Corn Hybrid/ Maturity Selection

Manni Singh

Cropping Systems Agronomist

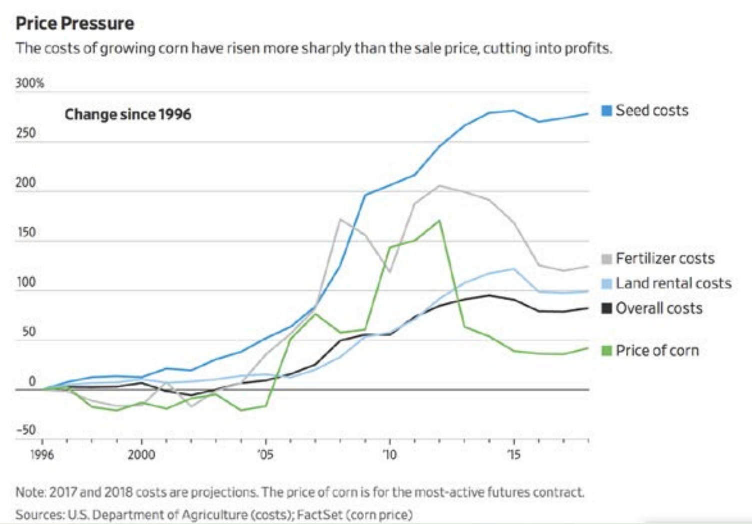
agronomy.msu.edu

msingh@msu.edu, 517-353-0226

Jan 13, 2021, Thumb Virtual Extension Meeting

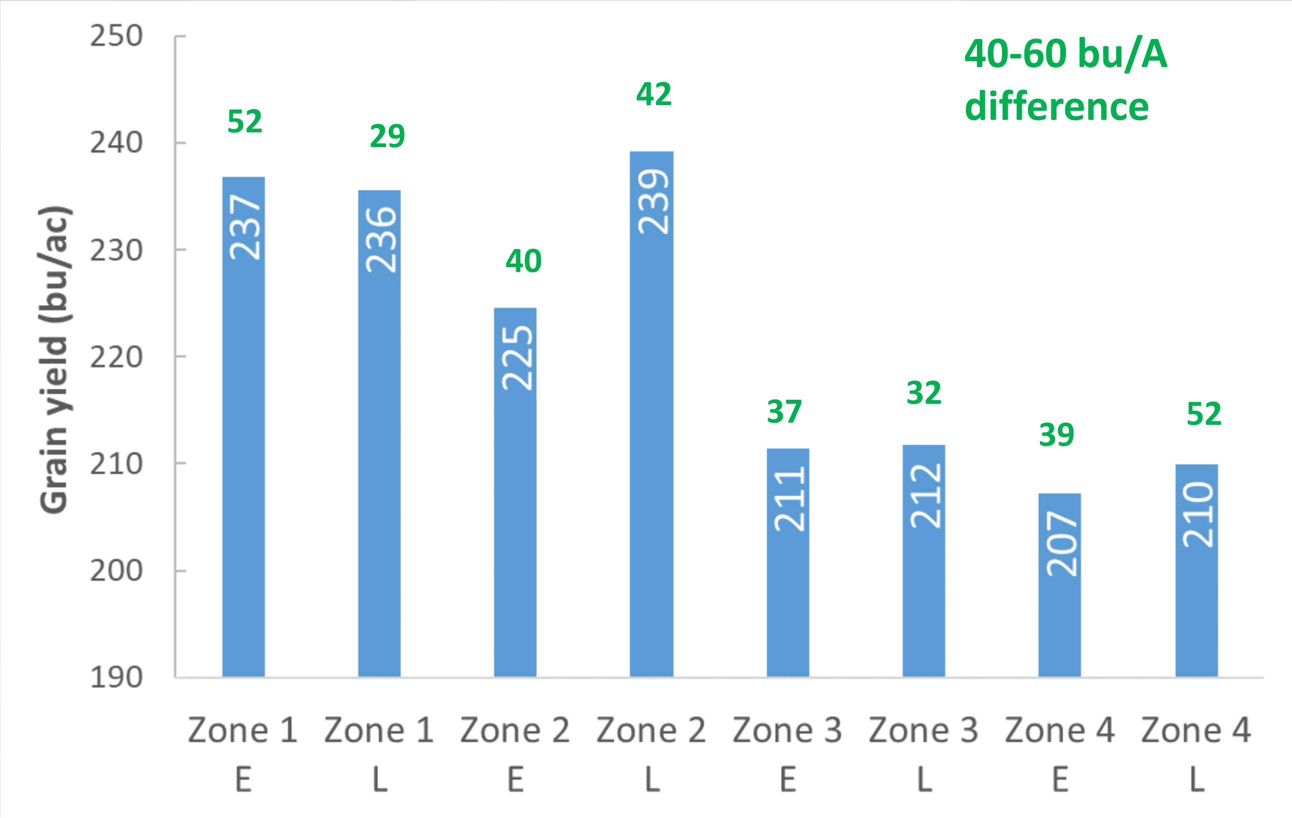
Hybrid Selection

- **Adaptation (maturity**, GDD requirement)
- Yield potential and stability
- Agronomic characteristics
  - Standability (stalk quality, lodging)
  - Disease resistance
  - Herbicide resistance (e.g. glyphosate)
  - Insect protection (stacks)



- Others: field history, management, G x E x M responses, farm drying capacity, end use, hybrid characters (e.g. drought tol., emergence/vigor, drydown, grain quality….)

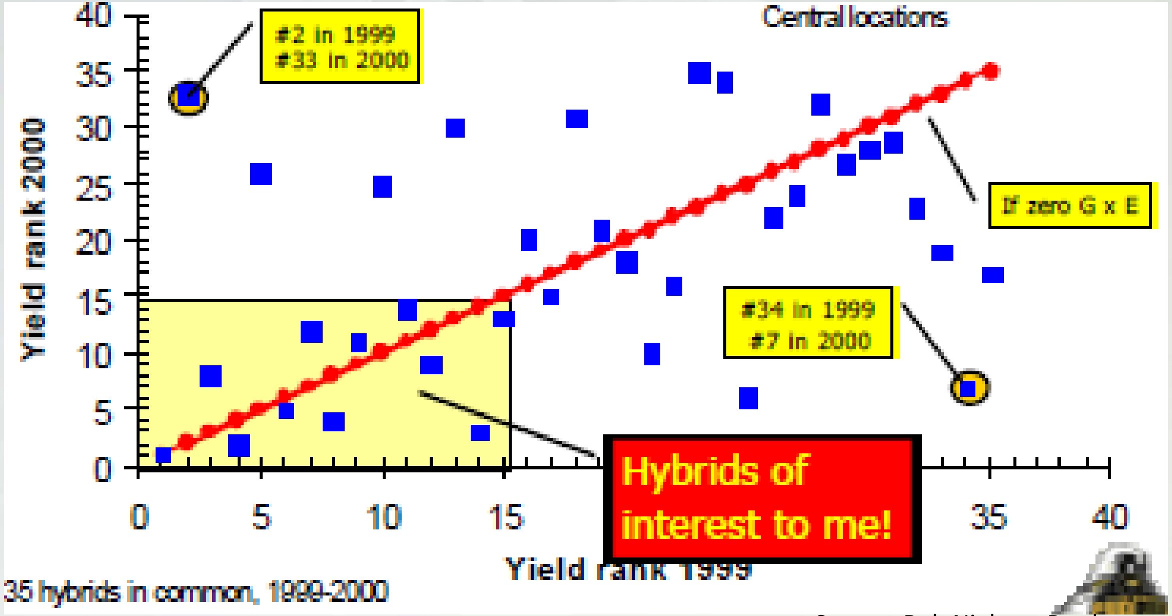
Difference Between Highest/Lowest Yielding Hybrid



Hybrid in each zone is average of 12 plots (3 locations, 4 reps)

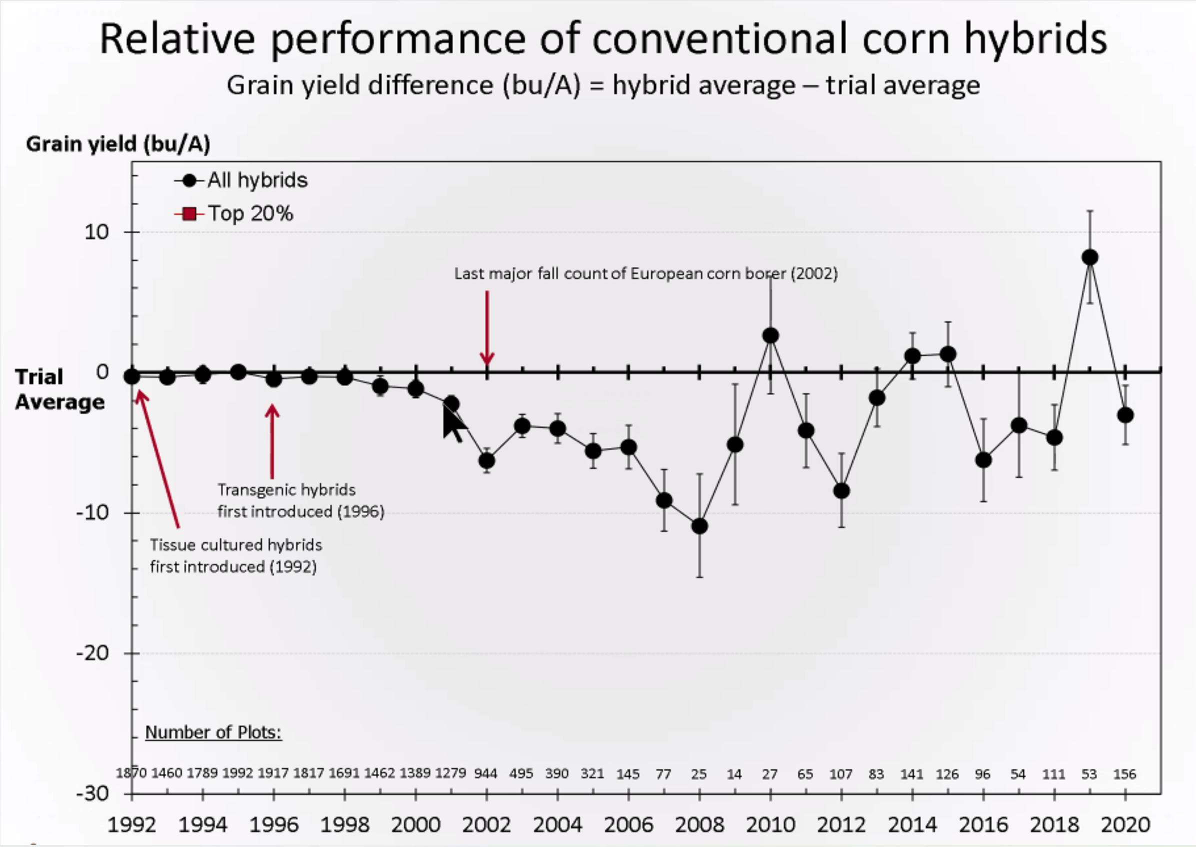
Yield Stability

- Yield potential and stability **(consistency)**
- Concept of **G x E** (Genotype x Environment interaction)
- Multi-location/sources hybrid performance data



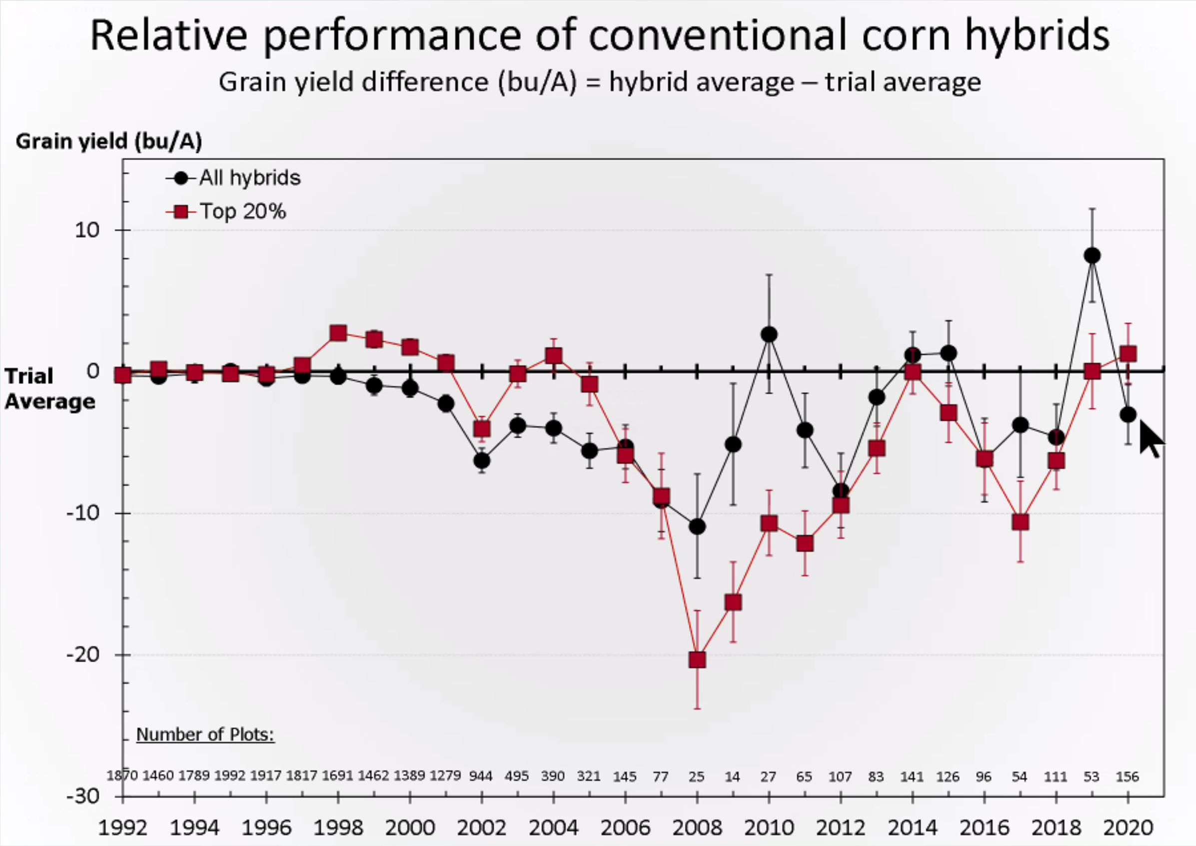
Source: Bob Nielsen, Purdue

Performance of Conventional Hybrids



Source: Joe Lauer, UW

Performance of Conventional Hybrids



Source: Joe Lauer, UW

Performance of Conventional Hybrids

	IngCon97	IngBt97	DIFF		IngCon101	IngBt101	DIFF		IngCon102	IngBt102	DIFF
AVG	156.4	157.2	0.8 bu, BT		156.9	156.7	0.2 bu, Con		128.5	149	20.5 bu Bt
LOW	130.8	144.8			146.6	135.5			101.8	131.8	
HIGH	182.8	184.9			167.1	176.2			154.6	181.3	
	MoCon97	MoBt97	DIFF		MoCon101	MoBt101	DIFF		MoCon102	MoBt102	DIFF
AVG	181.3	184.3	3 bu BT		174.2	183.5	9.3 bu BT		189.3	193.8	4.5 bu BT
LOW	162.2	157.5			164.7	156.9			162.1	183.5	
HIGH	205.0	218.4			190.3	209.3			207.0	202.7	

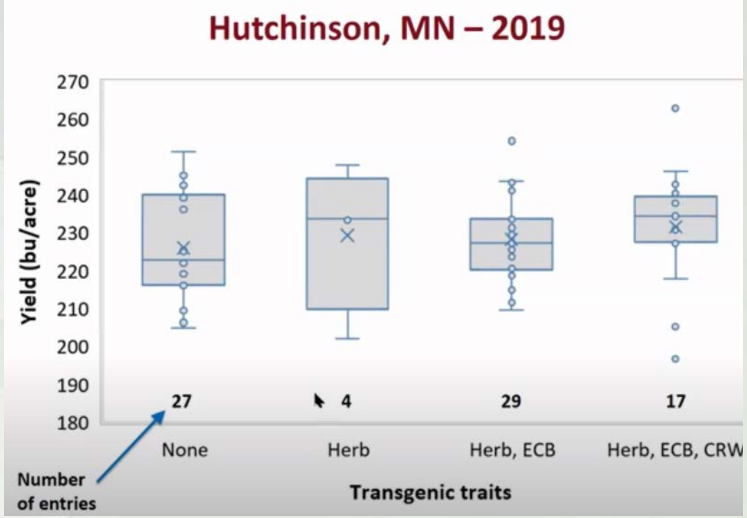
Source: Chris Difonzo, 2019 MCPT data

*Pest pressure is mostly absent in these trials

Performance of Conventional Hybrids

	All entries	Herbicide resistance only	Above ground insect resistance	Above and below ground insect resistance
Av. Yield (bu/ac)	226	220	224	229
Range (bu/ac)	181-262	196-249	181-260	192-262
No. of hybrids	334	13 (4%)	209 (63%)	113 (34%)

Michigan Data-2018



Jeff Coulter, UMN

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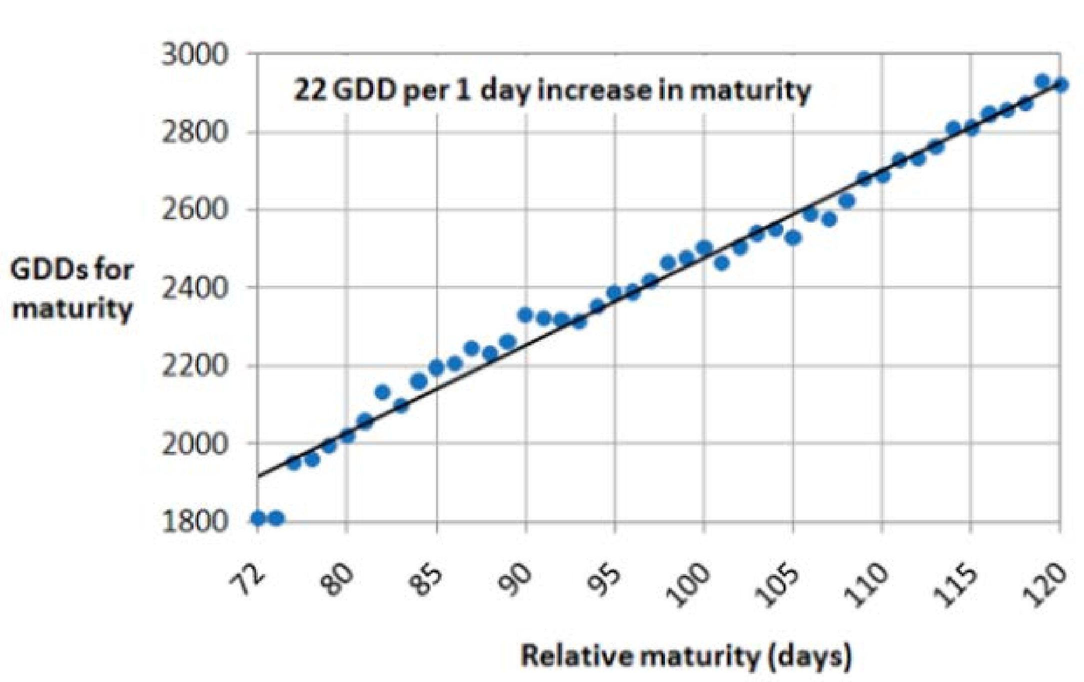
Optimal Hybrid Maturity Selection

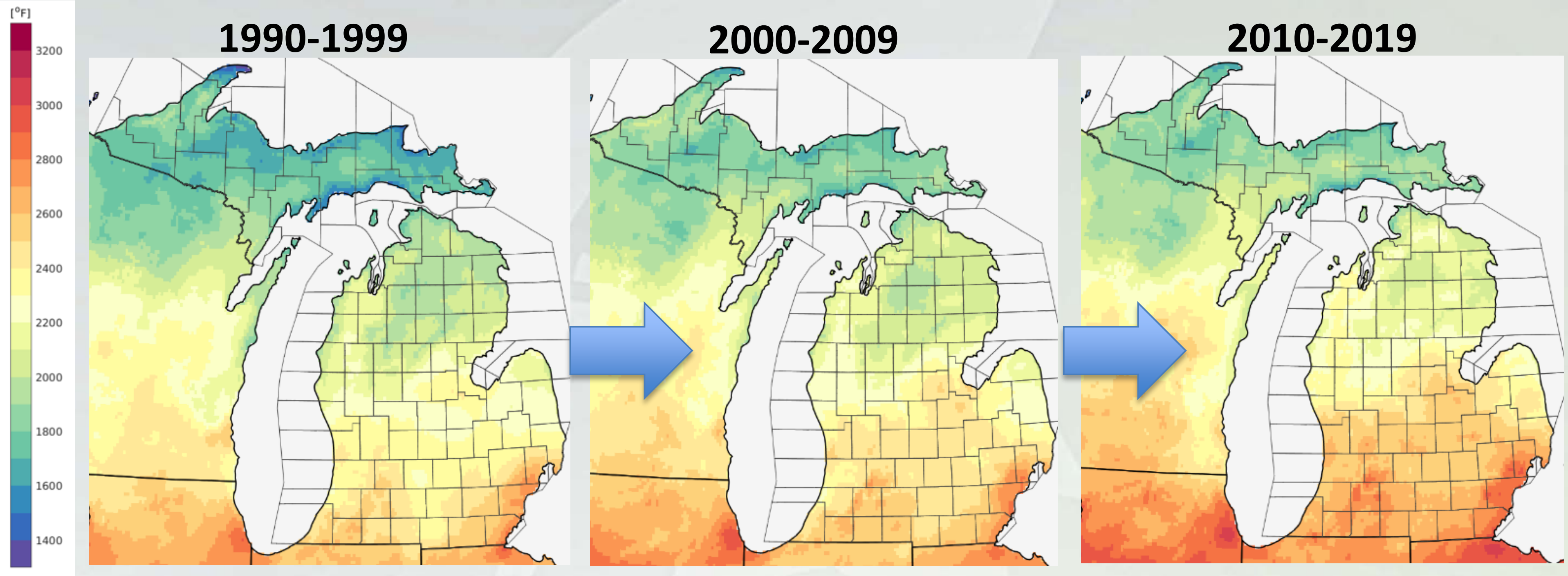
- Relative maturity (days)
- Heat units (GDDs)
- Grain moisture at harvest
- Days to mid silk
- Test weight/moisture at harvest



Source: Jeff Coulter, UMN

Role of Planting date?

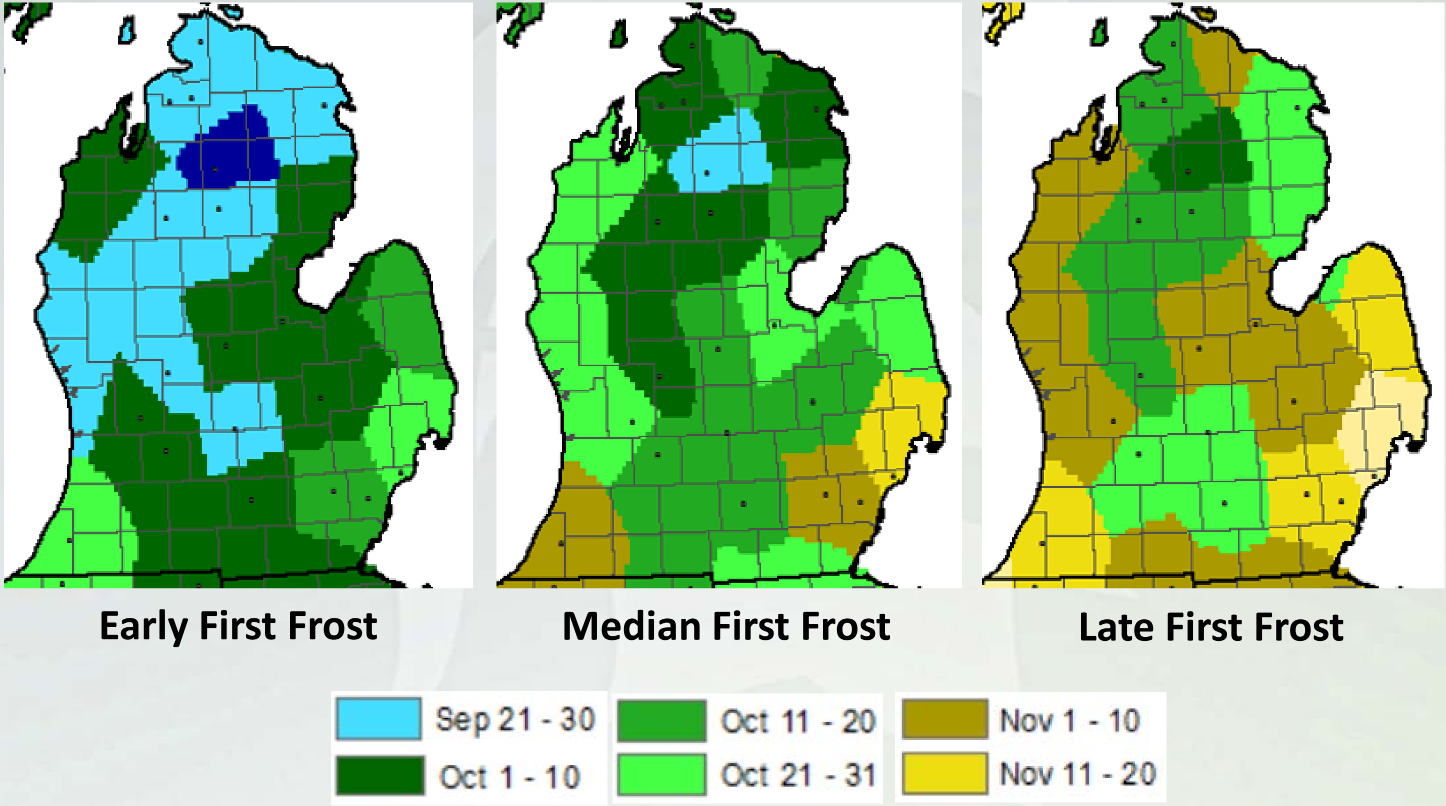
Corn Development Driven by **GDD Accumulation**



May 1- Sept 30 (86/50 method)

- **Seasonal GDD totals are increasing with time. Use GDD ratings for hybrid selection vs relative maturity 'days"?**

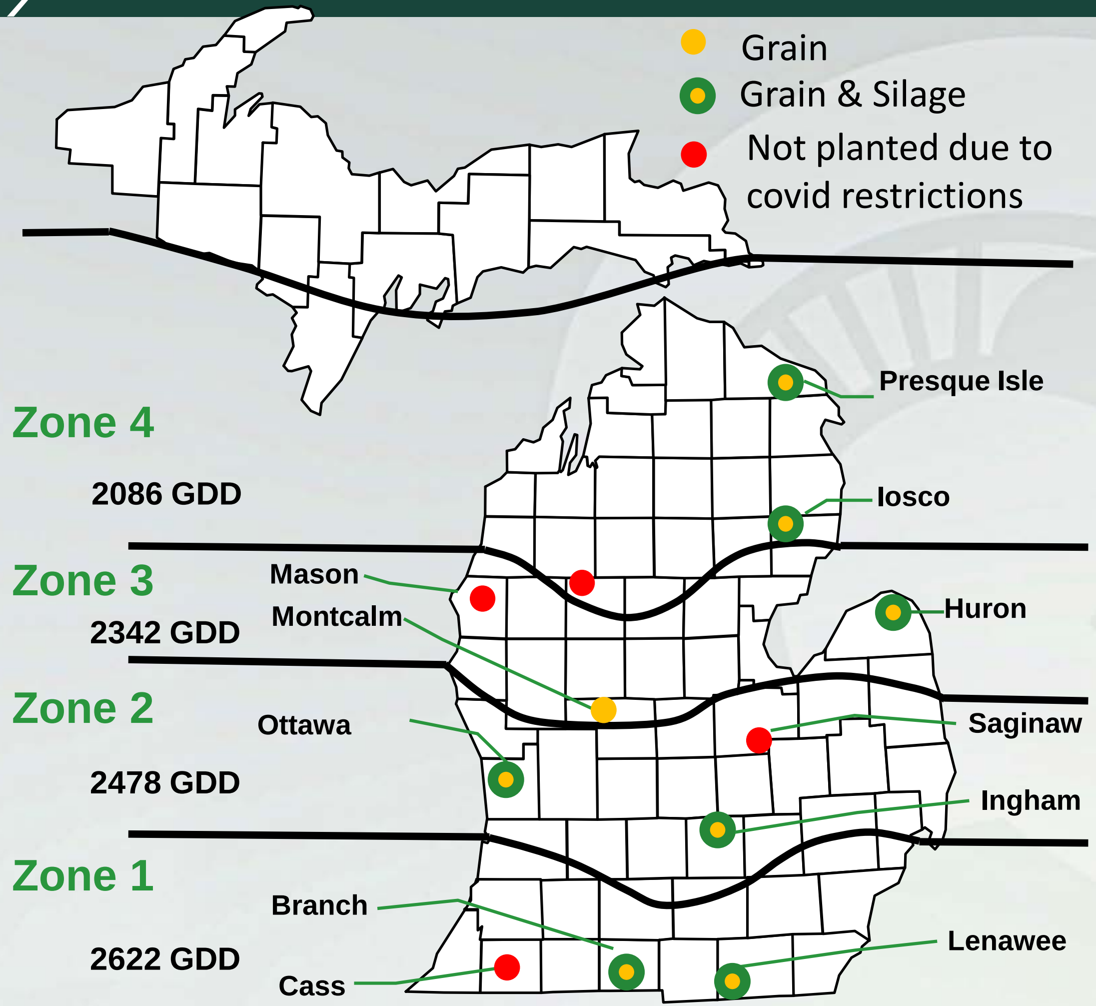
End Point? Frost (28 ^{o}F) Dates

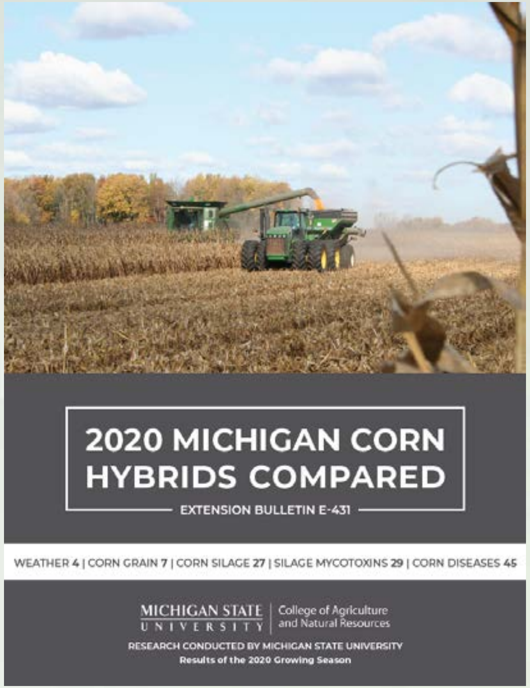


Source: https://mrcc.illinois.edu/VIP/frz_maps/freeze_maps.html

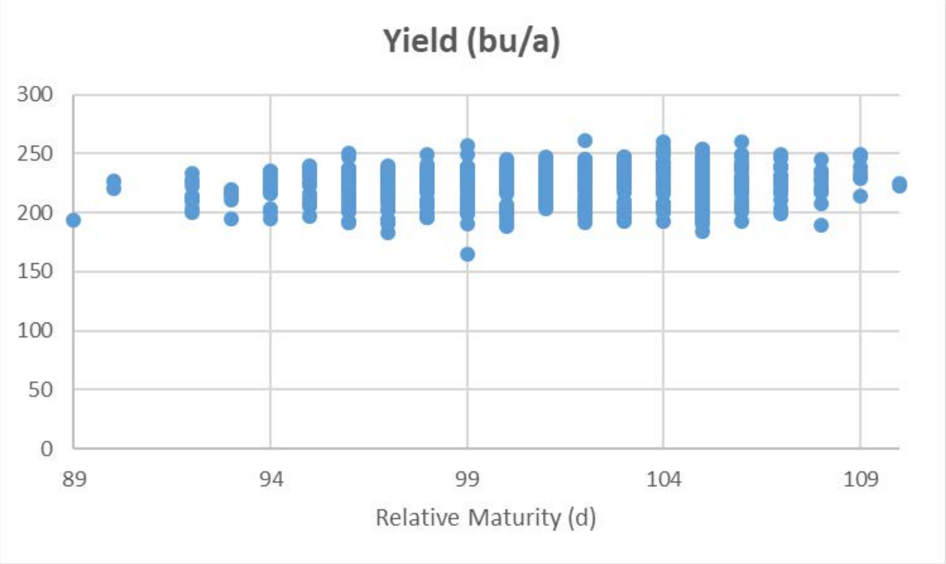
2020 Corn Hybrid Testing Locations

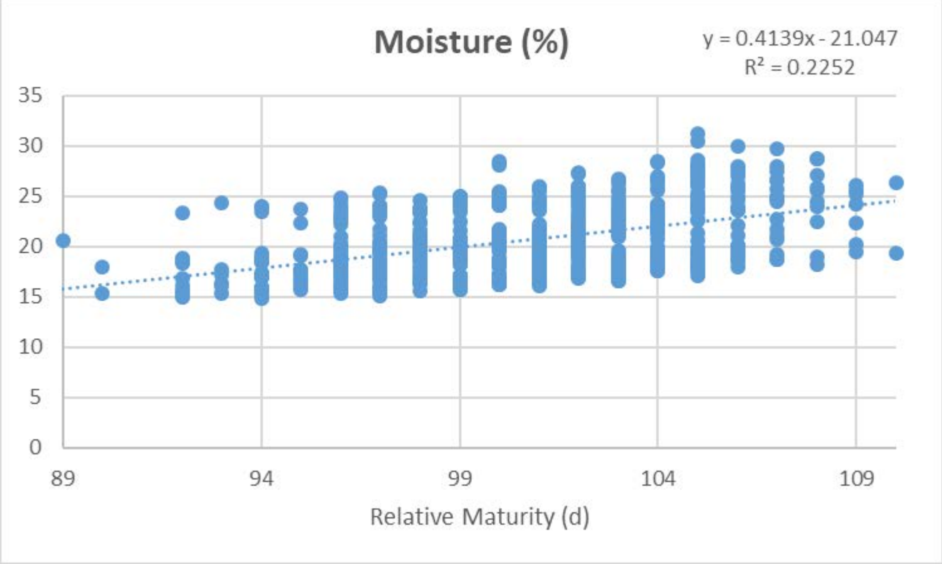
https://varietytrials.msu.edu/corn





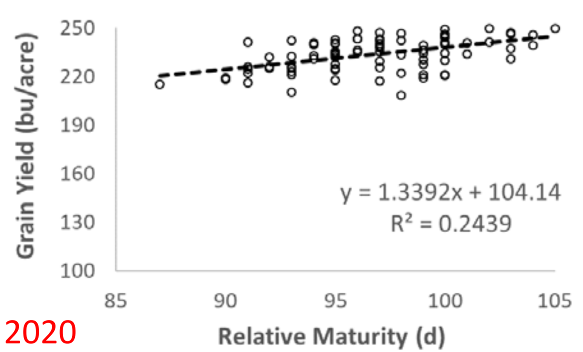
Relative Maturity Vs Yield & Moisture

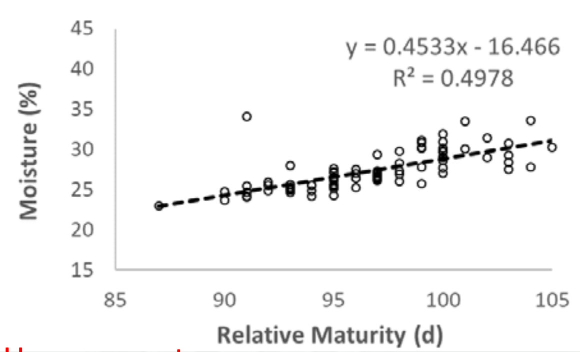


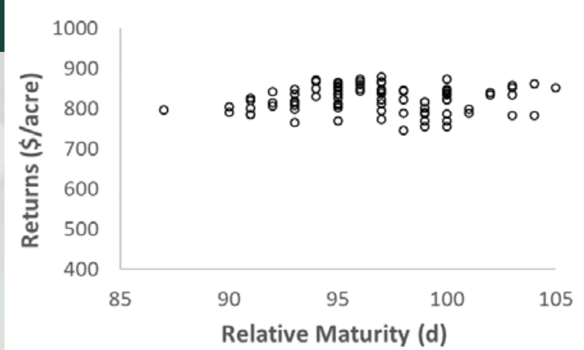


One Planting date (mid-season)

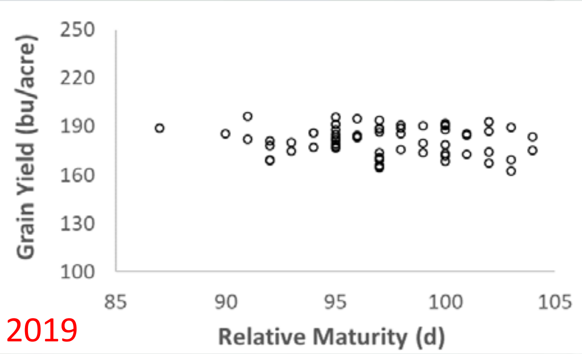
Data from MCPT Trials at one planting time (Zone 2, 2013 onwards)

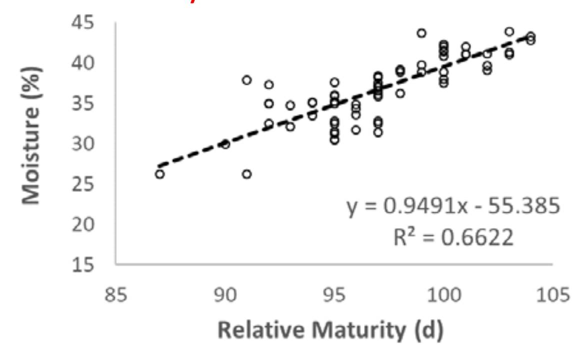


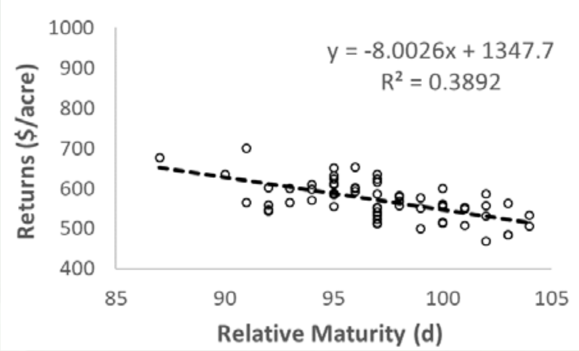


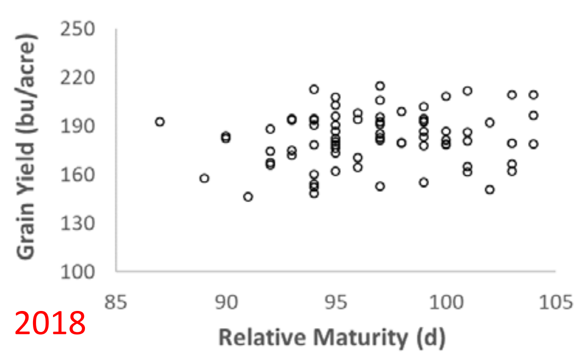


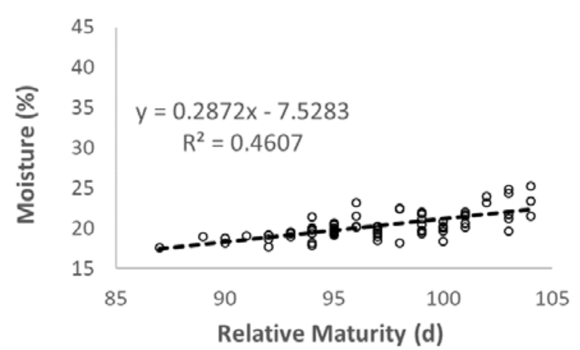
Huron county

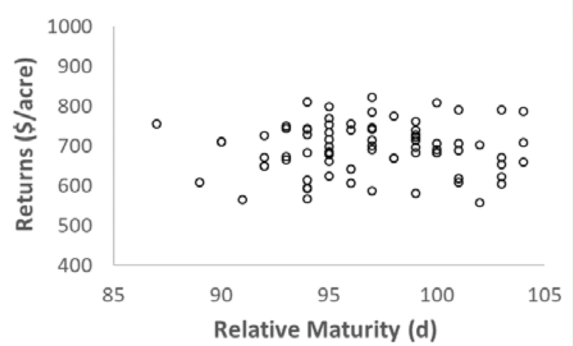












Relative Maturity Vs Economic Returns

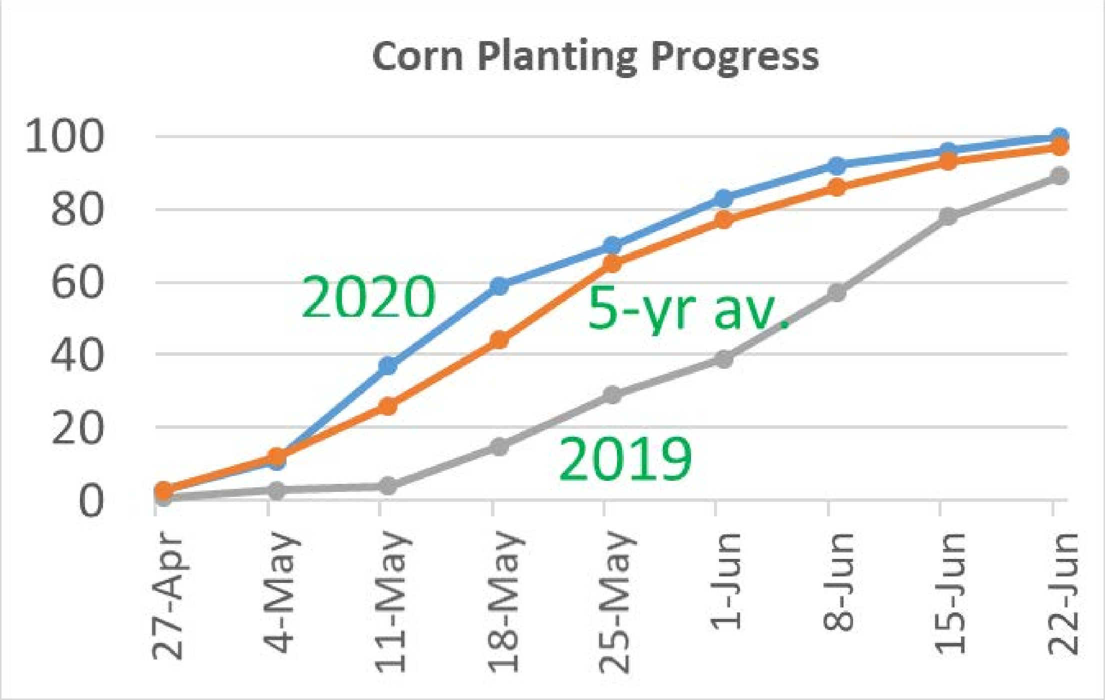
Difference b/w: Late- Early

Zone	Drying cost ($\$$ bu^{-1} point^{-1})	Corn grain price ($\$$ bu^{-1})		
		2.5	3.5	4.5
1	0.03	-11*	-8*	-5
	0.04	-17*	-14*	-11*
	0.05	-23*	-20*	-17*
2	0.03	-1	4	$\boxed{10*}$
	0.04	-6*	-1	5
	0.05	-11*	-6	0
3	0.03	-19*	-21*	-22*
	0.04	-25*	-26*	-27*
	0.05	-30*	-31*	32*

Mid-season planting

7 year data

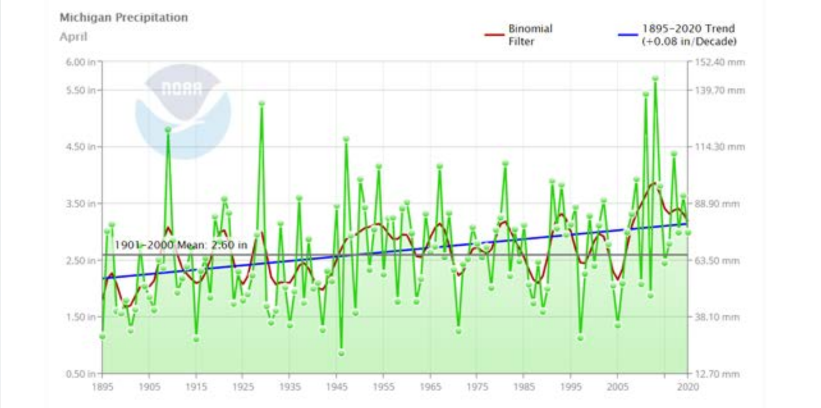
Recent planting seasons…



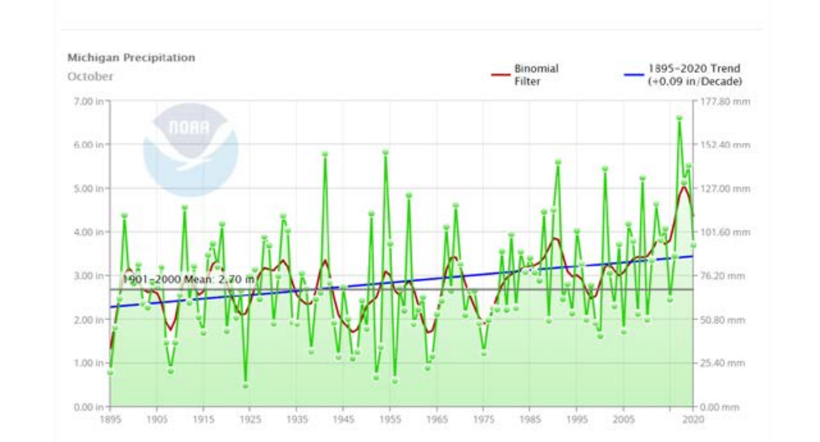
- <u>Variability</u> in planting window
- Extreme weather events- lead to poor field planting conditions
- Need to <u>adjust agronomic practices</u> based on planting time?
- **Optimal hybrid maturity selection** to best utilize the <u>relatively-short growing season</u>

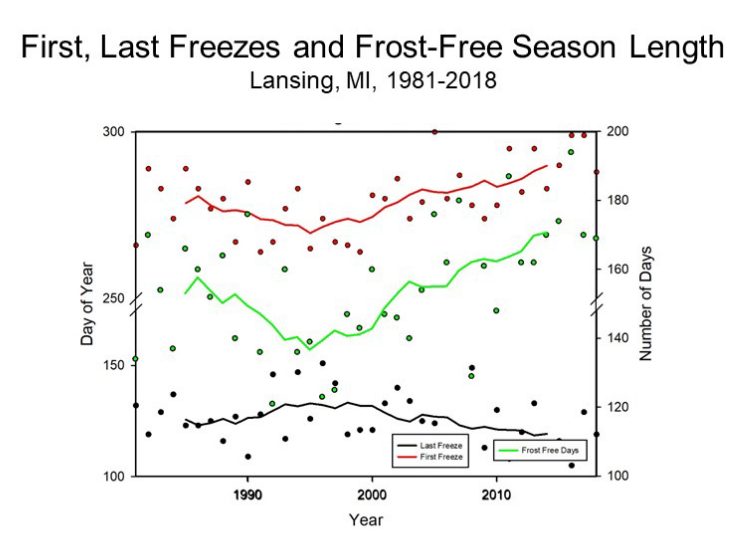
Weather Trends: Wetter and Warmer

Spring



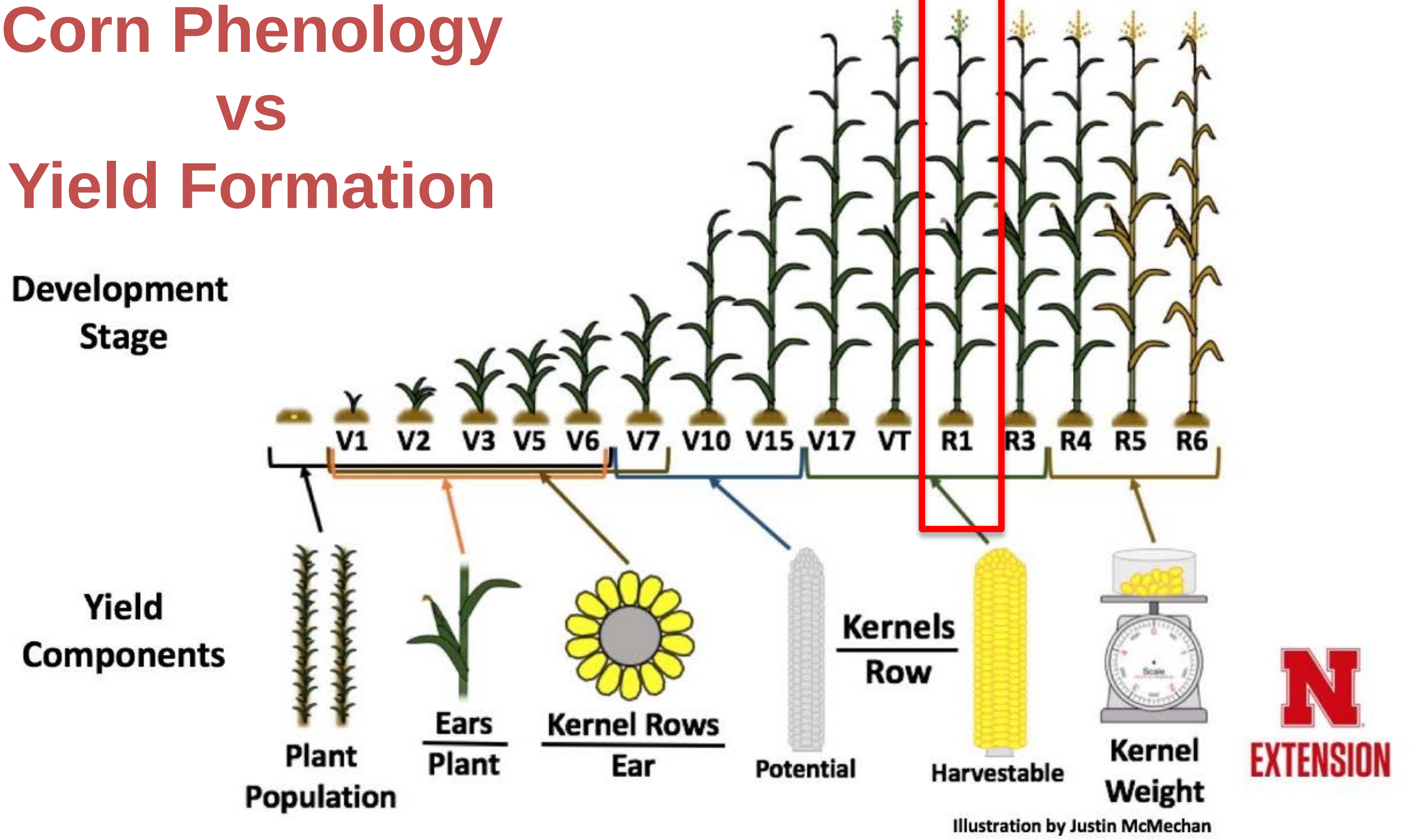
Fall





Planting Time	Conditions
➢ **Early Season** (before early-May)	• Extended Growing Season • Use of Late-maturity hybrid?
➢ **Mid Season**	• When to switch maturity? GDD compression • Timely drydown, harvest, fall operations
➢ **Late Season** (June)	• Restricted Growing Season • Use of Early-maturity hybrid? Field drydown

Corn Phenology vs Yield Formation



GDD Compression with **Late planting** or **Replant?**

- **GDD Compression**: Decrease in hybrid GDD requirements with delayed planting

- **6.8 fewer GDDs** for every day of delay beyond May 1 (Nielsen et al., 2002)
  - Example: May 31 vs May 1 planting (30 days delay x 6.8 = 204 less GDDs needed)

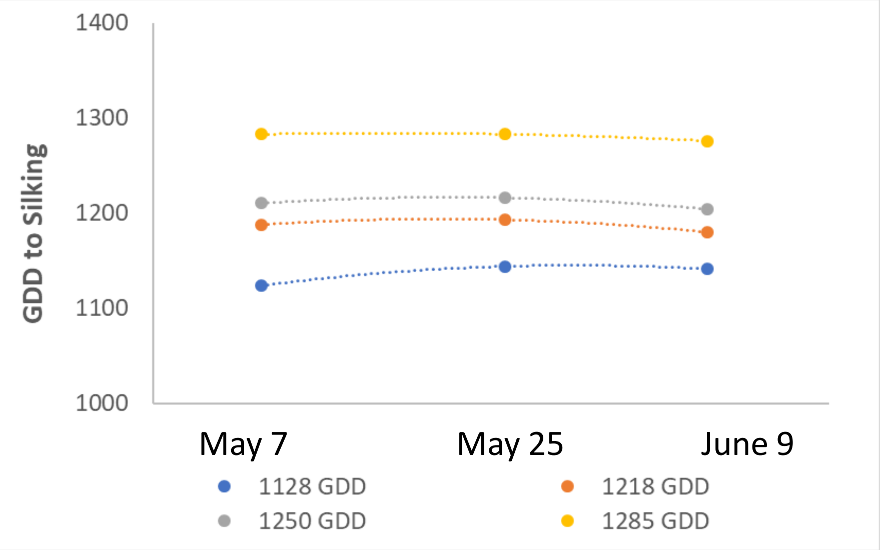
- Need Michigan data on new hybrids to verify **compression and yield** impacts

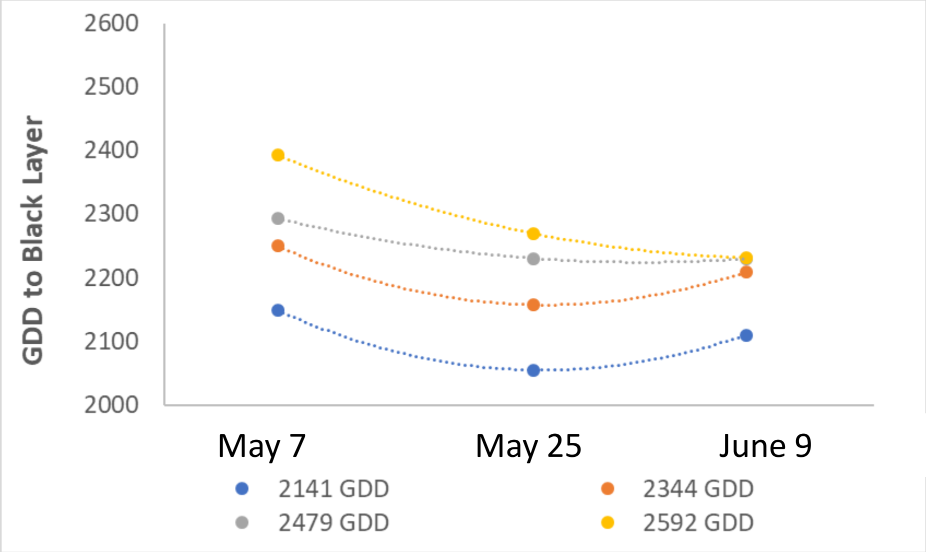
2020 Field Research

- Planting times: 3
  - Early (May 7)
  - Mid (May 25)
  - Late (June 9)

- Hybrid maturities: 4
  - 2100-2600 GDD (1100-1300 silk GDD)
  - 85 - 103 CRM (Comparative Relative Maturity)

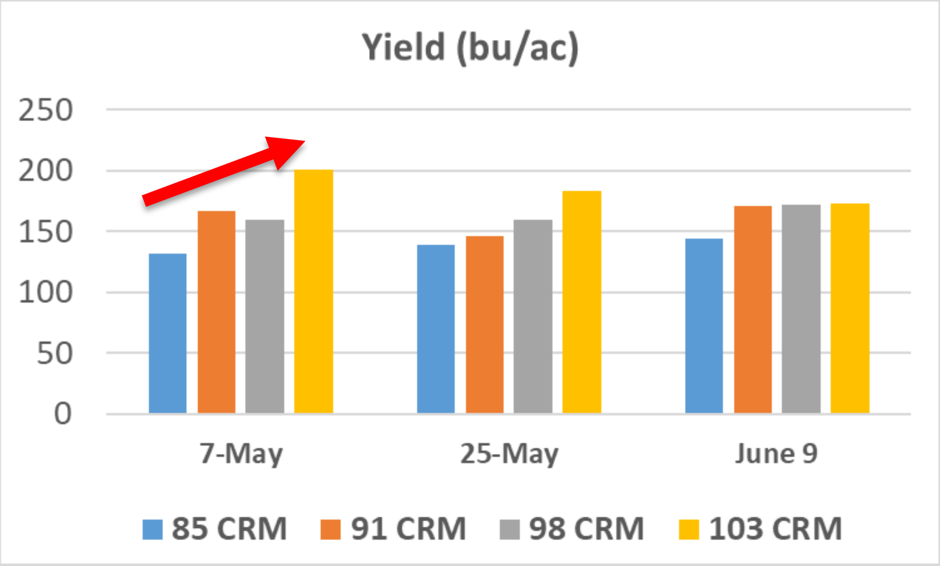
Silking and Black Layer

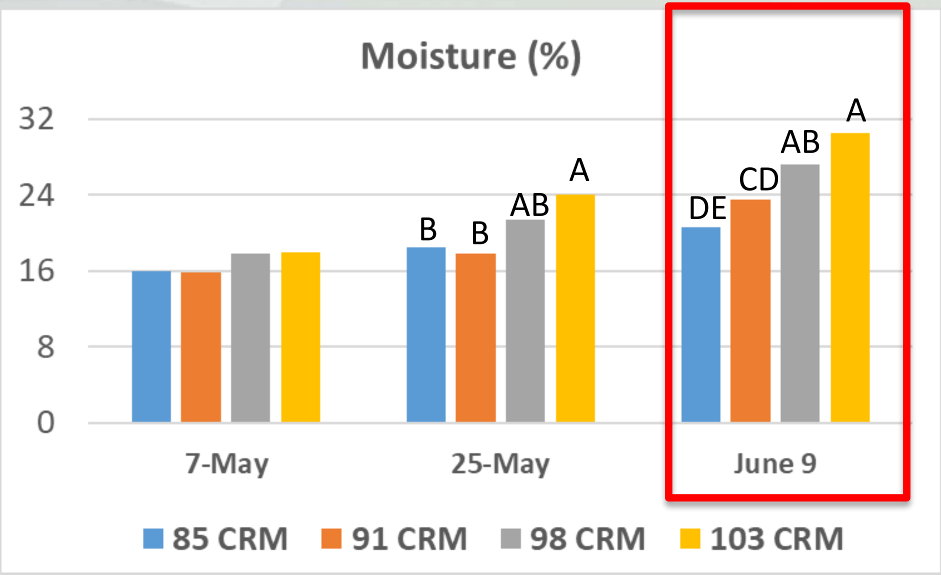




- No GDD compression observed for silking time
- Late-maturity hybrids showed GDD compression

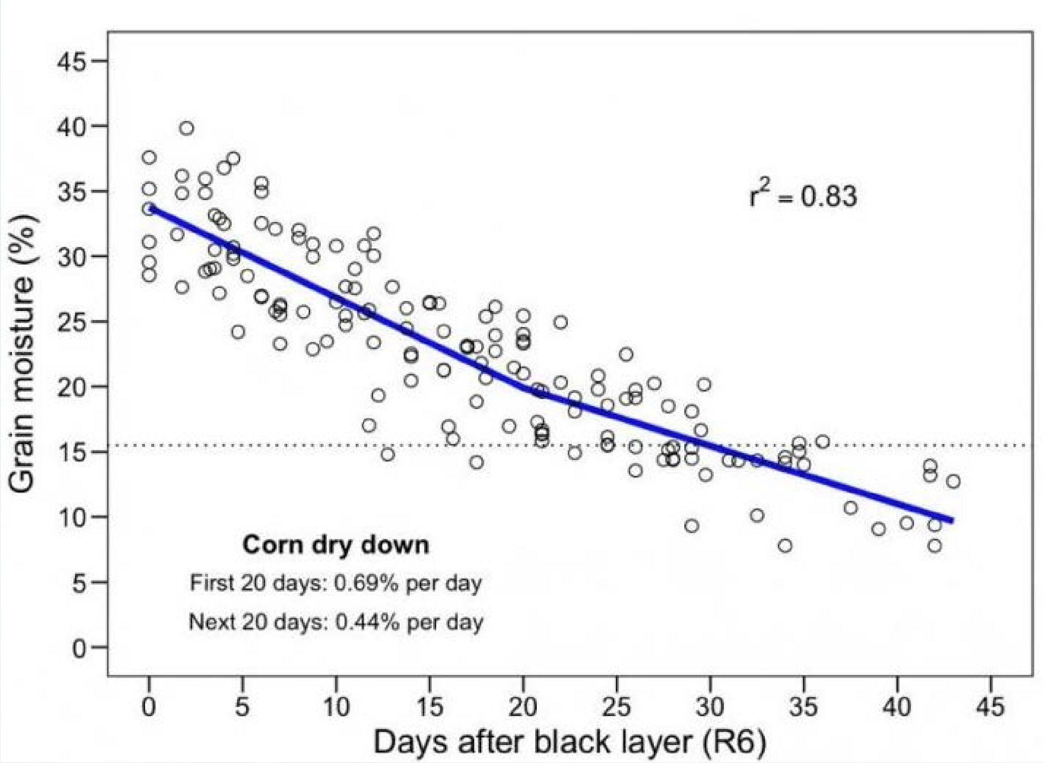
Yield and Moisture





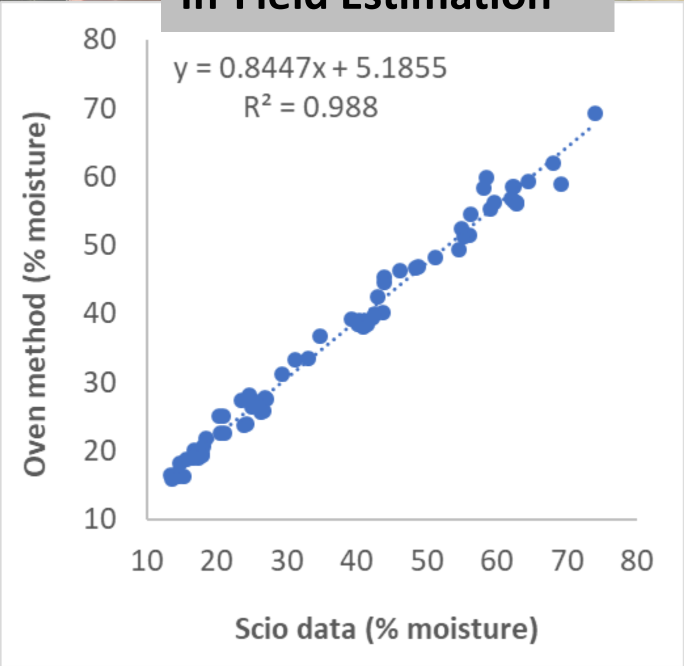
- Trend towards Increase in Yield by using late-maturity hybrid in early planting
- Greater Moisture by using late-maturity hybrid in late planting

Kernel Moisture Drydown

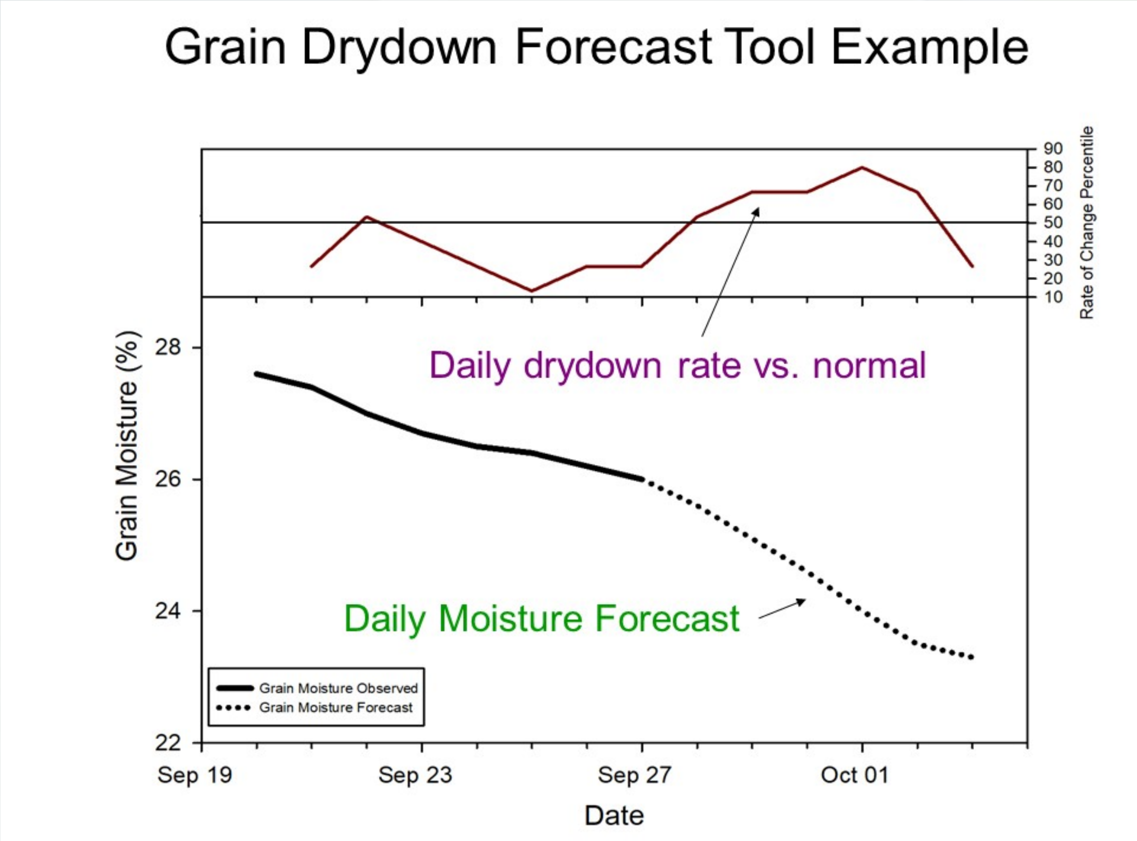


Source: ISU

In-Field Estimation



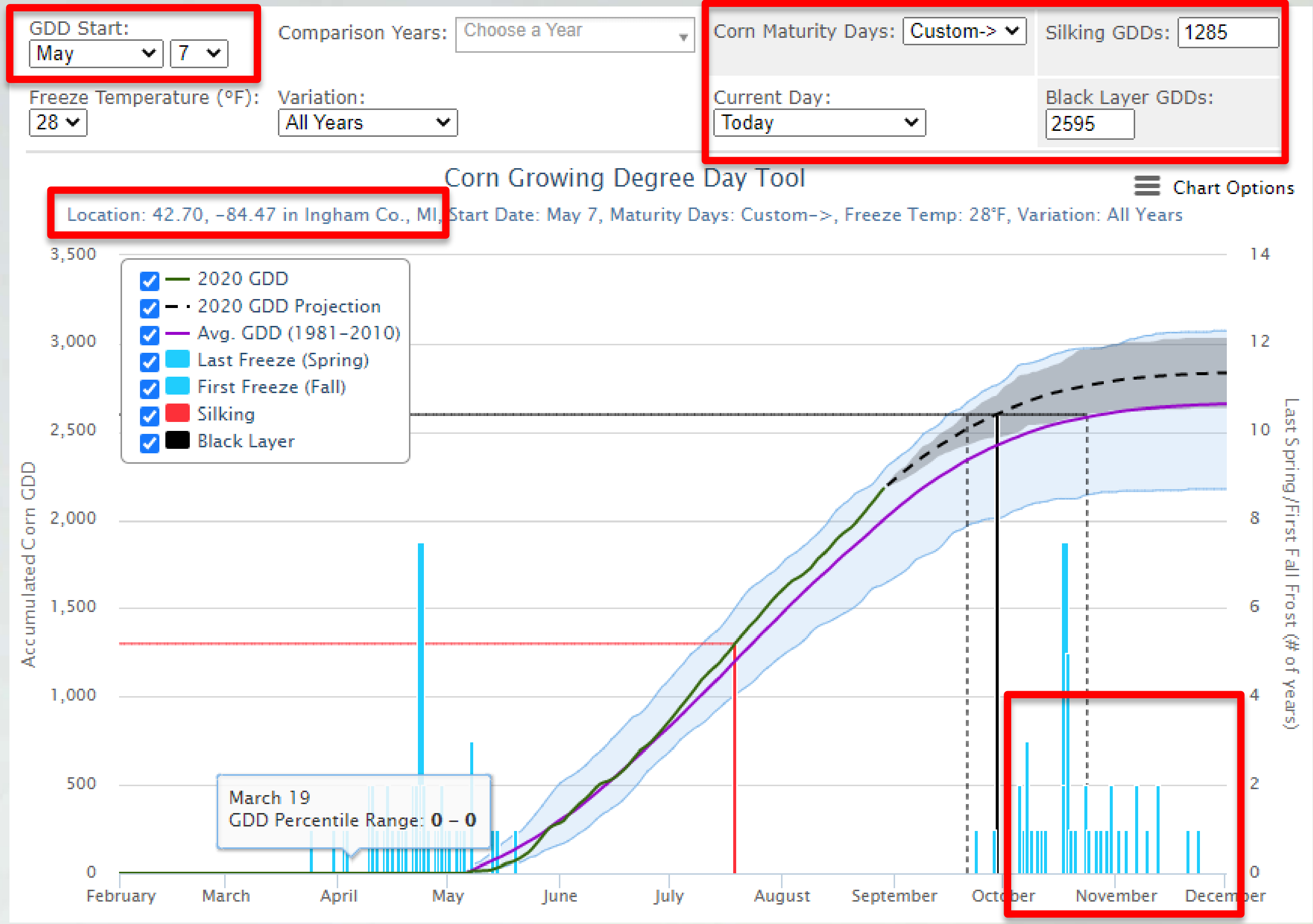
Kernel Moisture Drydown



Source: Jeff Andresen, MSU

Useful 2 Usable Tool (U2U)

https://mrcc.illinois.edu/U2U/gdd/



Does NOT account for GDD compression.

Goal: Update tool with new data. Develop NEW tool for estimating maturity dates, and dry down rates

Summary

- Use **multi-environment data** in making hybrid selection decisions
- For mid-season planting, mid- and early- maturity hybrids have competitive yield, and low moisture
- Benefits of early-season planting can be expanded upon with the use of late-maturity hybrid
- Select early-maturity hybrid to minimize yield loss/ moisture issues in delayed/replant situations
- **Portfolio approach** in maturity selection, accounting for planting time (early vs late), GDD compression, and drying capacity
  - Plant late-maturity hybrids first (~50% of acres)
  - Plant mid- and early-maturity hybrids in sequence to “stack” pollination
  - Plant ~20-30% acres to each of mid- and early-maturity hybrids

- Bill Widdicombe
- Tom Siler
- Katlin Fusilier
- Kalvin Canfield
- Harkirat Kaur
- Maddi Yaek
- Garrett Zuver
- Mike Particka
- Paul Horny
- Charles Scovill (Syngenta)
- **Undergrad students**
- **Farmer cooperators**

- Dr. Laura Lindsey (OSU)
- Dr. Chris Difonzo
- Dr. Dechun Wang
- Dr. Marty Chilvers
- Dr. Erin Burns
- Dr. Christy Sprague
- Dr. I. Ciampitti (KSU)
- Dr. Shawn Conley (UW)
- Mike Staton

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msingh@msu.edu

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agronomy.msu.edu

Thanks!

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