Soil Sample Survey

Washington County

Samples analyzed by CNAL (2002-2006)



Washington County (photo credit: Aaron Gabriel, CCE of Washington County).

Summary compiled by

Renuka Rao, Aaron Gabriel, 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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Washington County (photo credit: Aaron Gabriel, CCE of Washington County).



1. County Introduction

Washington County is located in eastern New York, north of Rensselaer County, south of Essex County, west of Lake Champlain and Vermont, and east of the Hudson River.



Washington County is a rural county with, according to the New York Agricultural Statistics Service, 543,680 of land, of which 201,800 acres were farmland (2006 data).

There were 835 farms in the county, averaging 242 acres per farm. In 2006, according to the

Census of Agriculture, the market value of all agricultural products sold from county farms was \$97.32 million. Leading products sold were dairy products, cattle and calves, vegetables, hay, and grains and dry beans.

Dairy farming is the main agricultural activity. To support 23,300 milk cows (2007 data), hay was harvested on about 46,500 acres and corn was planted on 27,200 acres (2006 data).

However, there is a great diversity of agricultural activity. Several hundred acres are devoted to fresh market vegetable production with apples as the main crop followed by strawberries and other small fruits. There are many small beef operations, totaling about 3,200 head in 2007, that use the abundant pastureland throughout the county. Ornamental horticulture and the horse industry are also active in the county.

Washington County is made up of three physiographic regions: the Adirondack Mountain area in the northwest, the Taconic Upland in the eastern half, and the Hudson-Champlain

Lowland. The soils in the Adirondack Mountain area are shallow and medium-textured, formed by glacial till over bedrock on uplands. The parent material is mostly syenite and granite. Soils in the Taconic Upland were also formed by glacial till on uplands, but they are deeper and have a fragipan. The parent material is mostly shale, slate, and sandstone. The soils in the Hudson-Champlain Lowland were formed from river and lake sediments. They are deep soils that range from medium-textured to fine clays. Several streams and rivers run through Washington County, along which there are productive gravels and alluvial silt loams. The Battenkill River and the Mettawee River are two notable rivers along which lie very productive river bottom soils. There are almost 7,000 acres of muck soils in the county, but they have not been developed for agricultural production.

Aaron Gabriel Field Crops Extension Educator Cornell Cooperative Extension of Washington County



Washington County (photo credit: Aaron Gabriel, CCE of Washington County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Washington County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 768. Of these, 677 samples (88%) were submitted by commercial growers while 91 samples (12%) were submitted by homeowners.



Homeo	owners	Comm	Commercial				
2002	13	2002	286	299			
2003	10	2003	73	83			
2004	17	2004	97	114			
2005	43	2005	114	157			
<u>2006</u>	<u>8</u>	<u>2006</u>	<u>107</u>	<u>115</u>			
Total	91	Total	677	768			

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for home garden vegetable production (23%), athletic fields (15%), perennials and greens (11% each), and lawns (10%). Commercial growers submitted samples primarily to grow alfalfa or alfalfa/grass mixes (25%), corn silage or grain (30%), and grass hay production (18%).

Soils tested for home and garden in Washington County were classified as belonging to soil management group 2 (23%), group 3 (10%), group 4 (47%), or group 5 (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, the majority (54%) belonged to soil management group 4. Seventeen percent belonged to soil management group 1. Group 2 and 3 were represented with 11% of the samples each. Six percent were group 5 soils. Only one sample belonged to group 6 while the remainder was of unknown origin. Bernardston was the most common soil series (21% of all samples), followed by Hoosic and Nassau (12% each), Vergennes (10%) and Kingsbury and Oakville (6% each).

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to almost 20%. For homeowners, 44% had between 2 and 4% organic matter, 16% tested between 4 and 5% organic matter and 29% had more than 5% organic matter. Of the

samples submitted by commercial growers, 59% contained between 3 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from less than 4.9to 7.7 for home and garden samples while 74% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 7.9 and 91% tested between pH 5.5 and 7.0.

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, 23% of the soils tested low for P, 10% tested medium, 38% tested high and 29% tested very high. This meant that 67% tested high or very high in P. For commercial growers, 13% tested very high. In total 27% were low in P, 24% tested medium for P while 36% of the submitted samples were classified as high in soil test P. This means that 49% 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 5).

Potassium classifications for Washington County soils varied from very low (5% of the homeowner soils and 3% of the commercial growers' soils) to very high (43% of the homeowner soils and 34% of the commercial growers' soils). For homeowners, 14% tested low in K, 15% tested medium, and 22% tested high for potassium. For commercial growers' soils, 11% tested low, 19% tested medium and 32% 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 28 to almost 2000 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (92% of the homeowner soils and 92% 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 98-99% in the normal range with only 1% of the homeowner soils and 2% of the commercial grower soils testing excessive for Fe. Similarly, most soils (98-99%) 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, 81% tested high for Zn while 13% tested low, 25% tested medium while 67% 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

Crops for which recommendations are requested by homeowners:

	2002-2006	%
ATF	14	15
BLU	2	2
CEM	3	3
FAR	2	2
FLA	3	3
GEN	10	11
GRA	2	2
HRB	2	2
LAW	9	10
MVG	21	23
OTH	2	2
PER	10	11
PUM	1	1
RSP	1	1
SAG	2	2
SOD	4	4
TRF	1	1
Unknown	2	2
Total	91	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	1	0	0	2	2	5	1
AGE/AGT	54	27	12	28	34	155	23
ALE/ALT	3	4	0	1	0	8	1
APP	1	1	0	2	0	4	1
ASP	1	0	0	0	0	1	0
BCT	6	0	0	3	0	9	1
BGE	2	1	0	0	1	4	1
BLB	1	0	0	1	1	3	0
BLU	0	1	0	0	0	1	0
BNS	0	0	0	1	0	1	0
BTE	1	0	0	0	0	1	0
CGE/CGT	28	0	0	1	4	33	5
CLE/CLT	2	1	0	0	0	3	0
COG/COS	90	9	41	27	34	201	30
GIE/GIT	0	0	3	3	2	8	1
GPF	0	1	0	0	0	1	0
GRE/GRT	64	18	15	5	10	112	17
LAW	0	0	1	0	0	1	0
MIX	0	0	2	5	3	10	1
MML	0	1	0	1	0	2	0
MVG	0	0	0	0	1	1	0
NUR	2	0	0	0	0	2	0
OAS	1	0	0	0	0	1	0
OAT	0	1	0	1	1	3	0
ONP	0	0	0	3	0	3	0
OTH	1	5	1	1	0	8	1
PAR	0	0	0	1	0	1	0
PEP	0	0	1	0	0	1	0
PGE/PGT	0	0	2	7	0	9	1
PIE/PIT	5	0	7	3	0	15	2
PLE/PLT	7	0	2	0	1	10	1
PNT	7	1	5	0	6	19	3
POP	4	0	1	0	0	5	1
РОТ	0	0	0	3	0	3	0
PUM	0	0	1	1	2	4	1
RSF	0	0	0	1	1	2	0

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
RSS	0	0	1	0	0	1	0
SOY	1	0	0	0	0	1	0
SQS	0	0	0	1	0	1	0
SQW	1	0	0	0	0	1	0
STS	0	0	0	0	1	1	0
SUD	0	0	0	1	0	1	0
SWC	0	0	2	3	0	5	1
ТОМ	0	0	0	1	0	1	0
TRE	0	2	0	0	2	4	1
Unknown	3	0	0	7	1	11	2
Total	286	73	97	114	107	677	100

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Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002-2006	%
SMG 1 (clayey)	0	0
SMG 2 (silty)	21	23
SMG 3 (silt loam)	9	10
SMG 4 (sandy loam)	43	47
SMG 5 (sandy)	18	20
SMG 6 (mucky)	0	0
Total	91	100

4.2 Commercial Samples

Name	SMG	2002	2003	2004	2005	2006	Total	%
Amenia	4	1	0	0	0	0	1	0
Belgrade	3	3	0	1	6	0	10	1
Bernardston	4	49	19	17	29	30	144	21
Carlisle	6	0	0	0	0	1	1	0
Charlton	4	3	0	0	0	0	3	0
Claverack	4	2	0	0	0	0	2	0
Cosad	4	0	0	0	0	1	1	0
Covington	1	3	0	0	0	1	4	1
Farmington	3	10	0	1	0	5	16	2
Fredon	4	0	0	0	3	0	3	0
Hamlin	2	2	1	1	3	6	13	2
Hartland	4	0	1	1	0	1	3	0
Herkimer	3	1	0	3	1	0	5	1
Hoosic	4	36	11	16	11	8	82	12
Hudson	2	16	0	3	2	3	24	4
Kingsbury	1	23	3	5	6	3	40	6
Limerick	3	3	3	5	1	6	18	3
Madalin	1	1	0	0	0	0	1	0
Middlebury	3	1	0	0	1	0	2	0
Nassau	4	20	21	14	14	10	79	12
Oakville	5	12	3	7	6	10	38	6
Otisville	4	6	4	1	5	8	24	4
Palatine	2	0	0	0	5	1	6	1
Pittsfield	4	8	0	0	0	0	8	1
Pittstown	4	7	0	1	0	0	8	1
Pootatuck	4	0	0	0	1	0	1	0
Rhinebeck	2	17	0	0	0	1	18	3
Scriba	4	0	1	0	5	0	6	1
Stissing	4	0	0	0	1	0	1	0
Sun	4	2	0	0	0	0	2	0
Teel	2	7	1	1	3	1	13	2
Venango	3	0	1	0	0	0	1	0
Vergennes	1	39	3	19	1	8	70	10
Wallington	3	9	1	1	10	2	23	3
Unknown	-	5	0	0	0	1	6	1
Total	-	286	73	97	114	107	677	100

Soil series for commercial samples:

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	1	9	24	16	15	8	8	10	91
Percentage	1	10	26	18	16	9	9	11	100

	2002-2006
Lowest:	0.6
Highest:	18.5
Mean:	4.3
Median:	4.2

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	13	39	90	94	31	10	9	286
2003	1	5	13	21	18	10	3	2	73
2004	0	4	20	30	22	10	4	7	97
2005	0	8	24	41	25	6	5	5	114
2006	2	9	12	34	24	16	8	2	107
Total	3	39	108	216	183	73	30	25	677

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

	2002	2003	2004	2005	2006
Lowest:	1.3	0.6	1.3	1.2	0.9
Highest:	13.0	7.5	11.5	9.2	9.2
Mean:	4.1	3.9	4.1	3.7	3.9
Median:	4.0	3.9	3.7	3.5	3.9

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	5	14	31	33	11	3	3	100
2003	1	7	18	29	25	14	4	3	100
2004	0	4	21	31	23	10	4	7	100
2005	0	7	21	36	22	5	4	4	100
2006	2	8	11	32	22	15	7	2	100
Total	0	6	16	32	27	11	4	4	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	1	7	10	20	16	31	6	0	0	91
Percentage	0	1	8	11	22	18	34	7	0	0	100

pH of homeowner samples (numbers):

	2002-2006
Lowest:	4.9
Highest:	7.7
Mean:	-
Median:	6.9

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	7	26	74	81	56	40	2	0	0	286
2003	0	0	3	15	22	30	1	2	0	0	73
2004	0	1	6	21	14	43	11	1	0	0	97
2005	0	0	6	21	36	39	10	2	0	0	114
2006	0	1	6	22	35	32	10	1	0	0	107
Total	0	9	47	153	188	200	72	8	0	0	677

pH of commercial samples (number):

	2002	2003	2004	2005	2006
Lowest:	4.6	5.0	4.6	5.0	4.9
Highest:	7.9	7.9	7.5	7.8	7.6
Mean:	-	-	-	-	-
Median:	6.2	6.4	6.5	6.4	6.2

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	2	9	26	28	20	14	1	0	0	100
2003	0	0	4	21	30	41	1	3	0	0	100
2004	0	1	6	22	14	44	11	1	0	0	100
2005	0	0	5	18	32	34	9	2	0	0	100
2006	0	1	6	21	33	30	9	1	0	0	100
Total	0	1	7	23	28	30	11	1	0	0	100

7. Phosphorus

7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):												
	<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	21	9	35	4	3	2	2	2	13
percentage	0	23	10	38	4	3	2	2	2	14

91 100

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

	2002-2006
Lowest:	1
Highest:	565
Mean:	85
Median:	22

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	М	Н	VH	VH	VH	VH	VH	VH	-	
2002	0	109	80	68	8	5	4	3	3	6	0	286
2003	0	9	17	38	3	2	0	2	1	1	0	73
2004	0	24	23	32	5	3	2	5	0	3	0	97
2005	0	26	25	48	7	2	0	5	0	1	0	114
2006	0	16	17	55	8	2	2	4	0	1	2	107
Total	0	184	162	241	31	14	8	19	4	12	2	677

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
1Highest:	376	217	329	218	505
Mean:	19	24	29	22	27
Median:	5	13	9	12	14

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	38	28	24	3	2	1	1	1	2	0	100
2003	0	12	23	52	4	3	0	3	1	1	0	100
2004	0	25	24	33	5	3	2	5	0	3	0	100
2005	0	23	22	42	6	2	0	4	0	1	0	100
2006	0	15	16	51	7	2	2	4	0	1	2	100
Total	0	27	24	36	5	2	1	3	1	2	0	100

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

8. Potassium

8.1 Homeowner Samples

、 		Soil M	Soil Management Group 1									
-	1	5011 101			r							
	<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	broup 2								
	<40	40-69	70-99	100-164	>164	Total						
	Very Low	Low	Medium	High	Very High							
Total (#)	0	4	5	4	8	21						
Total (%)	0	19	24	19	38	100						
		Soil M	anagement G	broup 3								
-	<45	45-79	80-119	120-199	>199	Total						
	Very Low	Low	Medium	High	Very High							
Total (#)	0	0	1	2	6	9						
Total (%)	0	0	11	22	67	100						
	Soil Management Group 4											
-	<55	55-99	100-149	150-239	>239	Total						
	Very Low	Low	Medium	High	Very High							
Total (#)	2	2	5	13	21	43						
Total (%)	5	5	12	30	49	100						
		Soil M	anagement G	broup 5								
	<60	60-114	115-164	165-269	>269	Total						
	Very Low	Low	Medium	High	Very High							
Total (#)	3	7	3	1	4	18						
Total (%)	17	39	17	6	22	100						
		Soil M	anagement G	roup 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):

Summary	Very Low	Low	Medium	High	Very High	Total
Number	5	13	14	20	39	91
Percentage	5	14	15	22	43	100

Potassium classification summary for homeowners:

	2002-2006
Lowest:	21
Highest:	1666
Mean:	271
Median:	196

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	4	9	28	25	66		
2003	0	0	3	2	1	6		
2004	0	0	4	6	14	24		
2005	0	0	0	0	7	7		
2006	0	1	1	1	9	12		
Total (#)	0	5	17	37	56	115		
Total (%)	0	4	15	32	49	100		
	Soil Management Group 2							
	<40	40-69	70-99	100-164	>164	Total		
	Very Low	Low	Medium	High	Very High			
2002	0	6	7	14	15	42		
2003	0	0	1	0	1	2		
2004	0	0	0	1	4	5		
2005	0	0	0	6	7	13		
2006	0	0	0	7	5	12		
Total (#)	0	6	8	28	32	74		
Total (%)	0	8	11	38	43	100		
		Soil I	Management	Group 3				
	<45	45-79	80-119	120-199	>199	Total		
	Very Low	Low	Medium	High	Very High			
2002	0	3	4	5	15	27		
2003	2	0	2	1	0	5		
2004	0	0	4	2	5	11		
2005	0	0	3	5	11	19		
2006	0	1	3	4	5	13		
Total (#)	2	4	16	17	36	75		
Total (%)	3	5	21	23	48	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	6	25	29	51	23	134			
2003	5	11	9	22	10	57			
2004	1	3	16	11	19	50			
2005	6	4	12	22	25	69			
2006	0	7	13	15	23	58			
Total (#)	18	50	79	121	100	368			
Total (%)	5	14	21	33	27	100			
Soil Management Group 5									
	<60	60-114	115-164	165-269	>269	Total			
	Very Low	Low	Medium	High	Very High				
2002	1	4	4	3	0	12			
2003	1	0	0	0	2	3			
2004	0	0	3	3	1	7			
2005	0	4	0	2	0	6			
2006	0	1	0	7	2	10			
Total (#)	2	9	7	15	5	38			
Total (%)	5	24	18	39	13	100			
		Soil I	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	0	0			
2004	0	0	0	0	0	0			
2005	0	0	0	0	0	0			
2006	0	1	0	0	0	1			
Total (#)	0	1	0	0	0	1			
Total (%)	0	100	0	0	0	100			

Summary (#)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	7	42	53	101	78	5	286
2003	8	11	15	25	14	0	73
2004	1	3	27	23	43	0	97
2005	6	8	15	35	50	0	114
2006	0	11	17	34	44	1	107
Grand Total	22	75	127	218	229	6	677

Potassium classification summary for commercial samples.

Summary (%)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	2	15	19	35	27	2	100
2003	11	15	21	34	19	0	100
2004	1	3	28	24	44	0	100
2005	5	7	13	31	44	0	100
2006	0	10	16	32	41	1	100
Grand Total	3	11	19	32	34	1	100

	2002	2003	2004	2005	2006
Lowest:	38	40	48	28	55
Highest:	1628	669	1535	777	963
Mean:	186	183	230	223	222
Median:	149	146	183	196	195

9. Magnesium

9.1 Homeowner Samples

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Number	0	4	3	25	59	91
Percentage	0	5	17	37	56	100

	2002-2006
Lowest:	35
Highest:	1329
Mean:	392
Median:	323

9.2 Commercial Samples

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	6	20	70	190	286
2003	0	4	6	15	48	73
2004	0	1	0	17	79	97
2005	0	5	5	25	79	114
2006	0	4	5	18	80	107
Total	0	20	36	145	476	677

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

	2002	2003	2004	2005	2006
Lowest:	33	34	62	28	45
Highest:	1989	1251	1718	1405	1304
Mean:	396	297	472	338	340
Median:	304	269	303	273	309

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	2	7	24	66	100
2003	0	5	8	21	66	100
2004	0	1	0	18	81	100
2005	0	4	4	22	69	100
2006	0	4	5	17	75	100
Total	0	3	5	21	70	100

10. Iron

10.1 Homeowner Samples

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

Total number of samples:							
	0-49	>49	Total				
	Normal	Excessive					
Summary	Summary 90 1 91						

Percentages:		
0-49	>49	Total
Normal	Excessive	
99	1	100

	2002-2006
Lowest:	1
Highest:	62
Mean:	13
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	276	10	186	97	3	100
2003	73	0	73	100	0	100
2004	97	0	97	100	0	100
2005	113	1	114	99	1	100
2006	104	3	107	97	3	100
Total	663	14	677	98	2	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	406	25	49	51	108
Mean:	14	8	8	10	12
Median:	8	5	5	6	6

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			
Summary	89	2	91		

Percentages:		
0-99	>99	Total
Normal	Excessive	
98	2	100

	2002-2006
Lowest:	4
Highest:	198
Mean:	40
Median:	39

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	283	3	286	99	1	100
2003	72	1	73	99	1	100
2004	97	0	97	100	0	100
2005	114	0	114	100	0	100
2006	107	0	107	100	0	100
Total	673	4	677	99	1	100

	2002	2003	2004	2005	2006
Lowest:	8	13	9	11	10
Highest:	139	253	95	91	82
Mean:	32	36	25	31	29
Median:	29	32	21	28	25

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	
Summary	5	12	74	91

	Percentages:					
al		<0.5	0.5-1.0	>1	Total	
		Low	Medium	High		
		5	13	81	100	

	2002-2006
Lowest:	0.2
Highest:	241.6
Mean:	13.0
Median:	3.2

12.2 Commercial Samples

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

Total number of samples:					Percentage	es:		
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total
	Low	Medium	High		Low	Medium	High	
2002	8	67	211	286	3	23	74	100
2003	14	23	36	73	19	32	49	100
2004	11	25	61	97	11	26	63	100
2005	6	33	75	114	5	29	66	100
2006	13	24	70	107	12	22	65	100
Total	52	172	453	677	8	25	67	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.1	0.3	0.1	0.1
Highest:	27.5	46.8	284.9	47.1	71.4
Mean:	2.3	2.3	10.8	2.0	2.7
Median:	1.5	1.0	1.2	1.3	1.3

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 pastures covercrops
CVE	Crownvetch. Establishment
CVT	Crownvetch, 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	
BDR/DND	Beans-dry	
BLU	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	