

What's Cropping Up?

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Soybean Soilborne Diseases Appearing Across the State

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Reports, photos and samples have been pouring in with regards to dying soybeans from western and central NY counties. Some people report general chlorosis and wilting, and others are finding swaths of dead plants. The drought conditions experienced in some parts of the state this year may have lulled some of us into thinking that we might be spared from some of our typical soybean diseases. And, it's true that foliar diseases have been nearly non-existent this season. But, some of our important soilborne diseases are now rearing their ugly heads, and some of us are scratching our heads to figure out which is which. Since many of these diseases tend to have similar general symptoms, especially early on, it's important to get an accurate diagnosis to make any management decisions for both this season and future variety selections. Thus far, I have confirmed *Phytophthora* root and stem rot,



Phytophthora stem rot internal symptoms (photo by Jeff Miller).

northern stem canker and *Fusarium* wilt in a handful of fields, but these problems are likely more widespread and we'll probably continue to see more samples.

Managing these soilborne diseases can be challenging, and requires an integrated approach. When a soilborne disease is identified in a field, you may need to implement multiple tactics, including resistant varieties, crop rotations, residue management, field drainage improvement, alternate weed host management, seed treatments and foliar fungicides where applicable. Below is more information on some of the diseases of concern identified, thus far, this season.

Phytophthora Root and Stem Rot

Phytophthora root and stem rot, caused by *Phytophthora sojae* is a complicated soilborne disease of economic concern in soybean production areas of NY. It has been confirmed in at least nine counties in NY, and it is likely more widespread throughout the state. As with most of the soilborne diseases, occurrence depends on favorable conditions, including cool and wet conditions and compacted soils at planting time. The disease is exacerbated by flooding of fields after seeding has

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Disease Management



Phytophthora root and stem rot stem lesion extending up from the soil line (photo by Mike Hunter).

Plants include lesions beginning at the soil line and extending up the stem, yellow/chlorotic leaves, wilting, reduced vigor, reduction in root mass and



Phytophthora root and stem rot in a section of a field in Oneida County early August, 2018 (photo by Jeff Miller).

occurred. The 2018 growing season has been ideal for this disease in some parts of the state, given our prolonged wet spring and recent heavy rain events causing saturation in some fields. The pathogen survives long-term in the soil as hardy oospores. These oospores germinate to produce sporangia that release the swimming zoospores which infect the soybean roots or are splashed up into the canopy. Infection of seedlings often results in damping off. Symptoms of infection of older

plants include lesions beginning at the soil line and extending up the stem, yellow/chlorotic leaves, wilting, reduced vigor, reduction in root mass and

death. We are currently seeing these symptoms in plants in various reproductive stages. Over 70 races of this pathogen exist, making management with resistant varieties challenging without knowing which races occur in a particular field. However, varieties with partial resistance (also called field tolerance), which adds some level of protection against all races, are available and highly recommended. Improving soil drainage, reducing compaction, utilizing seed treatments, genetic resistance, and crop rotation are good tools for managing Phytophthora root and stem rot.

Northern Stem Canker

Northern stem canker, caused by the fungus *Diaporthe caulivora*, is a disease of economic concern that was first identified and confirmed in NY in 2014. Since the initial confirmation, it has been discovered to be fairly widespread throughout many soybean production areas in NY, though usually only at moderately low incidences. We are starting to see it in western NY this year, and expect to find it more widespread as favorable weather conditions continue. The pathogen survives

on infected soy residue, and infection often occurs during vegetative growth stages, but symptoms don't appear until reproductive stages. Foliar symptoms include interveinal chlorosis, followed by necrosis, and is indistinguishable from the foliar symptoms of other soilborne diseases including sudden death syndrome and brown stem rot. Initially, small reddish-brown lesions appear, often near nodes on the lower stems, which expand into distinctive



Northern stem canker inside stem (photo by Jaime Cummings).



Northern stem canker inside stem (photo by Jaime Cummings).

'cankers' with slightly sunken, grayish-brown centers and reddish margins. Large cankers may girdle stems completely. Splitting stems longitudinally may reveal a browning discoloration of the vascular tissue and pith, often more pronounced near the nodes on the lower stems, similar to what is observed with brown stem rot. In severe cases with large cankers, the entire pith may be brownish-red. The disease reduces the number and size of seeds produced, and could result in yield losses of up to 50% in a severe epidemic. It is important to note that there are two forms of stem canker; 1) northern stem canker, and 2) southern stem canker. Southern stem canker has not been identified in NY. Each disease is caused by a different pathogen, and controlled by separate resistance genes. Because northern stem canker was dismissed as a disease of



Northern stem canker foliar symptoms of interveinal chlorosis and necrosis (photo by Jaime Cummings).

minor importance in the 1950s, most seed companies do not provide disease ratings specific for northern stem canker in their catalogs. Most 'stem canker' ratings in commercial seed catalogs are for southern stem canker (unless noted otherwise), which is a disease of great importance to many soybean production areas of the U.S., but

have no relevance to northern stem canker resistance. Foliar fungicide applications for management have shown inconsistent results, and may not be cost effective. Tillage practices to bury infected residues and rotation with non-host crops, including small grains or corn, are recommended for highly infested fields if varieties with resistance specific to northern stem canker are not available.

Fusarium Wilt

Fusarium wilt, caused by a number of *Fusarium* species, is a fungal soilborne disease of concern in soybean production areas of NY, particularly in years with drought, like we are experiencing in 2018. Though it has only been confirmed in a few counties, it is likely much more widespread, but is difficult to diagnose or differentiate from other diseases or stresses. It's easiest to rule out other diseases, like *Phytophthora* root and stem rot, northern stem canker, charcoal rot and brown stem rot to arrive at an accurate diagnosis. Infection is favored by cool temperatures and wet soils during early vegetative growth stages. Plants are infected during early vegetative stages, but symptoms appear later in the season during reproductive stages, and are exacerbated by hot, dry weather, when infected plants begin to wilt. In

addition to wilting, symptoms include brown discoloration of the vascular system in the roots, crowns and stems, and foliage may become generally chlorotic and defoliation may occur. Sometimes, the general wilting and chlorosis are overlooked as heat stress, and the full extent of the disease in a field doesn't become evident until



Internal discoloration of vascular tissue of lower stems caused by Fusarium wilt (photo by Jaime Cummings).

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Fusarium wilt in a field in Livingston County in early August 2018 (photo by Mike Stanyard).

many plants in a field die. Reducing soil compaction, delaying planting until soil temperatures are favorable for seed germination, crop rotation and seed treatments applied to high quality seed are good management practices for minimizing losses to Fusarium wilt.



Fusarium wilt in a field in Livingston County in 2018 (photo by Mike Stanyard).

There can be a lot of overlap in symptoms among many soilborne diseases of soybeans. Be sure to arrive at an accurate diagnosis before making any decisions.

And, remember, when scouting and collecting samples for submission for diagnosis, the diagnosis you receive is only as good as the sample you submit. Be sure to collect whole plants, with roots, and ship them overnight to ensure they arrive in good condition. Information on how to submit specimens for diagnosis is available on the Cornell Plant Disease Diagnostic Clinic website <http://plantclinic.cornell.edu/pddcforms/submissionform.pdf>, and a submission form is available at <http://plantclinic.cornell.edu/pddcforms/submissionform.pdf>. And, for more information on soybean diseases in NY, please visit the soybean disease survey portion of the Cornell Field Crops website (<https://fieldcrops.cals.cornell.edu/soybeans/diseases-soybeans/soybean-disease-survey/>).

Another Shocker: Organic Wheat with High Inputs 86 bu/acre vs.79 bu/acre for Conventional Wheat (both yield 80 bu/acre with recommended inputs)

Field Crop Production

Bill Cox, Eric Sandsted, and Phil Atkins

We initiated a 4-year study at the Aurora Research Farm in 2015 to compare the corn, soybean, and wheat/red clover rotation with different crop sequences in conventional and organic cropping systems during the 36-month transition and early certification period to an organic cropping system. One of the many objectives of the study was to determine if corn, soybean, and wheat respond similarly to management inputs (high and recommended) in conventional and organic cropping systems. This article will discuss the agronomic performance of organic wheat and conventional wheat with recommended and high inputs in the 4th year of the study (red clover-corn-soybean-wheat/red clover).

We no-tilled a treated (insecticide/fungicide seed treatment) Pioneer soft red wheat variety, 25R46, in the conventional cropping system; and the untreated 25R46 in the organic cropping system at two seeding rates, ~1.2 million seeds/acre (recommended input) and ~1.7 million seeds/acre (high input treatment) with a John Deere 1590 No-Till Grain Drill (7.5 inch spacing between drills) on September 27, the day after soybean harvest. We applied about 200 lbs. /acre of 10-20-20 as a starter fertilizer to wheat in both conventional treatments. We also applied Harmony Extra (~0.75 oz. /acre) to the high input conventional treatment at early tillering or GS 2 stage in the fall (October 27) for control of winter perennials (dandelion in particular).



Conventional wheat with recommended inputs (on the right), despite more yellowing of the leaves in the lower canopy in mid-June, yielded similarly (~80 bushels/acre) as high input conventional wheat (on the left).

We applied the maximum amount of Kreher's composted chicken manure (5-4-3 analysis) that would flow through the drill as a starter fertilizer (~150 lbs. of material/acre) in both organic treatments. We also broadcast Kreher's composted manure the day after planting to provide ~50 lbs. of actual N /acre (assuming 50% available N from the composted manure) in the high input treatment of the organic cropping system. In addition, we also added Sabrex, an organic seed treatment with Tricoderma strains, to the seed hopper of 25R46 in the high input treatment in the organic cropping system.

We frost-seeded red clover into all the wheat treatments on March 22. We applied ~70 lbs. of actual N/acre (33-0-0, ammonium nitrate) in the recommended input treatment of conventional wheat on March 23, about a week before green-up. In the high input conventional treatment, we applied ~50 lbs. of actual N/acre (33-0-0) on March 23 and then applied another 50 lbs. of actual N/acre on April 26 about 10 days before the jointing stage (GS 6). We also applied a fungicide (Prosaro at 4 oz. /acre) to the high input treatment on May 30.

We applied Kreher's composted chicken manure to provide ~70 lbs. of available N/acre to organic wheat in the recommended input treatment on March 21. Also, we applied an additional ~50 lbs. of available N/acre to organic wheat in the high input treatment on March 21. All the plots were harvested with an Almaco plot combine on July 10. We collected a 1000 gram from each plot to determine kernel moisture and grain N% in the laboratory.

We presented data on wheat emergence as well as wheat densities and weed densities in the fall (<http://blogs.cornell.edu/whatscroppingup/2017/12/01/organic-compared-with-conventional-wheat-once-again-has-more-rapid-emergence-greater-early-season-plant-densities-and-fewer-fall-weeds-when-following-soybean-in-no-till-conditions/>) and weed densities in the early spring (<http://blogs.cornell.edu/whatscroppingup/2018/05/25/no-till-organic-wheat-continues-to-have-low-weed-densities-in-early-spring-april-9-at-the-tillering-stage-gs-2-3/>) in previous news articles. Briefly, organic wheat had more plants/acre,

Field Crop Production



Organic compared with conventional wheat yielded similarly (recommended inputs) or 9% higher (high inputs) at the Aurora Research Farm in 2018.

and similar weed densities in the fall and spring (Table 1). This is the second time that organic compared to conventional wheat no-tilled into soybean stubble had better stands and very low weed densities. Organic growers who harvest soybean fields with low winter weed pressure (dandelion, mallow, chickweed, henbit, mayweed, etc.) should consider no-tilling organic wheat, especially if the soybean field had been moldboard plowed. If soybeans were no-tilled into roller-crimped rye in early June, the rye residue could harbor significant slug/snail populations during the cool and damp fall mornings, which could impact wheat stands.

A cropping system x management input interaction was observed for wheat yield in 2018 (Table 2). Organic and conventional wheat yielded 80 bushels/acre with recommended inputs in 2018. Organic wheat showed a 6 bushel/acre response to high input management (500,000 more seeds/acre and an additional 30 lbs. of N/acre). In contrast, conventional wheat did not respond to high input management, despite 500,000 more seeds/acre, a fall herbicide application, 30 lbs. more N/acre, and

a fungicide application. Once again, conventional wheat did not respond to the “new way” of managing wheat, high input wheat, which is similar to results that we have observed in all years with dry springs when we compared high and recommended input wheat in the 1980s and 2000s. Obviously, there is no need to apply additional N or apply a fungicide to wheat during dry springs because fertilizer N applied in late March or early April will not be lost to the environment via leaching or denitrification and disease pressure is low.

In 2016, a year with very similar precipitation patterns to 2018 (5.88 inches vs. 6.5 inches of precipitation, respectively, from April 1 through June 30), organic wheat yielded ~7.5% lower than conventional wheat when averaged across input treatments with no response to high input treatments in either cropping system (<http://blogs.cornell.edu/whatscroppingup/2016/09/26/organic-wheat-looked-great-but-yielded-7-5-less-than-conventional-wheat-in-20152016/>). Temperatures in May when N demand by wheat is the highest, averaged 62.0° in 2018 but only 56.5° in 2016. Cool temperatures

Table 1. Wheat densities at the 1-shoot stage (GS 1-October 9), fall weed densities at the early GS 2 stage (October 28), and spring weed densities at the GS2 stage (April 5) of treated (insecticide/fungicide) 25R46, a soft red winter wheat variety, in the conventional cropping system and untreated 25R46 in the organic cropping system, planted on September 27 at 1.2 million seeds/acre in the recommended input treatment and 1.7 million seeds/acre in the high input treatment. In addition, 25R46 in the high input treatment in the organic cropping system was treated with Sabrex, an organic seed treatment, in the seed hopper at planting time.

TREATMENTS	Fall Wheat densities	Fall weed densities	Spring weed densities
	Plants/acre	Weeds/m2	Weeds/m2
CONVENTIONAL			
Recommended	831,433 c ⁺	0.32 a	0.14 a
High Input	1,021,524 b	0.22 a	0.02 a
ORGANIC			
Recommended	1,279,448 b	0.11 a	0.10 a
High Input	1,692,828 a	0.09 a	0.22 a

⁺Values within a column followed by different letters are significantly different at the 0.05 level.

limit N mineralization from organic sources so in 2016 we speculated that the use of an organic N source may have resulted in less available N to the organic wheat crop. Indeed, grain N% concentration in organic (1.66%) vs. conventional wheat (2.03%) was much lower in 2016 lending credence to the lack of available N as the major factor in the lower organic wheat yields. In 2018, conventional compared with organic wheat once again had greater grain N% concentration (1.99% vs. 1.77%, respectively, Table 2) but the difference was not as vast. Evidently, the warm May conditions allowed for release of adequate N from Kreher's composted manure to maximize yields. May of 2018, however, was the second warmest on record in central and western NY. In years with cool late April and May conditions, organic wheat production may face N availability challenges because of low mineralization rates of organic N sources.

In conclusion, organic wheat yielded the same as conventional wheat with recommended inputs and yielded 9% greater than conventional wheat with high inputs. Kreher's composted chicken manure, however,

is very expensive (~\$300/ton with only 5% N analysis of which we assumed only 50% N availability) so N costs approximated \$6/lb. of N or ~12x higher than the ammonium nitrate source for conventional wheat. Consequently, organic compared with conventional wheat with recommended inputs probably had lower returns in 2018, despite being eligible for the organic price premium in the 4th year of this study (we will conduct a complete economic analysis of this 4-year study in late fall or spring of next year). Organic wheat with high inputs probably had similar economic returns as conventional wheat with high inputs, a common practice among some NY wheat growers, because the 12x higher cost for N in organic wheat would be offset by the higher cost for treated seed, fall herbicide application, the second N application, and late spring fungicide application in high input conventional wheat. Most organic wheat growers, however, probably use a dry solid manure source that is far less expensive than Kreher's composted chicken manure so the economic analyses in this study will be slanted against organic wheat. On the other hand, the use of dry solid manure is far more difficult to apply precisely and at the correct

Table 2. Grain yield, kernel moisture, and test weight of treated (insecticide/fungicide) 25R46, a soft red winter wheat variety, in the conventional cropping system and untreated 25R46 in the organic cropping system, planted on September 24 at 1.2 million seeds/acre in the recommended input treatment and 1.7 million seeds/acre in the high input treatment. In addition, the recommended treatments received ~70 lbs. N/acre in late March and the high input treatments received split-applications of ~100 lbs. N/acre. The high input conventional treatments also received a fall herbicide application and a fungicide application at GS 10.5, the anthesis stage.

time to insure availability to the wheat crop in May during stem elongation so the yield data may be slanted towards wheat in this study.

TREATMENTS	YIELD	MOISTURE	GRAIN N%
	Bushel/acre	%	%
CONVENTIONAL			
Recommended	80 b ⁺	11.4 b	1.89 b
High Input	79 b	11.7 a	2.09 a
ORGANIC			
Recommended	80 b	11.4 b	1.72 c
High Input	86 a	11.2 c	1.82 b

⁺Values within a column followed by different letters are significantly different at the 0.05 level.

Corn Silage and Grain Yield Monitor Data Cleaning

Tulsi Kharel, Sheryl Swink, Connor Youngerman, Angel Maresma, Karl Czymmek, and Quirine Ketterings
Cornell University Nutrient Management Spear Program

Calibration of yield monitors during the harvest season is essential for obtaining accurate yield data but even if calibrated properly, the data obtained from the yield monitors still need to be “cleaned”. Yield monitor values recorded are estimated based on:

1. Distance (inches or feet) travelled by the harvester during data logging time period.
2. Width (inches or feet) harvested during each logging time period.
3. Silage or grain flow (mass) measured by the equipment’s flow sensor per logging time period (lbs/second).
4. Moisture content (MC in %) of the harvested mass as measured by a moisture sensor per time period.
5. Logging interval of the yield monitoring system (seconds).

Errors that impact the accuracy of the yield data occur in multiple ways. The distance the combine/chopper travels during a time period and the width give the area required for yield calculation. If a combine is not equipped with a harvest swath width sensor, the default will be the chopper/combine width and that can cause errors when fewer rows are harvested than the equipment width. Another source of error is the delay time of grain or silage moving from the chopper/combine head to the flow rate sensor. Flow rate sensors, moisture sensors, and Global Positioning System (GPS) units are located in different places on harvest equipment and since it takes some time for harvested silage or grain to travel to the sensors, adjustments need to be made (this is called delay time correction). Each harvest pass will be affected by this delay correction, independent of whether a new pass starts from one end of the field or from somewhere within the field (in situations where the harvester is paused during harvest). The delay time itself is related to the speed of the combine/chopper as well, which may introduce another source of error.

calibrated for a certain velocity range. If the velocities that are recorded fall outside the calibrated range, flow rate and yield values associated with those points are no longer trustworthy and should be removed from the data. Similarly, abrupt changes in velocity affect the flow rate, resulting in erroneous yield calculations for logged data points. Other easily trackable errors are logged data points with zero grain or silage moisture; this may occur as the chopper or combine enters the field or pauses mid-field while the silage or grain flow has not yet reached the moisture sensor.

Last but not least, if the operator does not raise the combine/chopper head after completion of a pass, the pass number will not be updated in the logged dataset. Cleaning of data that are obtained this way will take additional effort, so *lifting of the combine/chopper head while turning in the field is recommended.*

The use of raw data without proper cleaning can lead to substantial over- and under-prediction of actual yield depending on the field and harvest conditions, especially for corn silage yield data. Figure 1 shows this in more detail for a number of fields. Look at a 20 ton/acre corn silage yield (cleaned yield) for the fields in this figure, and you will see that the raw data corresponding to this cleaned yield can range from 15 to 37 tons/acre! The raw data for many of the fields in this figure overpredicted yield, while for a number of other fields it actually underpredicted. Thus, data cleaning is

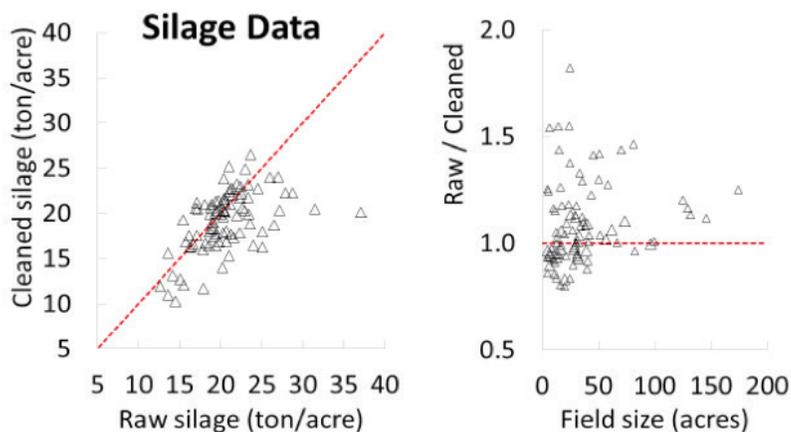


Fig. 1. Not cleaning yield monitor data can result in large over or under predictions of actual corn silage yield.

Combines and forage choppers are

absolutely necessary.

In the past months, the Cornell Nutrient Management Spear Program, in collaboration with colleagues at the University of Missouri, the United States Department of Agriculture Agricultural Research Service (USDA-ARS) Cropping Systems and Water Quality Unit, Columbia MO, and the Iowa Soybean Association, evaluated cleaning protocols to develop a standardized and semi-automated procedure that allows for cleaning of datasets for whole farm yield data recording. The protocol developed for whole-farm data cleaning calls for unfiltered or “raw” harvest data files that are downloaded from the yield monitor with corresponding field boundary files. These files are read into the Ag Leader Technology Spatial Management System (SMS) software to preview the yield map and reassign any harvest data that might show up in the wrong field. Next, the individual field harvest data are exported as Ag Leader Advanced file format. The yield map files are then imported into Yield Editor (<https://www.ars.usda.gov/research/software/download/?softwareid=370>) for cleaning. Yield Editor is a freely available software developed by the USDA-ARS. The software allows for use of different ‘filters’ to remove the errors mentioned above. The final step in the cleaning protocol is deletion of data points with a moisture content <1 % for corn grain and <46 % for corn silage, which can be done in Yield Editor or in MS Excel or other sortable spreadsheet program. This final step is particularly important for obtaining accurate corn silage yield data. A step-by-step protocol for cleaning individual field datasets and batch processing of harvest data from growers with large numbers of corn silage or grain fields is described in a manual that is available for downloading from the YieldDatabase page (<http://nmisp.cals.cornell.edu/NYOnFarmResearchPartnership/YieldDatabase.html>) of the Cornell Nutrient Management Spear Program website.

Farmers with an interest in sharing corn silage and/or grain yield data with the Nutrient Management Spear Program for updating of the Cornell University yield potential database are invited to get in touch with us. The protocols for data sharing are available at the same

weblink listed above. If interested in training sessions on the cleaning protocol this winter, contact Quirine M. Ketterings at gmk2@cornell.edu.

Acknowledgments

We thank the farmers and farm consultants that supplied data for this project, and our NMSP team members and colleagues in Missouri and Iowa for working with us on the protocol. For questions about the project contact Quirine M. Ketterings at 607-255-3061 or gmk2@cornell.edu, and/or visit the Cornell Nutrient Management Spear Program website at: <http://nmisp.cals.cornell.edu/>.



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Introduction

The application of manure to an actively growing crop can improve the uptake of nutrients, with benefits to both the crop and the environment. The “Nutrient Boom” (Figure 1) is a new tool developed by Doug Young of Spruce Haven Farm and Research Center (Union Springs, NY) and partners that allows for the application of liquid manure to corn as tall as 7 ft. It applies manure through flexible hoses in a 120 foot swath with little damage to the standing corn. Mid-season manure application allows for greater flexibility in the spring for planting and can reduce runoff by delaying spreading to a drier part of the growing season. Two years of field trials were conducted to compare corn yield with mid-season manure application with yields obtained with inorganic nitrogen (N) application.

Field Research

A trial was conducted in Union Springs, NY, in 2016 and 2017. There were two 120 foot wide manure treatments, each replicated three times: (1) No manure (control treatment); and (2) Manure (targeted rate of ~12000 gallons/acre). Within each manure treatment, six 300-foot long subplots were established that received the following sidedress N treatments after the manure was applied: (1) No sidedress N; (2) 35 lbs N/acre; (3) 70 lbs N/acre; (4) 105 lbs N/acre; (5) 140 lbs N/acre; and (6) 175 lbs N/acre. In 2016, one corn variety was used (PO157AMX). In 2017, each strip was split through the middle and planted to two corn varieties (DKC54-36AR and P0506). Corn stalk nitrate test (CSNT) samples were taken when the corn had a moisture content of about 35% dry matter (typical silage harvest time). The field was harvested for grain in both years. Yields

were obtained from yield monitor maps calculated from 200-ft lengths in the middle 80 ft (40 ft per variety in 2017) of the plots to minimize the influence of adjacent treatments.

Results

Plots receiving manure mid-season averaged 181 bu/acre (2016) and 159 bu/acre (2017). The corn grown in these plots did not respond to extra N fertilizer regardless of rate. The corn in plots that did not receive manure responded to N fertilizer (Figure 2). Pre-sidedress nitrate tests taken prior to manure and inorganic N application indicated a response to N was likely in both years.

Because corn grown in plots that received manure was not responsive to extra fertilizer N, the most economic rate of fertilizer N (MERN) where manure was applied was 0 lbs N/acre. The MERN for the non-manured plots was 121 lbs N/acre in 2016, and 133 lbs N/acre (DKC54-36AR) and 143 lbs N /acre (P0506) in 2017, using \$4.35/bu of grain and \$0.32/lb of N fertilizer. Yield at the MERN averaged 157 bu/acre in 2016, and 122 bu/acre (DKC54-36AR) and 145 bu/acre (P0506) in 2017. Manure addition increased yield to 16-35 bu/acre above yields obtained at the MERNs with fertilizer N only.

Results were similar both years despite large differences in precipitation between the two growing seasons. Of the two varieties planted in 2017, both performed similarly in the manured plots but P0506 responded more to the N in non-manured plots and used N more efficiently (MERN was 10 lbs/acre higher



Fig. 1. The Nutrient Boom allows for manure application in standing corn.



Nutrient Management

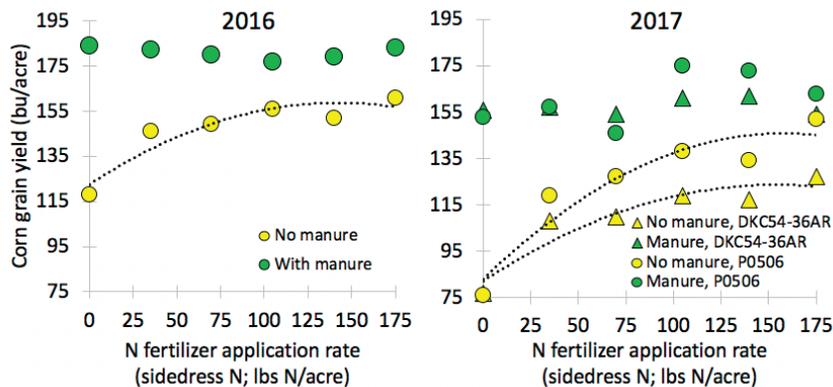


Fig. 2. Corn grain yields as impacted by mid-season manure application, fertilizer sidedress N rate and variety. Yield data obtained with a yield monitor. Conditions were extremely dry in 2016 and wet in 2017.

while yield at MERN was 23 bu/acre higher for P0506).

The CSNT results (Figure 3) showed an increase in CSNT when N fertilizer was added beyond the MERN in plots that had not received manure, resulting in peak in grain yield to CSNT ratio just prior to the MERN. For plots that had received manure, this relationship was different, reflecting that additional N fertilizer could not increase yield but did increase CSNT values.

These results show two things: (1) the benefit of the manure application mid-season for overall yield of the field; and (2) the potential for both gains in yield and savings in N fertilizer costs with application of manure to fields that are N deficient.

Conclusions and Implications

Manure application mid-season with the Nutrient Boom at rates applied in the study benefitted corn grain yield beyond what could be obtained with fertilizer in 2016 (dry year) and 2017 (wet year). Corn that was grown on plots that received the manure did not respond to sidedress N application in 2016 or 2017, independent of variety. Thus, manure applications were high enough to meet the crops' N needs but N supply was not solely responsible for the higher yield. The higher yield and lack of response to fertilizer N in

the manured plots suggest great potential for lowering of whole farm nutrient mass balances with manure application mid-season, especially for fields that are N deficient and would otherwise have needed a fertilizer N application. Future work should focus on rate calibration and control of the applicator and comparisons of impact of rates and timing of application on yield and N use efficiency. The current model was susceptible to clogging, but this is being addressed in the next version of the Nutrient Boom.

Acknowledgements

This work was supported by the New York Farm Viability Institute and Federal Formula Funding. We would like to thank the staff at Dumond Farms and Spruce Haven Farm and Research Center and NMSp team members who helped out with the trials. For questions about these results, 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/>.

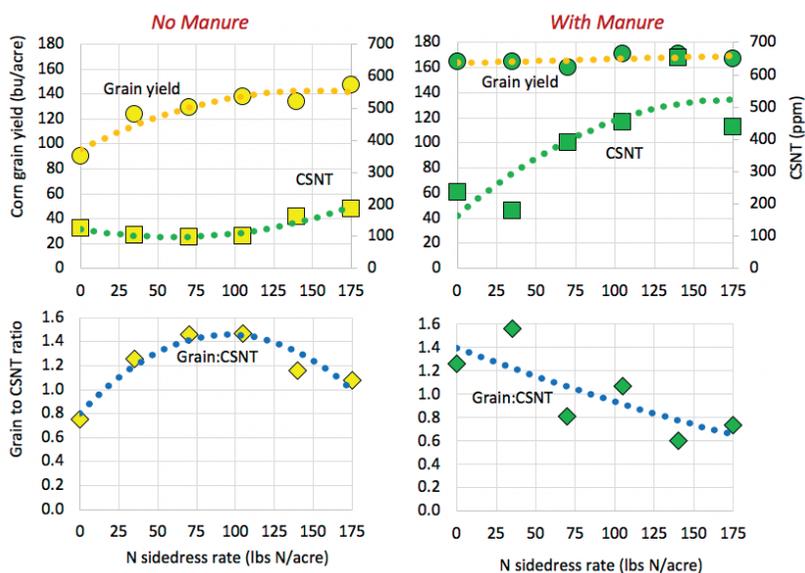


Fig. 3. Corn grain yield, Corn Stalk Nitrate Test (CSNT) and grain yield:CSNT ratio as influenced by N rate and manure application for 2016 and 2017 combined for plots that did not receive manure (yellow) and plots with manure addition (green).

Impact of Alfalfa Snout Beetle on Dairy Finances in times of Low Milk Prices

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It has been estimated that Alfalfa Snout Beetle costs NNY farmers \$445 per cow (or per acre) per year or \$44,500 per 100 cows (range \$30,000-\$60,000), once it has become established on the farm. The cost estimates are broken down in the following paragraphs. The Biocontrol Nematode solution to control alfalfa snout beetle currently costs \$28 per acre plus application cost. Research shows a single application provides multiyear control of alfalfa snout beetle. After application, biocontrol nematodes will also reduce the populations of wireworms and corn rootworm when the field is rotated to corn.



Undamaged root



Severe feeding damage

Initially, when alfalfa snout beetle move onto a farm, its presence is unnoticed for several years. The farmer begins to notice a more rapid loss of alfalfa stands, and shortening of alfalfa stand life, requiring more frequent replanting of alfalfa fields or farming them as grass fields. As ASB moves into additional fields, the farmer gradually begins to purchase more off-farm protein to offset the losses of high quality forages from alfalfa snout beetle. It is often a decade after the initial infestation of alfalfa snout beetle that the farmer realizes the farm is no longer as profitable as it once was and the causes of this lost profitability is often misidentified.

The true cost of alfalfa snout beetle moving onto the

farm can be separated into three distinct areas. 1) The cost of alfalfa stand loss (stand establishment and loss of yield, 2) The cost of the off-farm protein to replace the lost forage quality and 3) Resulting impact on the farm CAFO plan from the increased phosphorus brought on the farm with the increased purchases of protein like soybean meal. The following cost estimates do not include the impact on the farm CAFO plan.

1) Cost of Stand Loss from Alfalfa Snout Beetle damage:

With the assistance of Ev Thomas, Oak Point Agronomics, Ltd, Mike Hunter, NNY CCE and Tom Kilcer, Advanced Ag Systems LLC, it was estimated that alfalfa stand loss from alfalfa snout beetle cost the farmer between \$200-\$400 an acre per year in a three cut 4 yr rotation system and \$200-\$500 per acre per year in a 4 cut – 3 yr rotation system. The cost figure is a combination of establishment costs, loss of yield and fixed land costs. The variation in cost is dependent on the speed of stand elimination by alfalfa snout beetle. If stand is eliminated in a single year, the higher cost is appropriate and if the stand is eliminated over 2-3 years, the lower cost is appropriate. A middle of the road figure would be \$325 per acre per year. Using the rule of thumb that one acre of forage feeds a cow for a year, stand losses from alfalfa snout beetle equals \$325 per cow per year.

2) Increased Feeding Costs due to loss of high quality forage from Alfalfa Snout Beetle:

With the assistance of Ev Thomas, Oak Point Agronomics and Michael Miller, W.H. Miner Institute, using a diet of 30% forage & 70% corn, the cost of soybean meal to replace the lost alfalfa was estimated to be:

Situation 1: Clear Seeded Alfalfa is lost and replaced to High Quality Grass (15% CP)

Extra Soy Cost in Diet = \$9.30 per cow per month (\$111.60 per cow per year).

100 cows = \$930 per month or \$11,160 per year.

Situation 2: 50% alfalfa and the alfalfa is replaced with High Quality Grass (15% CP)

Extra Soy Cost in Diet = \$4.70 per cow per month (\$56.40 per cow per year).
 100 cows = \$470 per month or \$5,640 per year.

Situation 3: Clear Seeded Alfalfa is lost and replaced to Ave Quality Grass (11% CP)

Extra Soy Cost in Diet = \$16.80 per cow per month (\$201 per cow per year).
 100 cows = \$2,010 per month or \$20,100 per year.

Situation 4: 50% alfalfa and the alfalfa is replaced with Ave Quality Grass (11% CP)

Extra Soy Cost in Diet = \$8.40 per cow per month (\$100.80 per cow per year).
 100 cows = \$840 per month or \$10,080 per year.

A middle of the road figure would be \$10 per cow per month (\$120 per cow per year) and 100 cows = \$1,000 per cow per month (\$12,000 per year) (range \$5,640 - \$20,100 per 100 cows per year).

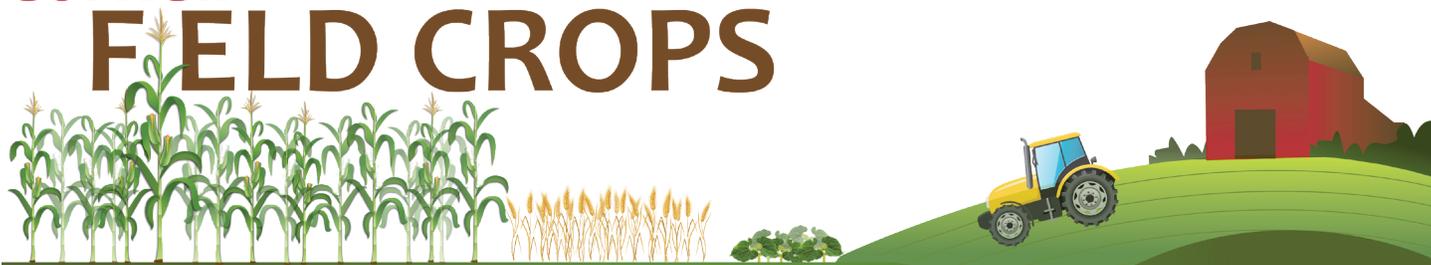
This brings the cost of alfalfa snout beetle on the farm to \$445 per cow per year (every year) and that cost is broken down in the following manner (Not accounting for the impact on the CAFO plan for the dairy).

Stand and Yield Loss:	\$325 per acre (per cow) per year (range \$200 - \$500)
Extra Soy costs:	\$120 per cow per year (range \$56.40 - \$201)
Total:	\$445 per cow per year (every year). (100 cows = \$44,500, range \$30,000 - \$60,000)

Control of Alfalfa Snout Beetle with Biocontrol Nematodes:

Research has shown a single application of biocontrol nematodes in a field at a current cost of \$28 per acre plus application costs will control alfalfa snout beetle for multiple years. When the field is rotated into corn, research has also shown impact on wireworms and corn rootworm. After 4 years of corn, research has shown that the biocontrol nematodes remain in the field at sufficient populations to provide continual control of alfalfa snout beetle. Even with terrible milk prices a farmer cannot afford not to apply biocontrol nematodes. (savings = \$445 - \$28 = \$417 per acre (cow) or \$41,700 per 100 cows).

Cornell FIELD CROPS



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Calendar of Events

AUG 14

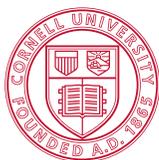
AUG 22, 23,

27, 28, 29, 30

[Cornell Industrial Hemp Research Team Field Day](#) - Geneva, NY

[2018 Corn Silage Pre-Harvest Meetings](#) - Locations Vary - see event description

Have an event to share? Submit it to jnt3@cornell.edu!



Cornell University Cooperative Extension

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What's Cropping Up? is a bimonthly electronic newsletter distributed by the Soil and Crop Sciences Section at Cornell University. The purpose of the newsletter is to provide timely information on field crop production and environmental issues as it relates to New York agriculture. Articles are regularly contributed by the following Departments/Sections at Cornell University: Soil and Crop Sciences, Plant Breeding, Plant Pathology, Animal Science and Entomology. **To get on the email list, send your name and address to Jenn Thomas-Murphy, 237 Emerson Hall, Cornell University, Ithaca, NY 14853**

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