What's Cropping Up?

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Herbicide Resistance Management Using Site of Action Classification

Russell R. Hahn

Department of Crop and Soil Sciences
Cornell University

The Weed Science Society of America (WSSA) has defined herbicide resistance as "the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. In a plant, resistance may be naturally occurring or induced by such techniques as genetic engineering or selection of variants produced by tissue culture or mutagenesis." This definition clearly includes weed populations with resistant biotypes as well as crop hybrids/varieties that have been developed to be resistant to certain herbicides.

Herbicide-resistant weeds have been a concern since 1968 when triazine-resistant common groundsel was first reported in the Pacific Northwest, but concern about resistant weed populations has escalated in recent years. The rapid increase in ALS- (acetolactate synthase) resistant weed populations and the introduction of herbicide resistant crops are largely responsible for this increased concern. ALS inhibition is the site of action for several herbicide families, including sulfonylureas (Accent, Beacon, Permit, etc.), imidazolinones (Pursuit, etc.), and triazolopyrimidines (Python). According to the http://www.weedscience.org/in.asp web site, there are more (93) ALS resistant weed biotypes than for any other group including triazine-resistant weed biotypes (65). In addition to the propensity of weeds to develop resistance to ALS inhibitors, these herbicides are used on numerous crops. The development of crops resistant to non-selective herbicides (glyphosate and glufosinate), growers are tempted to use herbicides with the same site of action multiple times during a growing season and/ or on multiple crops in rotation. Although herbicide resistant management plans encourage the use of crop rotation these trends make it clear that crop rotation alone does not ensure the use of herbicides with different sites of action from year to year. Consequently, rotating herbicides with different sites of action and using tank mixes *or* sequential applications that involve herbicides with different sites of action are key elements in herbicide resistance management plans.

Sites of Action

To utilize herbicides with different sites of action most effectively, everyone involved in weed management decisions must have site of action classification readily available. WSSA has approved a numbering system to classify herbicides by their site of action (Mallory-Smith, C.A. and Retzinger, E.J. 2003. Revised classification of herbicides by site of action for weed resistance management strategies. *Weed Technol.* 17:605-619). A group number is given to all herbicides with the same site of action. To further efforts in management of existing herbicide-resistant weed populations and to delay or avoid development of new herbicide-resistant weed populations in NY State, these **GROUP NUMBERS** are included in the chemical weed control tables in each section of the ***2006 Cornell Guide for Integrated Field Crop Management***. Since herbicide resistance management is most effective when practiced across all crops in rotation, **GROUP NUMBERS** for all herbicides in the guide can be found in Table 7.5 on pages 148-149 of the guide and are shown here in Table 1. Additional information about the site of action groups and chemical families within each group are shown in Table 2.

Weed Management

Table 1 Index of herbicide names with active ingredients and site of action GROUPS.

Trade Name	Active Ingredient(s)	Site of action GROUP(S)
*AAtrex	*atrazine	5
*Accent	*nicosulfuron	2
Aim	carfentrazone-ethyl	14
Assure II	quizalofop	1
*Atrazine 4L	*atrazine	5
Balan DF	benefin	3
Banvel	dicamba	4
Basagran	bentazon	6
Basis	rimsulfuron + thifensulfuron	2 + 2
*Beacon	*primisulfuron	2
†*Bicep II Magnum	*atrazine + *S*-metolachlor	5 + 15
†*Bicep Lite II Magnum	*atrazine + *S*-metolachlor	5 +15
Buctril	bromoxynil	6
Buctril + *Atrazine	Bromoxynil + *atrazine	6 + 5
Butyrac 200	2,4-DB	4
†*Bullet	*alachlor + *atrazine	15 + 5
Callisto	mesotrione	27
†*Cinch ATZ Lite	*atrazine + *S*-metolachlor	5 + 15
Clarity	dicamba	4
Clean Crop MCP Amine 4	MCPA	4
Cobra	lactofen	14
Command 4EC	clomazone	13
Crossbow	2,4-D + triclopyr	4 + 4
†Dual II Magnum	*S*-metolachlor	15
Eptam 7E	EPTC	8
Fusilade DX	fluazifop-P-butyl	1
Fusion	fluazifop-P-butyl + fenoxaprop	1 + 1
Glyphomax XRT	glyphosate	9
†*G-Max Lite	*atrazine + dimethenamid-P	5 + 15
*Gramoxone Max	*paraquat	22
†*Guardsman Max	*atrazine + dimethenamid-P	5 + 15
Harmony Extra XP	thifensulfuron + tribenuron	2 + 2
†Hornet WDG	clopyralid + flumetsulam	4 + 2
*Laddok S-12	*atrazine + bentazon	5 + 6
Liberty	glufosinate-ammonium	10
†Lightning	imazethapyr + imazapyr	2 + 2
Lorox DF	linuron	7
†*Lexar	*S*-metolachlor + mesotrione + *atrazine	15 + 27 + 5
†*Lumax	*S*-metolachlor + mesotrione + *atrazine	15 + 27 + 5
*Marksman	*atrazine + dicamba	5 + 4
†*Micro-Tech	*alachlor	15
NorthStar	primisulfuron + dicamba	2 + 4
†Outlook	dimethenamid-P	15
Pendimax	pendimethalin	3
Permit	halosulfuron	2
Poast Plus	sethoxydim	1
Princep 4L	simazine	5
Prowl 3.3 EC	pendimethalin	3
Prowl H2O	pendimethalin	3
†Pursuit	imazethapyr	2
†Python	flumetsulam	2
Raptor	imazamox	2
Reflex	fomesafen	14
Resource	flumiclorac	14
†Rhomene MCPA Amine	MCPA	4
Roundup WeatherMax	glyphosate	9
*Select	clethodim	1
Sencor DF	metribuzin	5
*Shotgun	*atrazine + 2,4-D	5 + 4
Spirit	prosulfuron + primisulfuron	2 + 2
Steadfast	nicosulfuron + rimsulfuron	2 + 2
*Steadfast ATZ	nicosulfuron + rimsulfuron + *atrazine	2 + 2 + 5
Touchdown Total	glyphosate	9
Velpar L	hexazinone	5
Yukon	halosulfuron + dicamba	2 + 4

*Restricted-use pesticide.
†Not for use on Long Island, NY.

Table 2. Site of action and chemical families for herbicide GROUPS				
Group	**Site of Action**	**Chemical Family**	**Active Ingredient**	**Example Products**
1	ACCase inhibition	Aryloxyphenoxy propionate Cyclohexanedione	fluazifop-P quizalofop-P clethodim sethoxydim	Fusilade DX Assure II Select Poast Plus
2	ALS inhibition	Sulfonylurea Imidazolinone Triazolopyrimidine	halosulfuron nicosulfuron primisulfuron thifensulfuron imazamox imazethapyr flumetsulam	Permit Accent Beacon Harmony GT XP Raptor Pursuit Python
3	Microtubule assembly inhibition	Dinitroaniline	benefin pendimethalin	Balan DF Pendimax, Prowl
4	Synthetic auxins	Phenoxy Benzoic acid Carboxylic acid	2,4-DB 2,4-D MCPA dicamba clopyralid	Butyrac 200 various various Banvel, Clarity Stinger
5	Photosynthesis inhibition at photosystem II site A	Triazine Triazinone Uracil	atrazine prometon simazine hexazinone metribuzin bromacil	AAtrex Pramitol 25E Princep Velpar Sencor Hyvar X, Hyvar XL
6	Photosynthesis inhibition at photosystem II site B	Nitrile Benzothiadiazole	bromoxynil bentazon	Buctril Basagran
7	Photosynthesis inhibition at photosystem II – site A, different binding from group 5	Urea	linuron tebuthiuron	Lorox DF Spike 8OW
8	Lipid synthesis inhibition – not AACase inhibition	Thiocarbamate	EPTC	Eptam 7E
9	EPSP synthase inhibition	Glycine	glyphosate	Glyphomax XRT Roundup products Touchdown Total
10	Glutamine synthetase inhibition	None	glufosinate – ammonium	Liberty
13	Bleaching: inhibition of DOXP synthase	Isoxazolidinone	clomazone	Command 4EC
14	PPO inhibition	Diphenylether N-phenyl-phthalimide Triazolinone	fomesafen lactofen flumiclorac carfentrazone-ethyl	Reflex Cobra Resource Aim
15	Long-chain fatty acid inhibition	Chloroacetamide	alachlor *S*-metolachlor dimethenamid-P	Micro-Tech Dual II Magnum Outlook
22	Photosystem I – electron diversion	Bypyridilium	paraquat	Gramoxone Max
27	4-HPPD inhibition	Triketone	mesotrione	Callisto

Recommended Corn Silage Hybrids

Bill Cox[1], Jerry Cherney[1], and Margaret Smith Einarson[2]
[1]Department of Crop & Soil Sciences, [2]Department of Plant Breeding & Genetics
Cornell University

Crop Management

Cornell University evaluates 95-115 day corn silage hybrids at two locations in central/western NY and 75-100 day corn silage hybrids at two locations in Northern New York. We arrange the hybrids in the field into 5-day relative maturity (RM) groups (i.e. 95-100, 101-105 day hybrids, etc.) and harvest one or two RM groups at a particular site when the hybrids are in the 60-70% moisture range. We also take a 2000-gram sample at harvest to determine moisture and to run silage quality analyses on all four replications of each hybrid at each site.

MILK2000, a spreadsheet from the University of Wisconsin, calculates milk/ton, a silage quality index, derived from neutral detergent fiber (NDF), NDF digestibility, crude protein, ash, and starch concentrations in the quality analyses. MILK2000 also calculates milk yield/acre of each hybrid by combining silage yield and milk/ton values.

We recommend hybrids that have comparative milk yields of 100 or greater (the average milk yield of each hybrid RM group is adjusted to 100 and hybrids within the RM group with above-average milk yields have values above 100). We have listed the comparative milk yields as well as comparative silage yields and milk/ton values for hybrids that have performed above-average in our trials (Tables 1 and 2). **Hybrids should only be compared within RM groups. Hybrids that have been tested more than 1 year should be given more weight because they have performed above-average in more tests.**

Central/Western NY

Hybrids 37K84 from Pioneer for the second consecutive year and 4955XRR from FS Seeds performed exceptionally well in the 95-100-day RM group in 2005 (Table 1). Hybrids 964L from LICA and 38H67 from Pioneer also performed very well in the 95-100 day RM group in 2005. Other hybrids that have performed well in this maturity group during the last 2-3 years include HL S047 from Hyland, 38H67 from Pioneer, and 5424 from Chemgro.

Table 1. Recommended 95-115-day corn silage hybrids in New York based on tests in Cayuga Co. (Aurora Research Farm) and Livingston Co. (Southview Farms).

Brand	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comparative Milk Yield	Years in Test
		-----------------------------%-----	-------------------		no.
		95-100 day Relative Maturity			
Pioneer	37K84	107	102	108	2
FS Seeds	4955XRR	108	101	108	1
LICA	964L	103	101	104	1
Hyland	HL S047	101	102	103	3
Pioneer	38H67	100	103	103	2
Chemgro	5424	105	98	102	3
Hyland	HL S042	100	102	101	1
		101-105 day Relative Maturity			
T.A. Seeds	TA557-00F	110	101	111	3
NK	N48-L4	104	102	106	2
DeKalb	DKC54-51 (YGCB)	105	100	104	2
Hyland	HL S058	106	96	103	3
Hytest	HT7428BT/RR	100	102	101	1
Pioneer	35A30	101	101	101	1
		106-110 day Relative Maturity			
Pioneer	34A86	113	102	115	1
Pioneer	34B23	106	103	107	6
Hyland	HL S067	105	102	107	5
UAP	DG 5324Bt	102	103	107	1
Doebler's	620	105	99	103	1
GH	H-8562	102	100	101	3
DeKalb	DKC57-84 (YGCB)	102	100	101	3
		111-115 day Relative Maturity			
Pioneer	34B39	103	104	107	1
Pioneer	31G66	108	100	106	2
Hytest	HT7749BT/RR2	107	99	105	1
GH	H-9493Bt	103	101	104	1
Pioneer	33D63	101	102	104	1
DeKalb	DKC61-72(RR2)	98	105	103	1
Asgrow	RX702RR2/YGCB	100	102	103	1
Heartland	TH-310	100	101	101	1

The hybrid TA557-00F performed exceptionally well for the third consecutive year in the 101-105 day RM group with a comparative milk yield of 122 in 2005 (Table 1). The hybrids HL S058 from Hyland and N48-L4 from Northrup King also had outstanding milk yields in the 101-105 day RM group in 2005. The hybrid DKC54-51 (YGCB) also performed well in this maturity group for the second consecutive year in 2005.

The hybrid 34B23 from Pioneer had its best year ever with a comparative milk yield of 121 in the 106-100 day RM group in 2005. It has been an outstanding silage hybrid for yield and quality now for 6 years in New York. The hybrid HLS 067 from Hyland also had outstanding milk yields for the fifth consecutive year in New York. New hybrid releases that performed well in the 106-110 day RM group in 2005 include 34A86 from Pioneer, DG 5324 from UAP, and 620 from Doebler's.

The hybrid 31G66 from Pioneer had its second consecutive outstanding year in the 111-115 day RM group in 2005 (Table 1). Although 31G66 compared to 34B39 from Pioneer had greater silage yields, both hybrids had about the same milk yields in 2005 because of the high milk/ton value of 34B39. Five new hybrids in the 111-115 day RM group, including HT7749 BT/RR2 from Hytest, H-9493Bt from Golden Harvest, 33D63 from Pioneer, DKC61-72 (RR2) from DeKalb, and RX702 RR2/YGCB from Asgrow also had outstanding milk yields in 2005.

Northern New York

Hybrids HL SR22 and HL S009 from Hyland had outstanding milk yields in the 75-85 day RM group in 2005 (Table 2). The hybrid HT7060BT/RR2 from Hytest performed very well for the second consecutive year and HL S014 from Hyland also had outstanding milk yields in the 75-85-day RM group in 2005.

A new hybrid release, 8922YG1 from Garst, had exceptional milk yields in the 86-90-day RM group in 2005 (Table 2). Hybrids HT7220 BT/RR2 from Hytest and HL S034 from Hyland had high milk yields in the 86-90 day RM group for the third or fourth consecutive year in 2005. Also, a new hybrid, N34-F1, from Northrup King had high milk yields in 2005 because of high milk/ton values.

Some outstanding new hybrid as well as older hybrids had exceptional milk yields in the 91-95 day RM group in 2005 (Table 2). The new hybrids, TNT-92RR2 from Hytest, DG 53P30 from UAP, and T23326 from Mycogen, had high milk yields because of high milk/ton values in 2005. The hybrids TA4010F from T.A. Seeds and 3030Bt from Northrup King continued to have exceptional milk yields in 2005. Also, DKC 42-95 from DeKalb once again had high milk/ton values in the 91-95 day RM group in 2005.

The hybrid 8787 YG1 from Garst for the second consecutive year had high milk yields in the 96-100 day RM group in 2005 (Table 2). Also, 470RR from Doebler's also had excellent milk yields in the 96-100 day RM group in 2005.

Conclusion

Hybrid selection is one of the most important management practices that affect corn silage yield and quality. Dairy producers should make an informed management decision, based on actual silage yield and quality data from New York, before selecting hybrids for the coming year. We urge seed companies to enter their hybrids in our corn silage hybrid testing program so New York dairy producers can make informed decisions in selecting their hybrids.

Table 2. Recommended 75-100-day corn silage hybrids in Northern NY based on tests in St. Lawrence Co. (Greenwood Farms) and Clinton Co. (Miner Institute).

Brand	Hybrid	Comparative Silage Yield	Comparative Milk/Ton	Comparative Milk Yield	Years in Test
		---------------	%	---------------	
		75-85 day Relative Maturity			
Hytest	HT7060Bt/RR2	103	104	104	2
Hyland	HL SR22	106	98	104	1
Hyland	HL S014	102	100	102	4
Hyland	HL S009	100	101	101	3
Hyland	HL S011	102	99	101	3
		86-90 day Relative Maturity			
Garst	8922YG1	110	103	112	1
Hytest	HT7220Bt/RR2	108	100	107	3
Hyland	HL S034	108	99	106	4
NK	N34-F1	100	102	102	1
		91-95 day Relative Maturity			
Hytest	TNT-92RR2	103	105	107	1
UAP	DG 53P30	100	105	104	1
Mycogen	T23326	100	102	103	1
T.A. Seeds	TA4010F	101	103	103	3
NK	3030Bt	101	103	102	6
DeKalb	DKC42-95(RR2/YGCB)	100	102	102	3
NK	N33-H6	106	97	102	3
Pioneer	38B85	103	99	102	1
		96-100 day Relative Maturity			
Garst	8787YG1	111	100	110	2
Doebler's	470RR	107	97	103	1

Crop Management

Recommended Roundup Ready Soybean Varieties in Central/Western New York

Bill Cox
Department of Crop & Soil Sciences, Cornell University

New York farmers planted almost 200,000 acres of soybeans in 2005, a new state record, and averaged 39 bu/acre in yield. Even with soybean prices hovering in the $5.00-5.50/bu range, soybean producers can realize a profit if their yields exceed about 35 bu/acre. Varieties have shown yield differences of 10 to 20 bu/acre or more in our variety trials so variety selection is a management practice that strongly determines whether growers realize a profit. The varieties in Table 1 are our recommended varieties for central/western NY, based on our tests in Cayuga and Livingston Co. We only recommend varieties that have average relative yields of 100% or greater (100% relative yield equals the mean yield of the test). Varieties that have been tested more than one year have performed well over different growing seasons in NY so more consideration should be given to those varieties. **When looking at the relative yields in Table 1, only compare the relative yields of varieties within the same maturity group.**

The new variety S19-V2, a late Group I variety from Northrup King, and AG1903, a late Group I variety from Asgrow, yielded exceptionally well in New York tests in 2005 (Table 1). Other late Group I varieties that did very well in NY in 2005 include TS1440R from T.A. Seeds, SG1919 from Seedway, and 199RR from FS Seeds. The new variety Rochester from Hyland and S19-R5 from Northrup King also did well in 2005.

New mid-Group II varieties, DKB26-53 from Dekalb and TS2560R from Hyland, yielded exceptionally well in New York tests in 2005 (Table 1). New early Group II varieties, 217RR from FS Seeds and SG2205 from Seedway, also yielded well in 2005. Mid-Group II varieties that continued to yield well in NY tests in 2005 include S24-K4 from Northrup King, and Rodney and Renwick from Hyland Seed. A new variety, C2439RR from Chemgro, also yielded very well in NY tests in 2005.

Conclusion

Variety selection strongly influences yield and subsequent profit. Commercial varieties do not have soybean rust or soybean aphid resistance yet so Maturity Group and yield are the most important factors in variety selection. Correct soybean variety selection can result in huge profit differences so growers should consider all sources of information when selecting varieties.

Table 1. Relative yields of recommended soybean varieties for Central/Western New York, based on tests in Cayuga and Livingston Co.

VARIETY	COMPANY	RELATIVE YIELD (%)	YEARS IN TEST
		GROUP I VARIETIES	
S19-V2	NK	116	1
AG1903	Asgrow	115	2
199RR	FS Seeds	112	2
SG1919	Seedway	111	3
TS1440R	T.A.Seeds	109	1
Rochester	Hyland	106	1
S19-R5	NK	104	2
		GROUP II VARIETIES	
DKB26-53	DeKalb	114	1
TS2560R	T.A.Seeds	110	1
S24-K4	NK	103	5
Renwick	Hyland	103	2
217RR	FS Seeds	103	1
SG2205	Seedway	103	1
C2439RR	Chemgro	103	1
Rodney	Hyland	101	2

Statewide and Whole Farm Phosphorus Balances: Tools to Help with Long-Term Nutrient Planning on Dairy and Livestock Farms

Nutrient Management

Caroline Rasmussen[1], Quirine Ketterings[1], Johan Mekken[1], Karl Czymmek[2], Larry Chase[3]
[1]Dept. of Crop & Soil Sciences, Nutrient Management Spear Program, [2]PRODAIRY,
[3]Dept. of Animal Science

To date, nutrient management regulations in NY and most other states in the US have addressed the Clean Water Act through implementation of the NRCS 590 standard for nutrient management. The NRCS 590 standard focuses on reducing risk to water quality by managing applications of fertilizer and manure; this is accomplished through development of plans that include the use of the P runoff index, the N leaching index, and land grant university crop nutrient guidelines. However, current nutrient management practices may not sufficiently address importation and subsequent loading of nutrients into farms and watersheds as shown, among others, by a steadily increasing number of acres testing high or very high in P in NY (see What's Cropping Up? 2004, 14(5): 3-6) and other states.

When the amount of P entering a field exceeds the P removed with harvest, this imbalance could lead to: (1) increase in soil reserves (potentially increasing the risk for future environmental losses), and (2) direct nutrient loss to the environment. A P balance can be derived for an individual field, a farm, a county, a watershed, a region, a state or even an entire country. An analysis of the nutrient flows onto and off the farm is essential to quantify current nutrient imbalances and identify farm practices that could be more efficient, thereby, increasing farm profitability and decreasing nutrient losses to the environment. As such, an imbalance may be an indicator of challenges and opportunities, current and future. The state- and county-wide balances have the potential to improve water quality protection by supporting activities that address the local differences between available nutrient supplies and potential nutrient use by crops. Such analyses are also the basis for measuring progress as farms make changes in management of soil, crop, fertilizer, feeds, and manure for watershed protection and long-term sustainability of our dairy industry.

Materials and Methods

To gain a better understanding of current balances, two studies were initiated: (1) state-wide and county-based assessment of P balances; and (2) individual farm mass nutrient balances for New York State dairy and livestock farms.

Statewide and county-based phosphorus balances for New York State

State-wide and county balances were derived as the difference between total amount of P in manure and fertilizer minus the amount of P in crop removal using the 2002 Census of Agriculture and NYS Agricultural Statistics Service data and following the same procedures used by the Mid-Atlantic Regional Water Program (http://mawaterquality.psu.edu/).

Nutrient accounting for New York dairy and livestock farms

The whole farm mass balance assessments included quantification of imports through feed and fertilizer purchases, nitrogen fixation from legumes, animals purchased, bedding as well as exports in the form of milk, animals, crops sold, and manure transported off the farm using a mass nutrient balance software tool (downloadable from http://nmsp.css.cornell.edu/projects/massbalance.asp). To date, 38 farms participated in this study. The information was collected from existing farm sources such as farm financial, crop recordkeeping and animal nutrition records. Acres of legumes, percent legume in the stand, yield, and crude protein content were used to estimate the amount of N fixed by the legumes if any.

Nutrient Management

Initial Results

Statewide and county-based phosphorus balances for New York State

The total P balance for New York State amounted to +28 million lbs of P (+17 lbs of P_2O_5 per harvested acre of cropland) in 2002. This net surplus per acre is lower than what was reported for the Mid Atlantic States (28 lbs P_2O_5 per acre for WV, 29 lbs of PA, 35 for MA, 39 for DE and 55 P_2O_5 per acre for VA; http://mawaterqualitly.psu.edu/) but nevertheless, this is a substantial annual per acre surplus. It needs to be recognized that not all manure and fertilizer P is equally applied to every crop acre explaining why 47% of the soil samples test below the agronomic optimum for P in New York (see What's Cropping Up? 2004, 14(5): 3-6).

Table 1. Selected farm characteristics and farm phosphorus balance factors, mean, median, minimum and maximum for 38 NY dairy and beef farms (2003 and 2004 data)[a].

	Mean	Median	Minimum	Maximum
Selected farm characteristics				
Animal density	0.72	0.73	0.15	1.42
Legume crop[b]	30%	30%	0%	75%
Purchased feed %[c]	30%	31%	1%	65%
Selected farm P balance factors				
P remaining (imports –				
P remaining tons	4.08	1.66	-0.34	17.24
P remaining lbs/acre	11	10	-2	30
P remaining %	51%	58	-53%	81%
P imported as purchased feeds				
P feed import tons	5.09	2.22	0.02	26.45
P feed import lbs/acre	13	11	0	37
P imported as purchased fertilizer				
P fertilizer import tons	2.04	1.03	0.00	20.96
P fertilizer import lbs/acre	5	6	0	16
P exported as milk sales				
P milk sales tons	2.24	0.92	0.00	13.05
P milk sales lbs/acre	6	6	0	15
P exported as crop sales				
P crop sales tons	0.42	0	0.00	7.74
P crop sales lbs/acre	1	0	0	8

[a] Dataset is comprised of 32 farms with 2004 data and 6 farms with 2003 data; 34 farms primary farm enterprise is dairy, 2 farms primary farm enterprise is beef and 2 farms had both beef and dairy enterprises.
[b] % of tillable crop and pasture acres
[c] Mean, median, minimum and maximum values for "Purchased feed %" include 32 case study farms.

Nutrient accounting for New York dairy and livestock farms

Farms participating in the mass nutrient balance pilot study ranged in size from 37 to just over 1300 mature cows. Case study tillable crop and pasture acres ranged from 140 to

2700 acres. Of the 38 farms in the study to date, 34 farms are dairy farms, 2 farms are beef cow-calf and 2 farms had both beef and dairy enterprises. Preliminary evaluation of farm mass nutrient balances showed that, on average, phosphorus imports (feed, fertilizer, animals and bedding) exceeded sales/exports (milk, meat, animals, crops, manure) by 50% ([imports-exports]/imports) resulting in an average of 26 lbs of P_2O_5 "remaining" per acre cropland (Table 1).

These results raise questions related to causes of such imbalances and opportunities to address these. Questions such as "what management decisions contribute most to these imbalances", "how do we increase nutrient use efficiency of nutrients already on the farm", "what happens if we expand in acres or number of cows, improve milk production per cow, improve yield per acre, change crop rotations, reduce storage losses?" etc. Our current work is focusing on trying to better understand these pools and flows (and farm economics) to find ways to reduce nutrient excesses and increase farm profitability.

In Summary

Typically more nutrients come onto dairy and livestock farms as purchased feed and fertilizer than leave the farm as animal products and crops. Losses could be significantly reduced if fewer nutrients could be imported onto the farm in the first place. The key solution lies in finding ways to increase nutrient use efficiency on farms and, thereby, decrease nutrient imports and reduce loadings to watersheds. Knowing a farm's mass nutrient balance is one step towards improving our understanding of nutrient movement onto, within, and away from the farm. For our mass nutrient balance project, a greater number of farms needs to be included with multiple years per farm so we can quantify the impact of best management practices on overall balances.

Acknowledgment and for Further Information

Funding for this project came from grants from the Upper Susquehanna Coalition, the Water Resources Institute, EPA Region 2, the CUAES and the Northern New York Agricultural Development Program (NNYADP). A subset of the farm data was provided by members of the Cornell Cooperative Extension – Delaware County Precision Feed Management Program. If you are interested in joining the whole farm nutrient balance project in 2006, contact Caroline Rasmussen (cnr2@cornell.edu, 607-255-2875, Nutrient Management Spear Program, Department of Crop and Soil Sciences, Cornell University, 707 Bradfield Hall, Ithaca NY 14853).

Calendar of Events

Jan. 3-6, 2006	Northeastern Weed Science Society, Providence, RI
Jan. 18	Western NY Corn Congress, Holiday Inn, Batavia
Jan. 19	Finger Lakes Corn Congress, Holiday Inn, Waterloo
Feb. 6	Pesticide Training, Fire Hall, Delphi Falls
Feb. 7	2006 Corn Conference, Otesaga Hotel, Cooperstown
Feb. 8	Western NY Soybean Congress, Batavia
Feb.9	Finger Lakes Soybean Congress, Waterloo
Feb. 13-16	Weed Science Society of America, New York, 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 Pam Kline, 234 Emerson Hall, Cornell University, Ithaca, NY 14853.**

Cornell Cooperative Extension

Dept. of Crop and Soil Sciences
234 Emerson Hall
Cornell University
Ithaca, NY 14853

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