Hudson Valley
Small Grains Project
Preliminary Research Summary
2014-2018

OVERVIEW

The Hudson Valley Small Grains Project is a partnership among 11 organizations to research and test varieties of wheat, barley, rye, and oats that are adapted to the Hudson Valley climate and have the qualities end users are seeking. The project began in 2014 at the Hudson Valley Farm Hub, a 1,255 acre research and educational farm in Hurley, New York dedicated to ecologically sound farming practices and a more equitable local economy. This small grains research project has continued for the past five years and has included 100 varieties in small plot trials, as well as larger grow-outs of 12 select varieties that have undergone milling, baking, malting, brewing, and distilling trials. The research results below summarize our lessons learned thus far.

RESEARCH DESIGN

In order to support development of a foundation for a viable local small grains economy, a five-year project was undertaken at the Hudson Valley Farm Hub, in collaboration with Cornell University and Cornell Cooperative Extension of Ulster County (CCEUC), to select varieties of small grains suitable to the Hudson Valley region and emerging market needs. The project consisted of trialing 100 varieties of spring and winter grains in small plots over five growing seasons and 12 select varieties in large ("field-scale") plots of 1.5 acres each over three growing seasons. The varieties included in the trial were chosen by the research team at Cornell University and were sourced by them from various sources, including commercial seed companies and other universities.

All trials had paired plots under both organic management and conventional integrated pest management (IPM) to compare the effects of difference methods. The organically managed plots were not third party certified, but used methods and inputs that a certified organic farmer would use. The chief differences between the management systems were use of herbicide and fungicide applications and synthetic nitrogen topdress (on hard wheats only) used in the conventional system. Base fertility differences were limited due to use of legumes as a previous crop and poultry manure to supplement micronutrient deficiencies in both systems.

The selected varieties grown in the field-scale trials, based upon desirable yield and disease resistance from the small plots, as well as end-user feedback from previous years, were then trialed by several local partnering bakers, maltsters, brewers, and distillers for market quality assessments. The small-plot trials were primarily overseen by Cornell University while the field-scale and end-use trials were overseen by the Hudson Valley Farm Hub and CCEUC.

Rotational cover crops, soft and medium red clover, were planted in 2015 and 2016 in preparation for the grain trials at the Hudson Valley Farm Hub. Several of these rotational crops did not perform as hoped and their ratio was reformulated to approximate the goals for preparing the field for the 2017 grain trials. In late September 2016, the 2017 winter grain trials were successfully established and spring grain trials successfully established in April of 2017. The red clover cover crop mixture again did not perform as hoped, boosting nitrogen rates for

the 2017 grains which, coupled with the spring and early summer rains, led to increased lodging throughout all the field scale plots.

The field scale grow-outs of select varieties has shown that grains grown under organic management can have comparable disease resistance. Similarly, both organically and conventionally managed grain varieties produced comparable results in the end-use trials. Tom wheat was shown to be a desirable grain in the baking trials and produced a high-quality product, while Warthog and Fulcaster were found to be more bitter in taste under both organic and conventionally managed scenarios, resulting in a less desirable product.

RESULTS FROM THE FIELD

The small plot variety trials were conducted at the Hudson Valley Farm Hub, in partnership with CCE Ulster County and Cornell University for five seasons, from 2014 through 2018. Each year until 2018, the trials were conducted under both conventional and organic management. In general, the ranking of the varieties was similar for both management conditions, so the summary descriptions apply to both. Below are the results from each year, as well as some overall findings across years.

2014 Small Plot Results

Spring Malting Barley

In general, the six row varieties, Lacey and Quest, had the highest yield, test weight and best agronomic traits. However, maltsters and brewers prefer two row types. Of the two row types, AAC Synergy was the best overall, followed by Cerveza. KWS Thessa and Genie yielded poorly. Herta is a long-term check.

Spring Wheat

Among the hard red spring wheat varieties tested, Tom, Glenn, and Sabin had good yields, test weight and lodging resistance. The heritage variety, Red Fife was consistently low yielding and was susceptible to lodging. The spelt variety CDC Zorba had the highest yield and Lucille emmer had the lowest.

2014 Hudson Valley Spring Malting Barley and Spring Wheat Summary - Cornell

Spring Malting Barley

		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Herta	1712	5	2161	5	1936	5	51.2	53.9	52.6	7.3	7.7	7.5	6/25	6/24	6/24
2	Conlon	1501	8	2030	7	1765	7	53.7	53.7	53.7	8.0	7.7	7.8	6/24	6/24	6/24
3	Genie	243	10	589	9	416	10	-	47.6	47.6	7.7	5.7	6.7	7/2	6/28	6/30
4	M152	2959	1	2886	2	2923	2	56.2	57.7	56.9	3.3	3.3	3.3	6/23	6/22	6/23
5	Lacey	2871	2	3128	1	2999	1	56.1	59.6	57.9	2.0	3.0	2.5	6/23	6/22	6/23
6	Quest	2516	3	2771	3	2643	3	56.3	58.3	57.3	7.3	5.7	6.5	6/22	6/22	6/22
7	KWS Thessa	383	9	504	10	443.7	9	-	-	-	8.7	7.3	8.0	6/27	6/26	6/26
8	Cerveza	1642	6	2048	6	1845	6	48.1	51.0	49.5	6.0	3.7	4.8	6/29	6/25	6/27
9	Newdale	1502	7	1639	8	1571	8	48.7	50.6	49.7	5.3	5.0	5.2	6/28	6/25	6/26
10	AAC Synergy	1898	4	2245	4	2071	4	46.6	49.4	48.0	5.3	4.3	4.8	6/26	6/25	6/25
	Mean	1723		2000		1861		52.1	53.5	52.6	6.1	5.3	5.7	6/26	6/24	6/25
	CV	11.2		13.7												

Spring Wheat

		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Stoa	1908	5	2019	8	1964	8	69.9	70.8	70.4	1.3	1.3	1.3	6/21	6/19	6/20
2	Red Fife	1905	6	2054	6	1979	6	71.2	70.0	70.6	4.7	5.7	5.2	6/21	6/20	6/21
3	RB07	2101	2	2218	3	2159	3	71.6	72.0	71.8	1.0	1.3	1.2	6/20	6/19	6/19
4	Tom	1962	3	2040	7	2001	5	72.5	71.6	72.1	1.7	1.0	1.3	6/21	6/18	6/20
5	MN06078W	1747	8	2182	4	1965	7	69.6	71.3	70.4	1.3	1.7	1.5	6/19	6/19	6/19
6	Rollag	1741	9	1860	9	1801	9	73.8	73.8	73.8	1.0	1.0	1.0	6/20	6/19	6/19
7	Sabin	1874	7	2532	2	2203	2	70.5	72.5	71.5	1.3	1.3	1.3	6/22	6/20	6/21
8	Glenn	1941	4	2073	5	2007	4	75.2	74.5	74.9	1.0	1.0	1.0	6/19	6/18	6/18
9	Lucille (Emmer)	1267	10	1723	10	1495	10	38.0	38.9	38.4	6.3	7.0	6.7	6/27	6/24	6/25
10	CDC Zorba (Spelt)	3035	1	2789	1	2912	1	34.2	36.2	35.2	2.7	3.3	3.0	6/28	6/28	6/28
	Mean	1948		2149		2049		64.7	65.1	64.9	2.2	2.5	2.4	6/22	6/20	6/22
	CV	8.5		4.5												

M. E. Sorrells, D. Benscher, and J. Shiffer - Department of Plant Breeding & Genetics - Cornell University

2015 Small Plot Results

Winter Wheat

The soft pastry type wheat varieties generally had the best yield, lodging, and disease resistance. Medina soft white and Erie soft red were the best soft wheats. Among the hard red winter wheat varieties, Warthog and NuEast had the best grain yield and agronomic traits. The heritage wheat varieties Fulcaster, Pride of Genesee, and Forward were consistently low in yield and were susceptible to lodging and diseases.

Winter Rye

The hybrid rye varieties were consistently the highest yielding varieties with Brasetto as the top performer.

Winter Malting Barley

Like the spring malting barleys, the six row types tended to yield better and exhibit better agronomic types. Among the two row types, SY Tepee, KWS Scala, and Endeavor were acceptable for yield, lodging and diseases.

Spring Wheat

Cromwell, Faller, Glenn and Tom were best overall, but Glenn had substantial leaf blotch. Red Fife and Elgin had the lowest yields.

Spring Malting Barley

Because of a germination problem, we were unable to test Cerveza, Newdale, and AAC Synergy in 2015. The six row types performed the best and among the two row types, ND Genesis performed best. Although some farmers have continued to grow Conlon, it has consistently shown low grain yield and susceptibility to diseases. There was also severe lodging in this trial.

Spring Ancient and Hulled Grains

Corral and Horsepower were the best oat varieties, but Horsepower lodged in the conventional treatment.

2015 Hudson Valley Winter Wheat, Malting Barley and Hybrid Rye Summaries - Cornell

Winter Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date			Leaf Rust		Glume Blotch	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Fulcaster	4219	9	3928	9	4073	9	73.4	75.6	74.5	7.5	4.3	5.9	5/28	5/27	5/27	23	1	3	2
2	Pride of Genesee	4082	10	3534	10	3808	10	75.0	77.9	76.4	6.0	2.3	4.2	5/27	5/28	5/27	28	4	6	4
3	Forward	5470	6	4414	7	4942	7	74.8	74.8	74.8	4.5	2.3	3.4	5/28	5/29	5/28	30	7	1	1
4	Yorkstar	5294	7	4572	6	4933	8	70.4	72.4	71.4	5.5	3.0	4.3	5/27	5/27	5/27	35	7	5	10
5	Warthog	5988	3	4904	3	5446	4	78.7	78.6	78.6	1.5	1.0	1.3	5/26	5/25	5/25	1	0	2	6
6	NuEast	6507	2	4835	4	5671	2	79.3	78.6	79.0	4.5	1.0	2.8	5/23	5/24	5/23	0	0	8	12
7	Appalachian White	5245	8	4660	5	4952	6	75.6	73.2	74.4	6.0	1.7	3.8	5/24	5/24	5/24	0	0	5	6
8	Medina	5683	5	5303	2	5493	3	71.6	73.6	72.6	1.5	0.7	1.1	5/27	5/27	5/27	50	4	3	7
9	Otsego	7321	1	5915	1	6618	1	77.7	76.3	77.0	2.5	1.3	1.9	5/25	5/24	5/24	13	1	3	4
10	Erie	5928	4	4225	8	5076	5	73.6	75.2	74.4	0.0	0.0	0.0	5/27	5/26	5/26	0	0	1	2
	Mean	5574		4629		5101		75.0	75.6	75.3	4.0	1.8	2.9	5/26	5/26	5/26	17.8	2.3	3.6	5.2
	CV	7.6		7.6																

Winter Rye		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging		Heading Date			Wint Surv		Leaf Rust	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Conv	Org	Mean	Conv	Org	Conv	Org
1	Brasetto (180 k/m2)	3767	6	3254	4	3511	6	62.9	66.2	64.5	0	0	5/21	5/20	5/20	57	100	0.0	7.0
2	Brasetto (200 k/m2)	4024	4	3082	8	3553	4	63.3	66.3	64.8	0	0	5/21	5/21	5/20	80	100	0.0	10.3
3	Brasetto (250 k/m2)	4725	1	3689	1	4207	1	64.0	66.9	65.5	0	0	5/19	5/21	5/19	77	100	0.0	9.0
4	KWS Bono (H 119)	3027	8	3193	6	3110	7	64.2	68.0	66.1	0	0	5/21	5/20	5/20	62	100	0.0	5.3
5	KWS Rhavo (H 120)	3224	7	2700	9	2962	9	65.5	68.8	67.1	0	0	5/19	5/18	5/18	67	100	0.0	5.0
6	KWS H-139 (Nikko)	2650	9	3561	3	3105	8	64.7	68.0	66.4	0	0	5/22	5/20	5/20	45	100	0.0	4.0
7	KWS H-140 (Daniello)	3840	5	3208	5	3524	5	64.6	67.6	66.1	0	0	5/18	5/20	5/19	73	100	0.0	0.3
8	KWS H-144 (Gatano)	4201	3	3606	2	3904	2	65.2	67.9	66.6	0	0	5/20	5/19	5/19	73	100	0.0	2.3
9	Medina (wheat ck)	NA		NA															
10	Danko	4247	2	3095	7	3671	3	67.3	69.4	68.4	0	0	5/17	5/18	5/17	78	100	0.0	6.7
	Mean	3745		3265		3505		64.6	67.7	66.2	0.0	0.0	6/22	6/20	6/22	68	100	0.0	5.6
	CV	8.5		4.5															

Winter Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date			Wint Surv		Leaf Rust	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Charles	2023	10	2237	10	2130	10	54.1	57.3	55.7	7.7	6.5	7.1	5/26	5/24	5/25	77	90	27	28
2	10467p2	3542	5	4398	1	3970	1	60.7	62.6	61.6	1.0	1.0	1.0	5/21	5/20	5/20	83	95	0	1
3	10467r2	3652	3	4187	2	3920	2	62.1	63.9	63.0	1.3	1.0	1.2	5/19	5/19	5/19	85	98	0	1
4	10467r4	2714	9	2858	9	2786	9	58.9	60.9	59.9	2.3	3.0	2.7	5/23	5/21	5/22	80	93	0	0
5	03/220/158	3639	4	4040	3	3839	3	58.5	63.0	60.7	3.3	3.0	3.2	5/25	5/25	5/25	90	98	0	0
6	KWS Scala	3683	2	2977	8	3330	8	60.6	61.4	61.0	0.7	0.5	0.6	5/27	5/25	5/26	90	95	0	0
7	SY Tepee (209-66)	3207	6	3615	5	3411	6	61.7	63.0	62.4	3.0	2.5	2.8	5/28	5/27	5/27	90	93	0	0
8	SY Mezmaar (209-72)	3821	1	3272	7	3546	4	61.5	61.3	61.4	1.3	1.0	1.2	5/27	5/27	5/27	82	93	0	1
9	Endeavor	3130	7	3953	4	3541	5	62.8	62.3	62.5	2.3	2.0	2.2	5/24	5/21	5/23	63	95	13	25
10	WintMalt	3098	8	3565	6	3332	7	58.8	60.0	59.4	1.3	1.5	1.4	6/2	5/31	6/1	80	93	5	3
	Mean	3251		3510		3381		60.0	61.5	60.8	2.4	2.2	2.3	5/25	5/24	5/25	82.0	94.0	4.6	5.7
	CV	14.9		16.5																

2015 Hudson Valley Spring Wheat, Malting Barley and Hulled Grains Summaries - Cornell

Spring Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)			Heading Date			Leaf Blotch%		Powd.Mild.%	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Stoa	1941	6	2100	4	2020	5	70.3	71.8	71.1	2.3	2.0	2.2	6/17	6/17	6/17	5.3	2.3	0.5	0.3
2	Red Fife	1163	10	1715	10	1439	10	70.6	72.2	71.4	6.0	3.7	4.8	6/23	6/22	6/22	1.0	0.8	0.3	0.7
3	RB07	2113	4	1746	9	1930	7	71.7	72.2	72.0	3.3	2.7	3.0	6/16	6/16	6/16	1.7	1.0	0.0	0.2
4	Tom	2492	1	2210	3	2351	3	75.7	76.9	76.3	1.7	2.0	1.8	6/14	6/15	6/14	1.0	1.7	0.3	0.3
5	Rollag	1895	7	1840	8	1867	8	74.8	77.4	76.1	2.0	2.0	2.0	6/5	6/15	6/10	2.3	1.0	0.2	0.3
6	Sabin	1788	8	2074	6	1931	6	72.9	74.7	73.8	4.0	2.3	3.2	6/20	6/18	6/19	4.3	3.0	0.0	0.0
7	Glenn	2028	5	2084	5	2056	4	77.8	75.4	76.6	1.7	2.0	1.8	6/3	6/15	6/9	11.0	4.3	0.0	0.0
8	Cromwell	2398	3	2604	1	2501	1	76.1	77.8	77.0	0.7	2.0	1.3	6/16	6/16	6/16	0.8	1.0	0.5	0.7
9	Faller	2464	2	2336	2	2400	2	71.8	72.9	72.4	0.3	1.7	1.0	6/17	6/18	6/17	1.7	1.0	0.0	0.3
10	Elgin	1660	9	2057	7	1858	9	70.2	72.7	71.4	1.7	1.7	1.7	6/14	6/14	6/14	10.0	2.3	0.3	0.5
	Mean	1994		2077		2035		73.2	74.4	73.8	2.4	2.2	2.3	6/14	6/16	6/15	3.9	1.9	0.2	0.3
	CV	11.2		11.4																

Spring Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)			Heading Date			Leaf Blight%		Powd.Mild.%	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org		Conv	Org	Mean	Conv	Org	Conv	Org
1	Herta	888.2	7	956.1	5	922.1	6	51.8	54.0	52.9	9	9		6/23	6/25	6/24	20	7	0.0	0.0
2	Conlon	943.1	6	559.9	7	751.5	7	51.9	53.0	52.5	9	9		6/17	6/19	6/18	73	53	0.0	0.0
3	M152	2093	1	1456	4	1774	2	55.6	57.0	56.3	9	9		6/16	6/19	6/17	7	4	11.7	2.3
4	Lacey	1909	3	1516	3	1713	3	55.8	56.3	56.1	9	9		6/17	6/19	6/18	4	3	6.3	2.7
5	Quest	1578	4	1662	1	1620	4	53.5	55.5	54.5	9	9		6/16	6/17	6/17	7	7	3.0	0.5
6	Cerveza	Poor Germination				-	-	52.5		-	9	9		6/28		-	7	6	0.0	0.0
7	Newdale	Poor Germination				-	-	50.6		-	9	9		7/1		-	8	4	0.0	0.2
8	AAC Synergy	Poor Germination				-	-	53.7		-	9	9		7/1		-	2	2	0.0	0.0
9	ND Genesis	2025	2	1638	2	1831	1	53.37	55.3	54.3	9	9		7/9	6/17	6/28	6	5	0.0	0.0
10	Pinnacle	997.3	5	866.5	6	931.9	5	49.8	49.0	49.4	9	9		6/17	6/19	6/18	70	57	0.0	0.0
	Mean	1490		1236		1363		52.9	54.3	53.7	9.0	9.0		6/22	6/20	6/22	21	15	2.1	0.6
	CV	24.9		31.6																

Spring Hulled Grains		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Ogle (oat)	2720	4	2083	3	2401	3	36.5	37.4	37.0	3.7	4.7	4.2	6/18	6/18	6/18
2	Corral (oat)	5408	1	2754	1	4081	1	40.4	39.7	40.1	2.3	1.3	1.8	6/22	6/24	6/23
3	Horsepower (oat)	4515	2	2359	2	3437	2	38.9	38.2	38.6	5.3	2.0	3.7	6/18	6/18	6/18
4	Hidalgo (oat)	1398	6	1105	6	1252	6	27.7	30.9	29.3	7.0	7.5	7.3	6/25	6/26	6/25
5	Oaklin (oat)	3418	3	748.8	8	2083	4	38.4	31.1	34.7	1.0	1.3	1.2	6/23	6/24	6/23
6	Red Vernal (emmer)	1186	8	1151	5	1169	7	32.9	35.2	34.0	7.7	5.3	6.5	6/26	6/27	6/26
7	Lucille (emmer)	1048	9	Poor Germination				33.7	-	-	6.0	2.3	4.2	7/1	-	-
8	ND Common (emmer)	1239	7	968.3	7	1104	8	35.6	35.7	35.6	8.0	7.3	7.7	6/27	6/28	6/27
9	TM23 (einkorn)	Poor Germination				-		-	-	-	-	2.3	-	-	-	-
10	CDC Zorba (spelt)	2499	5	1649	4	2074	5	30.9	29.8	30.4	3.3	3.0	3.2	6/29	6/29	6/29
	Mean	2603		1602		2200		35.0	34.7	35.0	4.9	3.7	4.4	6/24	6/24	6/24
	CV	23.4		38.6												

2016 Small Plot Results

Winter Wheat

Results were similar to 2015. Appalachian White hard white winter was added, and its yield was similar to NuEast, but it had much lower test weight.

Winter Rye

The hybrid rye varieties were again consistently the highest yielding varieties but this year Florano yielded better than Brasetto. The conventional variety, Danko, was the lowest yielding rye variety.

Winter Malting Barley

Among the two row types, SY Tepee, KWS Scala, and Wintmalt were acceptable for yield, test weight and lodging.

Spring Wheat

In 2016, we added Øland, Lagoda, and AAC Tenacious but they did not perform as well as Tom, Faller and Glenn. Glenn suffered from severe leaf rust.

Spring Malting Barley

The two row varieties AAC Synergy and ND Genesis along with the six row types Lacey and Quest had the highest yields and test weights but suffered from spot blotch.

Spring Ancient and Hulled Grains

There were six spring oat varieties tested this year. New varieties, Streaker and Buff, are hulless types. All the oat varieties yielded very well with Corral at the top. There was substantial lodging in all of the oat plots. The emmer varieties Lucille and Red Vernal along with the spelt variety CDC Zorba performed about the same. TM23 einkorn was the lowest yielding and had low test weight.

2016 Hudson Valley Winter Wheat, Malting Barley and Hybrid Rye Summaries - Cornell

Winter Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date			Leaf Rust		GlumeBlotch	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Fulcaster	3064	9	3399	9	3231	9	76.4	76.8	76.6	4.0	3.3	3.7	5/25	5/25	5/25	N	N	N	N
2	Pride of Genesee	2634	10	2720	10	2677	10	74.6	75.1	74.8	3.7	3.7	3.7	5/26	5/26	5/26	O	O	O	O
3	Forward	4463	5	4400	5	4431	5	74.1	74.2	74.2	1.7	1.0	1.3	5/27	5/26	5/26	N	N	N	N
4	Yorkstar	5013	3	4671	3	4842	4	71.6	71.9	71.7	1.0	1.7	1.3	5/24	5/24	5/24	E	E	E	E
5	Warthog	4457	6	4273	6	4365	6	76.7	76.3	76.5	0.0	0.0	0.0	5/23	5/24	5/23				
6	NuEast	4414	8	3949	8	4181	8	76.0	76.4	76.2	0.0	0.0	0.0	5/18	5/19	5/19				
7	Appalachian White	4441	7	4245	7	4343	7	72.3	72.2	72.2	0.0	0.0	0.0	5/19	5/19	5/19				
8	Medina	5464	4	4521	4	4993	3	74.3	74.1	74.2	0.0	0.0	0.0	5/23	5/23	5/23				
9	Otsego	5192	2	5091	2	5141	2	74.8	75.3	75.1	0.0	0.0	0.0	5/19	5/19	5/19				
10	Erie	5473	1	5345	1	5409	1	75.7	75.3	75.5	0.0	0.0	0.0	5/22	5/22	5/22				
	Mean	4461		4261		4361		74.7	74.8	74.7	1.0	1.0	1.0	5/23	5/23	5/23				
	CV	9.1		7.1																

Winter Rye		Grain Yield (kg/h)						Test Wt (kg/hl)			Heading Date			Leaf Rust	
	Entry		Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org
1	Brasetto (180 k/m2)	7205	8	7151	6	7178	8	68.9	69.0	69.0	5/12	5/12	5/12	N	N
2	Brasetto (200 k/m2)	7312	7	7073	7	7193	7	68.7	69.2	69.0	5/13	5/13	5/13	O	O
3	Brasetto (250 k/m2)	7478	4	6938	8	7208	6	68.17	68.63	69.0	5/12	5/12	5/12	N	N
4	KWS Bono (H 119)	7622	2	7650	2	7636	2	69.3	70.2	69.0	5/14	5/13	5/13	E	E
5	KWS H-140 (Daniello)	7590	3	7521	4	7556	3	67.77	68.57	69.0	5/12	5/13	5/13		
6	KWS H-144 (Gatano)	7392	6	7690	1	7541	4	67.23	67.73	69.0	5/13	5/12	5/12		
7	Medina (wheat ck)	NA		2947	10	NA		72.6	72.5	69.0	NA	NA	NA		
8	Danko	5845	9	6192	9	6019	9	69.9	70.1	69.0	5/11	5/11	5/11		
9	KWS H-141 Livado)	7470	5	7212	5	7341	5	68.83	69.1	69.0	5/13	5/15	5/14		
10	KWS-H-151 (KWS Florado)	8090	1	7631	3	7860	1	68.0	68.0	68.0	5/12	5/16	5/14		
	Mean	7334		6801		7281		69.0	69.3	68.9	5/12	5/13	5/13		
	CV	7.4		10.0											

Winter Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date			Leaf Rust	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org
1	Charles	3846	10	4107	8	3976	10	57.5	57.7	57.6	5.3	5.0	5.2	5/12	5/13	5/12	N	N
2	10467r2	5264	3	5038	3	5151	3	62.2	63.1	62.7	0.0	0.0	0.0	5/12	5/12	5/12	O	O
3	KWS Scala	6173	1	4899	4	5536	2	62.8	61.2	62.0	0.0	0.0	0.0	5/11	5/12	5/12	N	N
4	SY Tepee (209-66)	4594	8	4740	5	4667	5	63.8	63.0	63.4	0.0	0.0	0.0	5/14	5/15	5/14	E	E
5	SY Mezmaar (209-72)	6120	2	5047	2	5584	1	64.1	63.6	63.9	0.0	0.0	0.0	5/17	5/17	5/17		
6	Endeavor	4486	9	3651	10	4068	9	65.0	64.2	64.6	0.0	0.0	0.0	5/15	5/14	5/14		
7	WintMalt	4844	5	5169	1	5006	4	61.8	61.6	61.7	0.0	0.0	0.0	5/17	5/18	5/17		
8	6Ab08-X03W012-5	4754	7	4419	6	4586	6	62.9	63.4	63.2	0.0	0.0	0.0	5/16	5/16	5/16		
9	02Ab671	4888	4	3710	9	4299	8	64.3	60.4	62.3	1.0	5.3	3.2	5/17	5/17	5/17		
10	Nectaria	4778	6	4224	7	4501	7	63.4	62.4	62.9	0.0	0.0	0.0	5/16	5/16	5/16		
	Mean	4975		4500		4738		62.8	62.1	62.4	0.6	1.0	0.8	5/14	5/15	5/15		
	CV	9.6		19.2														

2016 Hudson Valley Spring Wheat, Malting Barley and Hulled Grains Summaries - Cornell

Spring Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)			Heading Date			Leaf Blight%		Leaf Rust.%	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Stoa	3163	3	2453	3	2808	3	71.9	69.4	70.6	3.7	2.7	3.2	6/10	6/12	6/11	12	15	0	0
2	Red Fife	2121	10	1325	10	1723	10	69.5	67.9	68.7	6.3	6.0	6.2	6/12	6/15	6/13	5	10	0	0
3	Tom	3142	4	2407	4	2775	4	72.9	72.3	72.6	4.0	3.0	3.5	6/8	6/10	6/9	5	2	0	0
4	Rollag	2540	6	2136	6	2338	6	73.6	73.0	73.3	3.3	2.7	3.0	6/8	6/11	6/9	2	0	92	95
5	Sabin	3088	5	2208	5	2648	5	73.6	71.1	72.4	4.7	2.7	3.7	6/9	6/10	6/9	0	0	77	83
6	Glenn	3205	2	2582	1	2893	2	74.8	74.7	74.7	2.3	2.3	2.3	6/7	6/7	6/7	0	0	80	70
7	Faller	3239	1	2573	2	2906	1	73.5	71.3	72.4	4.0	4.0	4.0	6/9	6/11	6/10	5	5	0	0
8	Øland	2180	8	1690	8	1935	8	67.8	65.8	66.8	6.3	6.7	6.5	6/17	6/18	6/18	13	10	2	2
9	Ladoga	2145	9	1620	9	1882	9	66.1	66.5	66.3	7.0	7.3	7.2	6/13	6/14	6/13	5	1	2	2
10	AAC Tenacious	2427	7	1813	7	2120	7	70.8	68.6	69.7	6.3	6.3	6.3	6/16	6/16	6/16	4	2	0	0
	Mean	2725		2081		2403		71.4	70.1	70.7	4.8	4.4	4.6	6/11	6/12	6/11	5	5	25	25
	CV	8.9		7.2																

Spring Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)		Heading Date			Spot Blotch%		Powd.Mild.%	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Conv	Org	Mean	Conv	Org	Conv	Org
1	Herta	2431	5	1997	7	2214	7	59.0	59.8	59.4	N	N	6/23	6/23	6/23	18	7	9	13
2	Conlon	1954	6	2512	6	2233	5	58.8	60.3	59.6	O	O	6/9	6/11	6/10	27	8	2	4
3	Lacey	2676	3	2774	3	2725	3	62.3	62.3	62.3	N	N	6/12	6/14	6/13	47	52	7	0
4	Quest	2463	4	2631	5	2547	4	59.7	61.0	60.3	E	E	6/13	6/14	6/13	22	18	0	1
5	Cerveza	1673	9	1962	9	1817	8	56.5	56.1	56.3			6/24	6/25	6/24	8	23	0	0
6	Newdale	1767	7	2665	4	2216	6	54.1	56.9	55.5			6/22	6/26	6/24	4	2	80	78
7	AAC Synergy	3237	1	3252	1	3244	1	56.9	58.7	57.8			6/19	6/22	6/21	18	7	5	9
8	ND Genesis	3198	2	3107	2	3153	2	58.4	58.7	58.6			6/13	6/18	6/15	17	20	3	5
9	Pinnacle	1552	10	1962	8	1757	9	57.0	57.1	57.1			6/14	6/16	6/15	70	43	5	7
10	KWS Tinka	1693	8	1565	10	1629	10	53.2	53.9	53.5			6/18	6/20	6/19	7	9	73	80
	Mean	2264		2443		2354		57.6	58.5	58.0			6/22	6/20	6/22	24	19	19	19
	CV	23.1		16.3															

Spring Hulled Grains		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	OGLE	4118	4	4385	4	4252	4	46.9	45.6	46.2	5.3	5.7	5.5	6/14	6/14	6/14
2	Corral	4995	2	5270	1	5133	1	48.5	47.4	48.0	6.0	6.7	6.3	6/16	6/16	6/16
3	Horsepower	4585	3	5233	2	4909	2	49.5	49.3	49.4	3.0	5.0	4.0	6/12	6/12	6/12
4	Hidalgo	5013	1	4661	3	4837	3	48.2	47.7	48.0	2.7	5.0	3.8	6/16	6/16	6/16
5	Red Vernal	1552	9	1512	10	1532	9	38.8	36.3	37.5	7.3	5.0	6.2	6/20	6/23	6/21
6	Lucille	1957	7	1736	7	1847	7	38.3	36.9	37.6	7.3	6.7	7.0	6/18	6/22	6/20
7	TM23	1479	10	1523	9	1501	10	34.0	35.7	34.8	5.7	5.0	5.3	6/18	6/19	6/18
8	CDC Zorba	1580	8	1684	8	1632	8	30.7	28.6	29.6	8.3	7.0	7.7	6/18	6/20	6/19
9	Streaker	2577	6	2511	6	2544	6	61.0	59.7	60.4	8.3	8.0	8.2	6/14	6/14	6/14
10	Buff	4106	5	4291	5	4199	5	56.9	54.2	55.5	4.0	5.0	4.5	6/12	6/12	6/12
	Mean	3196		3281		3238		45.3	44.1	44.7	5.8	5.9	5.9	6/16	6/17	6/16
	CV	11.3		16.2												

2017 Small Plot Results

Winter Wheat

New varieties in 2017 were AC Morley, Expedition, and Zorro. Among the hard winter wheats AC Morley had the highest yield followed by Warthog and NuEast. Unfortunately, AC Morley and NuEast have lower protein than Warthog so they are less desirable for baking bread.

Winter Rye

A new hybrid rye, Binntto, topped the trial with Florano as the second best performer. A conventional rye variety had the lowest yield.

Winter Malting Barley

A new variety, KWS Summerset, had the highest yield for two row types followed by SY Tepee and Flavia another new variety.

Spring Wheat

Faller, Tom and Glenn had the best yields again, all with acceptable test weight. Øland, Lagoda, and AAC Tenacious again were low yielding.

Spring Malting Barley

The two row varieties AAC Synergy, Cerveza and KWS Tinka had the highest yield and good test weight.

Spring Ancient and Hulled Grains

Poor emergence compromised this trial. Only five varieties survived to produce grain. CDC Zorba spelt and the hulless oat, Buff, had the best yields. The two emmer varieties had similar yield and TM23 einkorn was again the lowest yielding.

2017 Hudson Valley Winter Wheat, Malting Barley and Hybrid Rye Summaries - Cornell

Winter Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Leaf Rust (%)		Powdery Mildew (%)	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Fulcaster	535	10	2186	10	1360	10	70.0	72.7	71.3	7.7	5.7	6.7	5	2	0	0
2	Pride of Genesee	802	7	2391	9	1597	9	61.8	75.5	68.7	8.0	5.0	6.5	5	1	1	1
3	Warthog	1860	2	4102	3	2981	3	69.8	75.5	72.6	4.3	1.7	3.0	2	0	0	0
4	NuEast	1561	4	3576	5	2569	4	75.8	77.3	76.6	5.7	1.0	3.3	0	0	2	5
5	Appalachian White	773	8	3684	4	2228	6	68.8	75.4	72.1	7.3	2.0	4.7	0	1	0	2
6	Medina	880	6	3266	7	2073	7	69.2	70.4	69.8	3.7	1.0	2.3	8	2	0	0
7	Erie	3662	1	5337	1	4499	1	71.1	75.4	73.3	0.7	0.7	0.7	0	0	0	0
8	AC Morely	1611	3	4450	2	3031	2	70.1	77.1	73.6	5.0	1.7	3.3	0	0	0	1
9	Expedition	1332	5	3535	6	2434	5	73.9	74.7	74.3	2.7	1.3	2.0	0	0	10	15
10	Zorro	631	9	2655	8	1643	8	62.8	73.7	68.3	4.0	2.0	3.0	1	0	0	0
	Mean	1365		3518		2441		69.3	74.8	72.0	4.9	2.2	3.6	2.2	0.7	1.4	2.4
	CV	36.3		9.6													

Winter Rye		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Leaf Rust (%)		Powdery Mildew (%)	
	Entry		Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Brasetto (180 k/m2)	3947	8	5438	4	4692	6	61.0	64.1	62.6	3.0	0.3	1.7	N	N	N	N
2	Brasetto (200 k/m2)	4238	6	5077	7	4657	7	62.1	63.8	63.0	1.3	0.7	1.0	O	O	O	O
3	Brasetto (250 k/m2)	4658	4	5122	6	4890	5	61.7	64.0	62.9	2.0	0.3	1.2	N	N	N	N
4	KWS Bono (H 119)	4100	7	4967	8	4533	8	63.2	66.1	64.6	1.0	0.3	0.7	E	E	E	E
5	KWS H-140 (Daniello)	4490	5	5745	3	5117	4	61.8	65.1	63.5	1.3	0.7	1.0				
6	KWS H-144 (Gatano)	4903	3	5401	5	5152	3	61.8	64.0	62.9	1.3	0.7	1.0				
7	Medina (wheat ck)	1594	10	1691	10	1643	10	58.8	61.9	60.3	3.0	1.7	2.3				
8	Danko	2948	9	4381	9	3664	9	63.4	66.8	65.1	2.3	0.7	1.5				
9	KWS-H-151 (Florano)	5149	2	5816	2	5482	2	61.3	63.8	62.5	0.7	0.3	0.5				
10	KWS H-145 (Binntto)	6407	1	6087	1	6247	1	62.2	63.2	62.7	0.3	0.3	0.3				
	Mean	4243		4972		4608		61.7	64.3	63.0	1.6	0.6	1.1				
	CV	26.8		10.9													

Winter Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Leaf Rust (%)		Powdery Mildew (%)	
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Conv	Org
1	Charles	2128	9	4403	8	3266	8	56.2	51.0	53.6	6.3	3.0	4.7	30	4	0	0
2	10467r2	4575	3	5933	1	5254	1	62.1	58.4	60.3	0.0	0.0	0.0	0	0	0	0
3	KWS Scala	4053	5	4925	4	4489	5	64.0	61.0	62.5	4.0	1.0	2.5	0	0	0	0
4	SY Tepee (209-66)	4907	1	4845	6	4876	3	64.1	61.7	62.9	1.3	1.3	1.3	0	0	0	0
5	Endeavor	3092	7	4907	5	4000	7	61.6	59.6	60.6	8.3	4.0	6.2	0	0	2	1
6	6Ab08-X03W012-5	2281	8	3699	10	2990	9	60.1	57.7	58.9	4.0	1.7	2.8	5	12	18	32
7	02Ab671	853	10	4010	9	2432	10	57.3	55.1	56.2	7.7	1.3	4.5	9	0	10	15
8	Nectaria	4043	6	4770	7	4407	6	64.3	60.8	62.5	2.0	1.3	1.7	0	0	17	12
9	Flavia	4222	4	5026	3	4624	4	63.6	61.4	62.5	1.0	0.0	0.5	0	0	0	0
10	KWS Sommerset	4870	2	5391	2	5130	2	63.8	61.8	62.8	1.3	0.0	0.7	0	0	0	0
	Mean	3502		4791		4147		61.7	58.9	60.3	3.6	1.4	2.5	4.5	1.6	4.8	6.0
	CV	20.2		14.7													

2017 Hudson Valley Spring Wheat, Malting Barley and Hulled Grains Summaries - Cornell

Spring Wheat		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean
1	Stoa	2421	4	1861	3	2141	4	65.0	65.8	65.4	N	N		6/16	6/17	6/16
2	Red Fife	1130	8	817	7	974	8	63.2	63.5	63.4	O	O		6/17	6/17	6/17
3	Tom	3274	1	2295	2	2785	1	70.7	71.4	71.0	N	N		6/14	6/18	6/16
4	Rollag	2124	5	1592	6	1858	6	69.9	68.9	69.4	E	E		6/15	6/16	6/15
5	Sabin	2114	6	1841	4	1977	5	69.2	69.2	69.2				6/16	6/16	6/16
6	Glenn	2675	3	1836	5	2256	3	72.1	73.1	72.6				6/13	6/14	6/13
7	Faller	3016	2	2300	1	2658	2	69.0	69.7	69.4				6/15	6/16	6/15
8	Øland	876	9	726	8	801	9	61.3	62.0	61.6				6/23	6/22	6/22
9	Ladoga	498	10	719	9	608	10	62.4	63.5	62.9				6/19	6/19	6/19
10	AAC Tenacious	1492	7	627	10	1059	7	66.0	61.8	63.9				6/21	6/22	6/21
	Mean	1962		1461		1712		66.9	66.9	66.9				6/17	6/17	6/17
	CV	12.9		15.1												

Spring Malting Barley		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging (0-9)			Heading Date		
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org		Conv	Org	Mean
1	Herta	2432	3	1069	5	1751	4	56.1	53.8	55.0	N	N		6/18	6/26	6/22
2	Conlon	1997	7	732	7	1364	7	57.6	56.8	57.2	O	O		6/10	6/13	6/12
3	Lacey	1501	8	914	6	1208	8	55.8	55.7	55.8	N	N		6/12	6/14	6/13
4	Quest	1092	9	699	8	895	9	55.0	53.7	54.3	E	E		6/13	6/16	6/15
5	Cerveza	2124	6	2201	2	2163	2	53.8	53.5	53.6				6/18	6/21	6/20
6	Newdale	2296	5	1191	4	1744	5	52.5	51.2	51.9				6/19	6/28	6/24
7	AAC Synergy	2625	1	2581	1	2603	1	55.8	55.4	55.6				6/17	6/19	6/18
8	ND Genesis	2381	4	669	9	1525	6	55.4	52.6	54.0				6/12	6/15	6/14
9	Pinnacle	NA		NA		NA		NA	NA	NA				6/15	6/17	6/17
10	KWS Tinka	2606	2	1223	3	1915	3	51.7	52.1	51.9				6/16	6/17	6/17
	Mean	2117		1253		1685		54.8	53.9	54.4				6/15	6/18	6/17
	CV	40.5		32.4												

Spring Hulled Grains		Grain Yield (kg/h)						Test Wt (kg/hl)			Lodging			Heading Date			Crown Rust
	Entry	Conv	Rank	Org	Rank	Mean	Rank	Conv	Org	Mean	Conv	Org	Mean	Conv	Org	Mean	%
1	OGLE (Oat)	935	4			468		NA	NA	NA	N	N		6/19	6/18	6/18	12.5
2	Corral (Oat)	NA		NA		NA					O	O		6/17	6/18	6/17	32.5
3	Hidalgo (Oat)	NA		NA		NA					N	N		6/27	6/27	6/27	12.5
4	Red Vernal (Emmer)	586	7	684	3	635	4				E	E		6/27	6/27	6/27	0
5	Lucille (Emmer)	856	5	617	4	736	3							6/26	6/27	6/27	0
6	TM23 (Einkorn)	545	8	569	5	557	5							6/28	6/24	6/26	0
7	CDC Zorba (Spelt)	2022	2	1684	1	1853	1							6/22	6/23	6/22	0
8	Streaker (Naked oat)	718	6			359								6/17	6/19	6/18	6
9	Buff (Naked oat)	2023	1	966	2	1495	2							6/16	6/17	6/16	3
10	Hayden (Oat)	1136	3			568								6/20	6/21	6/20	0
	Mean	1103		904		834								6/22	6/22	6/22	
	CV	45.2		16.2													

2018 Small Plot Results

Winter Wheat

Jagger, Arapahoe and Clark's Cream were new this year. This was the first time we only planted under organic management. Among the hard red winter wheats, Warthog and Jagger had the highest yields, although test weight for Jagger was low. The hard white winter landrace, Clark's Cream, yielded surprisingly well.

Winter Rye

The hybrid ryes Daniello, Bono, and Binntto had the highest yields and good test weight. Again, Danko had the lowest yields.

Winter Malting Barley

Among the two row types, Flavia, Violetta (new), and Calypso (new) had the highest yields and very good test weights. The long-term check variety, Charles, was again the lowest yielding.

2018 Hudson Valley Winter Wheat, Malting Barley and Hybrid Rye Summaries - Cornell

Winter Wheat		Grain Yield			Test Wt		Heading	Leaf Rust	Powdery Mildew
	Entry	kg/h	Bu/a	Rank	kg/hl	lbs/bu	Date	%	%
1	Pride of Genesee	2321	35	12	79.1	61.3	5/28	N	N
2	Warthog	4126	61	2	79.7	61.8	5/24	O	O
3	NuEast	2635	39	11	76.8	59.5	5/19	N	N
4	Appalachian White	3045	45	9	73.5	57.0	5/19	E	E
5	Medina	4408	66	1	75.6	58.6	5/22		
6	Erie	3774	56	5	73.7	57.1	5/23		
7	AC Morely	3488	52	6	79.3	61.4	5/23		
8	Expedition	3292	49	7	77.4	60.0	5/21		
9	Zorro	2650	39	10	75.6	58.6	5/30		
10	Jagger	3820	57	4	74.9	58.1	5/19		
11	Arapahoe	3267	49	8	77.4	60.0	5/22		
12	Clark's Cream	3937	59	3	77.5	60.1	5/22		
	Mean	3397	51		76.7	59.5	5/22		
	CV	18.4							

Winter Rye		Grain Yield			Test Wt		Leaf Rust	Powdery Mildew
	Entry	kg/h	Bu/a	Rank	kg/hl	lbs/bu	%	%
1	Brasetto (180 k/m2)	926	15	8	57.0	44.2	N	N
2	Brasetto (200 k/m2)	1059	17	7	58.6	45.4	O	O
3	Brasetto (250 k/m2)	643	10	9	56.9	44.1	N	N
4	KWS Bono (H 119)	1481	24	3	56.7	44.0	E	E
5	KWS H-140 (Daniello)	3730	59	1	74.6	57.9		
6	KWS H-144 (Gatano)	1260	20	6	63.8	49.5		
7	Medina (wheat ck)	2001	32	2	57.0	44.2		
8	Danko	443	7	10	59.5	46.1		
9	KWS-H-151 (Florano)	1291	21	5	58.6	45.4		
10	KWS H-145 (Binntto)	1372	22	4	58.3	45.2		
	Mean	1421	23		60.1	46.6		
	CV	43.8						

Winter Malting Barley		Grain Yield			Test Wt		Leaf Rust	Powdery Mildew
	Entry	kg/h	Bu/a	Rank	kg/hl	lbs/bu	%	%
1	Charles	1992	37	10	42.7	33.1	N	N
2	KWS Scala	2661	49	5	50.8	39.4	O	O
3	SY Tepee (209-66)	2196	41	9	51.9	40.3	N	N
4	Endeavor	2379	44	7	51.6	40.0	E	E
5	Nectaria	2217	41	8	52.4	40.6		
6	Flavia	3954	74	1	58.6	45.5		
7	KWS Sommerset	2467	46	6	52.9	41.0		
8	Alba	3769	70	3	59.8	46.3		
9	Calypso	3577	66	4	55.3	42.8		
10	Violetta	3815	71	2	60.2	46.7		
	Mean	2903	54		53.6	41.6		
	CV	34.1						

Overall Small Plot Findings 2014-2018

Winter Wheat

The soft winter wheat varieties, Medina and Erie, generally performed better than the hard winter wheat, partly because they were bred for New York and also because they have lower protein, which is required for pastry quality. Among the hard red wheat varieties, Warthog was the clear winner followed by Appalachian White and NuEast. Heritage varieties of winter wheats were consistently lower yielding.

Winter Rye

The hybrid rye varieties had consistently better yields and better lodging resistance than the conventional variety, Danko. The best hybrid varied from year to year but Gatano, Florano and Binntto nearly always performed well.

Winter Malting Barley

SY Tepee was the best variety of winter malting barley overall, but unfortunately, Syngenta, the owner of the variety, has pulled the seed off of the market. SY Mezmar had good yields but Syngenta has decided not to market the variety in New York. Flavia, a more recent variety in our trials, has performed well in the last two years and has good quality. Additional testing is needed to identify a winter malting barley that shows consistent performance in the Hudson Valley.

Spring Wheat

Tom, Faller and Glenn are the top hard red spring wheat varieties overall, however, Glenn showed some susceptibility to leaf rust and leaf blotch.

Spring Malting Barley

The six row types of spring malting barley, Lacey and Quest, were typically higher yielding. However, because maltsters and brewers prefer two row barleys, our research team focused more on evaluating those varieties. The best two row varieties were AAC Synergy, Cerveza, and ND Genesis. Conlon and Pinnacle frequently showed high levels of disease and poor yield.

Spring Ancient and Hulled Grains

Spring oat varieties typically had the highest yields in this group with Corral and Horsepower as the top performers. Specialty grains are valued for their flavor either as cooked grains or in bread or pasta and so we included a number of these varieties in our research. Lucille and Red Vernal emmer are high value specialty grains. Their performance was similar, and both are susceptible to lodging. We also evaluated the specialty grains TM23 einkorn and CDC Zorba spelt. CDC Zorba usually performed pretty well but TM23 consistently had the lowest yield in the trials.

RESULTS FROM PROCESSING TRIALS

From 2015 through 2017, the Hudson Valley Small Grains Project research team expanded to include a number of partners for milling, baking, malting, brewing, and distilling trials.

Hudson Valley Small Grains Project Processing Partners	
Milling	Wild Hive, Clinton Corners, NY
Baking	Bread Alone, Boiceville, NY and Our Daily Bread, Chatham, NY
Malting	Hudson Valley Malt, Germantown, NY
Brewing	From The Ground Brewery, Red Hook, NY and Keegan Ales, Kingston, NY
Distilling	Denning's Point Distillery, Beacon, NY and Union Grove Distillery, Arkville, NY

Below is a summary of the grains selected for the larger grow-outs at the Hudson Valley Farm Hub that were used in the processing trials.

Varieties Selected for Processing Trials 2015-2017			
	2015	**2016**	**2017**
Milling and Baking	Tom (HRSW)	Tom (HRSW) Pride of Genesee (SWWW) Medina (SWWW) Warthog (HRWW) NuEast (HRWW) Appalachian White (HWWW) Fulcaster (SRWW) Tom (HRSW) Brasetto (Hybrid Rye)	Tom (HRSW) Appalachian White (HWWW) NuEast (HRWW) Medina (SWWW) Pride of Genesee (SWWW) Brasetto (Hybrid Rye) Danko Rye
Malting, Brewing, and Distilling		KWS Scala (WMB) Two-Row AAC Synergy (SMB) Medina (SWWW) Pride of Genesee (SWWW) Brasetto (Hybrid Rye)	ND Genesis (SMB) Two-Row KWS Scala (WMB) Two-Row Medina (SWWW) Pride of Genesee (SWWW) Brasetto (Hybrid Rye) Danko Rye
HRSW- Hard Red Spring Wheat; HRWW- Hard Red Winter Wheat; HWWW- Hard White Winter Wheat; SMB- Spring Malting Barley; SRWW- Soft Red Winter Wheat; SWWW- Soft White Winter Wheat; WMB- Winter Malting Barley			

2015 Processing Trials Results

The research team selected two varieties for larger grow-outs of one acre each in 2015 to have sufficient grains for processing trials. Due to limited seed availability for the 2015 season, only Tom spring wheat and AAC Synergy spring malting barley were grown for processing trials. Because of excess rain and weed pressure, the AAC Synergy spring malting barley was not able to be harvested. However, there was sufficient Tom for milling and baking trials. Below are excerpts of notes from the Wild Hive and Bread Alone processing trials.

Miller Don Lewis of Wild Hive Farms:

"...The milling process went as smoothly as possible. Tom broke out into flour very evenly and went through a very fine sifting process without complication. All signs of a practical wheat. It created a very smooth, clear flour while retaining some color from minute bran particles. Before baking, it had a moderate flavor, not really standing out in anyway.

I approached baking with Tom from the perspective of a home baker without equipment: hand- mixed, no-knead. I even went as far as to bake loaves in a retail toaster oven, to much success. From this process, I found that the gluten develops well, with substantial strength. The finished loaves had decent crumb and adequate flavor.

Since the initial tests, I have used Tom in a variety of recipes, including blending with other flours. Successful pitas, flatbreads, and pizzas have been made with Tom.

Finally, I believe that Tom wheat will prove to be an important part of the wheat varieties grown in commercial application throughout New York."

Artisan baker Sharon-Burns Leader of Bread Alone:

"...When I received the bags of "Tom" wheat [flour], I did a first test of the wheat at home using three different recipes: sourdough bread, shortbread cookies and focaccia bread.

I will go into details about the sourdough bread because that is the one that has the most value in the commercial bakery.

...The dough came together very nicely and I was able to bake a lovely loaf of bread right out of the gate. The flavor was unique and bold, but not bitter. The color was sandy- cream color.

...When I was asked to bake more bread for [a tasting at] the [Cornell

Cooperative Extension Small Grains] Field Day, I decided to mix the dough using a mechanical dough mixer. Though I had great success with mixing the dough by hand, I was concerned that the gluten strength might not be strong enough to handle mechanical mixing. This issue is an important one for the viability of any grain that might be suggested for commercial use.

...The dough responded very nicely, with buoyancy and easy strength... When brought to proofing temperature of 76-79° F, the breads held their shape nicely.

...The flavor of the wheat came through with this predictable method of baking a sourdough loaf. The color of the bread is a sandy-cream color and the flavor is distinct - full but not bitter, almost nutty. As professional bakers, my colleagues and I are very excited about the performance of the 'Tom' wheat. It has a lot of potential."

Bread Lab Results from 2015 Field Scale Plots

Variety	Market Class	Era	Management	Grain Moisture	Test Weight	Flour Moisture	Protein "As Is"	Dry Matter Protein	Falling Number	DON	Seed Germination	Yield
				%	lbs/bu	%	%	%	Seconds	ppm	%	bu/ac
Tom	HRSW	Modern	Conventional	12.7	60.5	9.8	15.85	17.6	464	1.8	85.5	N/A
Tom	HRSW	Modern	Conventional	12.3	60.2	10.25	16.35	18.2	448	1.9	76.5	N/A

2016 Field-Scale Variety and Processing Trial Results

In 2016, 8 varieties were planted in larger field-scale trials that were then sent to the processing trial partners to test for milling, malting, baking, brewing, and distilling qualities. Although 2016 was on of the project's best overall years for grain performance, the research team did experience some challenges. In particular, spring grains were not as successful as the winter grains because the conventionally managed field scale spring grain plots were mistakenly planted to a rye cover crop in fall of 2015, which compromised spring grains in those plots throughout the following season. There was also poor germination and effects on fertility. The spring grain plots were also under considerable weed pressure due to an exceptionally warm spring that incited early weed competition, a period of prolonged drought mid-season, and difficulty in the grain stands becoming competitive enough to withstand the weed pressure.

Despite the challenges of the growing season, sufficient grain was harvested to send 11 harvested plots to processing trials. To ensure the processing trials focused on individual grain qualities, they were numbered, rather than named, when sent to the processing sites. The names were then revealed after the conclusion of the processing trials. Below are the lab results and notes from the processing partners for those trials.

Bread Lab results from 2016 Field-Scale Plots												
Variety	**Market Class**	**Era**	**Management**	**Grain Moisture**	**Test Weight**	**Flour Moisture**	**Protein "As Is"**	**Dry Matter Protein**	**Falling Number**	**DON**	**Seed Germination**	**Yield**
				%	***lbs/bu***	***%***	***%***	***%***	***Seconds***	***ppm***	***%***	***bu/ac***
Pride of Genesee	SWWW	Heritage	Org.	13.3	58.8	11.6	11.4	12.9	336	<0.5	96	32
Pride of Genesee	SWWW	Heritage	Conv.	13.3	59.2	10.9	13.3	14.9	331	<0.5	95	36
Medina	SWWW	Modern	Org.	13.9	60.8	12.3	9.3	10.6	395	<0.5	94	96
Medina	SWWW	Modern	Conv.	13.8	60.9	12.3	9.8	11.2	387	<0.5	88	87
Warthog	HRWW	Modern	Org.	13.8	63.4	12.4	10.0	11.4	414	<0.5	76	92
Warthog	HRWW	Modern	Conv.	14.3	63.0	12.6	10.2	11.7	403	<0.5	65	85
NuEast	HRWW	Modern	Org.	14.2	63.4	12.7	9.8	11.2	443	<0.5	78	83
NuEast	HRWW	Modern	Conv.	14.4	63.4	13.0	10.7	12.3	417	<0.5	48	85
Appalachian White	HWWW	Modern	Org.	13.8	62.2	13.7	8.9	10.3	398	<0.5	99	76
Appalachian White	HWWW	Modern	Conv.	13.8	62.2	13.7	10.6	12.3	405	<0.5	89	81
Fulcaster	SRWW	Heritage	Org.	13.9	61.0	12.55	11.7	13.3	435	<0.5	98	37
Tom	HRSW	Modern	Org.	13.7	59.5	11.5	15.1	17.1	432	<0.5	88	31
Tom	HRSW	Modern	Conv.	14.1	59.7	12.8	13.4	15.4	441	<0.5	86	19
Brasetto	Hybrid Rye	Modern	Org.	13.1	55.9	10.8	7.2	8.1	280	<0.5	97	134
Brasetto	Hybrid Rye	Modern	Conv.	13.6	56.2	11.7	7.1	8.0	275	<0.5	98	125

Artisan baker Sharon-Burns Leader of Bread Alone reported:

Notes from 2016 Baking Trials		
Variety	***Appearance***	***Flavor***
Warthog Organic	yellow crumb	buttery nutty
Tom Organic	tight crumb needs more h2o	great smooth
NuEast Organic	open crumb	slight bitterness
Appalachian White Organic	tight crumb some holes	sticky – light
Appalachian White Conventional	tight crumb some holes	sticky – light
Warthog Conventional	loose crumb	slack sticky sweet flavor
Tom Conventional	tight crumb	good flavor
NuEast Conventional	nice open crumb yellow	good flavor

"By narrowing down the testing and conducting a taste test over two trials, I determined that 02 [Tom Organic] and 10 [Tom Conventional] were the outstanding varieties to consider. This is the flour that I made the loaves for the event from [2017 Small Grains Field Day at the Hudson Valley Farm Hub]."

Maltster Dennis Nesel of Hudson Valley Malt reported:

"… extremely pleased with the quality of the first batch of Organic Synergy from the 2016 trials…"

Conventional Scala from your field trials: "This malt performed very well in the Malthouse. Great germination and very plump kernels and very blonde color. No weathered staining. The flavor is very mild and delicate and sweet."

"…Medina organic white wheat….the wheat is very bright and clean of weeds and foreign matter. Very nice stuff."

Beverage Lab Results from 2016 Field-Scale Plots

Variety	Market Class	Management	Moisture	Protein	Test Weight	Plump	Thin	Germination Energy	Germination Capacity	RVA **	DON	Yield
			%	%,DB	lbs/bu	>6/64%	<5/64%	%	%		ppm	lbs/bu***
KWS Scala Era: Modern	WMB 2-Row	Organic	12.5	10.6	47.2	97.7	0.3	100	100	160	<0.1	108
KWS Scala Era: Modern	WMB 2-Row	Conventional	13.0	10.7	47.4	98.2	0.3	98	100	164	<0.1	88
AAC Synergy Era: Modern	SMB 2-Row	Organic	12.8	12.1	45.4	86.2	2.3	97	100	105	<0.1	38
AAC Synergy Era: Modern	SMB 2-Row	Conventional	12.4	11.5	44.7	88.8	1.7	97	97	93	<0.1	28
Medina Era: Modern	SWWW	Organic	14.7	10.2	61.2	98.3	0.2	98	100	184	<0.1	96
Medina Era: Modern	SWWW	Conventional	14.7	10.9	61.3	98.0	0.1	98	98	167	<0.1	87
Pride of Genesee Era: Heritage	SWWW	Organic	13.7	12.8	59.3	98.4	0.2	95	99	178	<0.1	32
Pride of Genesee Era: Heritage	SWWW	Conventional	13.7	13.8	59.7	98.5	0.2	95	97	163	<0.1	36
Brasetto Era: Modern	Hybrid Rye	Organic	12.1	8.5	55.3	62.9	4.4	99	100	145	<0.1	134
Brasetto Era: Modern	Hybrid Rye	Conventional	12.9	8.6	56.0	82.6	1.2	98	99	141	<0.1	125

*Notes: **RVA rating only applies to barleys. RVA >120 = little to no pre-germination; 120 to 50 = slight to moderate pregermination damage; > 50 = pre-germination damage issue. Falling number rating > 200 seconds = sound grain with little to no pre-germination damage*

****Based on barley at 48 lbs/bu, 14.5% standard moisture; wheat at 60 lbs/bu, 13.5% standard moisture; rye at 56 lbs/bu, 14.0% standard moisture)*

2017 Processing Trial Results

In 2017, the trials saw a record amount of rainfall from early spring through early summer, which greatly affected harvest timing and led to a decrease in final yield weights as compared to the 2016 harvest. All grains were nonetheless successfully produced and harvested, though some grains experienced heavy to moderate lodging, such as the heritage winter wheat, hybrid rye, and spring grains. Harvest was timely and largely successful in 2017. Some of the grains harvested in 2017 were processed for spirits, which are still aging. The final, comprehensive notes from these processing trials will appear in the final project report due out in 2019/2020.

ND Genesis was planned for a malting trial in 2017. However, just as the field-scale growout was dried down sufficiently and ready for harvest, the farm experienced several days of rain that prevented optimal harvest time. After harvest, the ND Genesis was dried down to below 14 percent moisture. Unfortunately, the processing trial did not yield good results because the RVA value, which indicates shelf stability during storage between harvest and processing and rate of germination capacity drop, was low. These factors require fast malting after harvest, which can be difficult to achieve.

Bread Lab Results from 2017 Field-Scale Plots

Bread Lab results from 2017 Field-Scale Plots

Variety	Market Class	Era	Management	Grain Moisture	Test Weight	Flour Moisture	Protein "As Is"	Dry Matter Protein	Falling Number	DON	Seed Germination	Yield
				%	*lbs/bu*	*%*	*%*	*%*	*Seconds*	*ppm*	*%*	*bu/ac*
Tom	HRSW	Modern	Conventional	13.4	60.4	12.1	15.1	17.2	388	<0.5	97	69
Tom	HRSW	Modern	Organic	12.4	59.5	12.0	15.1	17.2	399	0.6	94	57
Appalachian White	HWWW	Modern	Conventional	13.1	60.4	12.1	10.5	11.9	425	<0.5	98	22
Appalachian White	HWWW	Modern	Organic	13.5	56.4	12.2	11.5	13.0	476	<0.5	93	12
NuEast	HRWW	Modern	Conventional	14.2	60.8	12.6	11.8	13.5	413	<0.5	96	43
NuEast	HRWW	Modern	Organic	14.3	58.5	12.0	11.9	13.5	401	<0.5	91	35
Medina	SWWW	Modern	Conventional	13.95	50.5	13.2	11.8	13.6	219	<0.5	95	31
Medina	SWWW	Modern	Organic	13.4	46.6	13.2	12.5	14.4	238	<0.5	91	20
Pride of Genesee	SWWW	Modern	Conventional	13.1	57.8	11.8	12.7	14.3	255	<0.5	89	8
Pride of Genesee	SWWW	Heritage	Organic	12.6	56.0	11.5	12.8	14.5	273	<0.5	93	2
Brasetto	Hybrid Rye	Heritage	Conventional	13.9	55.5	11.2	9.10	10.2	290	0.5	98	99
Brasetto	Hybrid Rye	Modern	Organic	13.7	53.6	11.7	8.95	10.1	291	1.1	98	99
Danko	Rye	Modern	Conventional	13.6	55.7	11.4	9.55	10.8	271	<0.5	96	45
Danko	Rye	Modern	Organic	13.3	55.9	11.2	8.45	9.52	274	<0.5	97	38

Maltster Dennis Nesel of Hudson Valley Malt reported:

Concerning the 2017 ND Genesis Conventional Management SMB,

"…We did steep for our 2-day cycle and only got 23% germ.
Dark stained kernels.
We had to stop the process and get it out of the Malthouse…"

Beverage Lab Results for 2017 Field-Scale Plots

Beverage Lab results from 2017 Field-Scale Plots													
Variety	**Market Class**	**Era**	**Management**	**Moisture**	**Protein**	**Test Weight**	**Plump**	**Thin**	**Germination Energy**	**Germination Capacity**	**RVA**	**DON**	**Yield**
				%	**%,DB**	**lbs/bu**	**>6/64%**	**<5/64%**	**%**	**%**		**ppm**	**lbs/bu**
ND Genesis Era: Modern	SMB 2-Row	Modern	Organic	13.9	12.3	46.0	96.9	0.5	95	70	114	<0.1	92
ND Genesis Era: Modern	SMB 2-Row	Modern	Conventional	13.7	12.4	46.3	97.5	0.4	94	78	86	<0.1	110
KWS Scala Era: Modern	WMB 2-Row	Modern	Organic	12.9	12.3	43.9	88.0	2.3	98	69	183	<0.1	134
KWS Scala Era: Modern	WMB 2-Row	Modern	Conventional	12.8	10.8	45.9	93.4	1.1	100	84	166	<0.1	149
Brasetto Era: Modern	Hybrid Rye	Modern	Organic	13.0	10.1	53.5	40.7	14.4	93	94	161	0.5	99
Brasetto Era: Modern	Hybrid Raye	Modern	Conventional	13.2	9.9	54.5	56.2	9.5	100	96	145	0.15	99
Danko Era: Modern	Rye	Modern	Organic	12.5	10.7	55.2	51.9	8.4	99	99	146	<0.1	38
Danko Era: Modern	Rye	Modern	Conventional	12.8	11.0	55.3	49.2	11.2	97	98	145	<0.1	45
Pride of Genesee Era: Heritage	SWWW	Heritage	Organic	13.3	14.9	53.7	65.7	7.8	93	88	129	<0.1	2
Pride of Genesee Era: Heritage	SWWW	Heritage	Conventional	13.5	15.1	56.1	76.3	6.8	94	92	104	<0.1	8
Medina Era: Modern	SWWW	Modern	Organic	14.2	14.4	47.8	38.1	12.2	98	94	78	<0.1	20
Medina Era: Modern	SWWW	Modern	Conventional	14.8	13.8	50.9	60.9	4.7	94	98	89	<0.1	31

As special thank you to the labs who worked to provide us with results for the processing trials:

Beverage Lab:
Hartwick College Center for Food & Craft Beverage

Cereal Grain Lab:
University of Vermont Cereal Grains Lab

Summary of Findings 2014-2018

While the Hudson Valley Small Grains Project is continuing with small plot variety trials and processing trials, there are some helpful lessons learned that can be gleaned thus far. The most encouraging news from the project is that the Hudson Valley can produce high quality, food grade grains. Wheat and rye tend to be easier to grow than malting barley, but there are promising varieties within each type of small grain.

Of the wheat varieties tested, Medina, Erie, Warthog, Appalachian White, NuEast, Tom, Faller, and Glenn have performed the best on the farm. Among those, Medina and Tom have performed the best in our baking trials. The hybrid rye varieties also performed well in our trials. Among all of the varieties tested, Gatano, Florano, and Binntto performed the best. However, the Brasetto rye has proven to be a desirable variety for end users.

Malting barley has proven more difficult to grow than some of the other types of small grains, but some varieties have shown early promise. SY Tepee and SY Mezmar are two varieties that fared well during the on-farm variety trials. Unfortunately, they are no longer part of the trial because Syngenta, the seed owner, has pulled them off the market. This highlights the need for additional research and seed production of varieties that can be made available to regional farmers to support local agricultural resilience. Another lesson learned from our research is that the six row types of spring barley have grown better on the farm, but are less desirable to maltsters and brewers than the two row types of barley. Among the two row types, Synergy, Cervesa, and ND Genesis performed the best in our variety trials. As the processing trials continue, additional results will be available on malting barleys.

Overall, this project has demonstrated the need for coordinated research into small grains varieties that includes both farmers and the end user community. As we've learned, the processing trials are critical to understanding the viability of particular grains because the varieties that yield the highest and have the most disease resistance may not offer the best flavor profiles. For example, Warthog performed well in our variety trials on the farm, but was less desirable for baking than Tom. Additionally, the six row types of barley performed better agriculturally, but the two row types of barleys are more desirable to maltsters and brewers. It is therefore important to foster a dialog among people along the value chain to better identify promising grains for the Hudson Valley. This project will continue to do so in the coming seasons and will share the lessons learned with others in the Hudson Valley food and farming community.