

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Tompkins Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-41. 34 pages.

Soil Sample Survey

Tompkins County

Samples analyzed by CNAL (2002-2006)



Tompkins County (photo credit: Janice Degni, South Central NY CCE Dairy and Field Crops Program).

Summary compiled by

Renuka Rao, Janice Degni, Quirine M. Ketterings, and Hettie Krol

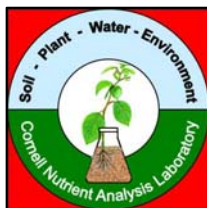
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December 6, 2007

Correct Citation:

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Tompkins County. Samples analyzed by the Cornell Nutrient Analysis Laboratory (2002-2006). CSS Extension Bulletin E07-41. 34 pages.

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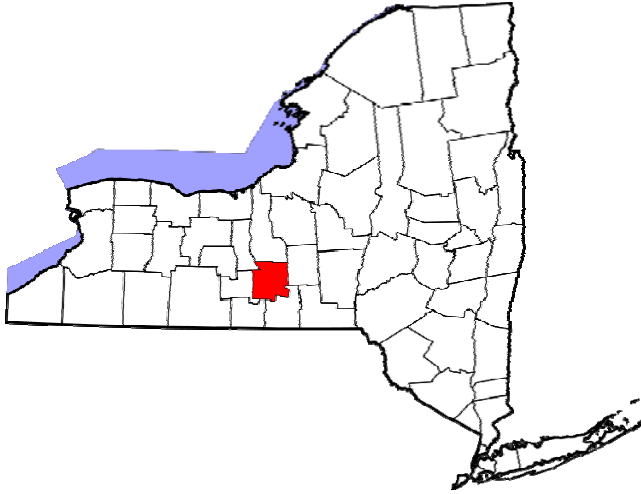
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Tompkins County (photo credit: Janice Degni, South Central NY CCE Dairy and Field Crops Program).

1. County Introduction

Tompkins County is located in the Finger Lakes region of central New York with an area of 314,240 acres or 491 square miles. Ithaca, the county seat, is home to Cornell



University and the College of Agriculture and Life Sciences, New York's land grant institution. The Morrill Act of 1862 funded educational institutions to teach agriculture, military tactics and the mechanical arts, not necessarily to the exclusion of classical studies, but to offer a practical college education to the working class. Cornell University, a world re-known leader in

agricultural research, both basic and applied, sits in a county with beautiful, rural countryside and a vibrant diversified agriculture.

Dairy and field crops production dominate land use and are an important economic contributor among a diversification of agricultural enterprises; small orchards, livestock and market gardens capitalizing on niche markets particularly local foods, value added specialty items and organic. Many of the products are sold locally at the world class Ithaca farmer's market.

According to the 2002 Census of Agriculture there were 563 farms in the county with 100,931 acres of cropland. Dairy farms number around 87 with 9,394 cows, producing 1,692,060 hundredweight of milk with a value of \$24 million dollars. Affiliated with dairy farming are the farm gate receipts for hay and silage as well as cattle and calves. Other agricultural enterprises include 111 beef farms with a total of 1,392 beef cows. The entire cattle/calves inventory was 20,867 head. There were 40 egg and 3 broiler poultry operations. Sheep farms numbered 42 with 2,479 sheep and lambs in inventory.

The soils and climate support a number of crop farms. Corn was grown for grain and silage on 14,893 acres. Land used for all hay and haylage covered 31,359 acres. Small

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grains include 1,749 acres of wheat and 1788 oats, and 292 acres of barley. Grain crops generated receipts of \$1.7 million.

The horticulture enterprises nursery, greenhouse, or floriculture generate \$1.9 million in revenue. Fruits and vegetables generated \$3.7 million while Christmas trees generated \$117,000.

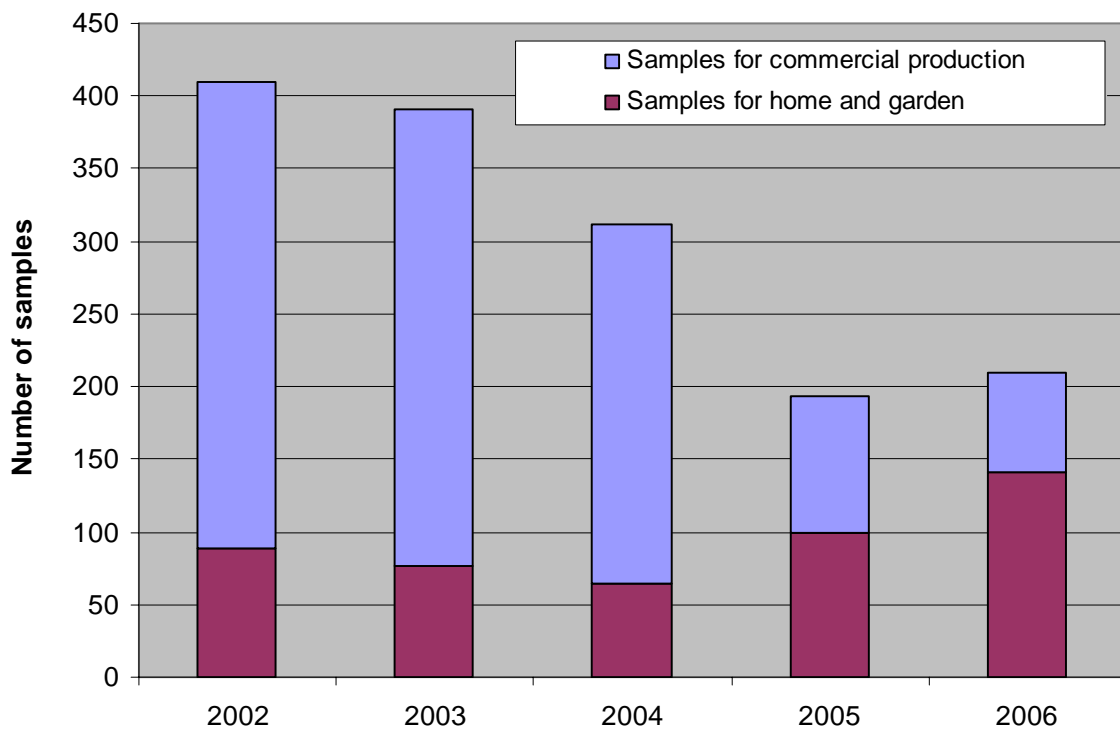
Regular soil tests contribute to optimized crop production while maintaining the quality of the environment through informed management of nutrients and soil fertility.

Janice Degni
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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 Tompkins County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1516. Of these, 1046 samples (69%) were submitted by commercial growers while 470 samples (31%) were submitted by homeowners. The number of commercial grower samples has sharply decreased since 2002.



Homeowners		Commercial		Total
2002	88	2002	322	410
2003	76	2003	315	391
2004	65	2004	246	311
2005	100	2005	94	194
<u>2006</u>	<u>141</u>	<u>2006</u>	<u>69</u>	<u>210</u>
Total	470	Total	1046	1516

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns or for home garden vegetable production. Commercial growers submitted samples primarily to grow alfalfa or alfalfa/grass mixes (9%), corn silage or grain (11%), and grass hay production (9%) while a few growers were planning to grow clover/grass mixes, oats, sweet corn and other crops or fertilizer pastures. A large number of samples (46%) were submitted for fertility data only (no crop identified).

Soils tested for home and garden in Tompkins County were classified as belonging to soil management group 5 (4%), group 4 (46%), group 3 (28%), or group 2 (22%). 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 (62%) belonged to soil management group 2. There were no group 1 samples. Thirty three percent belonged to group 3. Group 4 was represented by 4% of the samples while less than 1% each belonged to groups 5 and 6. Hudson was the most common soil series (50% of all samples mostly driven by a very large number of Hudson soils submitted in 2003; 67% of all samples that year), followed by Bath (36%), Howard (23%), Erie (12%) and Conesus (8%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to almost 60% (organic soil). For homeowners, 51% had between 2 and 5% organic matter, 11% testing between 5 and 6% organic matter while 24% had more than 6.9% organic matter. Of the samples submitted by commercial growers, 80% contained between 2 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.3 to 8.3 for home and garden samples while 48% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 8.3 and 64% tested between 6.0 and 7.4.

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, 16% of the soils tested low for P, 18% tested medium, 26% tested high and 40% tested very high. This meant that 66% tested high or very high in P. For commercial growers, 18% tested very high. In total 15% were low or very low in P, 23% tested medium while 44% were classified as high in soil test P. This means that 62% 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). The soil test interpretations for each of the management groups reflect these differences. 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 Tompkins County soils varied from very low (less than 1% of the homeowner soils and 1% of the commercial growers' soils) to very high (25% of the homeowner soils and 45% of the commercial growers' soils). For homeowners, 5% tested low in K, 9% tested medium, and 25% tested high for potassium. For commercial growers' soils, 8% tested low, 18% 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 20 to more than 10,000 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (98% of the homeowner soils and 97% of the soils of the commercial growers). In total 2% of the homeowner soils and 3% of the commercial growers' soil tested low or medium in Mg.

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 93-97% in the normal range with only 7% of the homeowner soils and 3% of the commercial grower soils testing excessive for Fe. Similarly, most soils (90 and 93% for homeowner and commercial samples, respectively) 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, 91% tested high for Zn while 8% tested medium. Of the commercial growers' samples, 5% tested low, 22% tested medium while 73% was 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 were requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	7	12	1	3	3	26	6
APR	0	2	0	0	1	3	1
ATF	2	1	0	1	9	13	3
BLU	1	1	0	1	2	5	1
CUR	0	0	0	0	1	1	0
FLA	3	2	0	3	1	9	2
GOO	0	1	0	0	0	1	0
GRA	1	1	0	0	1	3	1
HRB	2	1	1	0	1	5	1
LAW	19	12	17	32	34	114	24
MVG	29	22	20	20	36	127	27
OTH	6	4	4	1	7	22	5
PER	3	7	7	9	25	51	11
PRK	1	0	1	0	0	2	0
PTO	2	0	1	0	0	3	1
ROS	0	1	0	16	0	17	4
RSP	0	2	0	0	1	3	1
SAG	9	5	9	8	11	42	9
SPB	1	0	0	0	1	2	0
TRF	2	1	4	3	6	16	3
Unknown	0	1	0	3	1	5	1
Total	88	76	65	100	141	470	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	2	0	0	0	1	3	0
AGE/AGT	93	36	33	5	10	177	17
ALE/ALT	5	0	1	2	1	9	1
APP	0	0	1	1	0	2	0
ASP	1	0	0	0	0	1	0
BDR	0	0	0	3	0	3	0
BGT	1	0	16	0	0	17	2
BLB	2	0	1	0	0	3	0
BND	0	0	0	2	0	2	0
BNS	0	1	1	0	0	2	0
BRP	0	1	0	0	0	1	0
BSS	0	2	0	0	0	2	0
BUK	0	0	1	2	0	3	0
BWI	0	0	1	0	1	2	0
CAR	0	0	0	1	0	1	0
CBP	1	0	0	0	0	1	0
CGE/CGT	1	41	2	0	1	45	4
CKS	0	0	1	0	0	1	0
CLE/CLT	3	0	18	7	0	28	3
COG/COS	106	59	41	13	14	233	22
CST	0	0	0	4	0	4	0
CVT	0	0	0	1	0	1	0
GIT	1	0	1	0	0	2	0
GPA	1	0	0	0	0	1	0
GPV	0	0	0	10	6	16	2
GRE/GRT	19	45	21	2	7	94	9
IDL	2	8	2	0	0	12	1
LET	0	1	0	1	0	2	0
MIX	2	5	0	4	3	14	2
MUS	0	0	0	1	0	1	0
MVG	0	1	0	0	0	1	0
OAS	11	0	5	2	1	19	2
OAT	3	11	1	2	3	20	2
ONP	0	1	0	0	0	1	0
OTH	0	0	7	1	1	9	1
PAR	0	0	0	0	1	1	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
PEP	0	0	1	0	0	1	0
PGE/PGT	5	3	1	0	3	12	1
PIE/PIT	30	37	38	3	0	108	10
PLE/PLT	5	1	2	1	0	9	1
PNT	7	2	0	8	1	18	2
POT	1	2	0	6	0	9	1
PUM	0	2	0	1	0	3	0
RSF	0	0	2	0	0	2	0
RYC	1	3	1	0	3	8	1
RYS	4	0	1	0	0	5	0
SOY	9	19	4	1	2	35	3
SQS	0	0	1	0	0	1	0
STS	1	2	1	0	0	4	0
SWC	0	0	15	2	0	17	2
TME	0	0	3	0	0	3	0
TOM	0	0	1	0	0	1	0
TRE	0	0	2	0	0	2	0
TRP	0	1	3	0	0	4	0
TRT	0	0	1	0	0	1	0
WHS	0	1	2	0	0	3	0
WHT	0	15	2	4	8	29	3
WPT	1	0	0	0	0	1	0
Unknown	4	15	11	4	2	36	3
Total	322	315	246	94	69	1046	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)	21	20	31	16	47	135	29
SMG 3 (silt loam)	32	29	21	56	34	172	37
SMG 4 (sandy loam)	32	24	11	27	47	141	30
SMG 5 (sandy)	3	3	2	1	13	22	5
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	88	76	65	100	141	470	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alluvial lands	3	0	1	0	0	0	1	0
Appleton	2	2	0	0	0	1	3	0
Arkport	4	0	0	3	0	0	3	0
Bath	3	85	56	62	15	8	226	22
Braceville	4	0	3	0	0	0	3	0
Burdett	2	0	2	0	0	0	2	0
Canandaigua	3	0	1	0	0	0	1	0
Chenango	3	9	8	7	0	1	25	2
Chippewa	3	1	0	1	0	0	2	0
Collamer	3	0	0	1	3	0	4	0
Conesus	2	7	35	3	1	4	50	5
Darien	2	0	0	6	2	0	8	1
Erie	3	34	5	20	6	1	66	6
Fredon	4	3	3	0	0	1	7	1
Genesee	2	1	5	0	4	3	13	1
Halsey	4	0	2	0	0	0	2	0
Honeoye	2	0	28	0	0	0	28	3
Howard	3	34	27	48	18	10	137	13
Hudson	2	19	11	15	5	6	56	5
Ilion	2	1	1	0	0	0	2	0
Kendaia	2	0	19	0	0	0	19	2
Langford	3	71	32	35	7	5	150	14
Lansing	2	18	18	3	16	22	77	7
Lima	2	0	7	0	0	0	7	1
Lordstown	3	1	0	3	0	0	4	0
Lyons	2	1	0	0	0	0	1	0
Mardin	3	4	15	14	2	0	35	3
Middlebury	3	1	0	0	0	1	2	0
Odessa	2	0	0	0	0	1	1	0
Ovid	2	1	2	1	0	1	5	0
Palmyra	3	0	2	0	0	0	2	0
Phelps	3	6	19	2	2	0	29	3
Rhinebeck	2	4	4	5	7	1	21	2
Riverhead	4	0	1	0	0	0	1	0
Teel	2	0	1	2	1	2	6	1
Tioga	3	0	1	1	0	0	2	0

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Valois	3	10	2	0	0	0	12	1
Venango	3	3	2	0	0	0	5	0
Volusia	3	1	1	11	4	0	17	2
Wayland	2	0	1	1	1	0	3	0
Williamson	4	1	0	0	0	0	1	0
Unknown	-	4	0	2	0	1	7	1
Total	-	322	315	246	94	69	1046	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	0	6	10	17	12	5	13	25	88
2003	2	3	6	7	12	10	11	25	76
2004	1	2	6	15	8	6	11	16	65
2005	1	5	6	19	17	11	2	39	100
2006	1	10	13	25	30	14	8	40	141
Total	5	26	41	83	79	46	45	145	470

	2002	2003	2004	2005	2006
Lowest:	1.1	0.2	0.4	0.4	0.7
Highest:	52.9	29.5	42.0	59.9	48.4
Mean:	7.2	7.0	7.1	7.8	7.7
Median:	4.9	5.7	5.4	5.1	4.6

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	0	7	11	19	14	6	15	28	100
2003	3	4	8	9	16	13	14	33	100
2004	2	3	9	23	12	9	17	25	100
2005	1	5	6	19	17	11	2	39	100
2006	1	7	9	18	21	10	6	28	100
Total	1	6	9	18	17	10	10	31	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	0	1	17	76	128	73	23	4	322
2003	0	4	55	109	106	27	5	9	315
2004	0	3	21	98	66	21	15	22	246
2005	5	4	23	38	11	8	3	2	94
2006	1	3	13	34	12	5	0	1	69
Total	6	15	129	355	323	134	46	38	1046

	2002	2003	2004	2005	2006
Lowest:	1.4	1.6	1.4	0.2	0.7
Highest:	17.1	21.2	11.0	12.9	8.2
Mean:	4.5	4.0	4.4	3.5	3.4
Median:	4.4	3.8	4.0	3.4	3.4

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	0	5	24	40	23	7	1	100
2003	0	1	17	35	34	9	2	3	100
2004	0	1	9	40	27	9	6	9	100
2005	5	4	24	40	12	9	3	2	100
2006	1	4	19	49	17	7	0	1	100
Total	1	1	12	34	31	13	4	4	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	2	3	9	14	9	18	23	10	0	88
2003	1	1	4	4	8	12	24	22	0	0	76
2004	0	2	1	7	15	11	21	8	0	0	65
2005	1	2	2	11	8	14	45	16	1	0	100
2006	0	0	6	12	15	28	46	34	0	0	141
Total	2	7	16	43	60	74	154	103	11	0	470

	2002	2003	2004	2005	2006
Lowest:	4.6	4.3	4.5	4.2	5.0
Highest:	8.3	7.9	7.8	8.2	7.9
Mean:	-	-	-	-	-
Median:	7.2	7.2	6.7	7.1	7.1

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	2	3	10	16	10	20	26	11	0	100
2003	1	1	5	5	11	16	32	29	0	0	100
2004	0	3	2	11	23	17	32	12	0	0	100
2005	1	2	2	11	8	14	45	16	1	0	100
2006	0	0	4	9	11	20	33	24	0	0	100
Total	0	1	3	9	13	16	33	22	2	0	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	5	31	85	107	72	18	4	0	0	322
2003	0	9	17	48	109	86	35	10	1	0	315
2004	0	2	23	62	76	54	21	8	0	0	246
2005	0	2	5	16	31	23	12	3	2	0	94
2006	0	0	4	10	27	25	3	0	0	0	69
Total	0	18	80	221	350	260	89	25	3	0	1046

	2002	2003	2004	2005	2006
Lowest:	4.6	4.2	4.6	4.6	5.1
Highest:	7.7	8.1	7.8	8.1	7.0
Mean:	-	-	-	-	-
Median:	6.1	6.3	6.2	6.4	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	2	10	26	33	22	6	1	0	0	100
2003	0	3	5	15	35	27	11	3	0	0	100
2004	0	1	9	25	31	22	9	3	0	0	100
2005	0	2	5	17	33	24	13	3	2	0	100
2006	0	0	6	14	39	36	4	0	0	0	100
Total	0	2	8	21	33	25	9	2	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	13	11	25	3	4	6	9	3	14	88
2003	0	11	7	20	6	4	4	7	6	11	76
2004	0	9	13	13	8	1	2	3	5	11	65
2005	0	13	10	26	5	6	1	4	3	32	100
2006	0	10	17	44	10	7	4	4	13	32	141
Total	0	56	58	128	32	22	17	27	30	100	470

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	1318	920	2675	2083	973
Mean:	124	99	142	178	146
Median:	34	40	25	45	38

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	15	13	28	3	5	7	10	3	16	100
2003	0	14	9	26	8	5	5	9	8	14	100
2004	0	14	20	20	12	2	3	5	8	17	100
2005	0	13	10	26	5	6	1	4	3	32	100
2006	0	7	12	31	7	5	3	3	9	23	100
Total	0	12	12	27	7	5	4	6	6	21	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	96	97	108	13	4	2	0	1	1	322
2003	0	69	80	122	16	7	7	5	1	8	315
2004	0	66	72	85	4	4	3	3	5	4	246
2005	0	32	28	30	1	0	1	2	0	0	94
2006	0	11	23	29	4	1	0	1	0	0	69
Total	0	274	300	374	38	16	13	11	7	13	1046

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	572	549	666	123	129
Mean:	14	27	24	12	16
Median:	6	9	7	6	7

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	30	30	34	4	1	1	0	0	0	100
2003	0	22	25	39	5	2	2	2	0	3	100
2004	0	27	29	35	2	2	1	1	2	2	100
2005	0	34	30	32	1	0	1	2	0	0	100
2006	0	16	33	42	6	1	0	1	0	0	100
Total	0	26	29	36	4	2	1	1	1	1	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	1	1	4	15	21
2003	0	0	2	4	14	20
2004	0	0	1	7	23	31
2005	0	1	0	3	12	16
2006	0	0	1	8	38	47
Total (#)	0	2	5	26	102	135
Total (%)	0	1	4	19	76	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	1	3	6	22	32
2003	0	3	3	6	17	29
2004	1	1	2	4	13	21
2005	0	0	9	15	32	56
2006	0	0	2	5	27	34
Total (#)	1	5	19	36	111	172
Total (%)	1	3	11	21	65	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	3	1	2	26	32
2003	0	0	1	1	22	24
2004	0	0	1	3	7	11
2005	0	2	1	6	18	27
2006	0	1	4	9	33	47
Total (#)	0	6	8	21	106	141
Total (%)	0	4	6	15	75	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
2002	0	1	1	0	1	3
2003	1	2	0	0	0	3
2004	0	1	1	0	0	2
2005	0	1	0	0	0	1
2006	0	4	1	3	5	13
Total (#)	1	9	3	3	6	22
Total (%)	5	41	14	14	27	100

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	0	6	6	12	64	88
2003	1	5	6	11	53	76
2004	1	2	5	14	43	65
2005	0	4	10	24	62	100
2006	0	5	8	25	103	141
Grand Total	2	22	35	86	325	470

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	7	7	14	73	100
2003	1	7	8	14	70	100
2004	2	3	8	22	66	100
2005	0	4	10	24	62	100
2006	0	4	6	18	73	100
Grand Total	0	5	7	18	69	100

	2002	2003	2004	2005	2006
Lowest:	49	28	34	55	65
Highest:	4017	23138	3574	54121	3691
Mean:	533	642	374	1044	524
Median:	341	284	232	242	297

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	0	0	0	0	0
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	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	1	3	4	14	32	54
2003	0	10	18	36	70	134
2004	0	0	8	8	20	36
2005	2	2	9	12	12	37
2006	0	2	2	9	28	41
Total (#)	3	17	41	79	162	302
Total (%)	1	6	14	26	54	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	30	52	66	112	260
2003	0	25	24	41	82	172
2004	0	22	50	51	82	205
2005	0	6	12	25	14	57
2006	0	5	3	7	11	26
Total (#)	0	88	141	190	301	720
Total (%)	0	12	20	26	42	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	1	2	4
2003	1	1	1	2	4	9
2004	0	1	1	0	1	3
2005	0	0	0	0	0	0
2006	0	0	0	0	1	1
Total (#)	1	2	3	3	8	17
Total (%)	6	12	18	18	47	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	0	0	0
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	0	0
Total (%)	-	-	-	-	-	-
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	0	0
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	0	0
Total (%)	-	-	-	-	-	-

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	1	33	57	81	146	4	322
2003	1	36	43	79	156	0	315
2004	0	23	59	59	103	2	246
2005	2	8	21	37	26	0	94
2006	0	7	5	16	40	1	69
Grand Total	4	107	185	272	471	7	1046

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	10	18	25	45	1	100
2003	0	11	14	25	50	0	100
2004	0	9	24	24	42	1	100
2005	2	9	22	39	28	0	100
2006	0	10	7	23	58	1	100
Grand Total	0	10	18	26	45	1	100

	2002	2003	2004	2005	2006
Lowest:	38	40	45	30	60
Highest:	1376	4183	1154	1319	756
Mean:	243	266	224	175	218
Median:	171	183	163	137	174

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	0	1	2	5	80	88
2003	0	0	0	3	73	76
2004	0	0	1	4	60	65
2005	0	3	1	6	90	100
2006	0	0	2	14	125	141
Total	0	4	6	32	428	470

	2002	2003	2004	2005	2006
Lowest:	51	151	75	43	82
Highest:	4586	4865	8707	6758	2777
Mean:	648	590	771	711	652
Median:	463	488	467	560	523

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	0	1	2	6	91	100
2003	0	0	0	4	96	100
2004	0	0	2	6	92	100
2005	0	3	1	6	90	100
2006	0	0	1	10	89	100
Total	0	1	1	7	91	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	0	2	9	43	268	322
2003	0	8	4	47	256	315
2004	0	1	4	44	197	246
2005	0	1	4	18	71	94
2006	0	3	4	13	49	69
Total	0	15	25	165	841	1046

	2002	2003	2004	2005	2006
Lowest:	58	20	62	58	39
Highest:	1224	3799	2188	2375	625
Mean:	371	367	384	369	284
Median:	340	324	341	335	279

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	1	3	13	83	100
2003	0	3	1	15	81	100
2004	0	0	2	18	80	100
2005	0	1	4	19	76	100
2006	0	4	6	19	71	100
Total	0	1	2	16	80	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	83	5	89
2003	72	4	76
2004	57	8	65
2005	93	7	100
2006	137	4	141
Total	442	28	470

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	94	6	100
	95	5	100
	88	12	100
	93	7	100
	97	3	100
	94	6	100

	2002	2003	2004	2005	2006
Lowest:	1	1	2	1	1
Highest:	149	361	176	465	172
Mean:	15	20	20	22	15
Median:	7	8	10	12	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	318	4	322
2003	304	11	315
2004	232	14	246
2005	91	3	94
2006	67	2	69
Total	1012	34	1046

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	99	1	100
	97	3	100
	94	6	100
	97	3	100
	97	3	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	2
Highest:	66	156	90	125	58
Mean:	10	13	18	13	11
Median:	7	7	11	8	5

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	82	6	88	93	7	100
2003	69	7	76	91	9	100
2004	52	13	65	80	20	100
2005	87	13	100	87	13	100
2006	121	20	141	86	14	100
Total	411	59	470	87	13	100

	2002	2003	2004	2005	2006
Lowest:	10	12	11	8	6
Highest:	564	200	151	292	286
Mean:	57	61	59	67	58
Median:	42	55	43	57	46

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	321	1	322	100	0	100
2003	308	7	315	98	2	100
2004	245	1	246	100	0	100
2005	92	2	94	98	2	100
2006	69	0	69	100	0	100
Total	1035	11	1046	99	1	100

	2002	2003	2004	2005	2006
Lowest:	8	8	7	12	11
Highest:	140	212	157	170	86
Mean:	28	37	36	32	30
Median:	25	35	33	26	31

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	0	4	84	88
2003	1	5	70	76
2004	1	9	55	65
2005	3	12	85	100
2006	4	11	126	141
Total	9	41	420	470

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	5	95	100
1	7	92	100
2	14	85	100
3	12	85	100
3	8	89	100
2	9	89	100

	2002	2003	2004	2005	2006
Lowest:	0.5	0.3	0.4	0.1	0.1
Highest:	147.9	135.4	63.0	145.7	199.5
Mean:	12.1	13.7	8.5	10.6	14.8
Median:	4.8	4.4	6.0	5.3	4.6

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	67	248	322
2003	6	78	231	315
2004	5	63	178	246
2005	26	37	31	94
2006	11	17	41	69
Total	55	262	729	1046

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	21	77	100
2	25	73	100
2	26	72	100
28	39	33	100
16	25	59	100
5	25	70	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.3	0.1	0.1	0.1
Highest:	442.7	69.0	37.4	4.9	10.0
Mean:	3.5	2.6	2.4	1.0	1.5
Median:	1.6	1.6	1.4	0.8	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

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
BDR/DND	Beans-dry

Crop Code	Crop Description
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