What's Cropping Up?

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A Pre-Sidedress Nitrogen Soil Test for Corn

Stu Klausner
Dept. of Soil, Crop and Atmospheric Sciences

Background

Corn requires a large amount of nitrogen (N) to produce optimum yield. The amount of fertilizer N required depends on the amount of N supplied from organic sources, namely, soil organic matter, animal manure, and green manures in the rotation such as alfalfa or grass hay. Fertilizer N is readily available and recommendations can be estimated successfully when the primary N sources are soil organic matter and fertilizer. It is more difficult to estimate the fertilizer N requirements when animal and green manures are used because of the complex behavior of organic N in the soil.

Crops cannot use organic N directly. It must be decomposed by soil microorganisms into plant-available ammonium and nitrate. Some of the nitrate can be lost by leaching or converted to nitrogen gas and lost to the atmosphere. The amount of loss depends on rainfall, temperature, and soil properties. Losses vary considerably from year to year with the greatest loss in the spring and fall due to high rainfall and the absence of a crop to take up N. Therefore, the quantity of available N in the soil and its potential for loss are constantly changing. Traditional soil testing methods that work well for other plant nutrients, such as phosphorus and potassium, do not work well for constantly changing N.

Nitrogen Management

To minimize N loss and maximize profit, N should be managed to provide optimum availability just prior to the period of rapid crop uptake. For corn, this means applying a small amount of N in the starter fertilizer and sidedressing the remaining N, about 30-45 days after emergence, at a rate required to supplement the N available from organic sources.

The economic importance of organic N availability is demonstrated by the results of several field trials shown in the Table. Notice that the economic optimum fertilizer N rate decreased as the use of animal and green manures increased. It would be economically and environmentally unsound to apply the same rate of fertilizer N regardless of the organic N input.

Table 1. Fertilizer N requirement for several corn production systems.

No.	Cropping Practice	Economic N rate
	Continuous corn	lb/ac
1.	no manure	145
2.	manure (for 1 yr.)	75
3.	manure (for 6 yrs.)	40
	Corn in rotation	
4.	3rd yr. after alfalfa	130
5.	2nd yr. after alfalfa	60
6.	1st yr. after alfalfa	20
7.	2nd yr. after alfalfa + manure (50+ yrs.)	0

Our current N recommendations are based on research estimates of organic N availability. The standard recommendations are reliable when good field records are kept relative to soil type, manure rates and its N content, and the quality of the green manure in the rotation. However, the recommendations may be improved with the development of a soil test to quantify organic N availability from all sources.

Nitrogen Soil Test

A new interpretation of the nitrate soil test was recently developed for corn. The pre-sidedress nitrogen soil test measures the amount of nitrate in the soil, to a depth of 12 inches, when the corn is 6-12 inches tall. The idea behind the soil test is that the amount of nitrate in the soil, just before sidedressing time, is strongly related to the amount of N that will become available during the growing season. The timing of the soil sample is critical. The field must have dried down enough to reduce the threat of N loss, warmed up enough so that conversion of organic N to nitrate is well underway, and early enough to make a sidedress N application if needed.

The soil test has undergone extensive testing in New York.

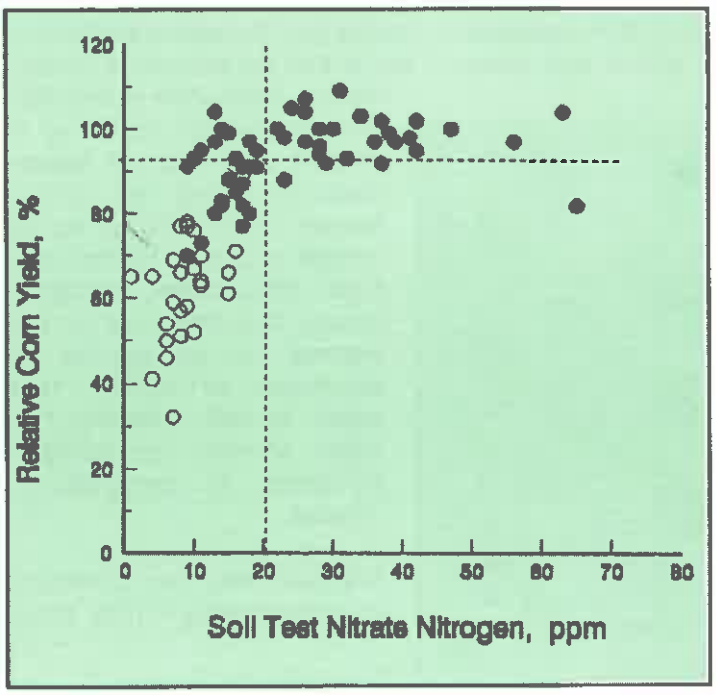
(See SOIL TEST, page 2)

SOIL FERTILITY

SOIL TEST, from page 1

The relationship between relative corn yield and soil test nitrate level from 78 research experiments are shown in the Figure. Relative yield is defined as the yield obtained without fertilizer as a percentage of the maximum yield achieved with fertilizer. Fields with relative yields close to 100% had sufficient available soil N and little to no fertilizer N was needed. Relative yields below about 92% (horizontal line) indicated that the yield without fertilizer N was lower than the economic optimum, and it was profitable to add fertilizer. The vertical line in the figure is called the critical level. Fields testing below the critical level were likely to increase in yield by adding fertilizer N, while fields above the critical level were unlikely to increase in yield if N was added.

The experiments showed that relative yield increased when soil test nitrate increased, indicating a good relationship between the level of soil nitrate and the ability of the soil to supply N. Generally, fields testing above the critical level of 21 parts per million (ppm) of nitrate N did not need additional sidedressed N. Fields below 21 ppm needed additional N to produce maximum economic yield. The open circles in the figure represent fields where animal or green manure were not used. The black circles represent fields where manure was used or a sod crop was plowed down within the last two years. Fields with recent organic N inputs had the higher soil test nitrate values, higher relative yields, and therefore needed less fertilizer N.



Use of the Soil Test

The pre-sidedress nitrogen soil test offers some excellent guidance for managing N. The major advantage of the soil test is it can be used with a relatively high degree of confidence to identify fields that are above the critical level and do not need additional N. The test is especially useful on livestock and poultry farms to help prevent the over-application of N. The test is also a good indicator where fertilizer N will likely increase yield.

The disadvantage of the soil test at this time is its inability to estimate how much fertilizer N to apply if the field is below the critical level. This is because of the large amount of variation in relative yield for any given soil test value. The standard N recommendation, based on soil type, manure use, and crop history should be used to determine how much to apply.

Because the soil test can be used with relatively good accuracy to determine the need (not the amount), we are offering it as a pilot program through Cooperative Extension. The extension specialist can assist you with your N management program and help verify that the results of the soil test are in agreement with the use of animal and green manures.

Nitrogen Soil Test Procedure

1. Do not apply fertilizer N in the spring except for some in the fertilizer band at planting.

2. Take 10 to 20 representative soil cores to a depth of 12 inches when corn is 6 to 12 inches tall.

3. Sample between the corn rows to avoid the starter fertilizer band.

4. Composite the cores for each field and dry on the same day to stabilize the nitrate. Dry in an oven at about 200° F, or in a microwave. Samples can also be air dried if spread out thinly. A fan will reduce drying time. Do not put wet samples on absorbent material because it will absorb nitrate.

5. Send the sample by quickest courier to the Cornell Soil Test Laboratory, along with the information sheet. The lab will return the results quickly to your Cooperative Extension office by computer network or fax.

Cornell Alfalfa Test Results, 1989-91

SEED & VARIETIES

Julie Hansen, Don Viands, Bill Pardee
Department of Plant Breeding

The following table summarizes test results from Cornell alfalfa variety trials, 1989-91. Seed companies entered varieties for these trials. Each year we seed 3 sites. Then we measure yields for 3 harvest years. We do not include seeding year yields.

This table compares variety performance with average yields of 2 check varieties (Oneida and Saranac AR) at these sites. A rating of 105 would show that a variety averaged 5% over these checks in the tests in which it occurred. A rating of 98 would show it was 2% below the checks.

Each year's data includes several test sites. For example, the 1989-91 column averages data from 3 sites (Tompkins, St. Lawrence, and Allegany counties), for 3 years (1989, '90, and '91). The 1990-91 column sums up 2 years of data from 3 tests seeded in 1989, also at 3 locations.

The final column in the table indicates the average performance of varieties by test years. Varieties seeded in 1988, and harvested through 1991 are credited with 3 test years. Those sown in 1989 have 2 test years.

Note that many varieties performed well at these sites. Results might have varied at other sites, or other years. See the *1992 Cornell Recommends for Integrated Field Crop Management* for disease resistance and fall dormancy ratings for these varieties. Check with your seed dealer for specific information on individual varieties.

Summary: 1989-91 Cornell Alfalfa Variety Tests
(1989-91 results for varieties listed in *1992 Cornell Recommends for Integrated Crop Management*)

	Years of results:	1989-91	1990-91	Total	Average
	Year seeded:	1988	1989	Test	of test
Total of:	Source	3-yr Avg.	2-yr Avg	Years	years
		Percent of Checks			*Avg %*
Allstar	Hytest	107	102	5	105
Apollo Supreme	America's Alfalfa		104	2	104
Arrow	America's Alfalfa	107	104	5	106
Asset	Seedway		104	2	104
Belmont	Great Plains	106	101	5	104
Centurion	Agway	109	108	5	109
Chief	Jacques	107		3	107
Cimmaron VR	Great Plains		96	2	96
Crown II	Cargill	111		3	111
DK 125	Dekalb	107	107	5	107
DK 135	Dekalb	106		3	106
Eclipse	Hytest		102	2	102
Excalibur	Agway	106	103	5	105
G-2852	Hoffman	106		3	106
Garst 630	Garst		118	2	118
Garst 636	Garst		106	2	106
GH 747	Golden Harvest	102		3	102
Kingstar	King Agro	108		3	108
Legend	Servos	108		3	108
Magnum III	Servos	106	114	5	109
Majestic	Agway	108	110	5	109
Medallion	Seedway	110		3	110
Medistan Extra	Hytest	110		3	110
Multi-plier	Jacques		105	2	105
Oneida VR	Cornell	112		3	112
Pinnacle	Seedway	108		3	108
5262	Pioneer	102	109	5	105
5331	Pioneer	102		3	102
5432	Pioneer	111	107	5	109
Pro-cut	Herried	108		3	108
Pro-cut 2	Herried		101	2	101
Promise	Hoffman		111	2	111
Royalty	Cargill		104	2	104
Sabre	Kinder	104	107	5	105
Ultimate	Terra		103	2	103
Vector	PGI	109		3	109
Victory	Hytest		110	2	110
VIP	VISTA		105	2	105
WL 225	Beachley-Hardy	106	101	5	104
WL 316	Beachley-Hardy	106		3	106
WL 317	Beachley-Hardy		108	2	108
WL 320	Beachley-Hardy	101	102	5	101
Check averages:		100	100	5	100

FARM MANAGEMENT

Economic Outlook for Field Crops in 1992

B. F. Stanton
Department of Agricultural Economics

The economic recession, which continued through much of 1991 in the United States, was part of a general economic slowdown in much of the Western world. The consensus view is that the U.S. economy will move out of its slump in the spring of 1992 with a general upturn occurring both here and abroad. Crop prices were generally higher in 1991 than in 1990. The U.S. *Index of Prices Received for All Crops* increased from 128 in 1990 to 134 reflecting reduced production of both corn and wheat in the United States and Canada.

Carryover stocks of both wheat and corn at the end of the 1991-92 crop year are estimated by USDA to be at the lowest levels in more than 10 years. Wheat prices rose in response to the expected, relatively short supplies during the fall of 1991. Corn prices have not increased as much as might have been forecast because hard currency demand in overseas markets has not materialized as yet. The relatively short supplies both in the United States and other exporting nations could lead to substantial price variability in the spring months of 1992 if poor weather in Brazil and Argentina should reduce the size of their crops or if funds are provided to Russia to buy needed supplies.

The set-aside requirements to participate in federal commodity programs in 1992 have been substantially reduced from those in 1991. The set-aside for wheat is five percent of program acres in contrast to 15 percent in 1991; the set-aside for corn is five percent instead of 7.5 percent. Much of this decision at USDA is related to the size of expected carryover at the end of the crop year. The "flex" options instituted for 1991 crops will apply again in 1992. Out of 33 million acres that could have been planted to other program crops on the "flex" acres, only 7.5 million were used accordingly in the U.S. in 1991. The largest net shift was 3.1 million acres from corn to soybeans.

During 1991, New York farmers increased their acreage harvested as corn for grain to 690,000 acres, up from 620,000 in 1990 and 570,000 in 1989. The New York Agricultural Statistics Service estimates an average yield of 92 bushels per acre in 1991 for a total crop of 63.5 million bushels. This is a substantial increase compared with the previous three years. Ten years ago, however, in 1981, there were 830,000 acres of corn for grain harvested for a crop of 77.2 million bushels.

Hay production was down in 1991 with both a smaller number of acres harvested and slightly reduced yields compared to both 1990 and 1989. The state's hay crop was estimated to be 4.28 million tons compared with 4.38 million in 1990 and 4.53 million in 1989. Hay prices may rise more than seasonally in the late winter and early spring months.

With world stocks of corn and wheat expected to be at low levels at the end of the 1991-92 crop year in the Northern Hemisphere, and set-asides at five percent for both crops in the United States, plantings are likely to be up in the U.S. this spring. If the poor weather of the fall and early winter continues in the Great Plains and the winter wheat crop there is reduced, prices should be strong in the spring.

Carryover Stocks of Wheat and Corn as Percent of Production in U.S. *USDA Estimates, December 1991.*

Year	Production	Ending Stocks	Stocks as percent of production	Farm price per bushel
	- - - million bushels - - -		*percent*	
WHEAT:				
1984-85	2595	1425	55	3.39
1985-86	2424	1905	79	3.08
1986-87	2091	1821	87	2.42
1987-88	2108	1261	60	2.57
1988-89	1812	702	38	3.72
1989-90	2037	536	26	3.72
1990-91	2736	866	32	2.61
1991-92	(1981)	(414)	(21)	(2.95)
CORN:				
1984-85	7674	1648	21	2.63
1985-86	8875	4040	46	2.23
1986-87	8226	4882	59	1.50
1987-88	7131	4259	60	1.94
1988-89	4929	1930	39	2.54
1989-90	7525	1344	18	2.36
1990-91	7933	1521	19	2.30
1991-92	(7486)	(1234)	(16)	(2.45)

Alfalfa and Perennial Grass Establishment

FORAGE MANAGEMENT

Jerry Cherney
Department of Soil, Crop and Atmospheric Sciences

The deadline for making your seeding decisions in 1992 is rapidly approaching. Your choice of perennial forages this year will impact your farming operation for many years to come. Although perennial forages are grown primarily for ruminant feed, their role on the farm as a conservation tool for nutrient management and erosion control may become as important to the farming operation as their feed value. Much emphasis currently is placed on yield and quality of companion crops, but keep in mind that your primary goal is successful establishment of perennial forages.

Alfalfa vs. Other Perennial Forages

The most important perennial forage decision made by New York State farmers is whether or not to grow alfalfa. Perennial grasses managed for high quality can maintain a level of milk production similar to alfalfa. However, the dollar value of an acre of well managed perennial grass will never be greater than about 90% of the value of an acre of pure alfalfa. This means that if you have alfalfa land, alfalfa should be your first choice. If alfalfa potentially can be sown on all of the farm's cropland, but manure and nitrogen management are of concern, it may be highly desirable in the long run to sow a portion of the cropland to a perennial grass.

Species Selection

Consider soil pH and drainage as the two most important factors in determining which perennial species to use. Of course, the species needs to be able to survive New York winters. Perennial ryegrass is an example of a species that is questionable for most areas of New York, due to insufficient winter hardiness. Although there are several other possible legume species besides alfalfa, the typical choice facing New York farmers is whether to sow pure alfalfa, an alfalfa/grass mixture, or a pure grass. Alfalfa will persist with adequate drainage and pH (above 6.0). It is not economically wise to sow alfalfa on land not suited to alfalfa, although many farmers attempt it annually.

A number of perennial grasses are well suited to the environment in the Northeast. Dry matter yields are linked much more to nitrogen fertilization than they are to grass species selection. Forage quality is directly related to harvest management and also not well related to species selection. The key to high quality grass forage is to select an adapted species and manage it properly for high quality and high yield. Variety selection is very important in species such as reed canarygrass and tall fescue. Low alkaloid, reed canarygrass has good potential in pure stands or in mixture with alfalfa, and low-endophyte tall fescue also has potential as a dairy feed if managed for high quality.

Time of Seeding

Although perennial legumes and grasses can be successfully established in either the early spring or late summer, most species do best at one of these seeding times. In the Northeast, alfalfa establishment in early spring is favored slightly, because of the greater likelihood of available moisture. Twelve to 15 pounds of pure live alfalfa seed per acre provides enough insurance seed if sown in spring or late summer. Spring weather conditions are usually more favorable for establishment of smooth bromegrass. The chances of a successful establishment of timothy or reed canarygrass may be slightly higher in the late summer, when weeds are less of a problem. Orchardgrass and tall fescue establish well in the spring or late summer.

Companion Crops

Companion crops (nurse crops) such as small grains are used with pure alfalfa, alfalfa/grass mixtures, and pure grass stands. Their purpose is primarily to control weeds; a second purpose is to provide an additional forage source for the farm. The additional forage source is of little consolation if the companion crop interfered with the successful establishment of the perennial species.

Small grain/field pea mixtures are used as companion crops for alfalfa establishment but currently are not recommended for use with an alfalfa/perennial grass seeding. Insufficient information is available on this topic, however, most researchers believe that the competition from alfalfa, a small grain, and field pea would be too much for the perennial grass, particularly in the case of reed canarygrass.

Small grain or small grain/pea mixtures need to be sown as early as possible in the spring. In the spring of 1991, successful results were found when the crop was sown before April 15. Late April seedings should be successful in a "normal year". Table 1 shows dry matter composition of first cut triticale/pea/alfalfa in 1991 at two central New York sites. Field pea was more competitive at a higher elevation, cooler site (Mt. Pleasant). Environment can have a dramatic effect on seeding mixtures of two or more species.

Table 1. Composition of dry matter at 1st harvest (1991).

	Site	
	Aurora	Mt. Pleasant
Triticale	73%	50%
Field pea	12%	41%
Alfalfa	14%	8%

Options To Consider

The following are relatively untested options to consider for anyone interested in something new and willing to take a risk. Spring triticale may be as good or better as a companion crop

(See ALFALFA, page 7)

CROP MANAGEMENT

TAg Teams: Tactical Agriculture Teams

Phil Sutton and Jim VanKirk, Area Extension Specialists - IPM
J. Keith Waldron - Dairy and Field Crops IPM Coordinator

A new approach in Integrated Crop Management (ICM) education, the TAg Team, was unveiled during the 1990 and 1991 growing seasons. TAg Teams are groups of farmers, agribusiness and extension personnel working together to tackle and understand ICM philosophy and techniques. These teams have proven themselves a very effective means to share ICM and Integrated Pest Management (IPM) information and help farmers to better meet today's production challenges.

The Team

Small working groups, the TAg teams, are established to encourage an open exchange of information among participants. The original goal was to form teams consisting of 3 farmers, 1 agrilender, 1 agrichemical person, and a local Extension representative. In 1991, team composition and size was less structured, however, the emphasis remains on establishing teams that would foster learning through constructive group interaction. . This past season most teams consisted of 4 farmers, 1 agrichemical person and a local extension representative. In 1991, many additional non-members would "drop in" to participate in regular TAg meetings. These extra clients would come to be termed "TAg-alongs".

In 1990, 9 teams were formed with 40 participants in 7 counties. In 1991, 13 teams with 72 participants in 11 counties enjoyed and benefitted from TAg Team involvement.

The TAg Process

Each member is an active contributor to their TAg Team. The TAg process begins with farmers enrolling 1 alfalfa field and 1 corn field which serve as TAg classrooms. Teams meet during key times of the cropping season and discuss current pest and crop production topics as they relate to the management of these fields.

At every meeting the team takes a holistic look at a variety of crop production and crop protection topics. Discussions of crop management include soil fertility, plant populations, crop records, and timely harvest. Pest management topics focus on the major pest problems associated with alfalfa and corn production such as: alfalfa weevil, potato leafhopper, post emergence weed control, and western corn rootworm. During the meetings team members learn to correctly identify the causes of problems encountered and to effectively manage these problems using economically and environmentally sound strategies. Teams also discuss how to minimize or avoid similar problems in the future.

Meetings last approximately 2 hours, but are conducted at times that least interfere with farm operations. Meeting location is rotated among the member farms throughout the season to enable teams to address farm specific questions and to apply their problem solving skills to different field situations.

It is important to note that individual TAg Teams are only formally together for one season. The 1990 members were not formally a part of the 1991 teams. This system was established to enable participating extension field staff to reach a larger audience with new clients in the program over time.

TAg Notes

To maintain contact with former TAg Team members, a newsletter is available during the field season to inform readers of current ICM and IPM topics. "TAg Notes" are distributed to all past TAg participants, current members, and DOS and Macintosh compatible versions are available on the FCROP bulletin board of Cornell's CENET (electronic mail) system. This season 5 editions were published. Twelve Editions are planned for 1992.

Participant Survey

At the end of each season a participant survey is conducted to assist with program evaluation and to determine acceptance of the program by the clients. It is quite evident from the enthusiastic responses of participants that TAg teams are a most effective means to convey ICM and IPM philosophies and techniques. Below are some of the key responses to the 1991 survey.

- **100% of respondents indicated that TAg Teams helped them to better understand their IPM role.**
- **100% indicated that they are now more aware of pest events in a season.**
- **96% indicated they would continue routine pest monitoring on their farms.**
- **88% indicated that TAg helped them realize the need for better timing and selection of their management practices.**

Pre and Post Testing

The primary product the TAg Team program produces is *knowledge*, i.e. an informed participant. To help measure changes in knowledge brought about by participation in the program, a test was developed consisting of questions on material covered by the TAg program agenda. The test is administered to TAg participants at the first meeting and again at the end of the season. The exact same test is used both times. A summary of test results follows.

Conclusion

The chief goal of the TAg Team approach is to effectively transfer ICM and IPM philosophy to farmers and other agricultural professionals. The program concentrates on direct "hands-on" training of participants to improve their ICM and IPM skills in a timely on-farm classroom format. If you are interested in becoming involved with a TAg Team contact your local Cooperative Extension agent for more details. Your involvement will be greatly rewarded.

(See TAg Teams, page 7)

RESIDUES

TAg Teams, from page 6

Results of TAg Written Tests

General Topic, Question Content	% correct (unless noted) Pre-test	Post-test	Δ
Early season corn problems			
Effectiveness of 3-way seed treatments on various pests			
Affected pests correctly chosen (avg. of 4)	47	54	+7
Non-affected pests correctly unchecked (avg. of 5)	87	82	-5
Attributes of field requiring seed treatment			
Tillage	72	94	+22
Fertilizer/manure	63	61	-2
Planting date	69	89	+20
% not understanding question	32	25	-7
Alfalfa stand counts and cutting management			
Benefits of 42-day cutting system	51	71	+20
Soil fertility			
Fertilizer labelling	53	70	+17
Nitrogen application timing	69	100	+31
Basis of Cornell soil test recommendations	45	50	+5
Soil type - effect on lime rates	40	63	+23
Effective elements of lime	60	75	+15
ID of acid-causing ions	13	33	+20
Comparing ppm with lb/a	19	42	+23
Ranking value of plowdown crops	49	45	-4
Weed management			
Weed growth	60	83	+23
Naming triazine-resistant weeds:.....** # named (avg)	0.9	1.5	+.6
Increased rates for control of resistant weeds	85	96	+11
Alfalfa pests			
Alfalfa weevil development factors	53	71	+18
Management options for AW:.....** # named (avg)	1.5	1.8	+.3
PLH monitoring - field risk assessment	79	83	+4
PLH migratory habit	17	63	+46
Verticillium wilt ID	21	42	+21
Management options for alfalfa diseases:.....** # named (avg)	1.2	1.5	+.3
Corn rootworm complex			
WCRW ID	15	85	+70
Relative potential impact of NCRW and WCRW	26	75	+49
Management options for corn rootworm:.....** # named (avg)	0.4	1.2	+.8

ALFALFA, from page 5

for alfalfa instead of oats, but keep in mind that there is considerable variation in plant morphology between triticale varieties. Red clover has been used as a companion crop for the establishment of reed canarygrass in western New York State. Red clover can provide additional forage while the reed canarygrass becomes fully established, which may not be until the second year after seeding.

Another option is to use cheap alfalfa seed (provided that it germinates) or "annual" types of alfalfa (relatively non-dormant alfalfa) as a companion crop for establishing reed canarygrass on land not suited to alfalfa. Non-dormant alfalfa varieties would behave similarly to red clover, providing forage the seeding year, with a reasonable number of plants remaining the year after seeding to provide some forage until the perennial grass is fully established.

Calendar of Events

February 11	**Jefferson Co. *Soy Clinic*. Dale Morse, Coop. Ext., 315-788-8450.**
February 15	**Transitions '92 Conf.: Economics & Environment, Batavia. Jill Bebee, 716-343-3040.**
February 17-19	**Interregional Corn Research Conference, Williamsburg, VA.**
February 20	**Cayuga Co. *General Crop Meeting*. Judy Wright, Coop. Ext., 315-255-1183.**
March 3-4	**Western NY Dairy Congresses *and* "Manure Nutrient Resource Mgmt." Symposium: (3/3 Mt. Morris, Dave W., 716-652-5453; 3/4 Depew, Beth C., 716-652-5453)**
March 26	**St. Lawrence Co. *Soybeans Meeting*. Pete Barney, Coop. Ext., 315-379-2311.**

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 for 1992 send a check for $8.00 along with the form at the right.**

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Department of Soil, Crop and Atmospheric Sciences
144 Emerson Hall
Cornell University
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