CornellCALS
College of Agriculture and Life Sciences

Corn Silage: Managing to Optimize Forage Value

Joe Lawrence, Cornell PRO-DAIRY

PRO DAIRY
Education & Applied Research

NY/VT Corn Silage Hybrid Evaluation

Collaboration of:

Cornell University CALS

- PRO-DAIRY, Department of Animal Science
- Department of Plant Breeding & Genetics

University of Vermont Extension

A Special Thank You

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Mike Davis
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Allison Kerwin
Sherrie Norman
Keith Payne
Dan Fisher
Paul Stackowski
Sara Ziegler

With support from:

- **Dairy Producers**
- **Seed Corn Industry**
- **Cornell Cooperative Extension**
- **Cornell University Agricultural Experiment Station**

NY & VT Corn Silage Evaluation Program

Locations

- 80-95 Day Relative Maturity
  - Albion, NY
  - Willsboro, NY
  - Alburgh, VT
- 96-110 Day Relative Maturity
  - Aurora, NY
  - Madrid, NY
  - Alburgh, VT

Thank you to host
- Greenwood Dairy
- Van Lieshout Dairy
- Hu-Lane Farm

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PRO DAIRY
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NY & VT Corn Silage Evaluation Program

2020 Program

2020 NY VT Corn Silage Hybrid Evaluation Report
Link: https://blogs.cornell.edu/varietytrials/corn-silage/

90 entries from 17 brands

Corn Silage Quality Ranking Metrics

- As good as the data you put into them.

  "Garbage in, Garbage out"

- Representative forage sampling
- Green vs Fermented Samples
- Do you have every value the equation is asking for
- Always relative to the specific criteria used
- Avoid mis-use
  - Relative rankings, not absolute values

Corn Silage Quality Ranking Metrics

MILK2006

- good tool when it came out
- ~~Currently no update for Corn Silage~~
- doesn't account for advancements in nutritional science in last decade
- More testing programs moving away from its use

- MILK2016 – alfalfa
- MILK2020 – corn silage (in progress)

Corn Silage Quality Ranking Metrics

- **Model based approach**
  - **Predicting milk yield based on overall diet.**
- **CNCPS Model** (Cornell Net Carbohydrate & Protein Synthesis)
  - Nutritional Model used to balance total rations for ruminants
    - Used on many farms by commercial nutritionist
  - Used in the NY & VT Corn Silage Hybrid Evaluation Program
  - Predicted hybrid performance in the context of the model inputs
    - Cow parameters
    - Fixed Starch D – Green Samples
    - Other ingredients in Diet

Van Amburgh, M. E.; M. Dineen, P.A. LaPierre, J. Lawrence, A. Kerwin, T.R. Overton. Determination of First Limiting Physical Factors in Corn Silage Hybrids: Modeling Multiple Pools of Ruminal aNDFom Digestion. Cornell Nutrition Conference, Syracuse, NY. October 17-18, 2018

Corn Silage Quality Ranking Metrics

- **RFC index** (Rumen Fermentable Carbohydrate)

  (NDFd30 + starch)/uNDF30

Jones, L.R., and J. Siciliano-Jones. 2015. Index useful for ranking silage samples. Feedstuffs 17, 19.

- **OMD index** (Organic Matter Digestibility)
  - Being developed by Hristov (Penn St) and Canale (Cargill)
  - **Accounts for *content* and *digestibility* of Fiber and Starch**
  - Spreadsheet based calculation utilizing forage quality metrics from laboratory analysis

- **Miner Institute – Yield of Potentially Digestible NDF**

  (Yield * NDF, % DM) * (NDF – uNDF240, % DM)

  Corn Silage Hybrid Fiber and Starch Yield Calculator

  http://www.whminer.org/dairy/

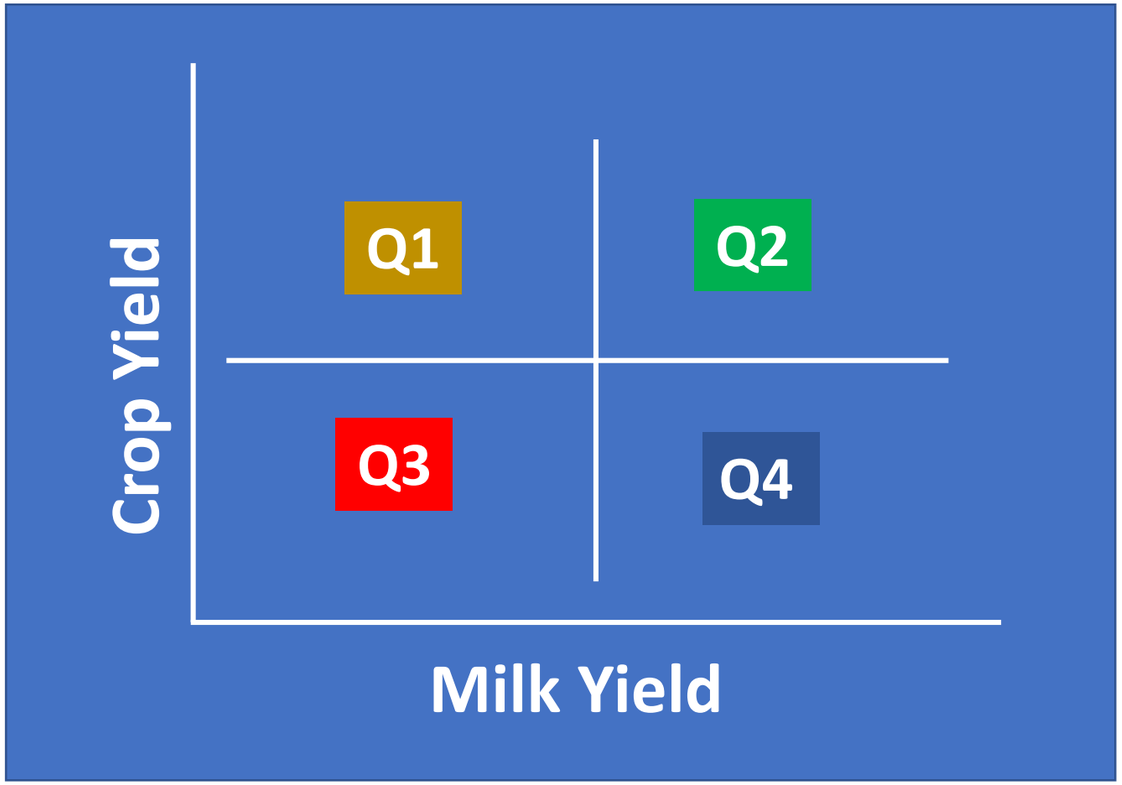
So many options……
What to use?

- New approaches take slightly different angles but,
  - have a reasonable correlation to each other
  - are not well correlated with MILK2006
    - Suggest we are all moving in a similar direction with new nutritional science and this new direction is away for what MILK2006 offers
- All have strengths and weaknesses
- All can be useful in the context of the dataset
- More important to understand the needs of your farm and what parameters have the most impact in your program

Company/Brand	Hybrid	Trait Code †	Relative Maturity	Harvest Population	Dry Matter	Yield, 35% DM	Starch	Crude Protein	Lignin	Ash	Total Fatty Acids	aNDFom	NDF	12 hr NDFD	Wet Chem aNDFom	Wet Chem 30 hr NDFD	30 hr NDFD	120 hr NDFD	240 hr NDFD	240 hr uNDFom	RFC - Fill Ratio[1]	CNCPS v. 7.0 Predicted Allowable Milk Yield	CNCPS v. 7.0 Predicted Dry Matter Intake
				plants/ac	%	tons/ac	% DM	% DM	% DM	% DM	% DM	% DM	% DM	% NDF	% DM	% NDFom	% NDFom	% NDFom	% NDFom	% DM		lbs/day	lbs/day
Schlessmanns	908 [3]	22	91	28169	29.1	17.9	33.1	7.0	2.6	2.9	2.2	37.3	38.1	28.3	37.0	53.3	58.7	65.1	68.0	12.0	3.4	99.6	58.6
Syngenta NK	NK9175-3110	16	91	30782	31.3	20.2	38.0	6.8	2.6	2.8	2.5	34.7	35.4	27.6	34.3	55.1	57.4	64.7	67.9	11.2	3.8	101.3	58.8
Local Seed Company	LC8667SSXRIB [5]	36	86	—	31.6	—	36.1	7.1	2.4	2.8	2.3	35.6	36.3	30.3			61.1	69.6	72.6	9.8	4.0	114.1	64.4
Seedway	SW3110GENSS	36	90	31508	31.8	18.5	33.1	6.8	2.6	2.8	2.1	39.1	39.8	30.3			61.5	71.8	74.8	9.8	3.7	106.9	61.7
Albert Lea Viking	O.71-90GS	1	90	29185	32.4	20.4	35.2	6.4	2.6	3.1	2.1	38.0	38.8	29.5			60.1	69.0	72.1	10.6	3.7	107.2	61.9
Hubner	H6038RCSS	36	89	29621	33.4	17.9	40.7	7.1	2.3	3.0	2.4	33.8	34.3	30.0			60.9	67.4	70.4	10.1	4.5	114.8	64.4
Growmark FS	FS4095X RIB	36	90	29476	34.1	20.6	38.5	7.1	2.3	3.3	2.3	33.0	34.2	30.1	33.6	57.2	62.0	68.2	71.1	9.6	4.3	118.5	66.1
Masters Choice	MCT3891 [5]	10	88	—	34.8	—	39.4	7.1	2.4	2.7	2.4	35.7	36.2	29.9			60.1	66.5	69.4	11.0	4.2	108.9	62.2
Local Seed Company	LC8597 VT2PRIB	41	85	31799	34.9	18.7	37.9	7.3	2.6	3.1	2.5	35.6	36.2	29.7			58.7	64.7	67.6	11.6	3.9	101.3	58.9
Albert Lea Viking	O.58-85P	1	85	29330	35.1	20.6	40.0	6.8	2.3	2.9	2.5	33.3	34.0	30.3			60.7	69.1	72.1	9.4	4.4	116.7	65.1
Hubner	HH6053RCSS	36	87	31508	36.0	18.3	40.8	7.0	2.3	3.0	2.6	33.6	34.1	30.0			60.2	67.0	69.7	10.2	4.4	113.9	64.1
Dekalb	DKC36-30RIB	42	86	29621	36.6	19.3	40.2	6.4	2.3	2.8	2.5	34.5	35.1	30.9			61.1	67.4	70.3	10.3	4.4	113.0	63.7
		85-91 day	**RM Mean**	**30100**	**33.4**	**19.2**	**37.7**	**6.9**	**2.4**	**2.9**	**2.4**	**35.3**	**36.1**	**29.7**	**34.9**	**55.2**	**60.2**	**67.5**	**70.5**	**10.5**	**4.0**	**109.7**	**62.5**
Masters Choice	MCT4572	14	95	28750	29.4	18.2	35.8	7.0	2.6	2.8	2.3	36.9	37.5	28.2			59.1	65.5	68.3	11.8	3.7	102.1	59.6
Channel	192-98STXRIB	36	92	31654	30.6	18.7	34.1	7.5	2.6	3.1	2.3	36.7	37.5	29.8			60.0	67.4	70.2	11.0	3.6	104.9	60.8
Local Seed Company	ZS9598 5222EZ	16	95	30056	30.9	17.7	35.7	7.2	2.6	2.9	2.4	35.9	36.5	27.2			58.9	65.5	68.4	11.4	3.7	104.7	60.6
Seed Consultants	SCS 958AGT	14	95	32089	31.0	20.1	31.6	6.5	2.6	3.0	2.1	38.9	39.8	30.7			62.5	68.5	71.5	11.1	3.7	105.7	61.1
Dekalb	DKC45-07RIB	42	95	30056	31.7	19.9	34.9	7.2	2.4	3.6	2.2	36.1	37.2	29.9			62.0	70.3	73.4	9.7	3.9	110.6	63.0
Dekalb	DKC44-80RIB	42	94	31654	31.8	18.8	37.6	6.5	2.4	3.0	2.3	36.0	36.6	30.7			60.3	67.7	70.6	10.7	4.0	110.4	63.0
Seedway	SW3600GENSS [4]	36	92	28750	31.9	—	36.1	6.9	2.5	3.1	2.2	35.8	36.7	29.3			61.3	70.3	73.2	9.6	4.0	112.4	63.7
Albert Lea Viking	O.82-95P	1	95	29911	31.9	19.5	35.9	7.1	2.3	3.1	2.4	36.7	37.3	31.7	36.9	62.9	62.5	69.1	72.0	10.3	4.2	111.9	63.4
Dekalb	DKC42-04RIB	42	92	31073	32.6	19.0	40.0	7.1	2.4	3.1	2.4	34.4	35.0	29.5			58.9	66.2	69.1	10.8	4.2	106.5	61.1
Local Seed Company	LC9278SSXRIB	36	92	31073	32.7	21.2	36.0	6.6	2.4	3.0	2.4	37.4	38.0	32.5			62.3	68.5	71.6	10.6	4.1	111.5	63.3
Seedway	SW3768GENSS	36	95	30202	32.9	19.1	36.8	7.3	2.3	3.0	2.2	35.5	36.0	32.4			62.3	68.8	71.7	10.1	4.3	113.0	63.7
Growmark FS	FS42R88VT2P	42	92	31799	32.9	13.1	37.0	6.6	2.3	3.1	2.5	34.4	36.1	31.1	34.8	54.3	61.5	67.8	70.7	10.2	3.9	113.5	63.9
Albert Lea Viking	42-92P	1	92	32380	33.3	21.9	35.8	6.5	2.5	3.1	2.3	37.0	37.9	31.1			60.7	66.6	69.8	11.2	3.8	106.0	61.2
Pioneer	P9330AM	3	93	30928	34.0	18.5	39.4	7.0	2.6	2.8	2.3	35.1	35.6	29.8			58.2	64.5	67.4	11.5	4.0	104.5	60.5
		92-95 day	**RM Mean**	**30741**	**32.0**	**18.9**	**36.2**	**6.9**	**2.5**	**3.0**	**2.3**	**36.2**	**37.0**	**30.3**	**35.8**	**58.6**	**60.7**	**67.6**	**70.6**	**10.7**	**3.9**	**108.4**	**62.1**
		LSD (0.10)		**NS [2]**	**2.6**	**NS [2]**	**4.1**	**0.5**	**NS [2]**	**NS [2]**	**NS [2]**	**3.1**	**3.1**	**2.2**	**2.3**	**3.5**	**NS [2]**	**NS [2]**	**NS [2]**	**NS [2]**	**0.5**	**NS [2]**	**NS [2]**
		OverallMean		**30474**	**32.6**	**19.0**	**36.9**	**6.9**	**2.5**	**3.0**	**2.3**	**35.8**	**36.6**	**30.0**	**35.3**	**56.5**	**60.5**	**67.6**	**70.5**	**10.6**	**4.0**	**109.0**	**62.3**

Full Report: https://blogs.cornell.edu/varietytrials/corn-silage/

Quartile Plots – What's on the axis?

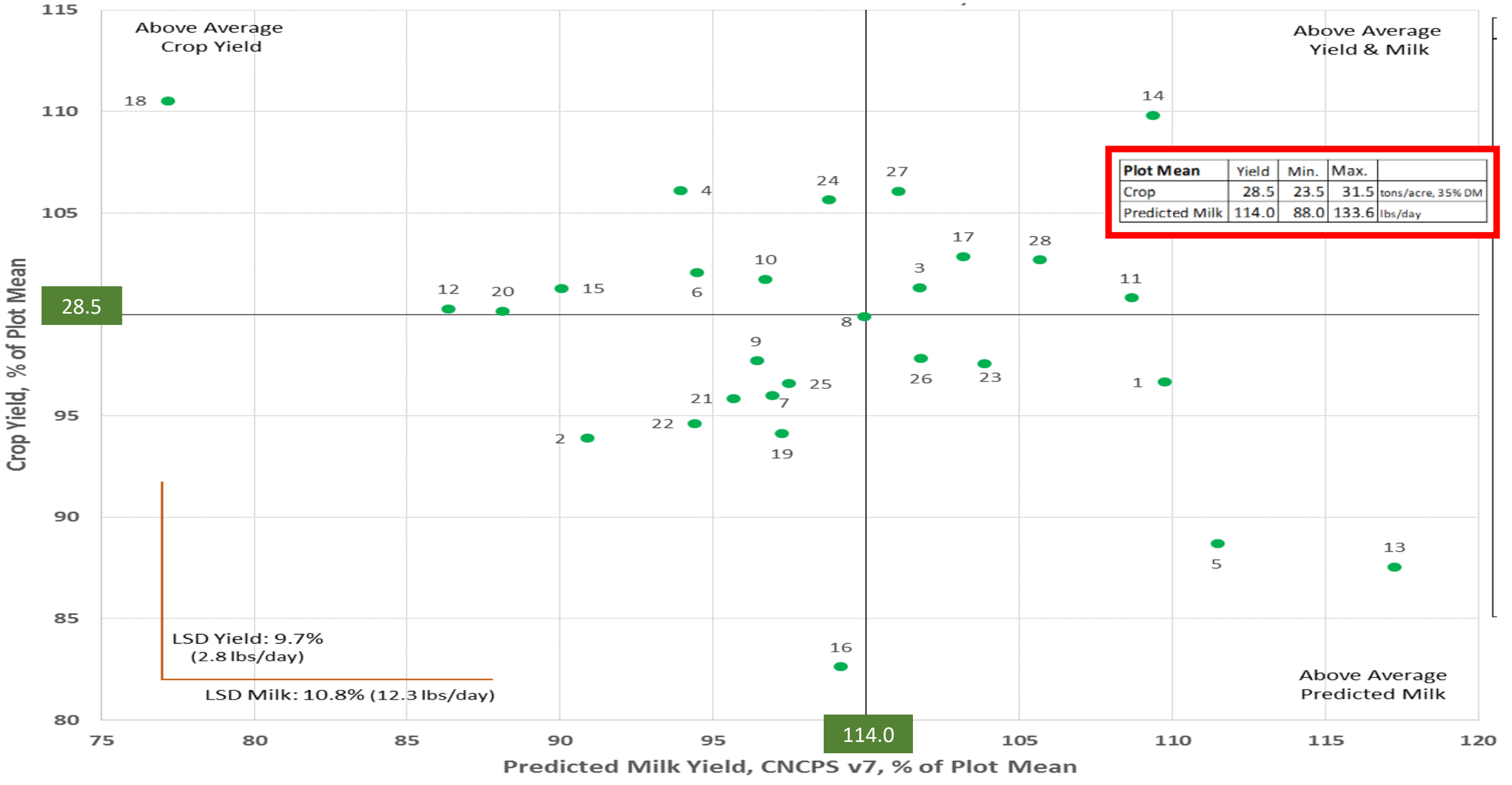


Q1: Crop Yield: Above Average
Milk Yield: Below Average

Q2: Crop Yield: Above Average
Milk Yield: Above Average

Q3: Crop Yield: Below Average
Milk Yield: Below Average

Q4: Crop Yield: Below Average
Milk Yield: Above Average


Above Average
Crop Yield
Above Average
Yield & Milk
Above Average
Predicted Milk
Plot Mean | Yield | Min. | Max.
Crop | 28.5 | 23.5 | 31.5 | tons/acre, 35% DM
Predicted Milk | 114.0 | 88.0 | 133.6 | lbs/day
28.5
114.0
LSD Yield: 9.7%
(2.8 lbs/day)
LSD Milk: 10.8% (12.3 lbs/day)
Crop Yield, % of Plot Mean
Predicted Milk Yield, CNCPS v7, % of Plot Mean
115
110
105
100
95
90
85
80
75
80
85
90
95
100
105
110
115
120
18
14
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17
28
10
3
12
20
15
6
11
8
9
26
23
25
1
21
7
22
2
19
5
13
16

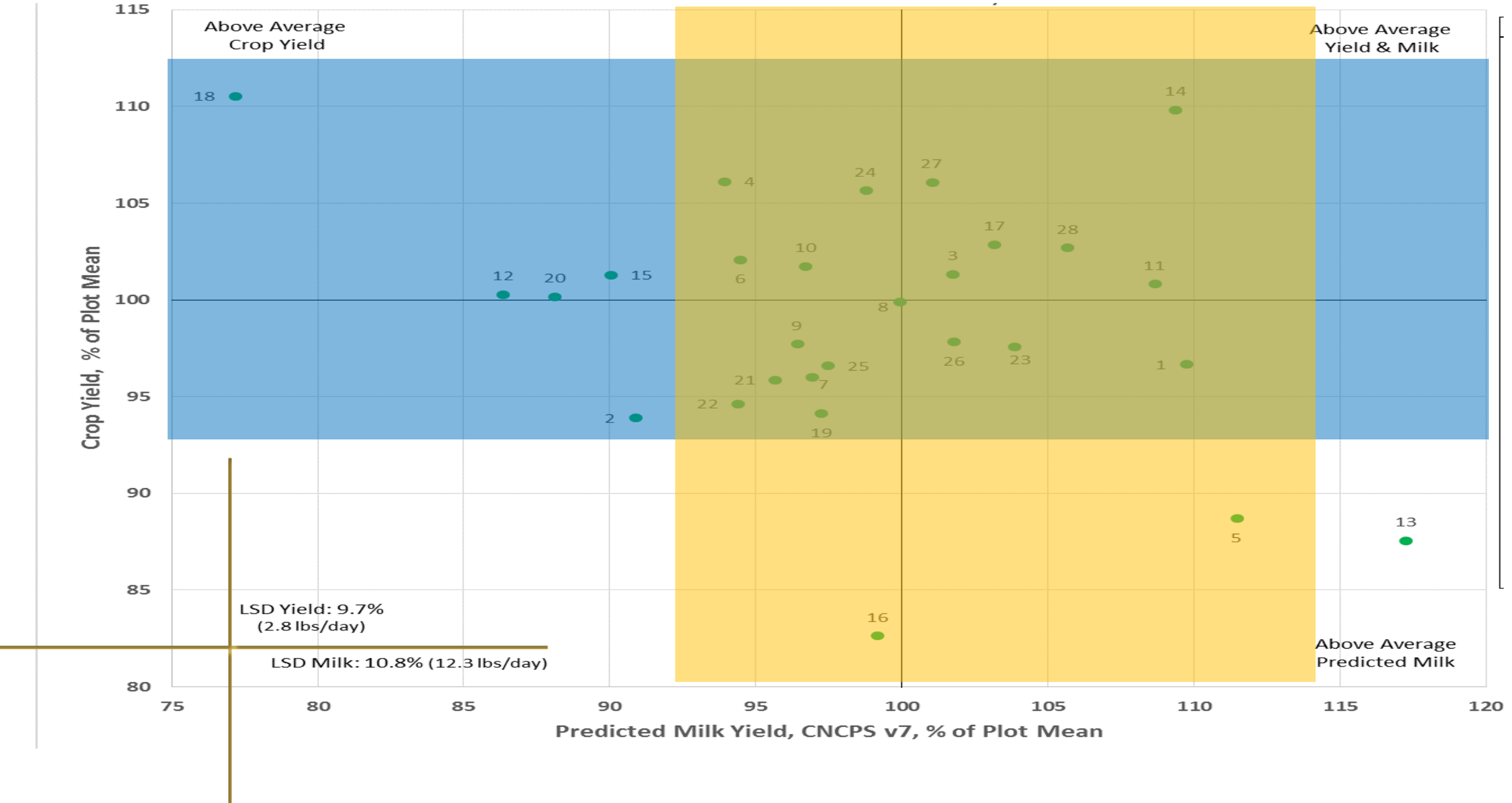
Least Significant Difference

LSD = Least Significant Difference

(0.10) = 90% confidence level

NS = No Significant Difference

Hybrid	Average	Sample			LSD
		1	2	3	
A	50	53	47	49	small
B	50	60	42	49	medium
C	50	90	15	46	Large or NS


Above Average
Crop Yield
Above Average
Yield & Milk
Above Average
Predicted Milk
LSD Yield: 9.7%
(2.8 lbs/day)
LSD Milk: 10.8% (12.3 lbs/day)
Crop Yield, % of Plot Mean
Predicted Milk Yield, CNCPS v7, % of Plot Mean
115
110
105
100
95
90
85
80
75
80
85
90
95
100
105
110
115
120
18
12
20
15
2
4
24
27
14
17
28
10
3
6
11
8
9
26
23
25
1
21
7
22
19
5
13
16

Growing Environment

Impact on Crop Performance

Weather prior to silking affects:

- corn plant height (and yield) and
- fiber quality

Weather after silking appears to exert more effect on:

- corn grain yield,
- neutral detergent solubles:NDF ratio,
- and total dry matter digestibility

The William H. Miner Agricultural Research Institute August 2017

FARM REPORT

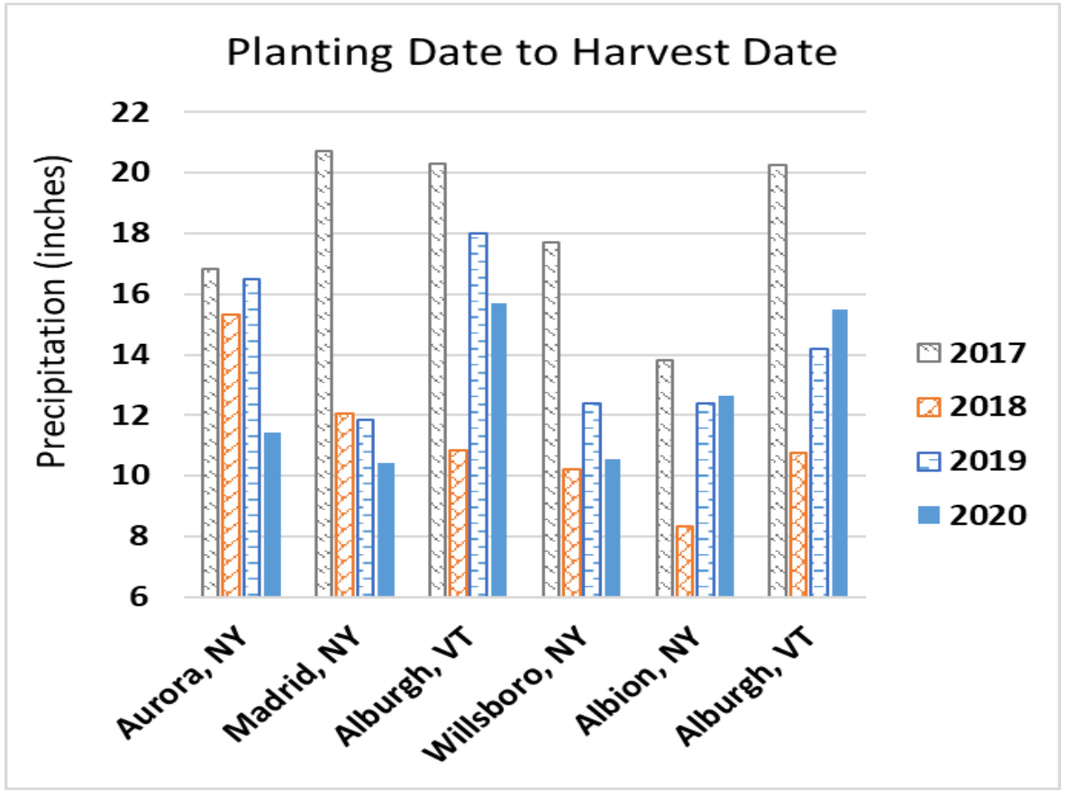
MINER INSTITUTE RESEARCH EDUCATION DEMONSTRATION CHAZY NY

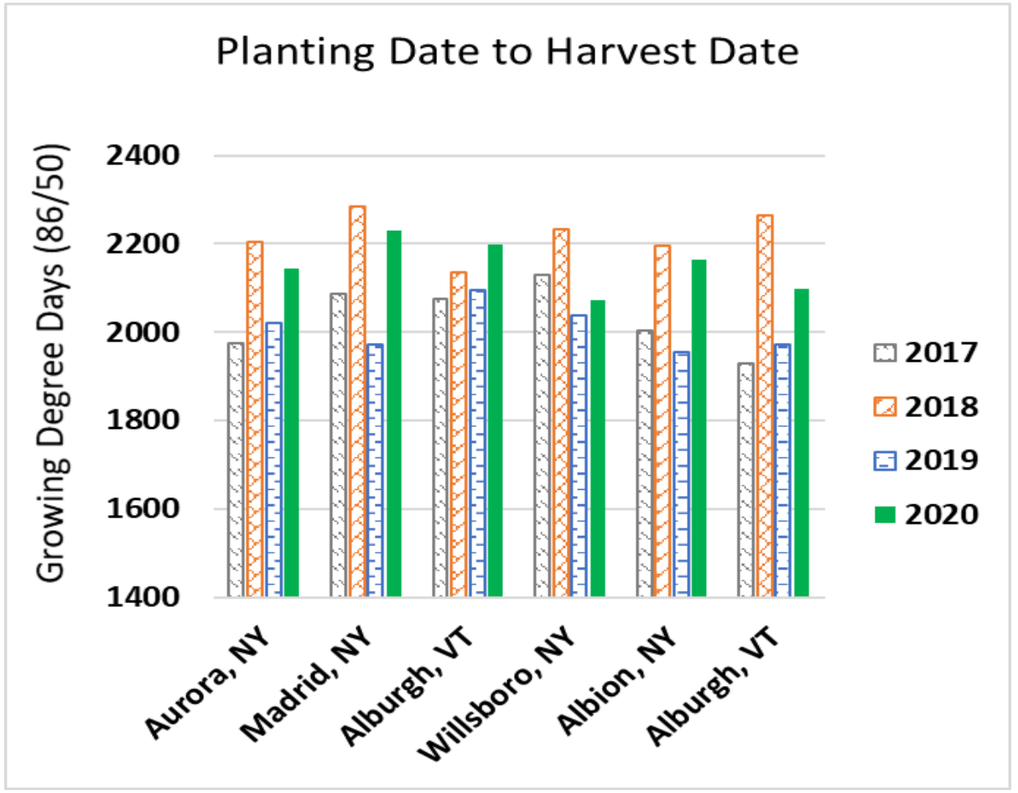
FROM THE PRESIDENT'S DESK:
HIGH UNDF FORAGES ON THE WAY?

All summer long the rain hasn't stopped, are associated with a specific hybrid, its

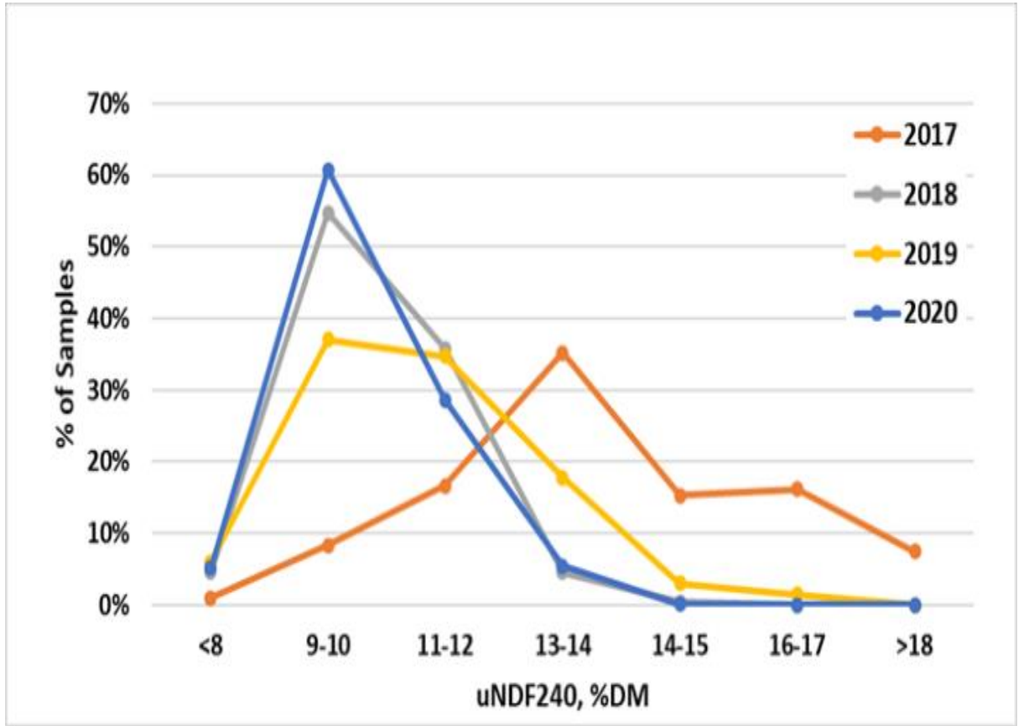
- Mertens (2002) summarized by Mahanna (2005)

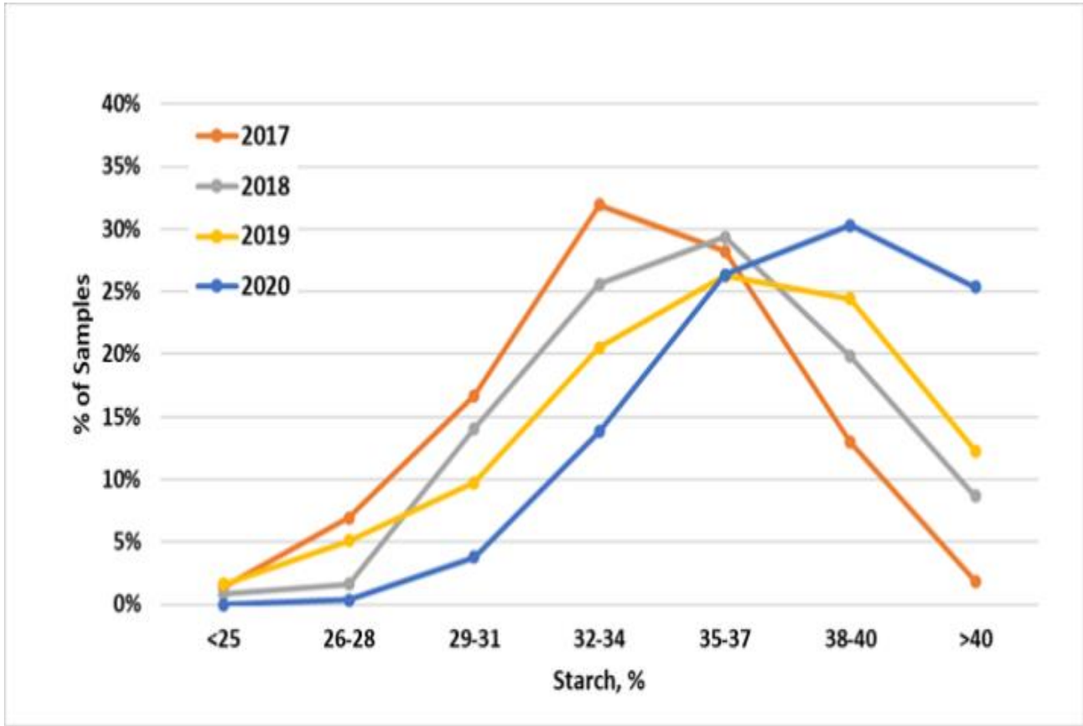
2020 Growing Season Summary





Sample Distribution 2017 - 2020





Growing Environment vs Genetics

Impact on Crop Performance

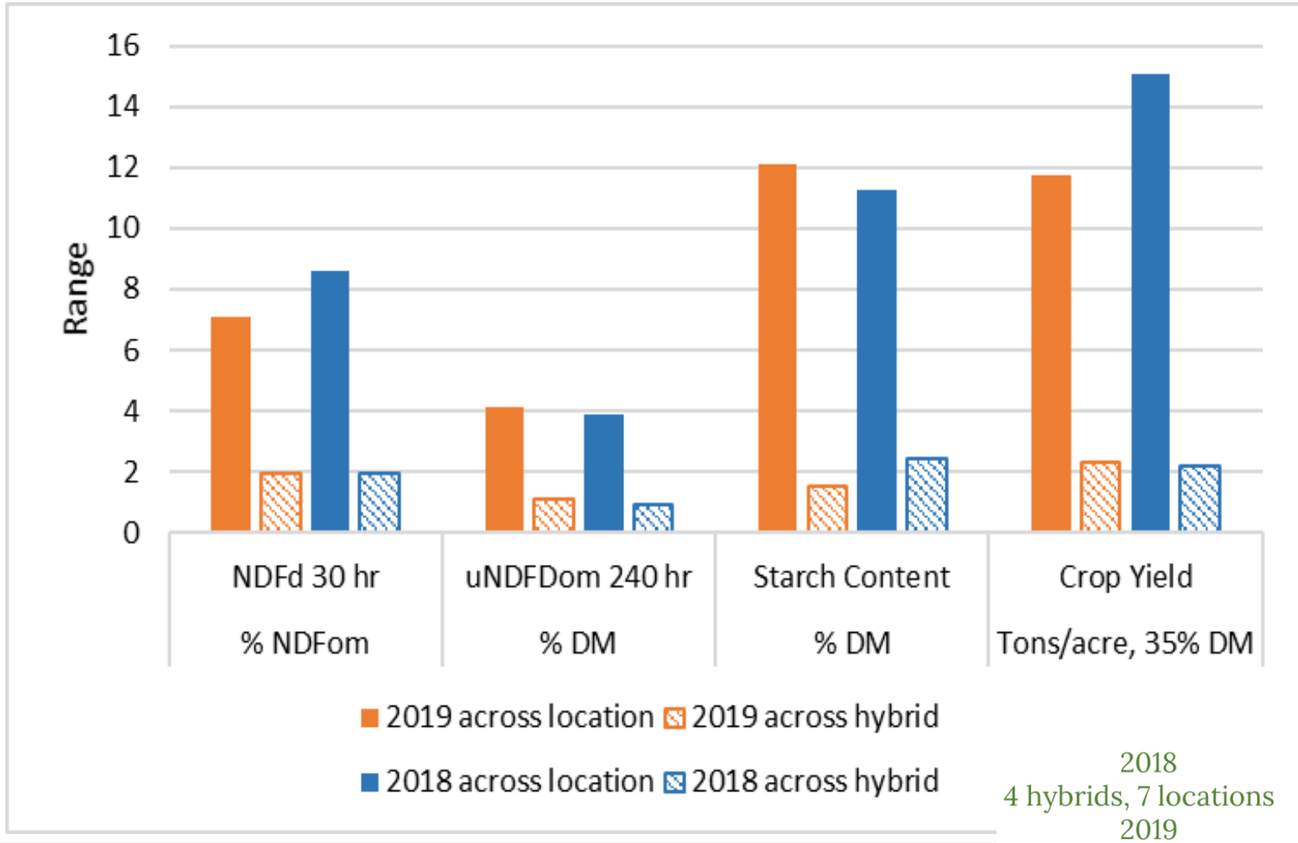
Same genetics at different locations

>

Different genetics at the same location[a,b]

[a] *there are exceptions such as BMR*

[b] *when DM is consistent at harvest*



2018
4 hybrids, 7 locations
2019
3 hybrids, 8 locations
NY, VT, PA

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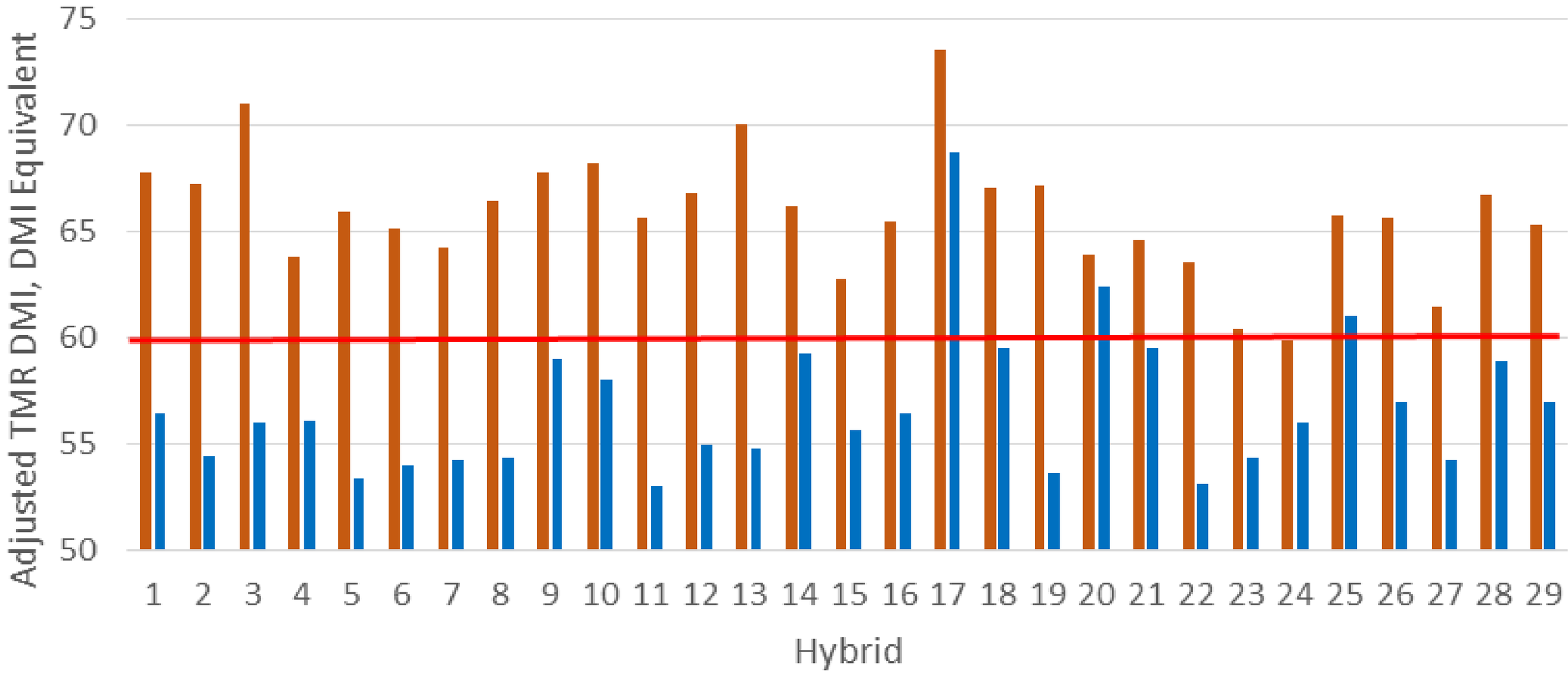
Predicted Dry Matter Intake (DMI)



2016 NYS Corn Silage Hybrid Trials

Using Public data as comparison

- Average digestibility numbers will vary by hybrid *and year*
- Public trials provide the range in expected values for a given growing season

Relative Maturity Group	Growing Season	Location	Yield, 35% DM tons/acre	Dry Matter %	Starch % DM	Crude Protein % DM	aNDFom % DM	30 hr NDFD % NDFom	120 hr NDFD %NDFom	240 hr uNDFom % DM
80-95 day RM	2020	**Albion, NY**	**19.3**	**36.6**	**41.7**	**8.0**	**32.5**	**60.2**	**68.9**	**9.2**
		Willsboro, NY	**16.5**	**30.6**	**34.7**	**7.4**	**37.7**	**60.4**	**71.9**	**9.5**
		Alburgh, VT	**19.8**	**32.4**	**37.8**	**8.3**	**35.9**	**56.0**	**65.6**	**11.4**
	2019	Albion, NY	26.0	31.9	35.1	7.4	36.5	59.1	66.3	11.3
		Willsboro, NY	19.2	32.6	36.9	6.9	35.8	60.5	67.6	10.6
		Alburgh, VT	23.4	33.7	36.5	7.3	37.8	61.6	67.6	11.2
	2018	Albion, NY	19.2	36.2	39.2	8.3	34.2	56.1	69.4	10.0
		Willsboro, NY	18.5	35.0	34.9	8.2	35.7	62.0	70.0	9.7
		Alburgh, VT	18.3	33.3	31.0	7.8	39.0	56.2	67.4	11.8
	2017	Albion, NY	25.2	30.8	32.3	8.3	37.2	59.1	69.8	10.1
		Willsboro, NY	19.2	31.3	38.1	7.7	39.5	56.3	66.8	12.1
		Alburgh, VT	27.5	31.8	34.4	7.5	38.9	53.2	62.7	13.4
96-110 day RM	2020	**Aurora, NY**	**17.1**	**36.0**	**38.2**	**7.5**	**36.0**	**61.1**	**68.3**	**10.4**
		Madrid, NY	**23.6**	**34.1**	**40.1**	**8.2**	**32.9**	**60.3**	**67.6**	**9.8**
		Alburgh, VT	**25.1**	**36.4**	**37.9**	**7.6**	**36.5**	**55.4**	**65.6**	**11.6**
	2019	Aurora, NY	27.1	34.7	38.3	6.5	36.9	55.5	62.2	12.9
		Madrid, NY	27.4	28.6	30.7	7.5	38.0	58.4	65.5	12.1
		Alburgh, VT	24.3	35.4	39.3	7.6	35.5	61.6	71.1	9.2
	2018	Aurora, NY	21.7	38.2	38.8	7.3	35.3	59.9	67.7	10.4
		Madrid, NY	28.6	32.9	35.4	7.7	35.9	61.2	69.9	9.8
		Alburgh, VT	23.3	34.9	34.2	7.2	38.3	55.2	66.0	12.0
	2017	Aurora, NY	26.0	31.9	31.2	6.1	42.6	54.5	63.8	14.4
		Madrid, NY	31.9	35.2	34.8	7.4	41.3	50.6	59.4	15.9
		Alburgh, VT	28.5	32.7	35.3	7.2	39.8	52.7	61.4	14.3

NY & VT Corn Silage Evaluation Program

Using Public data as comparison

		Mean*	2017 % of mean	2018 % of mean	2019 % of mean	2020 % of mean	Your Numbers
Precipitation (in.)	May	3.33	155%	62%	142%	82%	
	June	4.09	136%	62%	99%	38%	
	July	4.04	136%	76%	75%	94%	
	August	3.86	80%	100%	84%	127%	
	September	3.43	59%	102%	91%	67%	
	May-August	15.31	126%	76%	98%	85%	
GDD (86/50)	May	310	80%	125%	70%	98%	
	June	480	97%	92%	91%	105%	
	July	640	91%	107%	103%	113%	
	August	587	92%	114%	94%	101%	
	September	399	109%	115%	90%	92%	
	May-August	2017	91%	108%	92%	105%	

		Mean	Min/Max	Mean	Min/Max	Mean	Min/Max	Mean	Min/Max	
Corn Silage Performance Parameters	Yield, 35% DM, tons/acre	26.4	19.2 31.9	21.6	18.3 28.6	24.6	19.2 27.4	20.2	16.5 25.1	
	Dry Matter, %	32.3	30.8 35.2	35.1	32.9 38.2	32.8	28.6 35.4	34.4	30.6 36.6	
	Starch Content, % DM	34.3	31.2 38.1	35.6	31.0 39.2	36.1	30.7 39.3	38.4	34.7 41.7	
	aNDFom, % DM	39.9	37.2 42.6	36.4	34.2 39.0	36.7	35.5 38.0	35.3	32.5 37.7	
	30hr NDFD, % NDFom	54.4	50.6 59.1	58.4	55.2 62.0	59.4	55.5 61.6	58.9	55.4 61.1	
	120hr NDFD, % NDFom	64.0	59.4 69.8	68.4	66.0 70.0	66.7	62.2 71.1	68.0	65.6 71.9	
	240hr uNDFom, % DM	13.4	10.1 15.9	10.6	9.7 12.0	11.2	9.2 12.9	10.3	9.2 11.6	
	_____									
	_____									

* mean is the average of all host locations from 2005-2020
Host Locations: Albion, Aurora, Madrid, Willsboro, NY and Alburgh, VT

What influences Corn Silage Performance?

Maturity

- Whole Plant Dry Matter
  - Fermentation
- Kernel Maturity

Fiber Digestibility

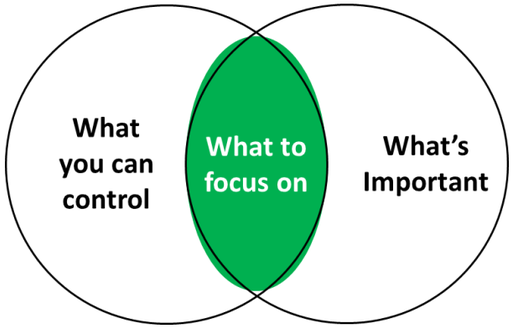
- Corn is an over mature grass
- BMR
- Ear to Stover Ratio
- Weather Conditions/Stress

Starch

- Ear to Stover Ratio
- Ear Maturity at Harvest

Crop Hygiene

- Ash
- Pest Damage
- Molds/toxins



Harvest Quality and Silo Management Have Profound Effects on Silage Quality at Feeding

Poor Quality Forage	⟹	Poor Silage Management	=	Poor Quality Silage
Poor Quality Forage	⟹	Excellent Silage Management	=	Poor Quality Silage
High Quality Forage	⟹	Poor Silage Management	=	Poor Quality Silage
High Quality Forage	⟹	Excellent Silage Management	=	Excellent Quality Silage

Slide Credit: Dr. Limin Kung, U. of Delaware

Corn Harvester Performance & Hybrid Characteristics

Corn Harvester Performance Study 2018/2019

NY farm viability INSTITUTE

Hybrid Selection

- 4 Hybrids Planted at Each Farm
  - Differences in:
    - Plant Size
    - Relative Maturity
    - Kernel Type

Farm	Location
CURC	Hartford, NY
SUNY Morrisville	Morrisville, NY
Miner Institute	Chazy, NY
Pominville Dairy	Croghan, NY
Hilltop Divine Dairy	Cortland, NY

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https://cals.cornell.edu/pro-dairy/our-expertise/forage-systems

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Harvest Timing

- ***Put yourself in the Drivers seat***
  - You pick harvest timing based on proper stage of crop
    - 35% whole plant DM
  - Don't let mother nature force your hand
    - Hurricane Season
    - Frost

- ***Is your Equipment ready?***
- ***Is your Labor Force ready?***

"***Despite our best efforts we always end up with forage that is below our quality standards due to weather or other challenges.*** The part that we can control is processing, fill, pack and cover."

- High Plains Ponderosa Diary, Plains, Kansas

From: These farms excel from field to feedbunk, Hoards Dairyman, Jan. 10, 2020

University of Wisconsin · Agronomy Department
1575 Linden Drive · Madison, WI · 53706 · (608) 262-1390

Agronomy Advice

http://corn.agronomy.wisc.edu

August 2019 Field Crops 28.5 - 132

The "Normal" Pattern of Corn Forage and Grain Development

Joe Lauer, *Corn Agronomist*

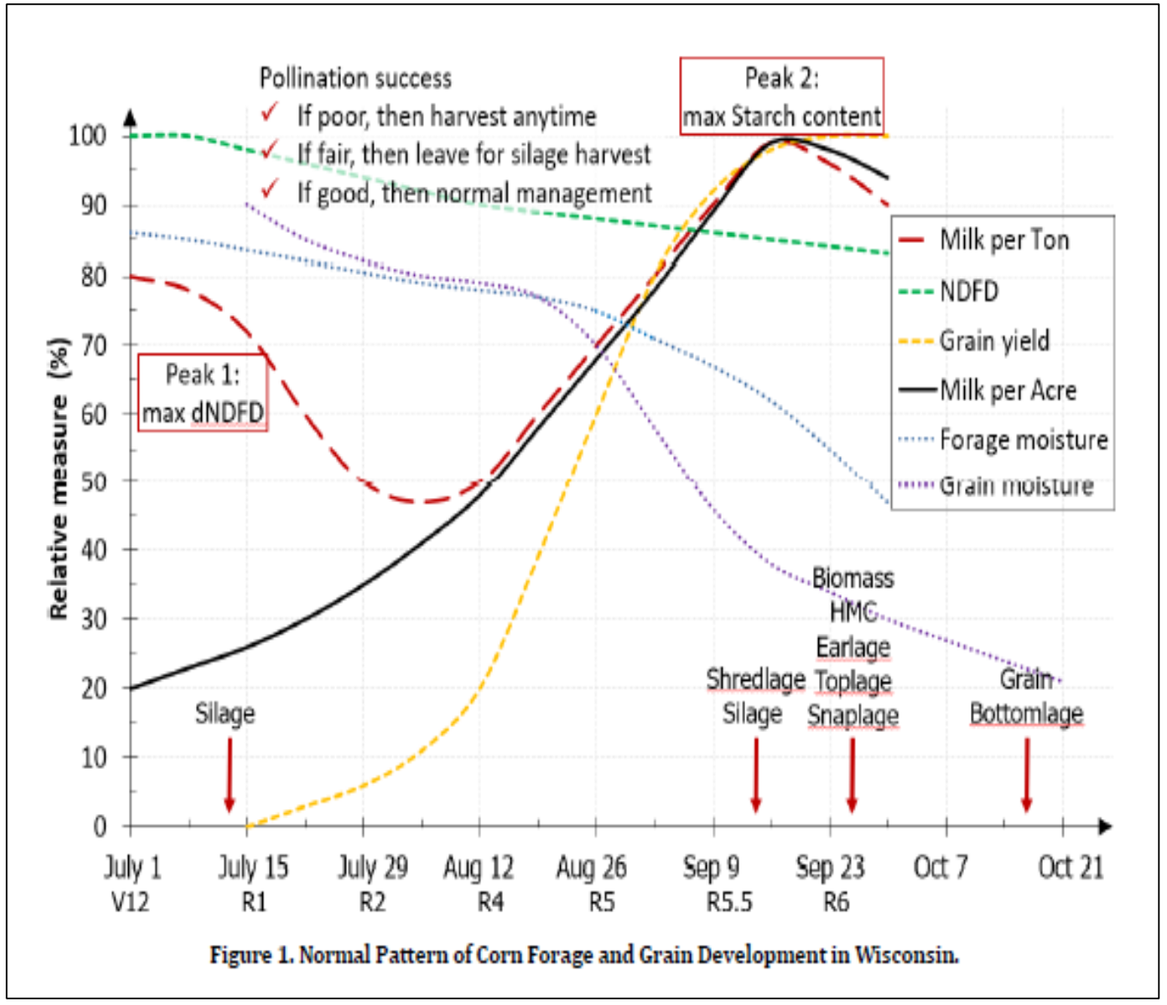


Figure 1. Normal Pattern of Corn Forage and Grain Development in Wisconsin.

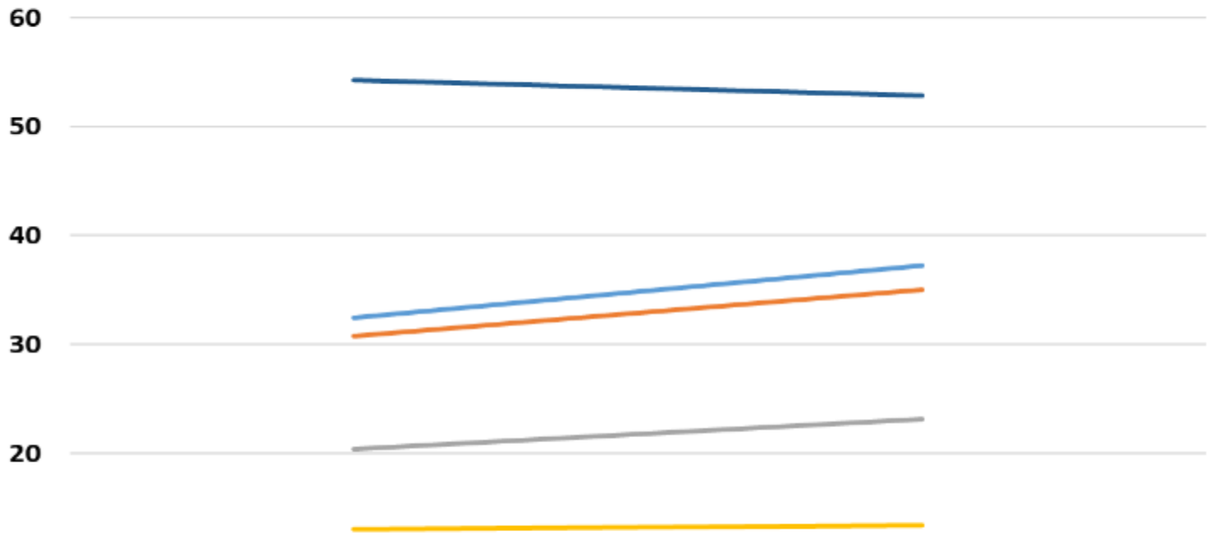
The relationship between kernel growth stage and development of corn for normal planting dates.

Stage	Percent of max yield		Moisture content (%)	
	Grain	Silage	Grain	Silage
R1: Silking	0	45-50	---	80-85
R2: Blister	0-10	55-60	85-95	80-85
R3: Milk	10-30	60-65	70-85	80-85
R4: Dough	30-60	65-75	60-70	75-80
R5: Dent	60-75	75-85	50-55	70-75
R5.5: 50% Kernel milk	90-95	100	35-40	65-70
R6: Black layer	100	95-100	30-35	55-65

Adapted From: Agronomy Advice University of Wisconsin, August 2013
http://corn.agronomy.wisc.edu/AA/pdfs/A102.pdf

Whole Plant DM: Yield & Quality

One week delay in harvest
2018 NY VT Corn Silage Hybrid Evaluation Program



Same 4 hybrids
(3 reps/hybrid/date)

	Sept. 12	Sept. 19	*P-value*
Whole Plant Dry Matter (%)	32.4	37.2	<0.0001
uNDF240 (%DM)	13.0	13.4	0.3947
NDFD30_NDF	54.3	52.9	0.0783
Starch Content (%)	30.8	35.0	0.04
Yield (tons/acre, 35% DM)	20.4	23.1	0.0517

Relative Maturity

- Matching Corn Relative Maturity (RM) to your growing season is critical to silage quality
  - Growing Degree Units (GDU's) or Growing Degree Days (GDD's) are used in some regions
- Starch Content
- Dry Matter Yield
- Fermentation

Interpreting Corn Hybrid Maturity Ratings
http://www.kingcorn.org/news/timeless/HybridMaturity.html

Corn Silage Yield & Relative Maturity (RM)

- As the RM of each hybrid increases by **5 days in length**, silage yields, adjusted to 65% moisture, increase by about **0.5 tons/acre**.

- Cox and Atkins, What's Cropping Up? Vol. 18 No. 5

**** This ASSUMES that you are able to harvest both hybrids at the proper maturity.***

90 day RM
35% DM

95 day RM
35% DM

RM & Risk to Silage Quality

- 2 tons/acre

+ 5 % NDF digestibility

+ Starch

Mud

- Raising the Cutter Bar
  - Raising the cutting height by **6 inches reduces yield** by **~1 ton/acre** (35% DM) or 5.5% of 18 tons/acre.
    https://extension.psu.edu/considerations-in-managing-cutting-height-of-corn-silage
- Feed Hygiene
  - Fermentation
  - Molds
  - Ash

Yield (tons/acre)	% of yield represented by 0.5 tons/acre
18	2.8%
22	2.3%
25	2.0%

RM & Risk to Silage Quality

Wet Silage

- Lower Dry Matter Yield
- Poor Fermentation
  - Storage Shrink
  - Additional dry matter losses resulting from less than ideal fermentation and challenging storage conditions can quickly eclipse the potential yield gain from increasing RM by 5 days.
- Compromised Forage Quality

Yield (tons/acre)	% of yield represented by 0.5 tons/acre
18	2.8%
22	2.3%
25	2.0%

RM & Risk to Silage Quality

Frost

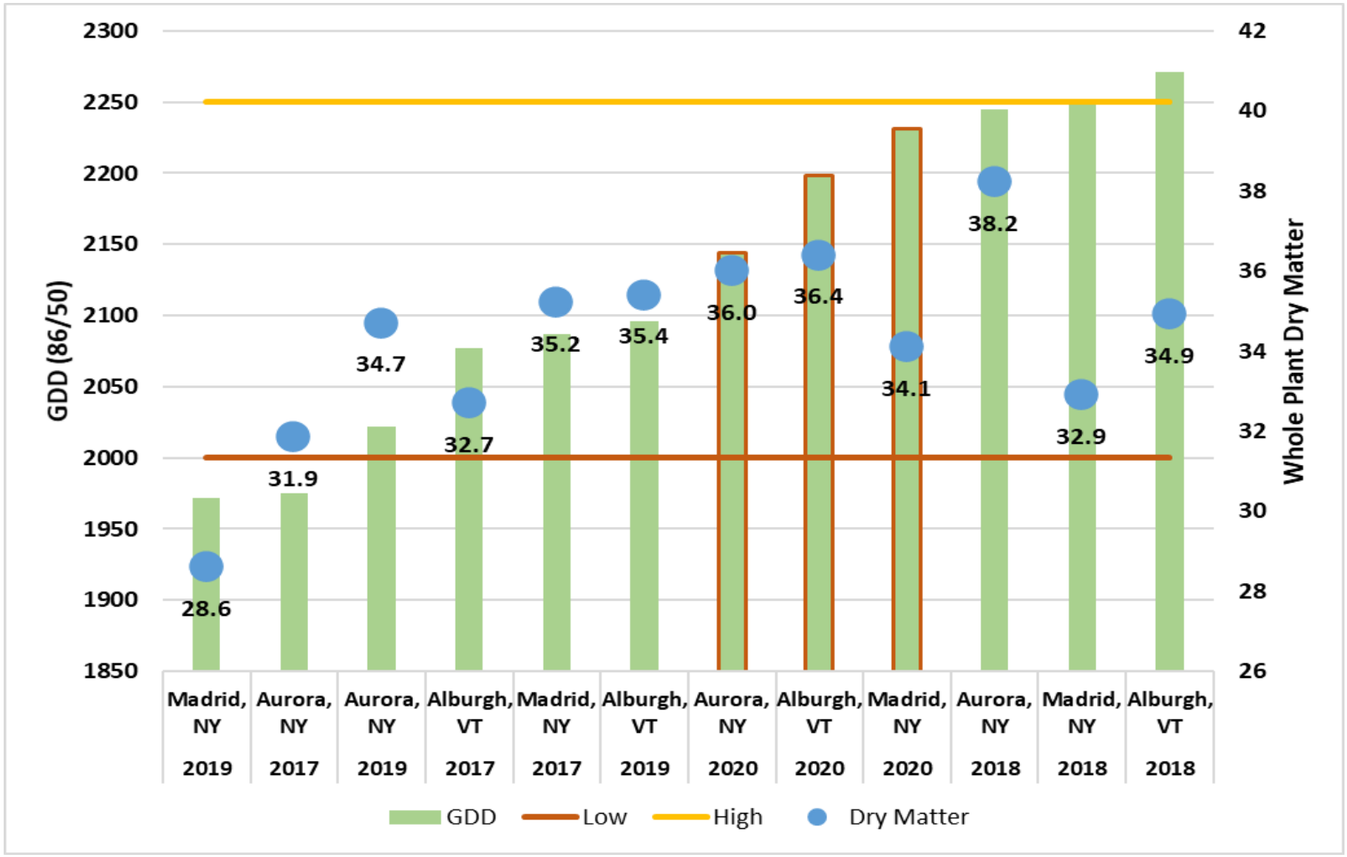
- It is hard to quantify the impact of frost on actual yield but it can have a significant impact on:
  - Dry matter content at harvest
  - Fermentation
  - Forage Quality
  - Starch levels

Yield (tons/acre)	% of yield represented by 0.5 tons/acre
18	2.8%
22	2.3%
25	2.0%

Weather, GDDs and Dry Down

- Not every GDD is created equal
- The season makes a difference

- Madrid 2020
  - Relief *(modest)* of drought after pollination
  - Crop tried to "make up" for stagnation earlier in the season



Ear and Stover DM Contribution to Whole Plant DM

Corn Harvester Performance Study 2018/2019

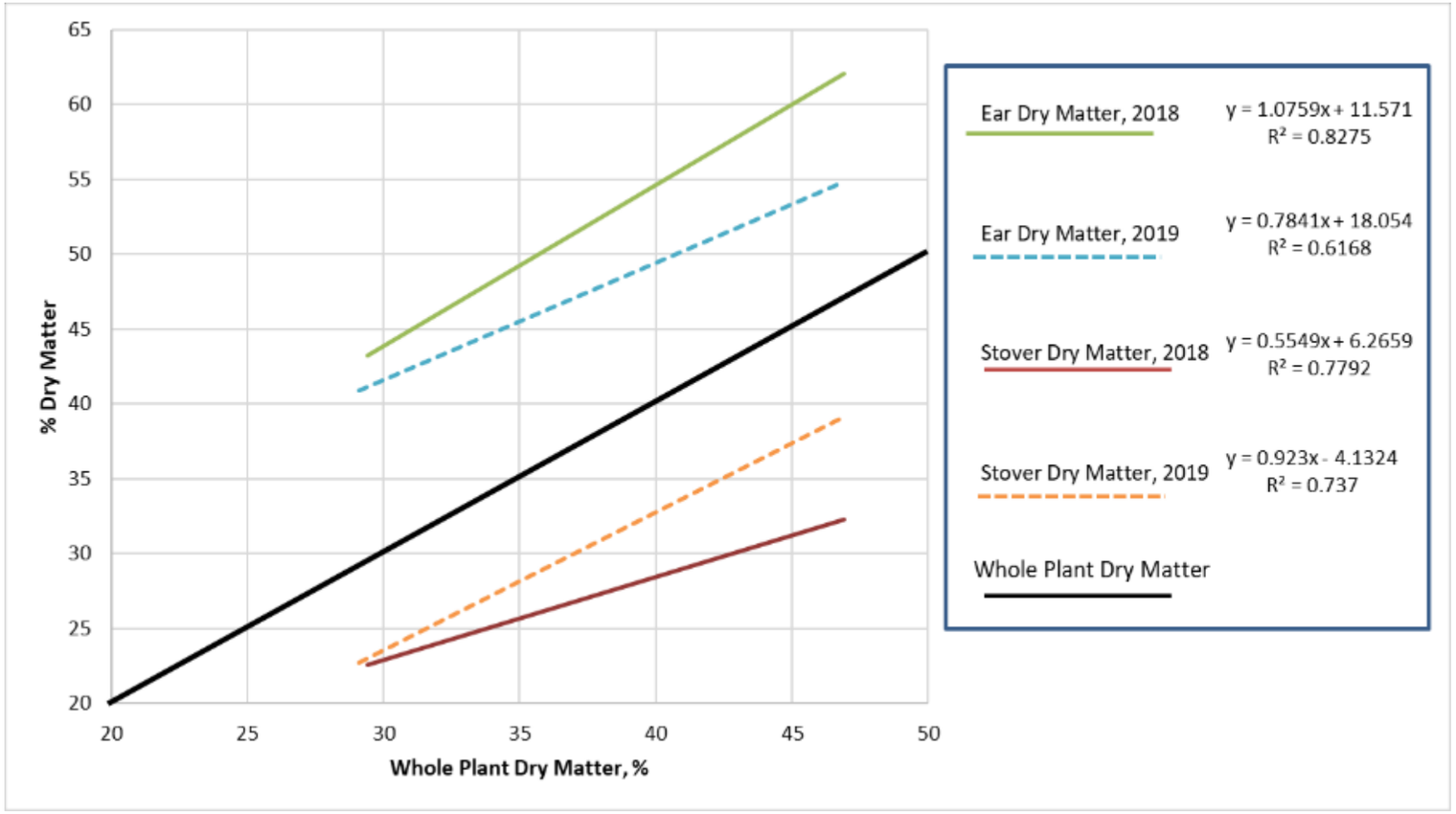
NY farm viability INSTITUTE

2018

- Season: warm
- Good conditions for dry down

2019

- Season: cool, late
- Dry down challenged



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Hybrid Characteristics & Processing Score

Corn Harvester Performance Study 2018/2019

NY farm viability INSTITUTE

How much do Hybrid Characteristics impact Corn Silage Processing Score?

Hybrid Code	Relative Maturity	Hybrid Description	Plant Height Rating	Average Ear to Stove Ratio, 100% DM
1	97	Dual	6 out of 9	1.44
2	98	Leafy	9 out of 9	1.14
3	91	Dual	4 out of 9	1.62
4	100	Leafy	9 out of 9	1.13

Characteristics of the four hybrids evaluated, as defined by the seed company, and measured by study (ear to stover ratio).

Hybrid Characteristics and Corn Silage Processing Score

Corn Harvester Performance Study 2018/2019

NY farm viability INSTITUTE

Corn Silage Processing Score	Starch - % of total on or below the 4.75 mm screen
Optimally Processed	> 70%
Adequately Processed	50 – 69%
Inadequately Processed	< 50%

	Unit Change	Resulting Change in CSPS, %
Ear to Stover Ratio, 100% DM	+ 0.10	+1.7
Ear DM, %	+1.0	- 0.78

Ear to Stover Ratio		Variation in Ear to Stover Ratio	Resulting Impact on CSPS, %
Within location		0.5 to 0.9	8 to 15
Between Locations	2018	0.2 to 0.9	3 to 15
	2019	0.6 to 0.9	10 to 15

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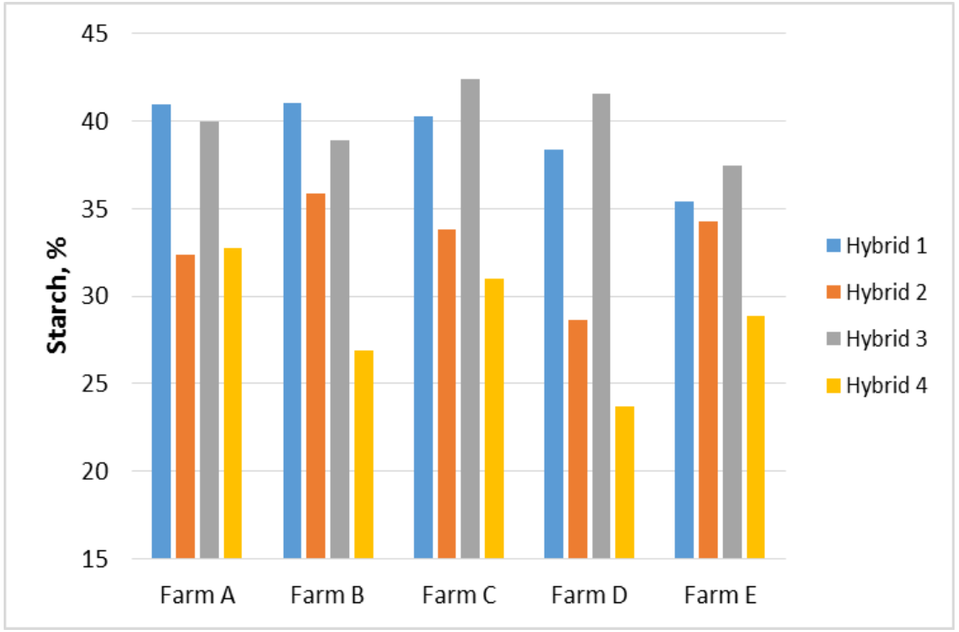
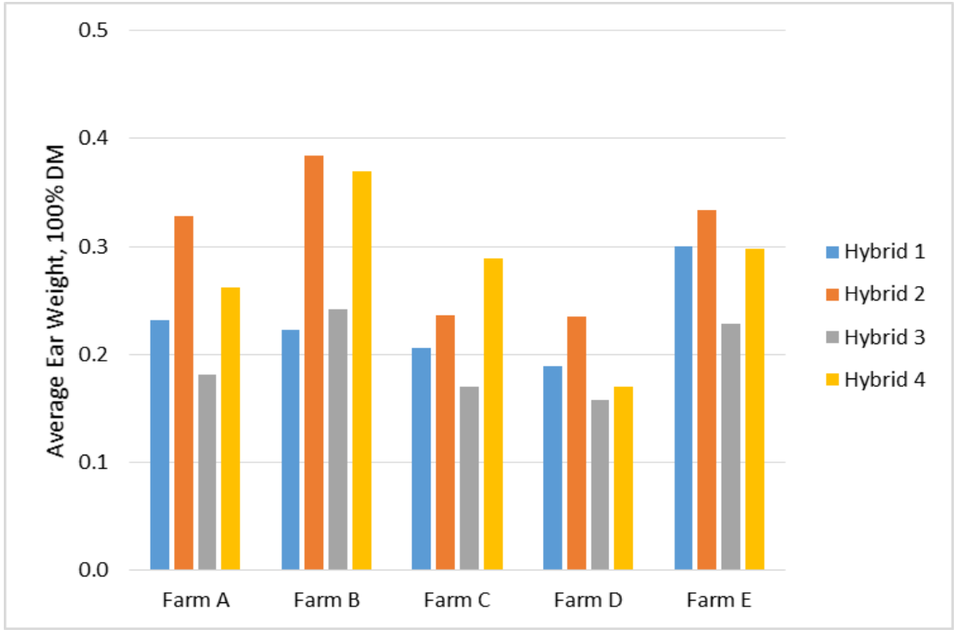
Starch Content

Corn Harvester Performance Study 2018/2019





Relationship between starch content and key plant characteristics at harvest.

	Ear weight, lbs (100% DM)	Whole Plant DM, %	Ear DM, %	Ear to Stover Ratio (100% DM)
R^2 Starch Content	0.242	0.417	0.366	0.687

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Starch D and Ensiling Time

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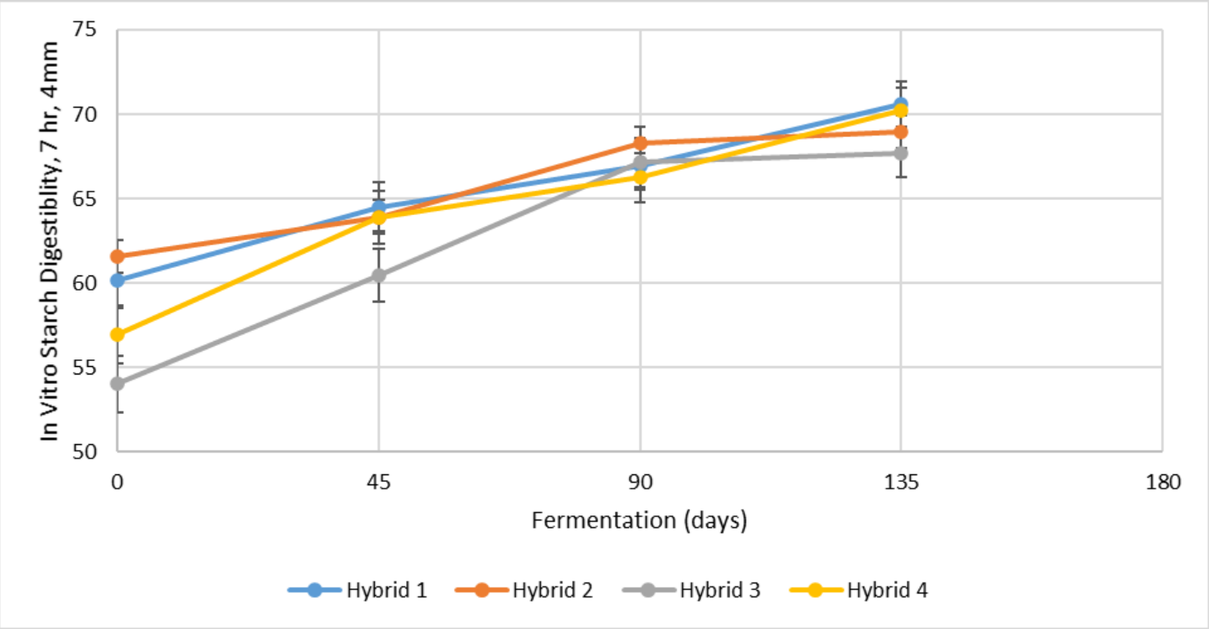

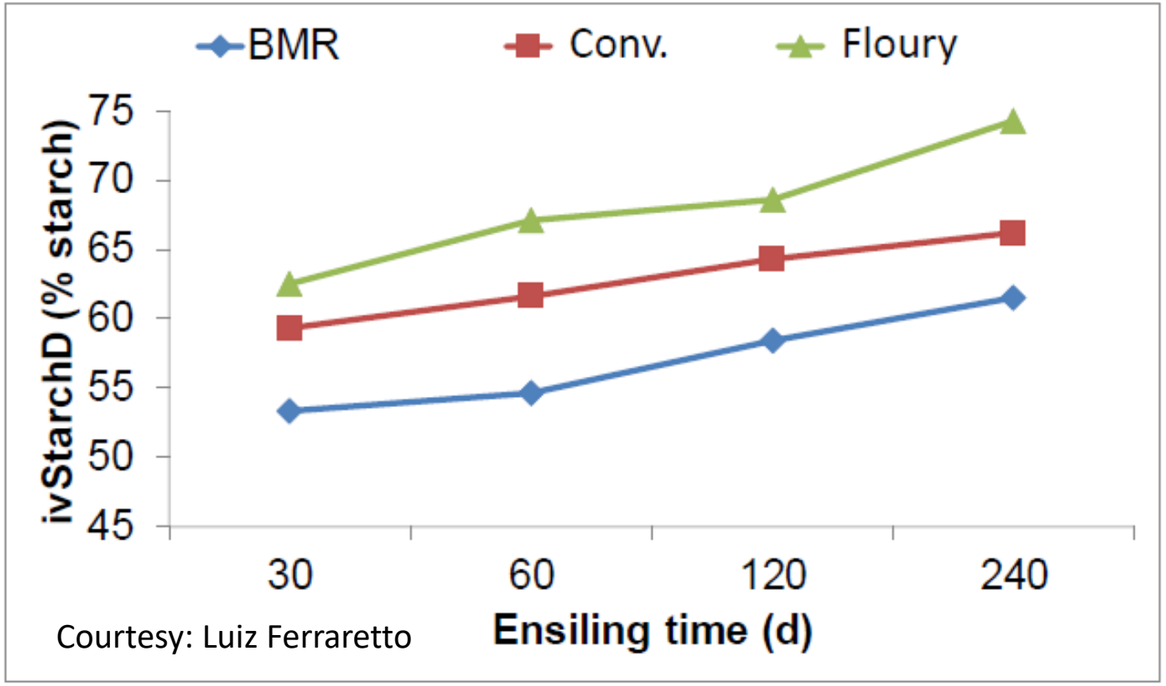

Courtesy: Luiz Ferraretto

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Does Processing Score Increase during Fermentation?

Corn Harvester Performance Study 2018/2019

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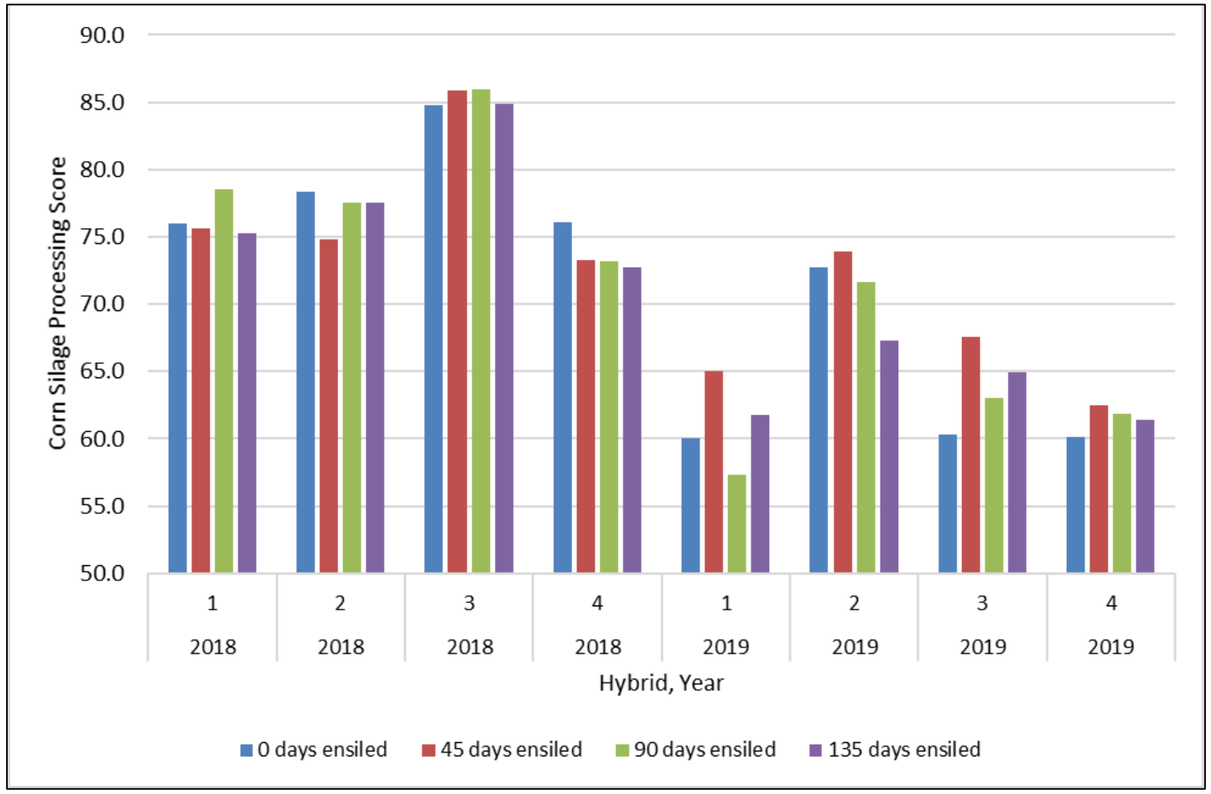
Time in the silo effect on corn silage processing score[1]

Storage length, days	0	30	120	240	P-value
Ferraretto et al., 2015 – trial 1	50.2	61.1	-	-	0.01
Ferraretto et al., 2015 – trial 2	60.3	63.6	67.2	68.4	0.08
Agarussi et al., 2020	28.8	-	28.8	-	0.97
Saylor et al., 2020	62.4	59.7	64.8	67.7	0.01

[1]Corn silage processing score - % of starch passing through the 4.75 mm sieve.

Table Courtesy: Luiz Ferraretto



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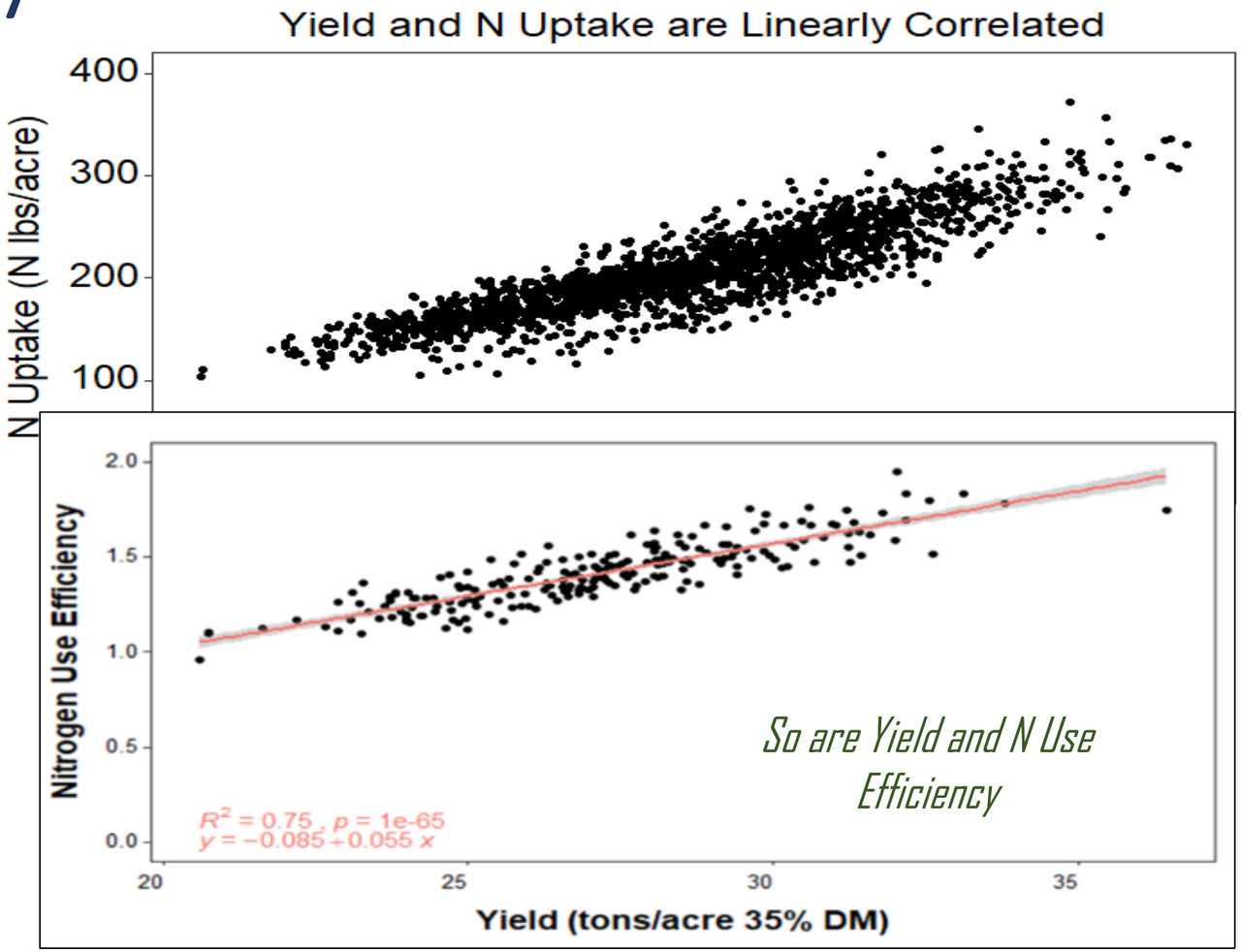
Corn N Use Efficiency

Use corn CP and yield to calculate N uptake

- **lb N uptake / lb of N available**
  - fertilizer and/or manure
  - soil N
  - sod N
- 2016 – 2018 – mine data
- 2019 & 2020
  - Track data
  - Corn Stalk Nitrate Test
- Work is on-going

Collaboration with Dr. Quirine Ketterings, Cornell



These initial results suggest that higher yielding crops are more efficient in N use than lower yielding crops.

Thank You!

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