

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Broome Soil Sample Survey 2002-2006. CSS Extension Bulletin E07-38. 30 pages.

Soil Sample Survey

Broome County

Samples analyzed by CNAL in 2002-2006



Broome County (photo credit: Laura Biasillo, Cornell Cooperative Extension of Broome County)

Summary compiled by

Renuka Rao, Janice Degni, 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/>



Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Broome Soil Sample Survey 2002-2006. CSS Extension Bulletin E07-38. 30 pages.

Soil Sample Survey

Broome County

Samples analyzed by CNAL in 2002-2006

Summary compiled by

Renuka Rao

Director

Cornell Nutrient Analysis Laboratory
Department of Crop and Soil Sciences
804 Bradfield Hall, Cornell University
Ithaca NY 14853

Janice Degni

South Central New York Team Coordinator
Dairy and Field Crops Specialist

Cornell Cooperative Extension of Broome, Cortland, Tioga and Tompkins Counties

Quirine M. Ketterings and Hettie Krol

Nutrient Management Spear Program
Department of Crop and Soil Sciences

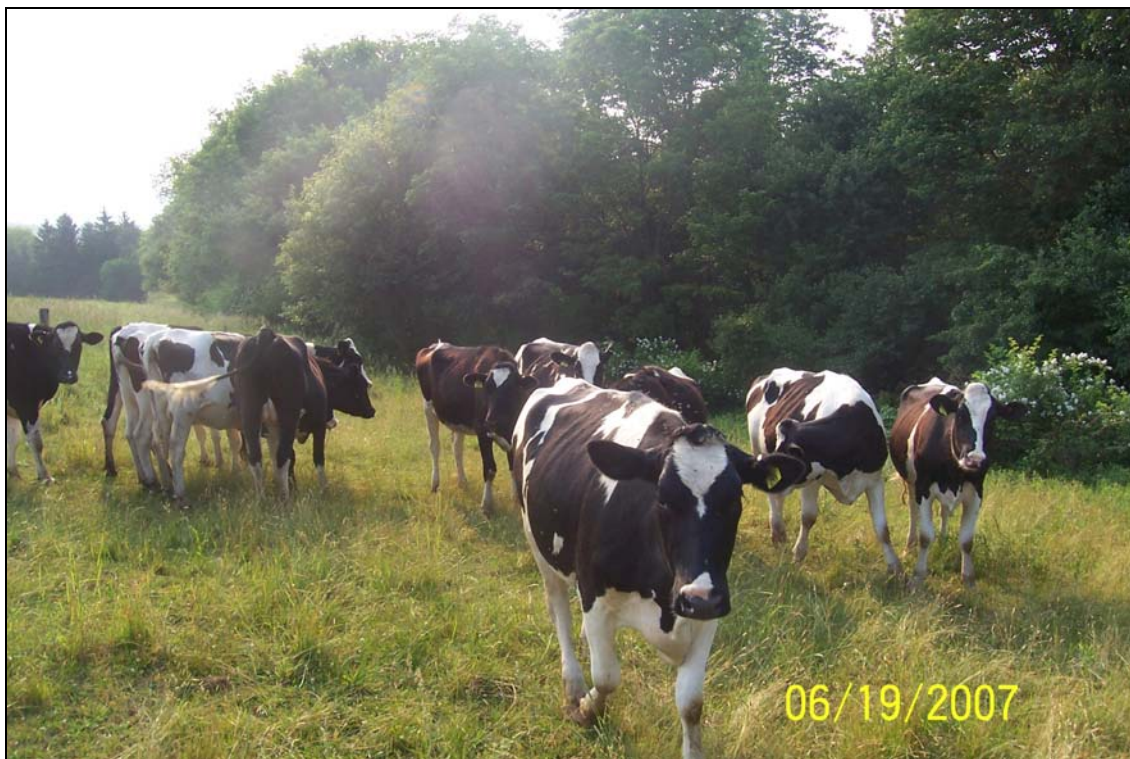
December 6, 2007

Correct Citation:

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Broome County. Samples analyzed by the Cornell Nutrient Analysis Laboratory in 2002-2006. CSS Extension Bulletin E07-38. 30 pages.

Table of Content

1. General Survey Summary	1
2. Cropping Systems	7
2.1 Homeowner Samples	7
2.2 Commercial Samples	8
3. Soil Types	9
3.1 Homeowner Samples	9
3.2 Commercial Samples	9
4. Organic Matter	10
4.1 Homeowner Samples	10
4.2 Commercial Samples	11
5. pH	11
5.1 Homeowner Samples	12
5.2 Commercial Samples	13
6. Phosphorus	14
6.1 Homeowner Samples	14
6.2 Commercial Samples	15
7. Potassium	15
7.1 Homeowner Samples	16
7.2 Commercial Samples	18
8. Magnesium	20
8.1 Homeowner Samples	20
8.2 Commercial Samples	21
9. Iron	22
9.1 Homeowner Samples	22
9.2 Commercial Samples	23
10. Manganese	24
10.1 Homeowner Samples	24
10.2 Commercial Samples	24
11. Zinc	26
11.1 Homeowner Samples	26
11.2 Commercial Samples	27
Appendix: Cornell Crop Codes	28

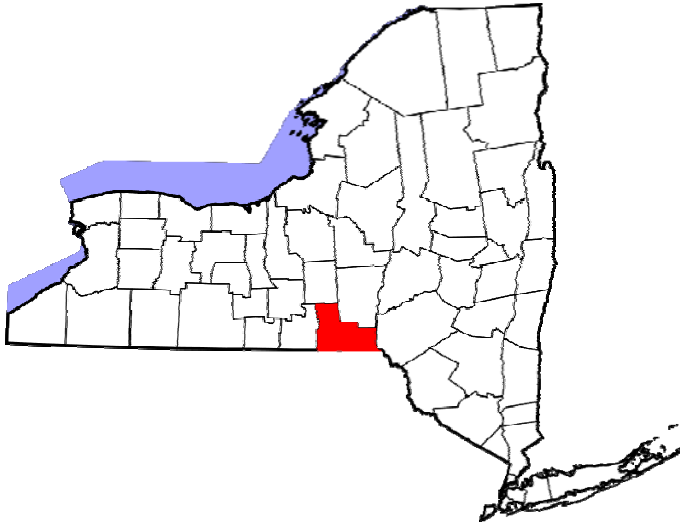


Broome County (photo credit: Laura Biasillo, Cornell Cooperative Extension of Broome County)



1. County Introduction

Broome County is located in south central NY, in the Southern Tier region. The Southern



Tier refers to the counties of New York State that lie west of the Catskill Mountains and along the northern border of Pennsylvania. The county has a total of 454,400 acres; of which 98,200 acres were in farms according to the 2002 Census of Agriculture. The triple cities of Binghamton, Endicott and Johnson City make up an industrial corridor in the county. Agriculture continues to co-exist

with development pressure with a small but stable commercial dairy industry and healthy part-time diversified enterprises. There is strong agency support for agriculture in the county. Diversity in agriculture is supported with a buy local campaign and development of niche marketing opportunities and agritourism.

Typical of the southern tier landscape, farms are located in the valleys and hills of Broome County. There are 6 identified soil associations in Broome County. They range from well-drained gravelly soils to somewhat poorly drained soils on the hills. The soil types offer different management challenges from the valley floors to the rolling hills. Well-drained, highly productive gravel soils are generally located along valleys floors but can be droughty. The soils on the hills are heavier, containing more silt and clay soil particles. They typically have a natural constricted layer within 2 feet of the soil surface, which restricts drainage and crop rooting depth.

According to the USDA Census of Agriculture there were 588 farms in the county in 2002. There were 68 dairy farms with a total of 7108 milk cows, and 142 beef farms with a total of 1,655 beef cows. The entire cattle/calves inventory was 20,486 head. For poultry, there were 37 egg farms with a total of 948 layers. Sheep farms numbered 21 with 533 sheep and lambs in inventory.

Rao, R., J. Degni, Q.M. Ketterings, and H. Krol (2007). Broome Soil Sample Survey 2002-2006. CSS Extension Bulletin E07-30. 34 pages.

Corn was grown for silage and to a lesser extent grain, on 7,077 acres. Land used for all haycrop covered 31,559 acres. Small grains are grown on a limited basis with 322 acres of oats.

Total market value of agricultural product sold in 2002 was \$28.8 million dollars. Dairy products contributed \$17.4 million, calf and cattle sales; \$5.2 million and hay and silage crops; \$3.4 million dollars. A green industry includes 287 crop, nursery and greenhouse enterprises with \$5,766,000 in sales. Twenty-two vegetable farms generated \$455,000 in sales and 65 nursery, greenhouse and Christmas tree farms generated \$3.4 million dollars in sales.

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

Janice Degni

Area Field Crops Specialist

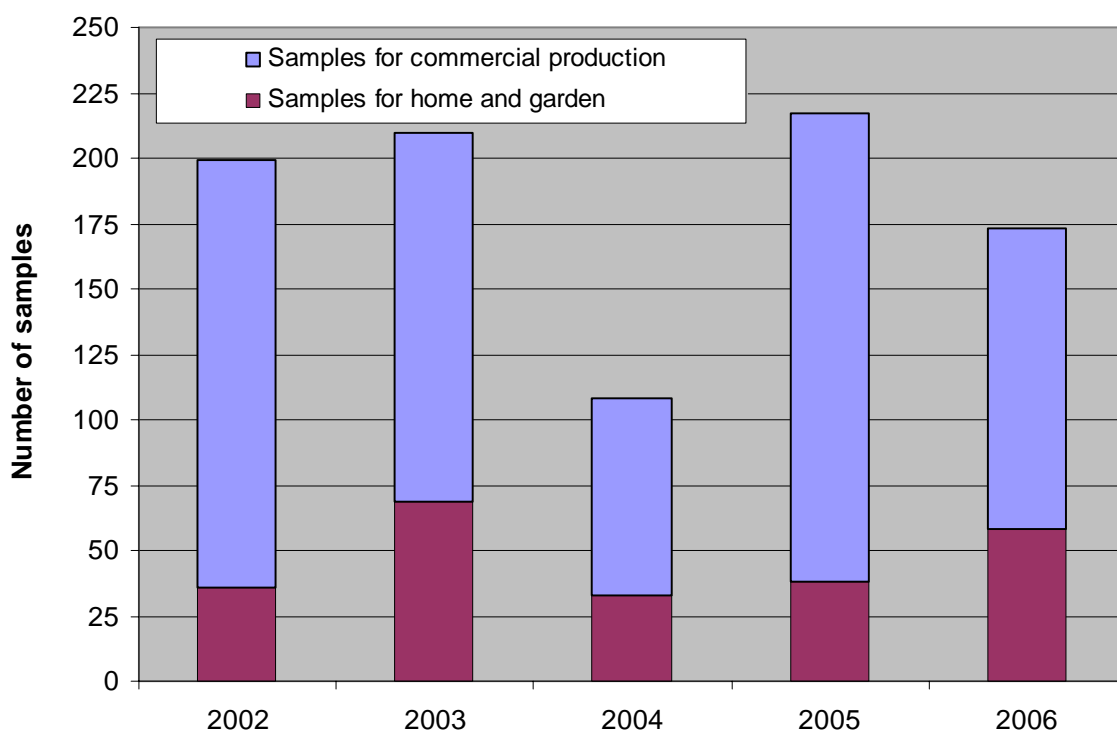
South Central NY Area Dairy and Field Crops Program, Cornell Cooperative Extension



Broome County (photo credit: Laura Biasillo, Cornell Cooperative Extension of Broome County)

1. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Broome County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) during 2002 and 2006. The total number of samples analyzed in these years amounted to 907. Of these 673 samples (74%) were submitted by commercial growers while 234 samples (26%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	36	2002	163	199
2003	69	2003	141	210
2004	33	2004	75	108
2005	38	2005	179	217
<u>2006</u>	58	<u>2006</u>	115	173
Total	234	Total	673	907

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (30%) or for home garden vegetable production (29%). Commercial growers submitted samples primarily to grow grass hay production (25%), corn silage or grain (22%), and alfalfa or alfalfa/grass mixes (19%).

Soils tested for home and garden in Broome County were classified as belonging to soil management group 2 (23%), group 3 (40%), group 4 (27%), or group 5 (10%). 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, almost all (96%) belonged to soil management group 3. There were no group 1 samples. Three percent belonged to group 2 and there were 2 samples from group 4. Mardin and Volusia were the most common soil series (each 26% of all samples), followed by Chenango (13%), and Tioga (9%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to greater than 25%. For homeowner samples, 36% had between 3 and 5% organic matter, 13% showed 5-6% organic matter while 29% had more than 6% organic matter. Of the samples submitted by commercial growers, 53% contained between 3 and 5% organic

matter, 26% had between 5 and 6% organic matter while 11% had more than 6% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.3 to 7.8 for home and garden samples with 57% testing between 5.5 and 6.9. For the commercial samples, the highest pH was 7.6 and 79% tested between pH 5.5 and 6.9.

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, 8% of the soils tested low for P, 11% tested medium, 34% tested high and 47% tested very high. This meant that 81% tested high or very high in P. For commercial growers, 6% tested very high. In total 42% w343 low in P, 27% tested medium for P while 25% of the submitted samples were classified as high in soil test P. This means that 31% 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 Broome County soils varied from very low (1% of the homeowner soils the commercial growers' soils) to very high (54% of the homeowner soils and 33% of the commercial growers' soils). For homeowners, 5% tested low in K, 11% tested medium, and 29% tested high for potassium. For commercial growers' soils, 14% tested low, 22% tested medium and 30% 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 29 to almost 2500 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (96% of the homeowner soils and 97% 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 78-92% in the normal range with 8% of the homeowner soils and 22% of the commercial grower soils testing excessive for Fe. Similarly, most soils (91-85%) 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, 94% tested high for Zn while the remainder tested medium in Zn. Of the commercial growers' samples, 2% tested low, 5% tested medium while 93% 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.

2. Cropping Systems

2.1 Homeowner Samples

Crops for which recommendations are requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	2	1	1	0	3	7	3
APR	0	0	0	0	1	1	0
ATF	1	0	0	0	0	1	0
BLU	1	0	1	0	0	2	1
CEM	0	13	0	0	0	13	6
DEW	0	0	0	0	1	1	0
FLA	1	1	1	0	4	7	3
GEN	0	2	0	0	0	2	1
HRB	0	1	0	0	0	1	0
IDL	0	0	0	0	2	2	1
LAW	15	15	6	15	19	70	30
MVG	9	19	14	11	16	69	29
OTH	0	3	0	2	9	14	6
PER	4	7	4	3	1	19	8
PTO	0	0	0	0	1	1	0
ROD	0	0	1	1	1	3	1
ROS	0	2	1	0	0	3	1
SAG	2	5	3	6	0	16	7
TOM	0	0	1	0	0	1	0
TRF	2	0	0	0	0	1	0
Unknown	0	0	0	0	0	0	0
Total	36	69	33	38	58	234	100

See Appendix for Cornell crop codes.

2.2 Commercial Samples

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE/ABT	1	3	0	31	0	35	5
AGE/AGT	24	25	5	0	31	85	13
ALE/ALT	0	2	0	0	2	4	1
APP	1	0	1	1	0	3	0
BCE	0	0	1	0	1	2	0
BGE/BGT	1	0	0	0	0	1	0
BLB	1	0	0	1	0	2	0
BSE	1	0	0	0	0	1	0
BSP	0	0	3	0	0	3	0
BUK	0	0	0	1	0	1	0
CBS	0	0	0	1	0	1	0
CGE/CGT	7	0	5	34	15	61	9
CKP	0	0	1	0	0	1	0
CLE/CLT	2	2	0	8	3	15	2
COG/COS	28	39	10	50	22	149	22
GIE/GIT	0	6	5	0	0	11	2
GPA/GPF/GPV	1	0	0	1	1	3	0
GRE/GRT	49	42	20	28	17	156	23
IDL	0	3	0	1	0	4	1
MIX	0	0	0	2	1	3	0
OAS	0	0	0	1	0	1	0
OAT	0	0	0	1	0	1	0
OTH	0	0	2	0	9	11	2
PGE/PGT	9	5	3	5	1	23	3
PIE/PIT	13	10	5	2	1	31	5
PLE/PLT	4	2	2	6	5	19	3
PNE/PNT	9	0	0	2	0	11	2
POT	0	0	0	0	1	1	0
PUM	4	1	0	0	0	5	1
RSF	1	0	0	1	0	2	0
RSS	0	0	0	0	1	1	0
RYS	1	0	0	0	0	1	0
SOF	1	0	0	0	0	1	0
STS	3	1	2	2	4	12	2
SWC	1	0	0	0	0	1	0
TRE/TRT	0	0	7	0	0	7	1
WPT	0	0	3	0	0	3	0
Unknown	1	0	0	0	0	1	0
Total	163	141	75	179	115	673	100

See Appendix for Cornell crop codes.

3. Soil Types

3.1 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)	7	6	11	16	14	54	23
SMG 3 (silt loam)	15	42	14	10	13	94	40
SMG 4 (sandy loam)	12	16	6	10	19	63	27
SMG 5 (sandy)	2	5	2	2	12	23	10
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	36	69	33	38	58	234	100

3.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Alluvial	3	0	0	0	3	0	3	0
Arnot	3	0	0	1	0	0	1	0
Braceville	4	0	1	0	0	0	1	0
Canaseraga	3	0	0	0	3	0	3	0
Castile	4	0	1	0	0	0	1	0
Chenango	3	25	26	2	9	23	85	13
Dalton	3	0	0	1	1	0	2	0
Hamlin	2	1	2	1	0	0	4	1
Lackawanna	3	22	0	0	0	1	23	3
Lordstown	3	5	1	12	12	4	34	5
Mardin	3	26	26	27	56	38	173	26
Middlebury	3	8	4	0	11	3	26	4
Morris	3	13	0	0	0	0	13	2
Scio	3	1	3	0	0	0	4	1
Teel	2	0	0	0	2	1	3	0
Tioga	3	10	36	1	10	6	63	9
Tuller	3	0	1	0	0	0	1	0
Unadilla	3	5	14	1	7	0	27	4
Venango	3	0	1	0	0	0	1	0
Volusia	3	35	16	29	61	36	177	26
Wallington	3	1	2	0	0	0	3	0
Wayland	2	3	7	0	4	2	16	2
Wellsboro	3	8	0	0	0	0	8	1
Unknown	-	0	0	0	0	1	1	0
Total	-	163	141	75	179	115	673	100

4. Organic Matter

4.1 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	0	4	10	8	1	4	9	36
2003	0	3	12	16	8	9	6	15	69
2004	0	3	4	4	8	6	4	4	33
2005	0	3	8	7	6	4	2	8	38
2006	2	2	8	8	10	11	5	12	58
Total	2	11	36	45	40	31	21	48	234

	2002	2003	2004	2005	2006
Lowest:	2.0	1.0	1.1	1.2	0.3
Highest:	15.3	26.4	9.8	11.8	21.5
Mean:	4.4	5.3	6.1	4.4	5.0
Median:	4.1	4.2	4.6	3.9	4.6

Organic matter 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	0	11	28	22	3	11	25	100
2003	0	4	17	23	12	13	9	22	100
2004	0	9	12	12	24	18	12	12	100
2005	0	8	21	18	16	11	5	21	100
2006	3	3	14	14	17	19	9	21	100
Total	1	5	15	19	17	13	9	21	100

4.2 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	10	32	58	34	16	12	163
2003	0	3	33	64	20	17	3	1	141
2004	0	0	4	8	19	29	13	2	75
2005	0	1	7	32	62	57	15	5	179
2006	0	4	6	14	51	35	5	0	115
Total	0	9	60	150	210	172	52	20	673

	2002	2003	2004	2005	2006
Lowest:	1.8	1.8	2.2	1.8	1.6
Highest:	21.2	9.3	9.9	8.9	6.6
Mean:	5.1	3.6	5.1	4.8	4.5
Median:	4.7	3.3	5.1	4.7	4.7

Organic matter 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	1	6	20	36	21	10	7	100
2003	0	2	23	45	14	12	2	1	100
2004	0	0	5	11	25	39	17	3	100
2005	0	1	4	18	35	32	8	3	100
2006	0	3	5	12	44	30	4	0	100
Total	0	1	9	22	31	26	8	3	100

5. pH

5.1 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	3	4	2	6	12	8	1	0	0	36
2003	2	3	7	14	14	12	13	4	0	0	69
2004	0	1	3	4	3	9	13	0	0	0	33
2005	0	3	3	7	7	5	10	3	0	0	38
2006	0	4	2	8	13	17	13	1	0	0	58
Total	2	14	19	35	43	55	57	9	0	0	234

	2002	2003	2004	2005	2006
Lowest:	4.4	4.3	4.6	4.7	4.5
Highest:	7.6	7.6	7.4	7.7	7.8
Mean:	-	-	-	-	-
Median:	6.6	6.3	6.7	6.4	6.4

pH homeowner of samples (% of total amount 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	8	11	6	17	33	22	3	0	0	100
2003	3	4	10	20	20	17	19	6	0	0	100
2004	0	3	9	12	9	27	39	0	0	0	100
2005	0	8	8	18	18	13	26	8	0	0	100
2006	0	7	3	14	22	29	22	2	0	0	100
Total	1	6	8	15	18	24	24	4	0	0	100

5.2 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	2	42	63	28	20	6	2	0	0	163
2003	0	3	33	54	20	30	1	0	0	0	141
2004	0	1	12	33	19	9	1	0	0	0	75
2005	0	3	30	67	48	28	2	1	0	0	179
2006	0	3	11	38	46	14	2	1	0	0	115
Total	0	12	128	255	161	101	12	4	0	0	673

	2002	2003	2004	2005	2006
Lowest:	4.5	4.7	4.7	4.8	4.6
Highest:	7.6	7.0	7.0	7.6	7.6
Mean:	-	-	-	-	-
Median:	5.7	5.7	5.8	5.9	6.1

pH of commercial samples (% of total amount 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	1	26	39	17	12	4	1	0	0	100
2003	0	2	23	38	14	21	1	0	0	0	100
2004	0	1	16	44	25	12	1	0	0	0	100
2005	0	2	17	37	27	16	1	1	0	0	100
2006	0	3	10	33	40	12	2	1	0	0	100
Total	0	2	19	38	24	15	2	1	0	0	100

6. Phosphorus

6.1 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	5	3	13	2	0	1	4	1	7	36
2003	0	3	6	25	7	7	3	4	3	11	69
2004	0	2	2	9	4	3	2	4	2	5	33
2005	0	3	6	13	2	2	0	0	4	8	38
2006	0	5	9	20	1	5	4	5	1	8	58
Total	0	18	26	80	16	17	10	17	11	39	234

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	2
Highest:	531	1149	515	460	711
Mean:	48	88	135	92	69
Median:	22	31	51	24	23

Phosphorus homeowner samples (% of total amount 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	14	8	36	6	0	3	11	3	19	100
2003	0	4	9	36	10	10	4	6	4	16	100
2004	0	6	6	27	12	9	6	12	6	15	100
2005	0	8	16	34	5	5	0	0	11	21	100
2006	0	9	16	34	2	9	7	9	2	14	100
Total	0	8	11	34	7	7	4	7	5	17	100

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

6.2 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	84	29	39	4	0	1	0	1	5	163
2003	0	52	38	39	6	2	1	3	0	0	141
2004	0	35	28	10	1	0	0	1	0	0	75
2005	0	98	47	26	6	1	0	0	0	1	179
2006	0	15	38	56	2	2	1	1	0	0	115
Total	0	284	180	170	19	5	3	5	1	6	673

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	870	122	144	219	127
Mean:	32	13	3	8	14
Median:	3	6	3	3	9

Phosphorus in commercial samples (% of total amount 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	52	18	24	2	0	1	0	1	3	100
2003	0	37	27	28	4	1	1	2	0	0	100
2004	0	47	37	13	1	0	0	1	0	0	100
2005	0	55	26	15	3	1	0	0	0	1	100
2006	0	13	33	49	2	2	1	1	0	0	100
Total	0	42	27	25	3	1	0	1	0	1	100

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

7. Potassium

7.1 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	0	3	4	7
2003	0	0	0	2	4	6
2004	0	0	2	1	8	11
2005	0	2	1	4	9	16
2006	0	0	0	2	12	14
Total (#)	0	2	3	12	37	54
Total (%)	0	4	6	22	69	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
2002	0	0	2	8	5	15
2003	1	3	6	15	17	42
2004	0	0	2	3	9	14
2005	0	0	1	5	4	10
2006	0	1	1	5	6	13
Total (#)	1	4	12	36	41	94
Total (%)	1	4	13	38	44	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
2002	0	0	0	1	11	12
2003	0	1	1	3	11	16
2004	0	0	0	1	5	6
2005	0	0	2	2	6	10
2006	0	3	4	5	7	19
Total (#)	0	4	7	14	40	63
Total (%)	0	6	11	19	63	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
2002	0	1	0	0	1	2
2003	1	0	1	2	1	5
2004	0	0	2	0	0	2
2005	0	0	1	0	1	2
2006	1	0	0	5	6	12
Total (#)	2	1	4	7	9	23
Total (%)	9	4	17	30	39	100

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	0	1	2	12	21	36
2003	2	4	8	22	33	69
2004	0	0	6	5	22	33
2005	0	2	5	11	20	38
2006	1	4	5	17	31	58
Grand Total	3	11	26	67	127	234

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	0	3	6	33	58	100
2003	3	6	12	32	48	100
2004	0	0	18	15	67	100
2005	0	5	13	29	53	100
2006	2	7	9	29	53	100
Grand Total	1	5	11	29	54	100

	2002	2003	2004	2005	2006
Lowest:	70	33	70	61	52
Highest:	1671	2229	1058	1269	4340
Mean:	370	325	274	257	291
Median:	240	214	203	223	229

7.2 Commercial Samples

Potassium (lbs K/acre Morgan extraction) in commercial 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	0	2	2	4
2003	0	6	0	0	3	9
2004	0	0	0	0	1	1
2005	0	0	1	2	3	6
2006	0	1	1	1	0	3
Total (#)	0	7	2	5	9	23
Total (%)	0	30	9	22	39	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	12	36	42	67	159
2003	5	38	30	36	21	130
2004	1	15	20	23	15	74
2005	0	16	41	55	61	173
2006	0	3	20	39	49	111
Total (#)	8	84	147	195	213	674
Total (%)	1	13	23	30	33	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	1	0	1	0	2
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	1	0	1	0	2
Total (%)	0	50	0	50	0	100

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	?	Total
2002	2	12	36	44	69	0	163
2003	5	45	30	37	24	0	141
2004	1	15	20	23	16	0	75
2005	0	16	42	57	64	0	179
2006	0	4	21	40	49	1	115
Grand Total	8	92	149	201	222	1	673

Summary (%)	Very Low	Low	Medium	High	Very High	?	Total
2002	1	7	22	27	42	0	100
2003	4	32	21	26	17	0	100
2004	1	20	27	31	21	0	100
2005	0	9	23	32	36	0	100
2006	0	3	18	35	43	1	100
Grand Total	1	14	22	30	33	0	100

	2002	2003	2004	2005	2006
Lowest:	30	33	44	47	61
Highest:	6161	734	1331	1056	1176
Mean:	351	147	125	192	220
Median:	170	108	105	154	173

8. Magnesium

8.1 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	0	3	5	28	36
2003	0	1	2	13	53	69
2004	0	0	1	5	27	33
2005	0	0	0	7	31	38
2006	0	2	2	2	52	58
Total	0	3	8	32	191	234

	2002	2003	2004	2005	2006
Lowest:	71	60	74	104	55
Highest:	1804	2466	856	1158	1696
Mean:	331	405	510	377	389
Median:	332	325	373	328	304

Magnesium homeowner samples (% of total amount of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	8	14	78	100
2003	0	1	3	19	77	100
2004	0	0	3	15	82	100
2005	0	0	0	18	82	100
2006	0	3	3	3	90	100
Total	0	1	3	14	82	100

8.2 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	5	33	123	163
2003	0	1	6	51	83	141
2004	0	1	2	20	52	75
2005	0	0	6	31	142	179
2006	0	2	4	25	84	115
Total	0	6	23	160	484	673

	2002	2003	2004	2005	2006
Lowest:	29	41	54	66	63
Highest:	2492	625	1004	1167	968
Mean:	360	271	234	346	298
Median:	281	229	237	314	283

Magnesium commercial samples (% of total amount of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	3	20	75	100
2003	0	1	4	36	59	100
2004	0	1	3	27	69	100
2005	0	0	3	17	79	100
2006	0	2	3	22	73	100
Total	0	1	3	24	73	100

9. Iron

9.1 Homeowner Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	33	3	36
2003	65	4	69
2004	30	3	33
2005	36	2	38
2006	52	6	58
Total	216	18	234

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	92	8	100
	94	6	100
	91	9	100
	95	5	100
	90	10	100
	92	8	100

	2002	2003	2004	2005	2006
Lowest:	2	2	3	3	3
Highest:	156	246	286	150	332
Mean:	7	15	24	27	16
Median:	5	8	8	17	9

9.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	124	39	163
2003	115	26	141
2004	51	24	75
2005	144	35	159
2006	94	21	115
Total	528	145	673

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	76	24	100
	82	18	100
	68	32	100
	80	20	100
	82	18	100
	78	22	100

	2002	2003	2004	2005	2006
Lowest:	2	3	5	2	3
Highest:	231	335	124	169	106
Mean:	35	35	26	30	30
Median:	24	22	22	21	23

10. Manganese

10.1 Homeowner Samples

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	36	0	36
2003	64	5	69
2004	29	4	33
2005	30	8	38
2006	54	4	58
Total	213	21	234

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	100	0	100
	93	7	100
	88	12	100
	79	21	100
	93	7	100
	91	9	100

	2002	2003	2004	2005	2006
Lowest:	12	10	10	21	18
Highest:	95	375	143	180	168
Mean:	40	39	71	68	53
Median:	39	34	49	63	44

10.2 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	149	14	163	91	9	100
2003	133	8	141	94	6	100
2004	69	6	75	92	8	100
2005	173	6	179	97	3	100
2006	113	2	115	98	2	100
Total	637	36	673	95	5	100

	2002	2003	2004	2005	2006
Lowest:	9	5	14	12	11
Highest:	553	486	142	392	293
Mean:	60	46	43	42	47
Median:	44	32	41	33	43

11. Zinc

11.1 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	0	36	36
2003	0	3	66	69
2004	0	4	29	33
2005	0	1	37	38
2006	1	4	53	58
Total	1	12	221	234

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	0	100	100
0	4	96	100
0	12	88	100
0	3	97	100
2	7	91	100
0	5	94	100

	2002	2003	2004	2005	2006
Lowest:	1.2	0.5	0.5	0.9	0.4
Highest:	99.4	225.1	65.2	47.8	55.6
Mean:	6.4	24.6	26.6	8.7	8.4
Median:	4.6	12.8	7.6	4.9	4.3

11.2 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	0	6	157	163
2003	0	5	136	141
2004	0	8	67	75
2005	1	13	165	179
2006	11	4	100	115
Total	12	36	625	673

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	4	96	100
0	4	96	100
0	11	89	100
1	7	92	100
10	3	87	100
2	5	93	100

	2002	2003	2004	2005	2006
Lowest:	0.7	0.7	0.6	0.4	0.1
Highest:	27.8	19.9	53.2	16.7	10.6
Mean:	4.9	4.2	2.1	3.1	2.7
Median:	4.0	3.6	2.1	2.7	2.3

Appendix: Cornell Crop Codes

Crop codes are used in the Cornell Nutrient Analyses 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
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 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