

Agronomics for Corn Management in 2023



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

Osler Orteza, Ph.D.

Corn and Emerging Crops
Horticulture and Crop
Science

Email: ortez.5@osu.edu

Phone: (330) 263-9725

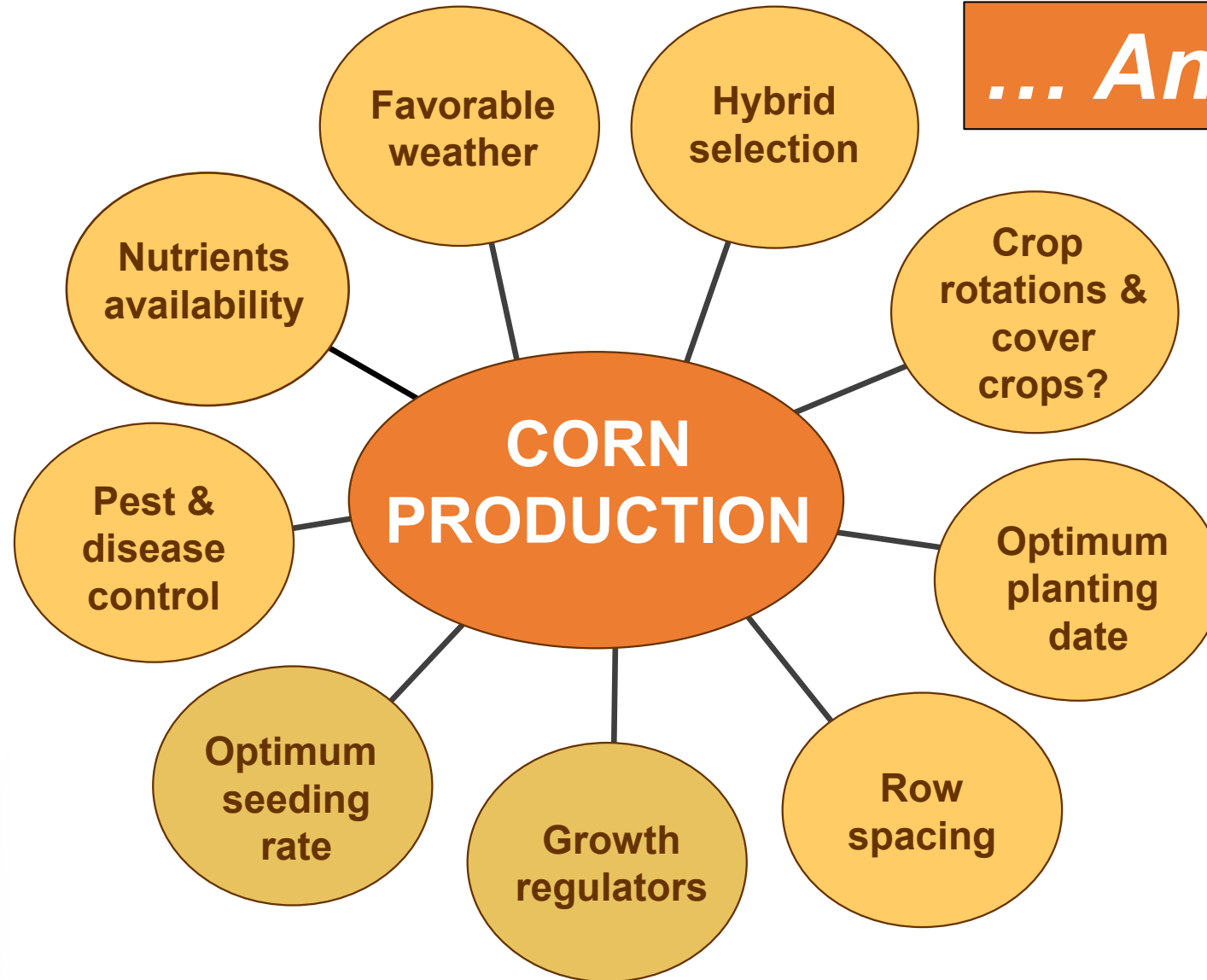
TODAY

- **Corn Growth and Development**
- Corn Topics in 2022
- New Corn Research

Corn Growth & Development



... And more!!!



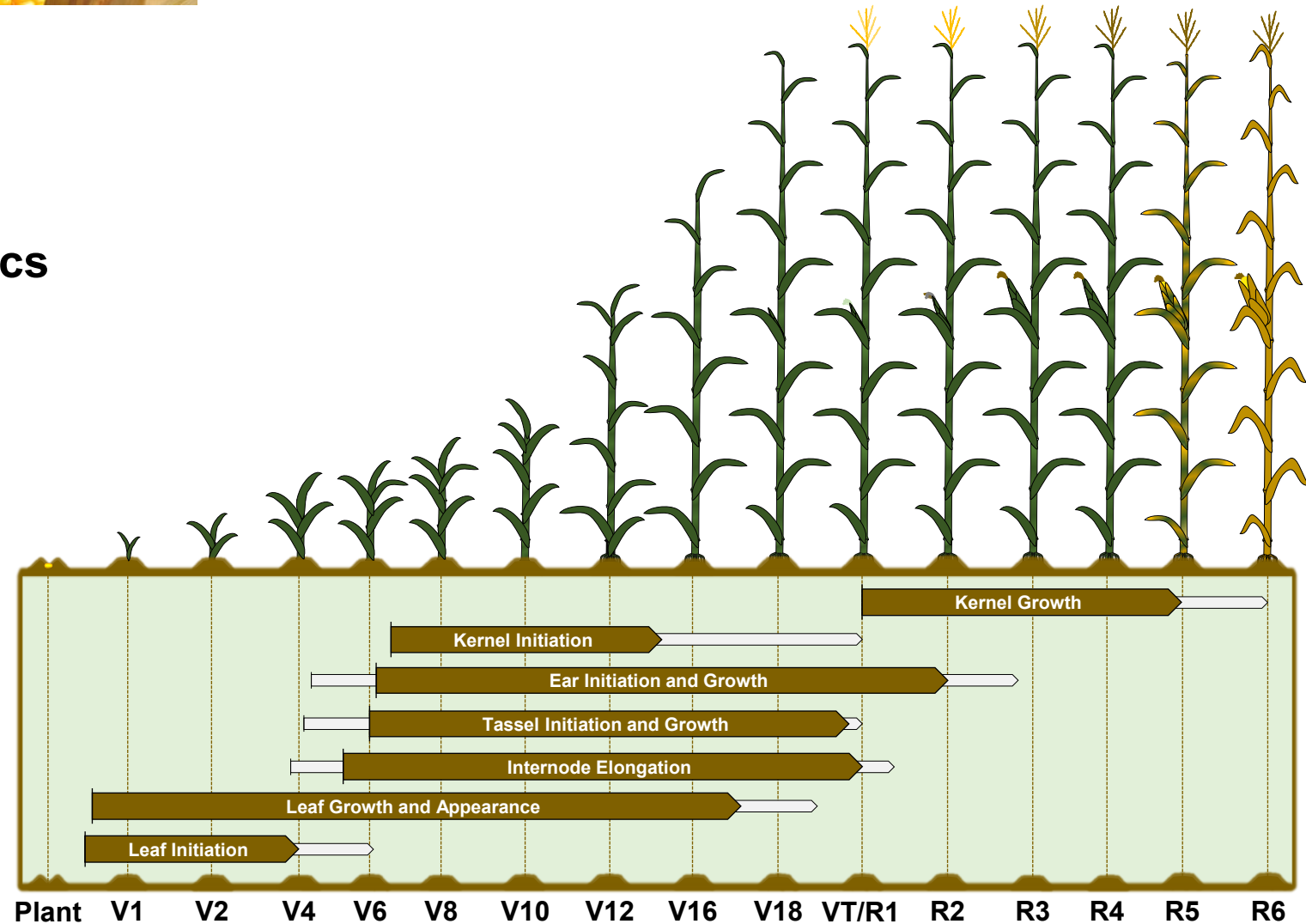
Corn Growth & Development



Why this matters?

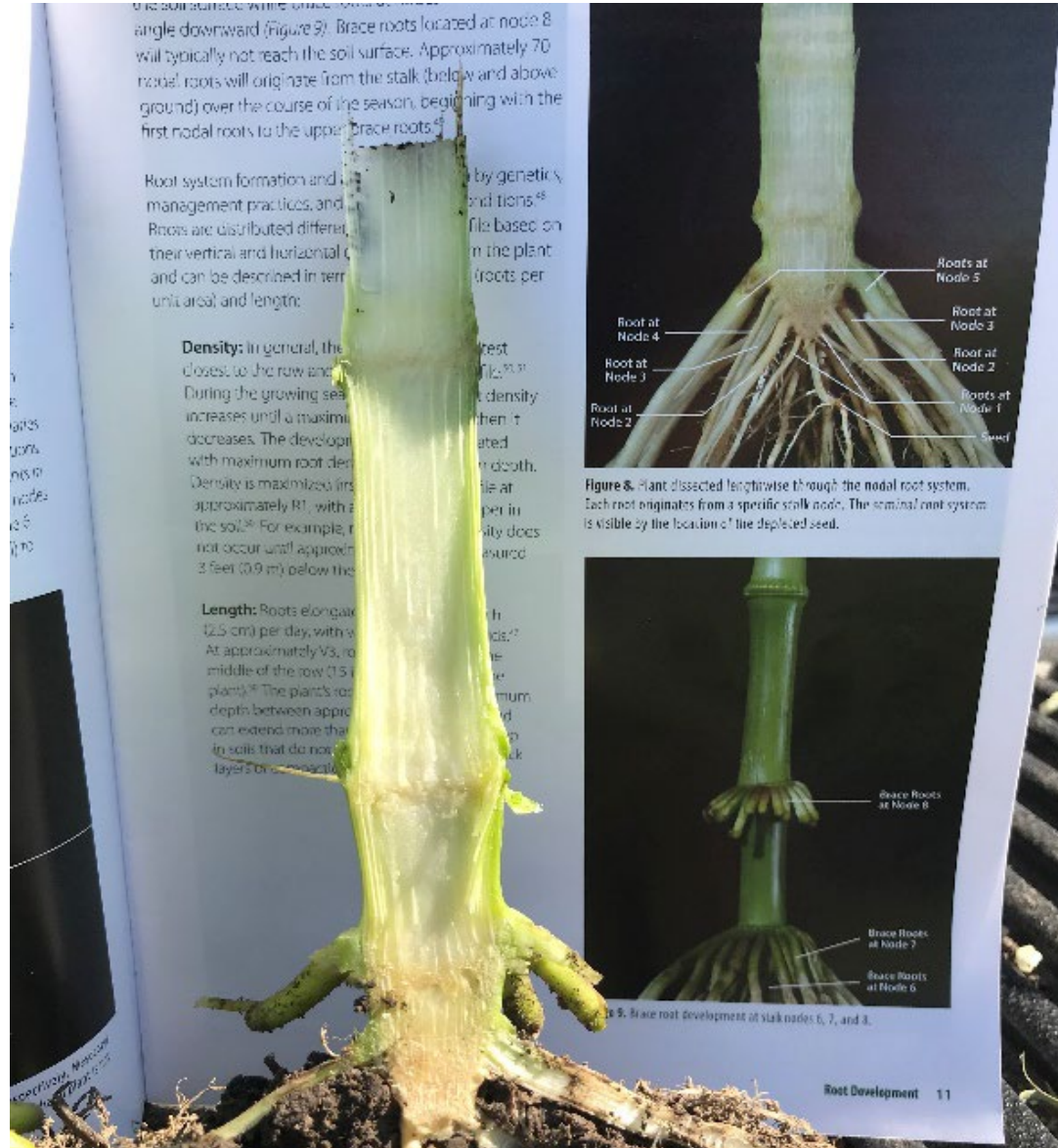
- Scouting
- Staging & diagnostics
- Applications timing
- Yield components
- Biotic & abiotic

insects,
disease,
drought/heat,
wind,
flood/hail/freeze



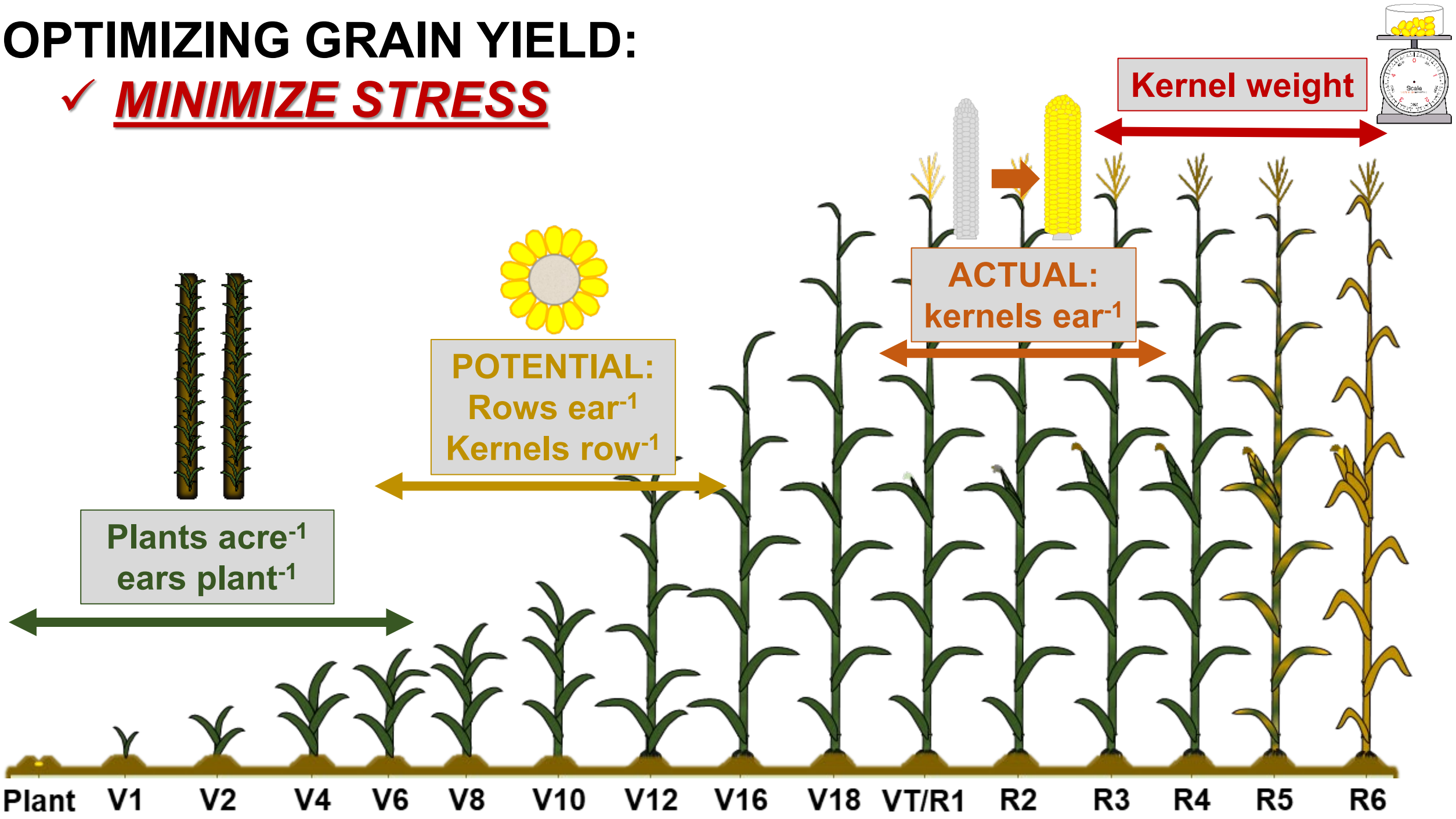
(Ortez et al., 2022)

Dissected plant at V9 stage



OPTIMIZING GRAIN YIELD:

✓ MINIMIZE STRESS



TODAY

- Corn Growth and Development
- Corn Topics in 2022
- New Corn Research



Imbibitional Chilling

- **Warmer temperatures** combined with the excitement (and need) to get crops in the ground triggered **planting around the state mid-April** or even before.
- **Cold temperatures and precipitation after planting** can cause **imbibitional chilling!!!**

Soil Crusting

Replanting does not guarantee an increase in yields. **Some alternatives:**

- 1) **planting a little deeper** for better seed/soil contact and access to moisture;
- 2) **reduced or no-till systems** that have more residues in the soil surface;
- 3) **rotary hoe** in the crusted layer (if crop is germinated and still below ground);
- 4) a **row crop cultivator** can be used if the crop is tall enough.



Replanting Decisions

Step 1. Wait... Plant stand should be assessed after 'stable' and 'better' conditions are achieved.

Step 2. Estimate the number of plants per acre from several areas within the field by conducting stand counts.

Step 3. Check the weather forecast. How soon can you get back to the field to replant?

For corn, early planting dates with lower stands can still produce good yields. From past research, a stand of 20,000 plants per acre planted on April 20 can still yield 91% of the optimum.

More on this topic here:

<https://agcrops.osu.edu/newsletter/corn-newsletter/2022-14/replanting-decisions-corn-and-soybeans%E2%80%A6what-consider>



Planting Date	Plants per acre at harvest					
	10,000	15,000	20,000	25,000	30,000	35,000
	% of optimum yield					
April 10	62	76	83	92	94	93
April 20	67	81	91	97	99	97
April 30	68	82	92	98	100	98
May 9	65	79	89	95	97	96
May 19	59	73	84	89	91	89
May 29	49	62	73	79	81	79



Useful-to-Useful Tool: U2U



Five steps:

Step 1. Access U2U:

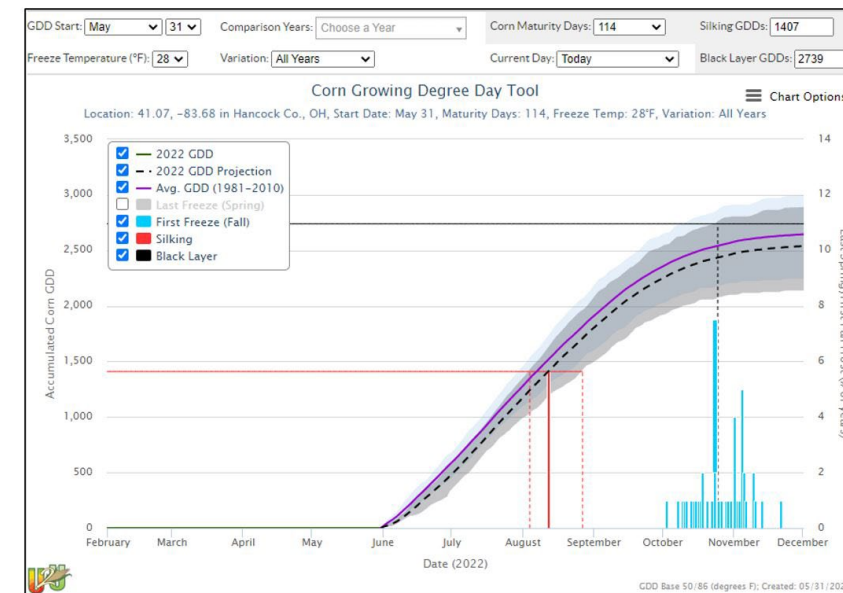
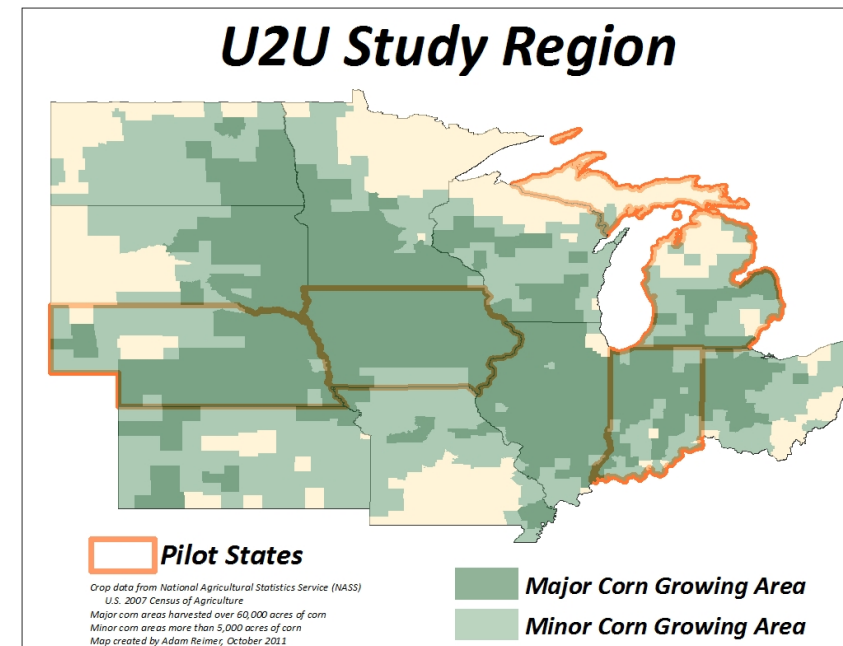
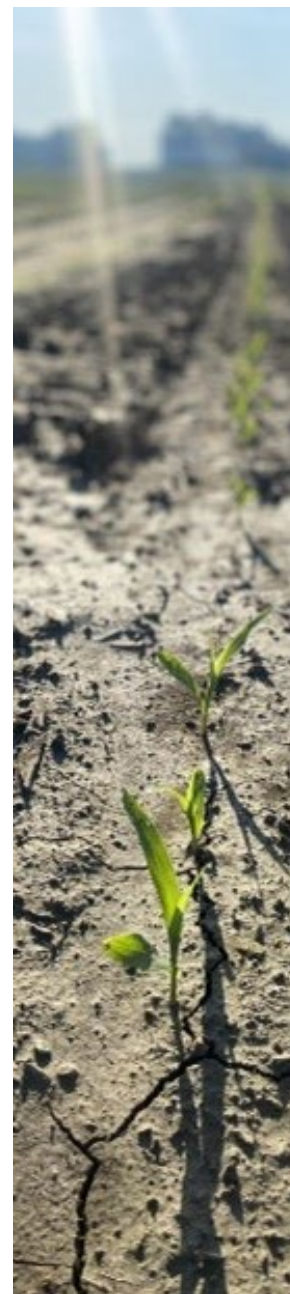
https://mygeohub.org/groups/u2u/purdue_gdd

Step 2. Select your location, zoom in-or-out as needed in map. Search by Zip/City/County can be used

Step 3. Select the start date for GDD. As a proxy, the planting date can be used here

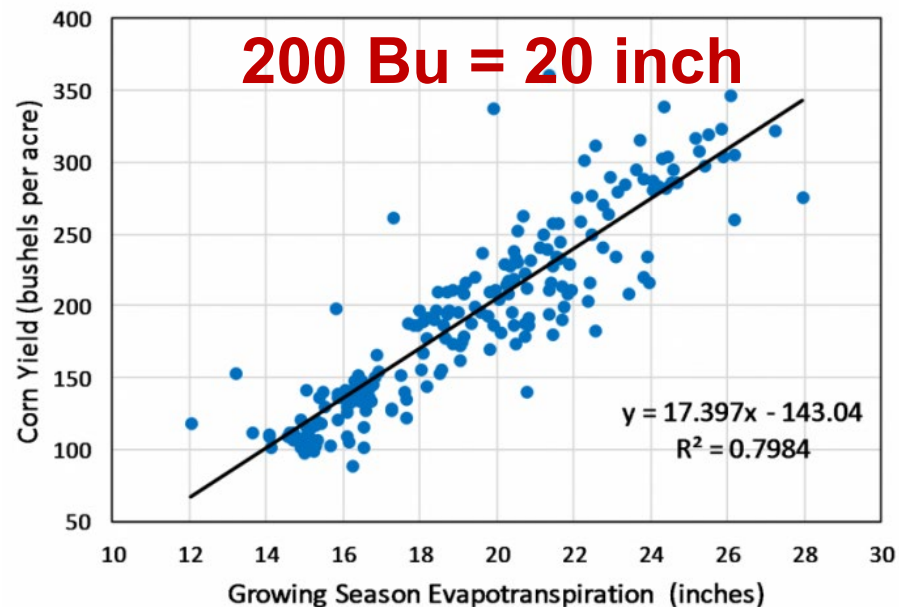
Step 4. Select your corn hybrid maturity. For example, 108 days, 114 days

Step 5. Observe the projections. Ensure all boxes are checked on the upper left-hand side of the screen



More on this topic here: <https://agcrops.osu.edu/2022-16/delayed-corn-planting-and-u2u-tool>

Crop Water Use



Source: <https://crops.extension.iastate.edu/cropnews/2017/06/corn-water-use-and-evapotranspiration>

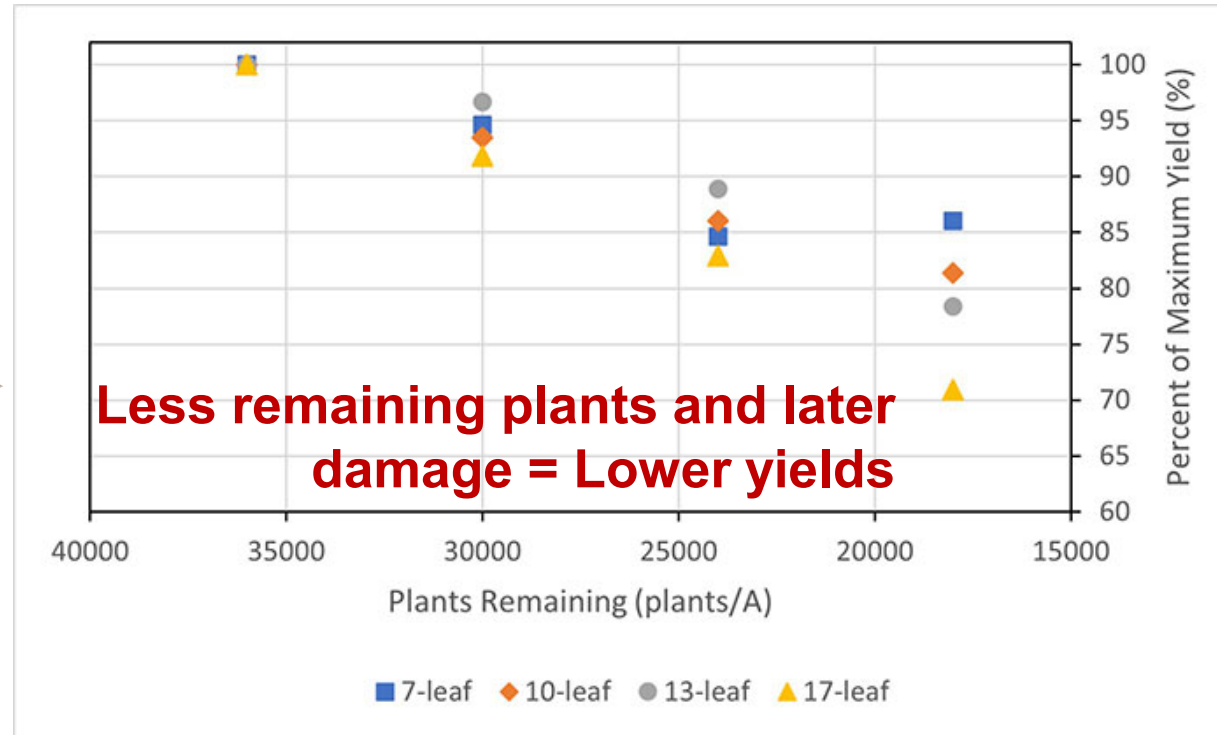
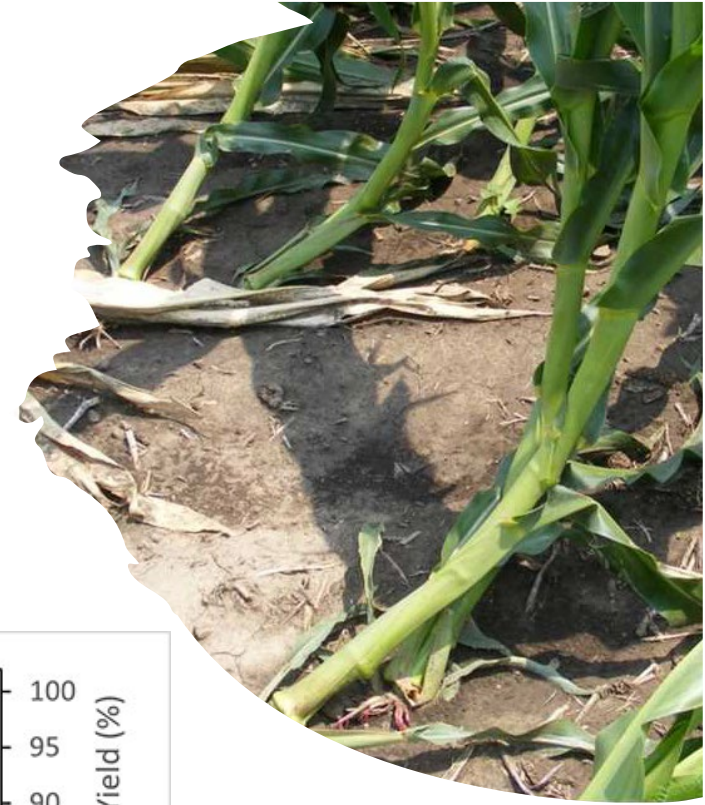
Stage	Water Use (Inch/day)
<12-leaf stage (<V12)	<0.20
12-leaf stage (V12)	0.24
Early tassel (VT)	0.28
Silking (R1)	0.30 = ~2 inch/week
Blister (R2)	0.26
Milk (R3)	0.24
Dent (R5)	0.20



More on this topic here: <https://agcrops.osu.edu/newsletter/corn-newsletter/2022-23/crop-water-use-corn-%E2%80%93-what-do-we-know>

Strong Storms and Downed Corn

- ❑ Strong storms: some **downed corn fields**
- ❑ Much of the yield penalty in corn is dependent on the **stage**, as well as if the damage is **root lodging** or **stalk damage**
- ❑ **Root lodging is easier for plants to recover from** and will lead to less yield loss **than stalk damage** if occurring at the same rate



Relative yield after stand loss of 17, 33, or 50% at various developmental stages. Peter Thomison, 2007–2009 Ohio field trials.

Crops Under Water – Crop Stage is Critical for Recovery



IMPLICATIONS

The later the flooding, the less impact it has on yield

Bacteria deposited in leaf whorls may result in diseased and dead plants

If plants are covered with mud, photosynthesis may be limited

Wet soil conditions may also increase susceptibility to root lodging of larger plants

Check the color of the growing point to assess plant survival after flooding

Evaluate the appearance and integrity of seeds or seedlings

Check for soil crusting as the soil dries

Many crops are sensitive to excess water, the amount of damage is typically driven by:

- **plant growth stage,**
- **rainfall intensity,**
- **duration of saturated/flooded conditions**

Corn and Nitrogen with Water Excess

For applications yet to happen:

Adjusting nitrogen fertilizer application timing:

Lower pre-plant rates and plan to apply the rest of the needed N later in the season (possibly post-flood) to help minimize losses.

Adjusting nitrogen fertilizer sources:

Some examples are enhanced efficiency fertilizers (EEFs) and organic fertilizers. Using EEFs may prevent and help minimize N losses such as leaching, denitrification, and volatilization.




Adjusting nitrogen fertilizer placement/method:

Using more efficient placements, for example, 2 x 2.

More on this topic here:

<https://agcrops.osu.edu/newsletter/corn-newsletter/2022-19/managing-corn-and-nitrogen-water-excess-conditions>



	Waterlogging	Flooding			
			Partial submergence	Complete submergence	
	Only the root system is under anaerobic conditions		All roots are immersed in water while just a portion of the shoot (which depends on the water depth) is covered by water		All plant is under the water level. Water depth and turbidity are important factors defining this scenario

Other *considerations*:

Better hybrids

Crop insurance

Use of drainage

Use of cover crops

Adjust planting dates and replanting

Pest & disease monitoring & applications

Adjusting Nitrogen Rates



Ohio recommended Nitrogen Rates (lbs N/Ac) for Corn following Soybean

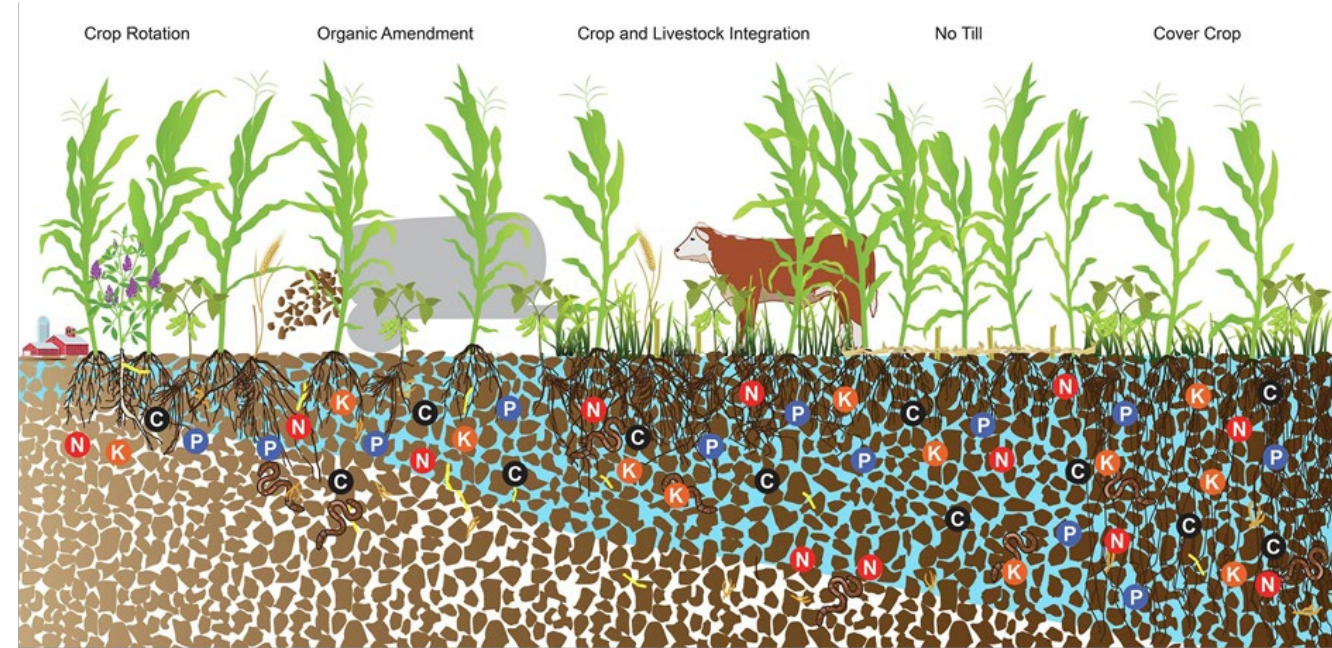
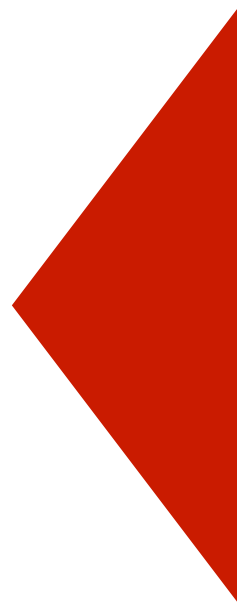
(Updated 5/23/2022)	Price of Nitrogen Fertilizer (\$/lb)					
Price/Bushel Corn	\$0.65	\$0.75	\$0.85	\$0.95	\$1.05	\$1.15
\$5.50	173	165	158	151	145	139
\$6.00	178	170	163	156	150	144
\$6.50	182	175	168	161	155	149
\$7.00	185	178	172	165	159	154
\$7.50	189	182	176	169	163	158

More on this topic here: <https://agcrops.osu.edu/newsletter/corn-newsletter/2022-15/update-corn-nitrogen-recommendations-mrtn>

TODAY

- Corn Growth and Development
- Corn Topics in 2022
- **New Corn Research**

NEW: Establishment of Cover Crops



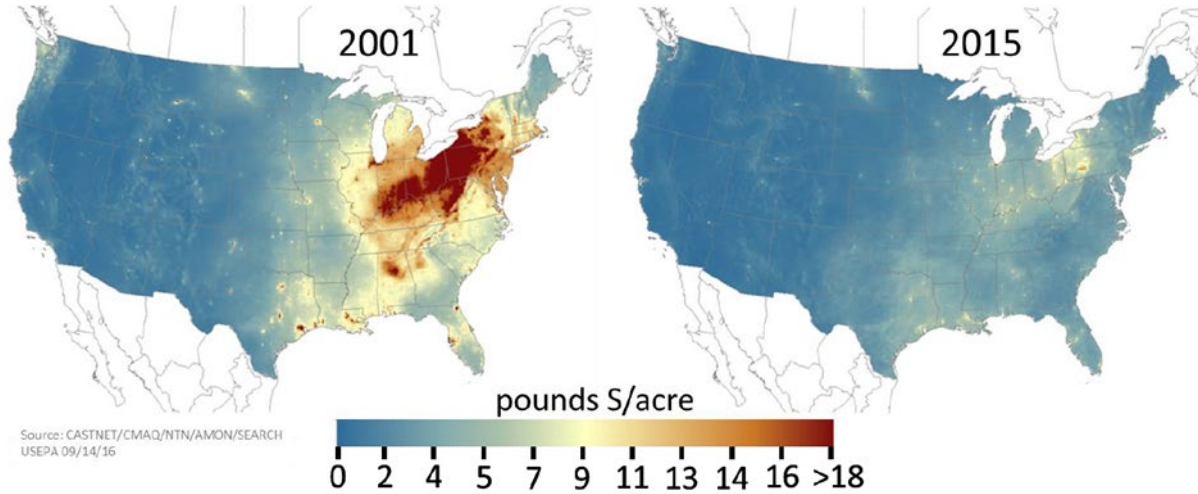
Growing window
Planting methods
Use of biologicals
Mixes and effects



News release here: <https://ocj.com/2022/07/osu-cover-crop-research/>

NEW: Sulfur Response, Yield and Quality

Total deposition of sulfur



<https://www.agry.purdue.edu/ext/corn/news/timeless/sulfurdeficiency.pdf>

Sulfur effect on crop-livestock:
grain & silage
productivity-profitability
protein and AA's
nutritional
plant-health



NEW: Storms Damage in U.S. Corn



**Hail damage
Flooding
Green-snap
Root lodging**



NEW: Corn vs Soybeans: Which crop should we plant 1st?

Osler Orteiz

Corn Specialist

Horticulture and Crop Science

Email: ortez.5@osu.edu



Laura Lindsey

Soybean Specialist

Horticulture and Crop Science

Email: lindsey.233@osu.edu



THE OHIO STATE UNIVERSITY

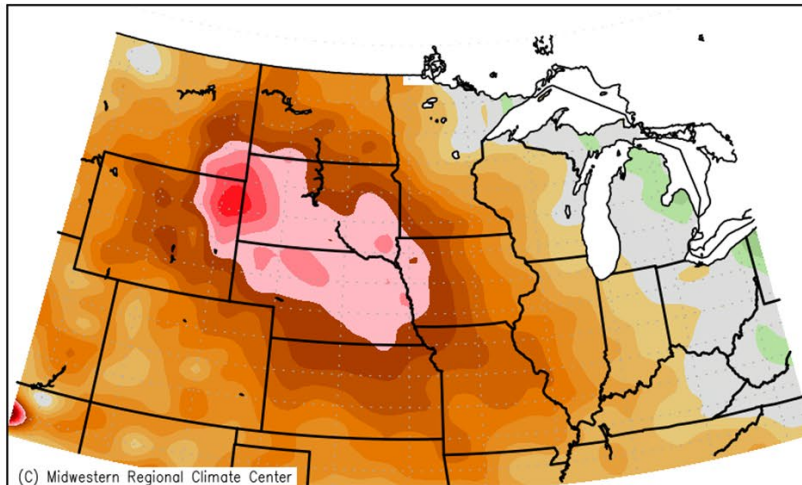
COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

WEATHER: always a challenge!

WHO AGREES HERE?

Warm days

Average Temperature (°F): Departure from Mean
June 8, 2016 to June 18, 2016

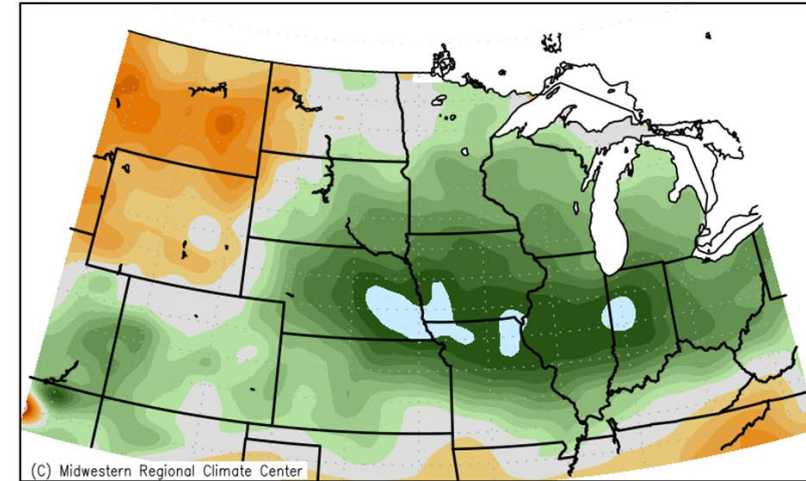


Mean period is 1981–2010.



Cold spell

Average Temperature (°F): Departure from Mean
July 1, 2016 to July 4, 2016



Mean period is 1981–2010.



Corn vs. Soybean: Battle for the Belt

Top agricultural products:

Soybeans, ~4.9M Acres

Corn, ~3.4M Acres

(Source: USDA, 2022)



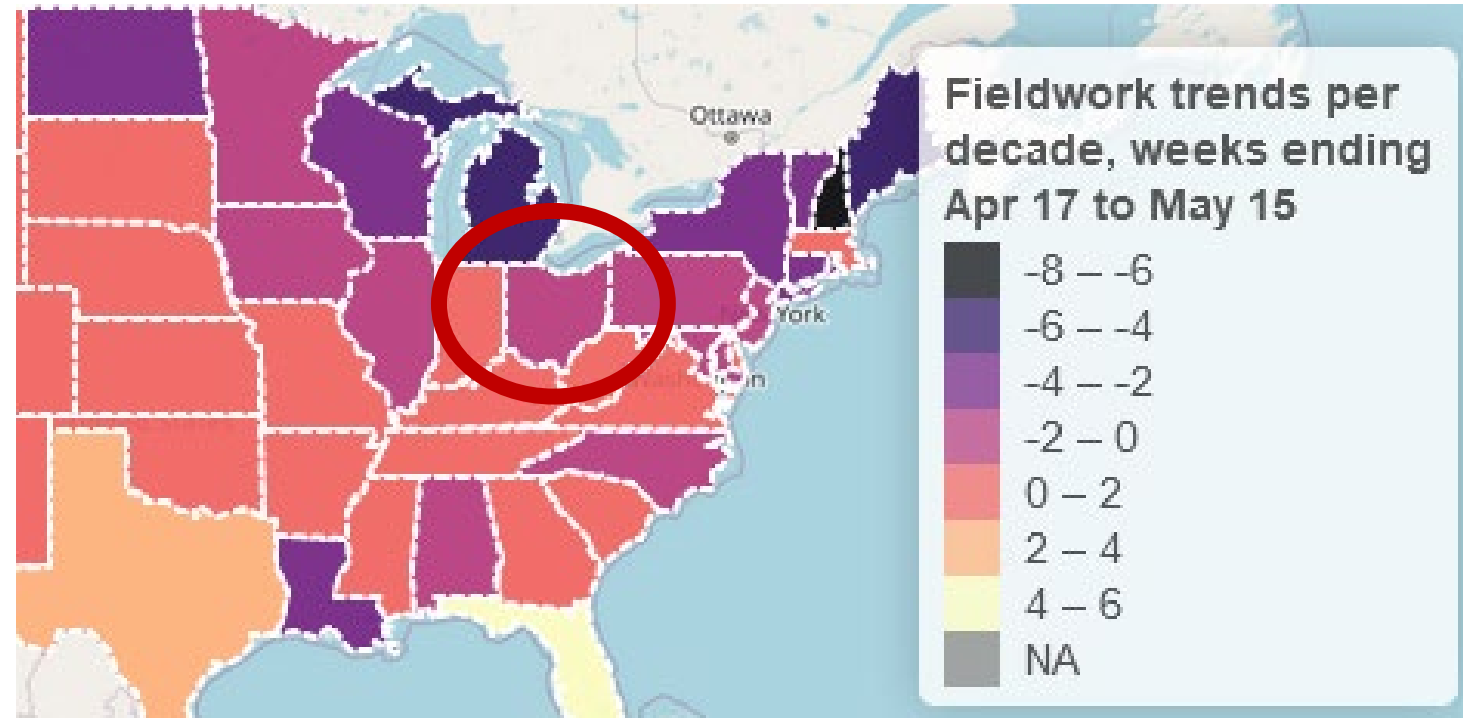
Corn vs. Soybean: Battle for the Belt

Suitable Working Days



- Per USDA, a 'suitable' day is when weather and field conditions allowed work most of day
- **MAP:** changes in fieldwork trends as number of days per decade for weeks ending on April 17 to to May 15
- **OHIO:** since 1995, an **average of 15 fieldwork days** were observed
- **Trend of days suitable for fieldwork** for weeks ending on 17 April-15 May, 1995-2020 >> **Most midwestern, decline of days**

Since 1995, **-1.19 days/decade** for suitable fieldwork in Ohio



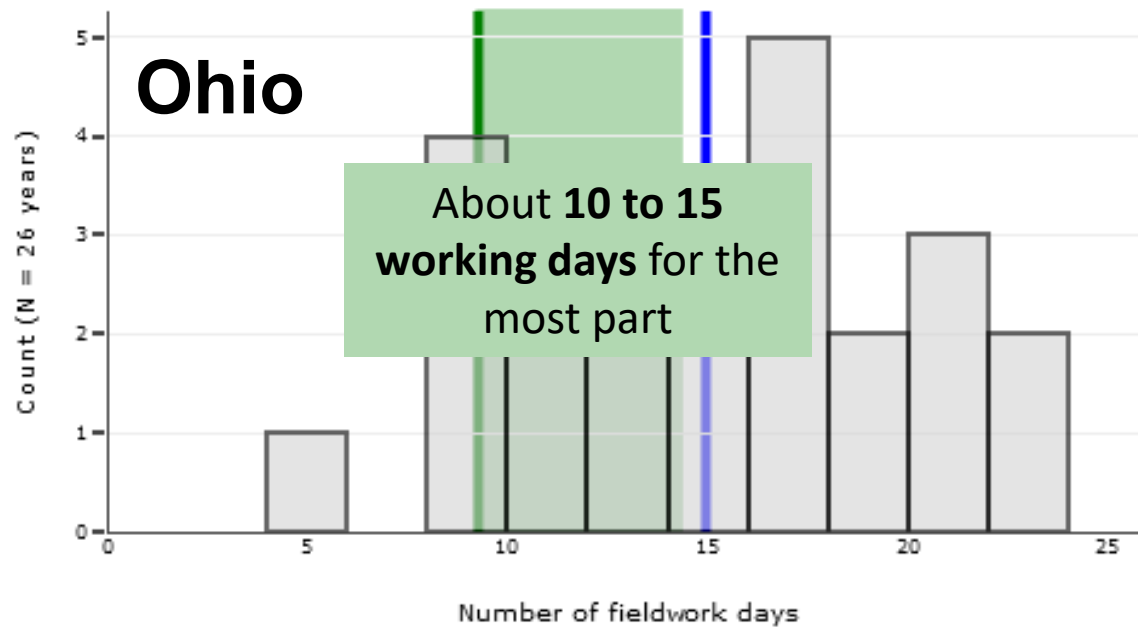
Source: [Days Suitable for Fieldwork](#) – All States, Kansas State University (2022)

Corn vs. Soybean: Battle for the Belt

Suitable Working Days



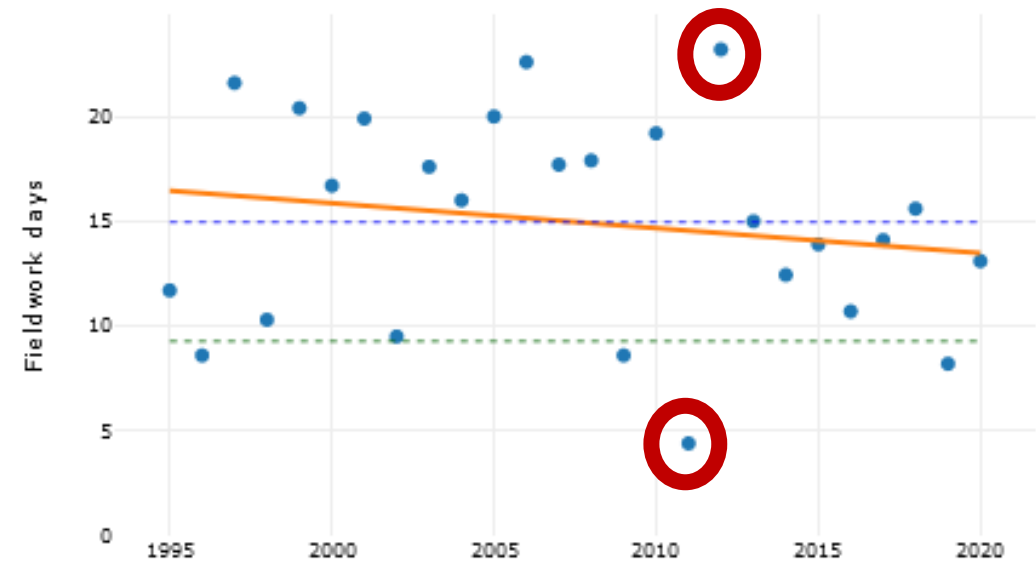
Ohio fieldwork days, weeks ending Apr 17 to May 15 (5-week 35-day)



Fieldwork days **decreased on average by 0.12 days** each year.

- A low of only **4.4 days in 2011**
- A high of **23.2 days in 2012**

Ohio fieldwork days, weeks ending Apr 17 to May 15



Corn vs. Soybean: Battle for the Belt

SO, WET/COLD springs & Planting DELAYS



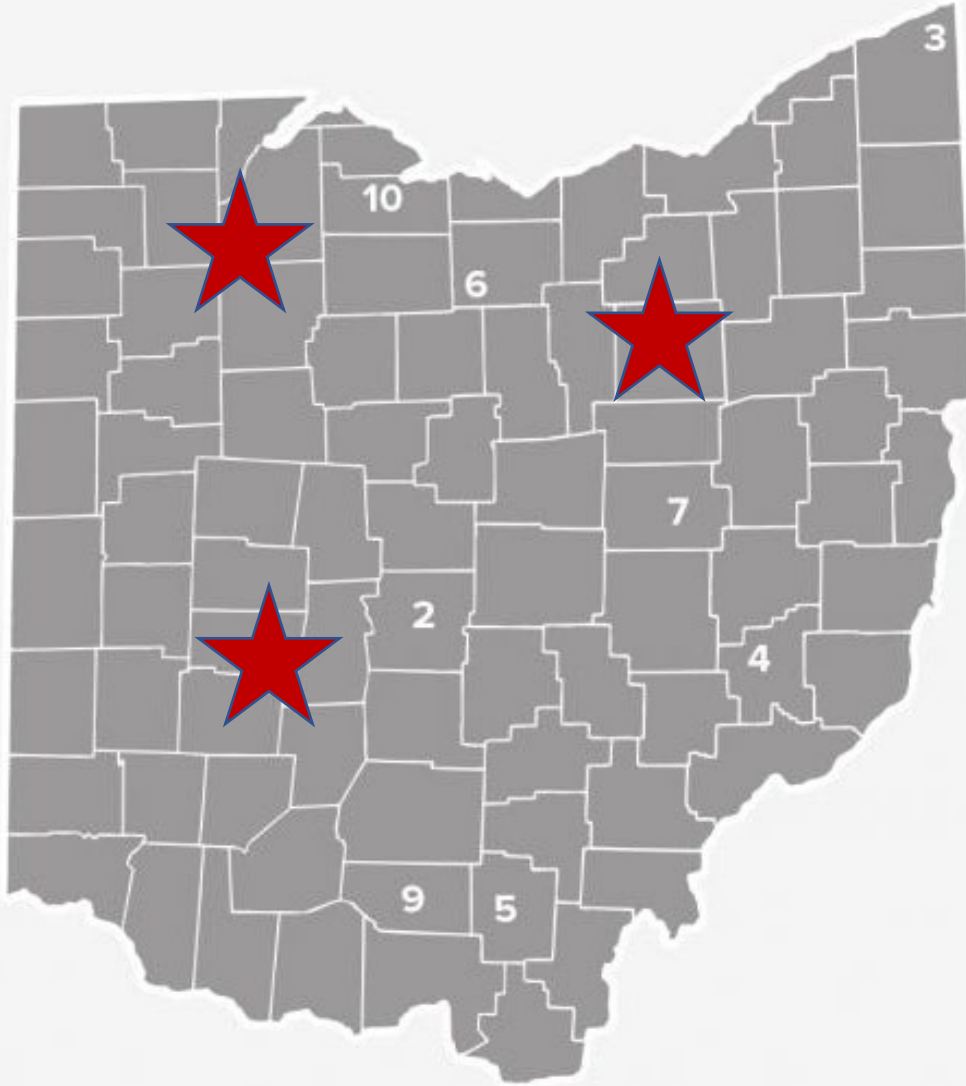
Corn vs. Soybean: Battle for the Belt



What should we plant first - corn or soybean?

- ☐ Which crop has the smallest yield penalty for delayed planting?
- ☐ Can we adjust management practices to mitigate losses due to late planting?
- ☐ How are insects, diseases, weeds, and other factors affected by planting date?

Corn vs. Soybean: Battle for the Belt



Objectives

- 1) Evaluate **yield response and economic return** of corn and soybean
- 2) Assess **current recommendations for normal versus late** planting date management
- 3) Identify planting date **interactions with weeds, insects, and diseases**

Project: 2023 and 2024

Northwest Agricultural Research Station (**Wood County**)

Wooster Campus (**Wayne County**)

Western Agricultural Research Station (**Clark County**)

Corn vs. Soybean: Battle for the Belt

Planting timeframes:

- **ultra early** = late March to early April
- **early** = mid to late April
- **normal** = early to mid-May
- **late** = late May-first week of June
- **very late** = mid to late June

Management:

For soybean, normal management includes a seeding rate of **140,000 seeds/acre** and late planting date management includes a seeding rate of **225,000 seeds/acre**.

For corn, normal management will include a **112-day** maturity hybrid (common for Ohio) and late planting date management will use a **104-day** maturity hybrid (early maturity).

Trt #	Crop	Planting timeframe ¹	Management ²
1	Corn	Ultra early	Normal management
2	Corn	Ultra early	Late planting management
3	Corn	Early	Normal management
4	Corn	Early	Late planting management
5	Corn	Normal	Normal management
6	Corn	Normal	Late planting management
7	Corn	Late	Normal management
8	Corn	Late	Late planting management
9	Corn	Very late	Normal management
10	Corn	Very late	Late planting management
11	Soy	Ultra early	Normal management
12	Soy	Ultra early	Late planting management
13	Soy	Early	Normal management
14	Soy	Early	Late planting management
15	Soy	Normal	Normal management
16	Soy	Normal	Late planting management
17	Soy	Late	Normal management
18	Soy	Late	Late planting management
19	Soy	Very late	Normal management
20	Soy	Very late	Late planting management

Corn vs. Soybean: Battle for the Belt



Subscribe to OSU Extension's Crop
Observation and Recommendation
Network (C.O.R.N.) Newsletter

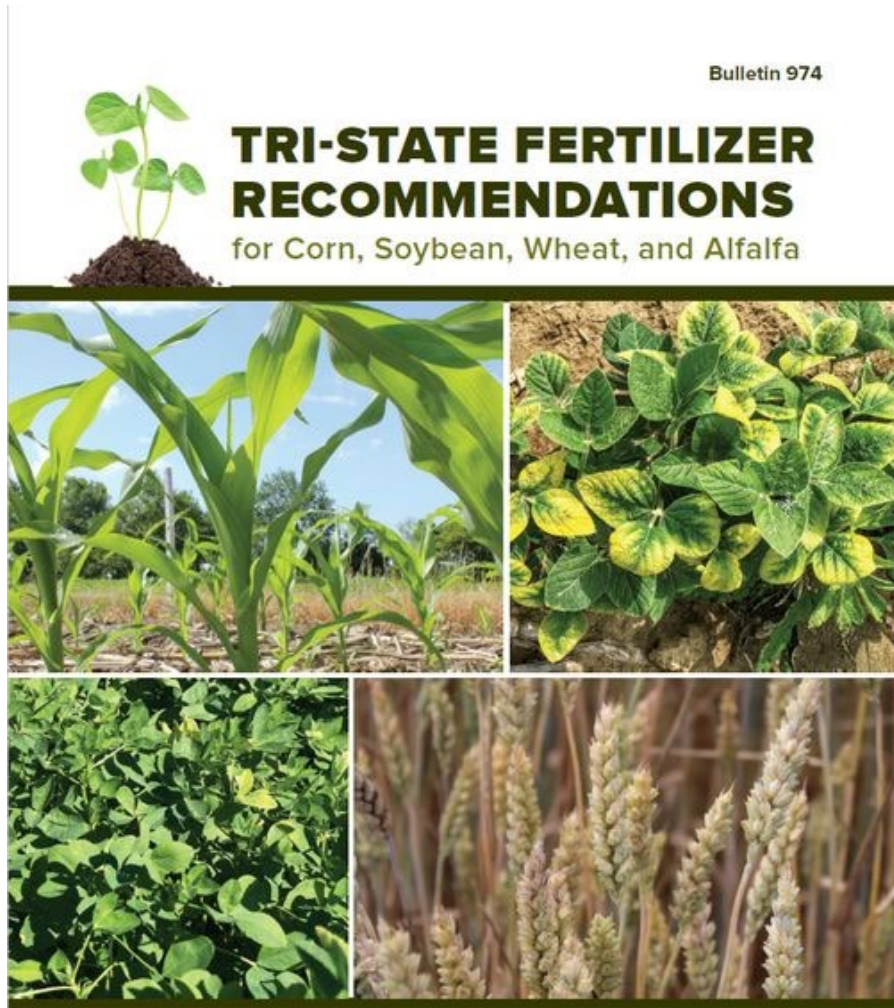


Subscribe to OSU Extension's Ohio
State Agronomy YouTube channel

Follow Laura Lindsey (@stepupsoy) on Twitter!
Follow Osler Orteza (@OrtezCornCrops) on Twitter!

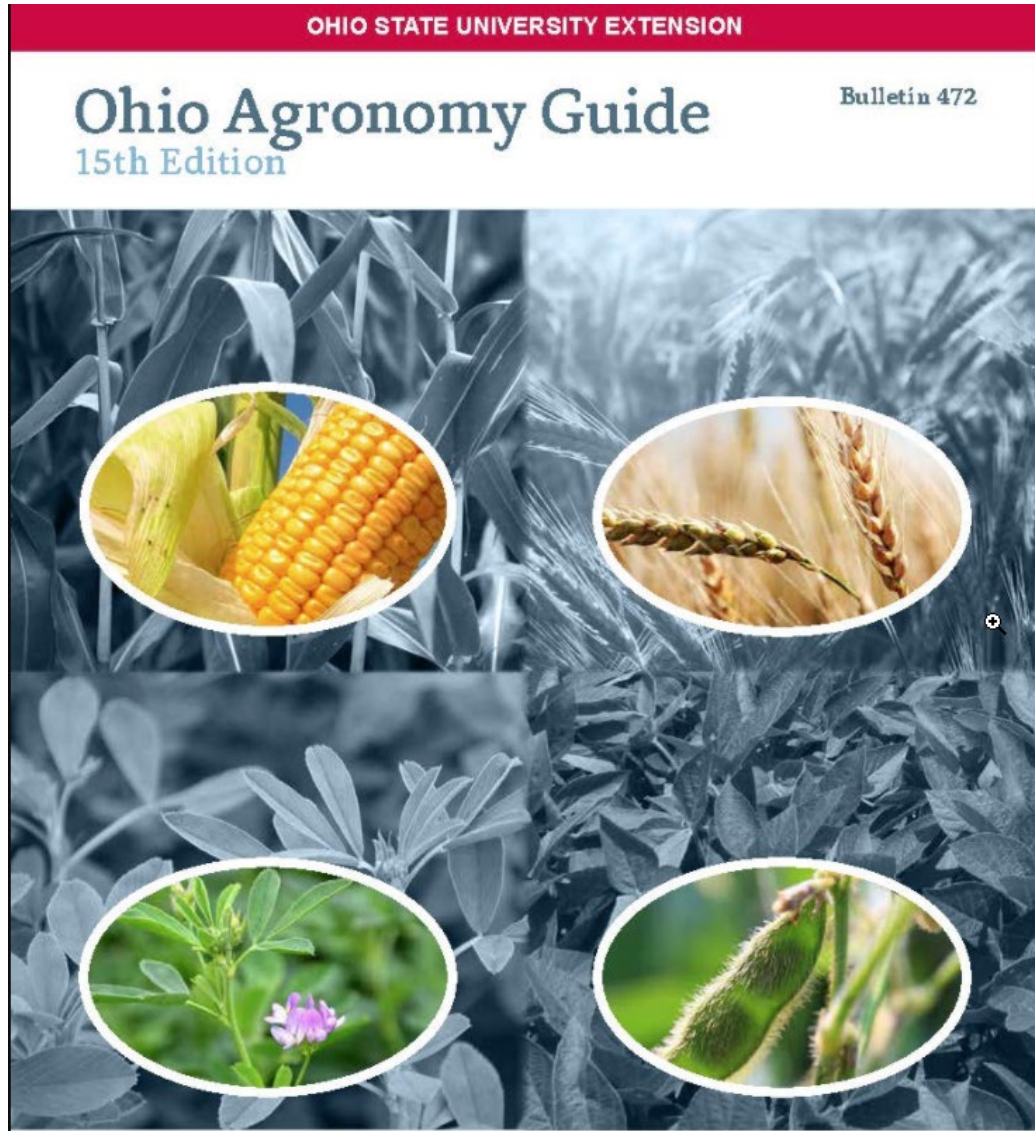
Follow the 'Battle' Starting 2023, stay tuned!

TRI-STATE Fertilizer Recommendations



Corn, soy, wheat, alfalfa!

Working on the 16th edition, be on the look for updates in 2023!



Other Ohio State University resources:

Short & Practical readings:

<https://agcrops.osu.edu/specialization-areas/corn>

YouTube Instructional Videos:

<https://www.youtube.com/channel/UCbqpb60QXN3UJIBa5is6kHw>

Chapter #4, Corn: Pages 32 to 54

<https://extensionpubs.osu.edu/ohio-agronomy-guide-15th-edition/>

SUMMARY



Corn Growth and Development

- **CORN GROWTH & DEVELOPMENT to OPTIMIZE YIELDS**



Corn Topics in 2022

- **CHALLENGES** seem to be the NORM: $G \times E \times M$
- **Several STRATEGIES** for more YIELD
- **HYBRID & AGRONOMICS**, critical



New Corn Research

- **Fine tuning AGRONOMICS**
- **Figuring out planting dates is a priority**
- **STAY TUNED** for results, let us know what else



**THE OHIO STATE
UNIVERSITY**

COLLEGE OF FOOD, AGRICULTURAL,
AND ENVIRONMENTAL SCIENCES

Comments or questions? Thank you

Osler Ortez, Ph.D.

Corn and Emerging Crops

Department of Horticulture and Crop Science

College of Food, Agricultural, and Environmental Sciences

<https://hcs.osu.edu/> || <https://hcs.osu.edu/our-people/osler-ortez>

ortez.5@osu.edu | (330) 263-9725

