farmer decisions

Crop choices

- Corn versus soybeans and other non-legumes
- Wheat versus soybeans and other non-legumes

Timing of applications, rates

- Fall versus spring versus post-plant

Begin discussion fall of 2021

COVID had impacted supply chains

- **Equipment (parts and new equipment delays)**
- **Pesticides (glyphosate)**

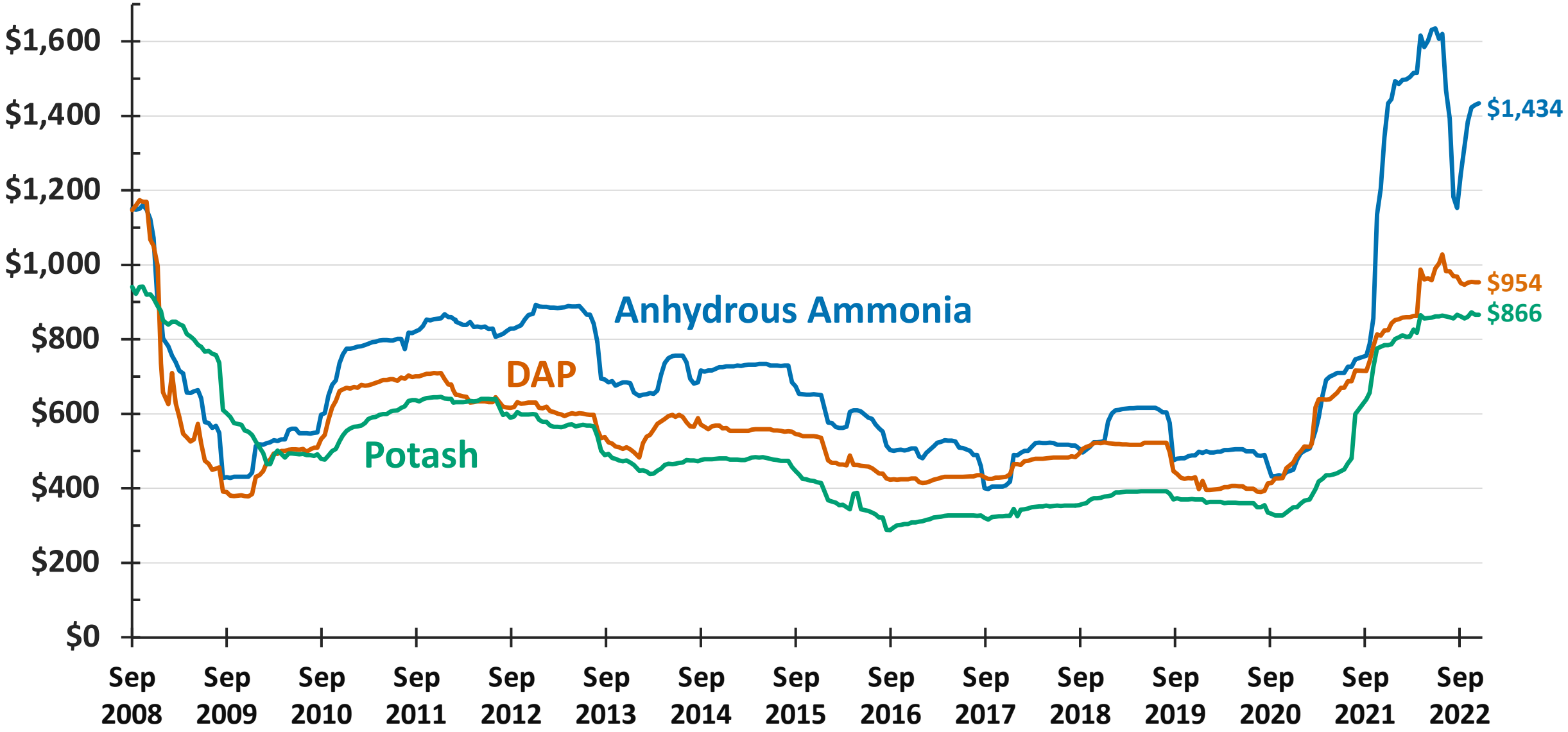
Inflation

COVID and policy responses

Finding labor is difficult

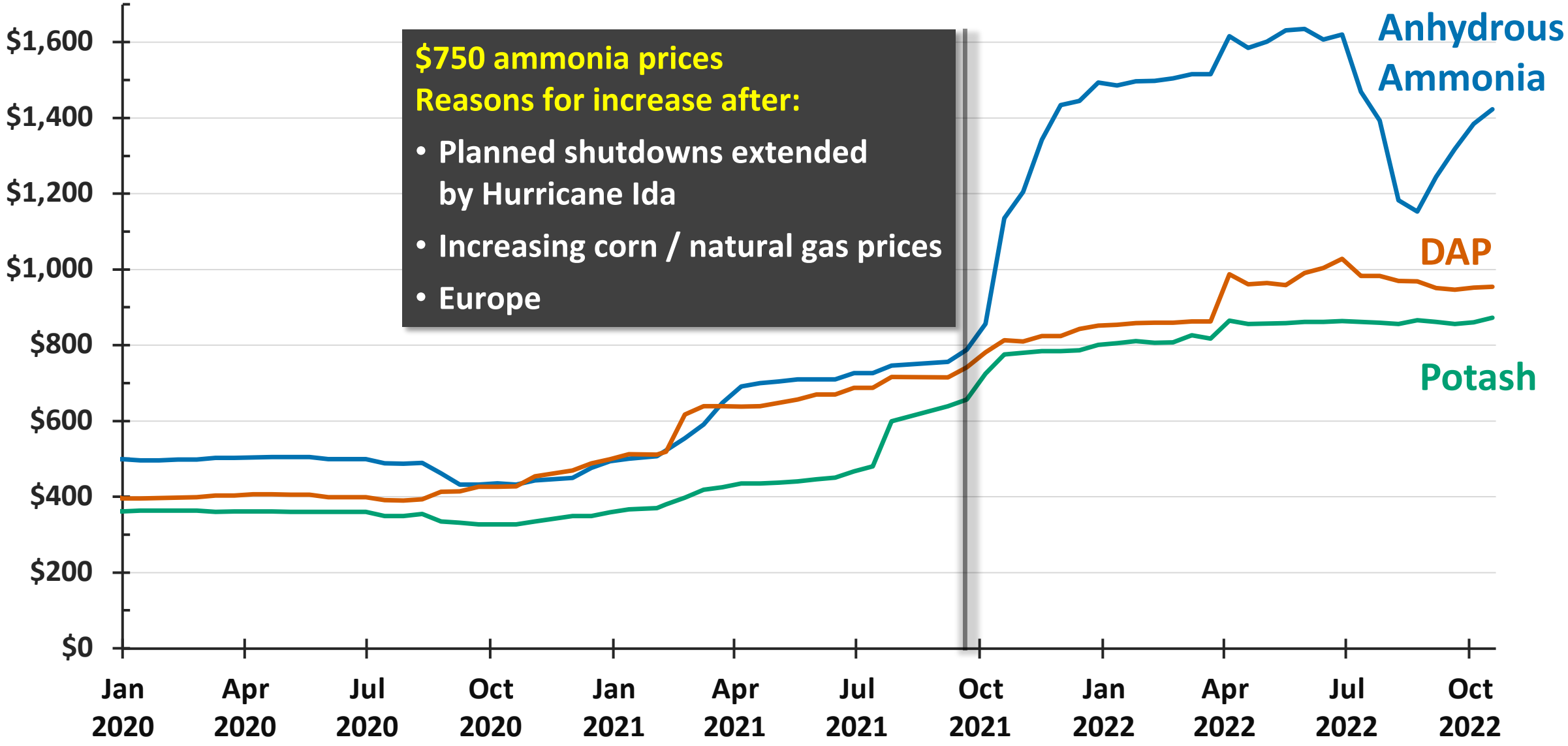
Farming Business Got Harder

Fertilizer Prices per Ton in Illinois From 2008 to 2022



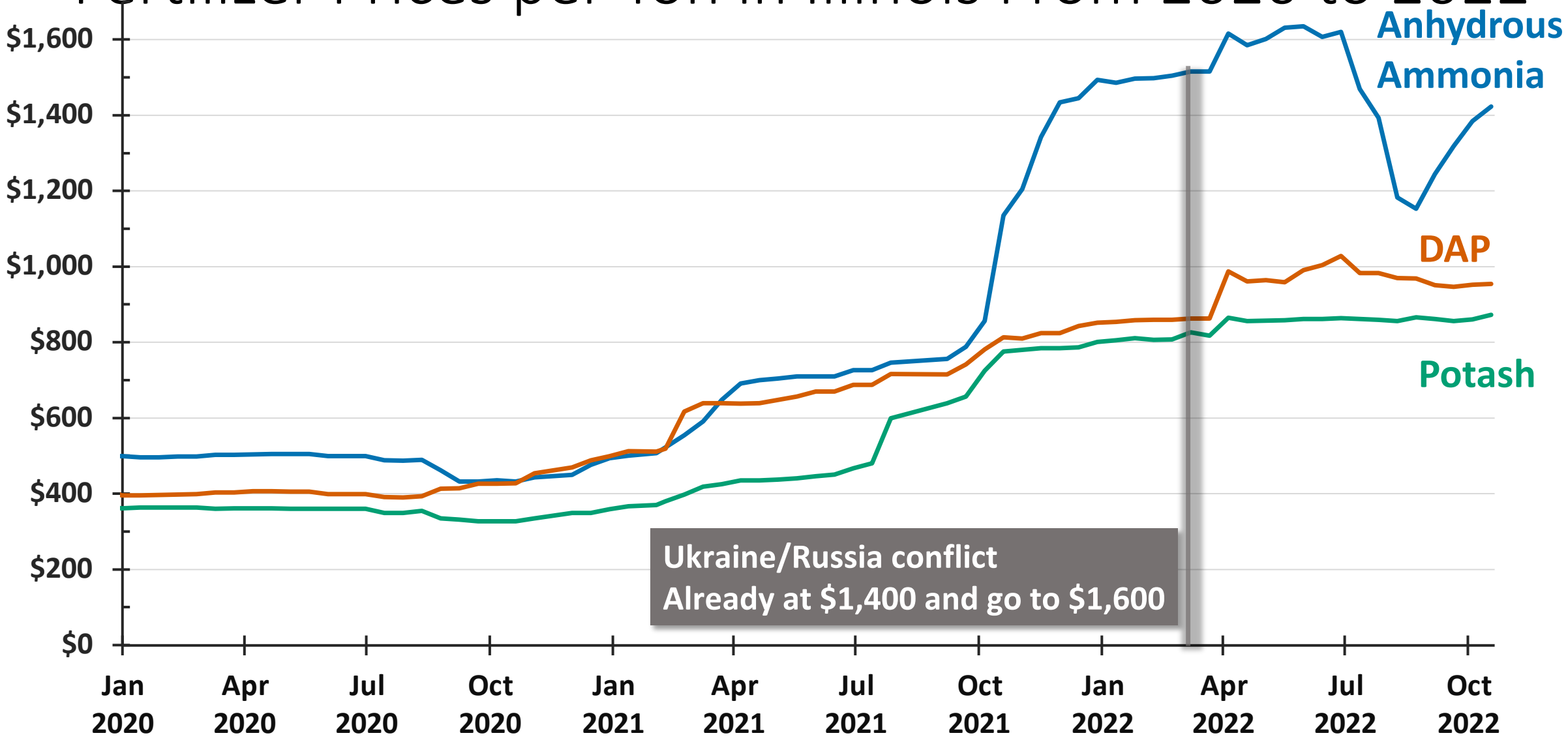
Source: US Department of Agriculture, Agricultural Marketing Service

Fertilizer Prices per Ton in Illinois From 2020 to 2022



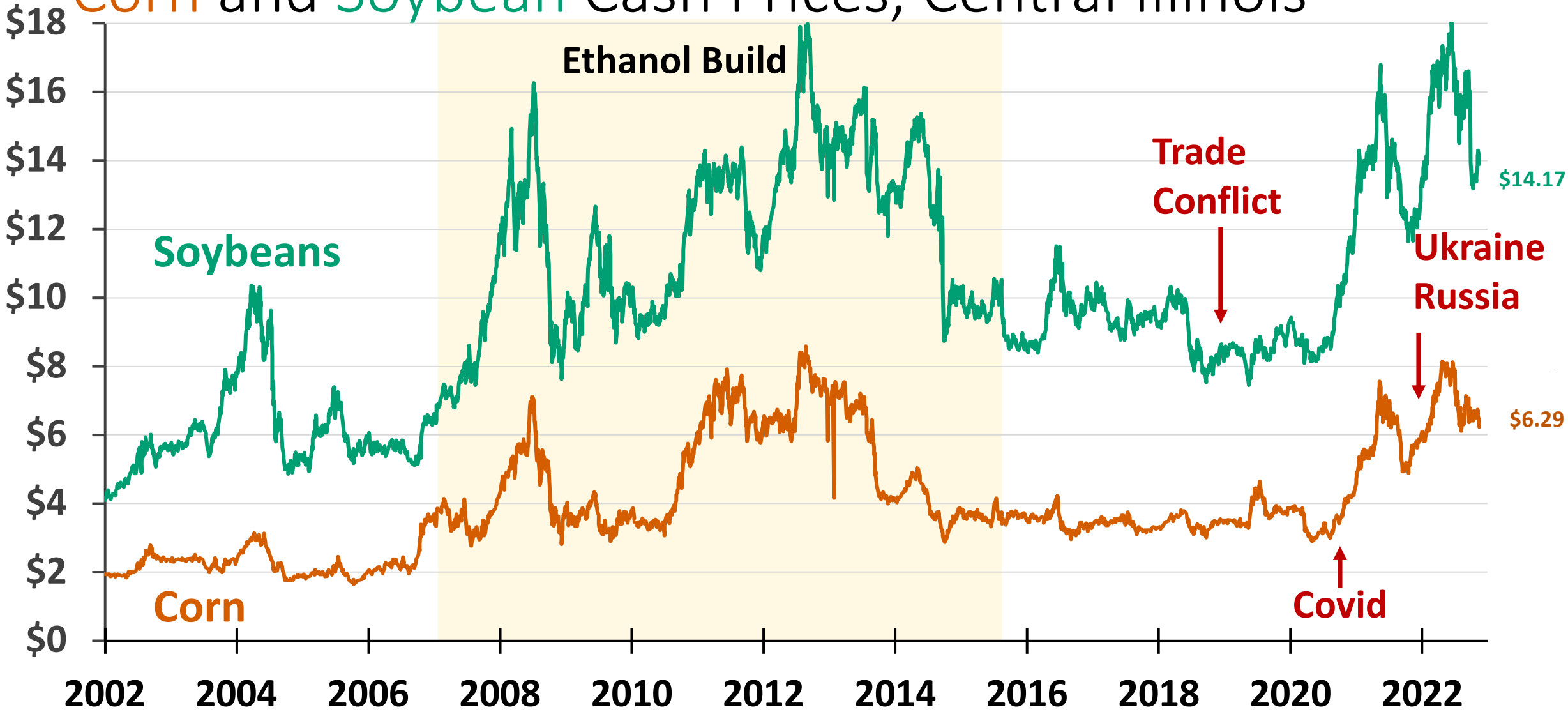
Source: US Department of Agriculture, Agricultural Marketing Service

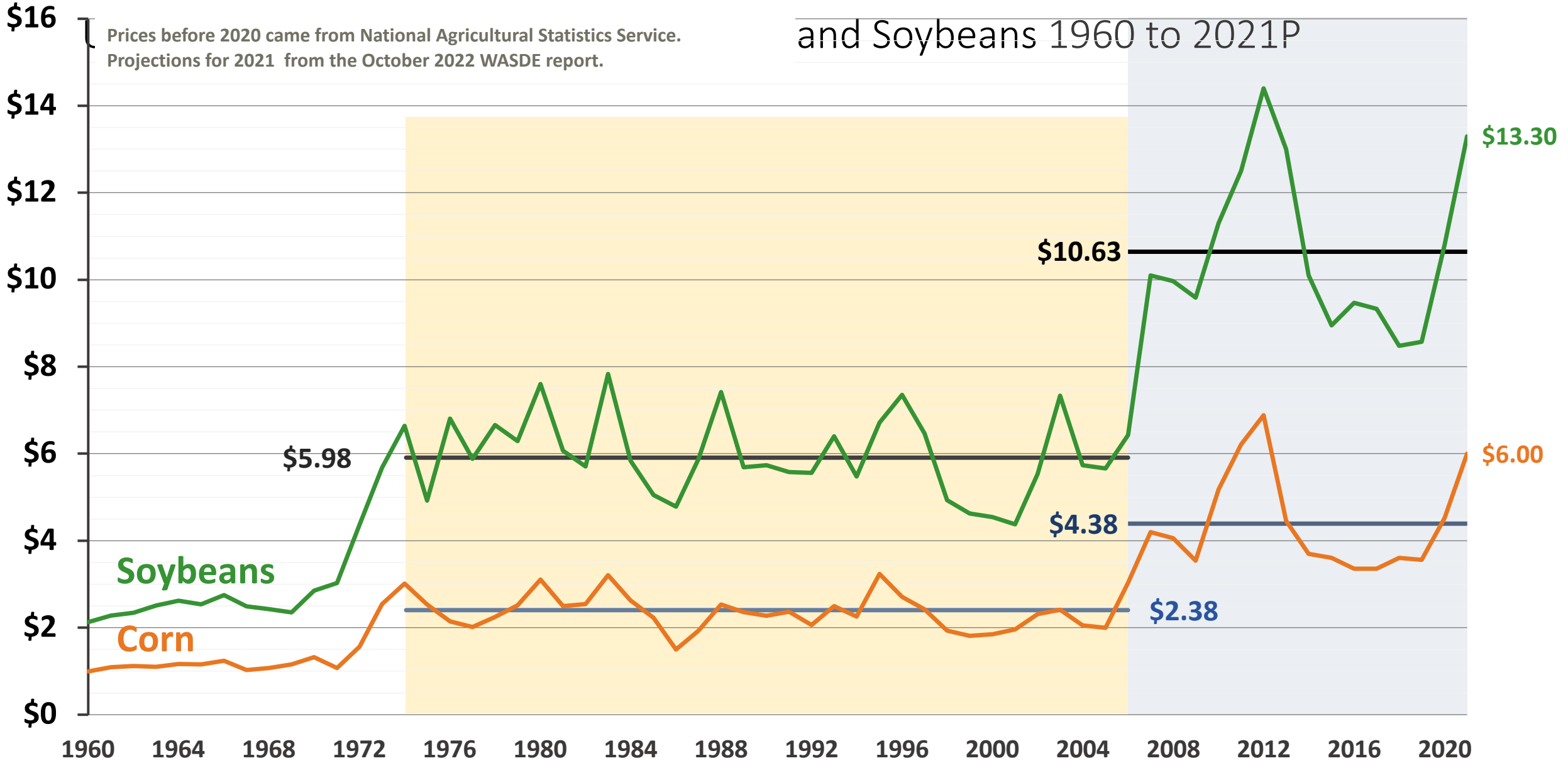
Fertilizer Prices per Ton in Illinois From 2020 to 2022



Source: US Department of Agriculture, Agricultural Marketing Service

Corn and Soybean Cash Prices, Central Illinois




and Soybeans 1960 to 2021P
Prices before 2020 came from National Agricultural Statistics Service.
Projections for 2021 from the October 2022 WASDE report.
$16
$14
$12
$10
$8
$6
$4
$2
$0
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008
2012
2016
2020
$13.30
$6.00
$10.63
$5.98
$4.38
$2.38
Soybeans
Corn

U.S. Prices by Marketing Year

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23 (P)	2023-24 (P)
Corn	**3.36**	**3.61**	**3.56**	**4.53**	**6.00**	**6.80**	**5.80**
Soybeans	**9.33**	**8.47**	**8.57**	**10.80**	**13.30**	**14.00**	**13.20**
Wheat	**4.72**	**5.16**	**4.58**	**5.05**	**7.63**	**9.20**	**8.25**

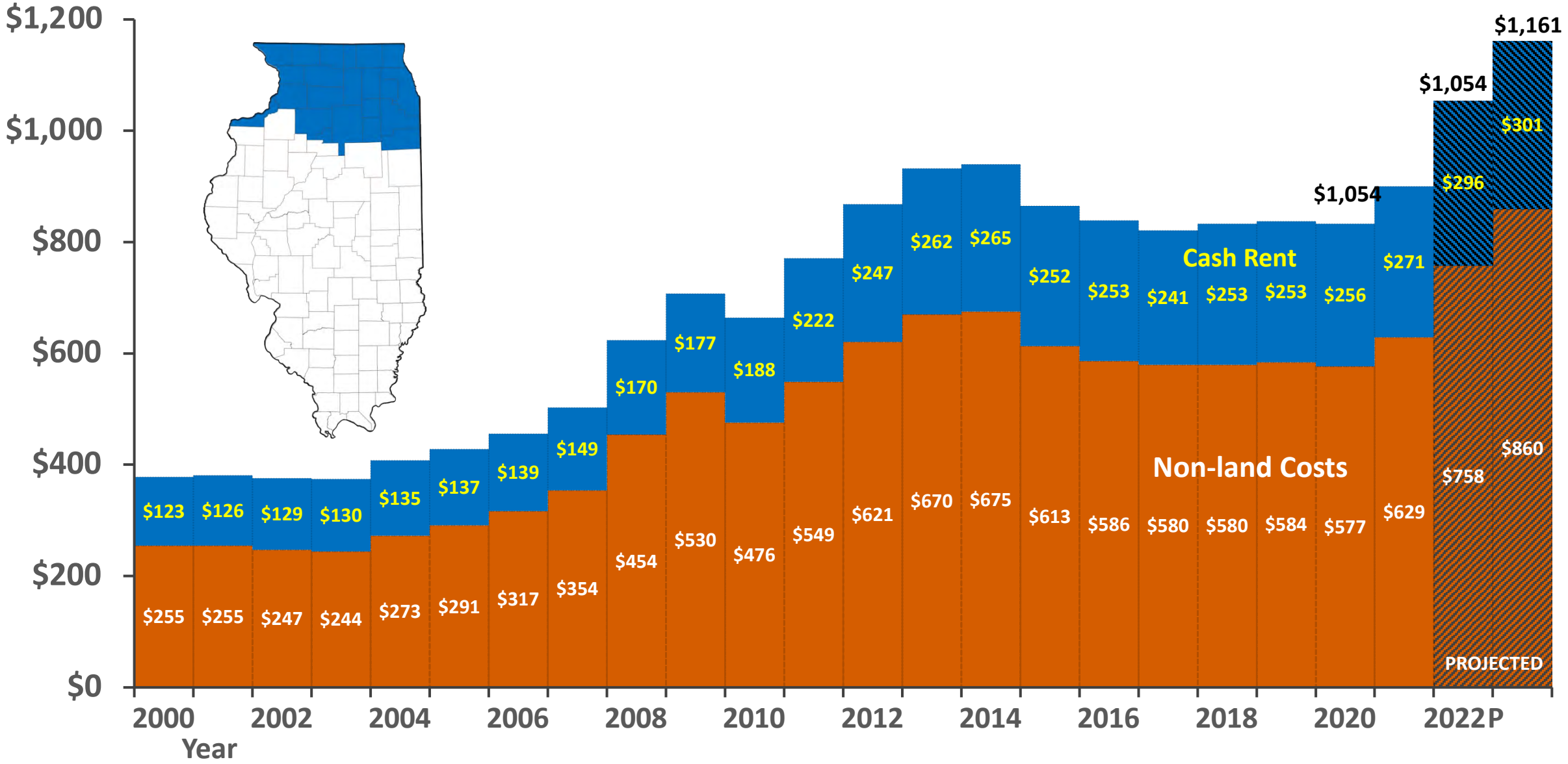
National Market Year Average (MYA) price by year

- September to August for corn and soybeans
- June to May for wheat

Calculated by NASS

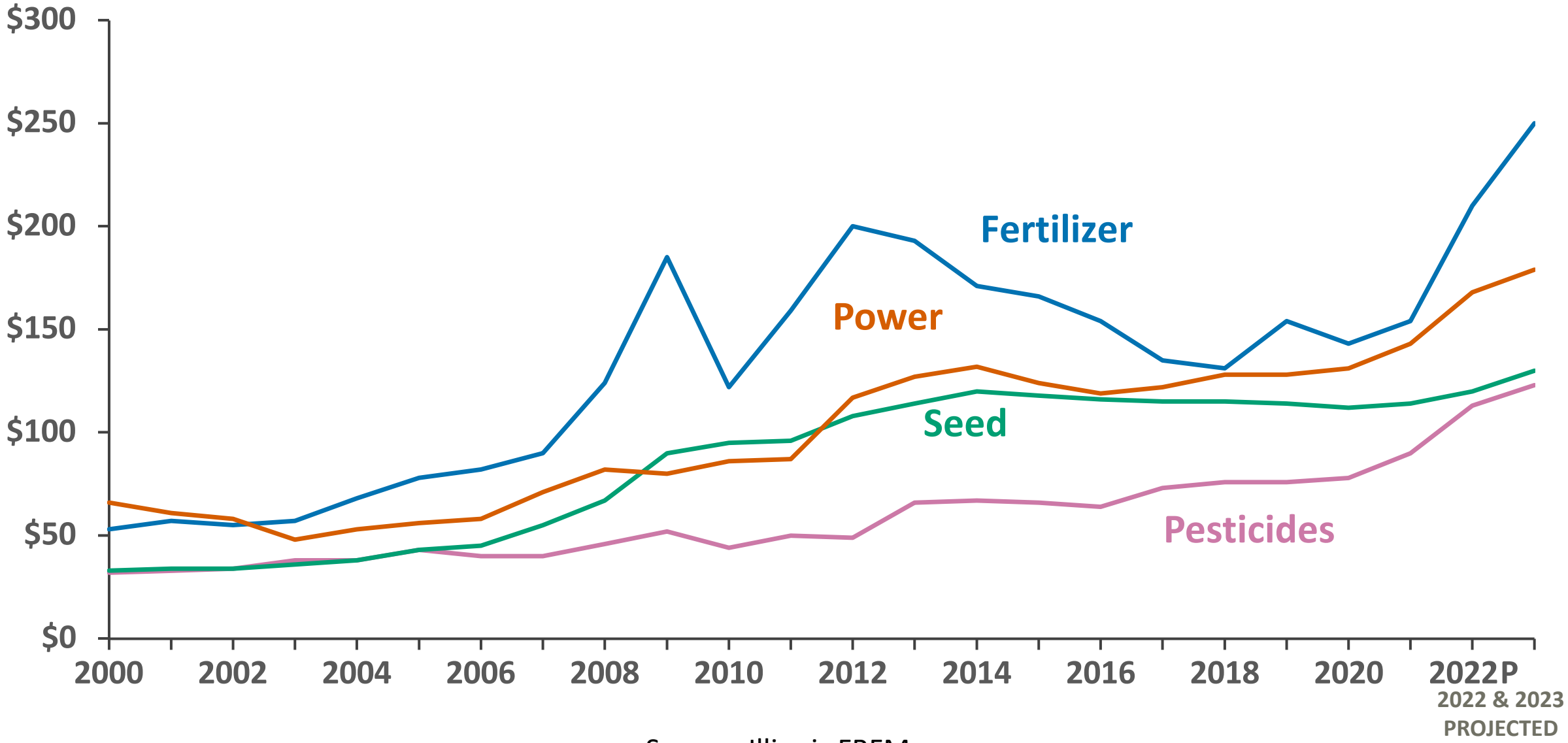
- 2022-23 (P) is projection in WASDE report
- 2023-24 is my projection

Total Costs of Producing Corn for Northern Illinois in $ per acre



Source: Illinois Farm Business Farm Management

Cost of Select Items, Central Illinois, $ per acre



Source: Illinois FBFM

2022 crop year decisions

Many farmers got lower cost inputs in the fall ($750 anhydrous ammonia versus $1,600 in spring)

Budgets said plant more corn, farmers planted less

From USDA Acreage Report, June 30, 2022

-4%	+1%	+1%	+11%
Corn	Soybean	All Wheat	All Cotton

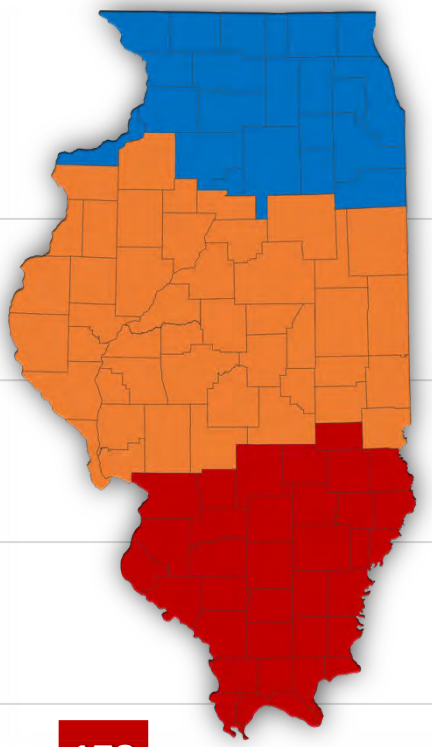
Acreage from 2021

Strategy 1

Split applications

1. Apply 75% of MRTN
2. Apply remaining post-plant

Strategy 2: Reduce rate



Generated using a $5.00 corn price

Actual N Per Acre

Anhydrous Ammonia Price per Ton	Actual N Per Acre		
$400	201	209	239
$600	187	195	216
$800	174	184	203
$1,000	164	175	195
$1,200	155	168	187
$1,400	148	162	178
$1,600	141	155	170

Pounds of Actual N per Acre

240
220
200
180
160
140
120

$400 $600 $800 $1,000 $1,200 $1,400 $1,600

Anhydrous Ammonia Price per Ton

Strategy 3

Apply most nitrogen as anhydrous ammonia

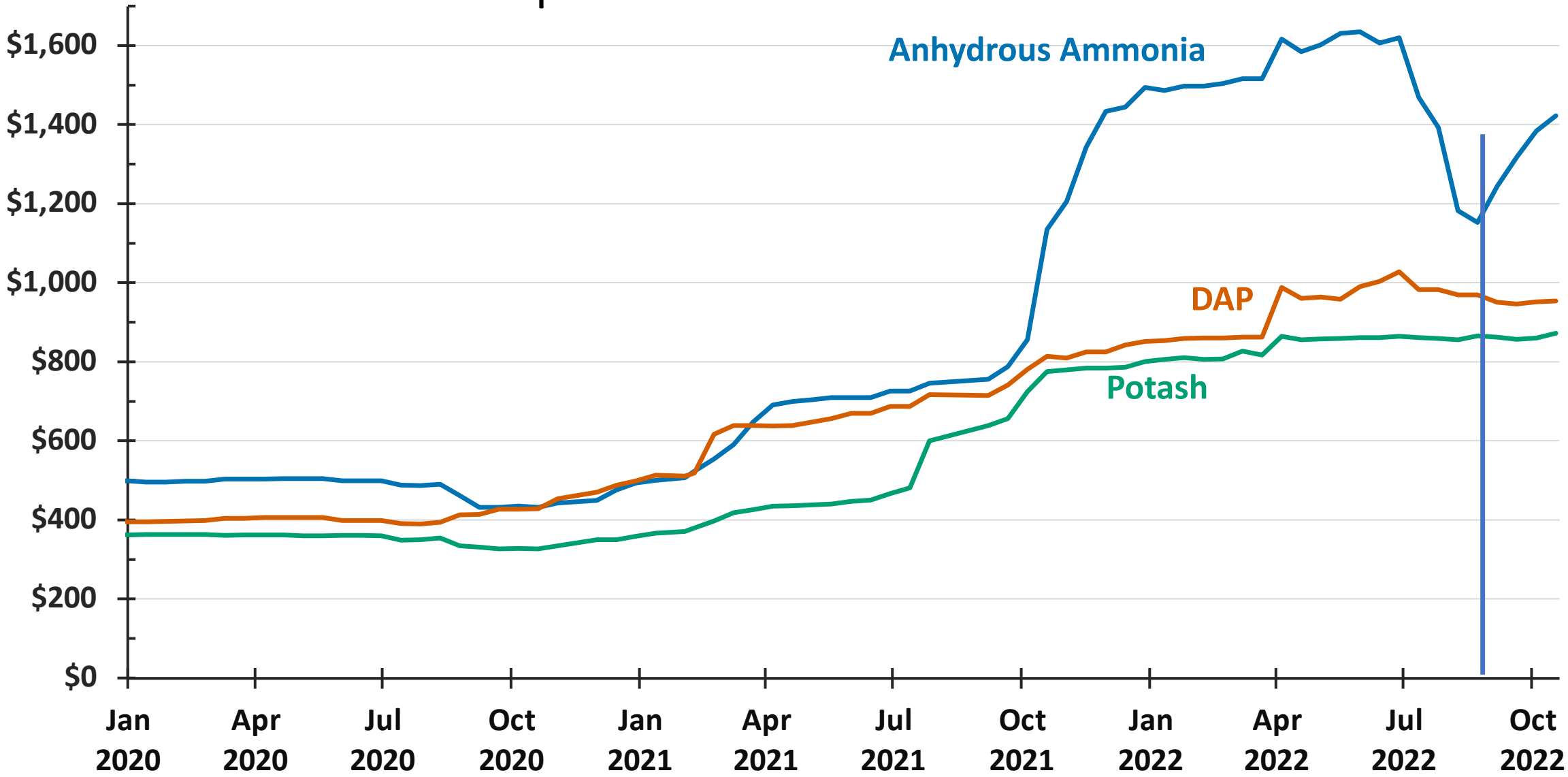
	Anhydrous Ammonia	28% Solution
Price per ton	**$1,344**	**$563**
$/lb of actual N	**$0.82**	**$1.00**

Those prices will vary situation.

Situation for 2023

- Rising nitrogen prices from early fall to end of October
- Still face great deal of uncertainty about nitrogen
  - Prices
  - Supplies
    (primarily focused on Europe)

Fertilizer Prices per Ton in Illinois From 2020 to 2022



Source: US Department of Agriculture, Agricultural Marketing Service

Natural Gas in Nitrogen Fertilizer Production

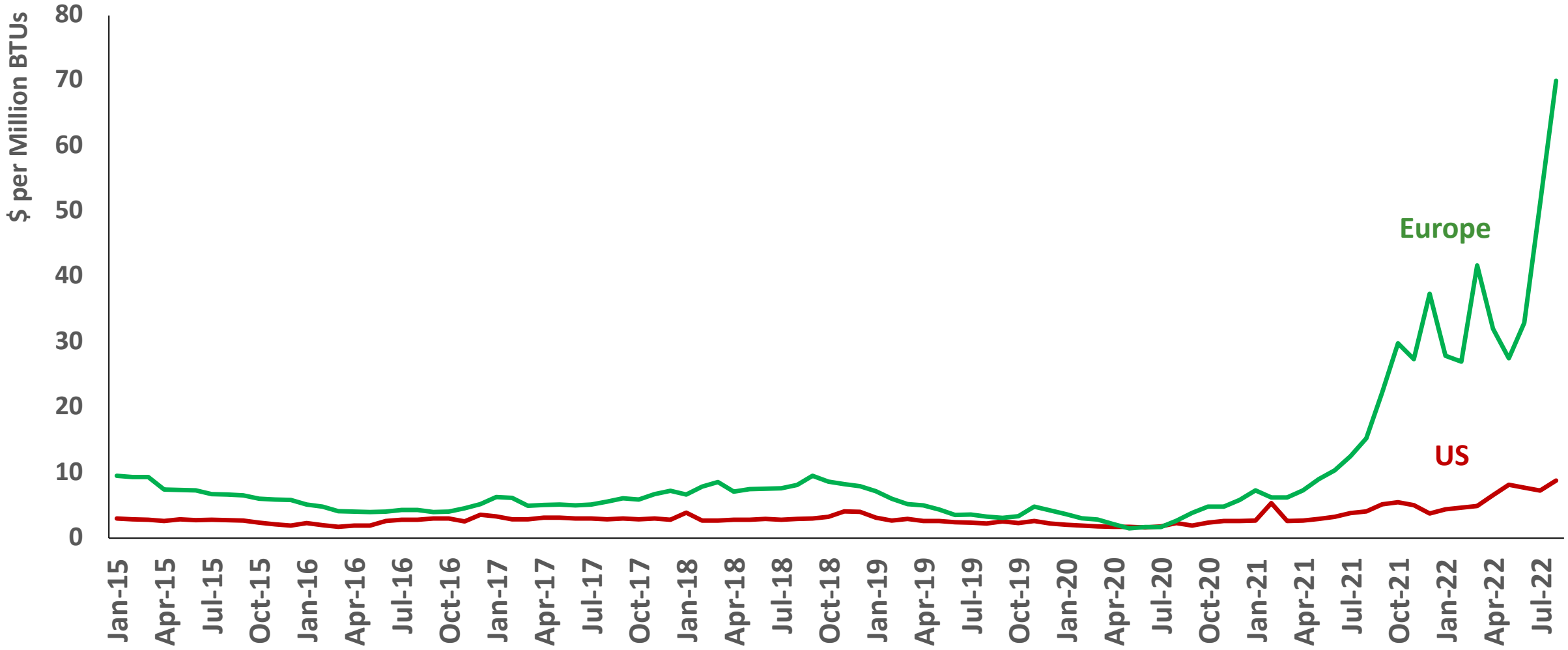
Top 10 Natural Gas Producers Labeled

Darkest Green Shading = Largest Nitrogen Producers

- Natural gas is an important feedstock in nitrogen fertilizer production.
- Top nitrogen producing countries align with leading natural gas producers.

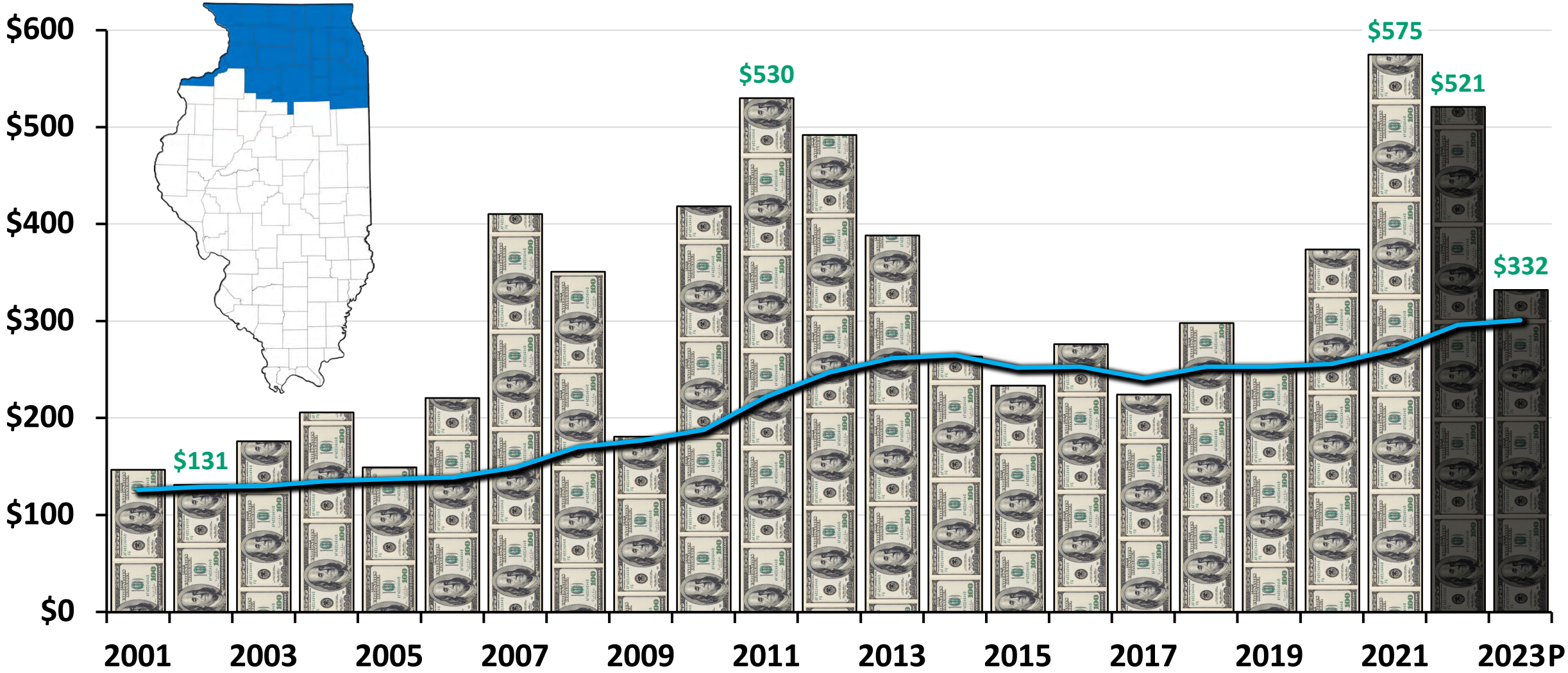
  Exception is Norway
- Russian/Ukraine war has changed normal trade flows of natural gas that could impact ammonia production.

Natural Gas Prices, US (Henry HUB) and Europe

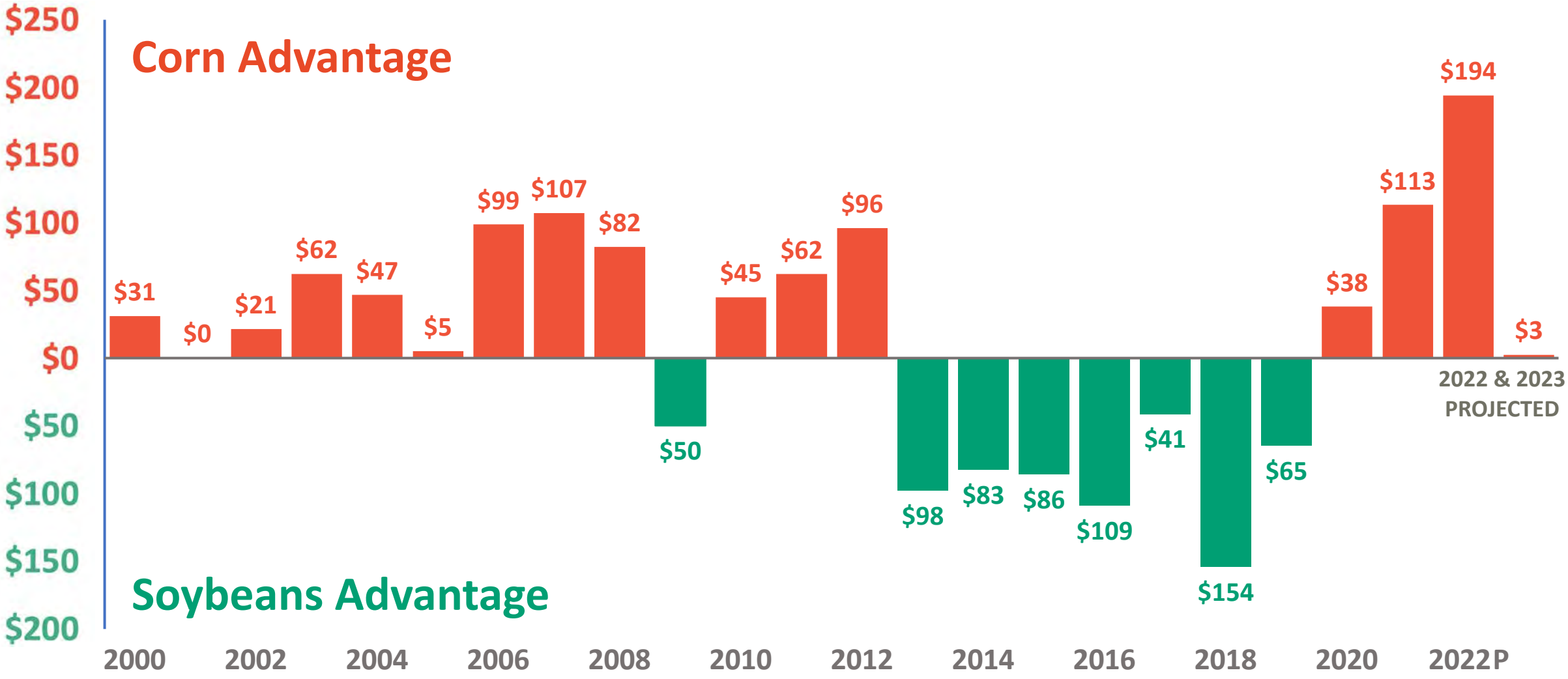


Operator and Land Return and Cash Rent in $ per acre

Northern Illinois



Corn Advantage Over Soybeans, Northern Illinois



What will happen in 2023?

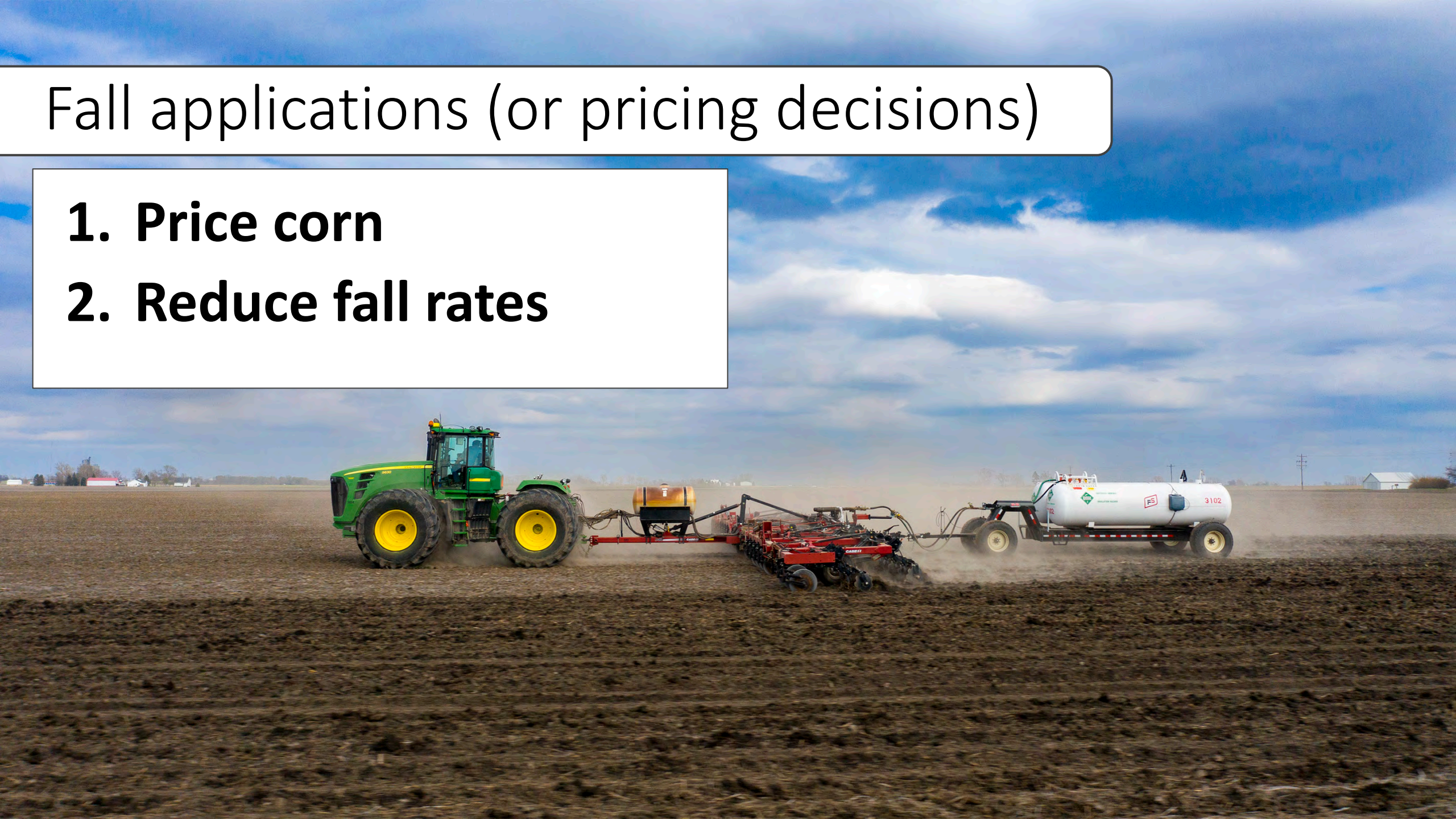
Cropping decisions

- **I don’t see a move to corn, perhaps wheat**

Nitrogen decisions

Fall applications (or pricing decisions)

1. **Price corn**
2. **Reduce fall rates**



General risk management strategies

- **Use rates near university recommendations**
- **Spread sales**
- **Risk advantage to waiting to apply**

Table 2. Corn and Soybean Returns, Central Illinois with High-Productivity Farmland.

	Corn			Soybeans		
	2021	2022P	2023P	2021	2022P	2023P
Yield per acre	221	225	227	72	71	72
Price per bu	$5.90	$6.40	$5.50	$13.40	$14.00	$13.00
Crop revenue	$1,304	$1,440	$1,249	$965	$994	$936
Total direct costs	**$415**	**$514**	**$582**	**$192**	**$264**	**$288**
Total power costs	**$143**	**$168**	**$179**	**$124**	**$147**	**$157**
Total overhead costs	**$76**	**$79**	**$93**	**$69**	**$72**	**$85**
Total non-land costs	**$634**	**$761**	**$854**	**$385**	**$483**	**$530**
Operator and land return	**$684**	**$679**	**$395**	**$585**	**$511**	**$406**
Land costs (cash rent)	311	336	341	311	336	341
Farmer return	**$373**	**$343**	**$54**	**$274**	**$175**	**$65**

Summary

High and volatile fertilizer prices

High and volatile crop prices

Falling crop prices, without input price declines is the concern

FARM ASSETS CONFERENCE

farmdoc

S&D Tables Price Prospects

Scott Irwin
Joe Janzen
University of Illinois

Supply and Demand Balance for Corn and Soybeans

Price Prospects for 2022/23 and beyond

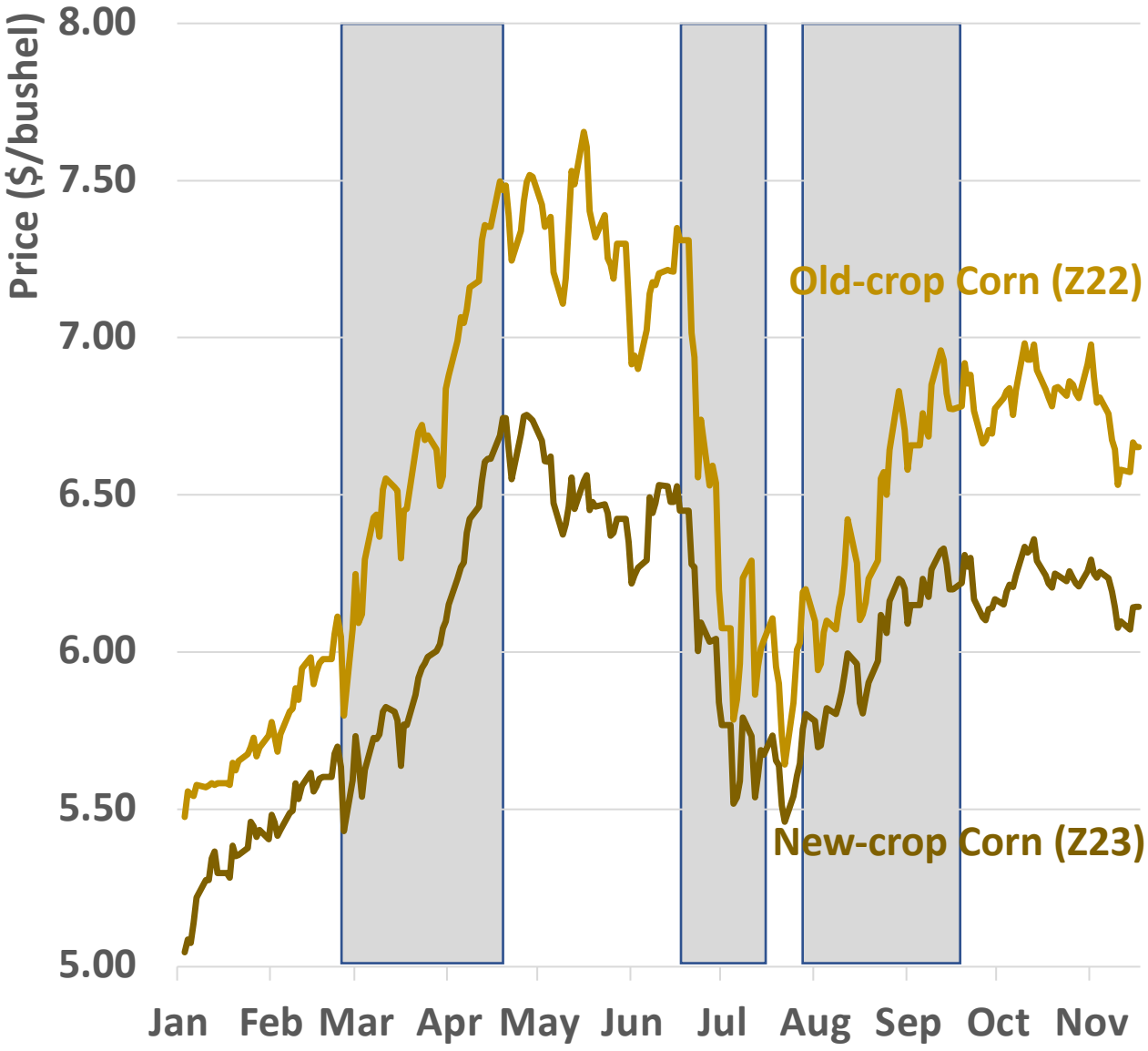
ILLINOIS
Agricultural &
Consumer Economics
COLLEGE OF AGRICULTURAL, CONSUMER
& ENVIRONMENTAL SCIENCES

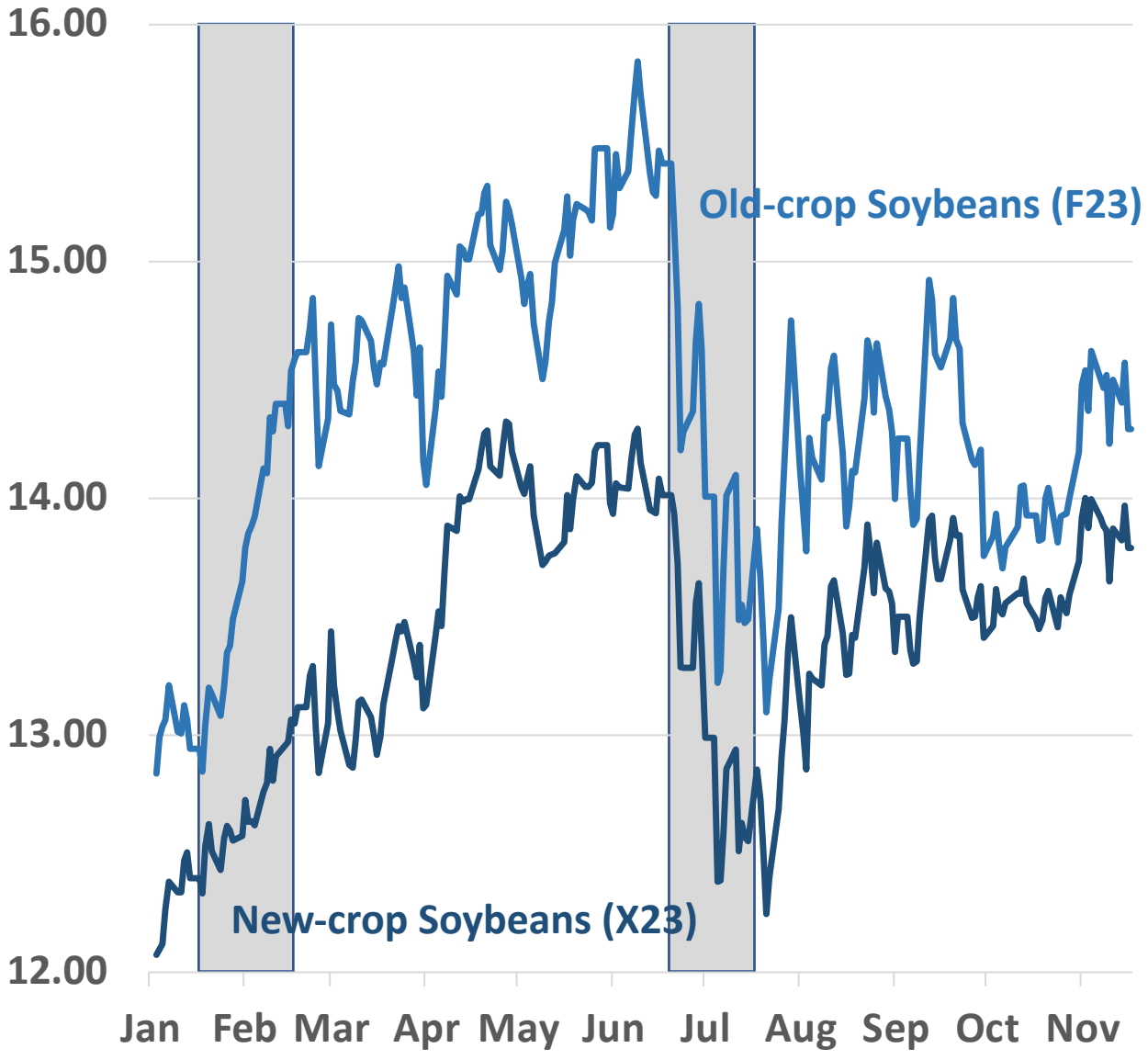
Scott Irwin
sirwin@illinois.edu

farmdoc

Joe Janzen
jjanzen@illinois.edu

Corn and Soybean Futures Prices since January 1, 2022



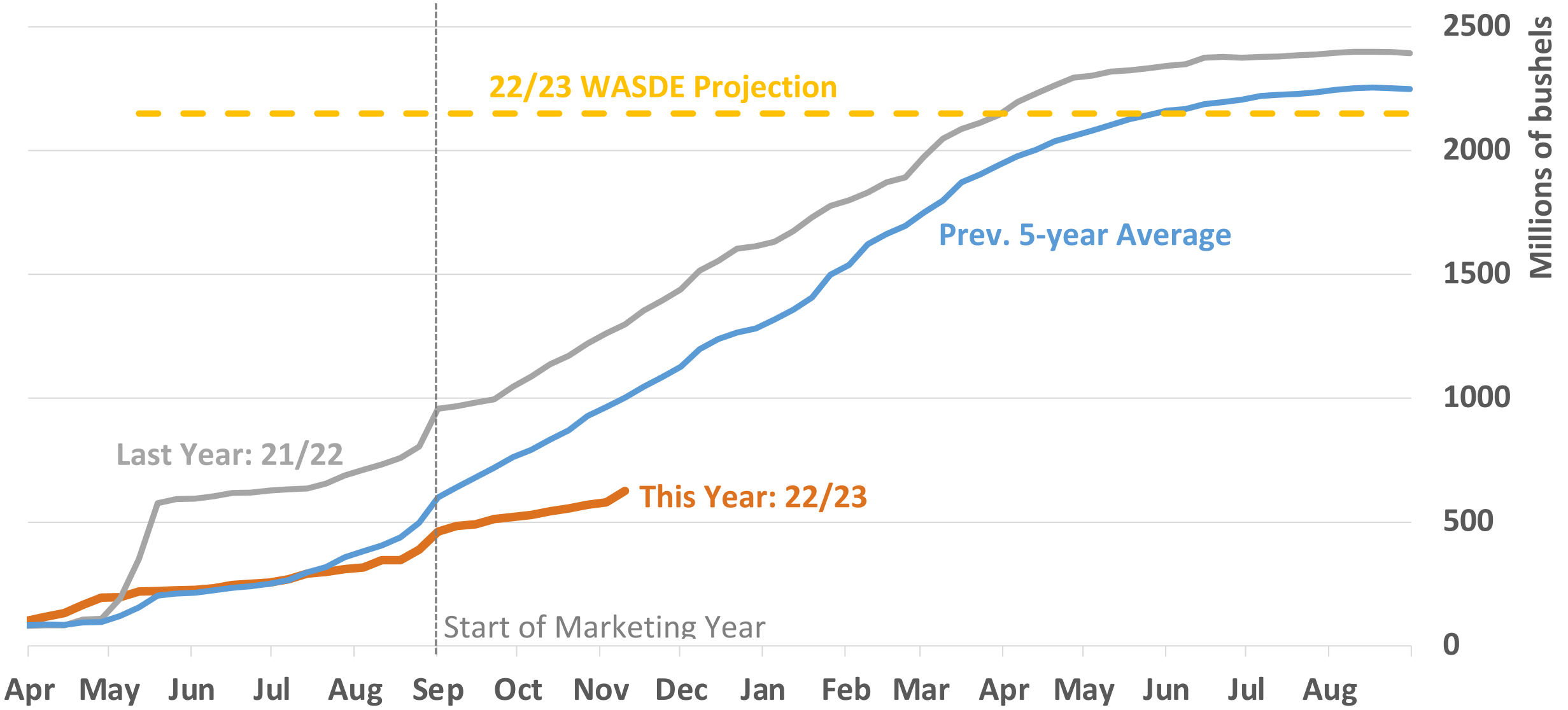


Source: Bloomberg

Old-Crop US Corn Balance Sheet

	(mil. bushels unless noted)	2021/22	2022/23 USDA Nov WASDE	2022/23 *farmdoc* Forecast
Supply	Area Planted (mil. acres)	93.3	88.6	88.6
	Area Harvested (mil. acres)	85.3	80.8	80.8
	Yield (bu./acre)	176.7	172.3	172.3
	Beginning Stocks	1,235	1,377	1,377
	Production	15,074	13,930	13,930
	Imports	24	50	50
	Total Supply	16,333	15,357	15,357
Use	Feed and Residual	5,717	5,300	5,300
	Food, Seed, and Industrial	6,767	6,725	6,650
	Ethanol	5,326	5,275	5,200
	Exports	2,471	2,150	2,075
	Total Use	14,956	14,175	14,025
	Ending Stocks	1,377	1,182	1,332
	Stocks-to-Use (%)	**9.2**	**8.3**	**9.5**
	Season Average Price ($/bu.)	$6.00	$6.80	$6.60

US Corn Export Sales by Week to November 10, 2022

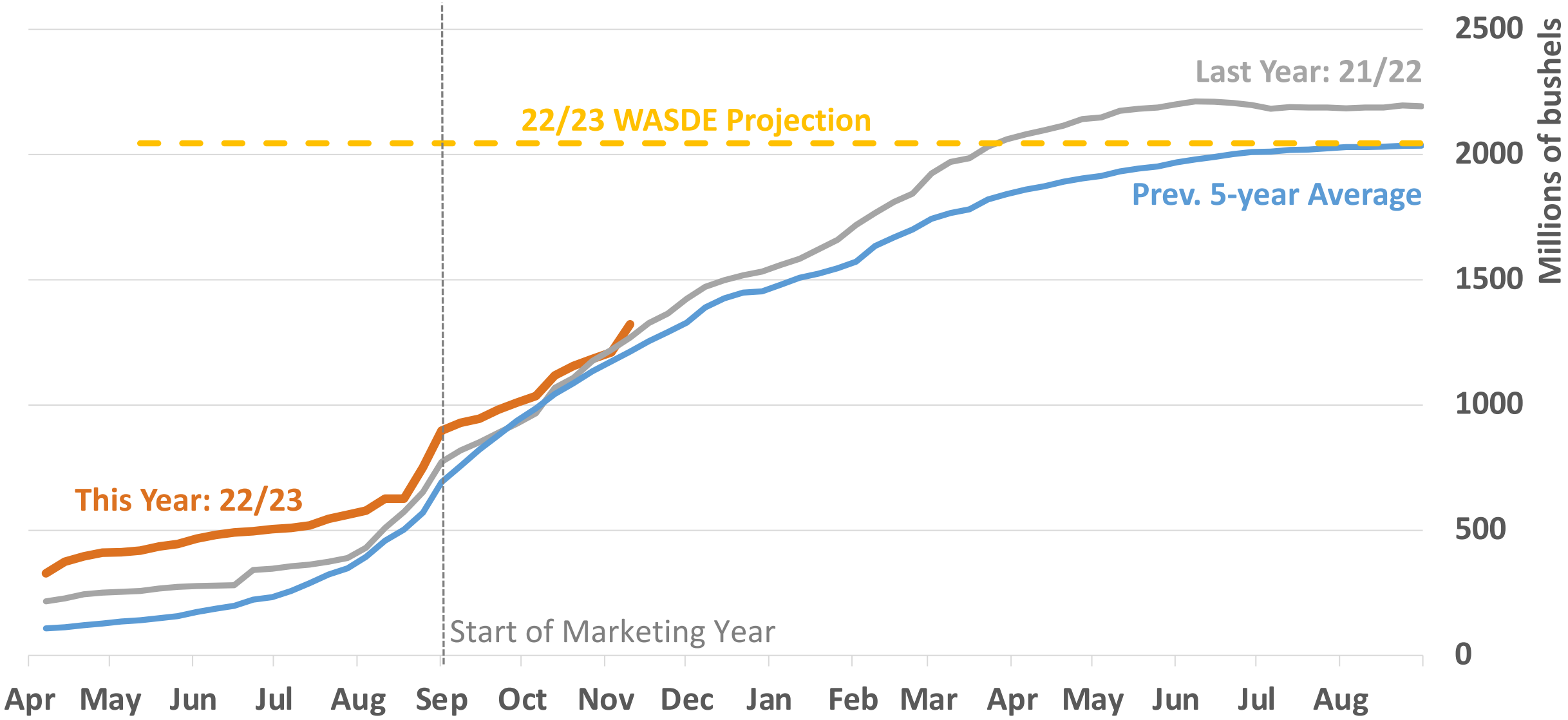


Note: Export Sales = Commitments + Accumulated Exports, Source: USDA Foreign Agricultural Service

Old-Crop US Soybean Balance Sheet

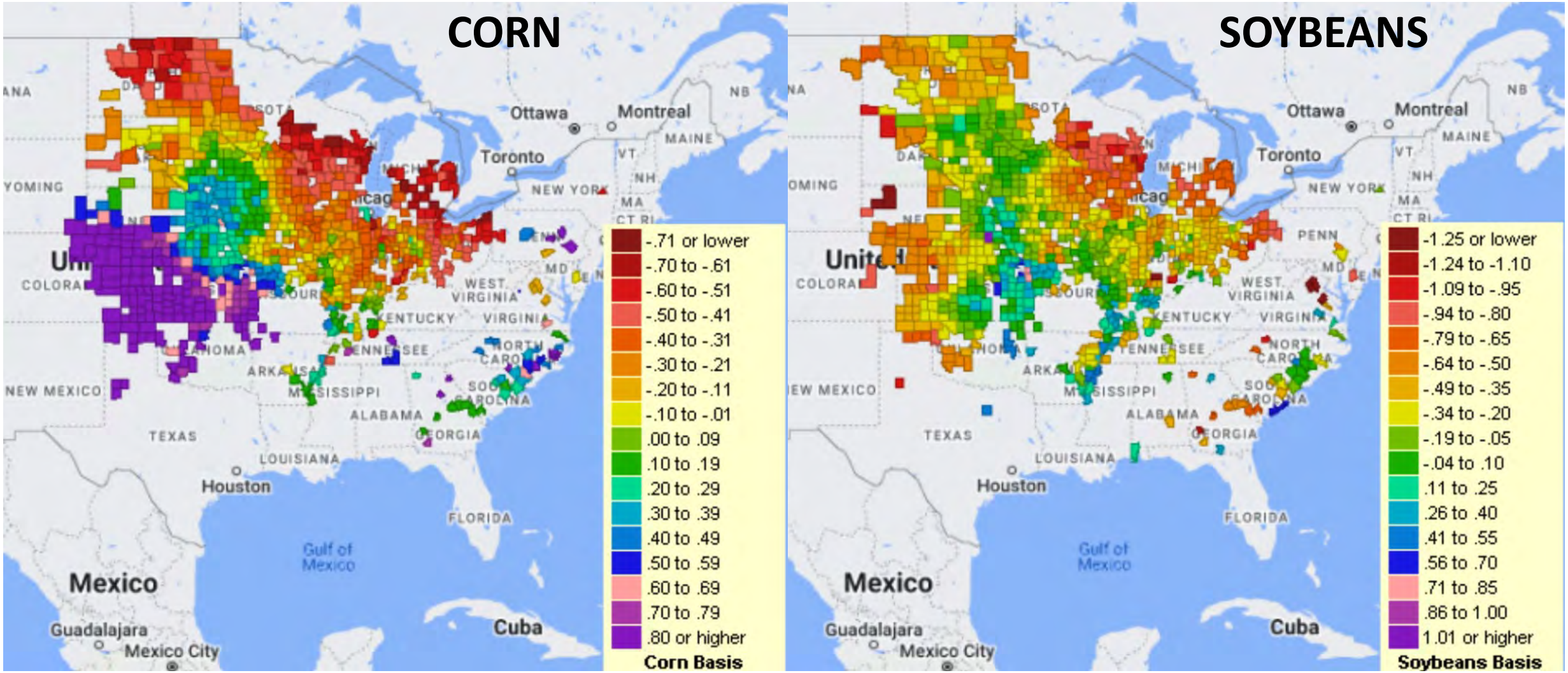
	(mil. bushels unless noted)	2021/22	2022/23 USDA Nov WASDE	2022/23 *farmdoc* Forecast
Supply	Area Planted (mil. acres)	87.2	87.5	87.5
	Area Harvested (mil. acres)	86.3	86.6	86.6
	Yield (bu./acre)	51.7	50.2	50.2
	Beginning Stocks	257	274	274
	Production	4,465	4,346	4,346
	Imports	16	15	15
	Total Supply	4,738	4,634	4,634
Use	Crushings	2,204	2,245	2,245
	Exports	2,158	2,045	2,045
	Seed	102	102	102
	Residual	2	22	22
	Total Use	4,465	4,414	4,414
	Ending Stocks	274	220	220
	Stocks-to-Use (%)	**4.6**	**5.0**	**5.0**
	Season Average Price ($/bu.)	$13.30	$14.00	$14.00

US Soybean Export Sales by Week to November 10, 2022



Note: Export Sales = Commitments + Accumulated Exports, Source: USDA Foreign Agricultural Service

Corn and soybean basis levels as of November 17, 2022



Source: DTN

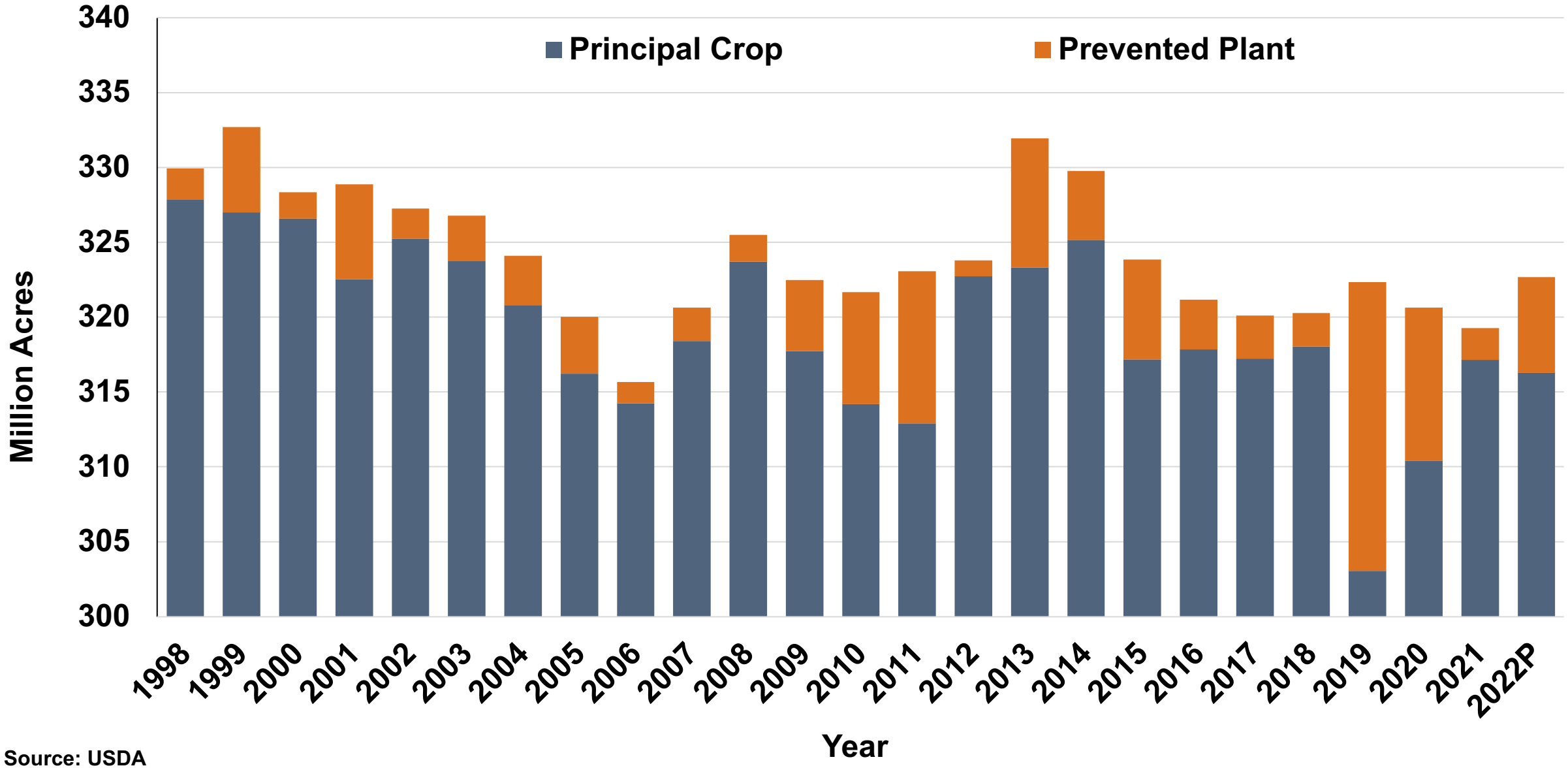
New-Crop US Corn Balance Sheet

	(mil. bushels unless noted)	2021/22	2022/23 USDA Nov WASDE	2023/24 USDA Oct Baseline	2023/24 farmdoc Forecast
Supply	Area Planted (mil. acres)	93.3	88.6	92.0	92.0
	Area Harvested (mil. acres)	85.3	80.8	84.1	84.1
	Yield (bu./acre)	176.7	172.3	181.5	180.0
	Beginning Stocks	1,235	1,377	1,182	1,332
	Production	15,074	13,930	15,265	15,139
	Imports	24	50	25	25
	Total Supply	16,333	15,357	16,472	16,496
Use	Feed and Residual	5,717	5,300	5,700	5,600
	Food, Seed, and Industrial	6,767	6,725	6,775	6,775
	Ethanol	5,326	5,275	5,325	5,325
	Exports	2,471	2,150	2,275	2,250
	Total Use	14,956	14,175	14,750	14,625
	Ending Stocks	1,377	1,182	1,722	1,871
	Stocks-to-Use (%)	**9.2**	**8.3**	**11.7**	**12.8**
	Season Average Price ($/bu.)	$6.00	$6.80	$5.70	$5.40

New-Crop US Soybean Balance Sheet

	(mil. bushels unless noted)	2021/22	2022/23 USDA Nov WASDE	2023/24 USDA Oct Baseline	2023/24 *farmdoc* Forecast
Supply	Area Planted (mil. acres)	87.2	87.5	87.0	88.0
	Area Harvested (mil. acres)	86.3	86.6	86.2	87.2
	Yield (bu./acre)	51.7	50.2	52.0	51.5
	Beginning Stocks	257	274	220	220
	Production	4,465	4,346	4,480	4,489
	Imports	16	15	15	15
	Total Supply	4,738	4,634	4,715	4,724
Use	Crushings	2,204	2,245	2,295	2,295
	Exports	2,158	2,045	2,050	2,050
	Seed	102	102	100	100
	Residual	2	22	23	23
	Total Use	4,465	4,414	4,468	4,468
	Ending Stocks	274	220	247	256
	Stocks-to-Use (%)	**4.6**	**5.0**	**5.5**	**5.7**
	Season Average Price ($/bu.)	$13.30	$14.00	$13.00	$13.00

Total Intended Crop Acreage in the U.S., 1998-2022P



Source: USDA

Daily Ratio of Nov 2023 Soybean and Dec 2023 Corn Futures Prices, January 4, 2021 to November 17, 2022

FARM ASSETS CONFERENCE

Field Crops Production

Giovani Preza-Fontes
University of Illinois

2022 Crop Year: challenges and victories
Farm Assets Conf., November 21, 2022

Giovani Preza Fontes
Crop Sciences
University of Illinois

ILLINOIS
Crop Sciences
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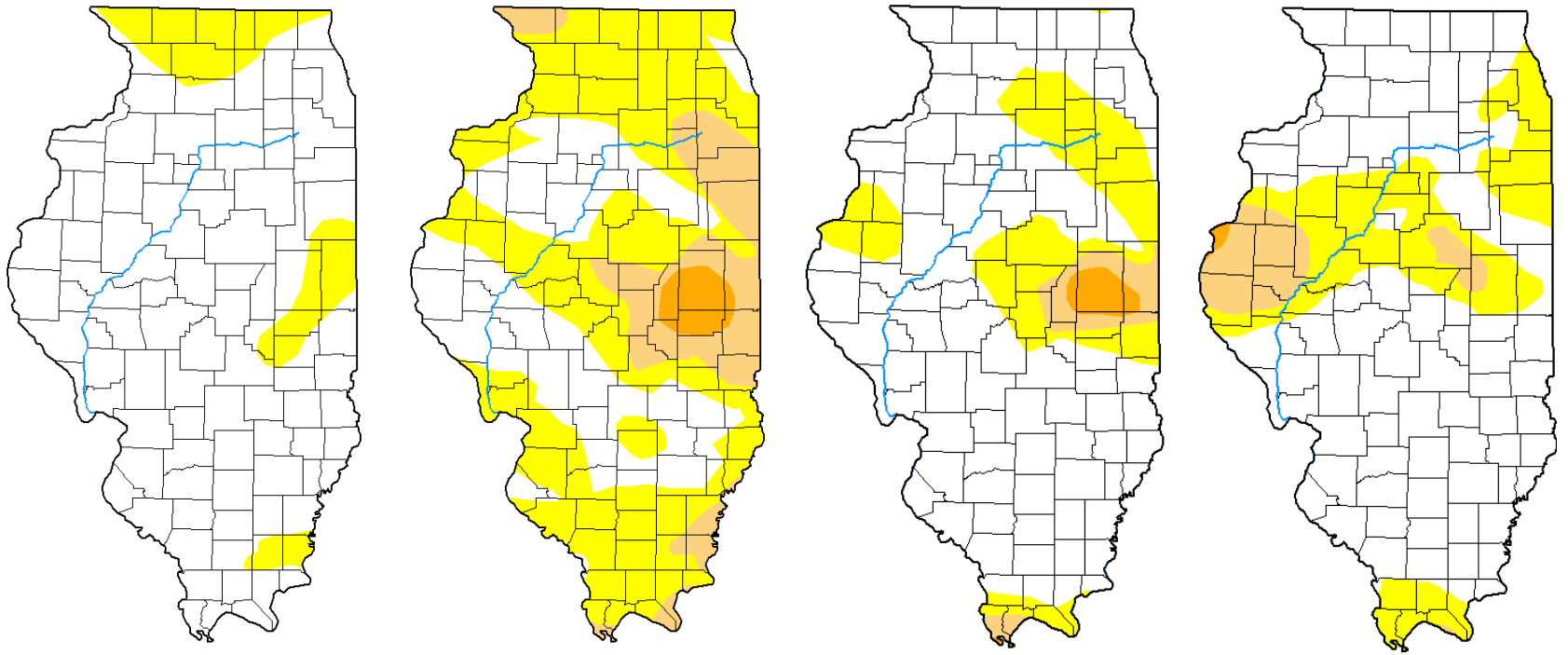
The big challenge 2022 (in some places): dry weather

June 7 | July 7 | Aug. 2



Dry weather: pros

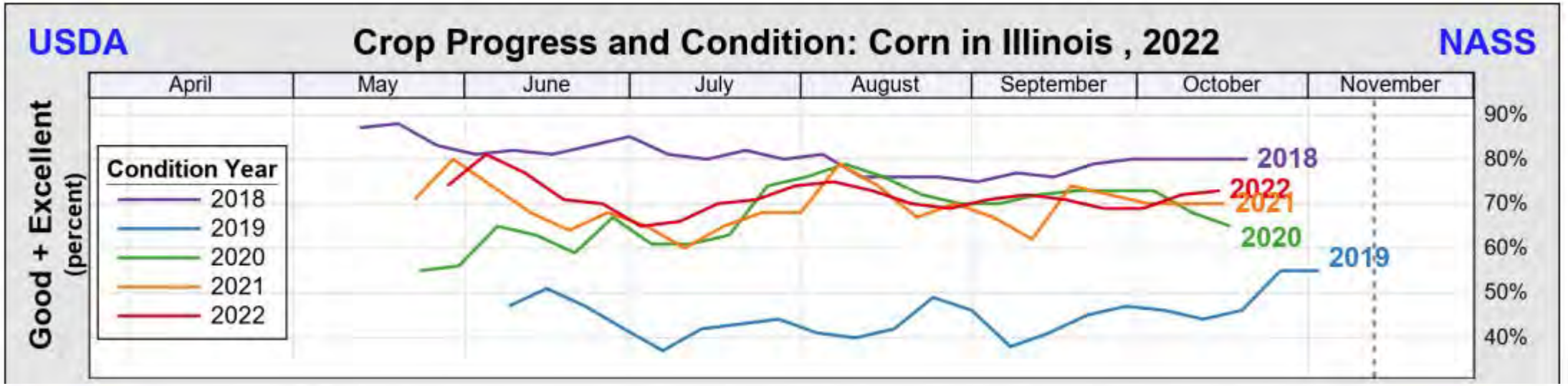
- Good plant stands
- Helps root growth and function
- Few disease pressure: root or foliar
- Less leaching of N

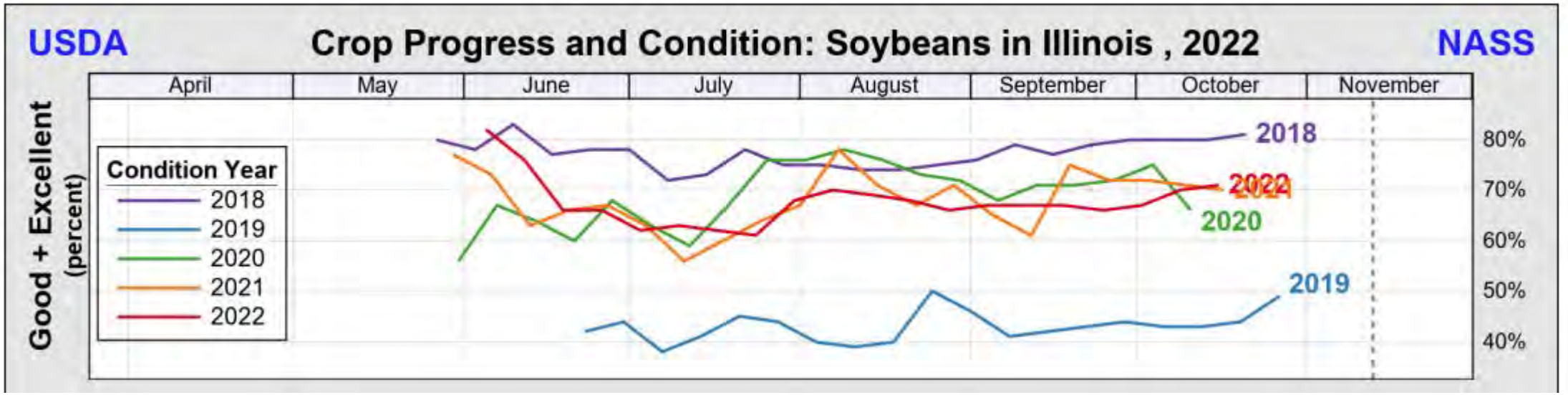
Dry weather: cons

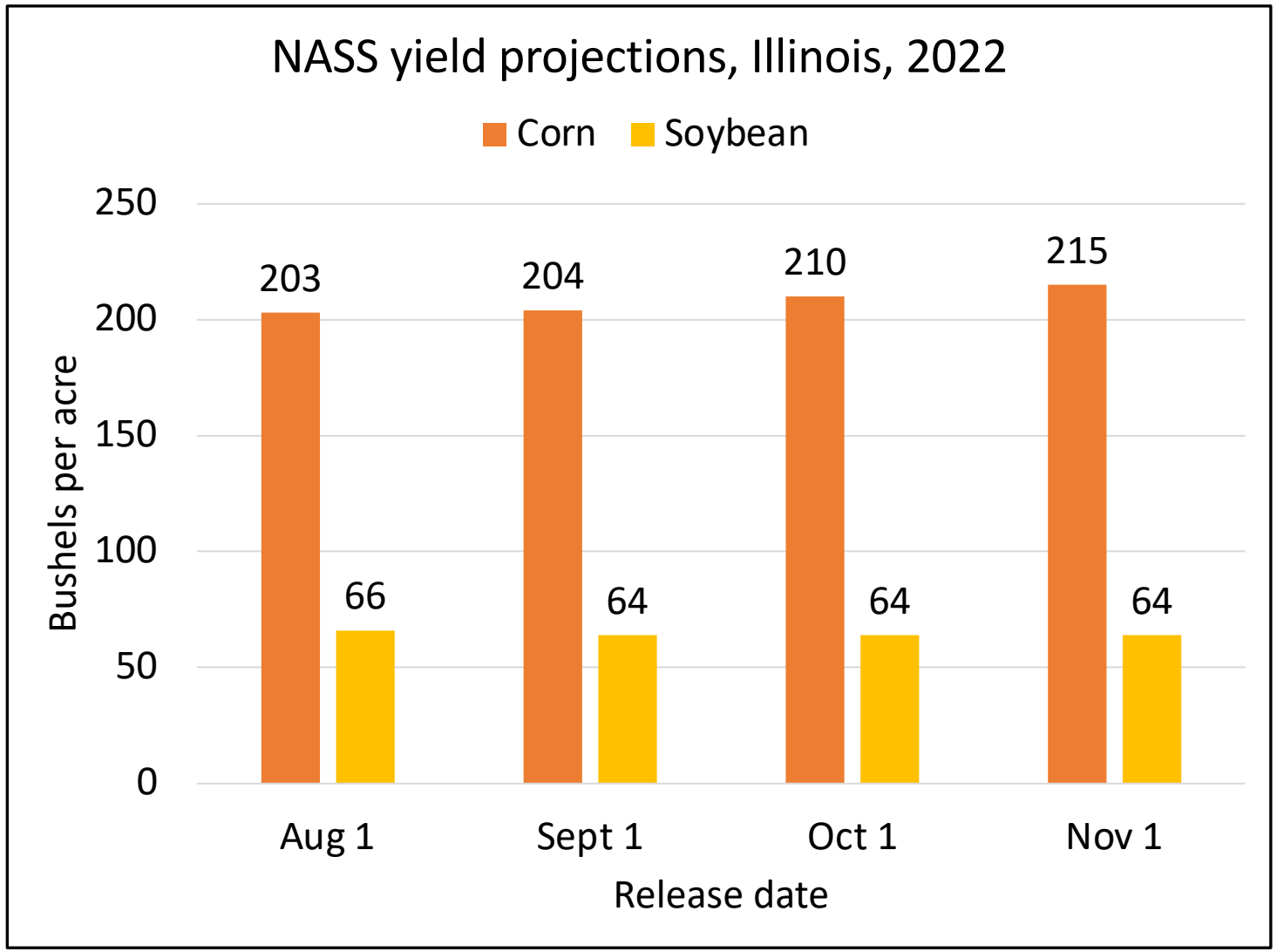
- Soil compaction effects show up
  - Drywall compaction if turns out dry following planting
- Less and delayed access of roots to nutrients
- Lower photosynthesis under stress
  - Fewer kernels set
  - Less kernel fill

} Lower yield

- Overall, good + excellent ratings ~70% during most of the season
- Timely rainfall in July and August: grain filling







Illinois crop yield records:

- Corn: 210 bu/ac (2018)
- Soybean: 65 bu/ac (2021)

Nutrient management considerations under high fertilizer prices

- 2022 corn crop got enough N
  - Nafziger, E. Why are the corn and soybean crops drying so slow? October 5, 2022.
  - Nafziger, E. Fall Nitrogen. October 19, 2022.

Corn stayed green up to maturity. Sept 27 2022

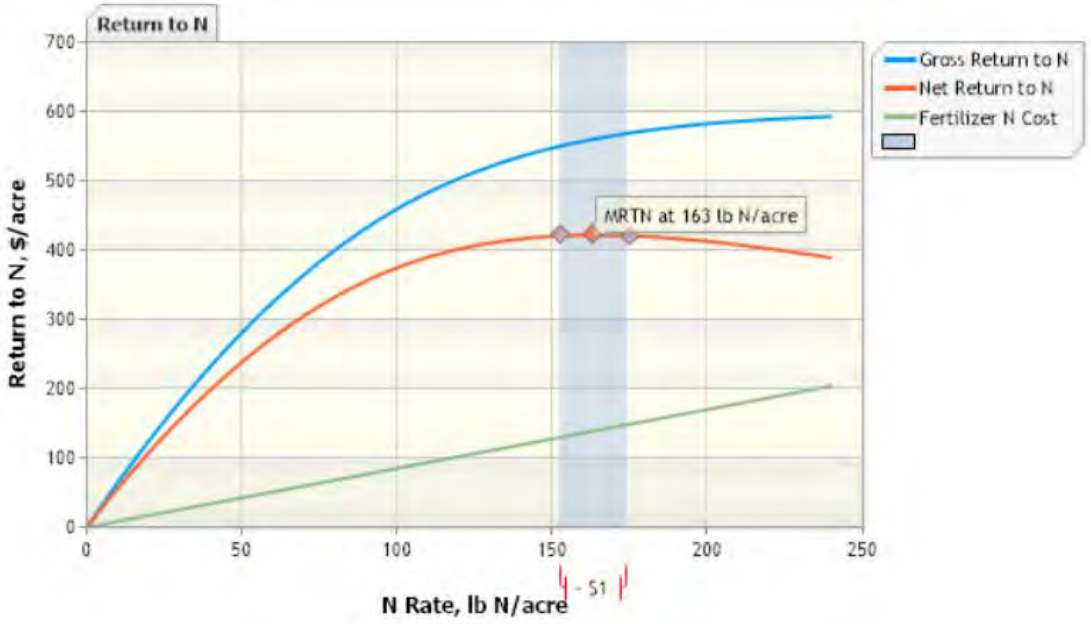
Strip	N rate	Trial 1	Trial 2
		--------bu/acre-------	
1	Low (185 lb N)	216.5	209.3
2	High (249 lb N)	219.2	215.0
3	Low N	207.2	215.7
4	High N	214.8	220.2
5	Low N	217.5	213.6
	Avg High N	217.0	217.6
	Avg Low N	213.7	212.9
Yield, high - low N		**3.3**	**4.7**
$ return to added N		**-$42.84**	**-$33.47**

Two-rate N trial in Urbana, IL 2022

N rate for 2023

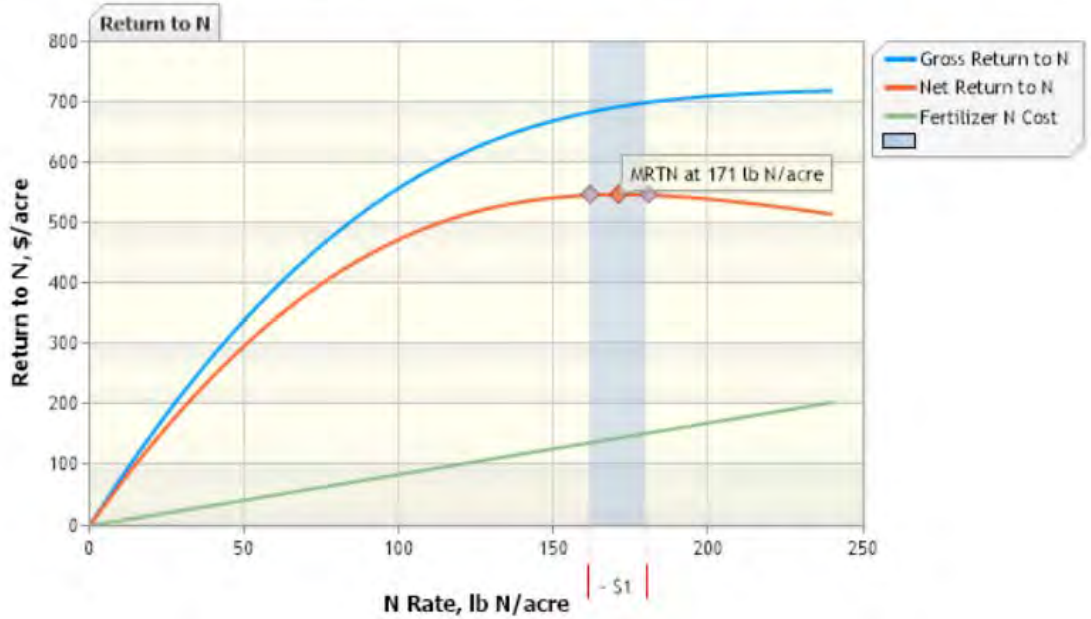
Northern IL

Nitrogen Price ($/lb):	0.85
Corn Price ($/bu):	6.50
Price Ratio:	0.13
MRTN Rate (lb N/acre):	163
Profitable N Rate Range (lb N/acre):	152 - 174
Net Return to N at MRTN Rate ($/acre):	$421.39
Percent of Maximum Yield at MRTN Rate:	98%
Anhydrous Ammonia (82% N) at MRTN Rate (lb product/acre):	198
Anhydrous Ammonia (82% N) Cost at MRTN Rate ($/acre):	$138.55



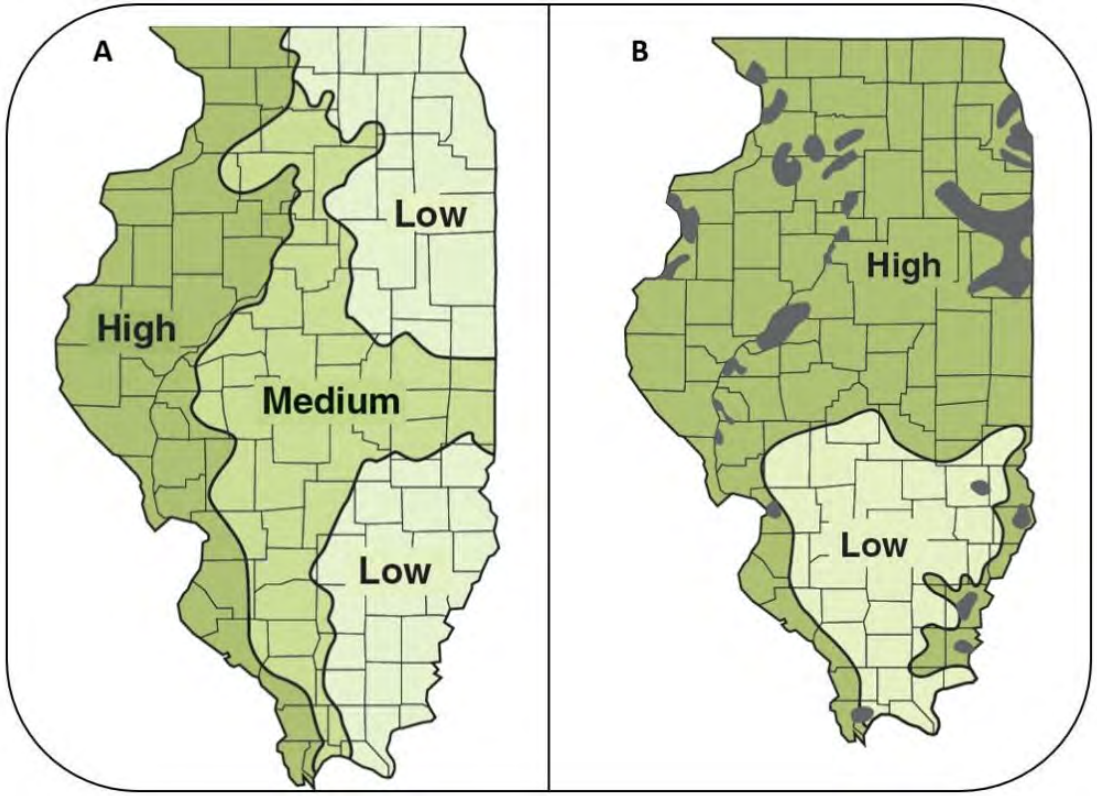
Central IL

Nitrogen Price ($/lb):	0.85
Corn Price ($/bu):	6.50
Price Ratio:	0.13
MRTN Rate (lb N/acre):	171
Profitable N Rate Range (lb N/acre):	161 - 180
Net Return to N at MRTN Rate ($/acre):	$547.21
Percent of Maximum Yield at MRTN Rate:	98%
Anhydrous Ammonia (82% N) at MRTN Rate (lb product/acre):	208
Anhydrous Ammonia (82% N) Cost at MRTN Rate ($/acre):	$145.35



Fertilizing with High-Priced P and K

Fontes, G. October 21, 2022.



A: Subsoil P-supplying power. B: CEC of IL soils.

- There is no agronomic advantages in applying P for corn and soybeans when Bray P values are higher than:
  - Low: 60 lbs/acre
  - Medium: 65 lbs/acre
  - High: 70 lbs/acre
- No K additions are suggested if ST levels are higher than:
  - Low CEC: 360 lbs/acre
  - Hihg CEC: 400 lbs/acre

Fertilizing with High-Priced P and K

Fontes, G. October 21, 2022.

Applying crop removal rates

Crop	Grain Nutrient Removal Rate	
	lb P_2O_5/bushel	lb K_2O/bushel
Corn	0.37	0.24
Soybean	0.75	1.17
Wheat	0.46	0.28

- Best done when ST levels are within the desire range
- 2-yr corn (200 bu/acre) and soybean (60 bu/acre) is estimated to remove 119 lb P_2O_5 and 118 lb K_2O
- Replacing these nutrients would take 229 lb of MAP and 197 lbs of Potash
- MAP $953.75/ton and Potash $873.11/ton
- **Together, it would cost about $200/acre**

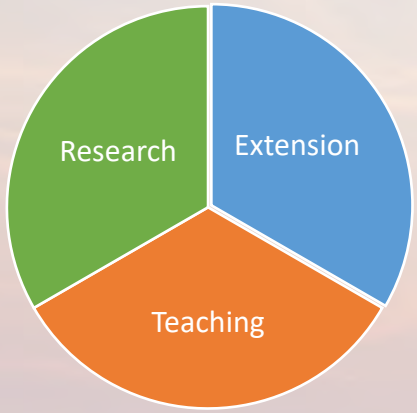
Emily Heaton

University of Illinois

What's new with regenerative ag?

Outline

- Who am I and what do I know?
- We ask: how does regenerative ag increase farm assets?
  1. Increase capital value of land
  2. Provide annual cash income
  3. Increase predictability



Emily Heaton

Professor, Dept. of Crop Sciences

Director, IL Regenerative Ag Initiative

Extension Biomass Specialist

CABBI Feedstock Production Theme Leader

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FRESH TASTE

USDA
United States Department of Agriculture

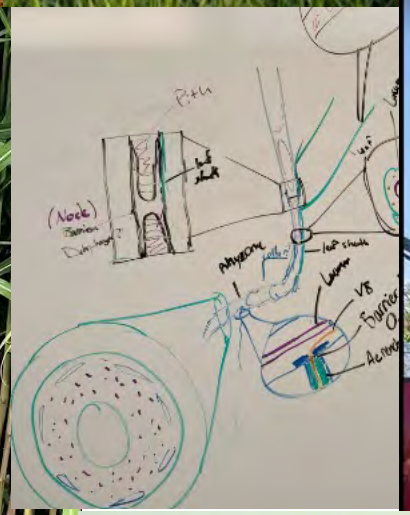
National Institute of Food and Agriculture

DCB
DIVERSE CORN BELT

C·CHANGE
CONSORTIUM FOR CULTIVATING HUMAN AND NATURALLY REGENERATIVE ENTERPRISES

Regenerative Ag increases the natural and human capital underpinning a thriving society

Eddy covariance system measuring field-scale energy, CO2 and H20 fluxes. Photo credit Heaton Lab



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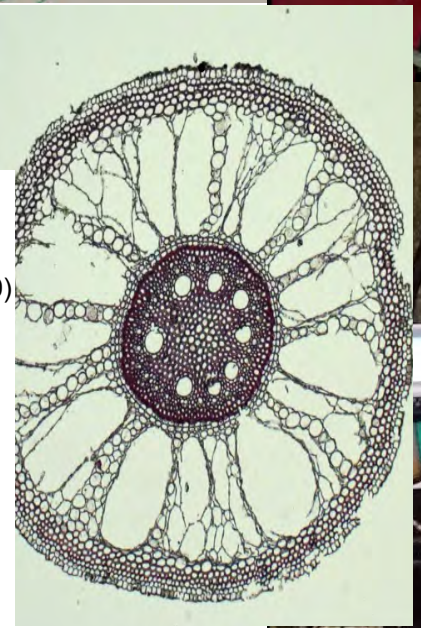
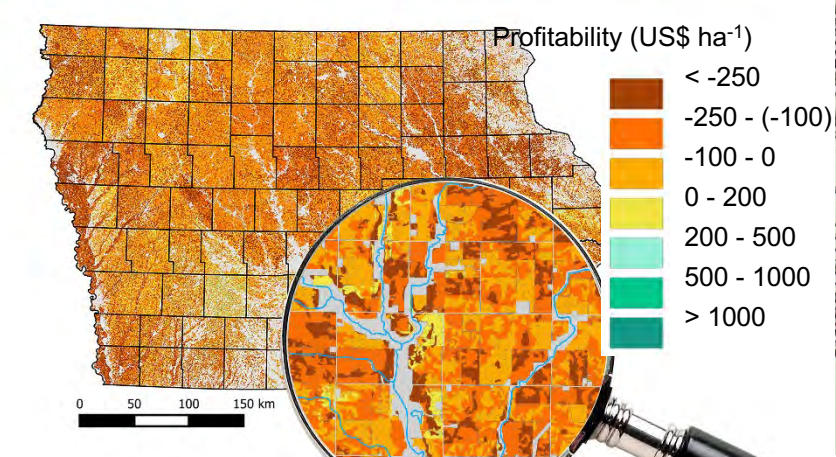
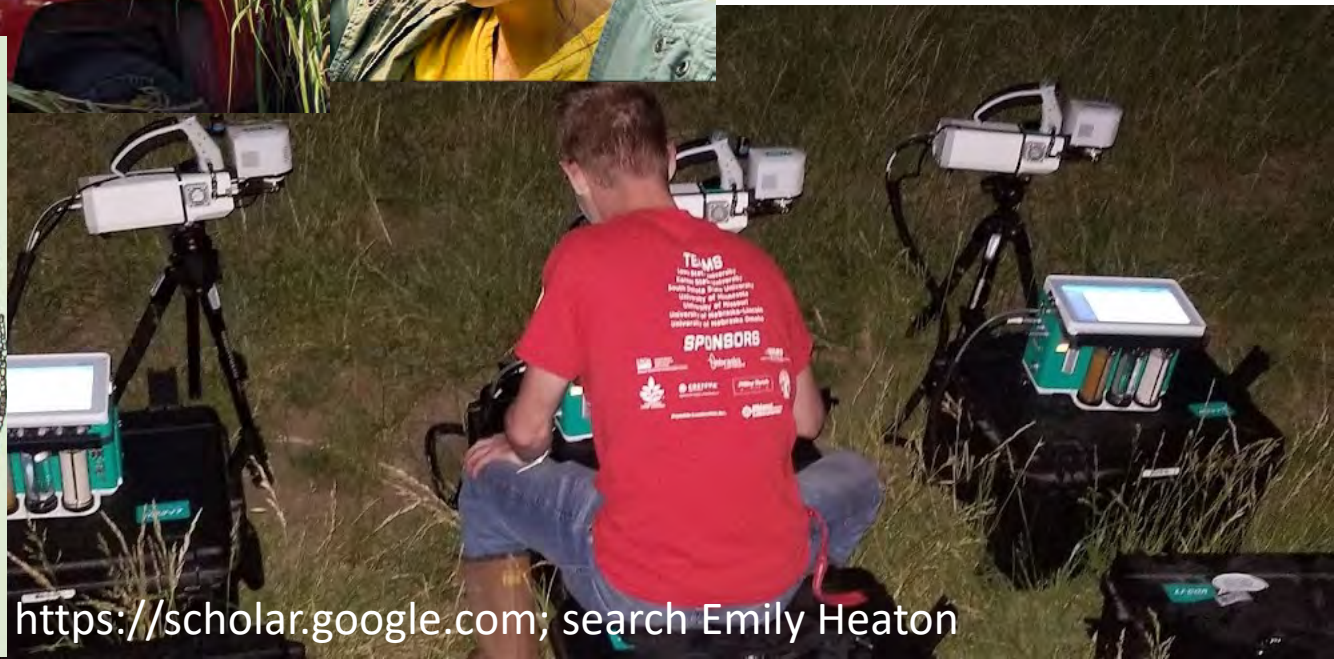
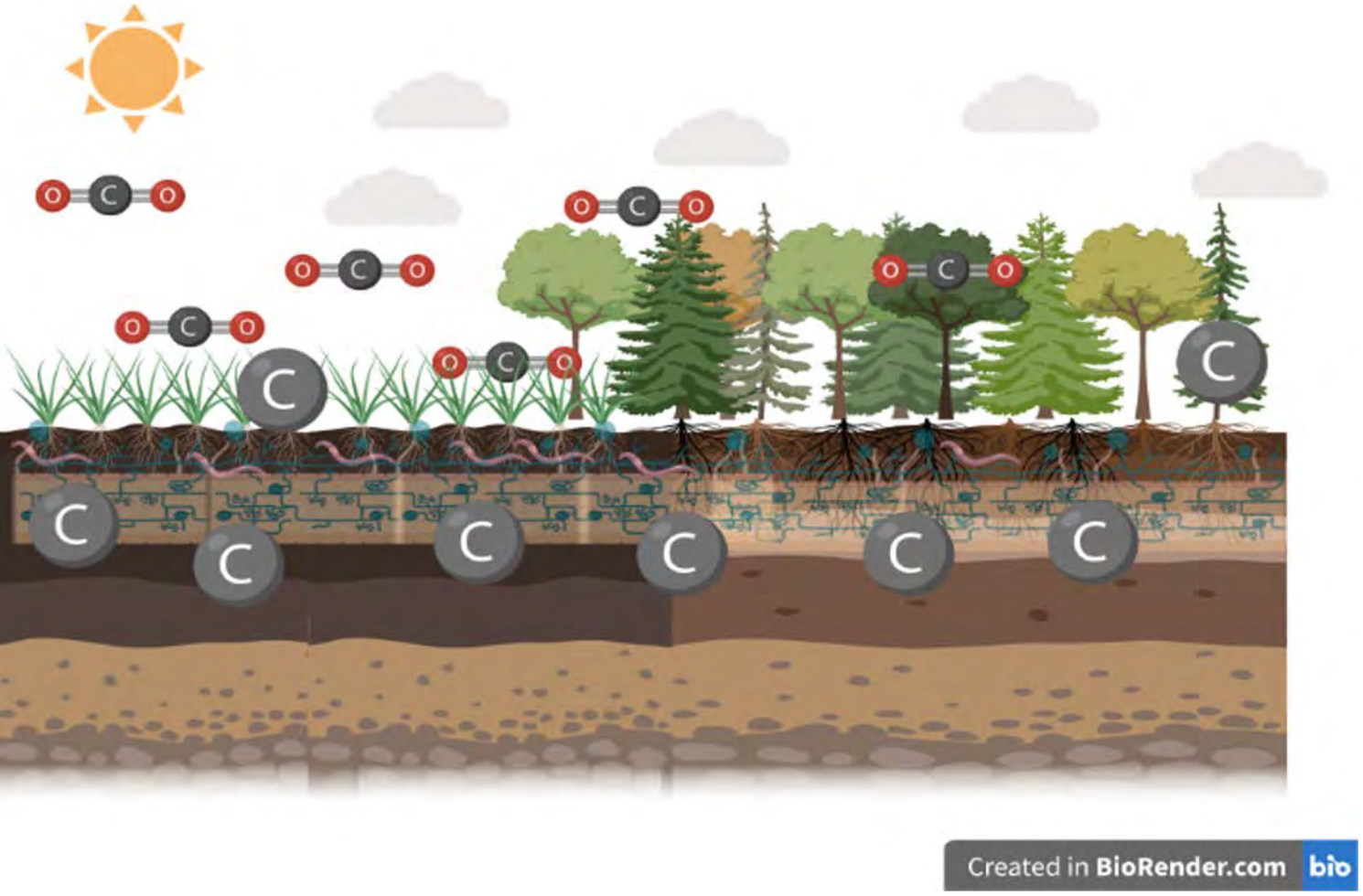






https://scholar.google.com; search Emily Heaton

What I have learned:



1. Plants are THE major mechanism CO2 is removed from the air
2. Putting 15% of cropland into perennial grasses solves >90% of ag's environmental problems and saves money

Strategically incorporating ~10% prairie into annual row crop fields leads to…

1. 44% reduction in water runoff
2. 95% reduction in soil loss through runoff
3. 90% reduction in phosphorus runoff
4. 84% reduction in nitrogen runoff and 70% reduction in subsurface nitrate loss (not tiled)
5. 2-3 times more beneficial insects and birds
6. No reduction in per acre yields
7. Costs less than terraces; comparable to cover crops

Schulte et al. 2017 Proceeding of the Natl Academy of Sciences Photo: Wright Co., Lynn Betts

Slide courtesy Dr. Lisa Schulte Moore www.prairiestrips.org,

“There’s lots of reasons to grow perennials, but money isn’t one of them”
- me, 2012

Outline

- Who am I and what do I know?
- We ask: how does regenerative ag increase farm assets?
  1. Increase capital value of land
  2. Provide annual cash income
  3. Increase predictability

Slow Food®
CHICAGO

OUR FARM

www.cavenyfarm.com

Caveny Farm, Monticello, IL

photo credit: Iowa State University

Miscanthus in a corn/soy pothole near Ames, IA, July 2019.

Mixed grass fiber can be used for multiple purposes

Photo credit Emily Heaton (left); Genera, Inc and Earthables (above)

Images courtesy Aggrow Tech and Koch Angus

Perennial grasses provide a regenerative carbon source in a layered ag enterprise

Conesville, IA 2021
Photo credit Travis Hedrick, AGgrowTech

Regen Ag turns “gas to grass to cash”

Illinois Regenerative Ag Initiative
Go.Illinois.edu/irai
heaton6@illinois.edu

FARM ASSETS CONFERENCE

The Value of Farmland

Bruce Sherrick

University of Illinois

Ag Land Value Trends

ILLINOIS
Agricultural & Consumer Economics
COLLEGE OF AGRICULTURAL, CONSUMER & ENVIRONMENTAL SCIENCES

Bruce J. Sherrick, Ph.D.
Director, TIAA Center for Farmland Research
Fruin Professor of Farmland Economics

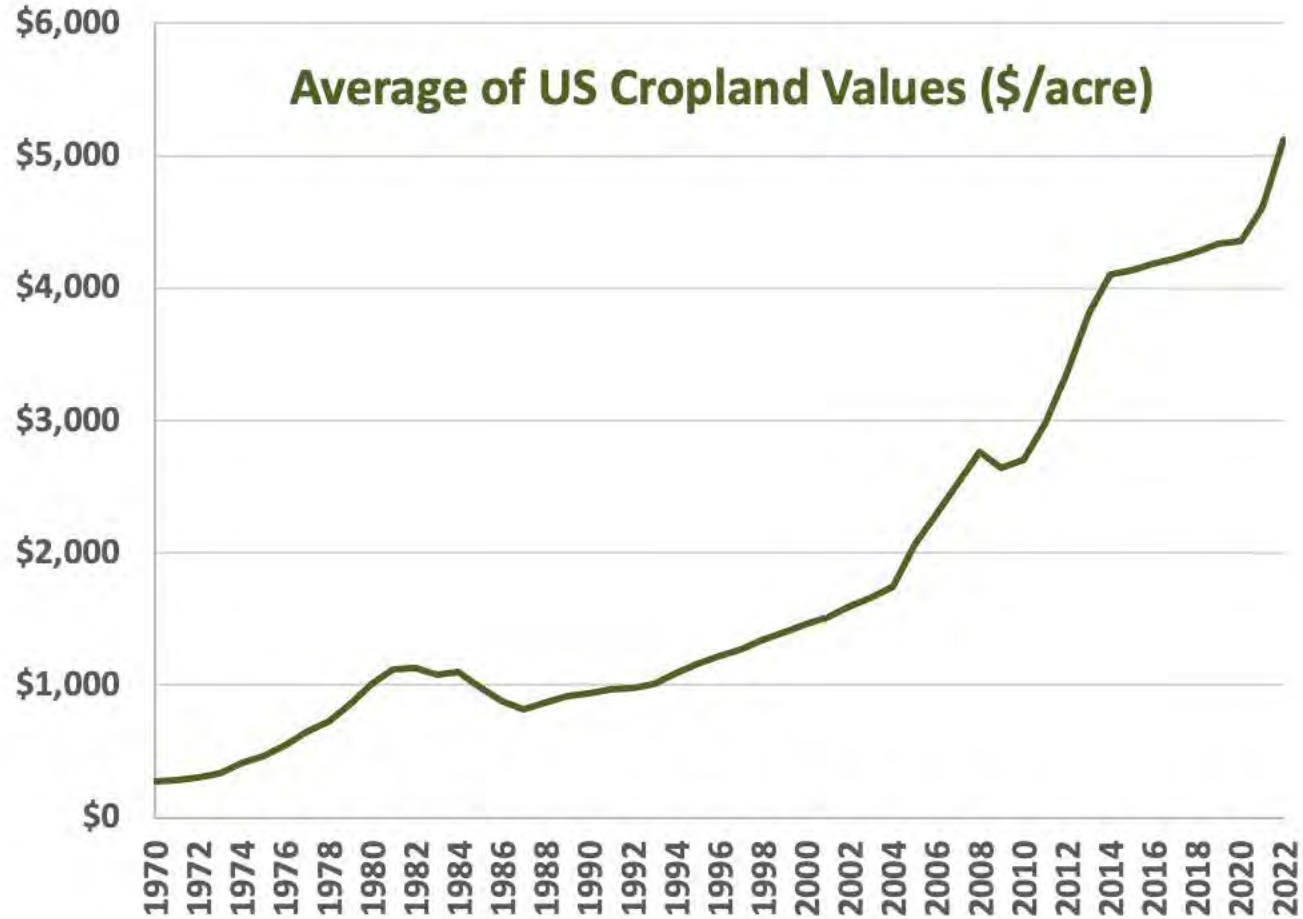
Luke Worrell
Worrell Land Services, LLC
Jacksonville Illinois

WORRELL LAND SERVICES, LLC

Factors affecting Ag Land Values

Purpose:

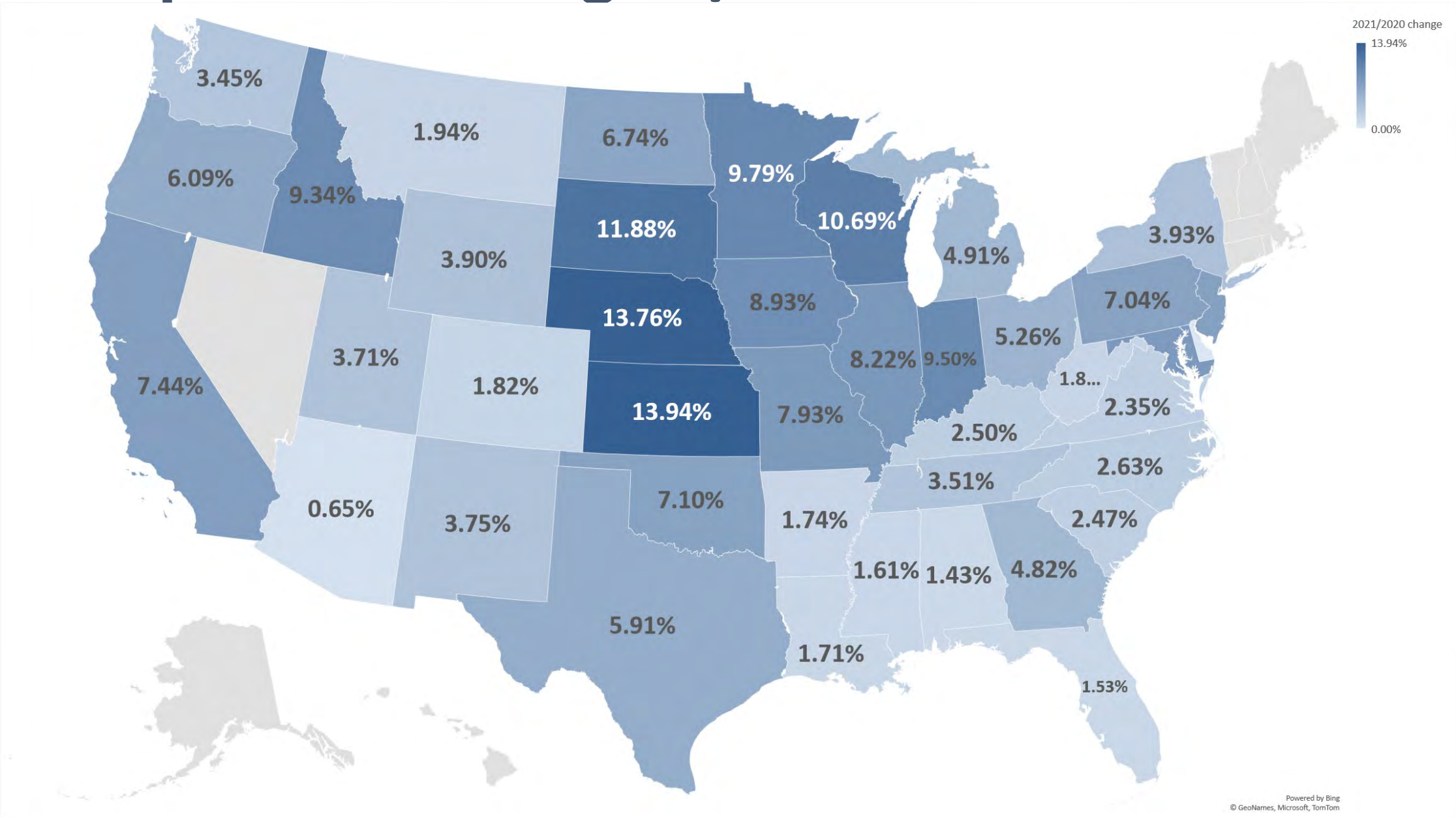
- Identify broad economic and farm-level factors that drive farmland values and rental rates.
- Provide context/interpretation current macro-market events.
- National to local progression, with eye toward future.



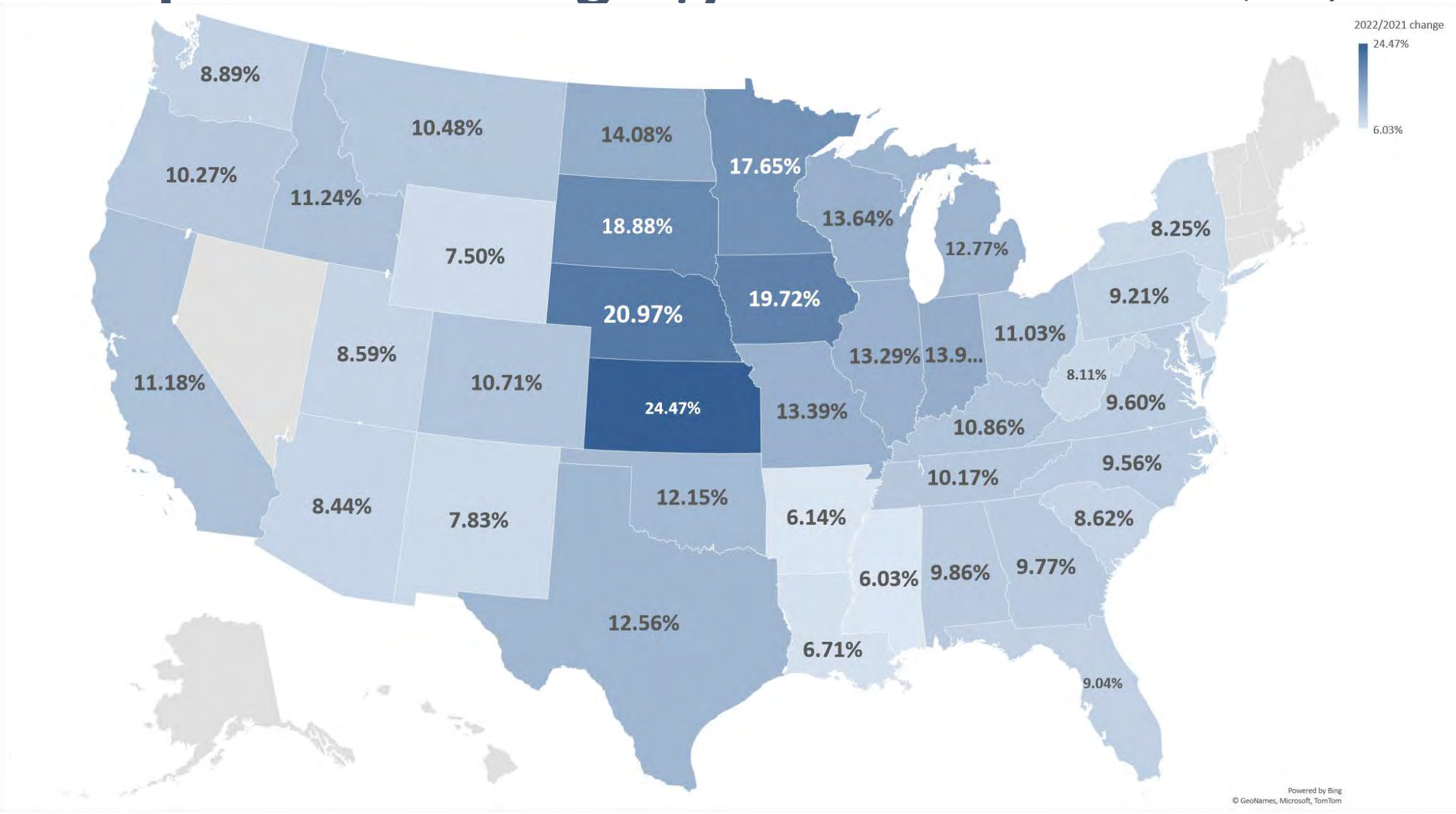
The *Usual Suspects, and some New Actors*

- *Income & commodity Prices*
- *Interest rates (and the Fed) vs.*
- *Inflation (and the Fed)*
- *International trade/conflicts*
- *Policy and Farm Bill focus*
- *Technology innovations*
- *Stimulus payments and temporary programs + ad hoc*
- *Carbon/Climate/Conservation*
- *Consumer preferences for food attributes*
- *Pandemic impacts/structural response*
- *Crop Insurance changes/conservation tie*
- *Alternative investment characteristics*
- *ROW Demand expansion and demographic patterns through time*

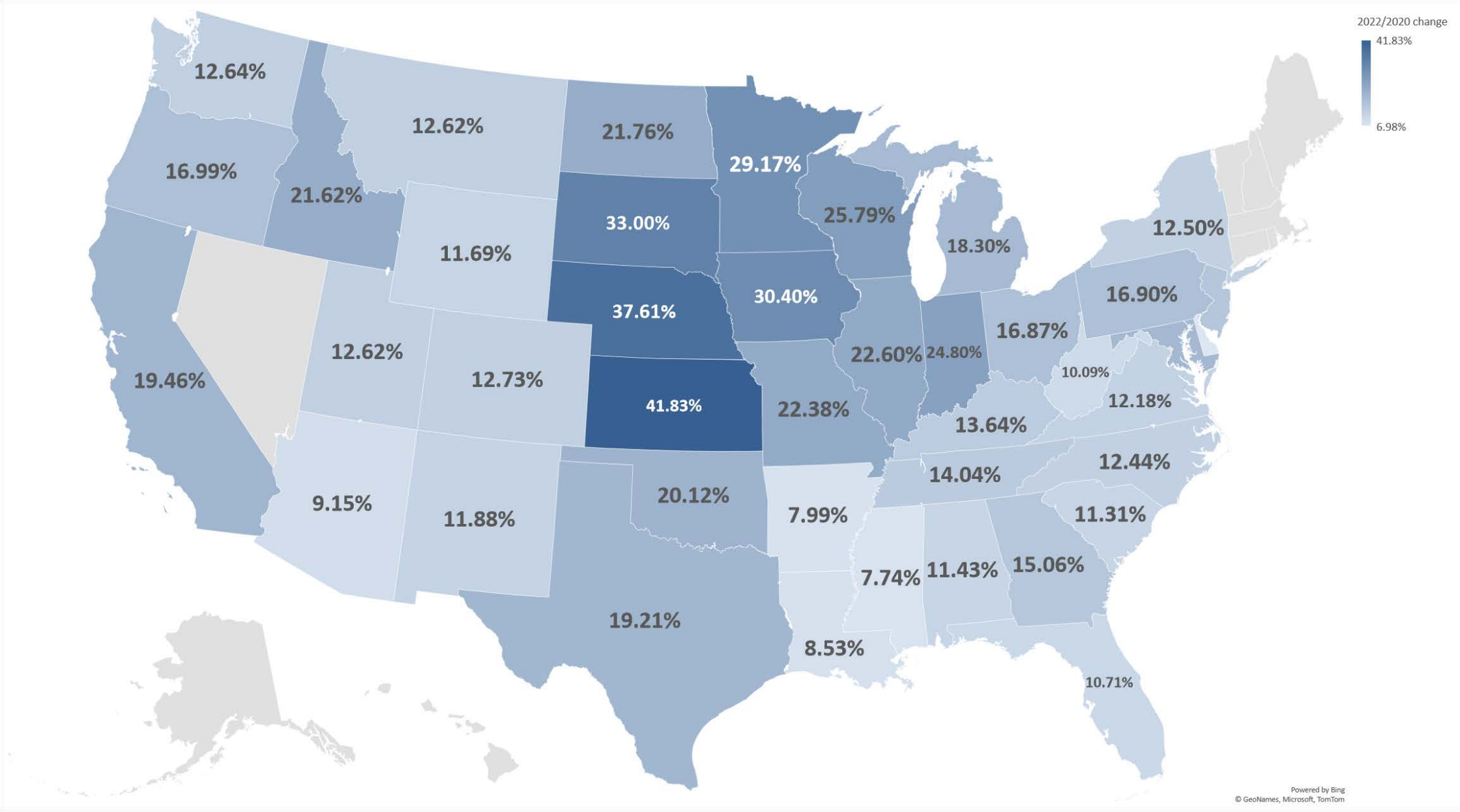
Cropland % change $/Acre 2020-2021 *(mid-year USDA)*



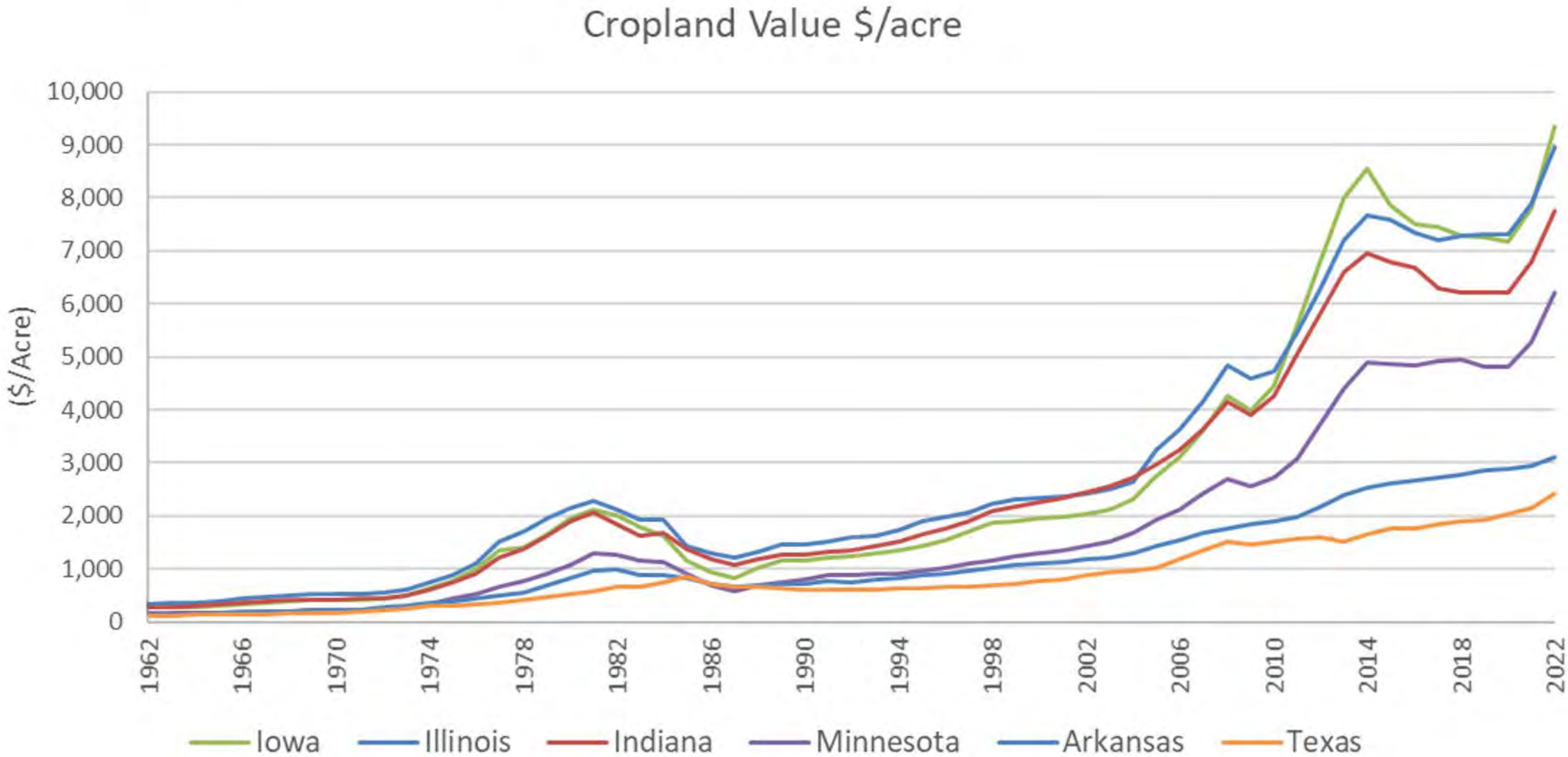
Cropland % change $/Acre 2021-2022 *(mid-year USDA)*



Cropland % change $/Acre 2020-2022 *(mid-year USDA)*



Cropland Values – selected states



Farmland Returns by region Q3-2022 (NCREIF 4Q rolling)

(1,300+ properties, $14.9 Billion)

NCREIF Farmland Property Index — All Farmland

3rd Quarter 2022

Total Market Value: $14,859,663,577.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
3.80%	2.63%	1.45%	1.98%	10.21%

NCREIF Farmland Property Index — Permanent Cropland

3rd Quarter 2022

Total Market Value: $5,774,675,222.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
2.51%	0.07%	0.53%	0.90%	4.05%

NCREIF Farmland Property Index — Annual Cropland

3rd Quarter 2022

Total Market Value: $9,084,988,355.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
4.65%	4.36%	2.05%	2.67%	14.43%

NCREIF Farmland Property Index — Corn Belt – Annual (All)

3rd Quarter 2022

Total Market Value: $1,837,396,654.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
8.05%	9.26%	3.06%	3.80%	26.29%

NCREIF Farmland Property Index — Lake States – Annual Cropland

3rd Quarter 2022

Total Market Value: $491,034,126.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
10.00%	3.98%	1.46%	1.71%	18.02%

NCREIF Farmland Property Index — Delta States – Annual (All)

3rd Quarter 2022

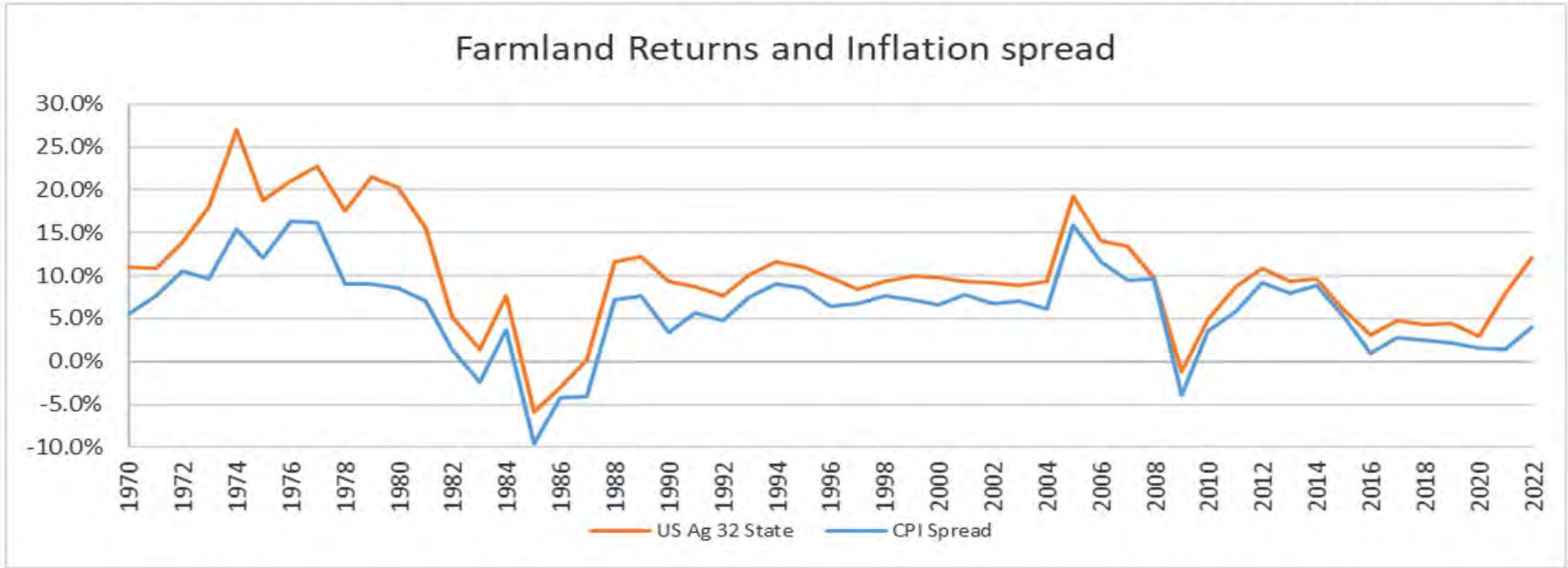
Total Market Value: $2,815,963,228.00

FILTER BY PROPERTY TYPE: All | Permanent Cropland | Annual Cropland

4Q2021	1Q2022	2Q2022	3Q2022	2022 ANNUAL TOTAL
4.42%	3.95%	2.23%	2.47%	13.71%

Inflation and Interest Rate Relationships *(to 11/17/22…)*

Farmland Returns and farmland returns minus inflation (spread)



Decade	Farmland to CPI Spread
1970 to 1979	11.1%
1980 to 1989	1.5%
1990 to 1999	6.7%
2000 to 2009	7.7%
2010 to 2019	4.9%
1970 to 2022f	***6.2%***

- **Farmland returns have been remarkably stable with positive alpha**
- **Perfect Storm in 1980s – still relatively good performance**
- **Low volatility annual returns, appreciation positive except 1980s**
- **Positive Inflation effect has been incredibly reliable – new forms?**

Balance Sheet of Ag Sector -- US

Table 1. Selected Balance Sheet Characteristics of US Agricultural Sector

	1970	1980	1990	2000	2010	2018	2020	2022
	($ millions, except ratios - source ERS-USDA)							
Farm Assets	**278,823**	**1,000,422**	**840,609**	**1,203,215**	**2,170,832**	**3,026,679**	**3,174,623**	**3,835,151**
Real Estate	202,418	782,820	619,149	946,428	1,660,114	2,510,163	2,640,942	3,188,219
Non Real Estate	76,405	217,602	221,459	256,787	510,718	516,515	533,681	646,931
Farm Debt	**48,501**	**162,432**	**131,116**	**163,930**	**278,931**	**402,606**	**441,254**	**496,025**
Real Estate	27,238	85,272	67,633	84,724	154,065	245,774	288,645	341,914
Non Real Estate	21,263	77,160	63,483	79,206	124,865	156,832	152,608	154,111
Equity	**230,322**	**837,990**	**709,493**	**1,039,285**	**1,891,902**	**2,624,073**	**2,733,369**	**3,339,125**
Selected Indicators								
Debt/Equity	21.1%	19.4%	18.5%	15.8%	14.7%	15.3%	16.1%	14.9%
Debt/Assets	17.4%	16.2%	15.6%	13.6%	12.8%	13.3%	13.9%	12.9%
Real Estate/Equity	87.9%	93.4%	87.3%	91.1%	87.7%	95.7%	96.6%	95.5%
Real Estate/Assets	72.6%	78.2%	73.7%	78.7%	76.5%	82.9%	83.2%	83.1%
Real Estate D/Total D	56.2%	52.5%	51.6%	51.7%	55.2%	61.0%	65.4%	68.9%

Farmland Returns in Context

Table 1. Asset Return Characteristics

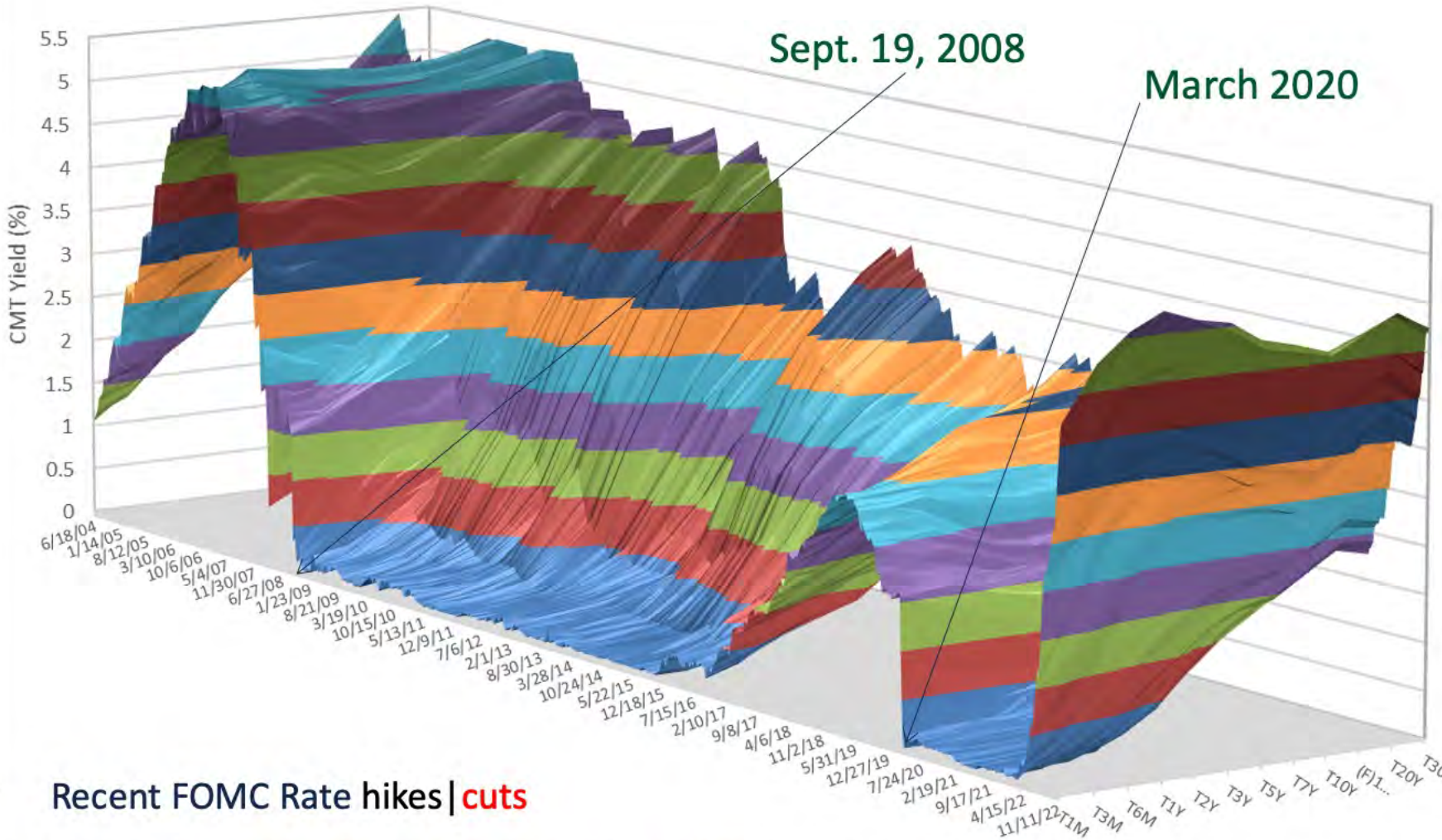
Asset/Index	Annual Ave. Return	Standard Deviation	Coefficient of Variation	US Ag 32 States Correlation	Minimum Return	Maximum Return
			1990 - 2022			
US Ag 32 States	8.5%	3.6%	0.42	1.00	-1.2%	19.0%
Illinois	9.3%	5.5%	0.59	0.80	0.8%	26.0%
Iowa	10.9%	7.3%	0.67	0.64	-5.3%	24.9%
Indiana	9.1%	4.9%	0.54	0.64	-1.0%	22.0%
Minnesota	10.7%	5.5%	0.51	0.78	-1.8%	20.3%
California	8.3%	5.0%	0.60	0.55	2.5%	30.7%
Washington	12.1%	3.6%	0.30	0.45	5.4%	24.1%
Oregon	11.1%	4.8%	0.43	0.56	-1.6%	23.5%
Kansas	10.1%	6.8%	0.68	0.69	-4.6%	24.4%
			1990 - 2021			
TCM10Y	4.30%	2.0%	0.47	0.28	0.9%	8.6%
S&P500	8.13%	16.7%	2.06	-0.14	-48.6%	29.3%
CompositeREITS	9.94%	18.3%	1.85	-0.13	-47.5%	33.7%
Gold	4.72%	13.9%	2.94	0.06	-31.9%	27.7%
PPI	2.43%	5.0%	2.07	0.14	-7.4%	20.5%
CPI	2.48%	1.3%	0.53	0.24	0.1%	6.7%

Source: USDA, TIAA Center for Farmland Research MSCI, FRED, NAREIT, London Bullion Market Association/GoldHub, U.S. Bureau of Labor Statistics (BLS).

Yield Curve through November 11, 2022 (weekly)

- Credit easing events *since 2008, and start of pandemic*
- Natural Multiple expansion/contraction
- Massive stimulus on top is a somewhat different effect
- Fed Purchases from Treas. to manage interest rates
- Massive reversal in 2022
- Fed B/S debate settling on managed chaos

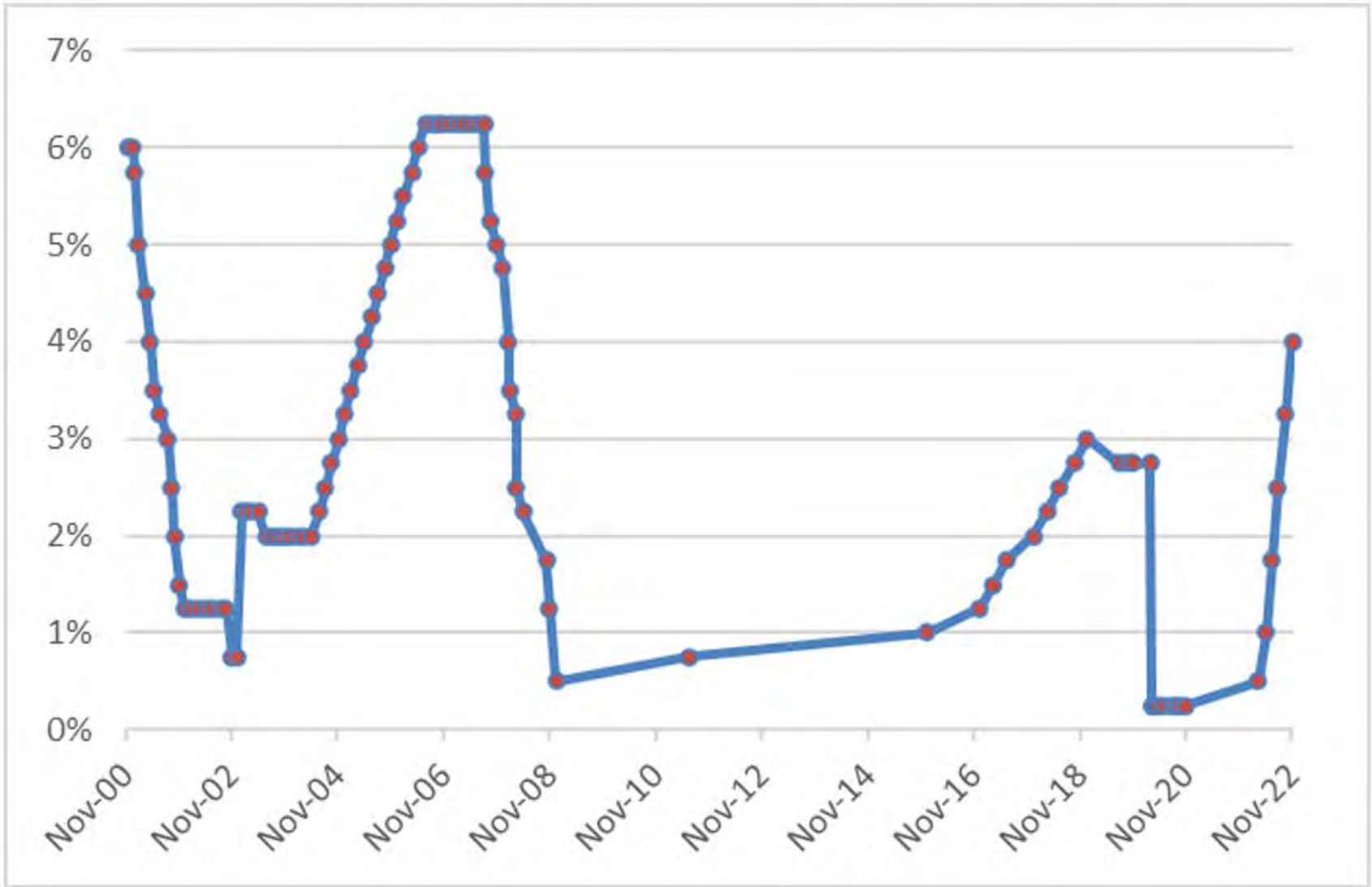
IMPACT ON REAL ESTATE via Inflation vs. Cap Rate effect?



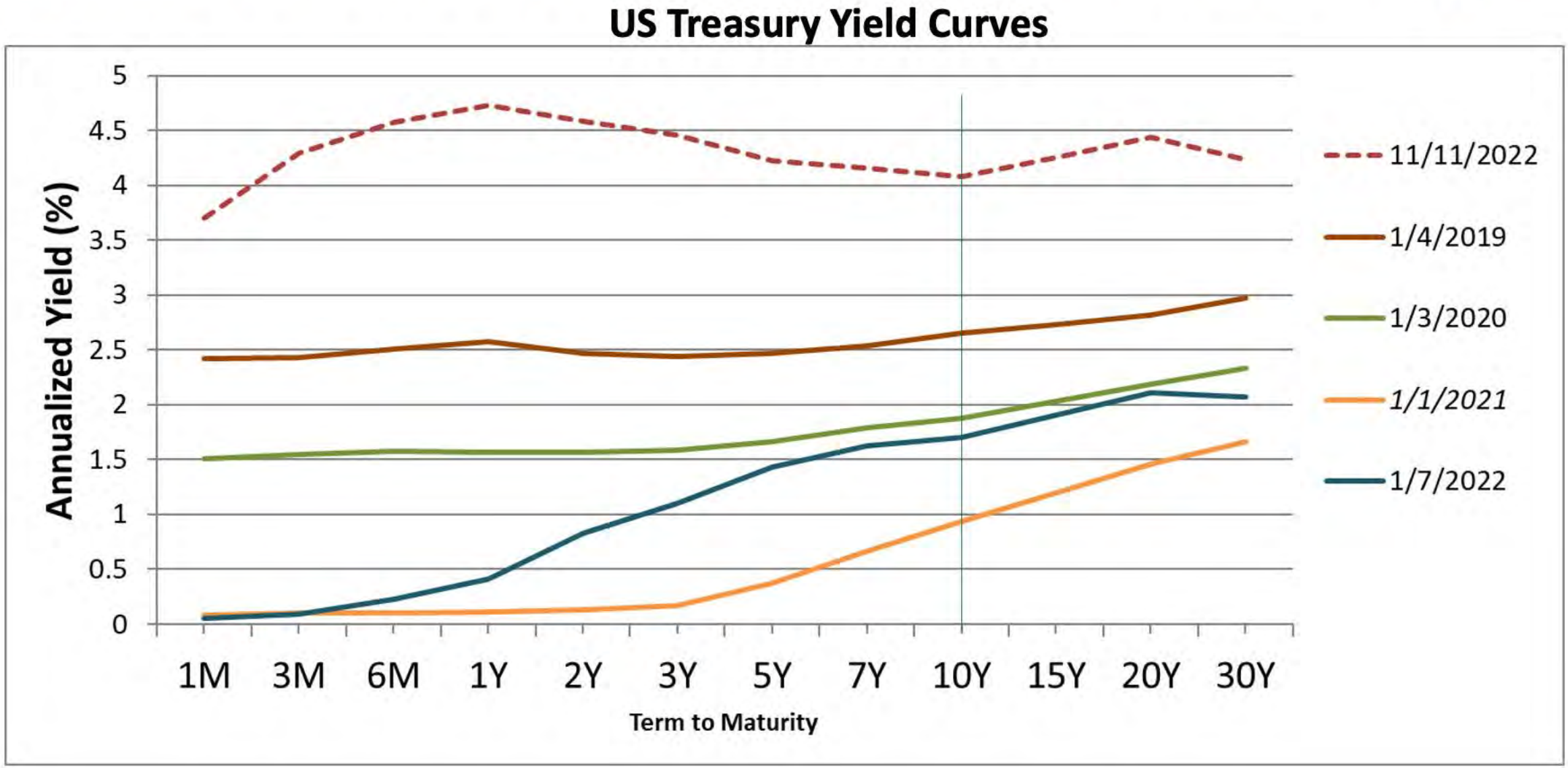
Recent FOMC Rate hikes | cuts

*(12/15, 12/16, 3/17, 6/17, 12/17, 3/18, 6/18, 9/18, 12/18, 7/19, 9/19, 10/19, 3/20, 3/20, **3/20,** 3/22, 4/22,6/22, 7/22, 9/22, 11/22 ..)*

Fed Discount rate and vote patterns through time



Expected future rates, and the discount rate for Ag



Income expectations – out year prospects quite strong

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CORN												
Projected Price	$6.01	$5.68	**$5.65**	**$4.62**	**$4.15**	**$3.86**	**$3.96**	**$3.96**	**$4.00**	$3.88	$4.58	$5.90
Harvest Price	**$6.32**	**$7.50**	$4.39	$3.49	$3.83	$3.49	$3.49	$3.68	$3.90	**$3.99**	**$5.37**	**$6.86**
Volatility	0.29	0.22	0.20	0.19	0.21	0.17	0.19	0.15	0.15	0.15	0.23	0.23
SOYBEANS												
Projected Price	**$13.49**	$12.55	$12.87	**$11.36**	**$9.73**	$8.85	**$10.19**	**$10.16**	**$9.54**	$9.17	$11.87	**$14.23**
Harvest Price	$12.14	**$15.39**	$12.87	$9.65	$8.91	**$9.75**	$9.75	$9.60	$9.25	**$10.55**	**$12.30**	$12.81
Volatility	0.23	0.18	0.17	0.13	0.16	0.12	0.16	0.14	0.12	0.12	0.19	0.19

- Forward Market Prices maintaining reasonable levels, insurance forwards similar.
- Input expenses (especially fertilizer and energy) dramatically higher, but slowing
- Demand Expansion thesis for Rest of World (ROW) positive but uncertain politically
- Export demand growth also dependent on strength of the dollar

Capitalized Value

A very simple (and reasonably accurate)capitalization formula

$$Capitalized\ Value = \frac{Cash\ Rent}{(r - g)}$$

Example:

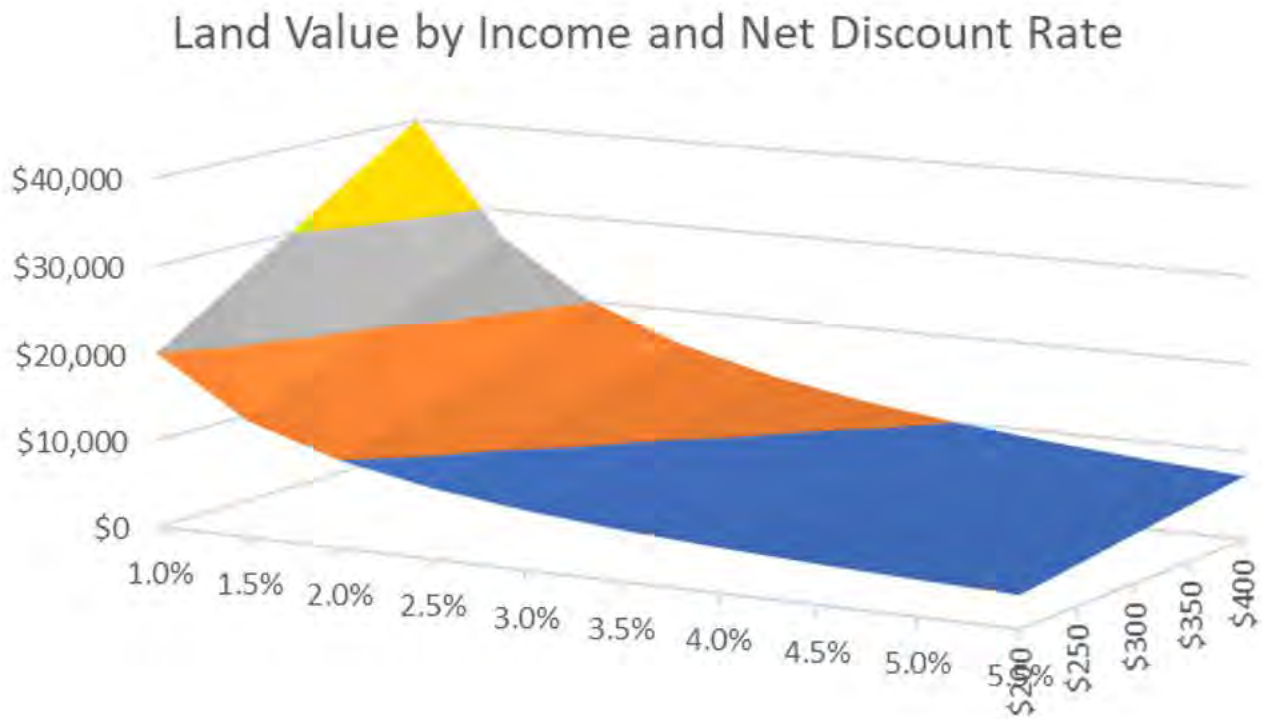
Cash rent = $400 per acre

r = 6.5% (required rate of return)

g = 4.5% (growth rate in return or asset appreciation)

Capitalized value = $20,000 = $400 / .02

Capitalized Value – *very* sensitive at low Net DR



Land Values by Income and Net Discount Rate

Net Discount Rate	*- - - - Income per year - - - -*				
	$200	***$250***	***$300***	***$350***	***$400***
1.0%	20,000	25,000	30,000	35,000	40,000
1.5%	13,333	16,667	20,000	23,333	26,667
2.0%	10,000	12,500	15,000	17,500	20,000
2.5%	8,000	10,000	12,000	14,000	16,000
3.0%	6,667	8,333	10,000	11,667	13,333
3.5%	5,714	7,143	8,571	10,000	11,429
4.0%	5,000	6,250	7,500	8,750	10,000
4.5%	4,444	5,556	6,667	7,778	8,889
5.0%	4,000	5,000	6,000	7,000	8,000
5.5%	3,636	4,545	5,455	6,364	7,273

Dec '23 Corn futures (best guess for 2023 PP)

Enter Price to Evaluate: $ 5.94

The implied distribution indicates that there is a 49.91% probability that the price will be below $5.94 at expiration.

Probability Below	Price at Expiration
5%	$4.08
15%	$4.69
25%	$5.09
35%	$5.44
45%	$5.77
50%	**$5.94**
55%	$6.12
65%	$6.49
75%	$6.94
85%	$7.54
95%	$8.66

Accessed on November 20, 2022, 11:38 AM.

https://fd-tools.ncsa.illinois.edu/pricedistribution

Nov '23 SB futures (best guess for 2023 PP)

Enter Price to Evaluate: $ 13.52

The implied distribution indicates that there is a 50.06% probability that the price will be below $13.52 at expiration.

Probability Below	Price at Expiration
5%	$10.07
15%	$11.23
25%	$11.98
35%	$12.62
45%	$13.22
50%	**$13.52**
55%	$13.82
65%	$14.48
75%	$15.25
85%	$16.27
95%	$18.14

Accessed on November 20, 2022, 11:40 AM.

https://fd-tools.ncsa.illinois.edu/pricedistribution

Key policy issues impacting Ag assets

- Inflation or recession seeds? Interest rate and productivity growth interaction – *(note: US productivity has not returned, just wages)*
  - FOMC stance becoming forced, world markets coordinated/integrated
  - Fed Balance sheet vs. stock market problem….up is down
- Continued demand growth for commodities in export markets, but strength of dollar and trade conflicts dampen effect
- Ag Policy impacts and changing emphasis of US Federal policy
  - Untethered spending in non-traditional titles and direct interventions
  - "Climate" as proxy for payment linkages in ag

Other Key issues impacting Ag assets

- Crop Insurance, changing technologies, and "practices" that overlap programs. Will remain key risk mitigator in any case.

- Financialization ("we've been 2 years away for the last 10")
  - Public vehicles (REITs, Adjacency funds (MT), Opportunity Zones…)
  - De-Fi vehicles (mAgma, AcreTrader, FarmTogether, Steward…)
  - Institutional investors and HNW positions, role in scale expansion
  - Rationalization of debt within asset class did not occur while rates were low, lending reactions often rear-view mirrored.
    - Credit spreads in ag did not expand like commercial credit
    - Historic loss rates incredibly low
    - Capital in Farm Credit System exceptionally high, community bank LTD path

....What asset would you rather own?

Luke Worrell

Worrell Land Services

The Path We've Traveled

Surveyed increases covering January 2021 through July 2022.

Statewide Averages as reported by ISFMRA

- "Excellent" -Class A Farmland increase of 43%
- "Good" -Class B Farmland increase of 44%
- "Average" -Class C Farmland increase of 43%
- "Fair" -Class D Farmland increase of 21%

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The Path We've Traveled - Continued...

Increases in **Cash Rents** from January 2021 through 2023 Projections

- "Excellent" Class A Farmland – 2023P - $386 - Up 25%
- "Good" Class B Farmland – 2023P - $336 – Up 27%
- "Average" Class C Farmland – 2023P - $284 – Up 26%
- "Fair" Class D Farmland – 2023P - $248 – Up 49%

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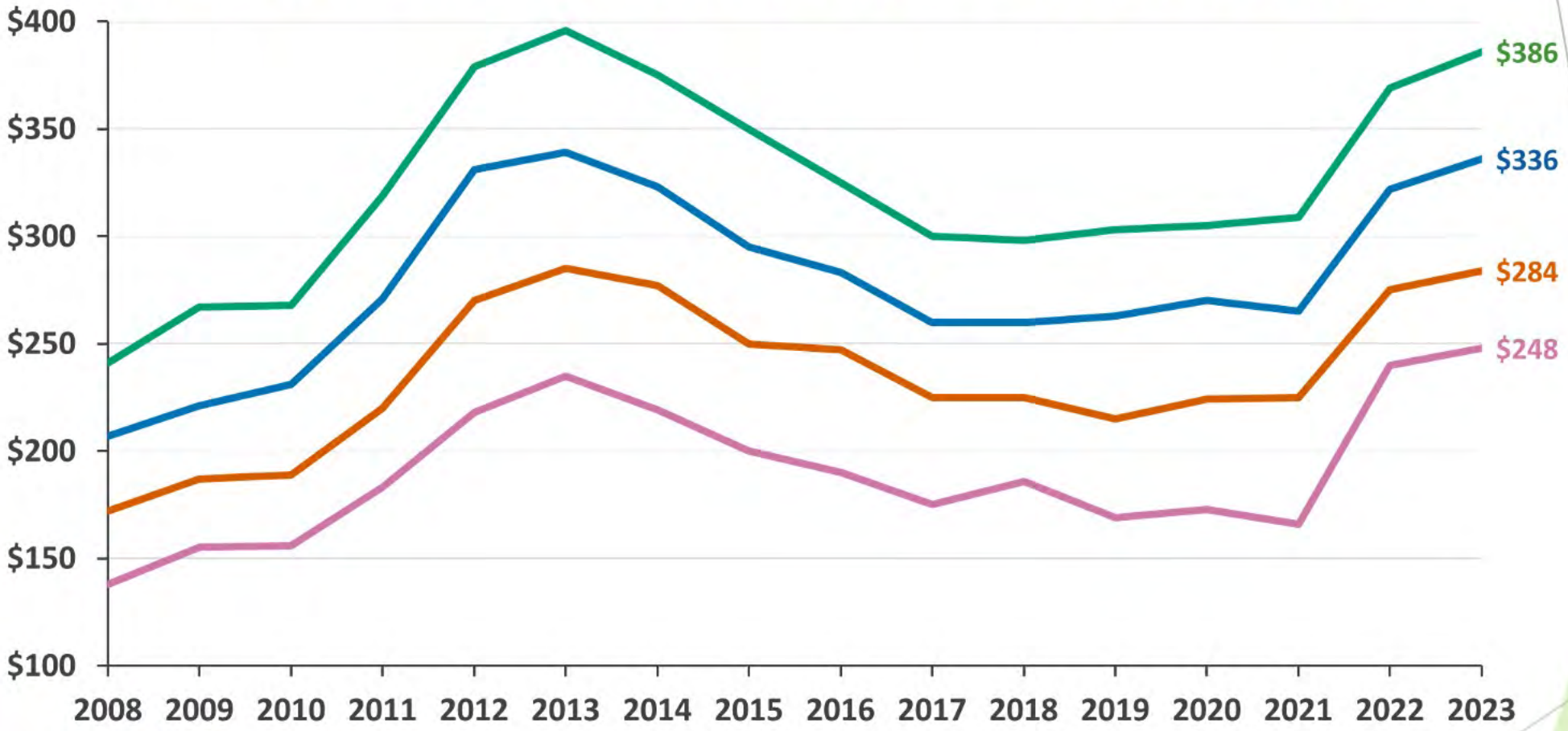
The Path We've Traveled - Continued...



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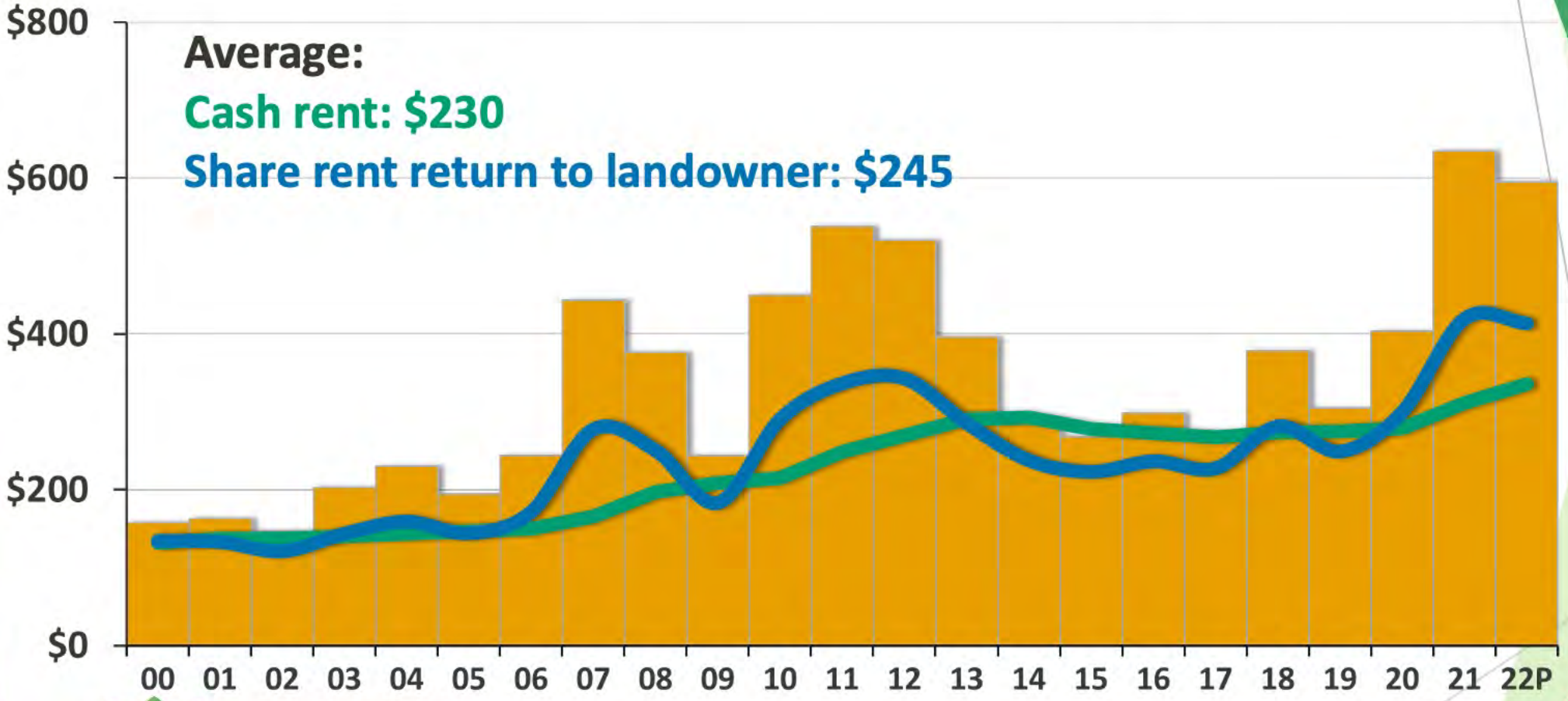
Operator and Land Returns, Share Rent, and Cash Rents, High-Productivity Farmland in Central Illinois, 2000 to 2022P



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What is around the corner?

- Continued volatility
- Flex leases continue to gain steam
- Rising interest rates
- Erratic Sales Results
- A softening of values
- Fewer transactions….at least temporarily
- The ratio between auctions vs listings to change
- A wild ride!

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thank you