Soil Sample Survey Orleans County

Samples analyzed by CNAL (2002-2006)



Summary compiled by

Renuka Rao, Nate Herendeen, Quirine M. Ketterings, and Hettie Krol



Cornell Nutrient Analysis Laboratory http://www.css.cornell.edu/soiltest/newindex.asp & Nutrient Management Spear Program http://nmsp.css.cornell.edu/



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Onions are an important crop on the organic soils in Orleans County that have been developed for farming for nearly 100 years. Guy Smith of Triple G Farms makes use of soil testing to produce high quality onions and minimize fertilizer costs. Soil testing and nutrient management help to minimize loss of nutrients from farmland to the adjacent wetlands. This soil resource needs careful management to keep it productive for the next 100 years.

1. County Introduction

Orleans County is located adjacent to Lake Ontario between Rochester and Niagara Falls in the northwest area of New York. The county lies entirely in the Ontario and Huron



Lake Plains region. The lake plain begins at Lake Ontario, where the elevation is 246 feet above sea level. It extends to the foot of the Niagara escarpment. There elevation the increases erratically to the crest of the escarpment, about 600 feet elevation. The Huron Plain extends from that crest southward into Genesee County. It has a high point of

737 feet near West Barre in the south central part of the county. The county contains over 253,000 acres of land area. Roughly 60% of the area is used for farm production.

The soils in the north are dominated by glacial till that was greatly modified by glacial outwash and/or glacial lake sediments. The soils in the south are derived from high carbonate materials deposited by glacial advance across the Niagara dolomite limestone escarpment. However, glacial outwash materials and/or lacustrine sediments also modified much of this area.

Large areas of wetlands occur in the southern portion of the county, the result of massive outwash during the period of glacial recession from western New York. Large areas of shallow wetlands were drained and have been farmed as organic soils or muckland for many years. Additional large areas of wetlands are protected in the federal Iroquois Wildlife Refuge and the New York State Tonawanda Wildlife Area. These areas are seasonal feeding and resting sites to many migratory waterfowl, especially Canada geese.

The agriculture of Orleans County is diverse. Processing and fresh market vegetable crops comprise the largest segment of the agricultural economy. Crops grown for processing

include peas, snap beans, sweet corn, and dry beans. Cabbage is grown for fresh marketing plus storage. There are several thousand acres of onions grown on the Elba mucklands at the south border of the county. Other fresh vegetables produced include potatoes, cucumbers, squash, pumpkins, and tomatoes.

Tree fruit production is next, with large acreages of apples and smaller acreages of cherries, peaches, and pears. There are several commercial storage and marketing facilities for tree fruits in the county. Small fruits such as strawberries and raspberries are grown for fresh markets.

Dairy farming and associated feed crops use large acreages in the county. Additionally, large acreages are devoted to grain corn, winter wheat, hay and soybean crops that are sold out of the county. In the last few years, there has been a proliferation of farms producing less common livestock such as llamas and alpacas. Livestock producers market beef, hogs and sheep from Orleans County.

The number of farms that have found niche markets for fresh produce, flowers, maple products and evergreen (Christmas) trees and is increasing. There are a few farms with recreational horse boarding and training facilities in the county.

A recent addition to the agricultural economy in Orleans County is the Western New York Energy Company that started production in December, 2007. The facility processes over 20 million bushels of corn a year to produce 50 million gallons of ethanol for fuel blenders plus 88,000 tons of distillers dried feeds for the dairy and livestock industry. They started purchasing local grain corn in November 2007. They will also capture and market carbon dioxide starting in 2008.

All the above industries rely heavily on soil testing to maintain optimum production while protecting the agricultural environment from nutrient runoff.

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2. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Orleans County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 607. Of these, 587 samples (97%) were submitted by commercial growers while 20 samples (3%) were submitted by homeowners.



Homeo	owners	Comm	Total	
2002 2003 2004 2005 2006	5 4 3 3 5	2002 2003 2004 2005 2006	64 135 78 110 200	69 139 81 113 205
Total	20	Total	587	607

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for home garden vegetable production (60%), flowering annuals, ornamentals and lawns (5% each). Commercial growers submitted samples primarily to grow apples (39%), corn silage or grain (10%0, alfalfa or alfalfa/grass mixes (9%), soybeans (7%) and peas (5%).

Soils tested for home and garden in Orleans County were classified as belonging to soil management group 5 (25%), group 4 (40%), group 3 (15%), or group 2 (20%). A description of the different management groups is given below.

Soil Management Groups for New York

1	Fine-textured soils developed from clayey lake sediments and medium- to fine-textured soils developed from lake sediments.
2	Medium- to fine-textured soils developed from calcareous glacial till and medium-textured to moderately fine-textured soils developed from slightly calcareous glacial till mixed with shale and medium-textured soils developed in recent alluvium.
3	Moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till.
4	Coarse- to medium-textured soils formed from glacial till or glacial outwash.
5	Coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas.
6	Organic or muck soils with more than 80% organic matter.

Of the samples submitted by commercial growers, groups 1, 5 and 6 were represented by 1% of all samples. Fifty percent belonged to group 2 while groups 3 and 4 were represented by 17 and 29% of the samples, respectively. Hilton was the most common soil series (29% of all samples), followed by Galen (15%), Appleton (10%), Collamer (9%) and Bombay (7%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to almost 60% (muck soil). For homeowner samples, 40% had 2 to 3% organic matter, 35% had 3 to 4% organic matter and 15% tested 4% or greater in organic matter. Of the

samples submitted by commercial growers, 50% contained between 2 and 3 organic matter while 27% tested 3% or greater in organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from pH 4.8 to 7.3 for home and garden samples. Thirty-five percent of the samples tested between pH 6.0 and 7.0. 25% had a pH 7.0 or higher while the remainder was pH 6.0 or lower. For the commercial samples, the highest pH was 7.7 and 62% tested between 6.0 and 7.0 while 27% had a pH of 7.0 or higher.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan method (Morgan, 1941). This solution contains sodium acetate buffered at pH of 4.8.

Soil test P levels of <1 lb P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and anything higher is classified as very high. For homeowners, 15% of the soils tested low for P, 25% tested medium, 35% tested high and 25% tested very high. This meant that 60% tested high or very high in P. For commercial growers, 11% tested very high. In total 14% were low or very low in P, 22% tested medium for P while 53% of the submitted samples were classified as high in soil test P. This means that 64% tested high or very high in P.

Classifications for K depend on soil management group. The fine textured soils (soil management group 1) have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Classification for each of the management groups in the above table represent very low, low, medium, high and very high. So for example for soil management group 5 and 6, <60 lbs K/acre means the soil is very low in K, between 60 and 114 lbs K/acre is medium, 115-164 lbs K/acre is medium, 165-269 lbs K/acre is high and >269 lbs K/acre is classified as very high (see Table on page 6).

Potassium classifications for Orleans County soils varied from very low (5% of the homeowner soils and 1% of the commercial growers' soils) to very high (25% of the homeowner soils and 60% of the commercial growers' soils). For homeowners, 20% tested low in K, 10% tested medium, and 40% tested high for potassium. For commercial growers' soils, 6% tested low, 9% tested medium and 23% tested high in K.

Soil Management Group	Potassium Soil Test Value (Morgan extraction in lbs K/acre)								
	Very low	Low	Medium	High	Very High				
1 2 3 4 5 and 6	<35 <40 <45 <55 <60	35-64 40-69 45-79 55-99 60-114	65-94 70-99 80-119 100-149 115-164	95-149 100-164 120-199 150-239 165-269	>149 >164 >199 >239 >269				

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Soils test very low for Mg if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for Mg. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 23 to almost 3000 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (90% of the homeowner soils and 99% of the soils of the commercial growers).

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Iron levels ranged from 90-99% in the normal range with 10% of the homeowner soils and 1% of the commercial grower soils testing excessive for Fe. Similarly, most soils (95-99%) tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb Zn per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the homeowner soils, 85% tested high for Zn while 15% tested medium. Of the commercial growers' samples, 4% tested low, 17% tested medium while 79% were high in Zn.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 3.

3. Cropping Systems

3.1 Homeowner Samples

	2002-2006	%
FLA	1	5
LAW	1	5
MVG	12	60
OTH	5	25
SAG	1	5
Total	20	100

Crops for which recommendations are requested by homeowners:

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE	0	1	4	0	2	7	1
AGE/AGT	2	1	12	8	9	32	5
ALE/ALT	2	0	3	6	9	20	3
ALG	0	0	1	0	0	1	0
APP	0	75	30	47	79	231	39
BCT	0	0	0	0	1	1	0
BET	2	0	0	0	0	2	0
BLB	1	1	0	0	0	2	0
BNS	7	5	0	0	9	21	4
CAR	1	2	0	0	1	4	1
CGE/CGT	1	1	0	9	6	17	3
CHC	0	0	0	0	2	2	0
CHT	0	4	0	0	0	4	1
CLE	0	1	1	0	1	3	1
COG/COS	11	8	6	10	23	58	10
GIE	0	1	0	0	0	1	0
GPA	2	0	0	0	0	2	0
GRE/GRT	2	0	0	5	2	9	2
IDL	0	0	0	0	1	1	0
OAT	0	1	4	2	0	7	1
ONP	0	0	1	0	1	2	0
ONS	2	4	0	0	0	6	1
PAR	0	1	0	0	0	1	0
РСН	2	5	1	1	1	10	2
PEA	11	0	0	0	18	29	5
PGE/PGT	0	0	0	4	1	5	1
PIE	2	0	0	0	0	2	0
PLE/PLT	0	0	0	1	1	2	0
POT	3	6	0	0	6	15	3
PSN	0	0	0	0	1	1	0
RAD	0	0	0	0	1	1	0
RYS	0	0	0	1	0	1	0
SOY	5	9	10	4	11	39	7
SQS	0	0	0	0	1	1	0
STS	0	1	1	0	0	2	0
WHT	5	1	0	0	3	9	2
Unknown	3	7	4	12	10	36	7
Total	64	135	78	110	200	587	100

Crops for which recommendations are requested in commercial samples:

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

	2002-2006	%
SMG 1 (clayey)	0	0
SMG 2 (silty)	4	20
SMG 3 (silt loam)	3	15
SMG 4 (sandy loam)	8	40
SMG 5 (sandy)	5	25
SMG 6 (mucky)	0	0
Total	20	100

Soil types (soil management groups) for homeowner samples:

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alton	5	0	1	0	0	2	3	1
Appleton	2	9	9	9	11	23	61	10
Arkport	4	2	5	2	1	10	20	3
Benson	4	4	0	0	0	0	4	1
Bombay	4	2	16	6	9	8	41	7
Brockport	1	0	0	0	0	1	1	0
Canandaigua	3	1	0	0	0	2	3	1
Cazenovia	2	1	1	7	3	2	14	2
Cheektowaga	5	0	0	0	1	0	1	0
Churchville	2	0	0	1	0	4	5	1
Claverack	4	1	1	0	0	0	2	0
Collamer	3	1	20	0	9	22	52	9
Colonie	5	0	0	0	0	1	1	0
Elnora	5	0	0	0	0	1	1	0
Galen	4	10	29	1	10	38	88	15
Hilton	2	15	33	40	38	45	171	29
Honeoye	2	1	0	0	0	0	1	0
Howard	3	0	0	0	0	1	1	0
Kendaia	2	0	0	0	1	0	1	0
Lairdsville	2	0	0	1	0	1	2	0
Lakemont	1	1	0	0	3	1	5	1
Lima	2	1	0	0	0	0	1	0
Madrid	4	0	0	2	3	0	5	1
Minoa	4	0	2	0	0	2	4	1
Muck	6	0	6	0	0	0	6	1
Newstead	4	0	0	0	1	0	1	0
Niagara	3	5	5	3	3	13	29	5
Odessa	2	0	1	1	3	1	6	1
Ontario	2	5	4	3	3	7	22	4
Ovid	2	1	0	2	0	1	4	1
Palmyra	3	3	0	0	0	0	3	1
Phelps	3	0	0	0	2	5	7	1
Rhinebeck	2	0	0	0	2	5	7	1
Schoharie	1	0	0	0	0	2	2	0
Wampsville	3	1	0	0	0	2	3	1
Wassaic	4	0	0	0	7	0	7	1
Unknown	-	0	2	0	0	0	2	0
Total	-	64	135	78	110	200	587	100

5. Organic Matter

5.1 Homeowner Samples

Organic matter (loss-on-ignition method) in homeowner samples (number):

	<1	1.0- 1.9	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	>6.9	Total
Number	0	2	8	7	1	0	1	1	20
Percentage	0	10	40	35	5	0	5	5	100

	2002-2006
Lowest:	1.3
Highest:	8.7
Mean:	3.3
Median:	3.0

5.2 Commercial Samples

	<1	1.0- 1.9	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	>6.9	Total
2002	0	17	30	15	1	1	0	0	64
2003	0	40	63	22	3	1	0	6	135
2004	0	11	45	19	3	0	0	0	78
2005	0	13	61	21	9	3	2	1	110
2006	2	52	95	46	4	1	0	0	200
Total	2	133	294	123	20	6	2	7	587

Organic matter (loss-on-ignition method) in commercial samples (number):

	2002	2003	2004	2005	2006
Lowest:	1.0	1.0	1.5	1.2	0.9
Highest:	5.9	56.8	4.8	7.2	5.0
Mean:	2.5	4.7	2.6	2.9	2.5
Median:	2.3	2.3	2.6	2.6	2.4

Organic matter in commercial samples (% of total number of samples):

	<1	1.0- 1.9	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	>6.9	Total
2002	0	27	47	23	2	2	0	0	100
2003	0	30	47	16	2	1	0	4	100
2004	0	14	58	24	4	0	0	0	100
2005	0	12	55	19	8	3	2	1	100
2006	1	26	48	23	2	1	0	0	100
Total	0	23	50	21	3	1	0	1	100

6. pH

6.1 Homeowner Samples

	<4.5	4.5- 4.9	5.0- 5.4	5.5- 5.9	6.0- 6.4	6.5- 6.9	7.0- 7.4	7.5- 7.9	8.0- 8.4	>8.4	Total
Number	0	2	3	3	4	3	5	0	0	0	20
Percentage	0	10	15	15	20	15	25	0	0	0	100

pH of homeowner samples (numbers):

	2002-2006
Lowest:	4.8
Highest:	7.3
Mean:	-
Median:	6.2

6.2 Commercial Samples

	<4.5	4.5- 4.9	5.0- 5.4	5.5- 5.9	6.0- 6.4	6.5- 6.9	7.0- 7.4	7.5- 7.9	8.0- 8.4	>8.4	Total
2002	0	0	1	3	12	17	26	5	0	0	64
2003	0	3	6	8	32	53	32	1	0	0	135
2004	0	1	2	8	26	24	15	2	0	0	78
2005	0	0	2	7	11	54	33	3	0	0	110
2006	1	0	1	23	40	91	42	2	0	0	200
Total	1	4	12	49	121	239	148	13	0	0	587

pH of commercial samples (number):

	2002	2003	2004	2005	2006
Lowest:	5.4	4.8	4.8	5.3	3.9
Highest:	7.7	7.5	7.7	7.6	7.6
Mean:	-	-	-	-	-
Median:	6.9	6.7	6.5	6.8	6.7

pH of commercial samples (% of total number of samples):

	<4.5	4.5- 4.9	5.0- 5.4	5.5- 5.9	6.0- 6.4	6.5- 6.9	7.0- 7.4	7.5- 7.9	8.0- 8.4	>8.4	Total
2002	0	0	2	5	19	27	41	8	0	0	100
2003	0	2	4	6	24	39	24	1	0	0	100
2004	0	1	3	10	33	31	19	3	0	0	100
2005	0	0	2	6	10	49	30	3	0	0	100
2006	1	0	1	12	20	46	21	1	0	0	100
Total	0	1	2	8	21	41	25	2	0	0	100

7. Phosphorus

7.1 Homeowner Samples

	<1	1-3	4-8	9-39	40-60	61-80	81- 100	101- 150	151- 200	>200	Total
	VL	L	Μ	Η	VH	VH	VH	VH	VH	VH	
Number	0	3	5	7	2	0	1	0	0	2	20
Percentage	0	15	25	35	10	0	5	0	0	10	100

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002-2006
Lowest:	1
Highest:	548
Mean:	55
Median:	12

7.2 Commercial Samples

	<1	1-3	4-8	9-39	40-60	61-80	81- 100	101- 150	151- 200	>200	Total
	VL	L	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	11	8	34	3	6	0	1	1	0	64
2003	0	14	35	71	6	2	3	1	0	3	135
2004	0	9	15	46	4	3	1	0	0	0	78
2005	0	29	25	49	4	3	0	0	0	0	110
2006	0	19	49	111	17	1	2	1	0	0	200
Total	0	82	132	311	34	15	6	3	1	3	587

Phosphorus (lbs P/acre Morgan extraction) for commercial samples (number):

VL = very low, L = low, M = medium, H = high, VH = very high.

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	154	286	82	80	110
Mean:	26	24	19	13	19
Median:	17	14	14	9	13

Phosphorus in commercial samples (% of total number of samples):

	<1	1-3	4-8	9-39	40-60	61-80	81- 100	101- 150	151- 200	>200	Total
	VL	L	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	17	13	53	5	9	0	2	2	0	100
2003	0	10	26	53	4	1	2	1	0	2	100
2004	0	12	19	59	5	4	1	0	0	0	100
2005	0	26	23	45	4	3	0	0	0	0	100
2006	0	10	25	56	9	1	1	1	0	0	100
Total	0	14	22	53	6	3	1	1	0	1	100

VL = very low, L = low, M = medium, H = high, VH = very high.

8. Potassium

8.1 Homeowner Samples

Soil Management Group 1										
_	<35	35-64	65-94	95-149	>149	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	0	0	0	0	0	0				
Total (%)	-	_	_	_	-	_				
		Soil M	anagement G	Froup 2						
	<40	40-69	70-99	100-164	>164	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	0	0	0	4	0	4				
Total (%)	0	0	0	100	0	100				
Soil Management Group 3										
	<45	45-79	80-119	120-199	>199	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	0	1	0	1	1	3				
Total (%)	0	33	0	33	33	100				
		Soil M	anagement G	broup 4						
	<55	55-99	100-149	150-239	>239	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	1	1	1	2	3	8				
Total (%)	13	13	13	25	38	100				
		Soil M	anagement G	Froup 5						
	<60	60-114	115-164	165-269	>269	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	0	2	1	1	1	5				
Total (%)	0	40	20	20	20	100				
		Soil M	anagement G	Froup 6						
	<60	60-114	115-164	165-269	>269	Total				
	Very Low	Low	Medium	High	Very High					
Total (#)	0	0	0	0	0	0				
Total (%)	-	_	_	_	-	_				

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

	Very Low	Low	Medium	High	Very High	Total
Number	1	4	2	8	5	20
Percentage	5	20	10	40	25	100

Potassium classific	ation summary	for homeowners:
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	2002-2006
Lowest:	50
Highest:	1252
Mean:	239
Median:	142

8.2 Commercial Samples

Soil Management Group 1							
	<35	35-64	65-94	95-149	>149	Total	
	Very Low	Low	Medium	High	Very High		
2002	0	0	0	0	1	1	
2003	0	0	0	0	0	0	
2004	0	0	0	0	0	0	
2005	0	0	1	2	0	3	
2006	0	0	0	3	1	4	
Total (#)	0	0	1	5	2	8	
Total (%)	0	0	13	63	25	100	
Soil Management Group 2							
	<40	40-69	70-99	100-164	>164	Total	
	Very Low	Low	Medium	High	Very High		
2002	1	4	4	10	14	33	
2003	1	2	6	8	31	48	
2004	0	7	11	11	35	64	
2005	0	3	6	18	34	61	
2006	0	1	2	21	65	89	
Total (#)	2	17	29	68	179	295	
Total (%)	1	6	10	23	61	100	
Soil Management Group 3							
	<45	45-79	80-119	120-199	>199	Total	
	Very Low	Low	Medium	High	Very High		
2002	0	0	2	4	5	11	
2003	0	1	1	5	18	25	
2004	0	1	0	2	0	3	
2005	0	1	0	3	10	14	
2006	0	2	6	13	24	45	
Total (#)	0	5	9	27	57	98	
Total (%)	0	5	9	28	58	100	

Potassium (lbs K/acre Morgan extraction) in commercial samples (number):

Soil Management Group 4							
	<55	55-99	100-149	150-239	>239	Total	
	Very Low	Low	Medium	High	Very High		
2002	1	2	2	3	11	19	
2003	3	1	4	6	39	53	
2004	0	2	1	5	3	11	
2005	0	4	6	6	15	31	
2006	0	3	3	13	39	58	
Total (#)	4	12	16	33	107	172	
Total (%)	2	7	9	19	62	100	
Soil Management Group 5							
	<60	60-114	115-164	165-269	>269	Total	
	Very Low	Low	Medium	High	Very High		
2002	0	0	0	0	0	0	
2003	0	0	0	1	0	1	
2004	0	0	0	0	0	0	
2005	0	1	0	0	0	1	
2006	0	0	0	2	2	4	
Total (#)	0	1	0	3	2	6	
Total (%)	0	17	0	50	33	100	
Soil Management Group 6							
	<60	60-114	115-164	165-269	>269	Total	
	Very Low	Low	Medium	High	Very High		
2002	0	0	0	0	0	0	
2003	0	0	0	0	6	6	
2004	0	0	0	0	0	0	
2005	0	0	0	0	0	0	
2006	0	0	0	0	0	0	
Total (#)	0	0	0	0	6	6	
Total (%)	0	0	0	0	100	100	

Summary (#)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	2	6	8	17	31	0	64
2003	4	4	11	20	94	2	135
2004	0	10	12	18	38	0	78
2005	0	9	13	29	59	0	110
2006	0	6	11	52	131	0	200
Grand Total	6	35	55	136	353	2	587

Summary (%)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	3	9	13	27	48	0	100
2003	3	3	8	15	70	1	100
2004	0	13	15	23	49	0	100
2005	0	8	12	26	54	0	100
2006	0	3	6	26	66	0	100
Grand Total	1	6	9	23	60	0	100

	2002	2003	2004	2005	2006
Lowest:	25	35	53	62	63
Highest:	436	2448	597	1641	1139
Mean:	190	336	204	269	291
Median:	184	311	169	223	259

9. Magnesium

9.1 Homeowner Samples

0		-				
	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Number	0	2	0	4	14	20
Percentage	0	10	0	20	70	100

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	2002-2006
Lowest:	23
Highest:	1165
Mean:	365
Median:	328

9.2 Commercial Samples

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	2	8	54	64
2003	0	0	0	18	117	135
2004	0	0	1	6	71	78
2005	0	0	0	6	104	110
2006	0	3	0	24	173	200
Total	0	3	3	62	519	587

Magnesium (lbs Mg/acre Morgan extraction) in commercial samples (number):

	2002	2003	2004	2005	2006
Lowest:	74	105	94	131	24
Highest:	902	2947	802	1554	1996
Mean:	349	429	378	503	380
Median:	318	339	340	449	374

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	3	13	84	100
2003	0	0	0	13	87	100
2004	0	0	1	8	91	100
2005	0	0	0	5	95	100
2006	0	2	0	12	87	100
Total	0	1	1	11	88	100

10. Iron

10.1 Homeowner Samples

Iron (lbs Fe/acre Morgan extraction) in homeowner samples:

Total number of samples:							
	0-49 >49 Tota						
	Normal Excessive						
Total	18	2	20				

Percentages:		
0-49	>49	Total
Normal	Excessive	
90	10	100

	2002-2006
Lowest:	2
Highest:	128
Mean:	23
Median:	10

10.2 Commercial Samples

Iron (lbs Fe/acre Morgan extraction) in commercial samples:

Total number of samples:			Percentages:			
	0-49	>49	Total	0-49	>49	Total
	Normal	Excessive		Normal	Excessive	
2002	63	1	64	98	2	100
2003	133	2	135	99	1	100
2004	78	0	78	100	0	100
2005	108	2	110	98	2	100
2006	197	3	200	99	2	100
Total	579	8	587	99	1	100

	2002	2003	2004	2005	2006
Lowest:	2	1	1	1	1
Highest:	51	90	46	79	219
Mean:	9	10	11	10	11
Median:	6	7	9	6	6

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11. Manganese

11.1 Homeowner Samples

Manganese (lbs Mn/acre Morgan extraction) in homeowner samples:

Total number of samples:							
	0-99 >99 Total						
	Normal Excessive						
Total	19	1	20				

Percentages:		
0-99	>99	Total
Normal	Excessive	
95	5	100

	2002-2006
Lowest:	11
Highest:	140
Mean:	38
Median:	27

11.2 Commercial Samples

Manganese (lbs Mn/acre Morgan extraction) in commercial samples:

Total number of samples:			Percentages:			
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	64	0	64	100	0	100
2003	133	2	135	99	1	100
2004	78	0	78	100	0	100
2005	110	0	110	100	0	100
2006	199	1	200	100	1	100
Total	584	3	587	99	1	100

	2002	2003	2004	2005	2006
Lowest:	8	2	11	5	3
Highest:	50	140	75	88	122
Mean:	25	22	28	28	23
Median:	25	16	27	26	21

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12. Zinc

12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:				
	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
Total	0	3	17	20

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	15	85	100

	2002-2006
Lowest:	0.5
Highest:	25.4
Mean:	3.8
Median:	2.0

12.2 Commercial Samples

Total number of samples:			Percentag	ges:				
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total
	Low	Medium	High		Low	Medium	High	
2002	0	13	51	64	0	20	80	100
2003	1	19	115	135	1	14	85	100
2004	1	10	67	78	1	13	86	100
2005	1	23	86	110	1	21	78	100
2006	18	35	147	200	9	18	74	100
Total	21	100	466	587	4	17	79	100

Zinc (lbs Zn/acre Morgan extraction) in commercial samples:

	2002	2003	2004	2005	2006
Lowest:	0.6	0.4	0.3	0.1	0.1
Highest:	40.1	1055.1	14.3	68.8	20.8
Mean:	3.2	15.1	2.6	3.6	2.5
Median:	1.8	2.2	1.9	1.8	1.6

Appendix: Cornell Crop Codes

Crop Code	Crop Description
	Alfalfa
ABE	Alfalfa trefoil grass. Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
	Birdsfoot
BCE	Birdsfoot trefoil clover, Establishment
BCT	Birdsfoot trefoil clover, Established
BGE	Birdsfoot trefoil grass, Establishment
BGT	Birdsfoot trefoil grass, Established
BSE	Birdsfoot trefoil seed, Establishment
BST	Birdsfoot trefoil seed, Established
BTE	Birdsfoot trefoil, Establishment
BTT	Birdsfoot trefoil, Established
	Barley
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
	Clover
CGE	Clover grass, Establishment
CGT	Clover grass, Established
CLE	Clover, Establishment
CLT	Clover, Established
CSE	Clover seed production, Establishment
CST	Clover seed production, Established

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses nastures covercrons
CVE	Crownyetch Establishment
CVT	Crownyetch, Established
GIE	Grasses intensively managed. Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats seeded with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
	Others
ALG	Azalea
APP	Apples
ATF	Athletic field

Crop Code	Crop Description
	Beans_dry
	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing