Nebraska Crop Management Conference

University of Nebraska Lincoln

Impact of annual precipitation on corn yield in a long-term tillage and N rate study

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Goals of this presentation

- Know the impact of annual precipitation on corn yield under certain management practices
- Decide if your farm management practices can be adjusted with changing precipitation patterns

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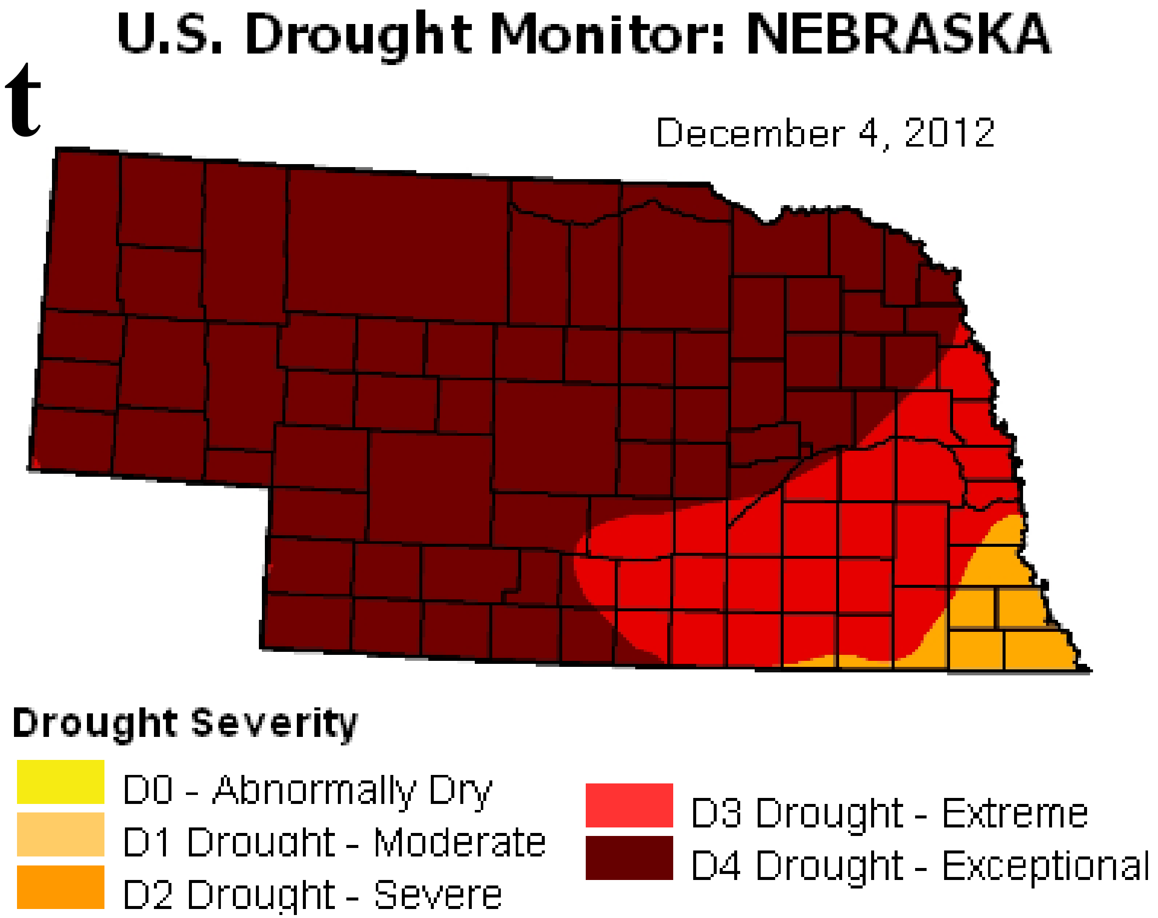
2012 Drought



Week	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
Nov 27, 2012	0.00	100.00	100.00	100.00	96.15	77.46
Dec 4, 2012	0.00	100.00	100.00	100.00	96.15	77.46

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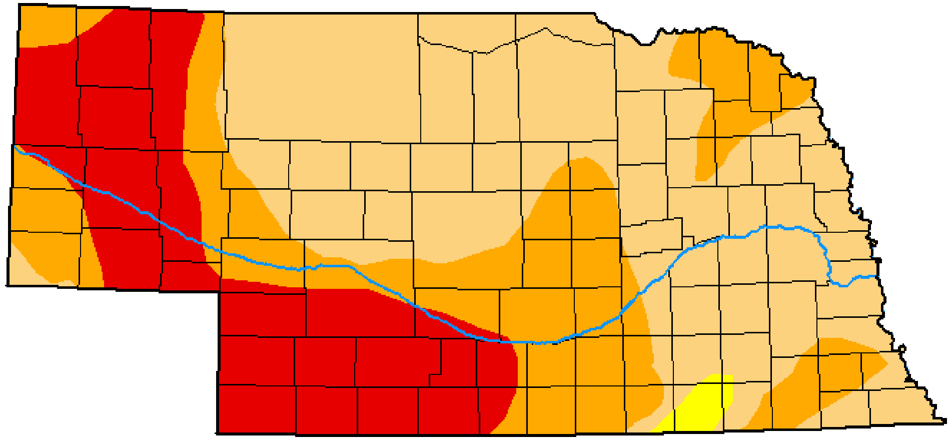
2020 Drought

U.S. Drought Monitor
Nebraska

December 22, 2020
(Released Thursday, Dec. 24, 2020)
Valid 7 a.m. EST

University of Nebraska Lincoln



Intensity:
- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:
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NOAA/NWS/NCEP/CPC

droughtmonitor.unl.edu

Objectives

Use Standardized Precipitation Evapotranspiration Index (SPEI) to

- Determine if SPEI helps differentiate the crop yield with tillage, nitrogen rate, and crop rotation across the index range, and
- Find out if SPEI helps in making management decisions with precipitation regimes

Methods

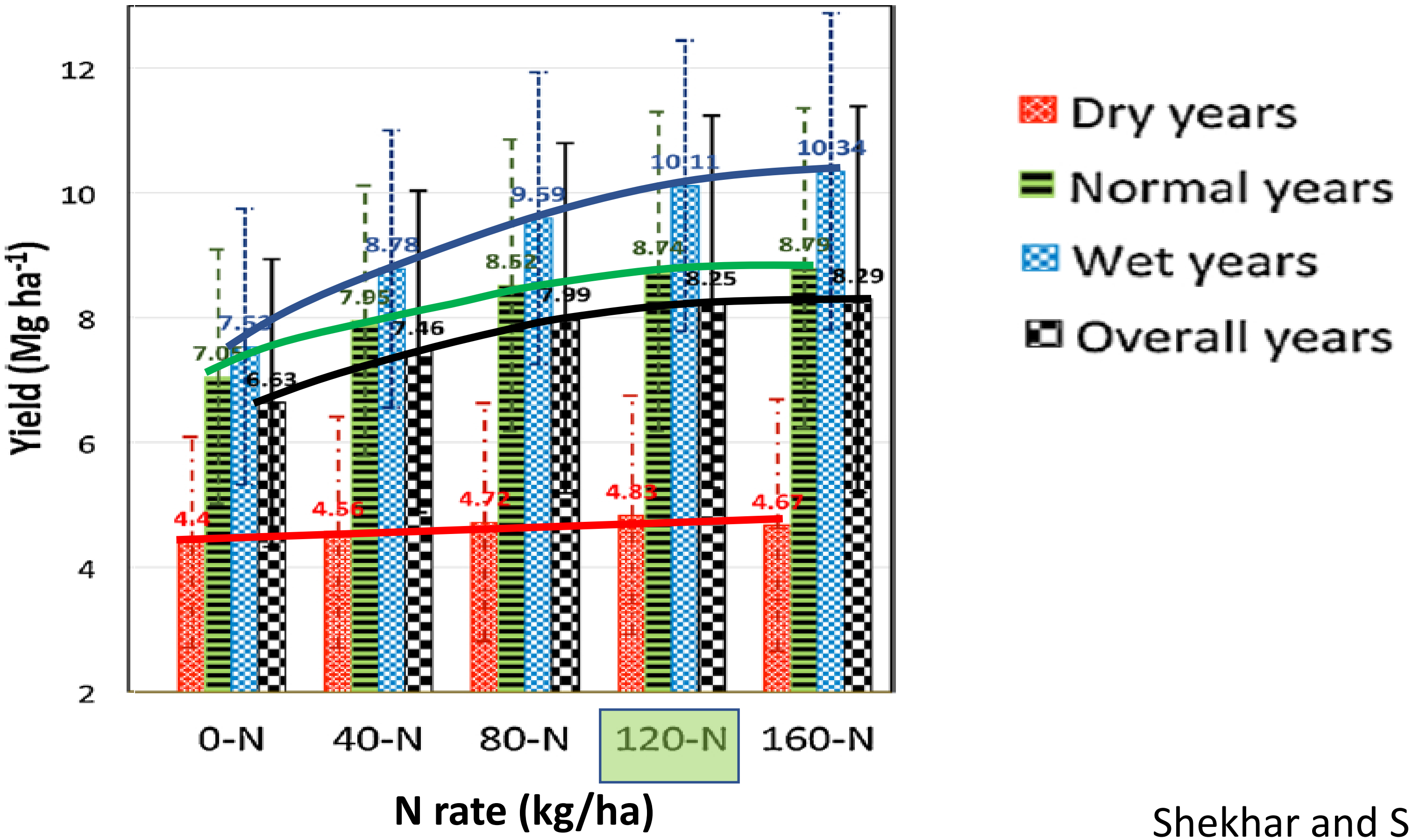
- Study site: Haskell Ag Lab, Northeast NE
- Study years: 1986-now (34 years)
- Study design: split-split plot
- Tillage treatments: No-Till (NT), Spring/fall plow (PL), Disk (DK)
- Crop rotation: Corn-Soybean (CS), Continuous Corn (CC)
- Nitrogen rates: 0, 40, 80, 120, and 160 kg N ha^{-1}
- Nitrogen source: Ammonium Nitrate

Standardized Precipitation Evapotranspiration Index (SPEI) and number of years in each category for 31 years

	Climatic Moisture categories	SPEI-5Sep OR SPEI-12Sep	Number of years	
Wet	Extremely wet	≥2.00	0	(6 of 31 times, 19% probability)
	Severely wet	1.50–1.99	2 (1993, 2014)	
	Moderately wet	1.00-1.49	4 (1992, 1996, 2010, 2015)	
Normal	Normal	0.99 to −0.99	19	(19 of 31 times, 61% probability)
Dry	Moderate drought	−1.00 to −1.49	3 (1990, 2000, 2002)	(6 of 31 times, 19% probability)
	Severe drought	−1.50 to −1.99	1 (1989)	
	Extreme drought	≤ −2.00	2 (1988, 2012)	

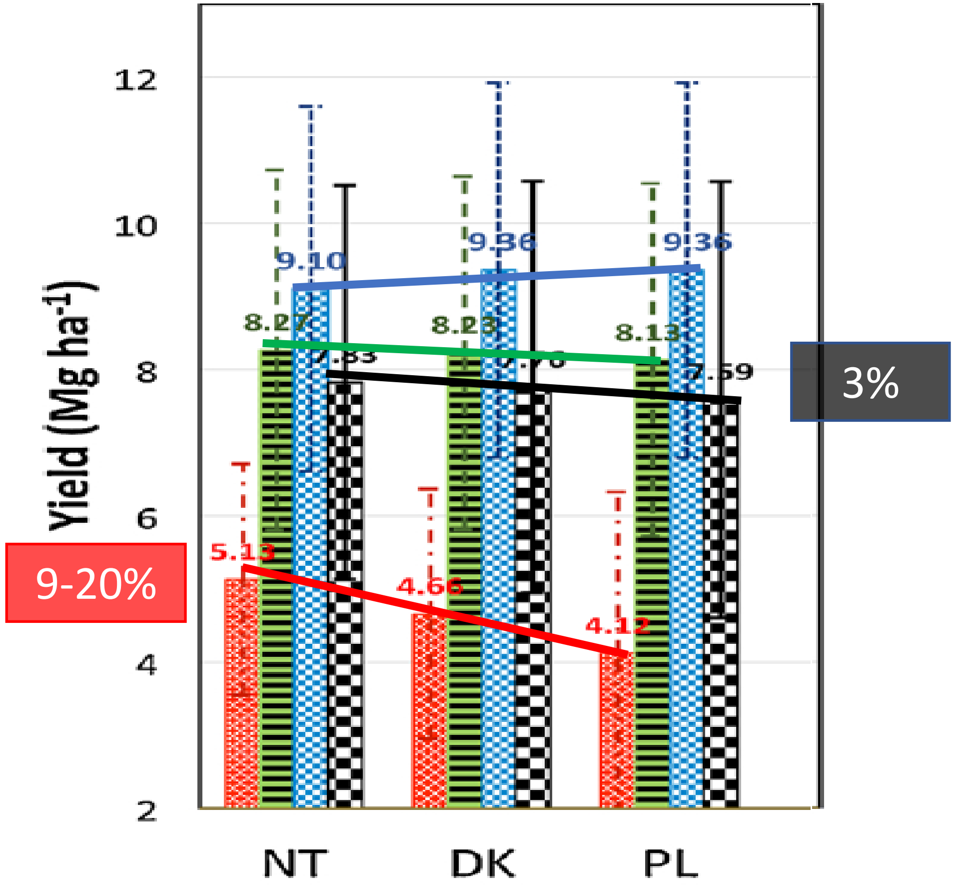
Shekhar and Shapiro et al. 2019

Corn yield response to N rate



Shekhar and Shapiro et al. 2019

Corn yield response to tillage

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CROPWATCH

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Strategic Tillage for the Improvement of No-Till Cropping Systems

JANUARY 21, 2020

Charles Wortmann - Extension Soil and Nutrient Management Specialist | Humberto Blanco - Professor of Soil Science

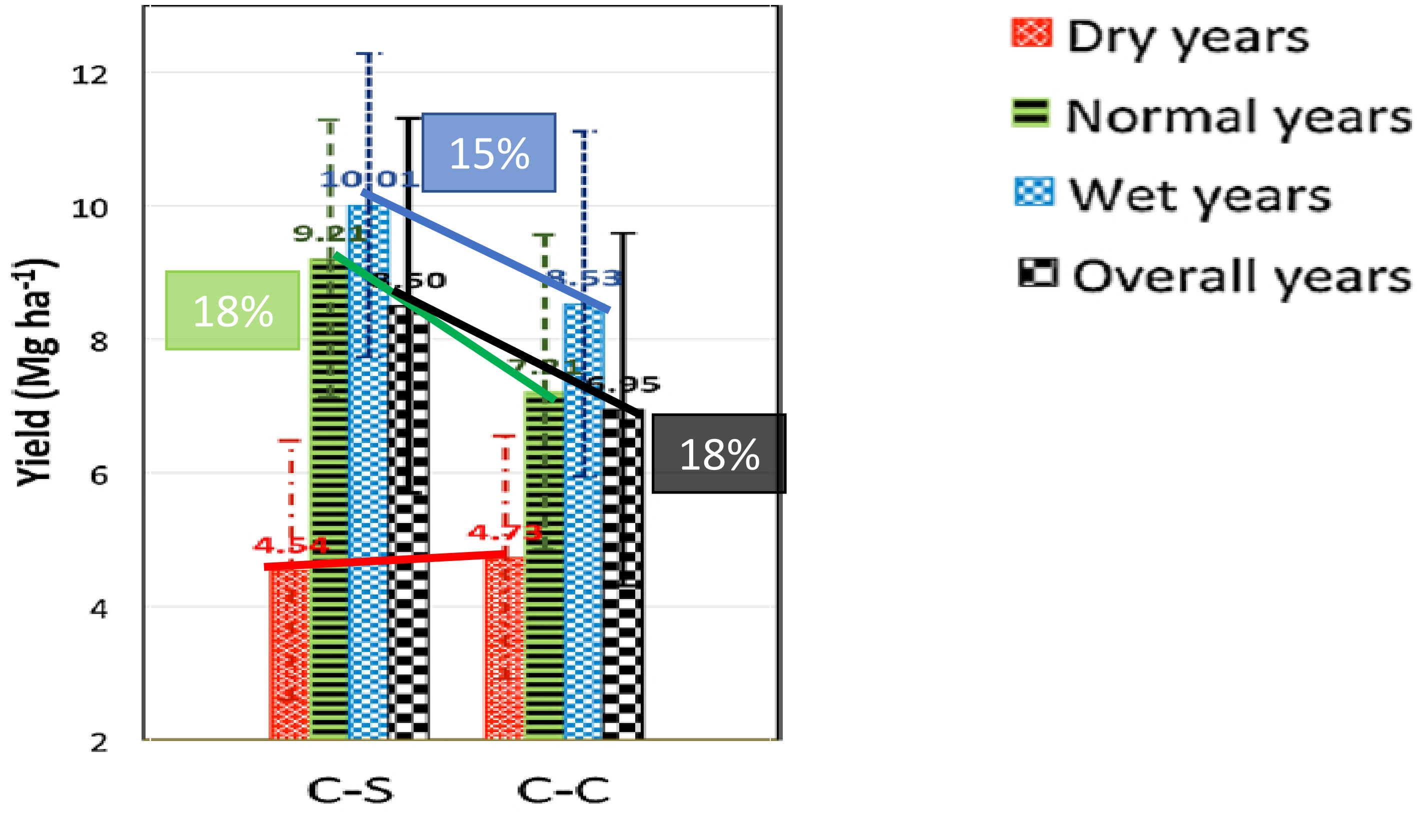
Occasional tillage (OT) of long-term no-till (also called one-time or strategic tillage) might be desired once in more than 5 or 10 years according to need for integrated weed management, fracturing a compaction layer, incorporating a soil amendment such as lime or manure, reducing vertical stratification of nutrient availability, increasing soil organic matter to greater depth, or reducing crop residue accumulation. The type of tillage for OT should be specific to the objective of the OT. Some of the early OT research was done in Nebraska including a 5-year study at the High Plains Agricultural Laboratory (HPAL) near Sydney using moldboard plow tillage and three 5-year trials in eastern Nebraska in which five OT practices were compared. However, there has been much additional study elsewhere during the past decade. Dozens of other multi-year trials have been conducted including trials in Australia, Brazil, Canada, Spain, and Turkey, as well as in Indiana, Kansas, Kentucky, Oregon, Texas, and Wyoming.

Negative, neutral and positive effects

An early concern with OT of no till was that benefits to soil properties and productivity gained from continuous no-till would be lost with a single or infrequent tillage practice. The findings from the above studies consistently show that such negative effects are highly unlikely, generally of less than 1-year duration and of little agronomic significance. The two consistent negative effects of OT are the cost of the tillage and increased risk of erosion until

Shekhar and Shapiro et al. 2019

Corn yield response to crop rotation



Shekhar and Shapiro et al. 2019

Tillage, rotation and N rate recommendations based on SPEI at rainfed silt loam soil

Tillage, rotation, and N rate recommendations based on a meteorological drought index (SPEI) analysis over 31 years at a rainfed silt loam site in Nebraska, US if precipitation index could be predicted.

Recommendations			
Moisture Conditions	Tillage	Rotation	N rate
Extremely/Severely Dry (SPEI ≤ -1.5)	No-Till	Continuous Corn (C-C)	-
Moderately Dry (-1 ≥ SPEI ≥ -1.49)	No-Till	Corn-Soybean (C-S) rotation	Maximum of 120 kg ha^{-1}
Normal (0.99 ≥ SPEI ≥ -0.99)	No-Till	Corn-Soybean (C-S) rotation	120 kg ha^{-1}
Wet (SPEI ≥ 1)	Plow or Disk	Both C-C and C-S	150 kg ha^{-1} for C-S and 220 kg ha^{-1} for C-C

Shekhar and Shapiro 2019

Take Home Message

- **N Rate:** Under normal and dry conditions, (25 of 31 times, *81% probability*) optimum NR of 120 kg N ha^{-1} can be more profitable for a rainfed silt-loam soil.
- **Tillage:** Under normal and dry conditions (25 of 31 times, *81% probability*), No-till enhances crop yield, profits, provides soils benefits, and can help to protect water quality.
- **Crop Rotation:** Rotation (C–S) under normal and wet conditions (25 of 31 times, *81% probability*) increase yields.

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