What's Cropping Up?

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Upper Susquehanna River Watershed Cropland P Balances

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Introduction

To address P accumulation on agricultural land and reduce P losses to the environment, New York State farmers and their advisors, in collaboration with university researchers, have focused over the past 5-9 years on two of the major management strategies with potential to reduce P accumulation while maintaining strong production: (1) elimination of the use of P containing fertilizers on fields that test high or very high in soil test P, and (2) reduction of P in dairy rations to levels recommended by the National Research Council. In this article, we report on cropland P balances for those counties and parts of counties that lie within the New York portion of Susquehanna River watershed, covering the U.S. Census of Agriculture years 1987, 1992, 1997, and 2002.

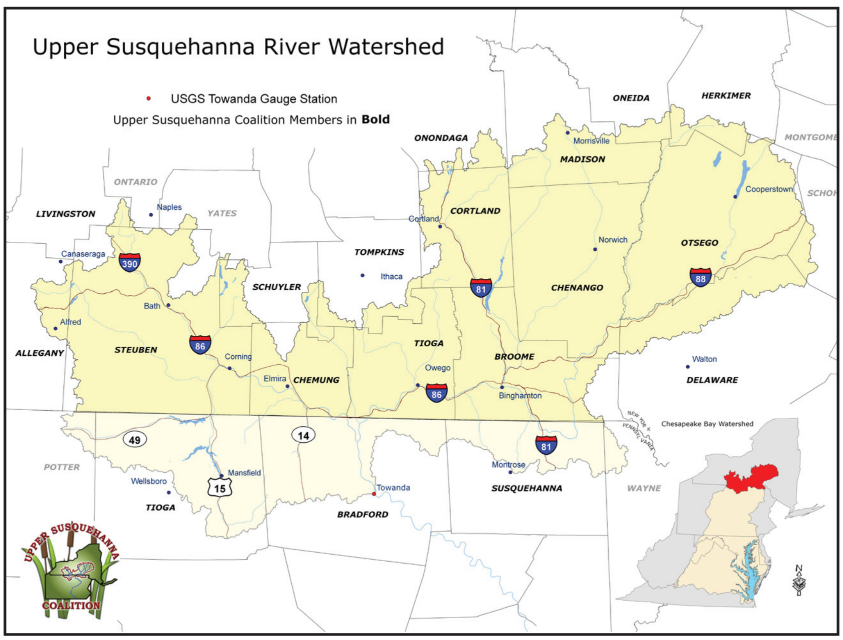

Figure 1: Upper Susquehanna River Watershed (Courtesy Chris Yearick, Upper Susquehanna Coalition).

How were balances derived?

Cropland P balances were determined as the difference between major P inputs (manure and fertilizer) and outputs (harvested crops) following the approach used in the Mid-Atlantic Regional Water Program (http://mawaterquality.agecon.vt.edu): P balance = Manure P + Fertilizer P – Crop P. The U.S. Census of Agriculture supplied animal population data, crop yields and acreage, and cropland use at state and county levels. Balances for portions of New York State counties in the upper Susquehanna River watershed were calculated using acres of cropland within the watershed (derived from data obtained from the Chesapeake Bay Program) and dividing the total by the 2002 Census of Agriculture total cropland acres for each of the counties to find the percentage of cropland within the watershed. It was assumed that the percentage is the same for all P balance components (e.g., manure P, fertilizer P, crop P, harvested acres cropland). Each county level P balance component was multiplied by the county's watershed cropland percentage to estimate the watershed balance for the county, and added together to derive the P balance for the New York State portion of the Susquehanna River watershed.

A word of caution

The P balances were developed to quantify P accumulation and to derive general trends in cropland P loadings over time. Balances per acre assume that manure P, fertilizer P, and animal units are equally distributed across all cropland acres. These balances are partial balances because of the inability to accurately determine all P inputs and outputs for cropland. They should not be equated to annual P losses; a higher P balance may indicate greater P loss potential, but actual P losses will depend on such factors as within-farm distribution of P, landscape patterns, soil resources and management, and climate or weather patterns.

What did we find?

In 2002, watershed cropland P inputs were estimated at 2.9 and 7.1 million lb of P for fertilizer and manure, respectively. Of the manure P, 99% originated from cattle, with 70% from milk cows. Crop P removal was 6.8 million lb, resulting in an overall 2002 P balance of 3.2 million lb or +5.5 lb P per acre of cropland in the New York portion of the upper Susquehanna River watershed. This is 24% less than the 2002 statewide balance for New York (+7.2 lb P per acre) and a very substantial reduction from the 1987 and 1992 watershed balances of +10.0 and +12.4 lb per acre, respectively.

Reduction in the watershed P balance was due to a steady decline in animal units over the years and significant reductions in use of fertilizer P since 1992. Animal units reported in the Census declined from 328,364 in 1987 to 255,479 in 2002, a 22% reduction, with a corresponding reduction in manure P from 9.8 million lb in 1987 to 7.1 million lb in 2002, a 28% reduction. Fertilizer P use declined from a high of 5.0 million lb in 1992 to 2.9 million lb in 2002, a 43% reduction. Crop P removal has remained fairly steady across Census years (Figure 2).

Implementation of the NRC (2001) guidelines for nutrient requirements for dairy cattle is estimated to reduce dairy cow manure excretion from the 62 lb per cow per production period used in the above analysis to 40 lb per cow per production period. When the new P excretion value is used in the 2002 P balance analysis, manure P in the watershed is reduced by 25% to 5.3 million lb of P, resulting in a reduced P balance of +1.4 million lb of P or a decrease from +5.5 lb P/acre to +2.4 lb P/acre with herd nutrition improvements, illustrating the importance of precision feeding for long-term sustainability of the dairy sector.

Implications for sustainable animal densities

For the 2002 cropland P balance, animal density explained 87% of the extra manure P over crop removal across the NY upper Susquehanna River watershed. The relationship

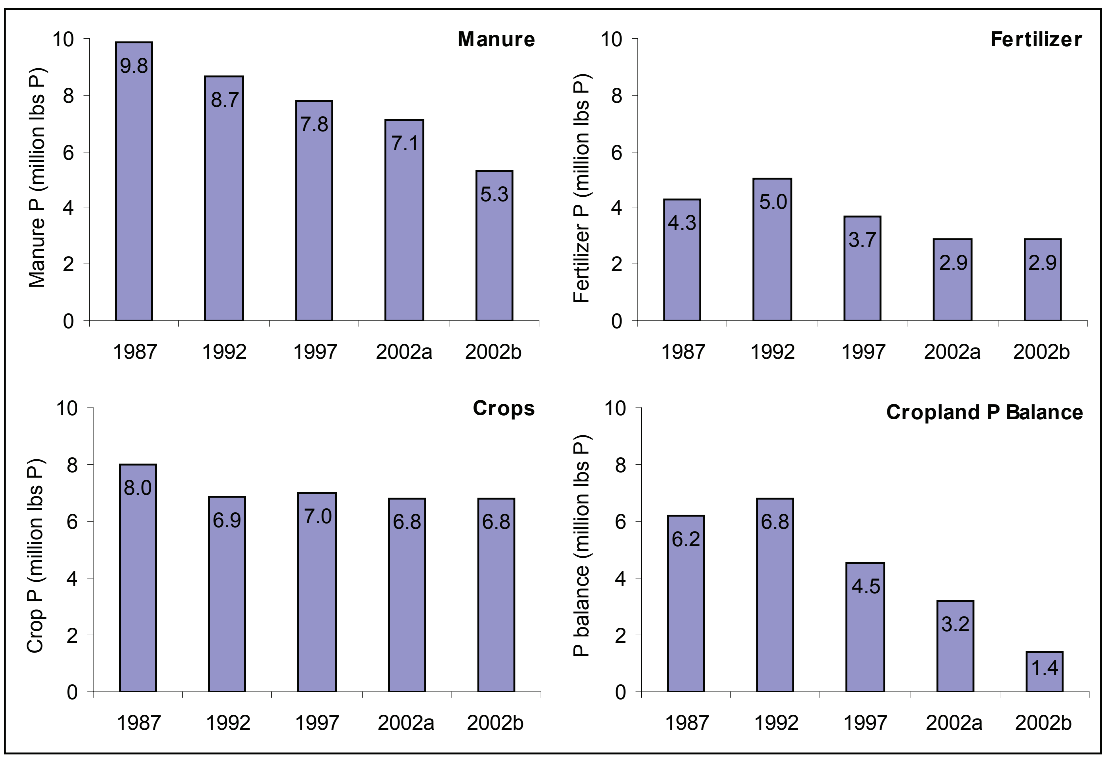

Figure 2: Total amount of phosphorus (P) in manure (top left), fertilizer (top right), harvested crops (bottom left), and the statewide P balance (bottom right). The 1987-2002a cropland P balances assume a P excretion of 62 lb P per cow per year. Improved herd nutrition was taken into account in the assessment of 2002b. The P balance per acre of cropland is indicated in the bar for each year.

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between animal density and manure P excess/deficiency suggests that if manure could be equally distributed over all cropland, an animal density of 0.42 animal units (AU) per acre would be optimal while higher animal densities will lead to P applications that exceed crop removal. In 2002, animal units in the counties in the watershed ranged from 0.30 to 0.56 per acre of cropland.

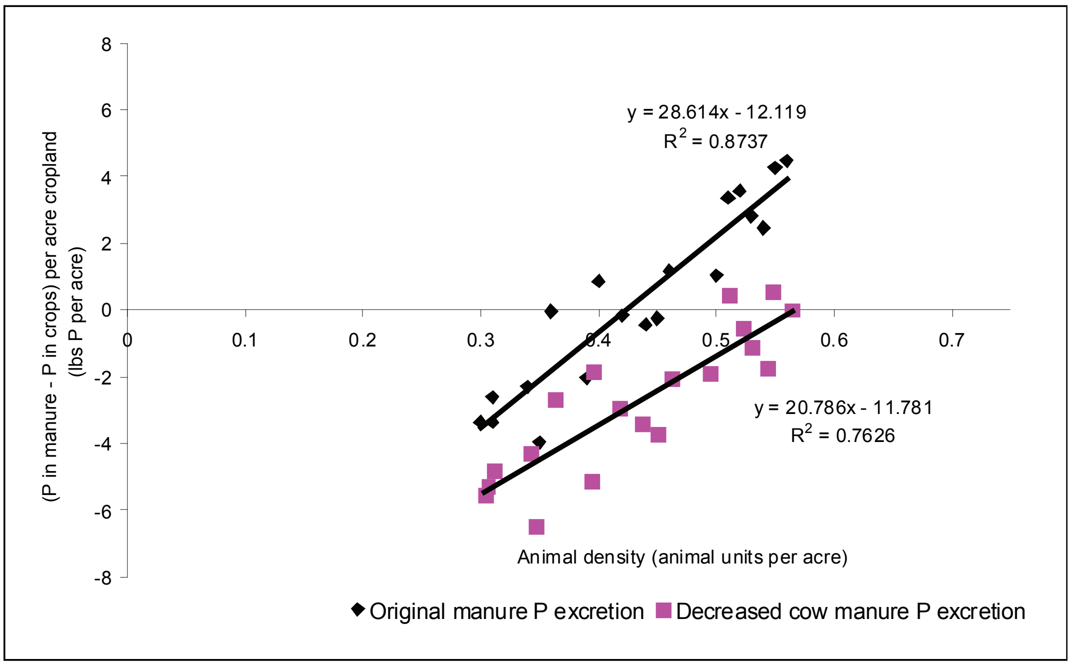

Figure 3: Animal density (animal units per acre) and manure P applied in excess of crop removal for portions of 19 New York State counties in the Upper Susquehanna River Watershed (2002 data) with (1) a P excretion of 62 lbs P per cow per production period as applied in the assessment of the Mid-Atlantic Regional Water Program (2005), and (2) reduced dairy cow manure P excretion (40 lbs per cow per production period), reflecting adherence to the NRC (2001) guidelines for nutrient requirements for dairy cattle.

The reduction in P excretion from 62 to 40 lbs per animal per production period, applied to the 2002 crop and animal production data, shifted the optimal animal density from 0.42 to 0.57 AU per acre in the watershed. With improvements in yields and the additional fertilizer use reductions over the past 5 years, the critical animal density will likely be closer to 0.75 AU per acre.

Acknowledgements and for more information

This P balance assessment for the upper Susquehanna River watershed is based on: Swink, S.N., Q.M. Ketterings, L.E. Chase, K.J. Czymmek, and J.C. Mekken. 2009. Past and future phosphorus balances for agricultural cropland in New York State. Journal of Soil and Water Conservation 64(2):120-133.

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Nutrient Management

Comparing Manure Incorporation Methods in Reduced Till Systems

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Introduction:

Determining effective manure management options that are compatible with reduced-tillage corn systems is important for reducing nutrient runoff and N-volatilization. Shallow tillage reduces soil erosion compared to conventional tillage by reducing overall soil disturbance and maintaining a greater degree of surface residue cover. Various companies make aeration tools that allow for shallow mixing of manure and soil. These aerators operate through the use of eight inch tines that rotate as they cut into the ground and shift the soil. This is unlike most conventional tillage equipment where the soil is churned and then followed by secondary tillage to prepare a seed bed. In a 3-yr trial conducted at the Aurora Research Farm, we used an AerWay® Aerator to compare N conservation following shallow mixing with chisel incorporation and with surface application (What's Cropping up? Vol. 17 No.4, Lawrence et al., 2007). This trial showed that shallow mixing of spring-applied manure resulted in corn grain yields that were similar to those obtained with chisel plowing, suggesting a similar level of ammonia-N conservation. On-farm testing of the effectiveness of shallow tillage was needed and funding from the New York Farm Viability Institute and Northern New York Agricultural Development Program allowed us to implement similar trials at ten farm locations in 2008. Of the ten sites, one farm conducted a chisel versus injection comparison. All others compared chisel with shallow incorporation using aerator tools. In this article, we report on the results of the aeration and chisel incorporation treatments.

Table 1: Surface residue before and after manure application/incorporation, corn yield, Pre-Sidedress Nitrogen Test (PSNT) (0-12 inches depth), and Late Season Stalk Nitrate (L=Low; O=Optimum; E=Excess), as impacted by manure application method.

Treatment	Residue coverage before	Residue coverage after	Corn silage yield (35% DM) tons/acre	PSNT (0-12 inches) ppm	Late Season Stalk Nitrate Test ppm	
	--------------%------------					
Site A (saturated field for large portion of the season)						
Chisel	46.2 a	7.6 b	12.9 a	12.8 a	9 a	L
Aerway	50.8 a	19.8 a	13.5 a	13.0 a	21 a	L
Site B*						
Chisel	83.3 a	.	22.7 a	17.0 a	363 a	O
Aerway	84.7 a	.	22.1 a	13.0 a	108 b	L
Site C						
Chisel	16.1 a	5.3 a	19.4 a	28.0 a	1,095 a	O
Aerway	15.7 a	6.8 a	19.4 a	32.8 a	840 a	O
Site D (severe hail damage and planter skips)						
Chisel	84.5 a	4.8 b	15.2 a	46.3 a	6,395 a	E
Aerway	88.1 a	14.8 a	14.9 a	26.9 b	3,545 b	E
Site E						
Chisel	22.3 a	2.5 b	21.7 a	42.6 a	8,167 a	E
Aerway	20.3 a	14.9 a	21.6 a	40.5 a	4,516 a	E
Site F						
Chisel	73.2 a	12.8 b	27.1 a	50.0 a	6,903 a	E
Aerway	68.3 a	33.5 a	27.1 a	50.5 a	6,458 a	E
Site G						
Chisel	19.2 a	6.2 a	20.1 a	48.0 a	9,845 a	E
Aerway	23.0 a	8.3 a	21.1 a	42.5 a	8,134 a	E
Site H (grain site - bu/acre)						
Chisel	83.1 a	14.3 b	179.9 a	55.0 a	517 a	O
Aerway	83.6 a	37.8 a	177.9 a	46.0 a	327 a	O
Site I (grain site - bu/acre)*						
Chisel	67.8 a	.	164.9 a	57.8 a	2,751 a	E
Aerway	68.3 a	.	175.1 a	57.9 a	1,795 a	O

†Average values with different letters (a,b) are statistically different (α= 0.05).

*Sites that had secondary tillage before "after treatment" residue measurement could be taken.

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Methods:

Farm fields were selected in seven counties, two each in St. Lawrence and Cayuga, and one each in Lewis, Clinton, Wyoming, Chenango, and Columbia. In addition, trials were continued at the Aurora Research Farm. Most of the fields in this study were either second or third year corn silage or corn grain sites. Site F was first year corn silage while Site H was fourth year corn grain. Soil samples, residue measurements and compaction readings were taken before manure was applied. The manure application rate at each site was determined by the farmer, with actual rates ranging from 5,000 to 9,000 gallons/acre. Incorporation took place within one hour of manure application and a second residue reading was done to compare the surface residue remaining for each treatment method. All sites were sampled three more times for soil fertility and soil moisture (at planting, sidedress time, and harvest). Stand density was determined at sidedress time. At harvest time, soil compaction was measured one last time, and yield and forage quality samples were taken.

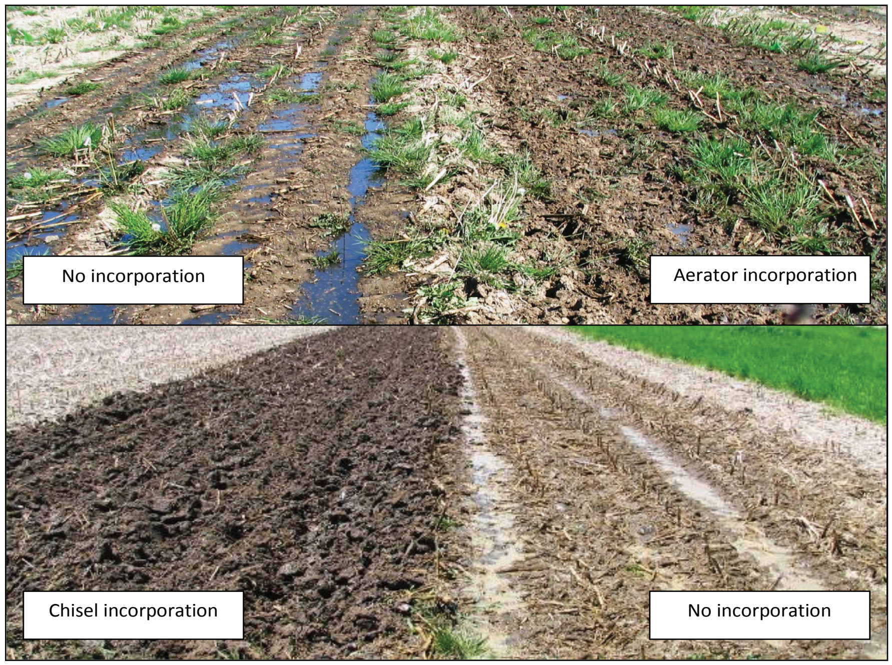

Figure 1: Surface application (top left,) and aerator incorporation (top right), chisel incorporation (bottom left) and surface application (bottom right).

Results:

Yield response and N requirements

For the first year of this trial there were no significant yield differences between the aerator and chisel incorporation treatments. The two sites with the lowest yields were impacted by saturated field conditions (Site A) and heavy hail damage (Site D). The Pre-sidedress Soil Nitrate Test (PSNT) (0-12 inch depth) results showed that at seven of the nine sites N was not yield limiting and stalk nitrate results confirm optimal to excessive nitrate levels for these sites. Except for one site (Site D, the location with planter skips and severe hail damage), N conservation with the aerator was not significantly different from the chisel treatment.

Surface Residue Coverage

Maintaining good surface residue coverage and minimizing soil disturbance are important for managing soil erosion and conserving soil moisture. The aerator incorporation treatments reduced soil disturbance and conserved significantly more surface residue than the chisel incorporation treatment at five of the seven sites in which we were able to measure residue coverage after application. For two sites, both with initial surface residue coverage of less than 25% (Sites C and G), there was no significant difference in residue coverage between the two application methods.

Year One Preliminary Conclusions

The results of this first year show no yield differences and PSNT and stalk nitrate results that indicate similar levels of N conservation between the two application methods. Aerator incorporation did show promise in reduced tillage systems for its ability to conserve surface residue coverage while incorporating manure and conserving N. Aerator incorporation is expected to conserve moisture as compared to the more aggressive chisel plow incorporation, but because 2008 was extremely wet at many of the sites, no soil moisture differences were observed this season. Another year of data will be collected and final conclusions will be drawn at the end of the 2009 growing season.

Contact for Further Information

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Crop Management

N Sidedress Rates on Corn Following Soybeans

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The 2008 soybean crop in NY, which was planted on a record 230,000 acres, averaged 46 bu/acre, similar in yield to the record 2006 crop. Corn acreage is expected to increase by 4% this year in NY (1.13 M acres) so we expect more corn to follow soybeans in the rotation. With N prices so volatile, it is important to apply the recommended rate of N to corn following soybeans in the rotation.

We conducted a 3-year study from 2000 to 2002 at the Aurora Research Farm to evaluate the response of corn to sidedress N rates (with 25 lbs N/acre in the starter) of 0, 50, 100, 150, and 200 lbs/acre when following soybeans in rotation. The recommended total N rate at this site is about 140 lbs N/acre. We used liquid urea-ammonium nitrate (UAN) as an N source and injected it about 4 inches deep when corn was at the 4-5 leaf stage in each year of the study.

Fig.1 clearly shows that the sidedress N rate on corn did not correlate well with the previous soybean yield as indicated by optimum sidedress N rates of 100 lbs/acre (125 lbs of total N/acre) in 2000 following a 30 bu/acre soybean crop in 1999, 50 lbs/acre (75 lbs total N/acre) in 2001 following a 45 bu/acre soybean crop in 2000, and no response to sidedress N in the very dry 2003 growing season following a 39 bu/acre soybean crop in 2001. Instead, the N response was correlated more with the amount of precipitation during the growing season. Consequently, growers in NY should not think that there will necessarily be a higher than normal N credit for corn in 2009 from the high-yielding 2008 soybean crop.

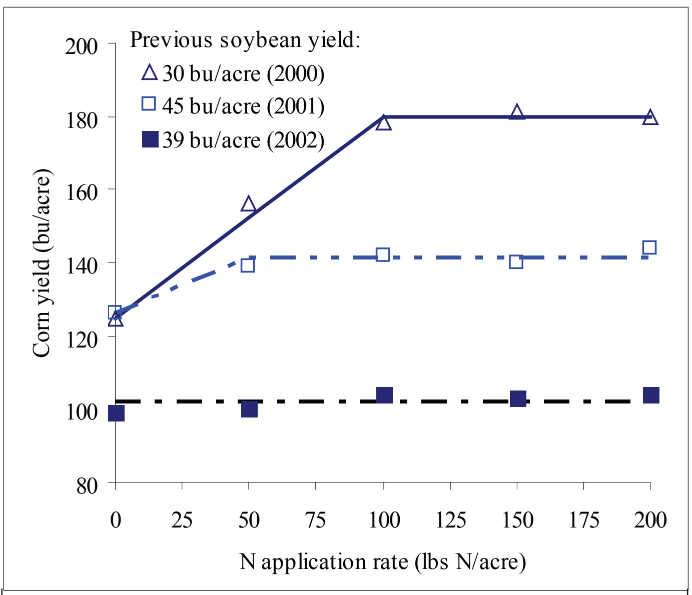

Figure 1: Corn yields in 2000, a wet year (following a 30 bu/acre soybean crop in the dry 1999 year), 2001, a somewhat dry year (following a 45 bu/acre crop in 2000) and 2002, an extremely dry year (following a 39 bu/acre soybean crop in 2001). All treatments received 25 lbs N/acre in a starter fertilizer. Currently, the recommendation for nitrogen for continuous corn at this site is 140 lbs N/acre.

Table 1. Corn yield following soybeans in 2007 (70 bu/acre soybean crop in 2006) and 2008 (35 bu/acre soybean crop in 2007), and averaged across the 2007 and 2008 growing seasons at Aurora, NY.

Sidedress N rate	2007	2008	Avg.
lbs N/acre	---bu/acre--	---bu/acre--	---bu/acre--
0	109	143	126
30	115	179	147
60	**130**	**193**	**162**
90	131	194	163
120	125	191	158
150	132	189	161

We repeated our sidedress N rate study in the dry 2007 and wet 2008 growing seasons. In both years, we used 25 lbs of N/acre in the starter and sidedressed at 0, 30, 60, 90, 120, and 150 lbs N/acre. Regression analysis indicated that in 2007, a dry year (following a 70 bu/acre soybean crop in 2006), the optimum sidedress N rate was 60 lbs/acre (Table 1). Likewise, in 2008, a wet year (following a 35 bu/acre soybean crop in 2007), 60 lbs N/acre (85 lbs total N/acre) also was optimum, despite the much high-yielding corn crop (Table 1). Obviously, corn yields, previous soybean yield, or even weather patterns do not totally explain the N response of corn when following soybeans.

Conclusion

We know that corn requires less N when following soybeans than when following corn but the exact reduction in N rate is difficult to quantify. Currently, Cornell recommends a reduction of 20-30 lbs N/acre when corn follows soybeans compared with corn on corn. Based on the data at the Aurora Research Farm, this is a fairly conservative estimate so growers should not hesitate to reduce N by 20-30 lbs/acre this year when corn follows soybeans in the rotation.

Agronomics and Economics of Zone Tillage Depth for Corn Silage Production

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Large-scale dairies are increasingly common in western NY where rolling topography and highly erodible land (HEL) dominate. Currently, more than 600 dairy farms in NY are classified as confined animal feeding operations or CAFOs. Many large dairy operations in western NY abandoned conventional tillage in 2004 because the NY CAFO planning process, which utilizes the Revised Universal Soil Loss Equation 2 (RUSLE2), permitted only one year of corn silage under conventional tillage followed by 5 years of perennial forage on HEL to meet tolerable (T) soil erosion losses. Many large-scale dairy operations adopted zone tillage because NY CAFO plans permitted a continuance of the 4-year corn silage-perennial forage rotation on their HEL topography with zone tillage. Most adopted zone tillage at a 14-in depth (Rawson method); despite previous research in the early 1990s on three dairy farms in Otsego Co., NY that indicated that corn grain yielded the same at 9 and 13-in chisel tillage depths. The volatile nature of diesel fuel costs prompted us to examine what is the optimum zone tillage depth for corn silage production in the first year and in the 3rd and 4th years following perennial forage in a 4-yr corn silage-perennial forage rotation.

A farmer-researcher partnership was formed to conduct field-scale studies at Table Rock Farm, a ~1000-cow operation that grows about 650 acres of corn silage, in Castile, NY. A field-scale study was established in two 10 acre fields with predominant soil types of Erie-Langford channery silt loams in 2007 and 2008. Employees on the dairy farm performed all field operations, including manure applications, tillage practices, planting, herbicide spraying, and harvesting. Zone tillage was performed in late April of both years when soil conditions had dried because of limited precipitation in the previous 2 weeks. A 20 ft wide zone builder subsoiler (Model 130, Unververth, Kalida, OH) with 8 shanks spaced 30-in apart with a 20 ft wide Aerway (Model, AWS-C-Flex single roller) attached to the zone builder was used in this study. The zone builder, which tilled strips about 8 in wide, was set at 0-in (with the use of the Aerway), and at 7 and 14 in (with the use of the Aerway) for the three zone tillage depth treatments.

A partial budget approach was used to estimate the expected change in annual profit in an average future year for the dairy farm to determine the optimum depth of zone tillage. We analyzed only variable costs because the dairy farm had already purchased a zone builder. No other equipment changes in relation to tillage practices will be made until a future decision on whether to replace the existing zone builder. Variable costs included labor ($15/hr), fuel ($3.15/gallon), and lube, repair, and maintenance costs of equipment where appropriate (ASAE, 2000). A 360 hp articulated tractor was used for all tillage treatments in the study with time estimates of 0.09 hours/acre for the 0-in (Aerway attached) depth, 0.13 hours/acre for the 7-in depth, and 0.17 hours/acre for the 14-in depth (ASAE, 2000). All other management inputs in this study were similar across zone tillage depths so the only other variable costs were associated with harvesting and hauling and silo filling for different corn silage yields. Expected changes in income were generated from average corn silage yields for each zone tillage depth in this study and the average corn silage price ($35/ton) in New York for 2008. All dollar values for income and cost items are expressed in real terms as 2008 dollars. The expected changes in profit reflected differences in total net income (increases or decreases) and differences in costs (increases and decreases) for the dairy farm in this study for a future average year.

Tillage depth results did not differ for 1st year, 3rd, and 4th

Table 1. Surface residue percent, plant densities, and dry matter (DM) accumulation of corn at the eight leaf stage (V8) under three zone tillage depths, averaged across the 2006 and 2007 growing seasons on a dairy farm near Warsaw, NY.

Depth	Residue	Plant densities	DM accumulation
--in--	----%----	----plants/ac---	-----g m^{-2}----
0	34.5	28990	334
18	33.7	29000	356
36	33.6	29959	365
		Contrasts	
0 vs. 7	NS	NS	NS
7 vs. 14	NS	NS	NS

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year corn or in 2007 or 2008 so the data have been averaged across rotations and years. Tillage depth did not affect surface residue, final plant densities, and DM accumulation of corn at the V12 stage (Table 1). Tillage depth, however affected silage yield with a 6% yield increase for the 7-in compared with the 0-in depth (Table 2). Zone tillage beyond the 7–in depth, however, did not provide additional silage yield increases. This is consistent with previous research in NY on three dairy farms with silt loam soils that indicated that corn grain yielded the same at a 9 compared with a 13-in chisel tillage depth.

Table 3. Crude protein (CP), starch, 30 hour neutral detergent fiber (NDF), and in vitro true digestibility (IVTD) of corn at harvest under three zone tillage depths, averaged across the 2006 and 2007 growing seasons on a dairy farm in Castile, NY.

Depth	CP	Starch	NDF	IVTD
--in--	---- % ---	---- % ---	---%---	---- %----
0	7.3	30.7	45.1	81.9
7	7.4	30.5	45.0	82.0
14	7.5	31.0	45.1	82.3
		Contrasts		
0 vs. 7	NS	NS	NS	NS
7 vs. 14	NS	NS	NS	NS

Tillage depth did not affect corn DM content at harvest with DM contents averaging about 36.5% for all tillage depths (Table 2). The 7-in zone tillage depth had greater N uptake compared with the 0-in depth but had similar N uptake when compared with the 14-in depth (Table 2). The greater DM yield between the 7 and 0-in zone tillage depths mostly contributed to the greater N uptake because crude protein contents did not differ among zone tillage depth treatments (Table 3). Tillage depth also did not affect any other corn silage quality characteristics measured in this study (Table 3).

Table 2. Silage yield (adjusted to 35% dry matter (DM), DM content, and N uptake of corn at harvest under three zone tillage depths, averaged across the 2006 and 2007 growing seasons on a dairy farm in Castile, NY.

Depth	DM yield	DM content	N uptake
--in--	----tons/ac^{-1}----	----%----	----lbs/ac----
0	23.8	36.7	195
7	25.3	36.6	210
14	25.1	36.9	210
		Contrasts	
0 vs. 7	*	NS	*
7 vs. 14	NS	NS	NS

Partial budget analyses, based on variable costs and corn silage values in 2008, indicate that a reduction from a 14 to 7-in zone tillage depth on the dairy farm where the study was conducted would increase profit by about $12/acre (Table 4). The increase in profit would be realized in part because of decreased time and draught on the tractor during the tillage operation, which would reduce labor ($0.60/ acre), tractor fuel ($2.38/acre), and repairs and maintenance for the tractor, zone builder and Aerway ($1.22/acre). Also, there would be an increased return with the ~ 0.25 ton/acre higher silage yield ($8.90/acre); partially offset by the increase in harvesting costs ($1.04/acre). If silage yields are considered similar between 7 and 14-in depths, the expected profit would be about $4/acre because of the savings in variable costs. Of course, the expected profit would change annually as diesel fuel costs and corn silage values change.

Partial budget analyses indicate that the use of the Aerway without the zone builder at a 7-in depth would not be profitable on this dairy farm in the near future (Table 4). The decrease in time and draught on the tractor as well as wear on the zone builder at the 0-in depth would contribute to decreased variable costs ($7.49/acre). Decreased variable costs, however, would be offset with a loss in crop value ($53.39/acre) because of higher silage yield at the 7-in depth, resulting in a loss of profit of about -$39/acre after adjusting for $6.64/acre lower harvesting costs. A loss of profit of this magnitude

Table 4. Partial budget analyses for a dairy farm that grows 650 acres of corn silage in Castile, NY, based on additional corn silage yield and mean corn silage price ($35/acre) in NY for 2008 and added variable (operating) costs at 2008 dollars for zone tillage (ZT) depths (with attached Aerway implement) of 0 vs. 7 in and 7 vs. 14-cm depths.

	ZT depth		ZT depth	
Partial budget	7 in	14 in	0 in	7 in
	-------$/acre ----------		---------$/acre-------------	
Income change	8.90			53.39
Variable costs change				
Labor	0.60		0.60	
Fuel	2.38		2.38	
Repairs & maintenance	1.22		3.37	
Harvest		1.04	6.64	
Depreciation-zone builder			1.14	
Expected profit change	12.06			39.27

across 650 acres of corn silage indicates that the dairy farmer will probably purchase a new zone builder when a decision must be made on replacement of the existing zone builder.

Conclusion

Despite significant potential for soil compaction in a 4-yr corn silage –perennial forage rotation on dairy farms, the results from this study indicate that an intermediate zone tillage depth of 7-in was optimum on a dairy farm in western NY with silt loam soils with thick fragipans at the 16 to 20 in depth. We recommend that dairy producers on these soils experiment with reducing their zone tillage depth from 14 to 7 in to reduce labor, fuel, and repair and maintenance costs because silage yields remained similar in this study. We recommend that dairy producers on these soils do not eliminate zone tillage, despite savings in labor, fuel, and repair and maintenance costs, because of reductions in silage yield and N uptake of corn.

Weed Management

Preplant Dandelion Control in Zone/No-Tillage Soybeans

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Some weeds are more commonly associated with zone/no-tillage cropping systems than with conventional tillage systems. Winter annual, biennial, and simple perennial weeds don't survive in plowed fields, however they can thrive in zone/no-tillage fields. Dandelions are among the weeds that can be a problem. This simple perennial is common in New York perennial forage fields, and each dandelion produces an abundance of seed with a tuft of hairs to facilitate wind dispersal to adjacent fields.

Widespread use of glyphosate-resistant corn and soybeans may also contribute to the dandelion problem. All too often, residual herbicides, which could prevent dandelion germination and establishment, are not used with glyphosate in these herbicide-resistant crops. As a result, dandelions can become a serious problem after several years of continuous zone/no-tillage cropping.

Table 1. Dandelion control ratings made 6 and 8 months after treatment (MAT) following herbicide applications in late October 2006 near Aurora, NY.

	Rate	% Dandelion Control	
Herbicides*	Amt/A	6 MAT	8 MAT
Canopy EX**	1.1 oz	100	47
+ 2,4-D LVE	1 pt		
Synchrony XP**	0.37 oz	97	22
+ Express	0.125 oz		
+ 2,4-D LVE	1 pt		
Roundup Original***	1 qt	73	22
+ 2,4-D LVE	2 pt		
LSD (0.05)		6	8

*Entire plot area received 44 fl oz/A Roundup WeatherMAX, 0.25% (v/v) NIS, and 2 lb/A AMS on June 29, 2007.

**Applied with 1% (v/v) crop oil concentrate and 2 lb/A ammonium sulfate.

***Applied with 1% (v/v) crop oil concentrate.

Fall Versus Spring Application

Fall herbicide applications have been thought to provide better dandelion control than spring applications. Recent research suggests this may not be true if dandelions are not actively growing in late fall. An experiment established near Aurora, NY in late October 2006 compared fall and spring applications of Canopy EX (chlorimuron and tribenuron) plus 2,4-D (Low Vol 4 Ester) and of Synchrony XP (chlorimuron and thifensulfuron) plus Express (tribenuron) and 2,4-D. Fall applications of Canopy EX plus 2,4-D and Synchrony XP plus 2,4-D provided 100 and 97% dandelion burndown respectively 6 months after treatment (MAT), but control declined to 47 and 22% respectively by 8 MAT in late June (Table 1). On the other hand, spring (early May) applications of these treatments averaged 85% by late June. Meanwhile, fall application of Roundup Original plus 2,4-D provided 73% burndown 6 MAT and 22% control 8 MAT. Applications of the Canopy EX plus 2,4-D and Synchrony XP plus 2,4–D treatments produced an average of 27 Bu/A when fall applied and 32 Bu/A when spring applied. Fall application of Roundup Original plus 2,4-D produced only 18 Bu/A which was no different than the yield from the untreated check.

Express Improves Control

In a separate experiment in 2007, Express herbicide again proved a valuable tool for dandelion control. Early

Table 2. Dandelion control 6 weeks after treatment (WAT) and soybean yields following early preplant herbicide applications in mid-May 2007 at Aurora, NY.

	Rate	% Control	Yield
Herbicides*	Amt/A	6 WAT	Bu/A
Enlite**	2.8 oz	68	45
+ 2,4-D LVE	1 pt		
Enlite**	2.8 oz	94	48
+ Express	0.1 oz		
+ 2,4-D LVE	2.8 oz		
Untreated	-	0	15
LSD (0.05)		9	6

*Entire plot area treated with 11 fl oz/A of Roundup WeatherMAX plus 2 lb/A ammonium sulfate July 2, 2007.

**Applied with 1% (v/v) crop oil concentrate.

Figure 1. Untreated dandelion check in zone-tillage soybeans at Aurora in 2008.

Figure 2. Dandelion control 7 weeks after treatment following preplant application of 0.37 oz/A of Synchrony XP plus 1 pt/A 2,4-D LVE and 1% COC in mid-May 2008.

Figure 3. Dandelion control 7 weeks after treatment following preplant application of 0.37 oz/A of Synchrony XP plus 0.5 oz/A Express, 1 pt/A 2,4-D LVE, and 1% COC in mid-May 2008.

preplant (EPP) applications in mid-May of 2.8 oz/A of Enlite (chlorimuron, flumioxazin, and thifensulfuron) plus 1 pt/A of 2,4-D (Solve 2,4-D Low Vol Ester) with 1% crop oil concentrate (COC) or this combination plus 0.1 oz/A (less than labeled rate) of Express controlled 68 and 94% of dandelion 6 weeks after treatment (WAT) with yields of 45 and 48 Bu/A respectively (Table 2). Soybean yield from the untreated check was 15 Bu/A.

Finally, with EPP (mid-May) applications in 2008, the addition of 0.5 oz/A of Express to the combination of 0.37 oz/A of Synchrony XP plus 1 pt/A of 2,4-D (Low Vol 4 Ester) increased dandelion control from 70 to 96% 7 WAT. See Figures 1, 2, and 3. In the same experiment, 0.47 oz/A of Canopy EX plus 1 pt/A of 2,4-D controlled 89% of dandelion while this combination plus 0.35 oz/A of Express controlled 96% of dandelion 7 WAT. An EPP application of 2.8 oz/A of Enlite plus 1 pt/A of 2,4-D provided 88% dandelion control.

Dandelion Control Guidelines

These research results have led to what is believed to be reasonable recommendations for dandelion burndown and control in zone/no-tillage soybeans. With considerations for label restrictions, the choice of two recommendations for South of I 90 (thruway) are different from the one for North of I 90.

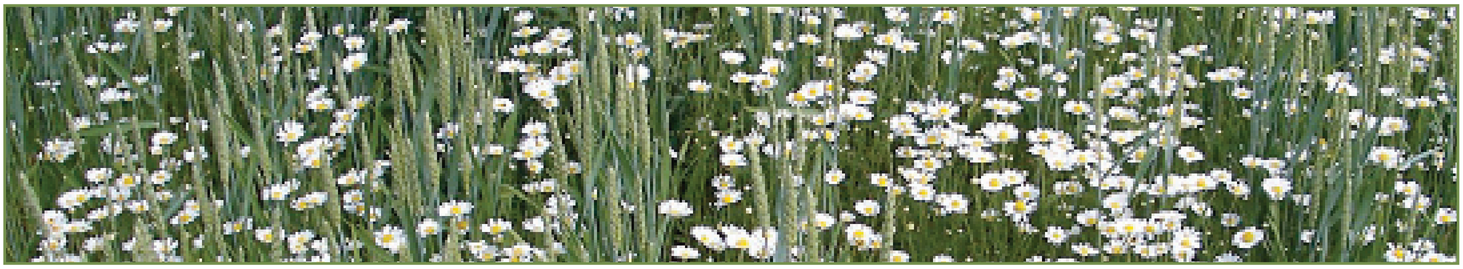
South of Interstate 90

• 1.1 oz/A of Canopy EX + 1 pt/A 3.8 lb/gal 2,4-D LVE with crop oil concentrate or nonionic surfactant according to label applied in fall after harvest or in spring up to 14 days prior to soybean planting.

• 2.8 oz/A of Enlite + 1 pt/A 3.8 lb/gal 2,4-D LVE with crop oil concentrate or nonionic surfactant according to label applied in fall after October 15 or in spring at least 14 days before planting soybeans.

North of Interstate 90

• 0.375 oz/A Synchrony XP + 0.25 oz/A Express + 1 pt/A 3.8 lb/gal 2,4-D LVE applied to no-tillage fields anytime after fall harvest up to 45 days prior to planting soybeans.



Calendar of Events

June 4, 2009	**Small Grains Management Field Day, Musgrave Farm, 1256 Poplar Ridge Rd, Aurora, NY**
July 7, 2009	**Cornell Seed Growers Field Day, Ithaca, NY**
July 12-15, 2009	**ASA-CSSA-SSSA Northeastern Branch Meeting, Portland, ME**
July 15, 2009	**Weed Science Field Day, Thompson Research Farm, Freeville, NY (morning program)**
July 15, 2009	**NYSABA Summer, BBQ, Musgrave Farm, Aurora, NY 12:00 noon**
July 15, 2009	**Weed Science Field Day, Musgrave Farm, Aurora, NY (afternoon program)**
Aug. 1-5, 2009	**American Phytopathological Society Meeting, Portland, OR**
Aug. 10-14, 2009	**Soil Health Training Workshop, Ithaca, NY**
Aug. 26, 2009	**New York Summer Crops Tour, Howlett Farms, Avon, NY**

What's Cropping Up? is a bimonthly newsletter distributed by the Crop and Soil Sciences Department 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: Crop and Soil Sciences, Plant Breeding, Plant Pathology, and Entomology. **To get on the mailing list, send your name and address to Larissa Smith, 237 Emerson Hall, Cornell University, Ithaca, NY 14853 or lls14@cornell.edu.**

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