

What's Cropping Up?

A NEWSLETTER FOR NEW YORK FIELD CROPS & SOILS

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Recently EPA established a revised set of rules for the application of sludge to land (National Sludge Rule CWA-503). These rules are now in force. States are allowed to set their own rules, as long as they are no more liberal than those of EPA. DEC has a set of current rules also (Land Application Facilities Part 360-4), but the Solid Waste Division is presently in the process of holding workshops on their proposed revised version. Hearings on this revision will be held in February. It is likely that many aspects of the EPA rules will be incorporated into the new DEC Part 360-4.

The Northeast Regional Research publication Bulletin 851, entitled "Criteria and Recommendations for Land Application of Sludges in the Northeast." and published in 1985, and represents efforts of researchers from the Northeast to put together a comprehensive set of guidelines based on the best available research. Maximum values for metals are presented for three sets of guidelines: 1) maximum concentration in sludge, 2) maximum loading rate, and 3) cumulative total load (Table 1). It is clear that the new EPA 503 rules are liberal, compared to current DEC or Northeast guidelines.

Guidelines for Sludge Application to Cropland

J. H. Peverly
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and Atmospheric Sciences

Our response to the newly established guidelines will be guarded when making recommendations. We will continue to define conditions which we can safely recommend sludge application to cropland, because there are valid reasons to beneficially use sludge by recycling the nutrients and organic matter in land applications. However, the landowner or grower should be careful about accepting the several risks associated with land application of sludge, when benefits to their land are not large, and when unknown dangers to the consumer may still exist. Our overall goal is to conserve and protect the soil resources and in so far as possible the grower's livelihood.

Presently, it is not entirely clear which guidelines should be followed. When considering the question of sludge application to cropland in New York, these points should be acknowledged and incorporated into the decision-making process.

1. Greater than 60% of cropped land is on dairy farms, most of which are N and P rich now. Sludge is not really needed as an inexpensive nutrient source, and pollution of water by excessive nutrient applications is to be avoided.
2. Metals in sludge applied to the soils remain there essentially forever. As long as soil pH is maintained at levels recommended for cropping, there is little risk of contamination of crops or water resources. In the Northeast, almost all of our soils require pH maintenance by periodic application of lime for metal control. This would be so not only during sludge application, but also afterwards, being a permanent requirement for protection of water, plants and animals.
3. A wide variety of directly consumed food products are produced on New York State farms, such as milk, fruit, wheat, and vegetables. We must maintain consumer confidence in the products. At the least, a farmer/consumer educational program will be needed if sludge is to be used.

(Cont'd on page 2)



Guidelines for Sludge Application to Cropland

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(Cont'd from Page 1)

4. Organic molecules in sludge are unregulated by the 503 rules. Cornell scientists are not ready to disregard organics in recently applied sludge as a possible health risk. The toxicity of dioxin is still being evaluated and most sludges contain a small amount.
5. Farm credit organizations may hesitate to lend money or land after sludge application. This is an unfounded policy, but in some lending agencies, is unlikely to change soon.
6. Pathogens seem to be a slight threat to sludge handlers (and farmers) and are evidently not transmitted through water or food products from sludge-treated land. Gastrointestinal attacks are the most likely symptoms, but are dangerous only to young, previously unexposed individuals.

Nutrients and organic matter additions to soil via sludge are beneficial, as are the pH maintenance properties of lime-stabilized sludge. But it should be inferred from the above that there are still concerns about society's waste problem and liability being transferred to landowners or growers. Sludge should be applied only after DEC permits and metal

analyses for at least the last six months are available for examination and which meet the State criteria. For cropland, soil nitrogen application recommendations based on soil testing should be used as a basis for calculating annual sludge application rates. Cumulative metal loading can be calculated on the basis of sludge application rates and the soil test values for the particular metals. Finally, discussions with the credit officer should always precede sludge applications.

Remember, sludge should be applied only to carefully

managed land, where pH control can continue indefinitely, processed food crops or grain are grown, soil nutrient imbalances are not produced, and cumulative metal loading is monitored closely.

It is recommended that Bulletin 851 be used for the time being as the best reference for land application of sludge. It should be used until there is better research-based analysis of best management in NYS and until we better understand the technical documentation behind EPA 503.

Table 1. Maximum metal and PCB values allowed for land application of sludge according to the new EPA 503 rules, current NY State DEC Part 300 rules and the Northeast Recommendations, Bulletin 851 (Dry wt basis).

Parameters	Maximum concentration mg/kg			Annual Loading kg/ha yr			Cumulative Load kg/ha		
	EPA	DEC	NE	EPA	DEC	NE	EPA	DEC	NE
Arsenic	41			2.0			41		
Cadmium	30	25	(20) ¹	1.0	0.5	0.06	30	3.3	3.3
Chromium	1200	1000		150			3000	333	333
Copper	1500	1000		74			1500	83	83
Lead	300	1000		15			300	333	333
Mercury	17	10		0.85			17		
Molybdenum	18			0.00			18		
Nickel	420	200		21			420	33	33
Selenium	30			5.0			100		
Zinc	2800	2500		140			2800	167	167
Total PCB's	NA	10							

¹ Suggested value, depending on sludge application rate as determined by current crop nitrogen requirement and annual cadmium loading rate.

Newdak Top Oat Variety for 1993

CROP
MANAGEMENT

Bill Pardee and Mark Sorrells
Plant Breeding

Newdak tops Cornell oat variety yield tests. Seed supplies good for 1993.

Newdak was the top yielding oat variety in Cornell yield trials in 1992, continuing its high performance record. Over the past 3 years Newdak has averaged 96 bushels per acre in Cornell tests (see table). Ogle has been second (at 90 bushels), with Hercules (84 bu.) and Porter (82 bu.) falling behind. Newdak also did well on farms in 1992, with several growers reporting yields over 100 bushels per acre.

Newdak has a high ratio of groats (grains) to hull, and so has less hull than most current varieties. This means more energy per pound or ton of

grain. Porter, in contrast, has more hull and less groat per kernel than Newdak, reducing its energy value as a horse feed.

Newdak has high test weight, though it can be a pound or two below Porter. Test weight is often seen as an indicator of feed value. But it underestimates the nutrient value of Newdak. Seedsmen tell me that Newdak hulls are so shaped that they settle less well in a test bucket than those of Porter. This lowers the test weight rating. But Newdak's higher groat percentage boosts its feed value. And it's the feed value that counts.

Newdak was released jointly by Cornell and the North

Dakota Experiment Station. Newdak is rapidly gaining in popularity across the Northern mid-West. Some mid-west buyers prefer Newdak over Porter, because of its higher feed value.

Newdak has white hulls, lighter in color than those of Porter. Newdak has strong resistance to most races of oat rust. It also has tolerance to barley yellow dwarf virus, another oat problem.

Ogle, a yellow-hulled oat, also did well in Cornell trials, though it was second to Newdak in yield, and below both Newdak and Porter in test weight. Hercules, from Penn State, was high in test weight but ranked below other varieties in yield. Hercules has shown stronger performance in Pennsylvania, where it was developed. Pennuda continued to attract interest as a hullless oat.

Certified seed supplies are sufficient to meet needs for all of the above varieties. Seed quality of most bin-run grain is low, due to the rains and late harvest of '92. This will be a good spring to buy certified seed. It will also be a good year to try Newdak oats.

Oat Variety Performance, Cornell Tests

	3-year Yield Bu/Acre	Average Test Weight Lbs/Bu	% Groat	Hull Color
Newdak	96	33.4	75	white
Porter	82	35.0	72	near-
Ogle	90	32.7	74	white
Hercules	84	35.3	*	yellow
Pennuda	59	41.3	99	yellow hullless

Frost Tillage: A Potential Management Option

Harold van Es and Robert Schindelbeck
Soil, Crop and Atmospheric Sciences

New York farmers are typically pressed for time when performing field operations in the spring. For many crops, it is advantageous to plant as early as possible, but soil wetness prevents timely field preparation. Wetter soils are therefore often tilled in the fall to save time in the spring and improve soil drying while allowing for more effective freeze/thaw action. Due to wet soil conditions this summer and fall, many soils have been compacted by field traffic and fall tillage was not possible. Frost tillage may be an attractive option which reduces the spring and fall work load and has some additional advantages. We have recently initiated experiments to evaluate the feasibility of this practice and the results appear promising.

Frost tillage involves primary tillage when the soil has a 1 to 3-inch frozen layer at the surface and is tillable below it. The frozen layer should be thick enough to provide support to the field equipment, yet is still thin enough to be readily ripped by the tillage implement. We have experimented with a chisel implement which is probably most appropriate for this practice. In general, conditions for frost tillage occur after several (dry) days and nights of considerable frost following a period of thaw (no snow cover and unfrozen soil). During this time, the freezing process draws water from the underlying soil layer into the frozen zone, often resulting in the formation of ice lenses (Fig. 1). The

frozen zone therefore stores water in ice form, while the soil layers below it dry out and become "tillable".

When planning on performing frost tillage, it is important to insure that the frozen layer is adequate for support of equipment and the soil under the frozen layer is dry enough for tillage. Otherwise, compaction damage may result. It is recommended to dig through the frozen layer at several locations in the field to verify these conditions. Soil under the frozen layer should fall apart readily when rubbed. If instead the soil forms a ball when squeezed, it is unfit for tillage. Frost tillage conditions do not occur frequently during the winter season. Last year in Ithaca, they occurred in early and late January and in early March and this winter again at the end of December and January. Frost tillage leaves a very rough soil with plates of frozen soil randomly oriented on the surface. Upon thawing, the soil becomes supersaturated and will gradually mellow out, still leaving a rough surface. In many cases, only light secondary tillage is required in the spring to facilitate planting.

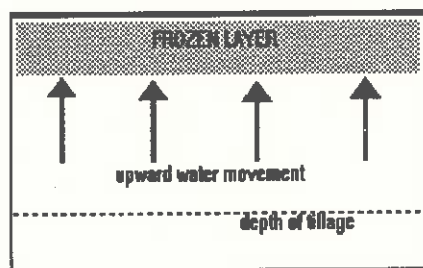
The following are some of the potential advantages of frost tillage:

- Shift of spring or fall workload to the winter. This may be especially advantageous for early season crops when a wet fall and/or spring delays tillage.
- Reduced soil compaction because field equipment is supported by the frozen layer.
- Improved soil drying in the spring.
- Improved water infiltration and reduced runoff potential due to greater soil roughness after tillage which increases surface storage and reduces the potential for uniform refreezing and sealing.
- Reduced need for pre-plant soil packing, because soil has already settled and mellowed naturally by spring time.
- Possibility for incorporation of winter-applied manure which reduces manure losses to streams during winter and early spring when snowmelt and rainfall on frozen/saturated soil cause high runoff volumes. It may also provide for a time window to apply and incorporate stored manure when odor nuisance is reduced due to decreased volatilization potential and less outside activity of neighbors.

Some potential disadvantages of frost tillage are:

- Increased power requirements to till the frozen layer (estimated up to 20%).
- Increased erosion potential on highly erodible soil. Despite reductions in runoff, the loosened soil may be more subject to erosion if runoff still occurs during heavy spring rains. This can be reduced with appropriate crop residue management.
- Predictability of appropriate conditions for frost tillage. It is still not clearly defined which weather and climate conditions allow for frost tillage and how often such conditions occur.

Research on frost tillage will be continued in the next years. Emphasis will be on the evaluation of its feasibility in different parts of New York, frost tillage methodology, and investigation of soil conditions before and after tillage including runoff and erosion potential.



Mold Toxins as a Factor in Grain Marketing

PEST
MANAGEMENT

Gary C. Bergstrom
Plant Pathology

The detection of *Fusarium* mold toxins in corn, wheat, and other grains is becoming an increasingly important factor in grain marketing in the Northeast and elsewhere. The current focus of concern in our region is deoxynivalenol (DON or vomitoxin), a toxic metabolite of the *Fusarium* mold that causes red ear rot and Gibberella stalk rot of corn, and wheat scab. This compound causes digestive disorders in humans and in animals with simple stomachs such as swine. Dairy cattle and poultry appear to be insensitive to low levels of DON. However, DON may contribute to reduced productivity of these species when it interacts with other toxins and stress factors. Although largely unsubstantiated, detection of DON also has been considered by many to be a 'flag' or indicator of more serious mycotoxins in grain.

A future focus of concern may be a class of compounds called fumonisins, toxic metabolites produced by another *Fusarium* mold that commonly occurs on corn. Fumonisins have been demonstrated to cause pulmonary edema in swine and leukoencephalomalacia in horses; they are also potential carcinogens. We found fumonisin B₁ to be a common contaminant of New York corn in 1991, but at extremely low levels.

Government Guidelines

USDA guidelines limit DON contamination to 1 part per million (ppm) in wheat and corn food products and 2 ppm in unmilled wheat and corn. USDA has not set guidelines for DON in animal diets. Agriculture Canada guidelines prescribe animal diets containing less than 1 ppm DON or no mycotoxins for pregnant or lactating animals. USDA recently proposed a

guideline limiting fumonisin contamination to less than 5 ppm in corn to be fed to horses. There are currently no guidelines available for fumonisin in grain for consumption by humans or other animals.

Current and Projected Market Decisions

Major feed grain buyers that I interviewed in the Northeast are concerned about any perception on the part of their feed customers that their feeds are contaminated with mycotoxins at any level. Although actual policy varies from elevator to elevator, and with the general market situation, major buyers in New York will readily accept grain with less than 0.5 ppm DON (and in several cases up to 1 ppm). Grain with 1 ppm or greater DON will be very difficult to market. Buyers appear to begin each market season with the assumption that the new year's crop is fairly clean. Many do random 'quick tests' for DON. Positive samples are then sent (often but not always at seller's expense) to analytical laboratories for quantitative assessment of DON and several other toxins. Black light tests are not valid indicators of *Fusarium* toxins!

When detection of mycotoxin becomes prevalent in a region and year, some buyers will sample and test every load. Others who lack adequate facilities for sampling or testing may restrict purchases to known suppliers with known 'clean' bins, based on presubmitted samples. When mycotoxin contamination becomes widespread, some buyers may restrict purchases to 'rail' corn from the midwest.

At present, no grain buyers in the Northeast are routinely testing for fumonisins, although some are doing exploratory testing.

1992 New York Corn Crop Situation

Due to the cold, wet growing season, much of the 1992 corn crop remained in the field at high kernel moisture content until late December. Much of the immature, high moisture grain that was harvested had visible mold (mostly the gray-black, nontoxin-producing mold, *Cladosporium*), low test weight, reduced energy and protein value, and, in some cases, reduced palatability. If there's a silver lining in this dark cloud, it's that DON and other mycotoxins were generally absent or at very low levels in preharvest corn. Fortunately, a relatively dry period coinciding with silk emergence in August prevented significant ear infection by *Fusarium* via the silks. As long as producers properly handle and manage their stored grain to prevent postharvest mold and mycotoxin production, toxins should not play a significant role in marketing this crop.

Regional Concerns

The Northeast is at a competitive disadvantage with the Midwest in that it lacks the capacity to blend large tonnages of grain and to separate the grain stream for different uses, i. e., different animal feeds. Proactive cooperation of grower groups, state agencies, and agribusiness to develop alternative uses and facilities to handle mycotoxin-contaminated grain would be

Soybean Variety Selection

Bill Cox and Madison Wright
Soil, Crop and Atmospheric Sciences

Soybean acreage in NY has increased from 20,000 to 55,000 acres during the past 10 years. Acreage will continue to increase because of recent construction of soybean handling facilities in NY. Consequently, many farmers will be first-time growers in the 1990s. A major question for first-time soybean growers is appropriate variety selection. Data from Minnesota indicate that the probability of selecting the highest yielding varieties at a particular location for the next growing season is highest if you select varieties that performed best at a number of locations rather than to select varieties that performed best at the particular location that you're planting soybeans at the following year. Fortunately, Cornell, which has conducted soybean variety trials at five NY locations during the last 10 years, has a soybean variety data set that can be used as a guide for variety selection.

Central and Western NY

Group I varieties have consistently performed well in central and western NY during the last 3 years (Table

Table 1. Yields of early (Group 00/0), medium (Group I), and late (Group II) maturing soybean varieties at Aurora (Cayuga Co.) and Mt. Morris (Livingston Co.) in 1990, 1991, and 1992.

Variety	Aurora			Mt. Morris			Ave.
	1990	1991	1992	1990	1991	1992	
-----bu/acre-----							
<u>Early (Group 00/0)</u>							
Maple Glen	49	44	55	73	43	51	52
Evans	46	44	49	77	54	42	52
AC Bravor	-	-	61	-	-	45	-
Lambert	-	-	61	-	-	41	-
<u>Medium (Group I)</u>							
DeKalb CX 187	50	52	63	73	65	63	61
OAC Dorado	48	49	57	74	72	64	61
Terra Runner III	44	57	65	58	69	63	59
Hardin	48	56	50	70	71	37	56
NK S19-90	49	54	68	72	-	66	-
Evasoy	-	-	65	-	-	59	-
<u>Late (Group II)</u>							
Terra Winner	46	74	59	68	72	45	61
Conrad	42	69	66	67	70	47	60
Pioneer 9202	43	66	55	68	68	54	59
DeKalb CX 174	45	65	54	61	74	43	57
Golden Harv. 1260	45	64	58	64	73	37	57
Pioneer 9293	47	65	50	62	70	42	56
Asgrow 2872	49	63	59	53	72	36	55
TS 205	-	-	64	-	-	51	-
Sturdy	-	-	61	-	-	51	-

1). Three specific Group I varieties that have yielded high at Aurora and Mt. Morris in 1990, 1991, and 1992 are CX 187 (Dekalb), OAC Dorado (SeCan), and Runner III (Terra International). Hardin (NYS certified) had performed well until 1992. In 1992, Hardin yielded poorly especially at Mt. Morris because it was killed by frost at the R6 to

R7 growth stage (full-sized green bean and the beginning of maturity). Two Group I soybean varieties that did exceptionally well in 1992 are S19-90 (Northrup King) and Evasoy. S19-90 yielded the highest at both Aurora and Mt. Morris in 1992, and has performed well at both sites in other years.

Group II soybean varieties, which were planted on May 19 at Aurora and on May 20 at Mt. Morris, did not reach the R7 stage at Mt. Morris nor the R8 stage (full maturity) at Aurora before a killing frost in early October. Consequently, yields were relatively low at Aurora and exceptionally low at Mt. Morris in 1992. Group II varieties that have performed best at both locations are Winner (Terra International), Conrad (Iowa public variety) and Pioneer 9202. Nevertheless, the 3-year average of these varieties are no better than yields of the top three Group I varieties.

The Aurora and Mt. Morris data suggest that soybean growers in central and western NY should select one or two varieties from maturity Groups 00/0, I, and II to spread risks associated with yearly differences in weather conditions. About 60 to 70% of the acreage should be planted to Group I varieties. Limited acreage should be reserved for Group II varieties in case there is a long hot growing season such as in 1991. Group II varieties, however, should not be planted after May 25. Likewise, limited acreage should be reserved for Group

00/0 varieties, especially when planting is delayed after June 5.

Northern NY

The data from Cornell research trials strongly suggest that Group 00 or Group 0 varieties are best adapted to Northern NY (Table 2). Although Maple Glen is an excellent Group 00 variety, AC Bravor (First Line) has outperformed Maple Glen in three of four comparisons in the last two years. If soybeans can be planted from May 15 to May 25 in Northern NY, growers should consider planting limited acreage to later-maturing varieties such as OAC Dorado or Pioneer 9111.

Conclusion

Soybean acreage continues to expand in NY. Appropriate variety selection will play a large role in the relative success of soybean production in NY. Cornell has an excellent soybean variety performance data set that can be used as a guide for variety selection. If you have questions on soybean variety selection, please contact your local Cooperative Extension agent.

Table 2. Yields of very early (Group 00), early (Group 0), and medium (Group I) maturing soybean varieties at Canton (St. Lawrence Co.) and Chazy (Clinton Co.) in 1990, 1991, and 1992.

Variety	Canton			Chazy			Ave.
	1990	1991	1992	1990	1991	1992	
-----bu/acre-----							
<u>Very Early (Group 00)</u>							
Maple Glen	45	38	62	56	52	60	54
AC Bravor	-	44	67	-	57	63	-
<u>Early (Group 0)</u>							
Dawson	46	48	46	50	62	44	49
Evans	43	45	44	50	56	47	48
Lambert	-	-	49	-	-	45	-
<u>Medium (Group I)</u>							
OAC Dorado	41	42	59	53	58	51	51
Pioneer 9111	46	46	43	57	60	39	49
Hardin	41	44	28	57	53	19	40
Haroson	-	44	48	-	58	47	-

Calendar of Events

Feb. 18-19	Northeast Corn Improvement Conf., Baltimore, MD. Contact Dan Bouck 315-449-6691
Feb. 20	Transitions Conference, SUNY New Paltz. Contact Judy Green 607-255-9832.
Feb. 23-25	National Conference on Silage Production. Syracuse, NY. Contact Ron Pitt 607-255-2492.
Feb. 25-27	New York Farm Show. NYS Fairgrounds, Syracuse, NY.
March 16	Sprayer/Planter Calibration School. Ford New Holland, Cortland, NY. Contact Carl Bannon. 607-753-5077.
June 3	Small Grain Management Day. Musgrave Farm, Aurora, NY. Contact Gary Bergstrom 607-255-7849
July 9	Aurora Farm Field Day. Musgrave Farm, Aurora, NY. Contact Bill Cox 607-255-1758.

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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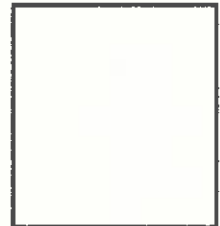
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