

Soil Sample Survey

Cortland Co.

Samples analyzed by CNAL in 1995-2001



Photo by Janice Degni.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid and Janice Degni



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

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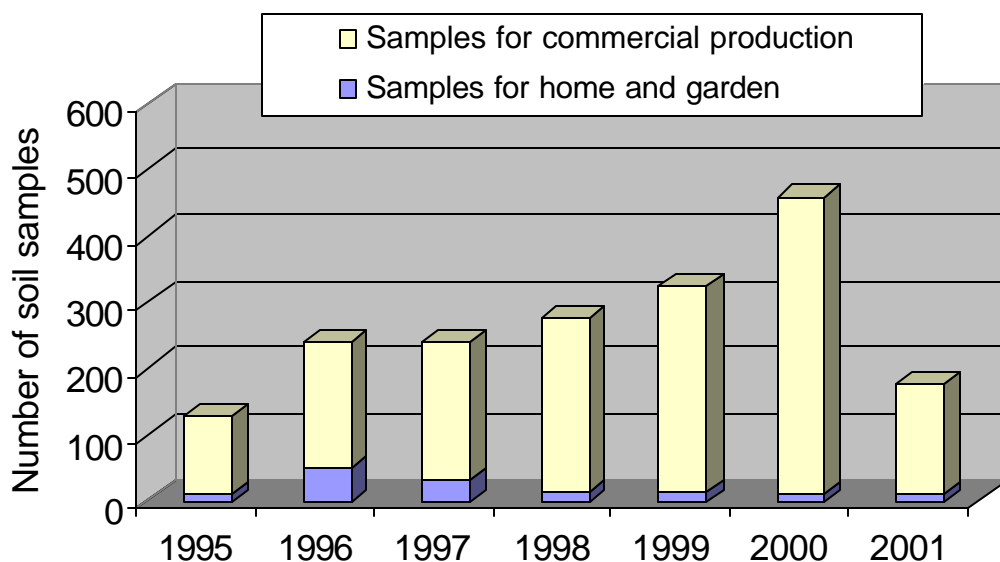
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1. General Survey Summary

This survey summarizes the soil test results from Cortland County soil samples submitted for analyses to the Cornell Nutrient Analysis Laboratory (CNAL) during 1995-2001. The total number of samples analyzed in these years amounted to 1844. Of these 1844 samples, 1712 (93%) were submitted to obtain fertilizer recommendations for commercial production while 132 samples (7%) were submitted as home and garden samples.



Homeowners		Commercial		Total
1995	8	1995	119	127
1996	48	1996	193	241
1997	32	1997	209	241
1998	14	1998	264	278
1999	12	1999	312	324
2000	9	2000	450	459
<u>2001</u>	<u>9</u>	<u>2001</u>	<u>165</u>	<u>174</u>
Total	132	Total	1712	1844

Home and garden soil samples were submitted to request fertilizer recommendations for home garden vegetable production (19%), for lawns (18%), for greens (16%), or perennials (11%) while others requested recommendations for athletic fields, fairways, flowering annuals, grapes, herbs, parks, berries, ornamentals, bulbs, and tree fruits. People submitting samples for commercial production requested fertilizer recommendations for corn silage or grain (33%), alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (24%), hay production (17%), or pasture (14%), while a few producers were planning on growing clover/grass mixtures.

Home and garden samples in Cortland County were silty (11%), silt loams (23%), sandy loams (12%), or sandy (4%), belonging to soil management groups 2, 3, 4, and 5, respectively. The table below gives descriptions of each of the soil management groups.

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 for commercial production, 74% belonged to soil management group 3. None of the samples belonged to group 1, 4, 5 or 6 while 4% were classified group 2, and the remainder was of unknown classification. The five most common soil

series, all belonging to soil management group 3, were Volusia (17%), Mardin (14%), Lordstown (12%), Howard (7%), and Bath (7%). These soils represent 23% (Volusia), 16% (Mardin), 24% (Lordstown), 3% (Howard), and 6% (Bath) of the total 320,800 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from 1% to just over 20% with median values ranging from 4.4 to 7.3% organic matter for home and garden samples and from 4.9 to 5.4% for samples submitted for commercial production. Forty-two percent of the home and garden samples had between 2.0 and 4.9% organic matter with 3% of the samples testing between 2.0 and 2.9% organic matter, 12% between 3.0 and 3.9% organic matter and 27% between 4.0 and 4.9% organic matter. Fifty-four percent of the soils submitted for home and garden tested >4.9% in organic matter. Of the samples submitted for commercial production, 8% contained between 3.0 and 3.9% organic matter, 32% tested between 4.0 and 4.9% while 36% had organic matter concentrations of 5.0-5.9%. One percent had less than 3.0% organic matter while 24% of the samples had 6.0% or more organic matter. In total, 84% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 4.4 to 8.2 with the median for home and garden samples ranging from pH 6.1 to pH 7.2 and for samples submitted for commercial production ranging from pH 6.1 to pH 6.3. Of the home and garden samples, 64% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, this was 74% while 25% tested between pH 5.0 and 5.9.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan solution and extraction method (Morgan, 1941). This solution contains sodium acetate buffered at a 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 soils with >39 lbs P/acre are classified as very high. Of the home and garden samples, 7% tested low, 13% tested medium, 30% tested high and 51% tested very high. This meant that 80% tested high or very high in P. Of the samples submitted for commercial production, 22% tested low in P. Twenty-nine percent were medium in P,

39% tested high while 9% of the samples were very high in P. This means that 48% tested high or very high in P. There were no clear trends in P levels over the 7 years.

Classifications for potassium depend on soil management group. The fine-textured soils of 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 low, 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 the table below).

Potassium classifications depend on soil test K levels and soil management group.

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

Of the home and garden samples, 6% was classified as very low or low in potassium. Four percent tested medium, another 18% were high and 72% were very high in potassium. For samples submitted for commercial production, 1% was very low in K, 6% tested low, 14% tested medium, 27% tested high and 51% tested very high in potassium while the remainder was of unknown K classification. As with phosphorus, there were no trends over the 7 years of soil sampling.

Soils test very low for magnesium 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 magnesium. 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 34 to almost 1,900 lbs Mg/acre (Morgan extraction). There were only 9 samples in the commercial agriculture datasets that tested low in Mg. None of the samples was very low in Mg. Most soils tested high or very high for Mg (almost 100% of the homeowner soils and 97% of the soils of the commercial growers). Only one of the home and garden samples and 43 of the commercial growers' soils tested medium in Mg. Thus, magnesium deficiency is not likely to occur in Cortland County provided the soil pH is maintained in the desirable range.

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. Ninety-four percent of the home and garden samples were classified as normal in Fe while also 94% of the commercial samples tested in the normal range for Fe. Similarly, most soils with the exception of 21 commercial samples (1%) and 22 home and garden samples (17%) 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 zinc 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 home and garden samples, no samples tested low for zinc while 10% tested medium and 90% tested high for zinc. Of the samples for commercial production, 4% tested low in zinc, 26% tested medium while 70% of the samples were high in zinc.

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 2.

Reference

- Morgan, M.F. 1941. Chemical soil diagnosis by the universal soil testing system. Connecticut Agricultural Experimental Station. Bulletin 450.

2. Cropping Systems

2.1 Samples for Home and Garden

Crops for which recommendations are requested by homeowners:

	1995	1996	1997	1998	1999	2000	2001	Total	%
ATF	0	2	5	5	0	0	0	12	9
FAR	0	8	0	0	0	0	0	8	6
FLA	1	0	0	0	2	1	0	4	3
GEN	0	19	0	2	0	0	0	21	16
GRA	0	0	2	0	0	0	0	2	2
HRB	1	0	0	0	0	0	0	1	1
LAW	2	4	1	3	6	4	4	24	18
MVG	2	7	5	1	3	2	5	25	19
OTH	0	0	1	1	0	1	0	3	2
PER	0	0	14	0	0	0	0	14	11
PRK	0	0	1	0	0	0	0	1	1
RSP	0	2	0	0	0	0	0	2	2
SAG	2	4	2	1	1	1	0	11	8
SUB	0	0	0	1	0	0	0	1	1
TRF	0	0	1	0	0	0	0	1	1
Unknown	0	2	0	0	0	0	0	2	2
Total	8	48	32	14	12	9	9	132	100

Notes:

See Appendix for Cornell crop codes.

2.2 Samples for Commercial Production

Crops for which recommendations are requested for commercial production:

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
ABE/ABT	8	3	1	2	1	9	0	24	1
AGE/AGT	40	40	37	31	40	69	52	309	18
ALE/ALT	7	12	16	10	16	15	6	82	5
APP	0	0	0	1	0	0	0	1	0
BCE/BCT	0	1	0	0	0	2	0	3	0
BGE/BGT	2	0	1	5	0	0	0	8	0
BSP	0	0	0	0	0	2	1	3	0
BSS	0	3	0	0	0	0	0	3	0
BUK	0	1	0	0	0	0	0	1	0
BWI	0	0	0	0	1	0	0	1	0
CBP	0	0	0	1	0	0	0	1	0
CBS	0	0	0	0	1	0	0	1	0
CGE/CGT	10	13	6	12	17	21	8	87	5
CLE/CLT	0	0	0	2	1	0	1	4	0
COG/COS	28	55	77	101	117	150	42	570	33
GIE/GIT	2	8	7	6	2	24	0	49	3
GPF	0	0	0	0	0	0	1	1	0
GPV	0	0	0	0	0	0	1	1	0
GRE/GRT	15	10	33	32	55	87	14	246	14
IDL	0	0	0	0	0	7	0	7	0
MIL	0	0	0	0	1	0	0	1	0
MIX	0	2	0	2	0	0	3	7	0
OAS	0	1	0	0	0	0	1	2	0
OAT	0	0	1	0	0	0	1	2	0
OTH	0	0	0	1	1	2	0	4	0
PEP	0	0	0	0	1	0	0	1	0
PGE/PGT	0	8	1	3	11	6	1	30	2
PIE/PIT	0	26	20	13	14	42	11	126	7
PLE/PLT	1	1	0	16	5	0	2	25	1
PNE/PNT	3	6	4	13	18	9	14	67	4
POT	0	0	0	1	1	0	0	2	0
PUM	0	0	0	1	0	0	2	3	0
RSS	0	0	0	1	0	0	1	2	0
RYC	0	0	0	0	3	0	0	3	0
SOY	0	0	0	1	0	0	0	1	0

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
SSH	0	0	0	3	0	2	1	6	0
STR	0	1	0	0	0	0	0	1	0
STS	0	0	0	1	1	0	1	3	0
SUD	0	0	0	2	0	0	0	2	0
SWC	1	1	0	0	0	0	0	2	0
TOM	0	0	0	1	0	0	0	1	0
TRE/TRT	0	0	3	0	1	0	0	4	0
WHT	0	0	0	0	0	1	0	1	0
Unknown	2	1	2	2	4	2	1	14	1
Total	119	193	209	264	312	450	165	1712	100

Notes:

See Appendix for Cornell crop codes.

3. Soil Types

3.1 Samples for Home and Garden

Soil types (soil management groups) for home and garden samples:

	1995	1996	1997	1998	1999	2000	2001	Total
SMG 1 (clayey)	0	0	0	0	0	0	0	0
SMG 2 (silty)	0	21	7	0	0	0	0	28
SMG 3 (silt loam)	5	11	22	9	6	3	5	61
SMG 4 (sandy loam)	3	9	3	3	6	6	1	31
SMG 5 (sandy)	0	7	0	2	0	0	3	12
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	8	48	32	14	12	9	9	132

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Alden	3	0	0	0	0	1	0	0	1
Alluvial	3	1	0	0	0	1	1	0	3
Arnot	3	4	0	3	4	1	7	0	19
Bath	3	6	7	13	7	17	30	38	118
Birdsall	3	1	0	0	0	4	0	0	5
Chagrin	3	0	4	2	6	12	10	6	40
Chenango	3	6	9	7	5	18	11	4	60
Chippewa	3	0	0	3	1	1	8	0	13
Conesus	2	0	0	9	0	0	6	3	18
Dunkirk	3	0	0	0	0	1	12	0	13
Erie	3	0	5	6	3	6	9	2	31
Homer	2	3	1	1	1	2	1	0	9
Howard	3	3	11	17	37	16	17	20	121
Kendaia	2	0	0	0	0	0	0	1	1
Langford	3	4	18	12	19	17	20	12	102
Lansing	2	0	0	0	1	3	9	4	17
Lobdell	3	0	0	1	0	3	2	2	8
Lordstown	3	14	15	23	30	26	78	12	198
Mardin	3	17	29	38	46	40	66	11	247
Middlebury	3	0	5	2	4	14	4	0	29
Palmyra	3	9	17	12	12	20	32	2	104
Phelps	3	2	2	0	3	6	9	0	22
Scio	3	1	1	1	0	6	2	0	11
Sloan	3	0	0	0	0	0	0	1	1
Tioga	3	2	8	11	7	20	14	5	67
Tuller	3	0	1	0	0	0	1	0	2
Unadilla	3	0	0	0	0	0	3	0	3
Valois	3	7	16	10	12	19	16	12	92
Volusia	3	37	37	25	54	44	72	22	291
Wallington	3	1	0	5	0	6	0	1	13
Wayland	2	1	0	6	3	7	6	0	23
Unknown	-	0	7	2	9	1	4	7	30
Total	-	119	193	209	264	312	450	165	1712

4. Organic Matter

4.1 Samples for Home and Garden

Number of home and garden samples within each % organic matter range:

	<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
1995	0	1	1	1	1	3	1	0	8
1996	0	0	1	10	23	8	5	1	48
1997	0	1	0	2	1	3	6	19	32
1998	2	0	0	0	4	2	3	3	14
1999	0	0	0	1	4	2	1	4	12
2000	0	0	1	1	3	1	1	2	9
2001	0	0	1	1	0	1	2	4	9
Total	2	2	4	16	36	20	19	33	132

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.6	2.8	1.6	0.2	3.9	2.9	2.8	
Highest:	6.0	9.1	14.3	7.7	8.9	7.5	20.5	
Mean:	4.4	4.7	7.7	5.1	5.8	5.3	8.6	
Median:	4.7	4.4	7.3	5.3	5.6	4.8	6.1	

Percent of home and garden samples within each % organic matter range:

	<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
1995	0	13	13	13	13	38	13	0	100
1996	0	0	2	21	48	17	10	2	100
1997	0	3	0	6	3	9	19	59	100
1998	14	0	0	0	29	14	21	21	100
1999	0	0	0	8	33	17	8	33	100
2000	0	0	11	11	33	11	11	22	100
2001	0	0	11	11	0	11	22	44	100
Total	2	2	3	12	27	15	14	25	100

4.2 Samples for Commercial Production

Number of samples for commercial production within each % organic matter range:

	<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
1995	0	0	0	2	35	52	23	7	119
1996	0	0	3	9	49	84	38	10	193
1997	0	0	2	15	75	75	26	16	209
1998	0	0	4	20	84	87	43	26	264
1999	0	0	1	39	101	107	48	16	312
2000	0	0	5	45	126	151	83	40	450
2001	0	0	3	14	72	53	18	5	165
Total	0	0	18	144	542	609	279	120	1712

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3.8	2.5	2.4	2.3	2.8	2.5	2.6	
Highest:	9.8	12.6	9.0	12.3	10.0	10.1	8.4	
Mean:	5.4	5.4	5.2	5.4	5.2	5.3	5.0	
Median:	5.4	5.3	5.1	5.2	5.1	5.2	4.9	

Percent of samples for commercial production within each % organic matter range:

	<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
1995	0	0	0	2	29	44	19	6	100
1996	0	0	2	5	25	44	20	5	100
1997	0	0	1	7	36	36	12	8	100
1998	0	0	2	8	32	33	16	10	100
1999	0	0	0	13	32	34	15	5	100
2000	0	0	1	10	28	34	18	9	100
2001	0	0	2	8	44	32	11	3	100
Total	0	0	1	8	32	36	16	7	100

5. pH

5.1 Samples for Home and Garden

Number of home and garden samples within each pH range:

	<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
1995	1	0	1	0	4	1	1	0	0	0	8
1996	0	1	0	5	6	5	23	8	0	0	48
1997	0	0	2	4	3	4	9	9	1	0	32
1998	0	0	0	2	1	2	3	6	0	0	14
1999	0	0	1	2	3	4	2	0	0	0	12
2000	0	0	2	1	2	2	2	0	0	0	9
2001	0	0	1	0	0	5	2	1	0	0	9
Total	1	1	7	14	19	23	42	24	1	0	132

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.4	4.7	5.4	5.5	5.3	5.1	5.2	
Highest:	7.2	7.7	8.2	7.9	7.3	7.2	7.9	
Mean:	-	-	-	-	-	-	-	
Median:	6.1	7.4	7.2	7.2	6.5	6.3	6.8	

Percent of home and garden samples within each pH range:

	<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
1995	13	0	13	0	50	13	13	0	0	0	100
1996	0	2	0	10	13	10	48	17	0	0	100
1997	0	0	6	13	9	13	28	28	3	0	100
1998	0	0	0	14	7	14	21	43	0	0	100
1999	0	0	8	17	25	33	17	0	0	0	100
2000	0	0	22	11	22	22	22	0	0	0	100
2001	0	0	11	0	0	56	22	11	0	0	100
Total	1	1	5	11	14	17	32	18	1	0	100

5.2 Samples for Commercial Production

Number of samples for commercial production within each pH range:

	<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
1995	0	0	3	25	52	31	8	0	0	0	119
1996	0	2	9	45	78	57	2	0	0	0	193
1997*	0	0	5	51	99	41	8	1	0	0	205
1998	0	1	12	66	87	83	15	0	0	0	264
1999	1	0	10	56	114	104	27	0	0	0	312
2000	0	2	11	76	176	147	37	1	0	0	450
2001	0	0	7	59	51	32	15	1	0	0	165
Total	1	5	57	378	657	495	112	3	0	0	1708

Four samples were not analyzed for pH in 1997.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.0	4.8	5.2	4.9	4.4	4.8	5.1	
Highest:	7.2	7.0	7.5	7.4	7.3	7.5	7.5	
Mean:	-	-	-	-	-	-	-	
Median:	6.3	6.2	6.2	6.3	6.3	6.3	6.1	

Percent of samples for commercial production within each pH range:

	<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
1995	0	0	3	21	44	26	7	0	0	0	100
1996	0	1	5	23	40	30	1	0	0	0	100
1997	0	0	2	25	48	20	4	0	0	0	100
1998	0	0	5	25	33	31	6	0	0	0	100
1999	0	0	3	18	37	33	9	0	0	0	100
2000	0	0	2	17	39	33	8	0	0	0	100
2001	0	0	4	36	31	19	9	1	0	0	100
Total	0	0	3	22	38	29	7	0	0	0	100

6. Phosphorus

6.1 Samples for Home and Garden

Number of home and garden samples within each range Morgan extractable P range (lbs/acre Morgan P):

	<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	
1995	0	2	2	1	1	0	1	0	0	1	8
1996	0	3	7	14	18	1	2	1	2	0	48
1997	0	2	0	9	5	8	4	2	1	1	32
1998	0	1	2	8	2	0	0	0	0	1	14
1999	0	0	3	3	1	1	1	2	0	1	12
2000	0	1	2	3	1	1	0	0	0	1	9
2001	0	0	1	1	2	0	2	1	0	2	9
Total	0	9	17	39	30	11	10	6	3	7	132

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	2	1	1	5	2	7	
Highest:	261	184	371	339	290	215	898	
Mean:	51	40	68	43	71	42	210	
Median:	7	40	59	24	48	12	84	

Percent of home and garden samples within each Morgan extractable phosphorus range:

	<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	
1995	0	25	25	13	13	0	13	0	0	13	100
1996	0	6	15	29	38	2	4	2	4	0	100
1997	0	6	0	28	16	25	13	6	3	3	100
1998	0	7	14	57	14	0	0	0	0	7	100
1999	0	0	25	25	8	8	8	17	0	8	100
2000	0	11	22	33	11	11	0	0	0	11	100
2001	0	0	11	11	22	0	22	11	0	22	100
Total	0	7	13	30	23	8	8	5	2	5	100

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

6.2 Samples for Commercial Production

Number of samples submitted for commercial production within each Morgan extractable phosphorus (lbs P/acre) range:

	<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	
1995	0	47	32	32	5	1	1	0	1	0	119
1996	0	36	63	77	11	2	3	1	0	0	193
1997	0	24	63	89	22	4	2	1	1	3	209
1998	0	62	70	99	16	7	4	2	0	4	264
1999	0	68	79	137	13	8	4	1	2	0	312
2000	0	106	140	176	16	5	2	1	3	1	450
2001	0	31	54	60	9	5	3	2	1	0	165
Total	0	374	501	670	92	32	19	8	8	8	1712

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	161	124	257	783	196	216	159	
Mean:	12	15	21	22	17	14	18	
Median:	5	8	11	9	10	7	8	

Percent of samples submitted for commercial production within each Morgan P range:

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
1995	0	39	27	27	4	1	1	0	1	0	100
1996	0	19	33	40	6	1	2	1	0	0	100
1997	0	11	30	43	11	2	1	0	0	1	100
1998	0	23	27	38	6	3	2	1	0	2	100
1999	0	22	25	44	4	3	1	0	1	0	100
2000	0	24	31	39	4	1	0	0	1	0	100
2001	0	19	33	36	5	3	2	1	1	0	100
Total	0	22	29	39	5	2	1	0	0	0	100

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

7. Potassium

7.1 Samples for Home and Garden

Number of home and garden samples within each K range (lbs K/acre Morgan extraction):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	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	
1995	0	0	0	0	0	0
1996	0	0	0	0	21	21
1997	0	0	1	1	5	7
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	5	5
Total (#)	0	0	1	1	31	33
Total (%)	0	0	3	3	94	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	2	1	2	5
1996	0	0	1	7	3	11
1997	0	0	0	2	20	22
1998	0	0	0	2	7	9
1999	0	0	0	1	5	6
2000	0	1	1	0	1	3
2001	0	0	0	0	1	1
Total (#)	0	1	4	13	39	57
Total (%)	0	2	7	23	68	100

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Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	3	3
1996	0	0	0	4	5	9
1997	0	0	0	1	2	3
1998	0	2	0	0	1	3
1999	0	0	0	1	5	6
2000	0	2	0	1	3	6
2001	0	1	0	0	2	3
Total (#)	0	5	0	7	21	33
Total (%)	0	15	0	21	64	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	3	4	7
1997	0	0	0	0	0	0
1998	1	1	0	0	0	2
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	1	1	0	3	4	7
Total (%)	11	11	0	33	44	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Number of home and garden samples within each potassium classification:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
1995	0	0	2	1	5	8
1996	0	0	1	14	33	48
1997	0	0	1	4	27	32
1998	1	3	0	2	8	14
1999	0	0	0	2	10	12
2000	0	3	1	1	4	9
2001	0	1	0	0	8	9
Total #	1	7	5	24	95	132

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	87	87	90	36	140	65	99	
Highest:	1125	1002	1494	548	2237	646	1346	
Mean:	389	290	408	284	764	272	538	
Median:	305	216	383	280	421	163	475	

Percent of samples submitted for home and garden within each potassium classification.

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	0	25	13	63	100
1996	0	0	2	29	69	100
1997	0	0	3	13	84	100
1998	7	21	0	14	57	100
1999	0	0	0	17	83	100
2000	0	33	11	11	44	100
2001	0	11	0	0	89	100
Grand Total	1	5	4	18	72	100

7.2 Samples for Commercial Production

Number of samples submitted for commercial production within each potassium (lbs K/acre Morgan extraction) range:

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	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	
1995	0	0	2	0	2	4
1996	0	0	0	1	0	1
1997	1	0	0	2	13	16
1998	0	0	1	0	4	5
1999	0	1	3	1	7	12
2000	0	1	0	3	18	22
2001	0	0	1	1	6	8
Total (#)	1	2	7	8	50	68
Total (%)	1	3	10	12	74	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	4	6	8	29	68	115
1996	0	7	22	49	107	185
1997	2	14	41	59	75	191
1998	0	16	33	76	125	250
1999	6	26	44	70	153	299
2000	4	29	62	130	199	424
2001	0	5	18	38	89	150
Total (#)	16	103	228	451	816	1614
Total (%)	1	6	14	28	51	100

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Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	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	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Number of samples submitted for commercial production within each potassium classification.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	4	6	10	29	70	0	119
1996	0	7	22	50	107	7	193
1997	3	14	41	61	88	2	209
1998	0	16	34	76	129	9	264
1999	6	27	47	71	160	1	312
2000	4	30	62	133	217	4	450
2001	0	5	19	39	95	7	165
Grand Total	17	105	235	459	866	30	1712

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	35	45	29	55	32	33	58	
Highest:	916	1576	1255	2158	1652	2851	1735	
Mean:	259	277	245	267	280	254	290	
Median:	216	230	176	207	207	192	235	

Percent of samples submitted for commercial production within each potassium classification.

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	3	5	8	24	59	0	100
1996	0	4	11	26	55	4	100
1997	1	7	20	29	42	1	100
1998	0	6	13	29	49	3	100
1999	2	9	15	23	51	0	100
2000	1	7	14	30	48	1	100
2001	0	3	12	24	58	4	100
Grand Total	1	6	14	27	51	2	100

8. Magnesium

8.1 Samples for Home and Garden

Number of home and garden samples within each Mg range (lbs Morgan Mg/acre):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	3	4	8
1996	0	0	0	8	40	48
1997	0	0	0	2	30	32
1998	0	0	0	2	12	14
1999	0	0	0	2	10	12
2000	0	0	0	1	8	9
2001	0	0	0	0	9	9
Total	0	0	1	18	113	132

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	94	145	145	119	145	173	246	
Highest:	728	1094	1343	746	1027	675	1879	
Mean:	330	399	502	383	513	377	783	
Median:	224	289	460	357	540	389	467	

Percent of home and garden samples within each Mg range (lbs Morgan Mg/acre):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	13	38	50	100
1996	0	0	0	17	83	100
1997	0	0	0	6	94	100
1998	0	0	0	14	86	100
1999	0	0	0	17	83	100
2000	0	0	0	11	89	100
2001	0	0	0	0	100	100
Total	0	0	1	14	86	100

8.2 Samples for Commercial Production

Number of samples submitted for commercial production within each Mg range (lbs Mg/acre Morgan extraction):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	5	31	83	119
1996	0	0	8	22	163	193
1997	0	0	5	23	181	209
1998	0	1	9	32	222	264
1999	0	3	7	28	274	312
2000	0	4	8	42	396	450
2001	0	1	1	20	143	165
Total	0	9	43	198	1462	1712

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	72	79	81	55	46	34	55	
Highest:	853	1156	1097	1567	939	978	1073	
Mean:	328	418	424	414	404	421	397	
Median:	293	390	403	385	371	410	368	

Percent of samples submitted for commercial production within each magnesium range (lbs Mg/acre Morgan extraction):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	4	26	70	100
1996	0	0	4	11	84	100
1997	0	0	2	11	87	100
1998	0	0	3	12	84	100
1999	0	1	2	9	88	100
2000	0	1	2	9	88	100
2001	0	1	1	12	87	100
Total	0	1	3	12	85	100

9. Iron

9.1 Samples for Home and Garden

Iron (lbs Fe/acre Morgan extraction) in samples for home and garden:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
1995	6	2	8
1996	46	2	48
1997	30	2	62
1998	14	0	14
1999	10	2	12
2000	9	0	9
2001	9	0	9
Total	124	8	132

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	75	25	100
	96	4	100
	94	6	100
	100	0	100
	83	17	100
	100	0	100
	100	0	100
	94	6	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	2	3	4	2	3	3	
Highest:	384	113	76	48	92	25	12	
Mean:	65	12	11	14	23	10	6	
Median:	9	5	5	8	7	8	5	

9.2 Samples for Commercial Production

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
1995	115	4	119
1996	180	13	193
1997	207	2	209
1998	254	10	264
1999	297	15	312
2000	430	20	450
2001	165	0	165
Total	1648	64	1712

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	97	3	100
	93	7	100
	99	1	100
	96	4	100
	95	5	100
	96	4	100
	100	0	100
	96	4	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	1	1	1	1	1	1	
Highest:	95	139	111	102	313	250	49	
Mean:	15	18	12	15	16	14	9	
Median:	9	11	9	10	9	8	6	

10. Manganese

10.1 Samples for Home and Garden

Manganese (lbs Mn/acre Morgan extraction) in samples for home and garden:

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
1995	7	1	8	88	13	100
1996	45	3	48	94	6	100
1997	16	16	32	50	50	100
1998	13	1	14	93	7	100
1999	12	0	12	100	0	100
2000	9	0	9	100	0	100
2001	8	1	9	89	11	100
Total	110	22	132	83	17	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	17	12	19	16	21	23	24	
Highest:	134	189	172	111	58	65	133	
Mean:	49	34	95	51	40	39	60	
Median:	38	26	98	48	36	35	44	

10.2 Samples for Commercial Production

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
1995	113	6	119
1996	191	2	193
1997	207	2	209
1998	264	0	264
1999	309	3	312
2000	442	8	450
2001	165	0	165
Total	1691	21	1712

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	95	5	100
	99	1	100
	99	1	100
	100	0	100
	99	1	100
	98	2	100
	100	0	100
	99	1	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	6	9	8	11	8	4	7	
Highest:	431	188	105	92	194	156	90	
Mean:	40	36	36	32	32	30	28	
Median:	26	31	34	28	29	25	25	

11. Zinc

11.1 Samples for Home and Garden

Zinc (lbs Zn/acre Morgan extraction) in samples for home and garden:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
1995	0	1	7	8
1996	0	6	42	48
1997	0	1	31	32
1998	0	1	13	14
1999	0	1	11	12
2000	0	2	7	9
2001	0	1	8	9
Total	0	13	119	132

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	13	88	100
0	13	88	100
0	3	97	100
0	7	93	100
0	8	92	100
0	22	78	100
0	11	89	100
0	10	90	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	0.6	0.7	1.0	0.8	0.7	1.0	
Highest:	8.9	22.4	127.7	33.6	53.2	23.3	55.6	
Mean:	4.6	5.5	15.3	4.1	8.5	6.4	26.2	
Median:	4.9	5.4	7.3	1.4	2.9	2.8	22.7	

11.2 Samples for Commercial Production

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

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
1995	5	35	79	119
1996	2	53	138	193
1997	4	57	148	209
1998	13	63	188	264
1999	20	77	215	312
2000	15	120	315	450
2001	3	40	122	165
Total	62	445	1205	1712

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	29	66	100
1	27	72	100
2	27	71	100
5	24	71	100
6	25	69	100
3	27	70	100
2	24	74	100
4	26	70	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.1	0.4	0.1	0.1	0.1	0.1	
Highest:	164.5	6.6	14.8	69.8	34.8	28.6	9.1	
Mean:	4.6	1.7	2.0	2.1	2.0	1.8	1.9	
Median:	1.4	1.4	1.4	1.4	1.5	1.4	1.5	

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
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
PNE	Pasture native grasses, Established
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
APR	Apricots

Crop Code	Crop Description
ASP	Asparagus
ATF	Athletic Field
BDR/BND	Beans-dry
BLU/BLB	Blueberries
BSP	Barley, Spring
BSS	Barley, Spring with legumes
CBP	Cabbage, Transplanted
CBS	Cabbage, Seeded
CEM	Cemetery
EGG	Eggplants
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GRA	Grapes
GRF	Grapes, French-American
GRV	Grapes, Vinifera
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
NUR	Nursery
ONS	Onion-seeded
OTH	Other
PAR	Pears
PCH	Peaches
PEP	Peppers
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
ROU	Rough
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)

Crop Code	Crop Description
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUB	Summer flowering bulbs
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing