Maine Corn Silage Hybrid Trial
2019 Results

Rick Kersbergen
207.342.5971
richard.kersbergen@maine.edu

Caragh Fitzgerald
207.622.7546
cfitzgerald@maine.edu

Location: Misty Meadows Farm, Clinton, Maine
Soil type: Woodbridge fine sandy loam
Planting date: June 3, 2019
Fertility: 10,000 gallons/acre liquid manure + 75 lbs/A N (sidedress)
Herbicide: Verdict pre-emergence, Spirit post-emergence
Plot size: 15' x 75'
Treatment arrangement: Randomized complete block design with 3 replications
Target planting density: 32,000 plants/acre
Harvest date: October 16, 2019. This was after a light frost (affected parts above 5') on September 19 and a killing frost on October 5.

Growing degree days: 1890 (86/50) (Climate Smart Farming)
Rainfall: 17.59 inches (NWS, Waterville, ME)

Harvest weights: Corn from each plot was chopped into a mixer wagon with scales.
Quality samples: Collected October 15, 2019. Three stalks per plot were randomly selected and chopped with a portable chipper. The chopped material was mixed, and a subsample was collected, frozen, and shipped for analysis (Cumberland Valley Analytical Services).

Data analysis: Analysis of variance was conducted using JMP. When a significant effect was found, linear regression analysis was conducted to see the effect of relative maturity on these parameters.

Results

Yield and Expected Milk Yield

Yields were corrected to a standard 30% dry matter. Forage digestibility and energy content were used to project potential milk yield (pounds of milk/ton of dry matter). Expected milk yield per acre was calculated by multiplying the potential milk per ton of dry matter by the tons of dry matter per acre. This serves as another measure of productivity of each hybrid. Both yield (30% DM) and expected milk yield results are shown in Table 1.

Average plot yield and milk yield were very low in 2019, with yield being the second lowest and milk yield being the lowest since the start of the replicated trials in 2007. Of course, the actual average will vary from year to year depending on the varieties submitted, but the low yields in 2019 are likely due to the late planting, overall low GDD, and early significant frost.

Analysis of variance showed that there were significant differences among the hybrids tested for both yield ($p=0.0395$) and expected milk yield ($p=0.0077$). In Table 1, hybrids followed by the same letter are statistically similar (Tukey's HSD). Although the overall analysis of variance of yield showed differences, it was not highly significant. The differences between individual pairs

were not large enough to be identified by mean separation with Tukey's HSD, which is why all hybrids are marked with the same letter.

There was a statistically significant linear correlation between relative maturity and yield (30% dry matter) ($p=0.0007$), but not between relative maturity and expected milk yield ($p=0.0005$). These relationships were weak, with r^2 of 1.1001 and 0.1055 for yield and expected milk yield, respectively.

Quality

Tables 1 and 2 lists select quality results for the 2019 trial.

Whole plant dry matter decreased as relative maturity increased. There was a significant linear effect with $p<0.0001$. At harvest time, most varieties were above optimum dry matter (Figure 1) due to a killing frost 11 days before harvest. Figure 2 displays the range of Neutral Detergent Fiber Digestibility (NDFD). The two varieties with the highest NDFD were BMR varieties and were significantly higher as expected. This year we have also reported uNDF to help further evaluate the digestibility of varieties.

One way to select high-performing hybrids is to identify those that have both high crop yield and high milk yield (estimated pounds of milk per ton of dry matter). Within an experiment, we can compare hybrids by looking at their relative yields. Relative yields can be calculated by dividing a hybrid's yield by the average yield of the whole experiment. Those hybrids with relative yields greater than 100% performed better than average, while those with relative yields less than 100% performed worse than average for the experiment. Figure 3 shows the relative crop yield and relative milk yield. Hybrids that yield better than average for both parameters are in the upper right quadrant of the graph. In 2019, the highest-performing hybrids were long-season hybrids (92+ days RM). They are also the ones that were at or close to optimum DM. Short-season hybrids were overly dry, in part due to the frost.

Discussion

This year had the second-lowest GDD since the replicated trials began in 2007, as shown in Table 3. Figure 4 shows the accumulation of growing degree days in comparison to averages. Rain was adequate overall, but it was not distributed evenly throughout the summer (Table 4). In all, yields in 2019 were lower than usual. Overall plot average yield was the second-lowest since 2007 and expected milk yield was the lowest since 2009, when this started being included in the trial (Figures 5 and 6). Plot yield averages will vary depending on the hybrids included each year, so individual hybrid comparisons are useful. Seven of this year's hybrids were also planted in 2018. Comparison of the yields of these hybrids in the past two years showed that 2019 yields (biomass and expected milk) were 15-35% lower than in 2018 (Figures 7 and 8).

We are usually able to harvest this plot before or immediately after a killing frost. A slow start to the season and a cool growing season meant that crops were not ready for harvest at the usual time before a frost. Field work was delayed due to wet weather as well. The plot received several light frosts (first on Sept. 19) affecting foliage higher than five feet above ground and a significant killing frost on October 5, 11 days before harvest. All of the hybrids were significantly drier at harvest due to frost, not necessarily due to plant maturity.

2019 proved challenging to farmers, with late planting, early frosts, and a wet harvest season. While the longer-season hybrids did provide higher yields in this year's trial, the quality of shorter-season hybrids would have provided higher quality feed if the plot had been harvested before significant frosts. The low GDD accumulation in 2019 emphasizes the need for farmers

to select hybrids that provide a wide variety of maturities to ensure the ability to produce the best quality feed for high milk production, adequate fermentation, and high intake potential.

Shorter season hybrids offer options for improved cover crop establishment and the potential for double cropping. Although they may be slightly less productive in some growing seasons, this additional crop flexibility can significantly improve the total yield of digestible nutrients per acre. There is risk associated with choosing longer season hybrids for higher yield. Yield responses to longer maturity was greatest in the highest growing degree years, and it tended to be lower or not present under average growing conditions. By choosing short-season or mid-season varieties, producers help to guarantee a level of maturity and dry matter that produces quality corn silage that ferments well in the silo. They become less vulnerable to late wet harvest years. This also opens the door for improved nutrient and soil management options such as cover cropping.

ACKNOWLEDGEMENTS
We would like to thank John Stoughton and the farm crew at Misty Meadows Farm for their help with planting, crop management, and harvest. We also thank Barney Wright and the Wright Place farm crew for lending a planter in the spring and a weigh wagon and driver for harvest time. Thanks are also extended to the seed dealers who helped with seed donation, planting, and harvesting and to staff and students who helped in the field and in the office.

Table 1. Yield and estimated milk yield, 2019 Maine corn silage hybrid trial.

Variety Number	Hybrid name	RM	Yield (tons/acre at 30% DM)*		Relative Yield**	Milk Yield (lbs/ton DM)*, ***		Relative Milk	Estimated Milk (lbs/acre)*		Dry Matter (%)*	
1	Dyna-Gro D25RR66	85	19.4	a	94%	2823	ab	98%	16522	a	33.2	b-e
2	Dyna-Gro 8331XP	87	16.8	a	81%	2932	ab	102%	14734	a	35.1	b-e
3	Dyna-Gro 9212XP	87	19.8	a	96%	2821	ab	98%	16599	a	35.3	b-e
4	Dyna-Gro D33QZ23	93	22.7	a	110%	2765	ab	96%	19067	a	31.5	cde
5	Dyna-Gro D32SS56	92	22.2	a	107%	2999	ab	104%	19905	a	35.2	a-e
6	Seedway SW2840GENVT2P	87	19.3	a	93%	2925	ab	102%	16960	a	38.2	a-e
7	Seedway SW3110GENSS(RIB)	90	21.4	a	103%	2888	ab	100%	18403	a	33.9	b-e
8	Seedway SW3600GENSS(RIB)	92	22.3	a	108%	2925	ab	102%	19596	a	31.4	cde
9	Seedway SW 3914L RR	98	22.0	a	106%	2703	ab	94%	17889	a	29.6	de
10	Seedway SW3768GENSS(RIB)	95	23.7	a	114%	3132	ab	109%	22277	a	37.4	a-e
11	Schlessman SX856 GT3011	85	19.4	a	94%	2850	ab	99%	16530	a	41.9	abc
12	Schlessman SX908 GT5222 RIB	90	20.8	a	100%	2868	ab	100%	17919	a	29.7	de
13	Channel 179-12 VT2PRIB	79	19.4	a	94%	2781	ab	97%	16155	a	40.9	a-d
14	Channel 181-11 VT2PRIB	81	17.7	a	86%	3244	ab	113%	17203	a	33.0	b-e
15	Channel 182-09 VT2PRIB	82	22.1	a	107%	2772	ab	96%	18368	a	43.6	ab
16	Channel 185-15 VT2PRIB	85	21.1	a	102%	2770	ab	96%	17507	a	40.6	a-d
17	Channel 185-30 VT2PRIB	85	20.3	a	98%	2512	b	87%	15250	a	41.8	abc
18	Channel 187-49 VT2PRIB	87	20.3	a	98%	2915	ab	101%	17685	a	39.0	a-e
19	Channel 189-03 VT2PRIB	89	21.7	a	105%	2627	ab	91%	17002	a	37.5	a-e
20	Mycogen MY 79C56	79	19.4	a	94%	2796	ab	97%	16230	a	40.4	a-d
21	Mycogen TMF 83Y26	83	20.4	a	99%	2816	ab	98%	17180	a	36.7	a-e
22	Mycogen TMF 2Q410	96	22.1	a	106%	2806	ab	97%	18565	a	31.8	cde
23	Mycogen BMR97B37RA	97	20.2	a	97%	3309	a	115%	19998	a	28.6	e
24	Mycogen BMR 90B17	90	18.5	a	89%	3006	ab	104%	16587	a	39.2	a-e
25	Master's Choice MCT 3891	88	19.1	a	92%	2548	ab	89%	14579	a	38.6	a-e
26	Master's Choice MCT 3393	83	20.1	a	97%	2601	ab	90%	15591	a	43.8	ab
27	Master's Choice MCT 4572	95	20.5	a	99%	3274	a	114%	20154	a	32.9	b-e
28	Red Tail RT 49T61	99	19.6	a	94%	3113	ab	108%	18258	a	33.8	b-e
29	Red Tail RT 51T51	101	20.1	a	97%	3001	ab	104%	18158	a	30.8	cde
30	DynaGro DGVC77	75	18.8	a	91%	2627	ab	91%	14825	a	47.8	a
31	DeKalb DK4480	94	20.1	a	97%	2799	ab	97%	16972	a	30.2	de
32	DeKalb DK4755	97	23.7	a	115%	3129	ab	109%	22317	a	32.4	b-e
33	DeKalb DK4857	98	22.3	a	108%	2824	ab	98%	18773	a	35.3	b-e
34	DeKalb DK4747	97	21.4	a	103%	2882	ab	100%	18738	a	31.9	cde
35	NK NK8881	88	21.3	a	103%	2906	ab	101%	18561	a	38.2	a-e
36	NK NK9175	91	19.7	a	95%	2935	ab	102%	17350	a	33.5	b-e
37	NK NK9227	92	23.3	a	112%	3056	ab	106%	21289	a	33.4	b-e
38	MycogenTMF011R87SX	101	23.1	a	112%	2906	ab	101%	20378	a	29.7	de
39	Mycogen 8528AM	85	21.8	a	105%	2678	ab	93%	17433	a	41.5	a-e
		Plot mean	20.7			2879			17885		35.9	

*Means followed by the same letter are not statistically different (Tukey's HSD).

**Relative yield is (hybrid yield / mean plot yield) x 100.

***Expected milk yield is calculated by multiplying the dry matter yield by the calculated milk lbs/ton. Calculated milk lbs/ton is a projection of potential milk yield per ton of forage dry matter, based on forage digestibility and energy content.

Table 2. Select quality results, 2019 Maine corn silage hybrid trial.

Variety Number	Hybrid name	RM	Crude Protein (%DM)	ADF (%DM)	NDF (%DM)	aNDFom (%DM)	Starch (%DM)	Net Energy Lactation (Mcal/lb)	NDF Dig. (30hr) (%NDF)	uNDF Dig. (240hr) (%NDF)
1	Dyna-Gro D25RR66	85	7.63	26.57	44.53	43.87	32.97	0.70	52.73	31.77
2	Dyna-Gro 8331XP	87	7.37	26.63	45.10	44.47	32.97	0.71	53.93	33.17
3	Dyna-Gro 9212XP	87	7.77	26.53	44.20	43.53	32.93	0.71	50.67	34.90
4	Dyna-Gro D33QZ23	93	8.13	26.60	44.70	44.03	29.33	0.71	52.80	31.73
5	Dyna-Gro D32SS56	92	7.27	24.95	43.38	42.74	35.22	0.73	54.40	29.13
6	Seedway SW2840GENVT2P	87	7.54	23.22	39.61	39.00	37.67	0.74	52.79	33.62
7	Seedway SW3110GENSS(RIB)	90	7.53	27.23	45.57	44.90	31.30	0.70	53.53	34.03
8	Seedway SW3600GENSS(RIB)	92	7.37	26.70	44.20	43.53	33.20	0.70	50.30	33.57
9	Seedway SW 3914L RR	98	8.07	30.10	49.93	49.20	26.53	0.68	50.53	36.93
10	Seedway SW3768GENSS(RIB)	95	7.07	20.70	36.50	35.93	42.77	0.76	54.60	29.53
11	Schlessman SX856 GT3011	85	6.97	21.00	37.27	36.70	42.73	0.76	53.53	32.10
12	Schlessman SX908 GT5222 RIB	90	7.87	27.63	45.27	44.60	30.53	0.69	48.87	37.27
13	Channel 179-12 VT2PRIB	79	7.67	22.93	40.10	39.50	38.53	0.74	53.20	32.73
14	Channel 181-11 VT2PRIB	81	7.89	21.53	37.16	36.56	40.31	0.75	54.06	31.31
15	Channel 182-09 VT2PRIB	82	7.67	20.50	35.43	34.93	43.67	0.76	54.57	30.93
16	Channel 185-15 VT2PRIB	85	7.07	22.30	38.07	37.50	40.90	0.74	50.83	32.47
17	Channel 185-30 VT2PRIB	85	7.33	25.27	42.93	42.30	36.93	0.72	50.87	34.77
18	Channel 187-49 VT2PRIB	87	7.63	21.53	37.20	36.60	41.30	0.75	51.77	30.83
19	Channel 189-03 VT2PRIB	89	7.23	27.53	46.17	45.43	32.50	0.71	51.07	34.27
20	Mycogen MY 79C56	79	7.63	22.97	39.67	39.03	39.03	0.73	52.53	32.23
21	Mycogen TMF 83Y26	83	7.34	25.92	42.51	41.90	34.07	0.71	51.39	34.32
22	Mycogen TMF 2Q410	96	7.83	29.43	48.10	47.37	29.90	0.68	52.13	33.13
23	Mycogen BMR97B37RA	97	8.00	26.10	44.63	43.97	28.83	0.73	65.33	22.07
24	Mycogen BMR 90B17	90	8.17	26.83	47.10	46.40	29.90	0.75	68.70	17.86
25	Master's Choice MCT 3891	88	7.17	28.80	48.43	47.69	30.67	0.69	50.50	36.03
26	Master's Choice MCT 3393	83	7.60	24.33	42.97	42.30	36.90	0.72	54.30	31.43
27	Master's Choice MCT 4572	95	7.83	23.07	39.63	39.03	36.23	0.74	54.60	32.60
28	Red Tail RT 49T61	99	7.53	24.10	41.50	40.93	35.73	0.74	56.63	28.87
29	Red Tail RT 51T51	101	8.17	26.57	44.60	43.93	30.27	0.72	53.43	33.13
30	DynaGro DGVC77	75	8.40	22.07	39.47	38.90	38.83	0.74	54.07	36.03
31	DeKalb DK4480	94	7.87	27.50	45.57	44.90	25.57	0.73	52.73	33.47
32	DeKalb DK4755	97	7.33	24.17	41.40	40.77	35.53	0.73	53.87	32.17
33	DeKalb DK4857	98	7.87	26.73	45.57	44.90	33.00	0.72	55.23	31.40
34	DeKalb DK4747	97	7.80	26.43	43.97	43.33	32.50	0.72	52.00	34.10
35	NK NK8881	88	7.50	23.73	40.93	40.30	37.03	0.73	53.97	32.77
36	NK NK9175	91	7.50	25.93	42.57	41.90	35.03	0.72	49.30	36.27
37	NK NK9227	92	8.03	25.00	42.70	42.07	33.67	0.72	54.57	31.40
38	MycogenTMF011R87SX	101	7.70	29.50	48.73	48.00	26.87	0.68	55.00	33.60
39	Mycogen 8528AM	85	7.39	22.07	36.31	35.75	41.47	0.75	48.69	35.37
		Plot mean	7.63	25.15	42.66	42.02	34.70	0.72	53.44	32.39

Table 3. Growing degree days, and increase in yield (30% dry matter) and expected milk yield for each 10 days increase in relative maturity as estimated by linear regression, Maine corn silage hybrid trial, 2007-2019.

	Location	Growing degree days (86/50)	Tons/acre yield (30% DM) increase per 10 days maturity	Pounds/acre milk yield increase per 10 days maturity
2007	Clinton	2086	1.1	Not calculated
2008	Clinton	1840	0.97	Not calculated
2009	Leeds	1908	No relationship	91
2010	Leeds	2120	1.9	2890
2011	Clinton	2287	2	3280
2012	Clinton	2160	1.1	1480
2013	Clinton	2027	No relationship	No relationship
2014	Clinton	1933	No relationship	No relationship
2015	Clinton	2347	1.08	2790
2016	Clinton	2082	Not calculated	Not calculated
2017	Clinton	2035	1.7	85
2018	Cinton	2004	0.62	No relationship
2019	Clinton	1890	1.2	132
	AVERAGE	**2055**	**1.30**	**1535**

Table 4. Monthly rainfall, Waterville, Maine, 2019 (National Weather Service)

Month	**Rain (inches)**
June (after planting)	4.4
July	2.84
August	4.9
September	3.26
October (before harvest)	2.19
Total	**17.59**

Figure 1. Effect of Relative Maturity on Dry Matter (2019)

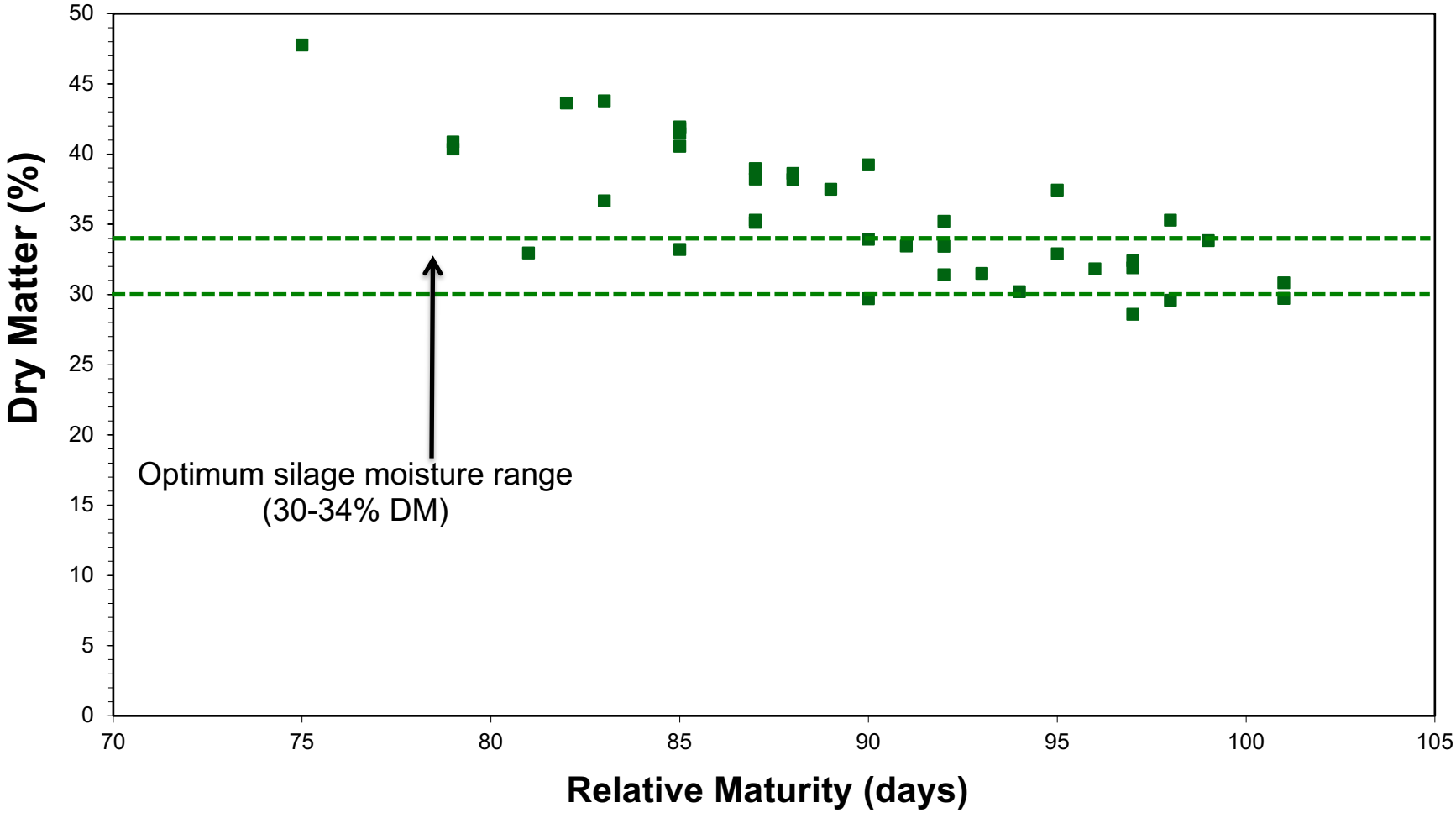


Figure 2. Distribution of NDFD (30hr), % NDF (2019)

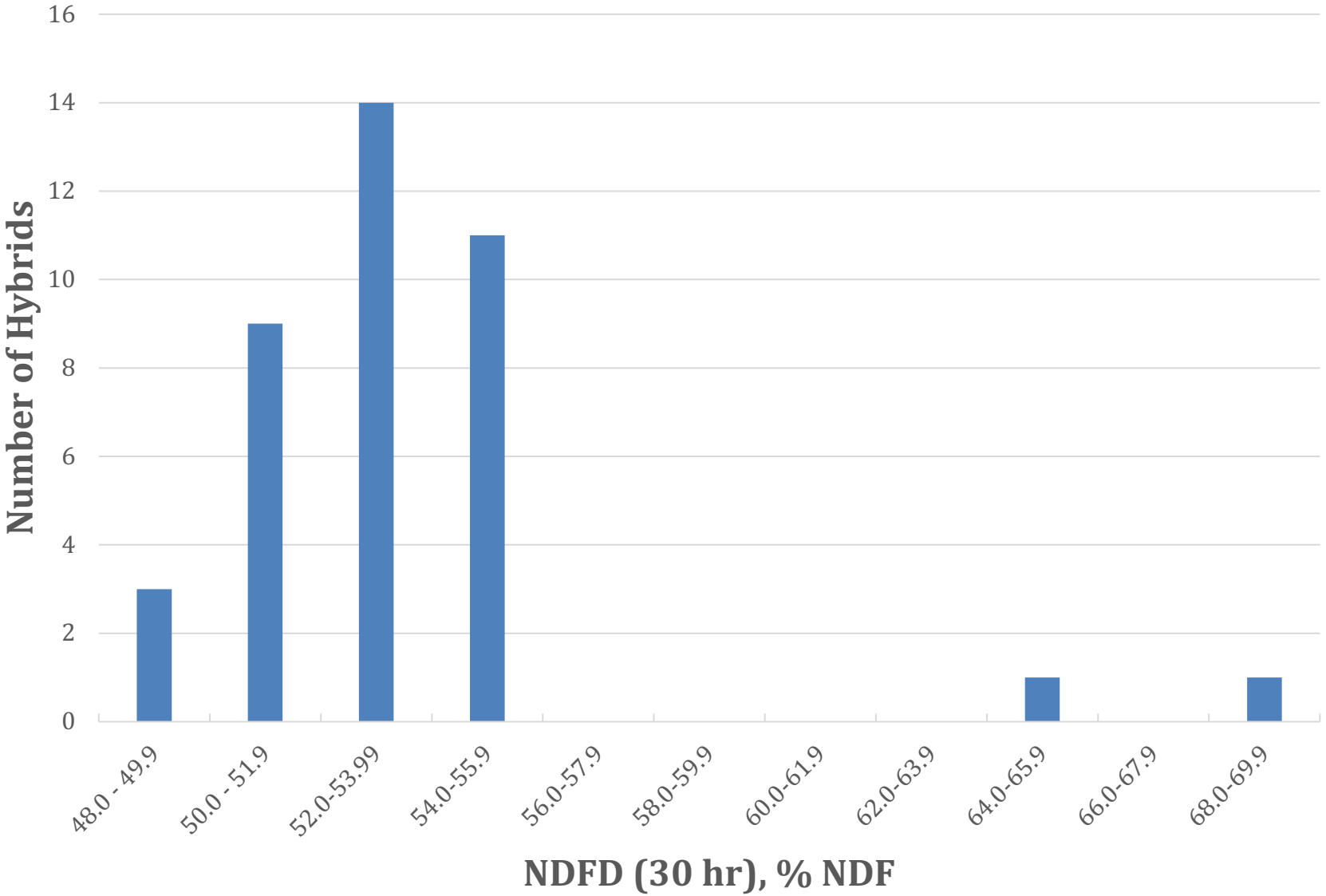


Figure 3. Relative Yield and Quality, 2019

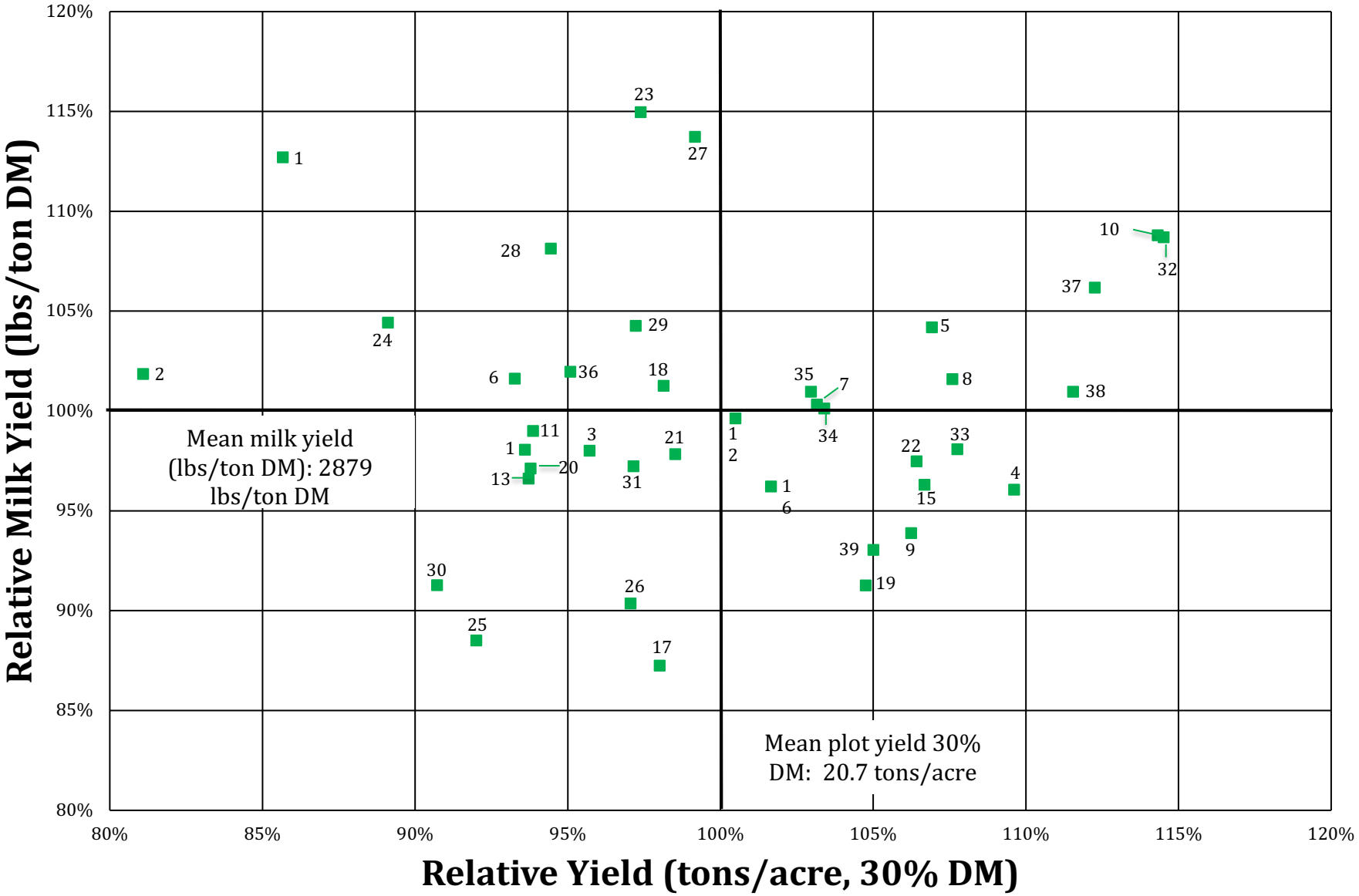


Figure 4. Accumulation of growing degree days, 2019 (86/50). (Climate Smart Farming)

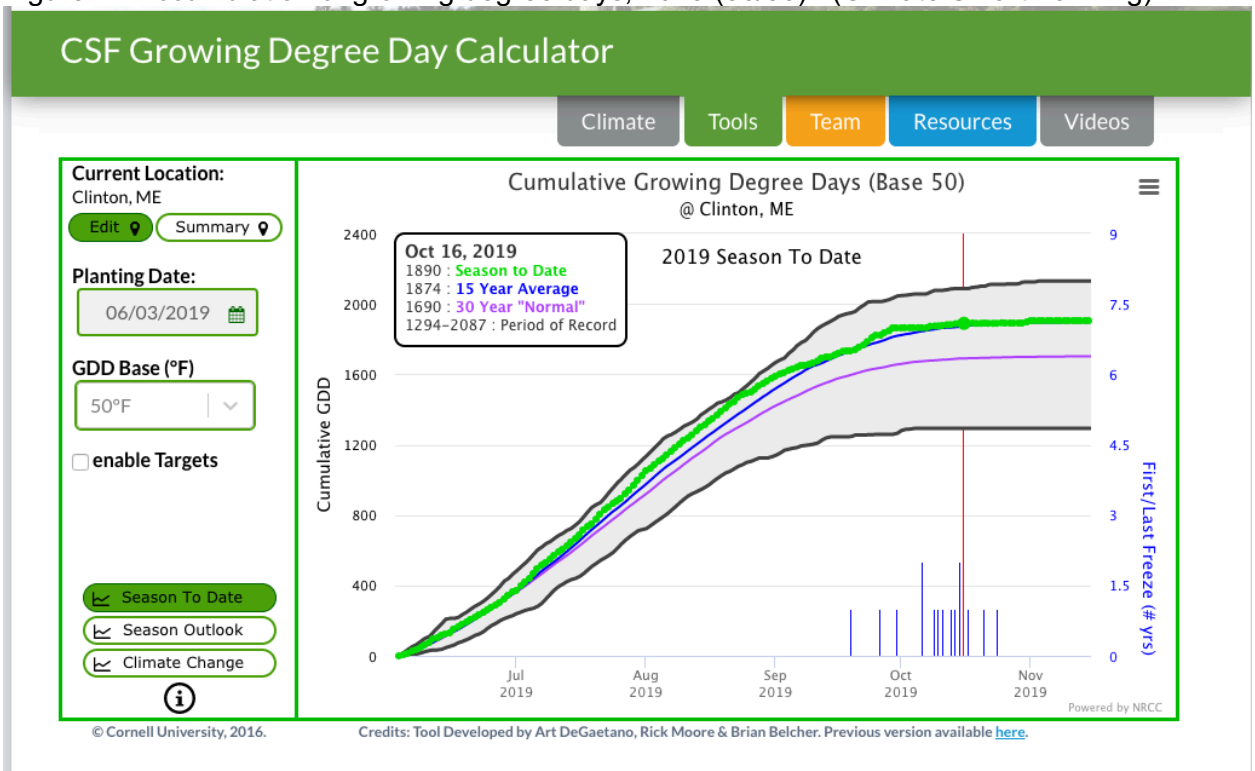


Figure 5. Annual Average Yield, tons/acre (30% DM), 2007 - 2019

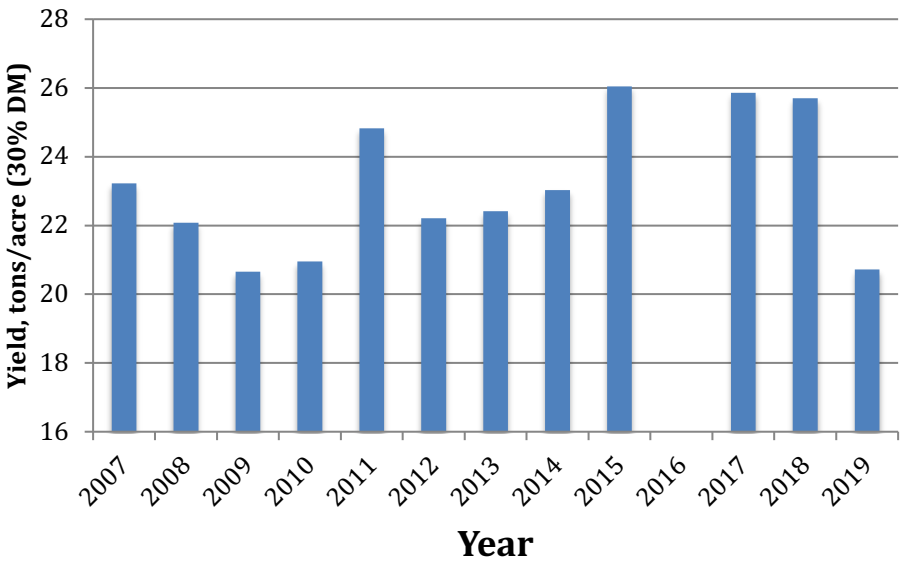
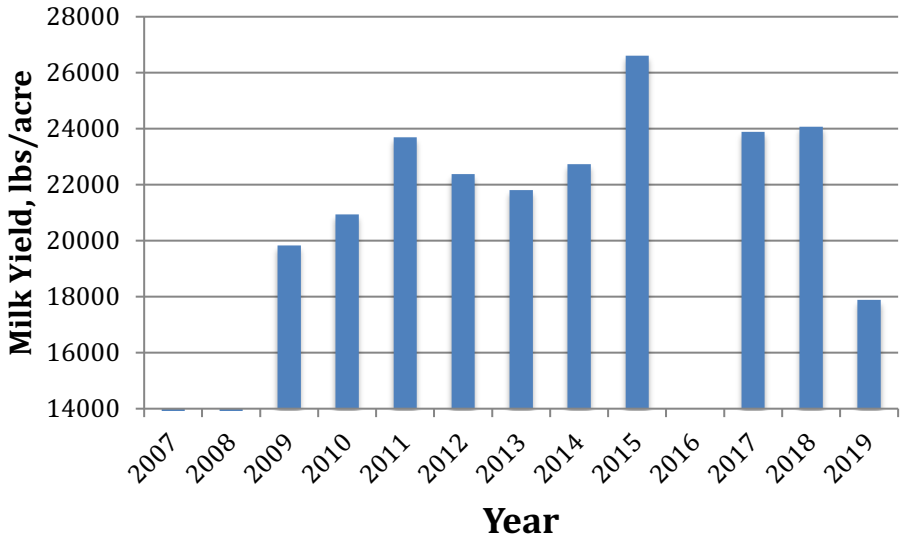
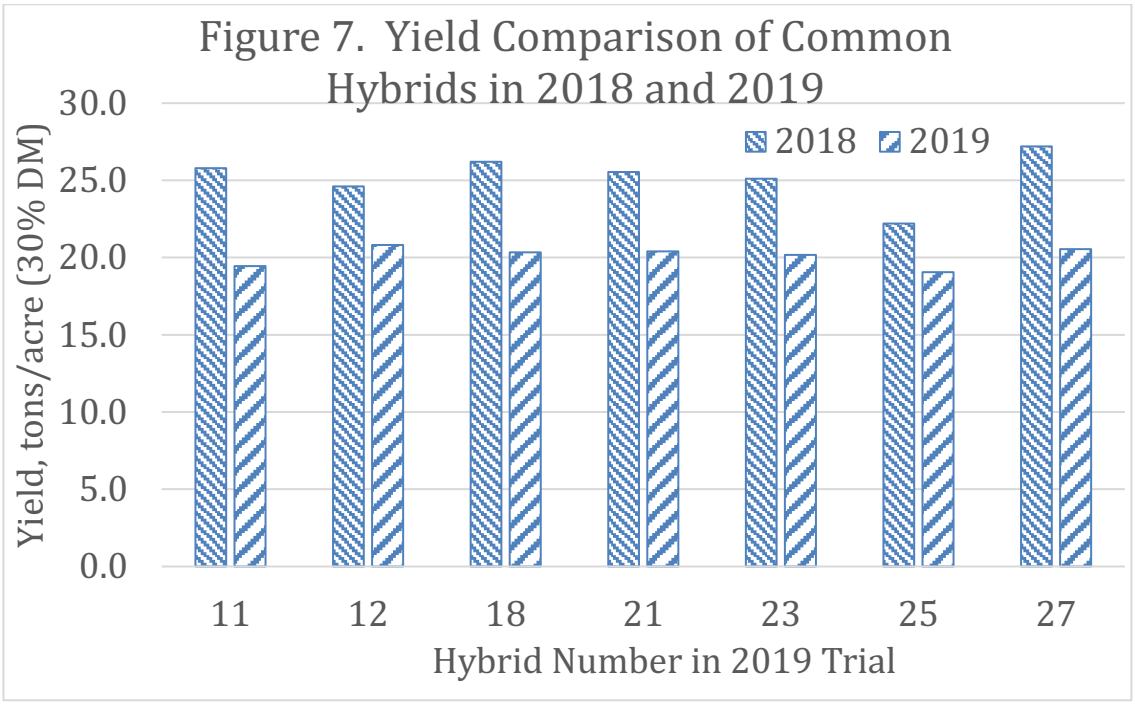


Figure 6. Annual Average Estimated Milk Yield, lbs/acre, 2007-2019





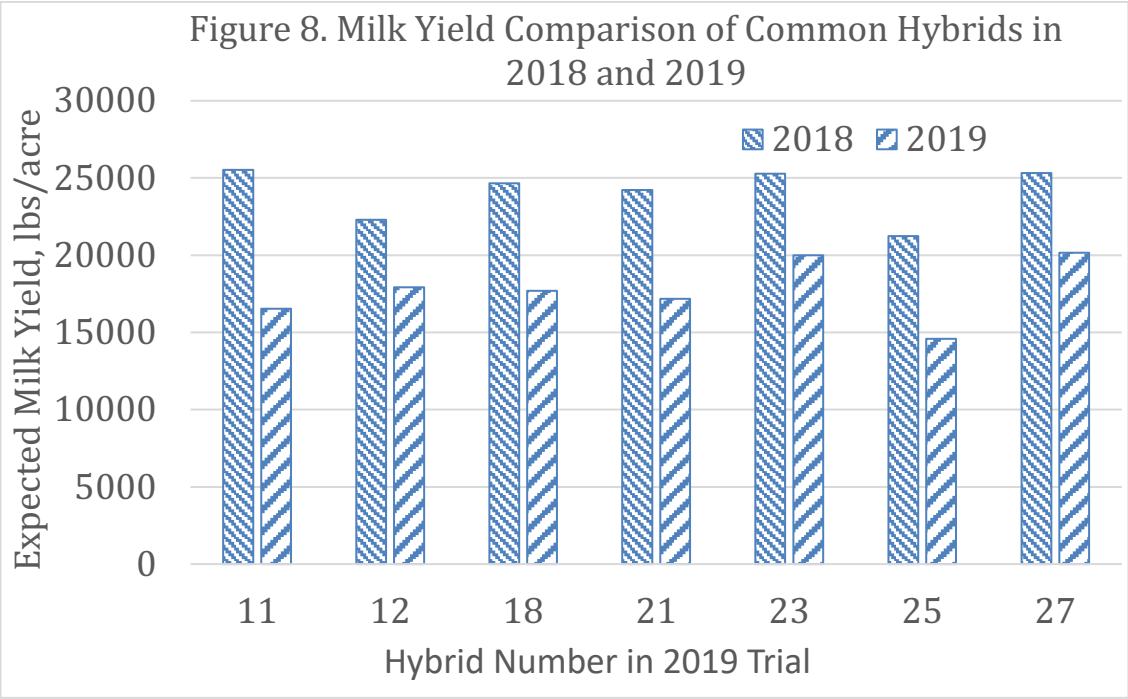


Figure 8. Milk Yield Comparison of Common Hybrids in 2018 and 2019
Expected Milk Yield, lbs/acre
30000
25000
20000
15000
10000
5000
0
2018
2019
11
12
18
21
23
25
27
Hybrid Number in 2019 Trial

Contacts for corn hybrids in 2019 trial												
Company	**Contact**	**Phone**	Email	Channel	DeKalb	Dynagro	Master's Choice	Mycogen	NK	Red Tail	Schlessman	Seedway
Seed Solutions Inc.	Matt Blodget	207.768.1711	matthewblodget@gmail.com	x								
Nutrien Ag Solutions (Office: 207.764.1860)	Brian McCleary	207.740.1911 (M)	brian.mccleary@nutrien.com		x	x		x	x			
	Franklin Leavitt	207.944.1922 (M)	frank.leavitt@nutrien.com		x	x		x	x			
	Randy Drown	207.650.0310 (M)	randy.drown@nutrien.com		x	x		x	x			
	Todd Winslow	207.551.6806 (M)	todd.winslow@nutrien.com		x	x		x	x			
Fedco Seeds	Alice Percy	207.426.8247	alice@fedcoseeds.com				x			x		
Gold Star Feed and Grain, LLC	Michele Bennett	207.754.0764	mbennett@goldstarfeed.com						x		x	x
	Emilee Robertson	207.399.6755	erobertson@goldstarfeed.com						x		x	x
	Andy Dugan	315.841.4167	adugan@goldstarfeed.com								x	
	R. Keith Hines	207.717.9558 (M)	hinesclan@reagan.com				x					
	Warren Hood	207.754.1853 (M)	hoodlah@aol.com					x				
Kent Nutrition Group	Nick Richardson	207.317.0469	nicholas.richardson@kentww.com								x	
King's Agriseeds, Inc.	Rod Porter	607.227.0836	rodporter@kingsagriseeds.com				x			x		
Master's Choice	Kyle Vosburgh	618.697.7031	kyle@seedcorn.com				x					
	Nick Michaud	207.649.9786	michaudfarm@gmail.com					x				
Mycogen	Claude Fortin, area mgr	802.363.2803	claudefortin@comcast.net					x				
Northeast Agricultural Sales (Office: 800.462.7672)	Justin Choiniere	802.535.9938 (M)	justin@neag.net		x				x			x
	Paul Peters	207.441.6250 (M)	pumpkinpaul1@aol.com		x				x			x
Paris Farmers Union	Jennifer Bailey	207.744.5598	jenb@parisfarmersunion.net				x					
	Tim Donovan	207.744.5602	timdonovan.pfu@gmail.com				x					
R.E. Belanger & Son	Rick Belanger	207.576.5845	veggiefarmerinme@roadrunner.com						x			
Seedway	Taylor Putnam, area mgr	207.703.3046	putnam.taylor@gmail.com						x			x
Syngenta/NK	Brendan Evans	607.302.0646	Brendan.evans@syngenta.com						x			