What's Cropping Up?

A NEWSLETTER FOR NEW YORK FIELD CROPS & SOILS VOLUME 4, NUMBER 3, 1994

Management of Corn Rootworm in 1995: Start Planning Today

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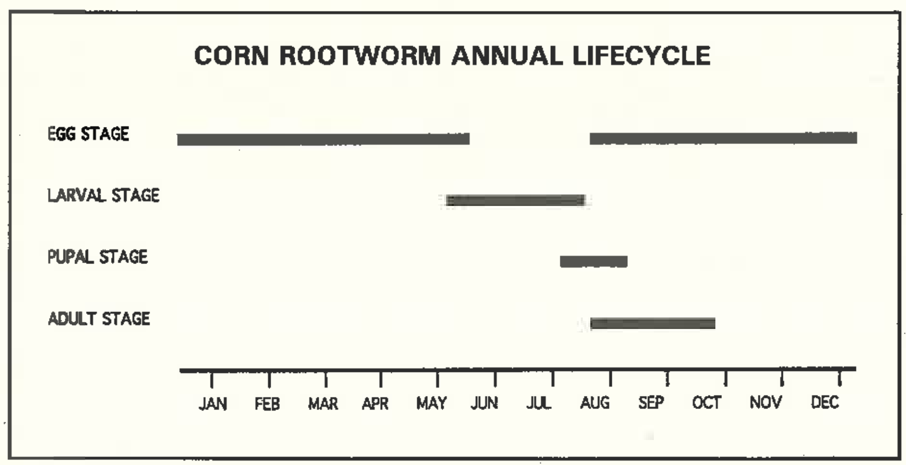
Since the discovery of western corn rootworm in Western New York in 1979, this insect has spread throughout the corn growing regions of New York, has risen to the status of a very significant economic threat to New York corn producers and has become the target of widespread soil insecticide application at planting for its control. Research conducted during the 1991-92 growing seasons by Dr. Paula Davis indicates that corn grown for silage is much more sensitive to yield losses from corn rootworm feeding than corn grown for grain. In corn grown for silage, as few as 100 corn rootworm eggs/row foot results in economic losses from $13-$18 per acre and economic loss in silage corn frequently occurs without lodging or "goose-necking" as an indication of larval feeding. In contrast, corn grown for grain suffers losses between $3-$5 with 100 corn rootworm eggs/row foot. With the cost of soil insecticides ranging between $14-$18 per acre, an insecticide is warranted in fields grown for silage with as few as 100 corn rootworm eggs per row foot. However, in fields of corn grown for grain, soil insecticide is not economically warranted until the egg population rises to a minimum of 300/row foot.

Fields at Risk in 1995

Fields planted to continuous corn are at greater risk to economic corn rootworm infestations than first year corn since corn rootworm eggs are laid the previous fall in existing corn fields (Fig. 1). Fields in continuous corn production increase in the risk of developing economic corn rootworm infestations, the longer corn is planted to the field on a continuing basis. Continuous corn fields planted after late planted corn the previous year are at high risk due to the attractiveness of the late pollinating corn to the adult CRW resulting in heavier than normal egg laying in the field.

Potentially damaging corn rootworm larval populations can be predicted in continuous corn fields which are scheduled to be planted to corn during the 1995 growing by scouting for adults present in the current corn crop during early August 1994. The need to rotate the field or use a soil insecticide next year to manage corn rootworm can be determined by counting the number of adult corn rootworm beetles per 55 corn plants (5 plants in 11 different field locations within a field) in each corn field during and shortly after pollination (see Cornell Extension Fact Sheet 501.00). If these beetle counts exceed 1 beetle per plant as a field average, the field is at high risk for corn rootworm damage providing the field is planted to corn in 1995.

While this insect can be easily controlled with an annual rotation of corn and a non-host crop, the economics of the alternative crop or land restrictions may prevent the use of rotation as an option to insecticides to control this insect. If the field cannot be rotated and must be planted to corn in 1995, then a registered soil insecticide is recommended at planting or during cultivation next spring. Consult the "1994 Cornell Recommends for Integrated Field Crop Management" for the current recommendations on soil insecticides registered in New York for corn rootworm control.



FORAGE QUALITY

Relative Feed Value

Jerry Cherney and Debbie Cherney
Soil, Crop and Atmospheric Sciences and Animal Science

The strong emphasis on forage quality by researchers and the forage seed industry over the last decade has improved the overall awareness of this issue. Systems to predict forage quality in both legumes and grasses have been developed and improvements in these systems continue to be made. Systems which simplify measurement of forage quality also have been developed, and the most popular of these systems is Relative Feed Value (RFV). This simplified system of valuing forage has limitations for use with alfalfa forage and has serious limitations for comparing legumes and grasses.

History

Relative Feed Value is an index developed by the Universities of Wisconsin and Minnesota over a decade ago which combines estimates of forage intake and digestibility into one number. Digestible dry matter is predicted using acid detergent fiber (ADF) and dry matter intake is predicted using neutral detergent fiber (NDF). These two estimates are multiplied together and divided by 1.29 to yield RFV. Standards for RFV as hay grading criteria have been proposed by the Hay Marketing Task Force of the American Forage and Grassland Council (see Table). Quality standards are defined for grades from 'Prime' down to '#5', based solely on RFV.

In the northern U.S. (except for most of the Northeast) RFV is used routinely at hay auctions to directly impact hay prices. The RFV concept is becoming increasingly popular, and is widely used to compare quality of alfalfa with alfalfa-grass and grass forages. Most popular literature comparing or valuing forages relies on RFV. The RFV index is included on Northeast DHIA forage analysis reports.

Grass vs. Legume Quality

Pre-bloom alfalfa and vegetative grass forage have numerous differences:

- digestion and passage rates.
- percent of NDF that is unavailable.
- protein solubility.
- percent of slowly degraded protein.
- percent of bound protein.

None of the above factors are considered with the RFV concept. Feed value also depends on chemical, biological, and physical properties of forages, as well as cost of production, level of milk production, and other feeds in the ration. The Cornell Net Carbohydrate and Protein System model, developed by Cornell Animal Scientists, does take all the above factors into account. This model has been successfully used on dairy farms to reduce protein use and increase milk production and profits.

Optimum Forage Quality

By using the Cornell model, it is possible to estimate the range in fiber and protein required by dairy cattle at a given level of milk production and a given level of concentrate fed. Results clearly indicate that optimum NDF level in grass forage is much higher in grasses than alfalfa, and the range in forage NDF content allowed in a ration to produce a given amount of milk is much larger for grasses than alfalfa.

Evaluation of protein requirements indicate that grass forage requires less protein to meet animal requirements than with alfalfa, because it is a better quality protein (less soluble, etc.). In addition, alfalfa crude protein in excess of 19-20% cannot be utilized in most dairy cattle rations, and must be disposed of by the animal, using energy that could have been used for milk production.

Summary

We will be conducting dairy cattle feeding trials over the next few years, comparing grass and alfalfa forage to verify the differences that exist. It is clear at this time that 40% NDF in grass is very different from 40% NDF in alfalfa, and alfalfa cannot be compared to alfalfa-grass or grass forage using RFV. It is a meaningless comparison. Optimum quality alfalfa is an RFV of 145-150. It is difficult to meet the effective fiber needs of high producing dairy cows with 'Prime' alfalfa at less than 40% NDF and over 20% CP.

'Prime' quality alfalfa may have killed more dairy cows in New York state in the last 10 years than any other anti-quality component of forages (such as nitrates, prussic acid, etc.). So the next time you see a company advertisement bragging that their alfalfa variety won a hay judging contest with an RFV of 205 (NDF=32%, CP=23%), you can only hope that the poor guy who owns that forage is planning on using it for chicken feed, and not as a primary fiber source for dairy cattle.

Forage quality standards for legumes, grasses, and legume-grass mixtures.

Quality standard	RFV	CP	ADF	NDF
Prime	> 151	> 19	< 31	< 40
1	151-125	17-19	31-35	40-46
2	124-103	14-16	36-40	47-53
3	102-87	11-13	41-42	54-60
4	86-75	8-10	43-45	61-65
5	< 75	< 8	> 45	> 65

Management of Potato Leafhopper in New York Alfalfa

PEST MANAGEMENT

Elson J. Shields
Entomology

The current emphasis on high quality alfalfa forage production has made many growers and agricultural consultants aware of the economic importance of potato leafhopper (PLH) on forage quality/yield and a focus of alfalfa pest management programs during the second and third cuttings.

Potato leafhopper, a small (1/8 inch) wedge shaped fast flying lime green insect does not overwinter in New York. Each spring to early summer adult PLH migrate into New York from their overwintering range in the southern US on the warm southwesterly winds. The magnitude, direction and arrival date of each annual migration is controlled by the overwintering conditions in the southern states and movement of the migrating adults on weather fronts toward the upper Midwest and the Northeast. Consequently, the spring arrival date and magnitude of PLH annual migration varies widely. Arrival dates range from early May through late June with mid-May to mid-June typical. The majority of adult PLH surviving the long migration are females which upon arrival begin laying eggs in alfalfa fields to start the first summer generation. Eggs hatch in 7-10 days with the immature PLH requiring about 2 weeks to develop into adults. Three to four generations of PLH occur in New York during each summer dependent on summer temperatures and date of arrival.

Leaf yellowing and stunting of growth from PLH feeding damage is often misinterpreted as drought stress, micro-nutrient deficiency or disease. During feeding, PLH secrete a salivary toxin into the plant tissue disrupting the plant physiology resulting in a wedge shaped yellow (sometimes reddish) area at the leaf tip. As increased damage occurs, yellowing spreads over the entire leaf and plant growth is stunted. PLH feeding damage may result in losses of forage quality, yield and plant vigor. Damage from PLH is most severe when a crop is under moisture or fertility stress. Good agronomic production practices, which encourage vigorous alfalfa, will limit the amount of damage caused by this insect. These agronomic practices include proper site selection, fertility, PH, harvest interval, and disease resistance.

To successfully avoid PLH losses, it is important to detect a leafhopper problem as early as possible. Loss occurs quickly on young regrowth before visible symptoms appear. Once symptoms are visible, further damage can be prevented but loss which has already occurred cannot be recovered. Potato leafhopper populations in alfalfa fields must be sampled with an insect sweep net. These insects fly too fast to be sampled in any other manner. Heavy duty 15 inch sweep nets are available from several sources.

To sample for PLH, a total of 100 sweeps should be taken evenly dispersed throughout the field. It is often convenient to group sweeps into individual sites using 10 site with 10 sweep/site regime or 5 site with 20 sweeps/site regime. Count the adult PLH in the sweep net at each site and total the number of PLH for the entire field. Also make note if PLH nymphs are present in the net during inspection. Counting adult PLH under high population pressure is easier using the 10 sweep/10 site regime resulting in fewer leafhoppers to be counted at each site. The total number of PLH adults collected is divided by the total number of sweeps taken in the field (100 sweeps) to calculate the number of PLH/sweep. In addition, measure the height of the alfalfa at each of the sample sites. Field sampling should begin shortly after the first cutting has been removed. If first harvest has been greatly delayed, sampling should begin by June 10.

If the average PLH field populations exceed the acceptable threshold value for crop height listed in table 1, the field needs to be sprayed with a registered insecticide for PLH control unless the field is within 7-10 days of normal harvest. Refer to the "1994 Cornell Recommends for Integrated Field Crop Management" for the recommended insecticides for PLH control. If the field is within 7-10 days of normal harvest, early cutting can prevent economic damage.

Table 1. Treatment thresholds for potato leafhopper in New York alfalfa.

Treatment Thresholds	
Stem Height Average in Inches	**Number of Leafhopper per Net Sweep**
under 3	0.2 adults
3 to 6	0.5 adults
7 to 10	1.0 adult or mymph
11 to 14	2.0 adult or mymphs

SOIL MANAGEMENT

Quality Control in a Soil Testing Laboratory

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There are four major areas within a soil testing laboratory that require careful attention to control: 1) Sample identification and integrity, 2) daily instrument calibration and stability, 3) data handling and reporting, and 4) long-term instrument calibration and stability. About 20% of the soil analyses within the laboratory are used for quality control.

Sample Identification and Integrity

Upon arrival, the soil samples and identification sheets are placed into separate sets of about 50 samples. The lab ID is then related to the set number and sample position within the set. The ID of a recent sample is 2801-35 or the 35th sample in set 2801. This position of the samples within the set remain fixed throughout the analyses.

Five additional soil samples are added to each set for quality control. Two of the soil samples are from large, well-mixed standard soils maintained within the laboratory and used for quality control. Master soils are randomly placed within each set. The high pH control soil was taken from the Aurora Research Farm, and the low pH control soil sample was taken from the Mt. Pleasant Research Farm. One grower sample is split into two samples. The original sample is positioned within the set as usual and the replicate is placed as the next to last sample. The last sample of each set is always the extracting solution. The analysts do not know the positions of the controls or the grower replicate sample during analyses.

Daily Instrument Calibration and Control

The instruments are initially standardized using standard chemical solutions and checked periodically (about every 10 samples) throughout the analyses of each set. The results of the analyses of the two control soils are compared to the means of previous analyses, as shown in the table. The means and deviations for the high pH and low pH control soils were for 600 and 295 previous analyses. If the results are outside the standard deviations, the analyses are repeated. The deviations also illustrate the reproductivity for repeat values of the same soil sample. For example, the pH on the same sample should repeat within the values of ±0.1. These values must be multiplied by about 10 to obtain the usually reported soil test

Analyses of control soils in set 2801 and comparison with previous control soil analyses.

ANALYSIS	HIGH pH CONTROL SOIL			LOW pH CONTROL SOIL		
	2801-27	Mean	Deviation	2801-14	Mean	Deviation
Extract Wt (g)	11.34	12.29	0.45	9.47	9.73	0.30
pH in Water	6.69	6.72	0.07	4.92	4.96	0.09
LOI (%)	8.30	8.69	0.90	5.20	5.98	0.67
NO_3-N (#/A)	45.0	44.8	3.9	84.5	71.9	15.4
P (#/A)	0.90	1.33	0.47	10.60	10.08	1.41
K (#/A)	70	76	9	91	96	39
Mg (#/A)	628	606	41	83	76	29
Ca (#/A)	5758	5439	361	996	947	197
Mn (#/A)	48.5	46.8	7.8	64.4	72.4	12.6
Fe (#/A)	7.9	7.6	2.2	214.4	226.0	36.6
Al (#/A)	22.9	25.6	4.1	288.3	316.3	37.6
Zn (#/A)	0.79	0.80	0.23	1.48	1.60	0.44
ExA (meq/100g)				16.77	17.58	1.36
SS (#/A)	0.38	0.36	0.05	0.36	0.31	0.04
OM (#/A)	5.60	5.85	0.62	3.40	3.95	0.47
Moisture (%)	1.57	1.31	0.71	1.66	1.24	0.53

values. The data from the replicated grower samples should be within the standard deviation obtained from the control soils. The data from the control soils, the replicates, and the extracting solution provide verification throughout the data set on sample identification, positioning, and analysis.

The final data check is provided by examining the results from ***each*** sample to determine if the data is consistent within known relationships. For example, the soil pH is compared to the base saturation to determine if the expected relationship between pH and percent base saturation exists (Peech, M. and D. J. Lathwell, 1962, *Interpretations of Soil Test Analyses*, Cornell Bulletin #962). Likewise, the weight of the 10 cc scoop of soil used for extraction is related to both quantity of bases and the organic matter and the mineral matter. The organic matter is compared to the quantity of bases, the soil name, and the pH. Finally, the results are compared to other soils from the same area and/or with the same name. If these relationships do not appear correct and physical examination of the soil does not explain the abnormality, the sample analyses are repeated.

Long-Term Instrument Stability

The data from the control soils are plotted to detect any trends that might become larger, long-term changes. An example of this type of comparison is shown by the pH values in Figure 1. The high pH control soil is from the large soil sample. The four low pH control soils were all sampled from the same field, but taken at different times or handled in different ways; therefore, vary somewhat in pH.

The high pH control soils show a very stable, long-term pH. The low pH soils show more variation. Some mineralization of soil nitrates occurred as well. From these data, there does not appear to be any long-term changes in the soil pH values.

Figure 1. SOIL pH for CONTROL SOILS

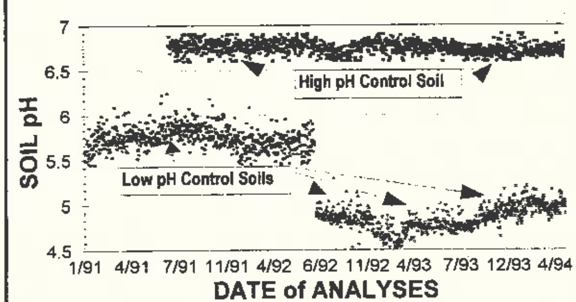
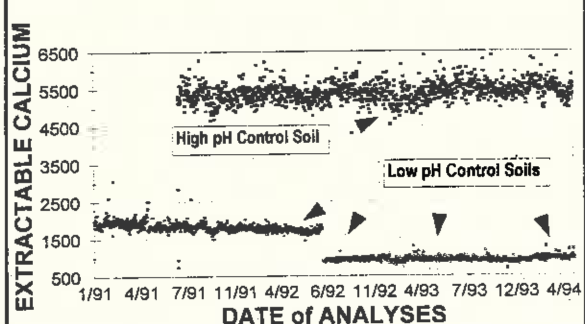


Figure 2. EXTRACTABLE CALCIUM from CONTROL SOILS



The quantity of calcium extracted by Morgan's solution is shown in Figure 2. There has been no change in the calcium levels over this period of time. There is more variability in the calcium readings from the high pH soil, probably because the extracting solution may dissolve some of the limestone rock fragments present in this soil.

Using this and other data, quality control for the laboratory can be maintained; however, the ultimate values are no better than the sample received by the laboratory. If the sample received by the laboratory does not represent the field, the best of analytical analyses are for naught.

SOIL MANAGEMENT

Composts and N in Row Crop Production

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New York State has adopted an integrated waste management policy that involves a hierarchy of solid waste management methods intended to reduce dependency on landfills for waste disposal. The hierarchy is incorporated into New York's Environmental Conservation Law in order of preference: 1) reduction, 2) recycle/reuse, 3) incineration, and 4) landfilling.

Recycle/reuse includes the application of waste and waste products on agricultural land. Solid wastes of several types have been suggested for this purpose and a number of them currently are used according to regulations set by the NYS Department of Environmental Conservation (DEC). The traditional material we're all familiar with is manure. Though generations of farmers have accepted the safety of spreading manure and seek the benefits of spreading it, we also know that even this material has some risks associated with its application, such as odor and nitrate pollution of water when excessive applications are made.

In the case of materials like sludge or municipal solid waste (MSW) composts, similar benefits and risks apply. Beneficial uses take advantage of the nutrient and soil-enhancing properties of composts, including increased water and nutrient-holding capacities and increased aeration or drainage of soils. Long-term concerns focus on the potential for chemical contamination by metals of soil, the food chain, or groundwater. In the short term, concerns are for calculating accurate N-based application rates.

The relative benefit and degree of risk depends on the way the waste products are produced and how they are managed during land application. Using the manure example, the product is simple and the chain from production to spreading is short and generally well controlled right on the farm. But, sludge and MSW composts--new materials that are complex and distant in origin--present difficulties. There is no long history of use in the field to demonstrate safety and beneficial uses. The quality and consistency of the product depend on others far from the site and end use. And too many guesses are made when calculating application rates. Potential for underfertilization or excessive nitrate release arises. Since compost products are different from manure, better definition of expected results for the land and grower are needed.

Field Trials

A three-year, replicated plot study was initiated in the spring of 1992 on the Lott farm in Seneca County for continuous corn. Two years' data have been collected, with the third and last application of compost to be made in May 1994. The waste materials, a source-separated MSW (municipal solid waste) compost from Delaware and a low-metal sewage sludge compost with woodchips from Massachusetts were applied at rates based on the nitrogen requirement of a 120 bu/acre corn yield. Both composts qualify as DEC Class I composts which can be applied under current regulations to all crops except those for direct human consumption (with no processing). Other plots used for control purposes, were treated with conventional fertilizers or left untreated. Several plots were split, so that some compost-treated plots also received inorganic-N fertilizer. Data on yield, and soil, crop, and water quality, were collected.

Results for Yield and Nitrate

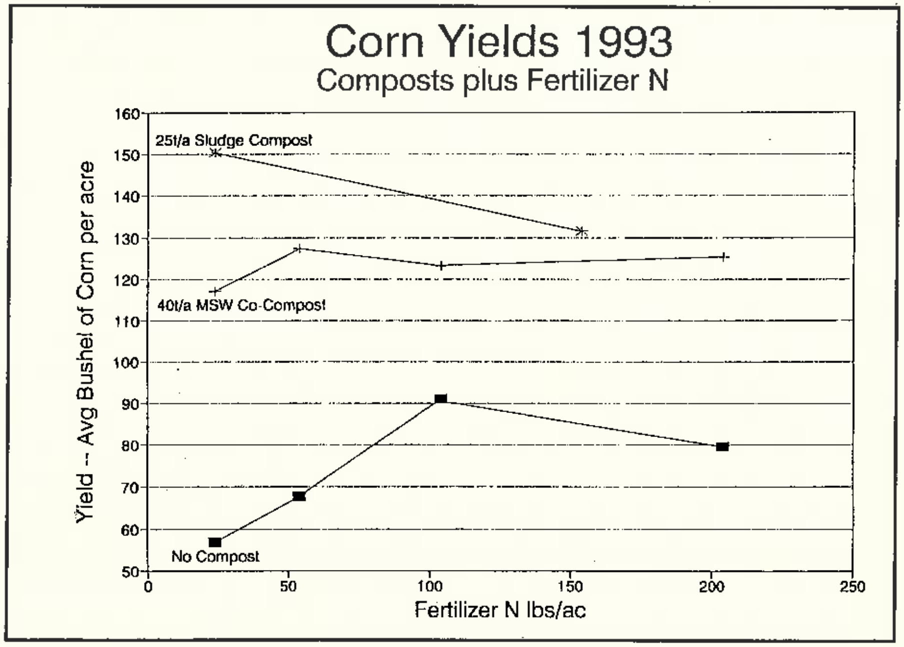
Apparently, nitrogen was the limiting factor in corn yield. There was no indication of any toxic effects of the composts on yield or growth. Analysis of the soil indicated:

- increased organic matter;
- decreased bulk density;
- positive effects on nitrate-nitrogen, phosphorus, and potassium; and
- increased metal levels in the topsoil, but no increase below.

Plant tissue analysis indicated:

- no treatment effect on grain quality
- hints of treatment-derived increases in copper, cadmium and nickel in stover.

Yields increased with added composts at any fertilizer N level (Fig. 1). Conversely, in the presence of compost at any of the three experimental rates, no yield effect was observed for added fertilizer N. This indicated excess available inorganic N from the composts. Laboratory N release



studies on plot soil samples confirmed this, indicating that at all levels of compost addition, over 200 lbs N/acre were released during the growing season. Specifically, at agronomic rates of compost application corresponding to a hypothesized cumulative nitrate release of about 120 lbs N/acre, the sludge compost samples had a mean production of 360 lbs N/acre and the MSW of 220 lbs/acre.

Soil pore water samples taken in April 1994, from the plots at a mean depth of 3 feet showed similar treatment results, i.e. greater nitrate concentrations under sludge compost plots than under MSW plots (Table 1). It is interesting to note that not only the compost plots but also in the conventionally fertilized plots (CV, 114 lbs N/acre), pore water nitrate concentrations exceed the drinking water standard of 10 parts per million (ppm) even 10 months after application. Apparently, the dry July and August conditions at the site limited N uptake and grain yield, especially in the CV treatment. Control plots (C, zero N) had about 8 ppm nitrate-N in April.

We can conclude that mineralization rates in compost-treated soils may exceed the currently assumed 10% organic N per year. Compost application rate calculations should rely not only on immediate organic N mineralization, but also on nitrate and ammonium N levels in the compost as it comes to the field. Otherwise, over application can occur and the potential could develop for nitrate loss from the rootzone by leaching to groundwater or denitrification.

Table 1. Nitrate-N in soil pore water under the treated plots. C = control, CV = conventionally fertilized control (114 lb N/acre), MA3 = 53 dry t/acre sludge compost, DE3 = 80 dry t/acre MSW compost applied May 1993.

	Nitrate-N ppm			
	C	CV	DE3	MA3
Dec. 1993	6	31	27	95
April 1994	8.3	28	16	67

Cornell Field Crop Dealer Meetings

Please note on your calendar the following dates and locations for the Cornell Field Crop Dealer Meetings:

- Holiday Inn - Waterloo
- Best Western - Canton
- Century House - Latham
- Sheraton Inn - Batavia

A topic to be discussed is the future of the Field Crop Dealer Meetings. Please plan on attending to provide your input on the type of educational program you would like the Field Crop Dealer Meetings to be.

Calendar of Events

June 2	Small Grain Management Field, Aurora Research Farm.
June 16	NYS Forage and Grasslands Summer Tour, Cornell Univ., Ithaca, NY.
July 7	Cornell Seed Growers Field Day, Cornell Univ., Ithaca, NY.
July 10-13	Northeast Branch American Society of Agronomy Meetings, MacDonald College.
July 13	Weed Science Field Days. Agronomic Crops, Aurora Research Farm, 1-5.
August 5	Certified Crop Adviser (CCA) Exam, New York State Grange, Cortland, NY.
September 8	Aurora Field Day, Aurora Research Farm.
Oct. 11-14	Cornell Field Crop Dealer Meetings.

What's Cropping Up? is a bimonthly newsletter distributed by the Department of Soil, Crop and Atmospheric Sciences 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 at Cornell University: Soil, Crop and Atmospheric Sciences, Plant Breeding, Plant Pathology, and Entomology. **To subscribe, send a check for $8.00 along with the form at the right.**

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