What's Cropping Up?

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Recommended Roundup Ready Soybean Varieties For New York

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Soybean acreage continues to expand in New York with about 280,000 acres projected to be harvested in 2011 at an average yield of 43 bushels/acre. Soybeans require a limited number of inputs so variety selection is a key management decision that affects soybean yield. Growers should gather as much information as possible on variety selection because of its importance in optimizing profit for the 2012 growing season.

The varieties in Table 1 are recommended varieties, based on tests in Cayuga County (Aurora Research Farm), Livingston County (Neenan Brothers Farm in Lima), and Jefferson County (Ron Robbins's farm in Sackets Harbor) sites. We recommend varieties that have average relative yields of more than 100% across the three sites (100% relative yield equals the mean yield of the test). **Recommended varieties, which have been tested more than one year, have performed well over different growing seasons in NY so more consideration should be given to those varieties. When looking at relative yields in Tables 1, only compare relative yields of varieties within a Maturity Group.**

Table 1. Relative yields of recommended Group I and Group II Roundup Ready soybean varieties for New York, based on tests in Cayuga, Livingston and Jefferson Co. over the last few years.

VARIETY	COMPANY/BRAND	RELATIVE YIELD (%)	YEARS IN TEST
		GROUP I VARIETIES	
S17-F3	SYNGENTA	113	1
HS 19A02	GROWMARK FS	110	2
HS 19A11	GROWMARK FS	109	1
1805R2	CHANNEL BIO	107	1
H16-10R2	HUBNER SEED	104	1
AG1832	ASGROW	104	1
1719R2	T.A. SEEDS	104	2
AG1931	ASGROW	104	2
S19-A6	SYNGENTA	103	1
HS 17A12	GROWMARK FS	102	1
RPM DB1711RR	DOEBLER'S	102	1
		GROUP II VARIETIES	
AG2232	ASGROW	109	1
AG2031	ASGROW	106	1
2800R2	CHANNEL BIO	106	2
S20-Y2	NK	105	1
V25N9RR	DYNA-GRO	104	3
HS 21A12	GROWMARK FS	104	1
S21-N6	NK	104	6
SG2410	SEEDWAY	104	1
H20-12R2	HUBNER SEED	103	1
34Y27	DYNA-GRO	103	1
SG2111	SEEDWAY	103	1
2292R2	T.A. SEEDS	102	1
2400R2	CHANNEL BIO	102	2
SG2018	SEEDWAY	102	1
AG2430	ASGROW	101	2
38RY23	DYNA-GRO	101	1

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GROUP I

When averaged across the Group I tests at Aurora, Lima, and Sackets Harbor in 2011, S17-F3 from Syngenta, HS 19A02 and HS19A11 from Growmark FS, and 1805R2 from Channel Bio had exceptionally high yields. Other newly entered varieties that yielded above average include H16-10R2 from Hubner Seed, AG1832 from Asgrow, S19-A6 from Syngenta, HS 17A12 from Growmark FS, and RPM DB1711RR from Doebler's. Also, 1719R2 from T.A. Seeds and AG1931 from Asgrow yielded above-average for the second consecutive year. The Group I varieties averaged only 1 bushel/acre lower than the Group II varieties at Aurora (drought stress from early July until late August) and Lima (planted 6 June because of the wet April-May conditions) and 3 bushels/acre more at Sackets Harbor (planted 3 June).

GROUP II

When averaged across the Group II tests at the three sites in 2011, newly entered varieties AG2232 and AG2031 from Asgrow, and S20-Y2 from Syngenta yielded much above-average. Other newly entered varieties that performed above average include, HS 21A12 from Growmark FS, SG2410, SG2111, and SG2018 from Seedway, H20-12R2 from Hubner Seed, 34Y27 and 38RY23 from Dyna-Gro, and 2292R2 from T.A. Seeds. An older variety, S21-N6 from Syngenta had the second highest average yield in 2011. Other varieties that had been entered previously that performed well include 2800R2 and 2400R2 from Channel Bio, V25N9RR from Dyna-Gro, and AG2430 from Asgrow.

Conclusion

Variety selection strongly influences yield and subsequent profit. Commercial varieties in the same maturity group have significant yield differences, lodging resistances, and harvest moistures. Consequently, soybean variety selection greatly impacts harvesting efficiency and profit so growers should consider all sources of information when selecting varieties. We provide yield, moisture, and lodging data in our 2011 New York State Soybean Variety Test Report (as well as reports from previous years), posted on our web site, www.fieldcrops.org.

Recommended Corn Silage Hybrids for New York

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The increase in corn prices over the last few years has prompted dairy producers to include a higher percentage of corn silage in the dairy ration. Consequently, dairy producers must carefully select corn silage hybrids that have high yields as well as outstanding silage quality to maximize milk production from their herd. We evaluated 85-115 day corn silage hybrids at three locations in NY (Aurora Research Farm in Cayuga County, Sparta Farms in Groveland Station in Livingston County, and the T&R Center in Harford in Cortland County). In previous years, we tested at two sites in northern NY but in 2011 we substituted the Harford site for NNY sites because of budgetary constraints. We arrange the hybrids in the field into 5-day relative maturity (RM) groups (i.e. 95-100, 101-105 day hybrids, etc.) and harvest two (Aurora) or all RM groups (Sparta Farms and T&R Center) at a particular site in one day when the hybrids are in the 62-70% moisture range. We also take an initial 10,000-gram sample from each plot and then sub-sample to 700 grams to determine moisture and to run silage quality analyses on all four replications of each hybrid at each site.

MILK2006, a spreadsheet from the University of Wisconsin, calculates milk/ton, a silage quality index, derived from ash, neutral detergent fiber (NDF), and NDF digestibility (30 hr), (these concentrations are determined from wet chemistry procedures for duplicate samples); and crude protein and starch concentrations (NIR procedures). MILK2006 also calculates milk yield/acre of each hybrid by combining silage yield and milk/ton values. We recommend hybrids that have comparative milk yields of greater than 100 across the two or three sites (the average milk yield of each hybrid RM group is adjusted to 100 and hybrids within the RM group with above-average milk yield have values above 100). We list the comparative milk yields as well as comparative silage yields and milk/ton values for recommended hybrids for all of NY (Table 1). **Hybrids within each table should only be compared within RM groups. Hybrids that have been tested more than 1 year should be given more weight because they have performed above-average in more environments.**

85-90 day RM

The hybrids, 87S9 from LICA and TA290-11 from T.A. Seeds, continued to perform well in this RM group in NY in 2011. Also, newly entered hybrids, WRV 2087L from Wolf River Valley, RPM 269HRQ from Doebler's, HiDF 3290-9 from Dairyland Seed, and DKC40-22 GENSS and DKC38-89 VT3 from DEKALB, had above-average milk yields. The DEKALB hybrids had much-above milk/ton values whereas the other hybrids had above to much-above average silage yields. In addition, Masters Choice 480 from King's Agriseeds had an above-average milk/ton value for the second consecutive year.

91-95 day RM

The hybrids, 946L RR from LICA and TMF2L418 from Mycogen continued to perform well with both hybrids having much-above silage yields in 2011. Also, newly entered hybrids, 4217XRR from Growmark FS and P9917AM1 from Pioneer, had the highest milk yields in the 2011 tests because of much-above average silage yields and above-average milk/ton values. Also, the newly entered hybrids, DKC42-72 VT3 from DEKALB, had a much-above average milk/ton value; and NK N29T-3000GT, an NK brand, had above-average silage yield.

96-100 day RM

The hybrids, TMF2L533 from Mycogen, had an exceptional silage yield; D39QN29 from Dyna-Gro had an above-average milk/ton value; and 478SL from Doebler's had an exceptional silage yield in 2011 so all three hybrids continue to be highly recommended. Newly entered hybrids that performed very well in 2011 include RPM 472XRR from Doebler's, HL SR48 from Hyland Seed, DKC46-61 GENSS from DEKALB, 99S7 from LICA, and NG 6550 from Fielder's Choice (because of much-above to above silage yields); and, DKC49-94 GENSS from DEKALB, 4811GT3 from Growmark FS, F2F488 from Mycogen, and TA477-31 from T.A. Seeds, (because of much-above to above milk/ton values).

101-105 day RM

The previously entered hybrids, G 86T82-3000GT from Garst, P0125HR from Pioneer, TA 545-20 and TA 557-00F from T.A. Seeds, and DKC52-59VT3 from DEKALB performed exceptionally well in 2011. Also, newly entered hybrids, HiDF 3702-9 from Dairyland Seed, 554GRQ from Doebler's, NK N53W-3000GT, an NK brand, and P0448XR from Pioneer also performed well in 2011.

106-110 day RM

Previously entered hybrids, P1011XR from Pioneer, 2114L from Wolf River Valley, and 1084L HX from LICA had much-above average calculated milk yields in 2011. Also, P0210HR from Pioneer and 5667GT3 from Growmark FS had much-above average silage and milk/ton values in 2011. Other newly entered hybrids that performed well include 209-85VT3P from Channel Bio, G 85E98-3000GT from Garst, D50VN10 from Dyna-Gro, and Masters Choice 535 from King's Agriseeds.

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Table 1. Recommended 85-115-day corn silage hybrids in New York based on tests in Cayuga Co. (Aurora Research Farm), Cortland Co. (T&R Center in Harford) and Livingston Co. (Sparta Farms in Groveland Station) and in NNY sites instead of Harford in previous years.

Brand/Co.	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comp. Milk Yield	Yr in Test
		-------------------------------	%	------------------------	no.
		85-90 day Relative Maturity			
LICA	87S9	115	98	112	2
T.A.Seeds	TA290-11	106	102	108	4
Wolf River Valley	WRV 2087L	107	101	107	1
Doebler's	RPM 269HRQ	103	103	106	1
Dairyland Seed	HiDF 3290-9	103	102	105	1
DEKALB	DKC40-22 GENSS	99	105	103	1
DEKALB	DKC38-89 VT3	101	102	103	1
King's Agriseeds	Masters Choice 480	100	102	102	2
		91-95 day Relative Maturity			
Growmark FS	4217XRR	108	102	111	1
LICA	946L RR	108	102	109	6
Pioneer	P9917AM1	107	101	109	1
Mycogen	TMF2L418	103	101	104	5
DEKALB	DKC42-72 VT3	99	104	103	1
NK	NK N29T-3000GT	102	100	102	1
		96-100 day Relative Maturity			
Mycogen	TMF2L533	113	96	109	2
Dyna-Gro	39QN29	104	104	108	2
Doebler's	RPM 472XRR	107	101	108	1
Hyland	HL SR48	110	98	107	1
Doebler's	478SL	103	100	104	3
DEKALB	DKC49-94 GENSS	99	105	104	1
Growmark FS	4811GT3	101	102	104	1
LICA	99S7	102	100	103	1
DEKALB	DKC46-61	102	100	102	1
Fielder's Choice	NG 6550	104	99	102	1
T.A. Seeds	TA 477-31	100	101	101	1
Mycogen	F2F488	93	108	101	1

111-115 day RM

Two DEKALB hybrids, DKC63-84 VT3, and the newly entered DKC62-54 VT3 had much-above average calculated milk yield with both hybrids having above-average silage yield and above-average milk/ton values. Also, 214-14VT3P from Channel Bio (highest calculated milk yield in the 111-115 day RM in 2011), and V5294HTXRNS from Dyna-Gro performed exceptionally well for the second consecutive year. The newly entered hybrids 6611GT3 from Growmark FS and 1498HR from Pioneer also had above-average milk yields in 2011.

Conclusion

Hybrid selection is one of the most important management practices that affect corn silage yield and quality. Dairy producers must select the best adapted hybrid for their region to maximize high-quality corn silage in the ration, especially if high corn grain prices continue. We urge seed companies to enter their hybrids in our corn silage hybrid testing program so New York dairy producers can make informed decisions, based on tests under NY environmental conditions. You can access the detailed 2011 Corn Silage Hybrid Report at our web site, www.fieldcrops.org.

Table 1 continued. Recommended 85-115-day corn silage hybrids in New York based on tests in Cayuga Co. (Aurora Research Farm), Cortland Co. (T&R Center in Harford) and Livingston Co. (Sparta Farms in Groveland Station) and in NNY sites instead of Harford in previous years.

Brand/Co.	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comp. Milk Yield	Yr in Test
		----------------------------%----------------------			no.
		101-105 day Relative Maturity			
Garst	G 86T82-3000GT	106	102	109	3
Pioneer	P0125HR	108	101	109	2
T.A. Seeds	TA 557-00F	106	101	108	8
T.A. Seeds	TA 545-20	106	101	107	2
Dairyland Seed	HiDF 3702-9	104	100	105	1
DEKALB	DKC52-59VT3	102	103	105	2
Doebler’s	554GRQ	103	102	105	1
NK	NK N53W -3000GT	104	98	103	1
Pioneer	P0448XR	106	98	103	1
Hyland	HL SR59	106	96	102	4
		106-110 day Relative Maturity			
Pioneer	P011XR	113	102	114	2
Wolf River Valley	2114L	109	99	108	2
Pioneer	P0210HR	107	103	110	1
Growmark FS	5667GT3	104	103	107	2
LICA	1084L HX	108	99	107	3
Channel Bio	209-85VT3P	105	101	107	1
Garst	G 85E98-3000GT	99	105	103	1
Dyna-Gro	D50VN10	104	98	101	1
King’s Agriseeds	Masters Choice 535	99	102	101	1
		111-115 day Relative Maturity			
DEKALB	DKC63-84 VT3	107	102	109	2
DEKALB	DKC62-54 VT3	103	104	107	1
Dyna-Gro	V5294HTXRNS	106	100	106	2
Channel Bio	214-VT3P	105	101	105	2
Growmark FS	6611GT3	102	100	102	1
Pioneer	1498HR	101	101	101	1

Plant Breeding

Buy Your Oat Seed Early! and Keep an Eye on Corral for Spring 2013

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We all know what a challenging growing season 2011 was, and here in New York the spring grains were especially hard hit by excessive rains at planting and during early crop development. In October, the New York office of the National Agriculture Statistics Service reported 55,000 acres planted to oat in New York, only 34,000 acres harvested, and an average yield of 50 bu/acre (down from 67 bu/acre reported last year). That all adds up to 1.7 million bushels of oats produced in New York this year – down 56% from last year's reported production of almost 3.9 million bushels. Figure 1 shows the last 15 years of oat yields in New York. Oat yields in 2011 were the lowest we've seen in New York in 20 years – in 1991 average state yield was also 50 bu/acre.

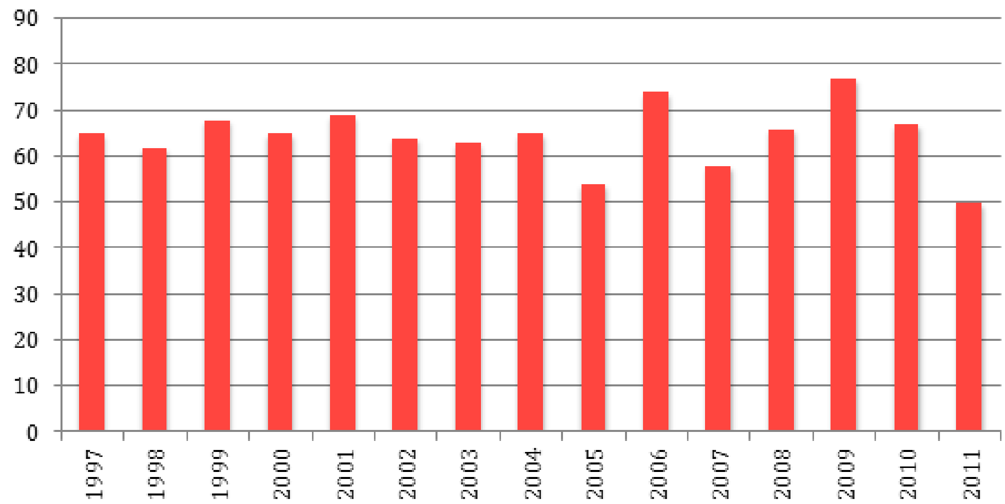

Figure 1. Oat yield (bu/acre) in New York from 1997 to 2011. Source: National Agricultural Statistics Service.

This trend was not just a New York issue. Producers throughout the country experienced a variety of challenges with the growing season. In the U.S. as in New York, oat acreage planted was down and acreage harvested was down even more (Figures 2 and 3). Together with lower than average yields, these trends led to oat production that was down by quite a bit in 2011, both in New York and nationally, as shown in Figure 4.

The same conditions that reduced farmers' yields and thus production of oats also reduced yields for seed growers. As a result, the supply of oat seed for 2012 planting is very tight. Advice to any growers planning to seed oats this spring is to purchase your seed early! Supplies are likely to run out as we get closer to planting season, particularly for the best adapted and most productive varieties.

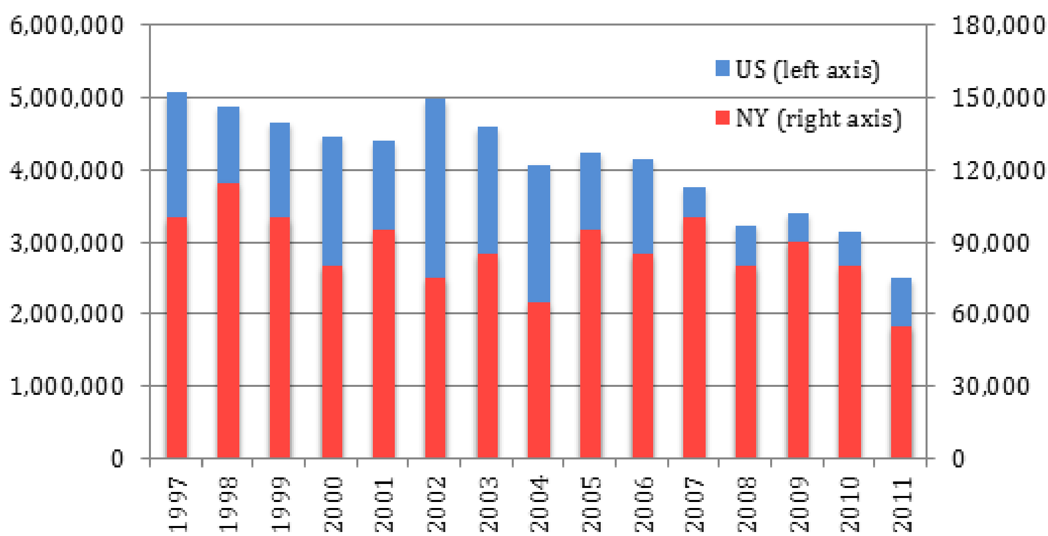

Figure 2. Oat area planted (acres) in the U.S. (blue, left axis) and in New York (red, right axis) from 1997 to 2011. Source: National Agricultural Statistics Service.

Plant Breeding

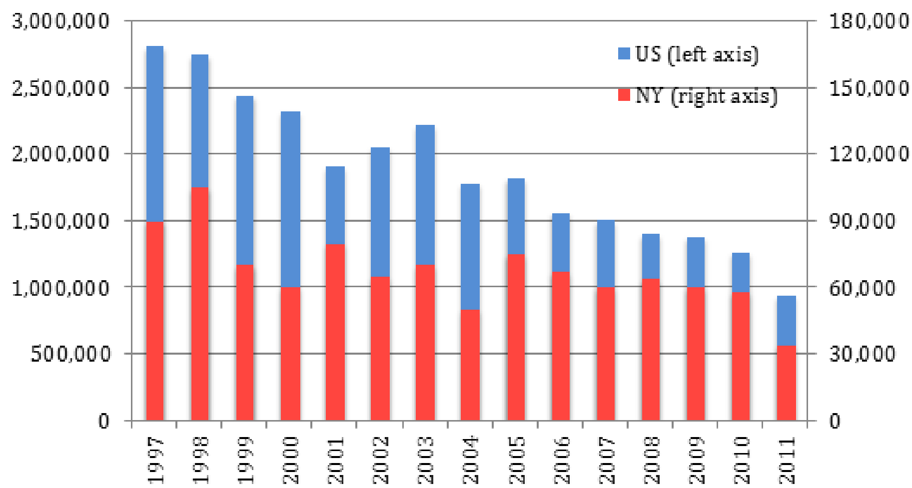

Figure 3. Oat area harvested (acres) in the U.S. (blue, left axis) and in New York (red, right axis) from 1997 to 2011. Source: National Agricultural Statistics Service.

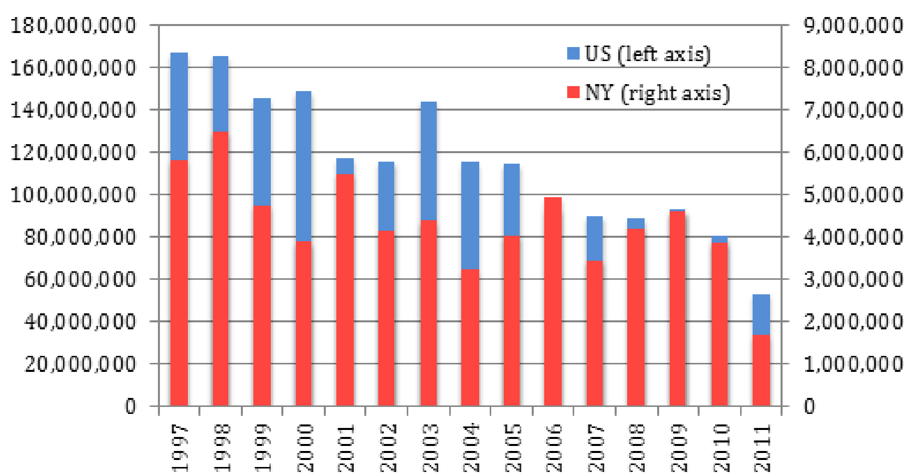

Figure 4. Total oat production (bu) in the U.S. (blue, left axis) and in New York (red, right axis) from 1997 to 2011. Source: National Agricultural Statistics Service.

Table 1. 2011 Spring Oat Performance Summary

Variety	Grain Yield, bu/A 5 Yr	Test Weight, lb/bu 2 Yr	Lodging, 0-9 score* 2 Yr	Heading Date 2 Yr	Plant Height, cm 2 Yr
Ogle	78	36.1	2.6	6/26	73
Blaze	79	38.0	4.0	6/26	67
Robust	82	39.0	1.5	6/27	68
Spurs	80	39.4	2.6	6/25	66
Corral	89	39.8	1.8	6/28	65

* Scores for lodging are done on a scale from 0 (no lodging) to 9 (completely lodged).

New York growers looking to choose the most productive oat varieties for our state will want to check out the spring grains performance summary in Table 1. This table shows the yield, test weight, and other performance characteristics of varieties tested in New York State over the past two to five years. The varieties are listed in order from those that have been tested the longest to those most recently entered into the testing program. For each trait, the number of years of data used to assess that trait is noted at the top of the table. The more years of evaluation, the more precise the data will be. The table includes only varieties that have been tested for at least two years in Cornell trials. All these spring oat varieties are good options for New York growers.

The variety Corral looks like an excellent performer. It is a variety developed at the University of Illinois and identified through Cornell testing as very well adapted in New York. Corral has excellent yield, excellent test weight, and very good lodging resistance. It is resistant to barley yellow dwarf virus and smut. It is a light yellow hulled oat with average groat percentage. Seed of Corral will not be available for commercial planting until 2013, but it promises to be an outstanding oat variety for New York.

Nutrient Management

Effect of Manure, Compost, and Potassium Application on Alfalfa Yield, Potassium Content and Soil Test Potassium in Aurora, NY

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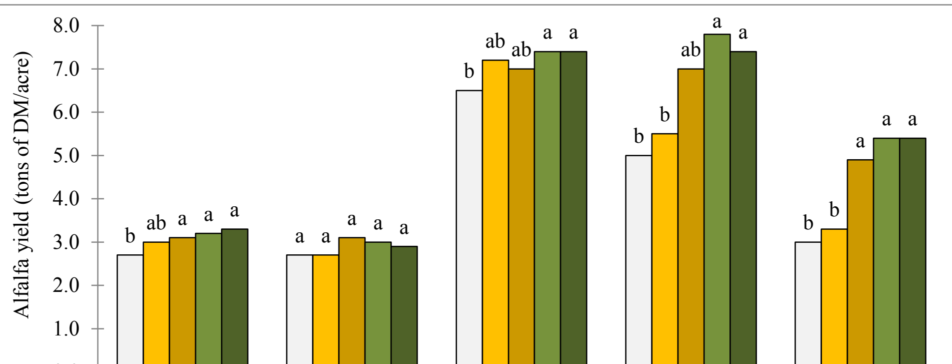
Introduction

While K fertilizer cost has decreased from recent all-time highs of $0.80/pound to currently $0.40/pound, K remains an expensive macro-nutrient. Alfalfa removes large amounts of K (57 lbs K_2O per ton DM assuming 2.384% K for legume hay; DairyOne Forage Library, 2011) and with alfalfa forage production of 740,000 acres and average per acre yield of 3.2 tons reported for 2010 (http://www.nass.usda.gov/Statistics_by_State/Ag_Overview/AgOverview_NY.pdf), total alfalfa crop K removal in New York State is approximately 135.5 million pounds of K_2O. If this removal had to be completely replaced by fertilizer K, at $0.40/pound, it would require about $73 per acre of alfalfa cropland or more than $54.2 million dollars annually. Potassium can be recycled through manure applications, replaced by fertilizer applications or resupplied by the soil. Soil K supplying capacity is large for clay soils and fairly low for sandy soils but all agricultural soils supply K to crops as clay minerals weather (break down) over time, and this process reduces the need for K supplementation from manure or fertilizer. Manure, when applied to meet N needs for corn in a corn-alfalfa rotation, supplies large amounts of K during the corn years, typically increasing soil test K levels and often providing excellent K levels for the first few years of a new alfalfa stand. However, as manure applications are often avoided early in the stand life, and as soil test K levels decline with heavy alfalfa utilization, producers and agricultural advisors are understandably reluctant to avoid K fertilizer use on older (3rd, 4th year) alfalfa stands out of concern for reduced yield and/or winter kill.

Producer questions addressed in this project are: (1) is the K applied with manure or compost in corn years sufficient to bridge alfalfa years in the rotation, and (2) what tools can be used to reliably identify if extra K is needed. In 2001, a large-scale long-term corn-alfalfa rotation study was initiated at the Musgrave Research Farm in central NY. Corn silage was grown for 5 years on calcareous soils under N-based (without incorporation) and P-removal based manure and/or compost management as well as 6 rates of N fertilizer plus banded P and K according to Land Grant guidelines. The field was then rotated to alfalfa. The questions related to K management were: (1) can manure or compost supply the K needed for the alfalfa years in the rotation, and (2) is extra K needed for the plots that did not have a manure or compost history?

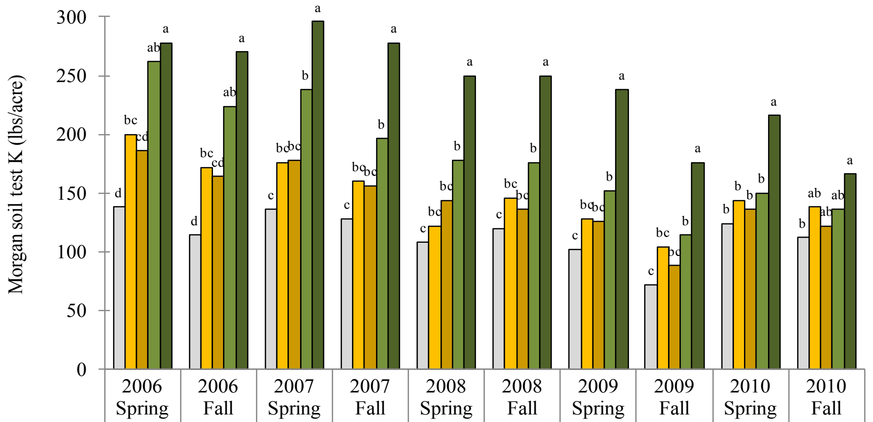
Materials and Methods

The long term study at the Musgrave Research Farm was initiated to compare corn and alfalfa yield under different fertility management strategies. During the corn years (first 5 years), in four of the ten treatments manure or compost was applied at two rates (annual application of 20 and 34 tons/acre compost or 8,000 and 20,000 gallons/acre liquid manure). The manure and compost rates were set to meet corn N needs without incorporation (the higher N-based rates) or P crop removal (the lower rates; manure was incorporated in the P-based treatments to conserve N). Additional treatments during the corn years consisted of a no-N control and five fertilizer N rates (50, 100, 150, 200 and 250 lbs N/acre). The entire trial was replicated five times (randomized complete block design). Alfalfa was established with 20 lbs P_2O_5 and 20 lbs of K_2O/acre in



	2006	2007	2008	2009	2010
Inorganic N	2.7	2.7	6.5	5.0	3.0
Manure P	3.0	2.7	7.2	5.5	3.3
Compost P	3.1	3.1	7.0	7.0	4.9
Manure N	3.2	3.0	7.4	7.8	5.4
Compost N	3.3	2.9	7.4	7.4	5.4

Figure 1: Annual dry matter yields (5 year average including the seeding year) for alfalfa grown after corn that was fertilized with compost, manure, or inorganic N fertilizer. Fields were fertilized with N or P based compost or manure rates or inorganic N fertilizer during the five years of corn production, prior to seeding of the alfalfa in 2006. No K was added during the alfalfa years. The year 2007 was a drought year at the Musgrave Research Farm.



	2006 Spring	2006 Fall	2007 Spring	2007 Fall	2008 Spring	2008 Fall	2009 Spring	2009 Fall	2010 Spring	2010 Fall
Inorganic N	138	114	136	128	108	120	102	72	124	112
Manure P	200	172	176	160	122	146	128	104	144	138
Compost P	186	164	178	156	144	136	126	88	136	122
Compost N	262	224	238	196	178	176	152	114	150	136
Manure N	278	270	296	278	250	250	238	176	216	166

Figure 2: Trends in soil test K during the alfalfa years of the rotation (calcareous Kendaia/Lima soil management group 2 soil). Fields were fertilized with N or P based compost or manure rates or inorganic N fertilizer during the five years of corn production, prior to seeding of the alfalfa in 2006. No K was added during the alfalfa years.

2006 (after the five years of corn) and harvested in a 4-cut system with the exception of 2006, the seeding year with two cuts, and 2007, which was harvested in three cuts due to drought.

A K rate study was initiated in 2007 using plots that did not receive manure or compost as part of the original 10 treatments established in 2001. Upon initiation of the K rate study, the soil test K levels of these plots averaged 117 lbs K/acre, classified as high in soil test K according to the Cornell Morgan soil test K interpretations for alfalfa. The K trial consisted of five annual K application rates: 0, 83, 166, 252, and 335 lbs K_2O/acre applied at green-up. The 252 lbs/acre rate was the estimated crop removal rate for the site, assuming an average crop removal of about 57 lbs K_2O per ton of DM (2.384% K_2O) and an estimated annual yield average of about 4.4 tons DM for the Kendaia/Lima soil at the farm.

Results and Discussion

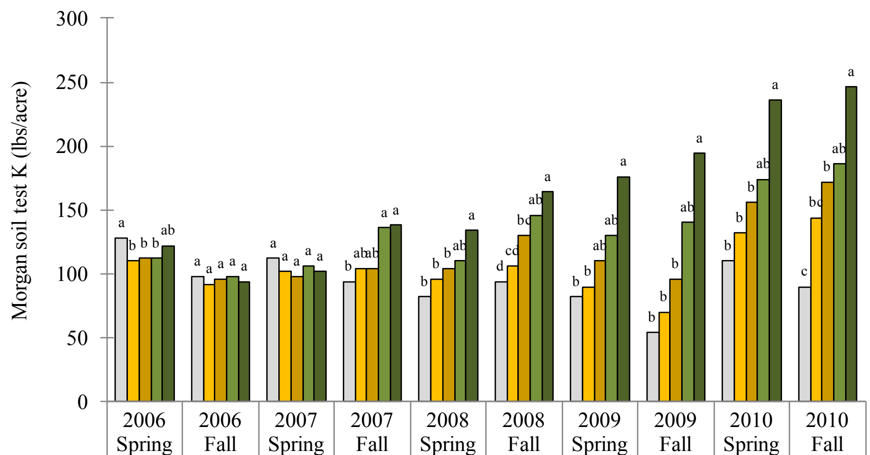
Compost versus Manure versus Commercial Fertilizer; Dry Matter Yield

Alfalfa dry matter yields ranged from an average annual yield (over 5 years including the establishment year and the 2007 drought year) of 4.0 tons/acre for plots that did not have a manure or compost history and did not receive additional K, to 5.3 tons/acre for plots with the higher compost and manure rates during the corn years. In years 4 and 5, the compost histories and the high manure N rate history out-yielded the lower manure rate and the yields of plots that had not received any manure or compost during the corn years (Figure 1).

Table 1: Alfalfa yield (tons/acre) as impacted by potassium rate. Alfalfa was established in 2006. First K applications took place in spring 2007. The soil is a calcareous Kendaia/Lima soil (SMG 2). The 252 lbs/acre application rate is the crop-removal based application rate for this site.

	Potassium (K_2O) applied in spring (lbs/acre)										
Year	0		83		166		252		335		*P value*
	Alfalfa yield in tons DM/acre										
2006	2.5	a	2.6	a	2.6	a	2.7	a	2.6	a	0.8517
2007	2.8	a	2.6	a	2.6	a	2. 6	a	2.6	a	0.8016
2008	6.3	b	5.9	b	6.5	ab	6.7	a	7.0	a	0.0013
2009	5.3	a	4.8	a	5.1	a	4.3	a	4.8	a	0.5254
2010	3.0	a	2.5	a	3.0	a	2.5	a	2.9	a	0.3945
Total	20.0	a	18.4	a	19.8	a	18.8	a	19.9	a	0.5819
Annual	4.0	a	3.7	a	4.0	a	3.8	a	4.0	a	0.1309

Nutrient Management



	2006 Spring	2006 Fall	2007 Spring	2007 Fall	2008 Spring	2008 Fall	2009 Spring	2009 Fall	2010 Spring	2010 Fall
No K control	128	98	112	94	82	94	82	54	110	90
83 lbs K2O/acre	110	92	102	104	96	106	90	70	132	144
166 lbs K2O/acre	112	96	98	104	104	130	110	96	156	172
252 lbs K2O/acre	112	98	106	136	110	146	130	140	174	186
335 lbs K2O/acre	122	94	102	138	134	164	176	194	236	246

Figure 3: Trends in Cornell Morgan soil test K with addition of K fertilizer. The K addition did not impact total yield. Soil tests are classified as high when the Cornell Morgan soil test K value is between 100 and 164 lbs K/acre and very high if it exceeds 164 lbs K/acre (the soil is a calcareous Kendaia/Lima soil management group 2 soil).

Compost versus Manure versus Commercial Fertilizer; Soil Test Trends

The five annual additions of manure or compost under the corn years increased soil test K levels over time, as represented by the spring 2006 difference between 138 lbs K/acre soil test K (no compost or manure) and 262 and 278 lbs K/acre soil test K under the N-based compost and manure treatments, respectively (Figure 2). These values suggest an annual increase of 25-28 lbs K/acre soil test K for the N-based rates, versus 10-12 lbs/acre annual increase for P-based rates.

Soil test K levels declined over time under the alfalfa years for all manure and compost amended plots (Figure 2). In the last alfalfa year, only the N-based manure rate showed soil test K levels that remained higher than in the plots that did not have a manure or compost history. At the end of the 5th year, soil test K levels for all compost or manure treatments were still classified as high in K, suggesting the rotation can be managed without the need for K fertilizer addition.

Potassium Addition; Dry Matter Yield

The addition of K to plots without a manure or compost history increased yields only in 2008, an exceptionally good growing season with average yields of 6-7 tons/acre dry matter, considerably above the average yield potential for the soil type (Table 1). That year, a K addition of 252 or 355 lbs K_2O/acre delivered a significantly higher yield (0.4-0.7 tons/acre) than the no-K control. For each of the other three years (2007, 2009 and 2010), K addition did not impact yield. Averaged over the five years of alfalfa, annual yield was 3.7 to 4.0 tons/acre, consistent with the yield potential for the soil type, with no net gain in yield with K addition. Thus, the optimum K rate across all five years was 0 lbs K_2O/acre, less than the 20 lbs K_2O/acre Cornell recommendation for a Kendaia/Lima soil with an initial Morgan soil test K of 117 lbs K/acre.

Potassium Addition; Soil Trends

The K addition did not increase alfalfa yield but elevated soil test K levels over time (Figure 3) where application rates exceeded 2/3rd of crop removal (166 lbs K_2O/acre). The average soil test K at seeding in the spring of 2006 was 117 lbs K/acre (classified as high). Without K addition, spring soil test K levels ranged from 82 lbs K/acre in 2008 and 2009 to 110 lbs K/acre in 2010, taking into

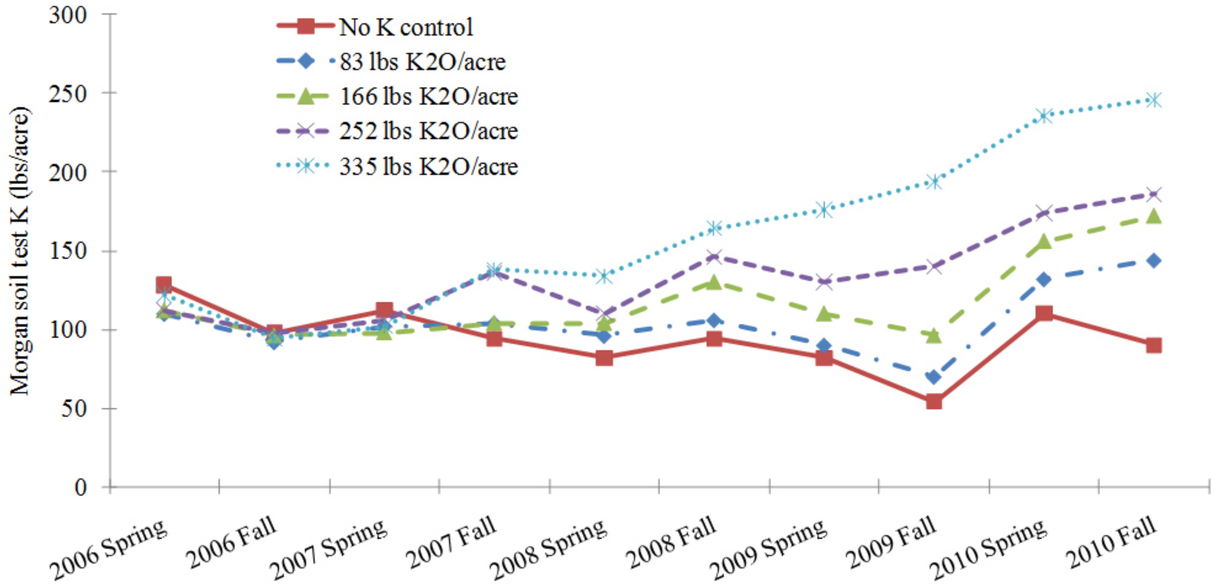


Figure 4: Soil test K levels increased with K addition of 166 lbs K_2O/acre or more.

consideration some expected variability in soil test K, these results primarily reflect the soils ability to resupply K after significant amounts of crop removal and suggest that this soil can supply needed K at the harvest/removal levels experienced over the five year period.

Potassium Addition; Tissue Trends

In addition to increasing soil test K levels, K addition at 166 lbs/acre or more also increased whole plant K content sampled at 3rd cutting in 2010 (Figure 5). In comparison, whole plant K levels for the plots with the manure and compost histories amounted to 1.5% for the fields with a compost history versus 1.6 and 1.9% for fields with P-based and N-based manure applications, respectively, further suggesting that K availability was not yield limiting in the inorganically fertilized plots. These results call into question the 2% critical value that is commonly reported for alfalfa, indicating further research is needed to evaluate the critical plant K levels for alfalfa.

Summary and Conclusions

The questions posed in this study related to K management were: (1) can manure or compost supply the K needed for the alfalfa years in the rotation, and (2) is extra K needed for the plots that did not have a manure or compost history? The data indicate that the annual manure and compost additions at both N and P-based rates during corn silage production years provided sufficient K to meet crop needs for the following five alfalfa years. When N-based rates of manure were applied during the corn years, soil test K levels were elevated at the start of the alfalfa portion of the rotation and remained elevated over all other treatments for the five years of alfalfa. Soil test K levels were back to 2006 baseline levels for the other three organic amended treatments. These results indicate that corn alfalfa rotations can be managed without K addition during the alfalfa years in a manure or compost context. For plots without a compost or manure history, soil test K levels were maintained over the years without K fertilizer addition and despite plant K levels below 2% the alfalfa did not show a yield increase with K fertilizer addition suggesting the soil's annual K supply was sufficient to sustain a 4 tons/acre per year yield at this location. Regular soil testing is the best way to monitor fields for responsive conditions to avoid yield losses or unnecessary expenses and unnecessarily high forage K levels that can lead to other problems. The yield increase in the plots with the manure or compost histories over plots that were managed with fertilizer only suggest benefits of manure and compost beyond their N, P and K additions. Similar studies are needed at different locations and with different soil types to evaluate if the results of this study can be repeated elsewhere.

Nutrient Management

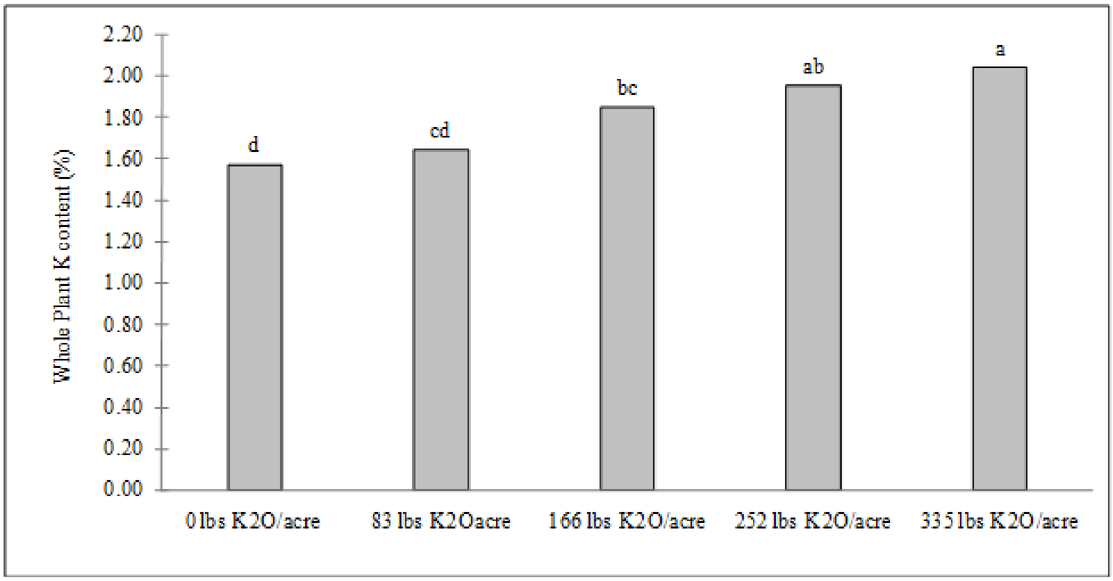


Figure 5: Impact of K addition on tissue K at 3rd cutting after four years of K addition (2010). The fertilizer addition (annual additions at green-up) did not increase yields.

Acknowledgments
We thank New York Farm Viability Institute (NYFVI) and the International Plant Nutrition Institute (IPNI) for support for this project. For questions about this project contact Quirine M. Ketterings at 607-255-3061 or qmk2@cornell.edu, and/or visit the Cornell Nutrient Management Spear Program website at: http://nmsp.cals.cornell.edu/.

Comparison of Tissue K and Whole Plant K for Alfalfa

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Nutrient Management

Introduction

Stakeholders have often referred to Cornell potassium (K) guidelines as too low to support high yields. However, increasing K fertilizer prices have many wondering if K applications can be reduced without impacting yield, quality or stand survivability. In collaboration with consultants, extension educators and farmers, we initiated a research station project on alfalfa K needs for alfalfa grown in rotation with corn. We report on the yield data for the K study in What's Cropping Up? 21(4): 8-11. Here we focus on assessing the impact of K addition on plant K status as well as the relationship between whole plant K content and tissue K content. We address the question: can whole plant K content from a forage analyses be used to diagnose a potential K deficiency?

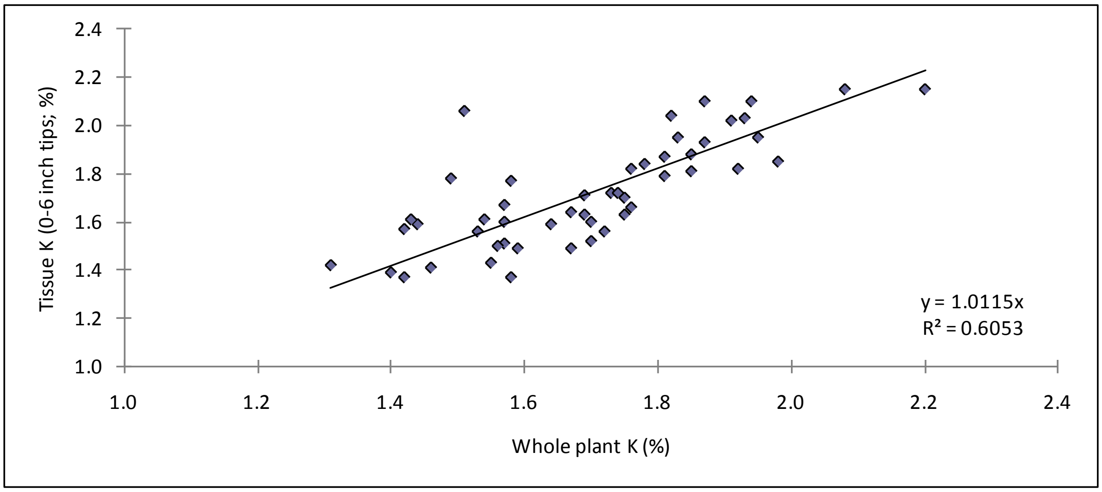

Figure 1: relationship between whole plant K and tissue K content across 50 plots sampled at 3rd cutting in 2010. The plots represent a variety of field histories.

Materials and Methods

At the Aurora Research Farm in central NY, a K rate study was initiated in 2007 on plots that had been planted to corn for five years and conventionally fertilized (i.e. no manure or compost history). The plots were classified as high in soil test K (average of 117 lbs K/acre in the spring of 2006) according to the Cornell Morgan soil test K interpretations for alfalfa. The trial consisted of five annual K application rates: 0, 83, 166, 255, and 335 lbs K_2O/acre. The 255 lbs/acre rate was the estimated crop removal rate for the site, assuming an average crop uptake of 56 lbs K_2O per ton of DM. In addition to the K rate study on plots that were conventionally fertilized during the corn years of the rotation, we also tracked alfalfa plots that during corn years had two compost application rates (20 and 34 ton/acre, representing P-removal and N-based application rates) and two liquid manure application rates (8,000 and 20,000 gallons/acre; representing P-removal based applications with

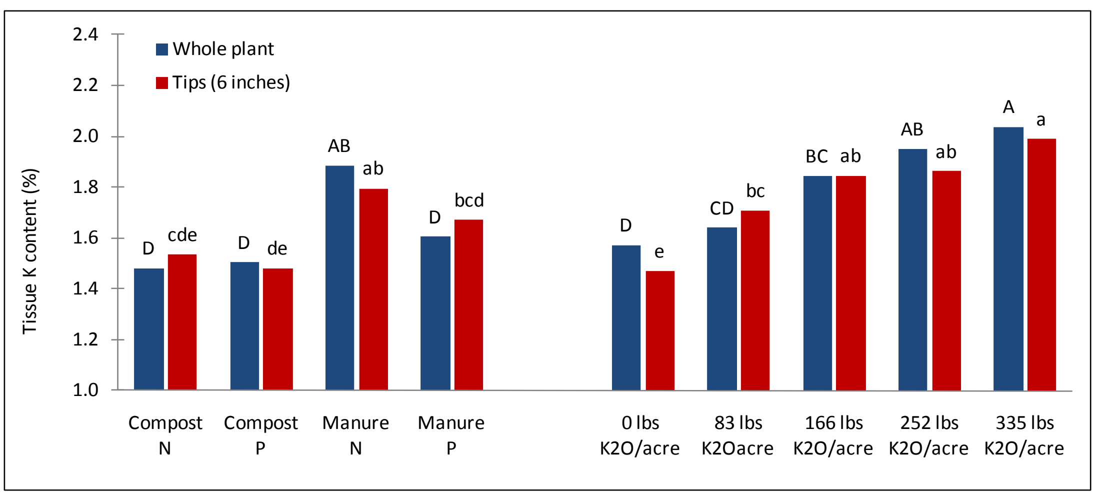

Figure 2: Tissue and whole plant K content as impacted by compost and manure history and K fertilizer application rate. In blue is whole plant K content while tissue K (top 6 inches) is represented by the red colored bars. Within tissue K (purple), lower case letters that are different indicate a significant change in tissue K. Within whole plant K (blue), upper case letters that are different among treatments indicate significant differences at P≤0.05.

Nutrient Management

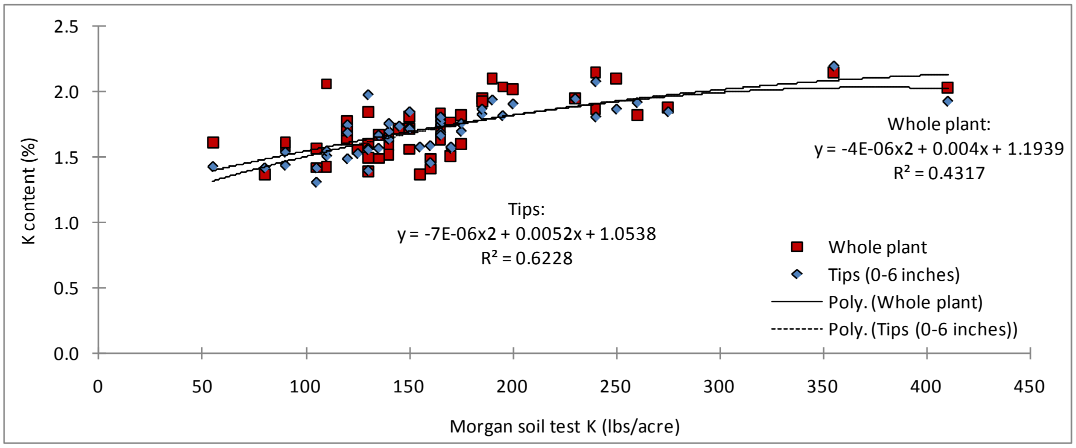

Figure 3: Tissue K contents leveled off at 1.8% when soil test K levels exceeded about 200 lbs/acre

incorporation of manure to conserve N, and N-based without incorporation of the manure, respectively). The organic materials were applied annually in the spring during the 5 years of corn that preceded the establishment of alfalfa and resulted in soil test K levels that were classified as very high (186 and 200 lbs P/acre for the P-based applications and 262 and 278 lbs P/acre for the N-based rates for compost and manure, respectively).

Alfalfa was established in 2006 and the K rate study initiated in 2007. All plots were sampled for tissue K (top 6 inches) during 3rd cutting in July of 2010. This was done in addition to yield sampling. All treatments were replicated five times (randomized complete block design) and alfalfa was typically harvested in a 4-cut system (except 2006, seeding year with two cuts, and 2007 which was harvested in three cuts due to drought). Whole plant and tissue samples were taken in 2010 (3rd cutting) and analyzed for total K.

Results and Discussion

A direct comparison of tissue K and whole plant K content across all plots in the study, showed a slope of 1.01 with an R^2 of 0.60, suggesting that whole plant K content explained 61% of the variability in tissue K (Figure 1). This indicates variability between tissue K and whole plant K but suggests that forage analyses can be used as a first indicator of the potential for a K deficiency or for excess K (high K forages).

Four years of application of K to alfalfa plots with no manure or compost history resulted in an increase in whole plant K from 1.57% without K addition to 2.04% with four annual additions of 335 lbs K_2O/acre (Figure 2). In the last year of the alfalfa stand, tissue K of fields that had received annual applications of compost under the five corn years prior to the alfalfa was

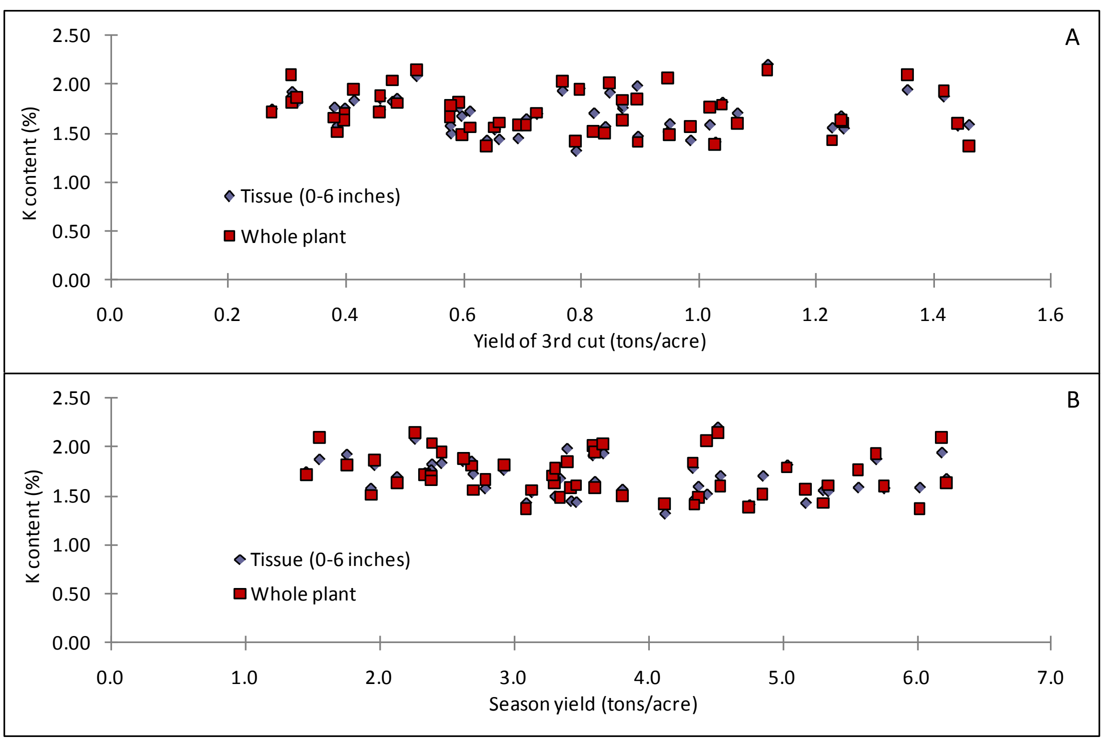

Figure 4: Tissue and whole plant K content of plots varying in (A) 3rd cut DM yield, and (B) full season DM yield across all treatments and plots.

as low as the tissue K of the zero K plots, while tissue K of plots that had received manure remained higher after five years of alfalfa harvest. However, for all but the highest K application rate, the average K content of the plants (whole plant and tissue K) was still less than 2% (Figure 2), the content typically reported as the critical tissue K level. These data, combined with the lack of yield response across rates and soil test K levels for the soil classified as high in soil test K, suggest the critical tissue K level might be lower than commonly reported in the literature..

Cornell Morgan soil test K results explained 62% of the variability in tissue K (tips) and 43% in whole plant K across all plots (Figure 3). The relationship was stronger for the plots that did not have a manure or compost history, in part reflecting a larger range in soil test K levels. However, tissue and whole plant K levels were not related to yield as is shown in Figure 4, also suggesting K was not yield limiting in this trial.

Summary and Conclusions

Whole plant K and tissue K are correlated with a slope of 1 but whole plant K only explained 61% of the variability in tissue K across all fields. Potassium application resulted in an increase in both tissue K and whole plant K. Alfalfa K content of 3rd cutting in the 5th year after the last compost or manure additions remained elevated only where manure had been applied. We conclude that whole plant K and tissue K are correlated and producers may want to evaluate whole plant samples from individual fields to determine if a follow-up tissue test is warranted. However, additional work is needed to determine critical tissue K or whole plant K content as the results of the current study do not support the 2% critical value commonly reported in the literature. Based on the results of this study and the yield data reported in What's Cropping Up? 21(4): 8-11, we recommend basing K applications on Cornell Morgan soil test results rather than tissue or whole plant K contents.

Acknowledgments

We thank Tom Bruulsema, Director of the Northeastern Region, North America Program of the International Plant Nutrition Institute (IPNI) for support for this project. For questions about this project contact Quirine M. Ketterings at 607-255-3061 or qmk2@cornell.edu, and/or visit the Cornell Nutrient Management Spear Program website at: http://nmsp.cals.cornell.edu/.

Nutrient Management

A Case Study on the Use of Adapt-N

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Precise estimation of corn nitrogen (N) needs has been difficult due to many interacting and complex processes that affect N in soils and crops. Over the past years, we developed the Web-based Adapt-N tool to provide improved in-season N recommendations based on model simulations of soil N dynamics and corn N uptake. The tool is currently available for farms in the Northeast and Iowa, and will be expanded for use in the entire eastern USA for the 2012 growing season. Adapt-N is built around the powerful Precision Nitrogen Management (PNM) model, which uses information of soil and crop management, organic inputs and newly-developed high-resolution weather information (3x3 mile grid) to develop accurate nitrogen recommendations. The Adapt-N tool is especially useful for in-season N rate applications, when the crop N needs are more predictable.

Figure 1: Variability of soils was mapped using aerial photographs and soil survey data.

Study Farm

For the 2011 growing season, we developed a case study to evaluate the utility of the Adapt-N tool for a large grain farm in western New York. The area of interest consisted of 87 corn fields that comprised nearly 1200 acres. Fields were digitized in ArcGIS 9.3 using 2005 aerial photographs (Figure 1). The digitized fields were then used as an overlay to clip a soil survey, and linked to the appropriate attributes that were used as inputs for the Adapt-N tool. Of the corn acreage, 76% was mapped as silt loam, 23% as silty clay loam, and 1% as gravelly soil. Soil organic matter varied widely, from 0.9% to 9.9%. The study area consisted of two sets of fields that were located several miles apart. Therefore, two different location coordinates were set up in the Adapt-N tool to access the high resolution climate data.

Nitrogen was applied to the field through pre-plant broadcast urea plus UAN solution banded at planting. Three rates of urea were used, 112, 126, and 140 lbs/acre, depending on soil type. UAN solution was applied at one of three rates, 54, 58, and 78 lbs/acre.

Western NY experienced unusual weather for the 2011 growing season. The months of April and May proved to be the wettest on record (over 6 inches in each month), but they were followed by a dry period in June (2.5 inches) and July (less than 1 inch). There were two distinct windows for planting: Fifty-eight percent of the corn ground was planted early - before May 1 -, and 42% was planted late in the season - after June 1.

Adapt-N input information varied based on soil and management practices. All fields were planted at 32,500 plants per acre and were grown as first year corn after soybeans without manure applications. Conservation tillage was used with an estimated 75% residue left on the surface. Field specific information was also entered for soil organic matter (from recent soil tests), soil type, planting date, corn variety, fertilization regime, and yield goals. Since the late planted corn's growing season was cut short by over a month, the yield goals were lowered from the earlier planted corn (from 230-to-250 down to 190-to-210 bu/ac). The Adapt-N tool was run through the Web portal every five days starting on June 6, 2011 until the crop was determined to be too high for possible sidedress N application.

Results

Adapt-N provided many outputs, but for this case study we focus on recommended sidedress N rates and levels of excess N. Planting date was the largest factor affecting N rate recommendations: The average recommended rate (i.e., the N deficit in the soil-crop system) for the April-planted corn was around 31 lbs/acre, even though 160-to-200 lbs/ac had already been applied (Figure 2). This is explained by post-planting losses as a result of high rainfall in May.

Conversely, the Adapt-N tool estimated excesses averaging 100 lbs/ac for the fields that were planted in June (Figure 2; note that excesses are indicated by negative N rate recommendations). In these cases, no post-planting losses

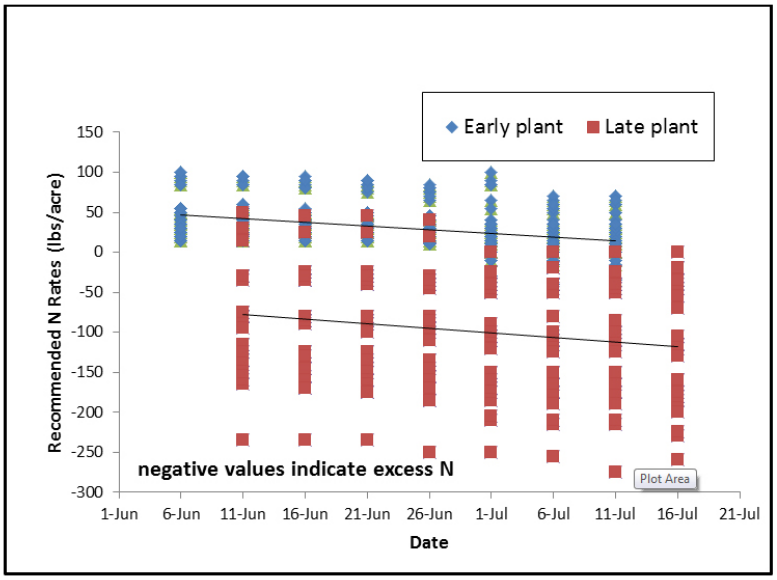

Figure 2: N recommendations for early (before May 1) and late planted (after June 1) corn. Each point on the graph represents an individual field.

were experienced due to dry weather conditions in June and July, and additionally the yield potential was lower due to late planting. Figure 2 indicates that the N rate recommendations modestly decreased (and N excesses increased) over time as June and July weather experienced lack of rainfall, because the probability of post-application N losses declined as crop growth progressed. Organic matter ranged widely on the farm and affected Adapt-N recommendations: As organic matter increased, the recommended N rate decreased for the early planted corn, and excesses increased for the late planted corn (Fig. 3).

Conclusions

In this case study, the Adapt-N tool incorporated multiple factors - especially those associated with weather - into the development of N management recommendations. The main benefit for this farm in 2011 would be the accounting for the effect of early vs. late planted fields and variable soil organic matter contents if most N were applied as sidedress instead of pre-plant. The early-planted corn required additional N to make up for post-planting losses from wet May weather, which would otherwise result in yield losses from N deficiencies. The late–planted corn had considerable excess N, especially on soils with high organic matter. This indicates that pre-plant N rates were too high for June planted corn and could have been reduced by an average of 100 lbs/ac. This would have reduced environmental impacts as well as fertilizer input costs (by about $11,000 for this farm), especially for the soils with high organic matter contents.

In all, this case study shows that delaying the bulk of N applications to sidedress time and estimating fertilization rates with Adapt-N based on localized factors – soil, crop, and weather – can have significant benefits for both farm profits and reduced environmental losses. In upcoming What's Cropping Up? articles, we will report on the results of 2011 strip trials that evaluated the performance of Adapt-N through yield results.

Adapt-N research and demonstration work is supported by funding from the New York Farm Viability Institute and the NRCS Conservation Innovation Grants program. For more information about the Adapt-N tool, visit (http://adapt-n.cals.cornell.edu).

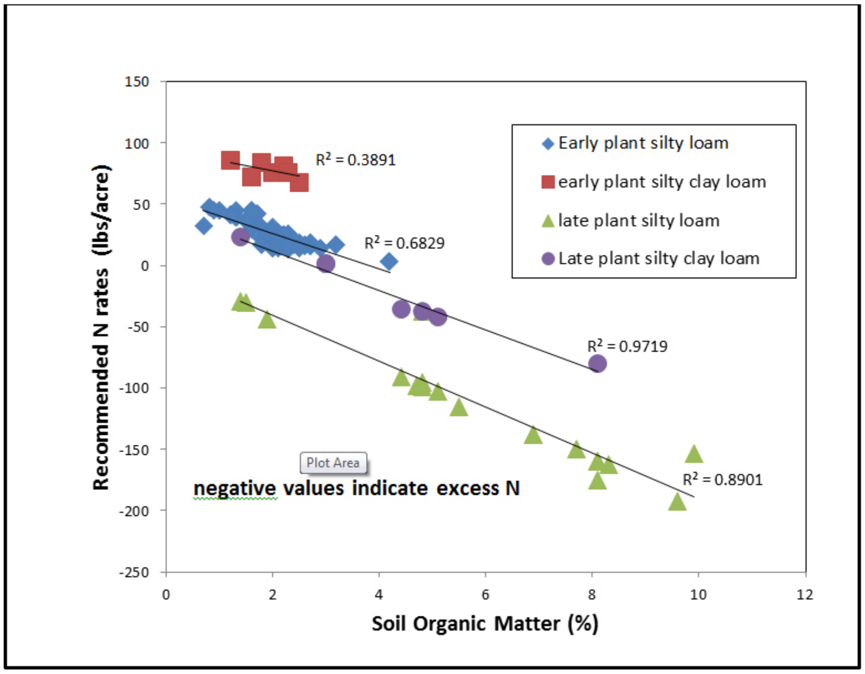

Figure 3. N recommendations as affected by soil organic matter content, soil type and planting period. Each point on the graph represents an individual field.

Weed Management

Capreno – A New Herbicide for Annual Broadleaf and Grass Weed Control in Corn

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Department of Crop and Soil Sciences, Cornell University

Capreno has been approved by the Department of Environmental Conservation for use on field corn harvested for grain or silage in NY. This new herbicide is a pre-mix of tembotrione, the active ingredient in Laudis, and thiencarbazone-methyl. Tembotrione, a Group 27 herbicide, inhibits an enzyme (4-HPPD) critical to the synthesis of plant pigments. Thiencarbazone-methyl, a Group 2 herbicide, inhibits an enzyme (acetolactate synthase or ALS) critical to production of amino acids and protein in plants. In addition to these active ingredients, Capreno contains a safener which reduces or prevents the temporary yellowing or stunting crop response sometimes observed when these active ingredients are applied postemergence (POST). Susceptible weeds are stunted with chlorosis and bleaching that results in plant death within 7 to 14 days after application.

Label Details

Capreno, like Laudis, is mainly for POST use but it has soil residual and can be used preemergence. Capreno is a 3.45 lb/gal suspension concentrate that can be applied from the one-leaf collar stage (V1, the first leaf has a rounded tip) through the six-leaf collar stage of growth (V6). POST applications of 3 fl oz/A should be made in minimum of 10 gal/A of spray solution and must include a crop oil concentrate (COC) and a nitrogen fertilizer source such as urea ammonium nitrate (UAN) or spray grade ammonium sulfate (AMS). Like Laudis, Capreno controls a number of common summer annual broadleaf weeds such as velvetleaf, pigweed, common ragweed, common lambsquarters, and wild mustard. In addition to the annual grasses controlled by Laudis (barnyardgrass, large crabgrass, and giant and yellow foxtail), Capreno controls fall panicum and provides better control of green foxtail than Laudis. Applications with 0.5 lb ai/ A of atrazine will increase the speed of control, weed spectrum, and consistency of control for most labeled species. A combination of Capreno plus atrazine provides a total POST option for conventional (non GMO) corn providing both burndown and residual activity. It can also be used with Ignite 280 SL herbicide in Liberty Link corn or with glyphosate in glyphosate-resistant (i.e. Roundup Ready Corn).

Field Trials

Experiments conducted in 2009 and 2010 at Aurora, NY compared efficacy of Capreno with Laudis and Impact, another 4-HPPD inhibitor. Common ragweed and giant foxtail were the dominant weeds both years. In 2009, applications were made early postemergence when corn was in the V2 stage (3 inches) and weeds were 1 to 2 inches tall. Applications in 2010 were made mid-postemergence when corn was at the V5 stage (8 inches) and weeds were 3 to 4 inches tall.

The average weed control ratings and grain corn yields for the two years are shown in Table 1. Common ragweed control 8 weeks after treatment (WAT) was excellent (99%) with all three total POST programs. There was no difference in giant foxtail control among these treatments with an average control rating of 90%. With good to excellent control of the dominant weeds in these trials, it is no surprise that there were no differences in corn yields among these treatments. These POST treatments averaged 192 bu/A compared with an average of 80 bu/A from the untreated weedy checks.

These results show that Capreno can provide POST burndown and residual control of annual grass and broadleaf weeds. The main advantage of this new herbicide is that it should provide better control of green foxtail and of fall panicum than either Laudis or Impact. These other herbicides only provide partial control of green foxtail. Impact also provides partial control of fall panicum but Laudis has little, if any, activity against this summer annual grass.

Rotational Intervals

Wheat can be planted 4 months after applying Capreno to corn, and the rotational interval for spring grains and soybeans is 10 months as long as there's been 15 inches of precipitation from application to planting the rotational crop. Spring seeded alfalfa can also be planted 10 months after Capreno application if soil pH is less than 7.5. When the pH is 7.5 or higher the rotational interval for spring planted alfalfa/spring oats must be at least 1

Table 1. Average weed control ratings 8 weeks after treatment (WAT) and grain corn yields following POST herbicide applications in 2009 and 2010 at Aurora, NY.

	Rate	% Control 8 WAT		Yield
Herbicides	Amt/A	Ragweed	Foxtail	Bu/A
Impact*	0.75 fl oz	99	95	195
+ AAtrex 4L	1 pt			
Laudis*	3 fl oz	99	87	194
+ AAtrex 4L	1 pt			
Capreno**	3 fl oz	99	89	188
+ AAtrex 4l	1 pt			

*Applied with 1% MSO (methylated seed oil) and 1.7 lb/A AMS.
**Applied with 1% COC (crop oil concentrate) and 1.7 lb/A AMS.

Understanding Manure Nutrient Variability

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[1]Nutrient Management Spear Program and [2]PRODAIRY Program,
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Nutrient Management

With high fertilizer prices, nutrient management regulations and increasing interest in export of manure for use on crop farms, there is a need to better understand variability in manure nutrient composition and to accurately determine application rates. We evaluated variability in manure composition across loads on a field (Study 1), across fields during a spreading event (Study 2), across farms (Study 3), and across years (Study 4) to understand how best to obtain an accurate estimate of the nitrogen (N), phosphorus (P) and potassium (K) content of manure. Manure samples were collected in the field from the manure spreader as it was filled. Samples were analyzed for total N, ammonium-N, total P, total K, percent solids and density. Organic N was calculated as the difference between total-N and ammonia-N per standard laboratory procedure.

Study 1: Manure nutrient variability across loads
Manure was spread on two fields (13 and 19 acres) from a single liquid manure storage structure. Each load was sampled from the spreader immediately after loading of the spreader in the field from a nurse truck (14 and 13 loads were taken from the 13-acre and 19-acre field, respectively). Manure handling prior to spreading involved solid separation, 4-6 months storage in a large surface area pit, and agitation as the manure was pumped into nurse trucks.

Study 2: Manure nutrient variability across fields
Manure samples were collected during four spreading events on four different farms. Samples were taken every 40,000 to 100,000 gallons during emptying of 680,000 to 4,300,000 gallon storages for a total of 13 to 18 evenly spaced samples during each event. Bedding used and the solids content of manure sources varied from farm to farm (Table 1).

Study 3: Manure nutrient variability across farms
Manure was sampled in the spring for two years on eight farms. Samples were taken from the spreader at the time of application. Manure consistency ranged from separated liquid (2% solids) to slurry (14% solids) (Table 2).

Study 4: Manure nutrient variability across years
Manure was applied from a temporary (1-3 days),

Table 1: Manure handling/sampling characteristics on four farms during fall spreading events.

	Farm 1	Farm 2	Farm 3	Farm 4
Samples (N)	14	14	13	18
Solid separation	Yes	No	No	No
Percent solids	2-4	5-6	6-8	6-8
Months stored	4-6	4-6	4-6	4-6
Bedding	Recycled solids	Recycled solids	Sawdust	Recycled sheetrock
Gallons spread	4,271,591	1,500,000	680,000	1,400,000
Agitation	few hours	few hours	12 hours	few hours

Table 2: Manure sampling and handling characteristics on farms that were sampled during two spring manure events (two years).

ID	Sample numbers		Cows	Bedding	Storage time	Agitated	Separated	Pump location
	Yr 1	Yr 2			weeks	(Y/N)	(Y/N)	
1	12	3	600	Sawdust	24	Yes	No	Bottom
2	12	3	280	Hay and sawdust	20-24	Yes	No	Bottom
3	3	3	155	Straw	24-48	Yes	No	Bottom
4	12	3	380	Sawdust	24	Yes	No	Bottom
5	3	3	750	Sawdust and fiber	16-32	Yes	No	Bottom
6	9	3	1430	Sawdust and paper	1-24	Yes	No	Bottom
7	14	6	2692	Recycled solids	1-3*	No	No	Top
8	5	3	3300	Syracuse fiber	24	Yes	No	Bottom

*days.

Nutrient Management

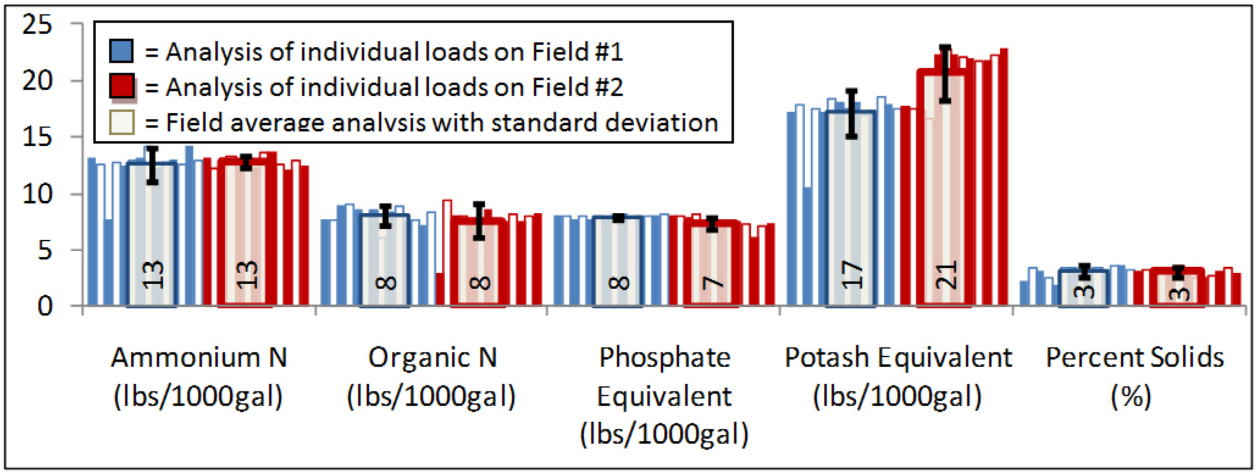

Figure 1: Manure nutrients from different loads applied to two fields were not statistically different. Each narrow blue or red bar represents a load applied to Field #1 and #2, respectively. The wide white bar in front represents the field average with a standard deviation bar.

under-barn storage, with the exception of 2002 and 2007, when a different manure source was used (years excluded from this study). During each application event multiple samples were taken from the spreader directly prior to unloading and analysis results averaged. Each annual average was compared to two types of analyses used by planners: (1) 3-yr running average, or (2) previous year's analysis.

Results

Study 1: Manure nutrient variability across loads

Variability across loads from the same source was low (Figure 1). Analyses from each load were averaged per field. None of the manure values were significantly different between fields.

Study 2: Manure nutrient variability across field

Variability across the fields that received manure during the spreading event was low with the exception of five outlier samples for farm #1 (all in the calculated organic N fractions) one outlier sample for farms #2 and #3, two outlier samples for farm #4 (Figure 2). Outliers appeared at non-distinct times during the spreading event with the exception of farm #4 in which the outliers were the first and last samples taken. Outliers were identified as greater than 20% coefficient of variation and excluded from average (translucent white bars) and standard deviation (error bars) calculations.

Study 3: Manure nutrient variability across farms

Manure nutrient values and relative ratios were different from farm to farm (Figure 3, Table 3). Total N varied ±28%, ammonium-N ±29%, organic-N ±42%, phosphate equivalent ±25%, potash equivalent ±24% and total solids ±47%.

Study 4: Manure nutrient variability across years

Manure nutrient values fluctuated from year to year especially for potassium levels (Figure 4).

A comparison of the current year manure analysis with the two different planning analyses (1: three-year running average or 2: previous year manure analysis, Figure 5) showed little difference in the error associated with using either method for nutrient planning.

Summary and Conclusions

This study showed: (1) low nutrient variability across loads on a field; (2) low nutrient variability across fields with the exception of outlier samples; (3) presence of outlier samples in four out of four datasets; (4) high variability across farms in nutrient levels and nutrient ratios; and (5) fluctuation in annual farm manure nutrient levels. Based on these results, we conclude that there are no practical differences between using a 3-year running average and prior-year analyses for current-year planning. However, all nutrient plans should be completed with a farm specific manure sample (i.e. use of estimated or 'book values' should be avoided) because of the large differences observed in sample results across farms. For most accurate sample results, we suggest farmers take three separate samples and have them analyzed separately. This will allow for identification of outliers and also avoids extra

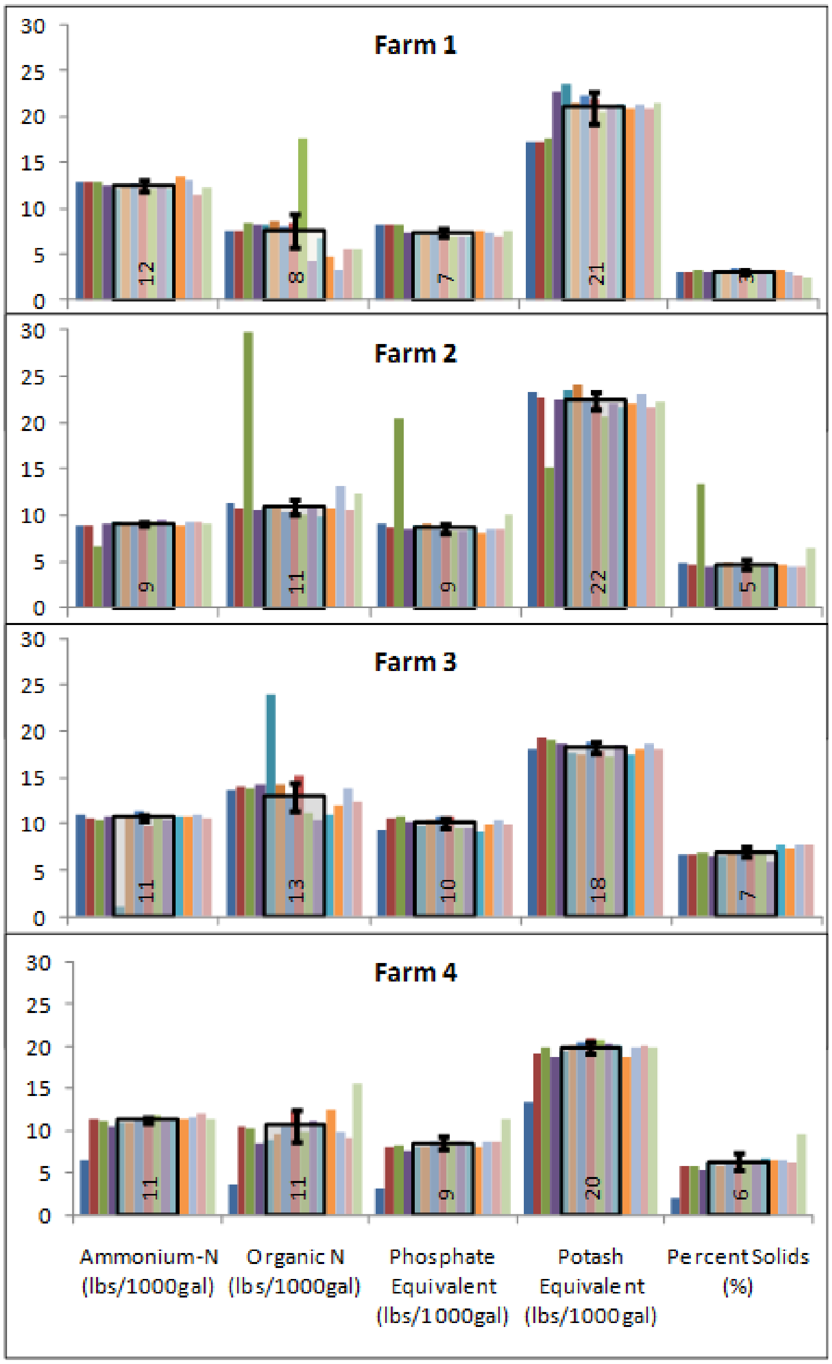

Figure 2: Manure nutrient variability across fields during a spreading event was found to be low on four farms with the exception of outlier samples identified for each event. Individual samples are represented by narrow, colorful bars, averages are represented by translucent white bars and error bars represent standard deviation. Red arrows are pointing to outlier samples that were not included in the calculations of averages and standard deviations.

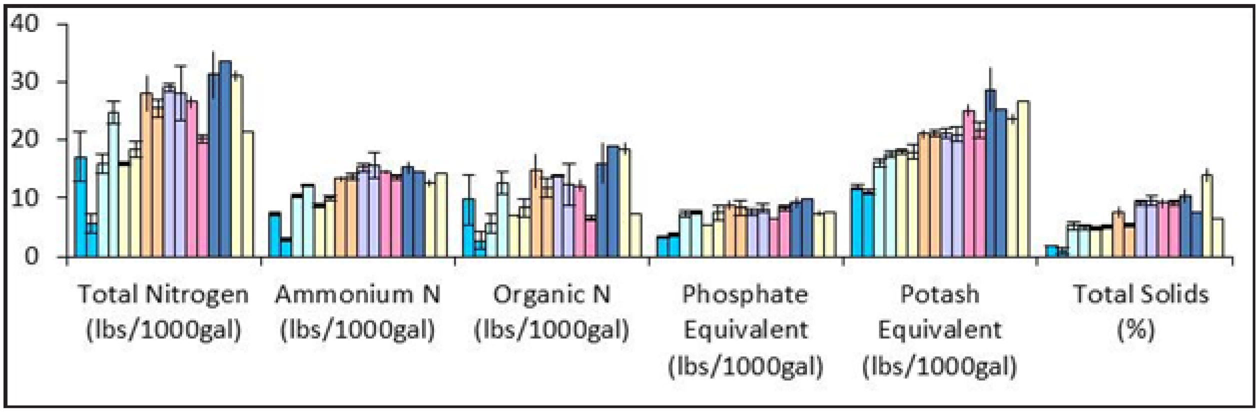

Figure 3: Manure nutrient content of the main dairy facility was found to vary across farms.

Table 3: Nitrogen to P_2O_5 and K_2O ratios of manure from eight different farms.

Farm	Number of samples	$N:P_2O_5$ ratio	$N:K_2O$ ratio
Farm 1	12	5.25	1.45
Farm 2	12	2.19	0.99
Farm 3	3	2.95	0.88
Farm 4	12	3.17	1.33
Farm 5	3	3.84	1.37
Farm 6	9	4.09	1.06
Farm 7	14	3.42	1.12
Farm 8	6	4.24	1.78
Total/average	82	3.53	1.21

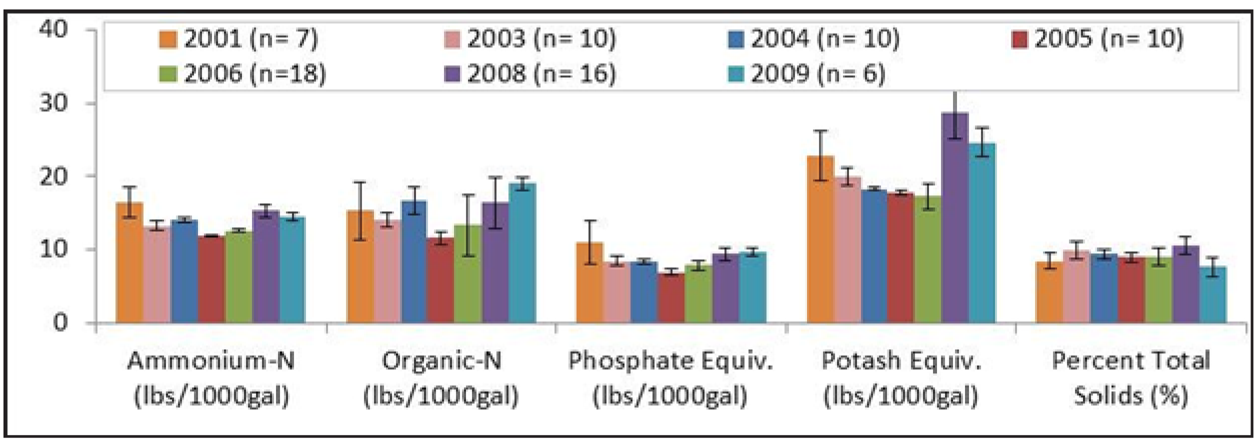

Figure 4: Manure nutrient levels were measured annually on one farm and nutrient level changes tracked.

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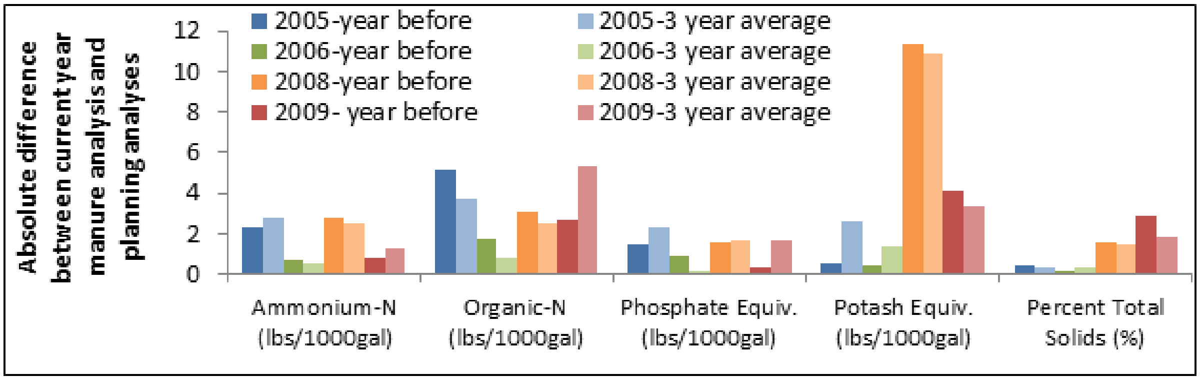

Figure 5: No practical differences were observed between the absolute difference of current-year manure nutrient levels analysis and analysis used for planning: (1) 3-year running average nutrient levels or (2) prior-year manure nutrient levels.

steps of sub-sampling and mixing manure in a separate bucket as was suggested by earlier versions of the Cornell manure sampling guidelines. The three manure analyses should be compared to identify outliers. If an outlier is present, that sample should be discarded and the average should be based on the remaining two analyses.

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Calendar of Events

January 5, 2012	NYS Agricultural Society Annual Forum, Syracuse, NY
January 25, 2012	NY Corn and Soybean Expo, Holliday Inn, Liverpool, NY

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