Choosing Crop Insurance During Market Volatility

January 11, 2023

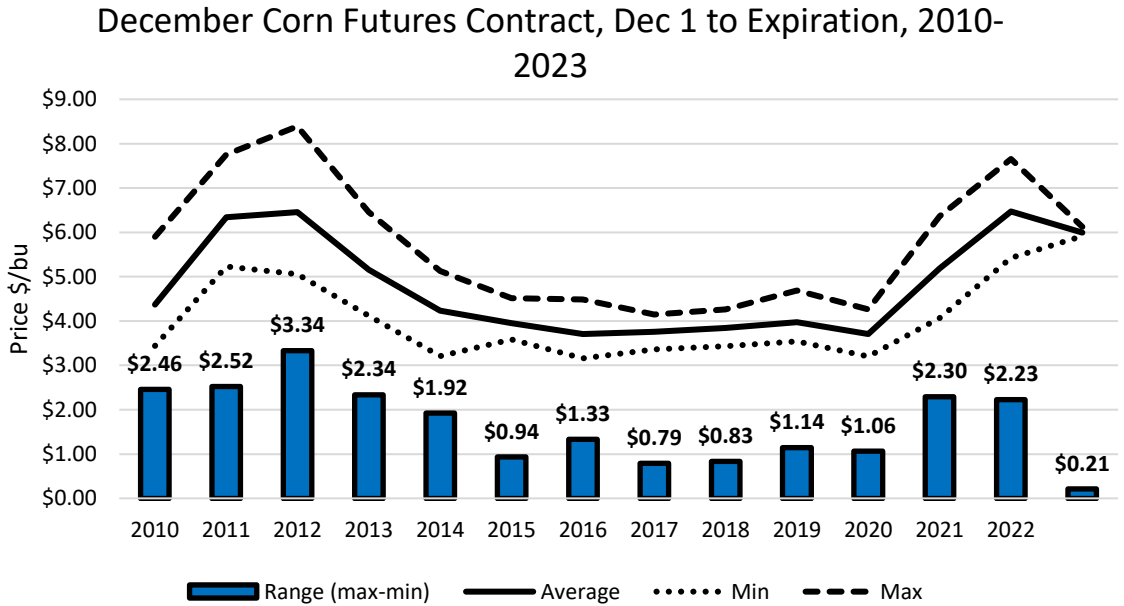
Delaware Ag Week: Risk Management Session

Dr. S. Aaron Smith, Associate Professor and Extension Economist
Department of Agricultural and Resource Economics
University of Tennessee Institute of Agriculture
Email: aaron.smith@utk.edu
Web Page: https://cropeconomics.tennessee.edu

Overview

- Identifying and bridging price risk gaps
- Producer considerations when purchasing crop insurance
- Interactions with crop marketing
- Summary and conclusions

Identify & Analyze



- $6.00 corn futures price + $2.50 basis = $8.50 cash price
  - Futures price risk 71%
  - Basis risk 29%

Action

What tools can be used to mitigate the price risk identified?

Action

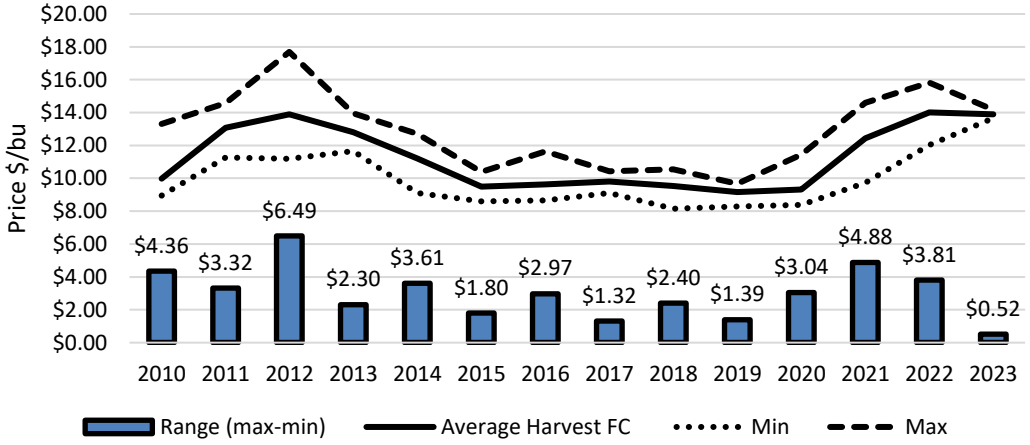
- Futures Price Risk
  - Crop insurance
  - Futures and Options
  - Storage
  - Contracting
- Basis Price Risk
  - Basis contracts
  - Storage
  - Contracting

Action, Monitor, & Control

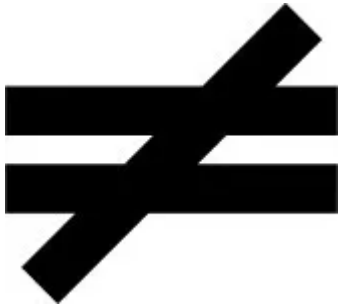
Example: Bridging the price risk gap until crop insurance prices are determined – put option

- January 9, Buy a $14.00 November 2023 put option for $0.90, sets a $13.10 futures floor.
- After crop insurance prices are determined:
  - Out-of-the money: exit options position recoup premium.
  - In-the-money: maintain the position as price protection.

November Soybean Futures Contract, Nov 1 to Expiration, 2010-2023



Price Protection



Final Price

Price Risk Management Considerations

- Access to credit.
- Yield and cost of production projections.
- Understand local, national, and global factors affecting price.
- Work to expand your risk management toolbox.

Producer Considerations

CROP INSURANCE

Crop Insurance Considerations

- Insurance Type / Production Practices
- Unit Structure
- Price / APH
- Buy-up Coverage
- Premium
- Trigger Yields / Indemnities
- Companion Policies

Purpose

- Crop insurance is an important producer tool to manage **production, financial, and/or revenue risk** during the growing season.
  - Production risk – yield, quality
  - Revenue risk – price, yield, quality
  - Financial risk – repay loans, cover production costs

Type of Insurance Plan

- **Crop insurance policies can be divided into three broad categories:**
  1. ***Yield:*** policies provide protection during the production season against yield losses from insurable causes of loss that are outside the producer's control, such as drought or flood.
  2. ***Revenue:*** policies provide coverage against decreases in revenue (price and yield combinations) during the growing season.
  3. ***Index***: is a relatively new but innovative approach to insurance provision that pays out benefits on the basis of a predetermined index (e.g. rainfall level) for loss resulting from weather and other events.
- **Crop insurance policies can be further segmented into individual or group policies**
  1. ***Individual policies***: provide coverage for individual farms or farms managed by one producer – determined by the type of policy and the unit structures available to the farm operation
  2. ***Group policies:*** provide protection against area wide losses and are not generally attached to production from one specific producer, instead coverage is determined spatially (often at the county level).

Common Types of Insurance

- Yield (YP)
- Revenue (RP) or (RP-HPE)
- Whole Farm Revenue Protection (WFRP)
- Noninsured Crop Disaster Assistance Program (NAP)
- Pasture Rangeland Forage (PRF)
- Area Risk Protection Insurance (ARPI) – County Yield or Revenue
  - Area Yield Protection, Area Revenue Protection, Area Revenue Protection with Harvest Price Exclusion, and Catastrophic Coverage
- Companion policies
  - SCO, ECO
- Private products may be available to meet your needs

Production Practices

- Irrigated and non-irrigated, conventional and organic all present different risks that will not all be covered under the same insurance policy.

- Producers should consider their production practices when choosing a crop insurance plan to ensure their insurance product best suits their operation.

- Not all production practices are insurable in every county.

Unit Structure

- Determines the coverage, premium paid, premium subsidy, and indemnity trigger for the crop insurance policy
- A “unit” is defined as any parcel of land that is insured separately from other parcels
- *Four different unit structures, including:*
  1. Basic
  2. Optional
  3. Enterprise
  4. Whole farm

Price

- Prices used to set the revenue guarantee
  - Projected – Price prior to planting (Feb 1-Feb 28)
  - Harvest – Price of the commodity determined at harvest (Oct 1-31

- For most commodity crops, prices are set in the futures market during the price discovery periods, which vary by location.

Corn Crop Insurance Prices

Commodity Year	Sales Closing Date	Projected Price Market Symbol	Projected Price Date Range	Projected Price	Price Volatility	Harvest Price Date Range	Harvest Price	Harvest less Projected
2011	3/15/2011	ZCZ11	02/01 - 02/28	$6.01	0.29	10/01 - 10/31	$6.32	$0.31
2012	3/15/2012	ZCZ12	02/01 - 02/29	$5.68	0.22	10/01 - 10/31	$7.50	$1.82
2013	3/15/2013	ZCZ13	02/01 - 02/28	$5.65	0.2	10/01 - 10/31	$4.39	($1.26)
2014	3/15/2014	ZCZ14	02/01 - 02/28	$4.62	0.19	10/01 - 10/31	$3.49	($1.13)
2015	3/15/2015	ZCZ15	02/01 - 02/28	$4.15	0.21	10/01 - 10/31	$3.83	($0.32)
2016	3/15/2016	ZCZ16	02/01 - 02/29	$3.86	0.17	10/01 - 10/31	$3.49	($0.37)
2017	3/15/2017	ZCZ17	02/01 - 02/28	$3.96	0.19	10/01 - 10/31	$3.49	($0.47)
2018	3/15/2018	ZCZ18	02/01 - 02/28	$3.96	0.15	10/01 - 10/31	$3.68	($0.28)
2019	3/15/2019	ZCZ19	02/01 - 02/28	$4.00	0.15	10/01 - 10/31	$3.90	($0.10)
2020	3/15/2020	ZCZ20	02/01 - 02/29	$3.88	0.15	10/01 - 10/31	$3.99	$0.11
2021	3/15/2021	ZCZ21	02/01 - 02/28	$4.58	0.23	10/01 - 10/31	$5.37	$0.79
2022	**3/15/2022**	**ZCZ22**	**02/01 - 02/28**	**$5.90**	**0.23**	**10/01 - 10/31**	**$6.86**	**$0.96**

Soybean Crop Insurance Prices

Commodity Year	Sales Closing Date	Market Symbol	Projected Price Date Range	Projected Price	Price Volatility	Harvest Price Date Range	Market Symbol	Harvest Price	Harvest less Projected
2011	3/15/2011	ZSF12	02/01 - 02/28	$13.52	0.24	10/01 - 10/31	ZSF12	$11.71	($1.81)
2012	3/15/2012	ZSF13	02/01 - 02/29	$12.60	0.18	10/01 - 10/31	ZSF13	$14.48	$1.88
2013	3/15/2013	ZSF14	02/01 - 02/28	$12.91	0.18	10/01 - 10/31	ZSF14	$12.93	$0.02
2014	3/15/2014	ZSF15	02/01 - 02/28	$11.41	0.13	10/01 - 10/31	ZSF15	$10.32	($1.09)
2015	3/15/2015	ZSF16	02/01 - 02/28	$9.78	0.16	10/01 - 10/31	ZSF16	$8.66	($1.12)
2016	3/15/2016	ZSF17	02/01 - 02/29	$8.90	0.13	10/01 - 10/31	ZSF17	$10.07	$1.17
2017	3/15/2017	ZSF18	02/01 - 02/28	$10.23	0.15	10/01 - 10/31	ZSF18	$9.88	($0.35)
2018	3/15/2018	ZSF19	02/01 - 02/28	$10.21	0.13	10/01 - 10/31	ZSF19	$8.83	($1.38)
2019	3/15/2019	ZSF20	02/01 - 02/28	$9.63	0.12	10/01 - 10/31	ZSF20	$9.12	($0.51)
2020	3/15/2020	ZSF21	02/01 - 02/29	$9.21	0.11	10/01 - 10/31	ZSF21	$11.45	$2.24
2021	3/15/2021	ZSF22	02/01 - 02/28	$11.81	0.19	10/01 - 10/31	ZSF22	$12.43	$0.62
2022	**3/15/2022**	**ZSF23**	**02/01 - 02/28**	**$14.30**	**0.2**	**10/01 - 10/31**	**ZSF23**	**$14.44**	**$0.14**

Yield

- The first step in developing a crop risk management program for a farm is to establish the proven yield.

- Actual Production History (APH) yield is used to set the crop insurance guarantee.
  - Minimum of 4 years; maximum of 10 years.
  - If 4 consecutive years are not available, a transition (T-Yield) is used.
  - T-Yield = 10 yr historical county average yield.
  - Maintain yield by unit structure.

It is important to note that for marketing purposes APH can be different than expected production or yield potential

APH-Yield

- The higher the yield the higher the guarantee and thus the greater revenue protection.
- Greater APH yield and revenue guarantee = higher premium.
- Yield may vary based on insurable unit.
- Trend adjustments and yield exclusion can increase your APH.

Actual Yield

- Harvested yield for crop insurance purposes.
- Can be adjusted for quality purposes.
  - Damage or quality adjustments can reduce yield for crop insurance purposes
    - Increases likelihood of a claim in the current year

Coverage Level (buy-up)

- CAT coverage is set at the 50/55 level, which means that your yield must fall below 50% of your average yield before a loss is paid.
  - Losses are paid at a rate of 55% of the price.
  - You must pay an administrative fee to become eligible to receive CAT coverage, but the government pays the entire premium.
- Buy-up - the amount that exceeds the CAT level.
  - Coverage is available from 50% up to 85% (75% for some crops) of your average yield at 100% of the price.
- Companion policies can further increase coverage but are not the same insured unit.

Premiums

- Producers can obtain premium estimates from approved insurance providers (AIP) in their county or RMA. https://ewebapp.rma.usda.gov/apps/costestimator/
- Premium cost will be affected by:
  - Insured unit
  - APH
  - Price / volatility factor
  - Production practices
  - Location

Subsidy Level by Unit Structure and Coverage Level

Coverage Level (%)	Basic & Optional (%)	Enterprise (%)	Whole Farm Unit (%)
50	67	80	80
55	64	80	80
60	64	80	80
65	59	80	80
70	59	80	80
75	55	77	80
80	48	68	71
85	38	53	56

Why are different unit structures/products subsidized at different rates?

In general, optional and basic units increase the likelihood of a payment. Fewer fields need to experience a loss.

Revenue or Yield Guarantees

- Crop insurance provides yield or revenue protection during the crop production year
  - Yield – bu/acre or lbs/acre
  - Revenue - $/acre (yield x price)
- **Revenue Guarantee = Yield x Price x Coverage Level**
- **Yield Guarantee = Yield x Coverage Level**
- Indemnities are paid when actual crop insurance yield or revenue falls below the guarantee.

Revenue Example

- Yield Guarantee = APH x Coverage Level
  - 45 bu/acre x 75% = 34 bu/acre
- Revenue Guarantee = Yield Guarantee x Base Price
  - 34 bu/acre x $10.19/bu = $346.46/acre
- Actual Revenue = Harvest Price x Actual Yield
  - $9.50/bu x 30 bu/acre = $285.00/acre
- Indemnity = Revenue Guarantee – Actual Revenue
  - $346.46/acre - $285.00/acre = $61.46/acre

2022 Coverage RP vs. RP-HPE

- RP-HPE guarantee = 175 bu/acre x $5.90/bu x 80% = $826/acre
  - Trigger yield = 120 bu/acre
- RP guarantee = 175 bu/acre x $6.86/bu x 80% = $960.4/acre
  - Trigger yield = 140 bu/acre

Supplemental Coverage Option (SCO)

Step	SCO Coverage Calculation	
A	SCO Endorsement begins to pay when **county revenue** falls below this percent of its expected level (the percent is the same for all SCO policies – set by law)	86%
B	SCO Endorsement pays out its full amount when **county revenue** falls to the coverage level percent of its expected level (always equal to the coverage level of the underlying policy)	75%
C	Percent of expected crop value covered by SCO (A – B, or 86% – 75%)	11%
D	Amount of SCO Protection (C * Expected Crop Value, or 11% x $765)	$84.15

Source: USDA RMA Fact Sheet: https://www.rma.usda.gov/en/Fact-Sheets/National-Fact-Sheets/Supplemental-Coverage-Option-2022

Enhanced Coverage Option (ECO)

Step	ECO Coverage Calculation for 95 percent Area Trigger Level	
A	ECO Endorsement begins to pay when county revenue falls below this percent of its expected level	95%
B	ECO Endorsement pays out its full amount when county revenue falls to 86 percent of its expected level	86%
C	Percent of expected crop value covered by ECO (A – B, or 95- 86 percent)	9%
D	Amount of ECO Protection (C x Expected Crop Value, or 9 percent x $765)	$68.85

ECO cannot be elected if you have a Margin Protection or an Area Risk Protection Insurance policy. The underlying policy for ECO cannot have the Hurricane Insurance Protection – Wind Index Endorsement. ECO coverage cannot attach to any acres that are insured by a Stacked Income Protection Plan (STAX). Acres not insured under STAX may be insured under ECO. You can select SCO on all acres covered by ECO, but you are not required to elect SCO to purchase ECO.

Source: USDA RMA Fact Sheet: https://www.rma.usda.gov/en/Fact-Sheets/National-Fact-Sheets/Enhanced-Coverage-Option

Example 1: 95% ECO Trigger		
Deductible (no coverage)	100-95%	
ECO Coverage Range		95-86%
SCO or ARC Coverage Range		86-75%
MCPI Coverage Range	75%	
	Insured Unit	County

Example 2: 90% ECO Trigger		
Deductible (no coverage)	100-90%	
ECO Coverage Range		90-86%
SCO or ARC Coverage Range		86-75%
MCPI Coverage Range	75%	
	Insured Unit	County

CROP INSURANCE INTERACTIONS WITH CROP MARKETING

Corn - Net Return Table ($/acre) ($950/acre COP)

Price ($/bu)	Yield (bu/acre)										
	125	135	145	155	165	175	185	195	205	215	225
4.00	(450)	(410)	(370)	(330)	(290)	(250)	(210)	(170)	(130)	(90)	(50)
4.25	(419)	(376)	(334)	(291)	(249)	(206)	(164)	(121)	(79)	(36)	6
4.50	(388)	(343)	(298)	(253)	(208)	(163)	(118)	(73)	(28)	18	63
4.75	(356)	(309)	(261)	(214)	(166)	(119)	(71)	(24)	24	71	119
5.00	(325)	(275)	(225)	(175)	(125)	(75)	(25)	25	75	125	175
5.25	(294)	(241)	(189)	(136)	(84)	(31)	21	74	126	179	231
5.50	(263)	(208)	(153)	(98)	(43)	13	68	123	178	233	288
5.75	(231)	(174)	(116)	(59)	(1)	56	114	171	229	286	344
6.00	(200)	(140)	(80)	(20)	40	100	160	220	280	340	400
6.25	(169)	(106)	(44)	19	81	144	206	269	331	394	456
6.50	(138)	(73)	(8)	58	123	188	253	318	383	448	513
6.75	(106)	(39)	29	96	164	231	299	366	434	501	569
7.00	(75)	(5)	65	135	205	275	345	415	485	555	625
7.25	(44)	29	101	174	246	319	391	464	536	609	681
7.50	(13)	63	138	213	288	363	438	513	588	663	738
7.75	19	96	174	251	329	406	484	561	639	716	794

Estimate Cost of Production (Revisit)

- Develop cost of production estimates for crops.
- Start with a template and modify to meet your specific needs.
- Note uncertainty and variability in estimates.
- Track actual costs compared to budgeted.

2022 Corn, No-Till, Non-Irrigated Budget

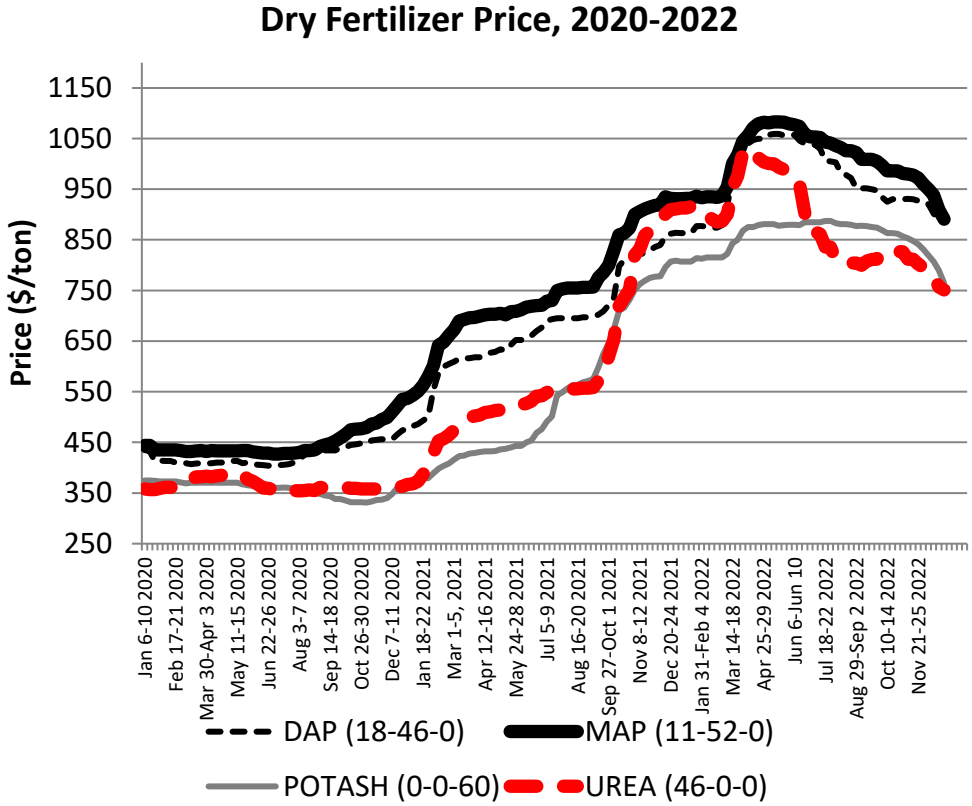
	Unit	Quantity	Price	Total
Revenue [1]			**Gross Revenue ($/Acre)**	
Corn	Bu/acre	175	$5.65	$988.75
Government Payments	$/acre	1	$0.00	$0.00
Other Revenue	$/acre	1	$0.00	$0.00
			Total Revenue	**$988.75**
Variable Expenses				
Seed [2]	Thous.	32	$3.65	$116.80
Fertilizer & Lime (Table 1)	Acre	1	$318.44	$318.44
Chemical (Table 2)	Acre	1	$64.79	$64.79
Crop Scout or Consultant	Acre	1	$15.00	$15.00
Repair & Maintenance (Table 3)	Acre	1	$43.89	$43.89
Fuel, Oil & Filter (Table 3)	Acre	1	$19.66	$19.66
Operator Labor (Table 3)	Acre	1	$13.98	$13.98
Crop Insurance [6]	Acre	1	$15.91	$15.91
Machinery Rental	Acre	1	$0.00	$0.00
Custom Work	Acre	1	$0.00	$0.00
Drying (Fuel/Electric)	Bu	175	$0.00	$0.00
Other	Acre	1	$0.00	$0.00
Other	Acre	1	$0.00	$0.00
Operating Interest [7]	%	$608.47	4.35%	$13.23
			Total Variable Expenses	**$621.71**
			Return Above Variable Expenses	**$367.04**
Fixed Expenses				
Machinery				
Capital Recovery (Table 3)	Acre	1	$103.81	$103.81
Other Fixed Machinery Costs	Acre	1	$0.00	$0.00
General Overhead	Acre	1	$20.00	$20.00
Cash Rent [8]	Acre	1	$104.00	$104.00
Insurance (Non-Machinery)	Acre	1	$0.00	$0.00
Management Labor	Acre	1	$25.00	$25.00
Other	Acre	1	$0.00	$0.00
			Total Fixed Expenses	**$252.81**
			Total Expenses	**$874.52**
			Return Above Specified Expenses	**$114.23**

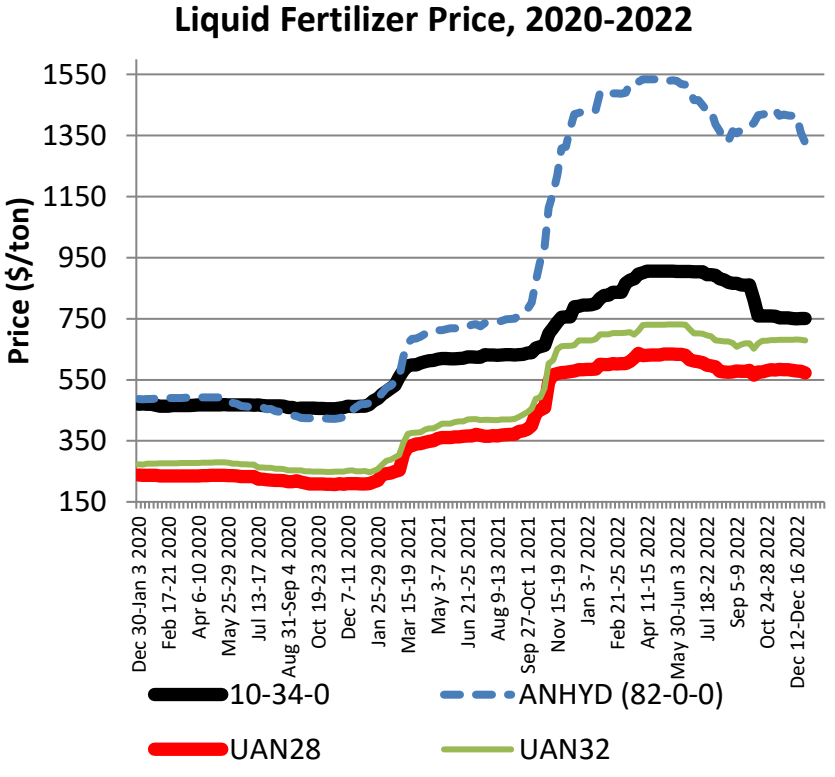
Higher interest rates will cost you money

	$1,250,000 Operating Utilization		
Interest Rate	3.25%	5.5%	7.5%
Interest	$22,114	$37,552	$51,361
Change	-	$15,438	$29,247
Cost ($/acre)*	$11.06	$18.77	$25.68

* Assumes 2000 acres

Fertilizer Price



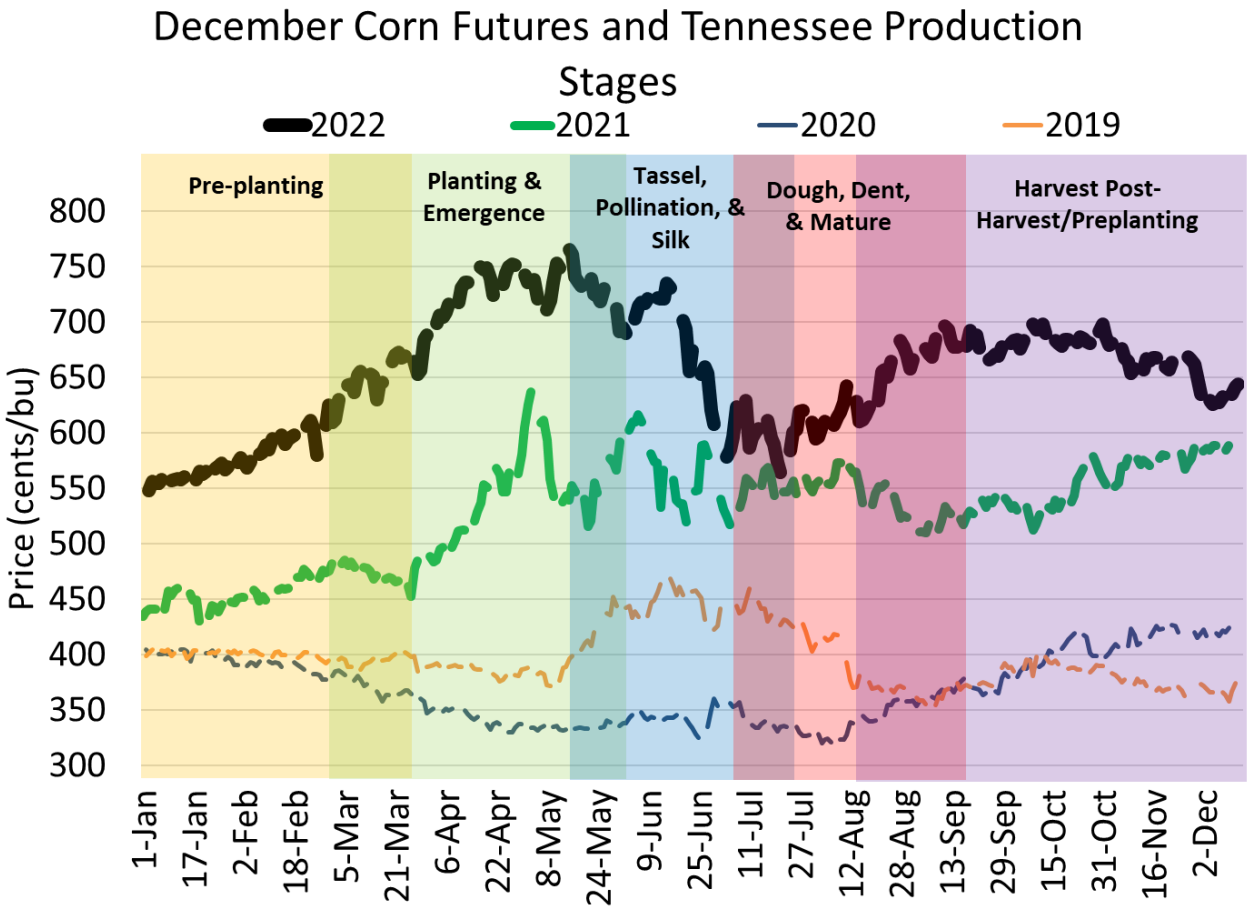


How Many Bushels Does it Take to Cover Specified Expenses?

	60 bu/acre Yield Target			
		Harvest Price		
Expense	$/acre	$13.58	$11.84	$10.00
Seed	64.40	4.7	5.4	6.4
Fertilizer & Lime	93.49	6.9	7.9	9.3
Chemical	**104.03**	**7.7**	**8.8**	**10.4**
Crop Scout /Consultant	15.00	1.1	1.3	1.5
Repair & Maintenance	31.59	2.3	2.7	3.2
Fuel, Oil & Filter	13.19	1.0	1.1	1.3
Operator Labor	8.90	0.7	0.8	0.9
Crop Insurance	10.32	0.8	0.9	1.0
Operating Interest	6.98	0.5	0.6	0.7
Total Variable Expenses	**347.90**	**25.6**	**29.4**	**34.8**
Capital Recovery	123.23	9.1	10.4	12.3
General Overhead	20.00	1.5	1.7	2.0
Cash Rent	180.00	13.3	15.2	18.0
Management Labor	25.00	1.8	2.1	2.5
Total Fixed Expenses	348.23	25.6	29.4	34.8
Specified Expenses	**696.14**	**51.3**	**58.8**	**69.6**

Growing season pricing

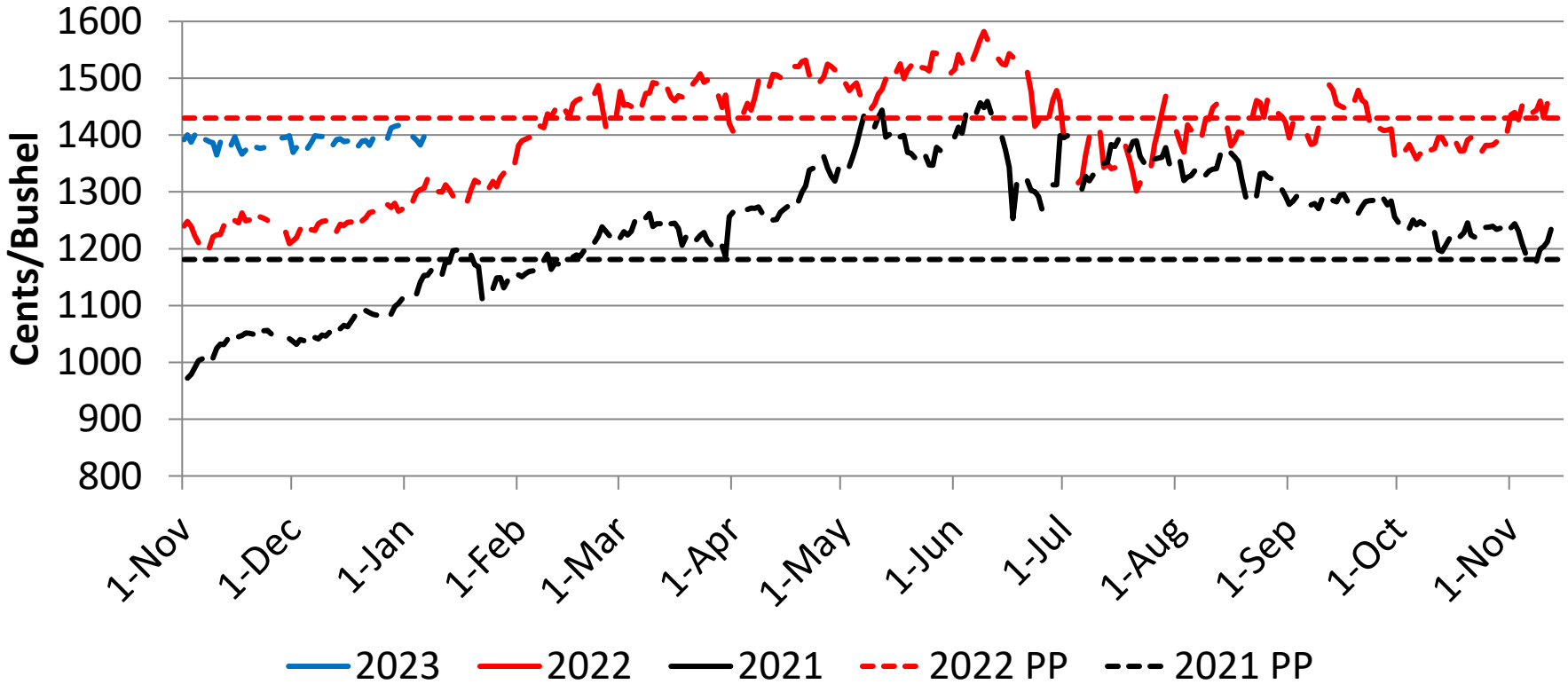
USE CROP INSURANCE AS A GUIDE



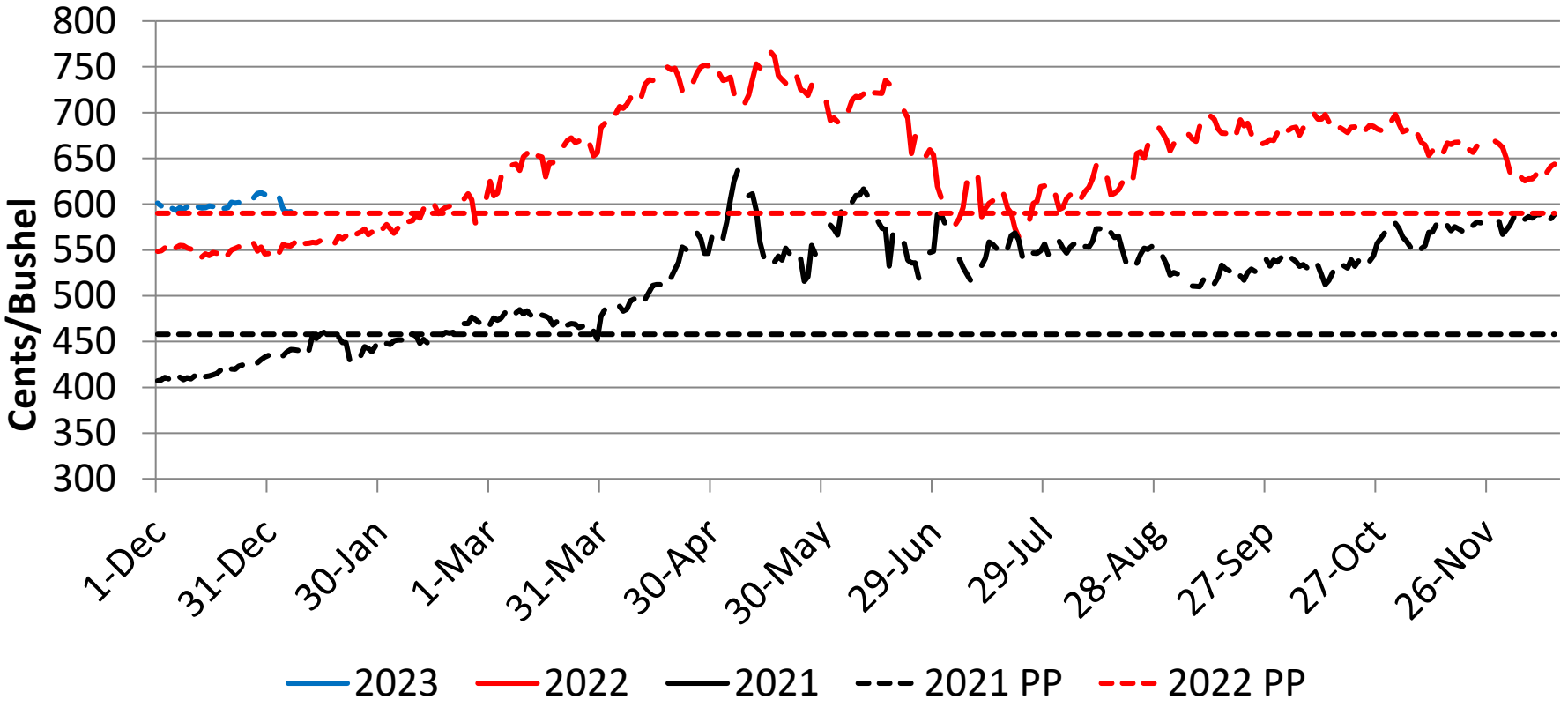
Marketing Tools

- Identify pricing or price protection opportunities during the growing season.
  - Futures
  - **Options**
  - Contracts
  - Managed products
  - Storage
  - Cash sales

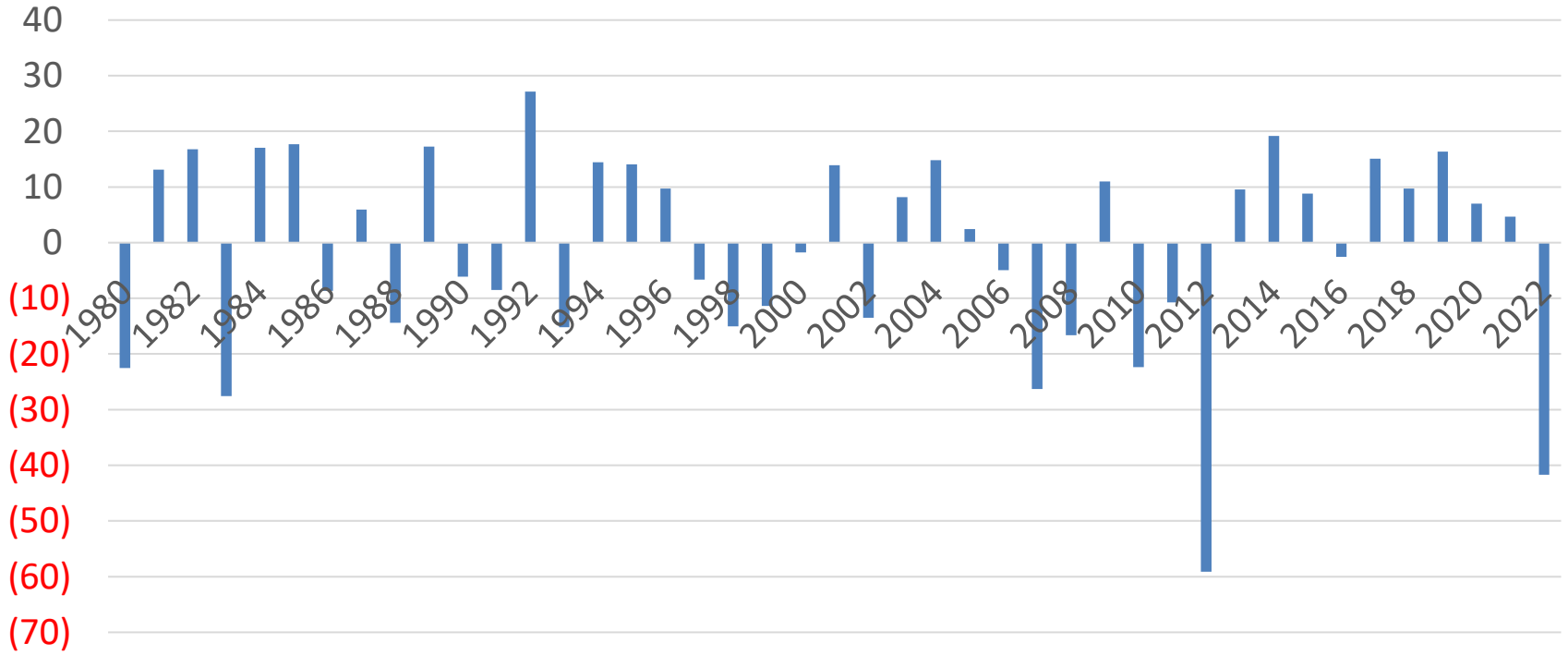
November Soybean Futures



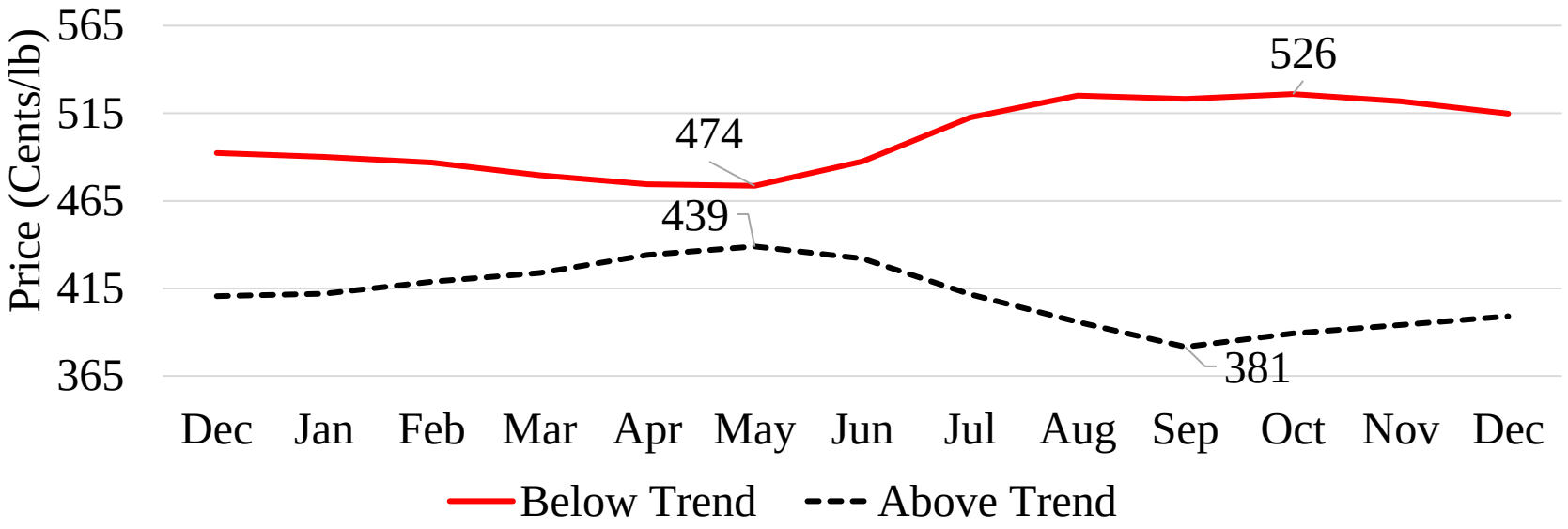
December Corn Futures



Deviation from Projected Trendline Yields

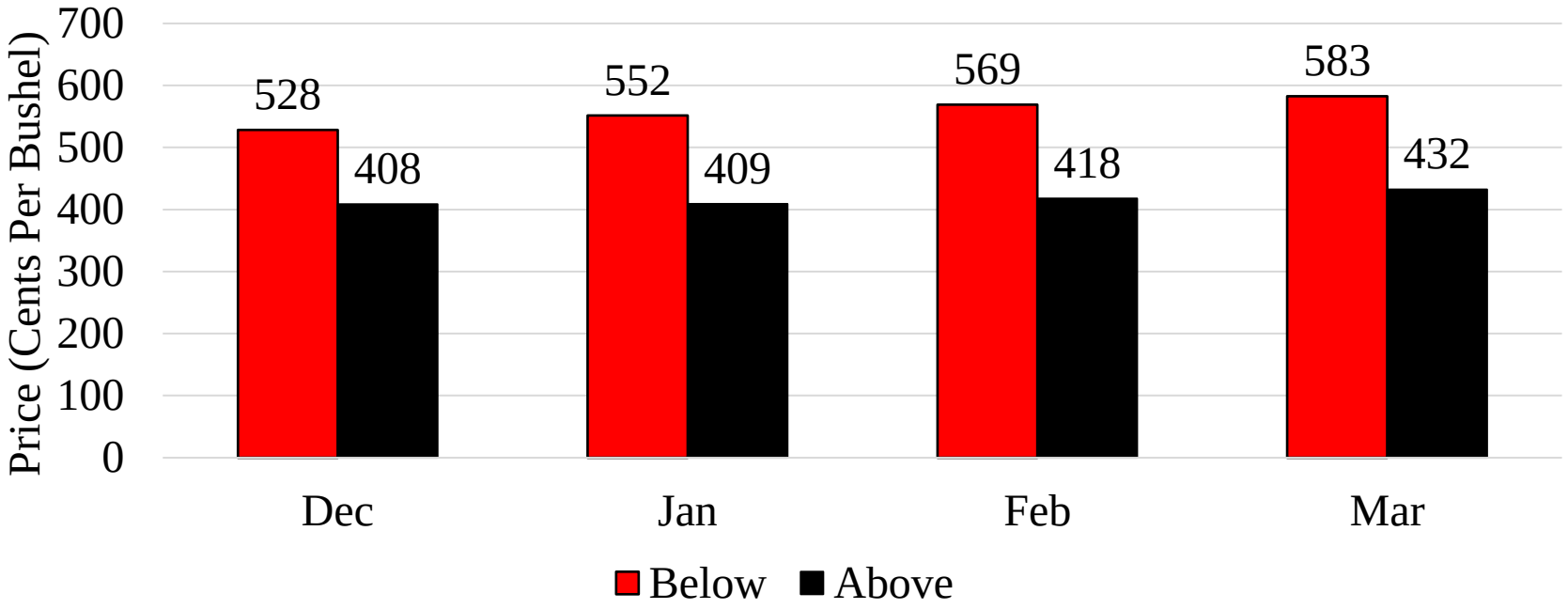


Monthly Average Daily Closing Price for the December Corn Futures Contract in Years with Above and Below Trendline Yields, 2010-2021



*Below trendline years included 2010, 2011, 2012, 2013, 2019, and 2020. Above trend line yields occurred in 2014, 2015, 2016, 2017, 2018, 2021.
Data Source: Barchart

Average Monthly Futures price for the March Corn Contract from December to March following a production year with above or below trendline yield, 2010-2021 crop years

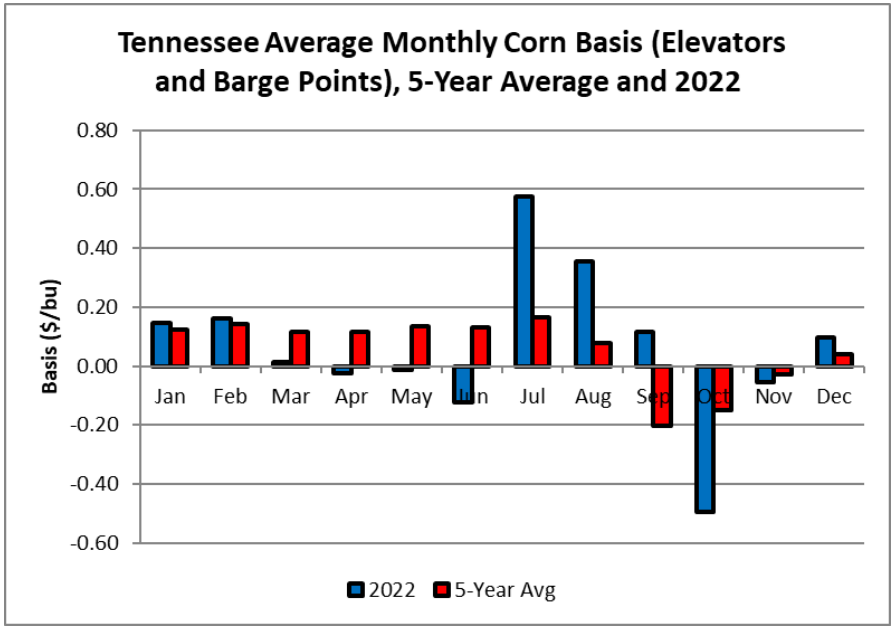


*Below trendline years included 2010, 2011, 2012, 2013, 2019, and 2020. Above trend line yields occurred in 2014, 2015, 2016, 2017, 2018, 2021.

Data Source: Barchart

Basis

- Cash price – futures price
- Crop insurance prices do not cover basis
  - +50Z vs. +150Z @ last years projected price of $6.86
    - 93% vs. 82% price protection
- Price futures use storage and basis to achieve higher cash prices.
- On demand (direct terminal market sales).



Summary and Take-home

- Crop insurance is the most important risk management tools available to crop producers.
- Incorporate crop insurance into a broader price and financial risk strategy.
- Build your risk management toolbox.

January 11, 2023
Dr. S. Aaron Smith Associate Professor and Extension Economist
Department of Agricultural and Resource Economics
University of Tennessee Institute of Agriculture
Email: aaron.smith@utk.edu
Web Page: https://cropeconomics.tennessee.edu

THANK YOU