

Rao, R., S. Beebe, Q.M. Ketterings, and H. Krol (2007). Saratoga Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-53. 29 pages.

Soil Sample Survey

Saratoga County

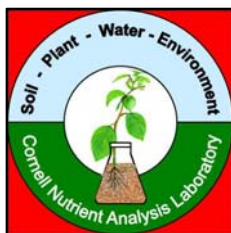
Samples analyzed by CNAL (2002-2006)



Cows at Purinton Farm in Bacon Hill (Photo credit: Susan Beebe, CCE of Saratoga County).

Summary compiled by

Renuka Rao, Susan Beebe, Quirine M. Ketterings, and Hettie Krol



Cornell Nutrient Analysis Laboratory
<http://www.css.cornell.edu/soiltest/newindex.asp>

&
Nutrient Management Spear Program
<http://nmisp.css.cornell.edu/>



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Table of Content

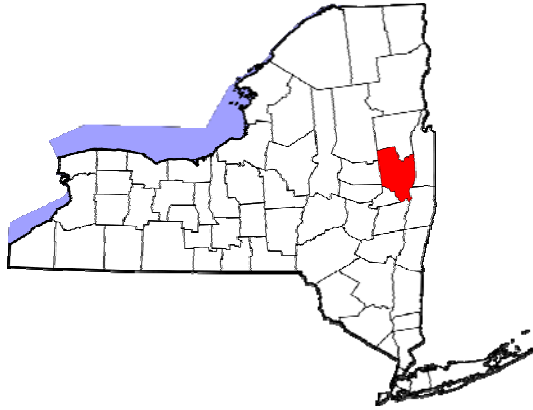
1. County Introduction.....	1
2. General Survey Summary.....	1
3. Cropping Systems.....	7
3.1 Homeowner Samples.....	7
3.2 Commercial Samples.....	8
4. Soil Types.....	9
4.1 Homeowner Samples.....	9
4.2 Commercial Samples.....	9
5. Organic Matter.....	12
5.1 Homeowner Samples.....	12
5.2 Commercial Samples.....	13
6. pH.....	14
6.1 Homeowner Samples.....	14
6.2 Commercial Samples.....	15
7. Phosphorus.....	16
7.1 Homeowner Samples.....	16
7.2 Commercial Samples.....	17
8. Potassium.....	18
8.1 Homeowner Samples.....	18
8.2 Commercial Samples.....	20
9. Magnesium.....	22
9.1 Homeowner Samples.....	22
9.2 Commercial Samples.....	23
10. Iron.....	24
10.1 Homeowner Samples.....	24
10.2 Commercial Samples.....	24
11. Manganese.....	25
11.1 Homeowner Samples.....	25
11.2 Commercial Samples.....	25
12. Zinc.....	26
12.1 Homeowner Samples.....	26
12.2 Commercial Samples.....	26
Appendix: Cornell Crop Codes.....	27



Saratoga Springs Farmers' Market (Photo credit: CCE of Saratoga County).

1. County Introduction

Saratoga County is located in eastern New York approximately 150 miles north of New York City. The county is bounded to the north by Warren County, and separated from



Warren, Washington, and Rensselaer counties to the northeast/east by the Hudson River. Additionally to the southeast it is bounded by the Mohawk River and to the south and west by Schenectady, Montgomery, Fulton and Hamilton counties.

Saratoga County is made up of two physiographic provinces: the Adirondack Highlands to the northwest portion of the county and the remainder lies within the Hudson-Mohawk Lowland province. Elevations range from 20 feet above mean sea level along the Hudson River in Waterford to nearly 2,800 feet above mean seal level at Tenant Mountain in the General Edwards Range at the northwestern corner of the county.

The total area of Saratoga County is 840 square miles or 537,300 acres, with a total population of approximately 215,475. About 14% of the land area of the county, 73,400 acres is in farms; and 5,000 acres designated for national, state, county and town parks. There are 20 towns, 8 villages, and 2 cities. Ballston Spa is the county seat.

Over the past five years the number of farms has decreased slightly with the acreage devoted to farming remaining fairly constant. The county had approximately 47,520 acres devoted to cropland in 2002 devoted to support the dairy and equine industries with the remaining acreage spread among the diversity of agricultural activities ranging from small livestock operations, to fresh market vegetables, tree fruit and small fruit (strawberries, blueberries and raspberries) operations. According to the New York Agricultural Statistics Service (2006 data), there are 560 farms in the county with the market value of all agricultural products sold at \$36.7 million.

Tourism, with its connection to the mineral springs and the thoroughbred and standardbred horseracing of Saratoga Springs, is also a major industry in the county. The southern towns are heavily developed and serve as bedroom communities for cities to the south. This growth is spreading northward with each passing year.

Rao, R., S. Beebe, Q.M. Ketterings, and H. Krol (2007). Saratoga Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-53. 29 pages.

In recognition of the importance of the role of agriculture to the economic and cultural life of the growing population of Saratoga County, the county has adopted a new Green Infrastructure plan to work in conjunction with the Agricultural and Farmland Protection Plan to ensure that farming, recreational areas, and clean drinking water will be protected and preserved for future generations to enjoy.

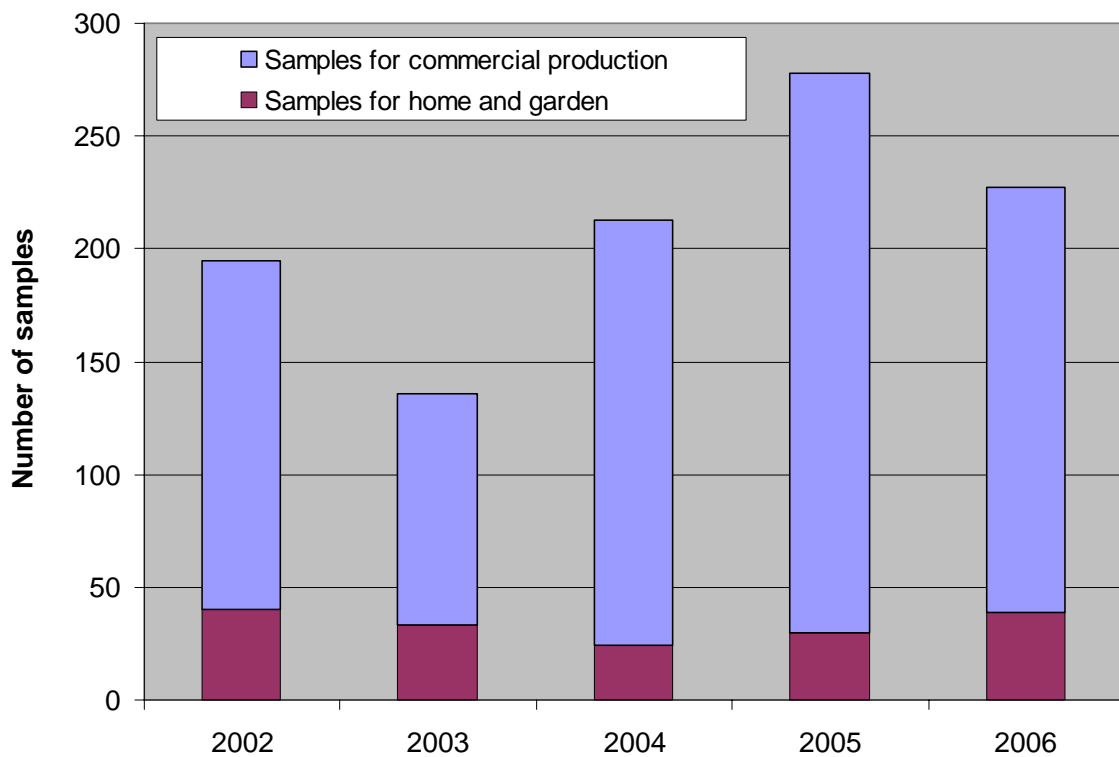
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Ice Storm 2007 - Saratoga Spa State Park
(Photo credit: Susan Beebe, CCE of Saratoga County)

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Saratoga County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1049. Of these, 883 samples (84%) were submitted by commercial growers while 166 samples (16%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	40	2002	155	195
2003	33	2003	103	136
2004	24	2004	189	213
2005	30	2005	248	278
<u>2006</u>	<u>39</u>	<u>2006</u>	<u>188</u>	<u>227</u>
Total	166	Total	883	1049

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (33%) or for home garden vegetable production (22%). Commercial growers submitted samples primarily to grow corn silage or grain (34%), alfalfa or alfalfa/grass mixes (30%), and grass hay production (11%).

Soils tested for home and garden in Saratoga County were classified as belonging to soil management group 2 (11%), group 3 (20%), group 4 (17%), or group 5 (51%). 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, 47% belonged to soil management group 2. Soil management groups 1, 3, 4, and 5 were represented with 2, 10, 20 and 20% of all samples while 1% was of unknown origin. There were no organic soils. Rhinebeck was the most common soil series (23% of all samples), followed by Oakville (12%) and Hudson (19%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to almost 25%. For homeowner samples, 43% had between 2 and 4% organic matter, 34% had less than 2% organic matter, and 23% had more than 4% organic matter. Of the samples submitted by commercial growers, 61% contained between 2 and 4% organic

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matter, 19% had more than 4% organic matter, whereas 21% had less than 2% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.8 to 8.3 for home and garden samples. Fourteen percent tested pH 6 or lower, 34% were between pH 6 and 7 and 51% had a pH of 7 or greater. For the commercial samples, the highest pH was 8.2 and 57% tested between 6 and 7 while 23% had a pH greater than 7.

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, 13% of the soils tested low for P, 18% tested medium, 38% tested high and 31% tested very high. This meant that 69% tested high or very high in P. For commercial growers, 13% tested very high. In total 26% were low in P, 22% tested medium for P while 39% of the submitted samples were classified as high in soil test P. This means that 53% 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 Saratoga County soils varied from very low (11% of the homeowner soils and 5% of the commercial growers' soils) to very high (28% of the homeowner soils and 35% of the commercial growers' soils). For homeowners, 23% tested low in K, 19% tested medium, and 19% tested high for potassium. For commercial growers' soils, 16% tested low, 17% tested medium and 27% 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	<35	35-64	65-94	95-149	>149
2	<40	40-69	70-99	100-164	>164
3	<45	45-79	80-119	120-199	>199
4	<55	55-99	100-149	150-239	>239
5 and 6	<60	60-114	115-164	165-269	>269

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 1 to almost 3500 lbs Mg/acre. There were only two soils that tested very low for Mg within the homeowner samples while five samples for commercial production tested very low in Mg. Most soils tested high or very high for Mg (82% of the homeowner soils and 91% 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 95-98% in the normal range with 5% of the homeowner soils and 2% of the commercial grower soils testing excessive for Fe. Similarly, most soils (97-100%) 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, 77% tested high for Zn while 15% tested medium and 8% were low in Zn. Of the commercial growers' samples, 5% tested low, 25% tested medium while 70% 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	2003	2004	2005	2006	Total	%
ALG	0	0	0	1	0	1	1
ATF	3	0	1	4	5	13	8
BLU	0	1	0	0	2	3	2
CEM	1	0	0	2	0	3	2
FAR	0	0	0	0	1	1	1
FLA	0	6	1	0	0	7	4
HRB	1	0	0	0	0	1	1
IDL	0	0	0	4	0	4	2
LAW	18	11	6	5	14	54	33
MVG	6	9	7	8	6	36	22
OTH	2	0	0	1	5	8	5
PER	2	2	2	4	5	15	9
ROD	1	0	0	0	0	1	1
ROS	1	0	0	0	0	1	1
ROU	0	1	0	0	0	1	1
RSP	0	1	0	0	0	1	1
SAG	5	2	6	1	1	15	9
SOD	0	0	1	0	0	1	1
Total	40	33	24	30	39	166	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABT	0	0	0	0	2	2	0
AGE/AGT	24	27	58	73	48	230	26
ALE/ALT	4	0	11	16	2	33	4
APP	0	0	4	1	1	6	1
BCE	0	1	0	0	0	1	0
BGE	0	0	1	0	1	2	0
BKB	0	0	0	1	0	1	0
BLB	0	0	0	1	0	1	0
BWI	0	1	0	0	0	1	0
CGE/CGT	8	1	6	8	3	26	3
COG/COS	30	53	63	86	69	301	34
CSE	0	0	0	0	1	1	0
GIE/GIT	5	5	2	18	0	30	3
GPA	1	0	0	0	1	2	0
GRE/GRT	26	6	11	23	35	101	11
IDL	2	0	0	0	0	2	0
MIX	2	3	0	3	4	12	1
MML	0	0	1	0	0	1	0
OAS	0	0	3	3	2	8	1
OAT	0	0	2	0	0	2	0
OTH	15	1	5	0	3	24	3
PGE/PGT	15	2	3	5	6	31	4
PIE/PIT	2	1	0	0	0	3	0
PLT	1	0	0	0	0	1	0
PNT	3	0	6	0	3	12	1
POT	1	1	1	0	0	3	0
PUM	4	0	0	0	0	4	0
RSF	0	0	2	0	0	2	0
RYC	0	0	4	0	2	6	1
RYS	0	0	2	0	0	2	0
STE	2	0	1	1	0	4	0
STS	4	0	3	0	0	7	1
TRP	0	1	0	0	2	3	0
TRT	0	0	0	3	0	3	0
WHT	0	0	0	5	0	5	1
Unknown	6	0	0	1	3	10	1
Total	155	103	189	248	188	883	100

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002	2003	2004	2005	2006	Total	%
SMG 1 (clayey)	0	0	0	0	0	0	0
SMG 2 (silty)	4	7	6	0	2	19	11
SMG 3 (silt loam)	10	7	2	11	4	34	20
SMG 4 (sandy loam)	8	1	3	5	12	29	17
SMG 5 (sandy)	18	18	13	14	21	84	51
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	40	33	24	30	39	166	100



Saratoga Monument
as seen from
Saratoga Apple Orchard,
Schuylerville
(Photo credit: Susan Beebe,
CCE of Saratoga County).

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Albia	3	1	0	3	1	0	5	1
Allagash	5	1	0	0	0	0	1	0
Allis	3	1	0	0	0	0	1	0
Berkshire	5	0	0	0	0	2	2	0
Bernardston	4	6	1	2	4	4	17	2
Broadalbin	4	8	5	8	3	4	28	3
Burdett	2	0	0	0	0	2	2	0
Cambridge	3	1	0	0	0	0	1	0
Charlton	4	9	3	4	0	5	21	2
Chenango	3	0	1	2	0	3	6	1
Claverack	4	5	3	2	12	10	32	4
Colonie	5	0	0	0	20	0	20	2
Cosad	4	0	0	0	0	7	7	1
Deerfield	5	0	17	0	3	5	25	3
Elnora	5	0	0	0	5	0	5	1
Galway	4	0	3	0	6	0	9	1
Hinckley	5	0	0	0	0	1	1	0
Hoosic	4	0	0	6	0	3	9	1
Howard	3	0	0	0	0	1	1	0
Hudson	2	32	13	24	68	31	168	19
Ilion	2	0	1	0	0	0	1	0
Joliet	4	0	0	0	5	0	5	1
Langford	3	0	0	0	0	1	1	0
Madalin	1	0	1	0	13	0	14	2
Manlius	3	2	0	2	4	0	8	1
Mardin	3	0	0	0	1	2	3	0
Middlebury	3	1	0	0	0	0	1	0
Mosherville	4	5	6	2	1	0	14	2
Nunda	2	1	0	0	0	0	1	0
Oakville	5	15	0	15	28	49	107	12
Otisville	4	0	0	0	0	2	2	0
Paxton	4	1	0	1	1	0	3	0
Rhinebeck	2	23	2	106	39	31	201	23
Riga	2	6	30	3	2	0	41	5
Scio	3	13	5	1	10	10	39	4

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Sun	4	1	0	0	0	0	1	0
Sutton	4	5	3	0	1	0	9	1
Teel	2	0	0	1	0	0	1	0
Tioga	3	0	0	0	2	2	4	0
Unadilla	3	4	0	1	5	4	14	2
Vergennes	1	0	7	1	0	0	8	1
Wallington	3	0	0	0	2	0	2	0
Wareham	5	4	0	0	0	3	7	1
Wassaic	4	0	1	3	1	0	5	1
Williamson	4	0	0	0	8	0	8	1
Windsor	5	4	1	0	2	4	11	1
Woodbridge	4	2	0	0	1	0	3	0
Unknown	-	4	0	2	0	2	8	1
Total	-	155	103	189	248	188	883	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
2002	4	10	13	8	1	2	0	2	40
2003	1	9	8	8	5	1	0	1	33
2004	5	7	3	3	3	0	2	1	24
2005	4	4	6	8	3	1	1	3	30
2006	5	8	14	0	4	1	2	5	39
Total	19	38	44	27	16	5	5	12	166

	2002	2003	2004	2005	2006
Lowest:	0.1	0.2	0.1	0.2	0.1
Highest:	8.3	7.9	7.6	11.5	20.6
Mean:	2.7	2.8	2.7	3.5	3.9
Median:	2.5	2.7	2.3	3.2	2.3

Organic matter in homeowner 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	10	25	33	20	3	5	0	5	100
2003	3	27	24	24	15	3	0	3	100
2004	21	29	13	13	13	0	8	4	100
2005	13	13	20	27	10	3	3	10	100
2006	13	21	36	0	10	3	5	13	100
Total	11	23	27	16	10	3	3	7	100

5.2 Commercial Samples

Organic matter (loss-on-ignition method) in commercial 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
2002	4	22	56	42	24	3	3	1	155
2003	0	24	39	26	14	0	0	0	103
2004	3	45	54	54	26	5	0	2	189
2005	2	37	105	64	21	14	2	3	248
2006	4	41	64	32	26	12	7	2	188
Total	13	169	318	218	111	34	12	8	883

	2002	2003	2004	2005	2006
Lowest:	0.3	1.1	0.8	0.8	0.6
Highest:	7.9	4.9	23.9	9.1	8.5
Mean:	3.0	2.8	2.9	3.0	3.0
Median:	2.9	2.6	2.7	2.8	2.6

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	3	14	36	27	15	2	2	1	100
2003	0	23	38	25	14	0	0	0	100
2004	2	24	29	29	14	3	0	1	100
2005	1	15	42	26	8	6	1	1	100
2006	2	22	34	17	14	6	4	1	100
Total	1	19	36	25	13	4	1	1	100

6. pH

6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<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	5	9	5	15	4	1	0	0	40
2003	0	1	3	1	6	6	8	8	0	0	0	33
2004	0	0	0	5	2	3	8	5	0	0	1	24
2005	0	0	2	0	7	6	8	7	0	0	0	30
2006	0	1	2	3	10	3	11	7	2	0	0	39
Total	0	2	8	14	34	23	50	31	3	0	1	166

	2002	2003	2004	2005	2006
Lowest:	5.0	4.9	5.5	5.4	4.8
Highest:	8.0	7.9	7.9	7.8	8.3
Mean:	-	-	-	-	-
Median:	6.9	6.8	7.0	7.0	7.0

pH of homeowner of 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	3	13	23	13	38	10	3	0	0	100
2003	0	3	9	3	18	18	24	24	0	0	0	100
2004	0	0	0	21	8	8	33	21	0	0	4	100
2005	0	0	7	0	23	23	27	23	0	0	0	100
2006	0	3	5	8	26	26	28	18	5	0	0	100
Total	0	1	5	8	20	20	30	19	2	0	1	100

6.2 Commercial Samples

pH of commercial samples (number):

	<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	9	27	30	40	31	14	4	0	0	155
2003	0	0	10	16	19	24	28	6	0	0	0	103
2004	0	1	11	19	47	75	32	2	1	0	1	189
2005	0	0	5	24	70	95	53	1	0	0	0	248
2006	1	3	16	34	55	51	25	3	0	0	0	188
Total	1	4	51	120	221	285	169	26	5	0	1	883

	2002	2003	2004	2005	2006
Lowest:	5.0	5.1	4.9	5.1	4.4
Highest:	8.2	7.7	8.0	7.7	7.9
Mean:	-	-	-	-	-
Median:	6.7	6.6	6.6	6.6	6.3

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	6	17	19	26	20	9	3	0	0	100
2003	0	0	10	16	18	23	27	6	0	0	0	100
2004	0	1	6	10	25	40	17	1	1	0	1	100
2005	0	0	2	10	28	38	21	0	0	0	0	100
2006	1	2	9	18	29	27	13	2	0	0	0	100
Total	0	0	6	14	25	32	19	3	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	M	H	VH	VH	VH	VH	VH	VH	
2002	0	14	6	15	1	1	1	0	1	1	40
2003	0	2	7	13	7	1	1	2	0	0	33
2004	0	1	6	12	1	0	0	0	1	3	24
2005	0	1	4	7	4	1	4	3	0	6	30
2006	0	3	7	16	2	2	0	2	3	4	39
Total	0	21	30	63	15	5	6	7	5	14	166

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

	2002	2003	2004	2005	2006
Lowest:	1	2	2	2	2
Highest:	415	112	500	509	608
Mean:	29	32	70	100	76
Median:	8	26	16	50	24

Phosphorus in homeowner 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	M	H	VH	VH	VH	VH	VH	VH	
2002	0	35	15	38	3	3	3	0	3	3	100
2003	0	6	21	39	21	3	3	6	0	0	100
2004	0	4	25	50	4	0	0	0	4	13	100
2005	0	3	13	23	13	3	13	10	0	20	100
2006	0	8	18	41	5	5	0	5	8	10	100
Total	0	13	18	38	9	3	4	4	3	8	100

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

7.2 Commercial Samples

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

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
2002	0	62	32	37	6	3	0	2	0	13	155
2003	0	36	16	19	8	5	5	1	0	13	103
2004	0	31	49	97	6	1	1	1	0	3	189
2005	0	47	53	118	21	7	2	0	0	0	248
2006	0	51	42	77	9	5	2	2	0	0	188
Total	0	227	192	348	50	21	10	6	0	29	883

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	465	503	852	97	145
Mean:	39	62	23	18	16
Median:	4	8	11	12	9

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	M	H	VH	VH	VH	VH	VH	VH	
2002	0	40	21	24	4	2	0	1	0	8	100
2003	0	35	16	18	8	5	5	1	0	13	100
2004	0	16	26	51	3	1	1	1	0	2	100
2005	0	19	21	48	8	3	1	0	0	0	100
2006	0	27	22	41	5	3	1	1	0	0	100
Total	0	26	22	39	6	2	1	1	0	3	100

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

8. Potassium

8.1 Homeowner Samples

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

Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	2	1	4
2003	0	0	0	0	7	7
2004	0	0	2	1	3	6
2005	0	0	0	0	0	0
2006	1	0	0	0	1	2
Total (#)	1	0	3	3	12	19
Total (%)	5	0	16	16	63	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	1	1	2	3	3	10
2003	2	0	1	0	4	7
2004	0	1	0	0	1	2
2005	0	2	1	5	3	11
2006	0	0	0	1	3	4
Total (#)	3	4	4	9	14	34
Total (%)	9	12	12	26	41	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	2	1	4	1	8
2003	0	0	1	0	0	1
2004	0	0	3	0	0	3
2005	0	0	0	2	3	5
2006	0	0	4	4	4	12
Total (#)	0	2	9	10	8	29
Total (%)	0	7	31	34	28	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
2002	4	6	4	2	2	18
2003	4	9	1	4	0	18
2004	3	5	2	1	2	13
2005	1	3	2	3	5	14
2006	2	10	6	0	3	21
Total (#)	14	33	15	10	12	84
Total (%)	17	39	18	12	14	100

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	5	9	8	11	7	40
2003	6	9	3	4	11	33
2004	3	6	7	2	6	24
2005	1	5	3	10	11	30
2006	3	10	10	5	11	39
Grand Total	18	39	31	32	46	166

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	13	23	20	28	18	100
2003	18	27	9	12	33	100
2004	13	25	29	8	25	100
2005	3	17	10	33	37	100
2006	8	26	26	13	28	100
Grand Total	11	23	19	19	28	100

	2002	2003	2004	2005	2006
Lowest:	10	24	46	44	17
Highest:	1135	2097	2256	1831	2983
Mean:	185	253	236	411	360
Median:	121	133	104	184	140

8.2 Commercial Samples

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

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	0	0
2003	0	4	3	0	1	8
2004	0	0	0	0	1	1
2005	0	0	0	2	11	13
2006	0	0	0	0	0	0
Total (#)	0	4	3	2	13	22
Total (%)	0	18	14	9	59	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
2002	0	6	7	18	31	62
2003	2	6	1	13	24	46
2004	2	10	23	47	52	134
2005	0	3	18	40	48	109
2006	0	2	8	32	22	64
Total (#)	4	27	57	150	177	415
Total (%)	1	7	14	36	43	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	2	4	4	13	23
2003	0	1	0	1	4	6
2004	0	1	1	2	5	9
2005	0	4	1	5	15	25
2006	1	2	4	7	9	23
Total (#)	1	10	10	19	46	86
Total (%)	1	12	12	22	53	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	11	14	10	0	7	42
2003	5	13	5	0	2	25
2004	1	8	4	6	9	28
2005	2	9	10	11	11	43
2006	1	8	11	6	9	35
Total (#)	20	52	40	23	38	173
Total (%)	12	30	23	13	22	100

Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	9	6	2	5	2	24
2003	2	4	1	5	6	18
2004	0	4	1	7	3	15
2005	2	12	15	16	13	58
2006	2	20	18	15	9	64
Total (#)	15	46	37	48	33	179
Total (%)	8	26	21	27	18	100

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	20	28	23	27	53	4	155
2003	9	28	10	19	37	0	103
2004	3	23	29	62	70	2	189
2005	4	28	44	74	98	0	248
2006	4	32	41	60	49	2	188
Grand Total	40	139	147	242	307	8	883

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	13	18	15	17	34	3	100
2003	9	27	10	18	36	0	100
2004	2	12	15	33	37	1	100
2005	2	11	18	30	40	0	100
2006	2	17	22	32	26	1	100
Grand Total	5	16	17	27	35	1	100

	2002	2003	2004	2005	2006
Lowest:	21	16	33	40	42
Highest:	3236	710	5637	665	888
Mean:	206	202	218	191	172
Median:	124	128	149	169	142

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	
2002	1	1	6	13	19	40
2003	0	4	1	8	20	33
2004	0	2	5	4	13	24
2005	0	2	1	4	23	30
2006	1	5	1	9	23	39
Total	2	14	14	38	98	166

	2002	2003	2004	2005	2006
Lowest:	10	35	49	52	8
Highest:	793	1072	998	1283	2636
Mean:	262	314	311	429	421
Median:	191	248	208	282	239

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	3	3	15	33	48	100
2003	0	12	3	24	61	100
2004	0	8	21	17	54	100
2005	0	7	3	13	77	100
2006	3	13	3	23	59	100
Total	1	8	8	23	59	100

9.2 Commercial Samples

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	9	9	35	100	155
2003	2	7	9	21	64	103
2004	1	6	6	35	141	189
2005	0	3	5	33	207	248
2006	0	8	13	43	124	188
Total	5	33	42	167	636	883

	2002	2003	2004	2005	2006
Lowest:	10	16	15	36	24
Highest:	942	1247	3484	1787	1843
Mean:	306	272	402	427	347
Median:	272	248	341	360	246

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	1	6	6	23	65	100
2003	2	7	9	20	62	100
2004	1	3	3	19	75	100
2005	0	1	2	13	83	100
2006	0	4	7	23	66	100
Total	1	4	5	19	72	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	
2002	38	2	40
2003	33	0	33
2004	23	1	24
2005	30	0	30
2006	33	6	39
Total	157	9	166

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	95	5	100
	100	0	100
	96	4	100
	100	0	100
	85	15	100
	95	5	100

	2002	2003	2004	2005	2006
Lowest:	1	2	3	2	2
Highest:	165	32	90	48	201
Mean:	16	10	15	14	28
Median:	7	7	10	8	10

10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	153	2	155
2003	101	2	103
2004	185	4	189
2005	244	4	248
2006	181	7	188
Total	864	19	883

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	99	1	100
	98	2	100
	98	2	100
	98	2	100
	96	4	100
	98	2	100

	2002	2003	2004	2005	2006
Lowest:	1	2	2	1	2
Highest:	70	61	155	93	88
Mean:	9	10	12	9	14
Median:	5	7	8	6	9

11. Manganese

11.1 Homeowner Samples

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

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	39	1	40	98	3	100
2003	33	0	33	100	0	100
2004	24	0	24	100	0	100
2005	28	2	30	93	7	100
2006	37	2	39	95	5	100
Total	161	5	166	97	3	100

	2002	2003	2004	2005	2006
Lowest:	2	10	5	13	4
Highest:	201	99	93	125	303
Mean:	24	26	33	42	41
Median:	15	21	24	31	25

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	155	0	155	100	0	100
2003	103	0	103	100	0	100
2004	188	1	189	99	1	100
2005	247	1	248	100	0	100
2006	186	2	188	99	1	100
Total	879	4	883	100	0	100

	2002	2003	2004	2005	2006
Lowest:	3	5	5	5	3
Highest:	78	79	125	125	142
Mean:	20	22	22	28	24
Median:	19	19	20	25	20

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	
2002	3	6	31	40
2003	1	5	27	33
2004	3	3	18	24
2005	1	4	25	30
2006	6	7	26	39
Total	14	25	127	166

Percentages:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
	8	15	78	100
	3	15	82	100
	13	13	75	100
	3	13	83	100
	15	18	67	100
	8	15	77	100

	2002	2003	2004	2005	2006
Lowest:	0.2	0.2	0.3	0.4	0.1
Highest:	84.7	85.3	13.3	435.7	235.6
Mean:	8.3	6.7	3.8	24.6	11.6
Median:	2.2	3.6	2.6	5.6	1.9

12.2 Commercial Samples

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

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	7	39	109	155
2003	9	26	68	103
2004	6	56	127	189
2005	9	64	175	248
2006	14	38	136	188
Total	45	223	615	883

Percentages:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
	5	25	70	100
	9	25	66	100
	3	30	67	100
	4	26	71	100
	7	20	72	100
	5	25	70	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.2	0.2	0.1	0.1
Highest:	29.6	180.9	14.9	29.8	7.0
Mean:	2.6	4.1	1.8	2.1	2.0
Median:	1.5	1.5	1.3	1.5	1.6

Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

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
	Corn
COG	Corn grain
COS	Corn silage

Crop Code	Crop Description
	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
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Greens

Crop Code	Crop Description
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