Ketterings, Q.M., H. Krol, W.S. Reid and J. van der Heide (2004). Oswego County Soil Sample Survey 1995-2001. CSS Extension Bulletin E04-22. 37 pages.

Soil Sample Survey

Oswego Co.

Samples analyzed by CNAL in 1995-2001

Onion cultivation in Oswego County.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid & Jan van der Heide

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

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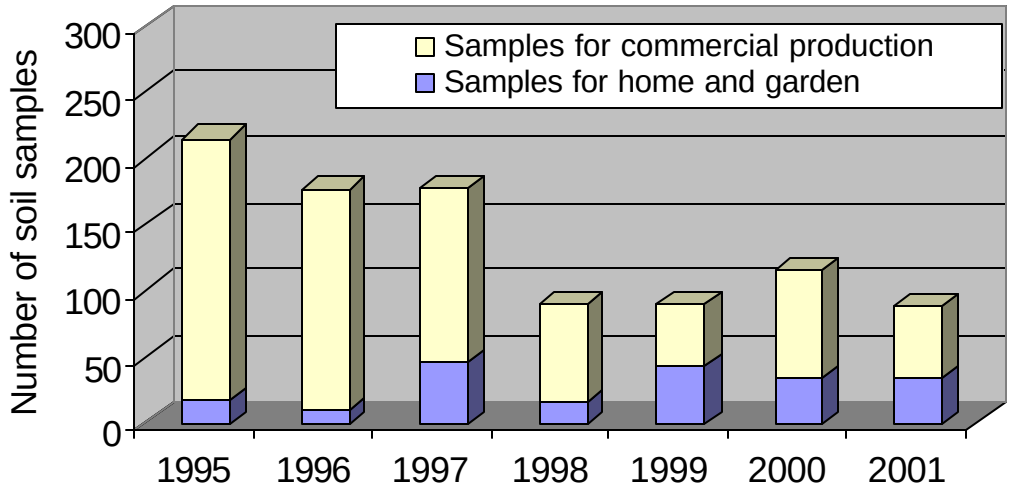
1. General Survey Summary

This survey summarizes the soil test results from Oswego 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 953. Of these 953 samples, 755 (79%) were submitted to obtain fertilizer recommendations for commercial production while 198 samples (21%) were submitted as home and garden samples.



Homeowners	
1995	17
1996	10
1997	47
1998	15
1999	42
2000	33
2001	34
Total	198

Commercial	
1995	198
1996	167
1997	131
1998	75
1999	48
2000	82
2001	54
Total	755

Total
215
177
178
90
90
115
88
953

Many of the home and garden (32%) were submitted to request fertilizer recommendations for home garden vegetable recommendation while 27% of the samples were submitted to obtain recommendations for athletic fields and 24% came from home lawns. People submitting samples for commercial production requested fertilizer recommendations for onion production (20%), corn silage or grain production (16%), alfalfa or alfalfa/grass mixtures (14%), while fewer samples were submitted for other crops including clover/grass and legume stands for hay production, small grains, soybeans, sweet corn, apples, vegetables, Christmas trees, and fruits.

Home and garden samples in Yates County were silty (23%), silt loams (14%), sandy loams (32%) or sandy (31%) belonging to soil management group 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, 30% belonged to soil management group 6, the muck soils. One percent belonged to soil management group 1 while 8% were classified as group 3 soils. Group 4 and 5 were represented with 30 and 24% of all

samples, respectively, with regards to soil management group. The five most common soil series were Carlisle (27%), Williamson (11%0, Alton (8%), Raynham (5%) and Oakville (5%). Carlisle is a much soil that represents 3% of the counties acreage. Williamson and Alton are each representing 3% of all acres in the county while Raynham represents 4% and Oakville represents 1% of the total 619,520 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 60% for a few muck soils with median values ranging from 3.2 to 5.0% organic matter for home and garden samples and 3.4 to 5.7% for samples submitted for commercial production. Sixty-five percent of the home and garden samples had between 2.0 and 4.9% organic matter with 17% testing between 2.0 and 2.9% organic matter, 26% between 3.0 and 3.9% organic matter, and 22% between 4.0 and 4.9% organic matter. Twenty-seven percent of the soils submitted for home and garden tested >4.9% in organic matter while 8% had less than 2.0% organic matter. Of the samples submitted for commercial production, 11% contained between 1.0 and 1.9% organic matter, while 16% had between 2.0 and 2.9% organic matter and 20% contained between 3.0 and 3.9% organic matter. Thirty percent of the samples (mostly the muck soils) contained more than 6.9% organic matter. In total, 48% of the samples had less than 4.0% organic matter while 52% tested higher in organic matter.

Soil pH in water (1:1 extraction ratio) varied from pH 4.0 to pH 8.1 with the median for home and garden samples ranging from pH 6.1 to pH 6.9 and for samples submitted for commercial production ranging from pH 5.6 to pH 6.4. Of the home and garden samples, 82% had a pH of 6.0 or higher. For the samples submitted for commercial production, this was 50% while 45% tested between pH 5.0 and pH 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, 19% tested low, 24% tested medium, 34% tested high and 23% tested very high.

This meant that 57% tested high or very high in P. For the commercial samples, 29% tested very high in P. Nineteen percent were low in P, 20% tested medium for P while 32% of the submitted samples were classified as high in soil test P. Thus, 62% of all samples tested high or very high in P. Of the 229 muck soils, 198 (86%) tested 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, less than 8% were classified as very low in potassium, 19% were classified as low in plant available K, a little less than 15% tested medium, 25% tested high and 34% tested very high in potassium. For samples submitted for commercial production, 7% tested very low, 19% tested low, 16% tested medium, another 16% tested high and 36% tested very high in plant available potassium with the remainder being 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 7 to more than 9,000 lbs Mg/acre (Morgan extraction). There were only three home and garden samples and five commercial production samples that tested very low in Mg. Most soils tested high or very high for Mg (89% of the homeowner soils and 80% of the soils of the commercial growers). Ten percent of the home and garden samples and 20% of the commercial production samples tested low or medium in Mg. Thus, for 80-90% of the samples, magnesium deficiency is not likely to occur 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. Iron levels fell for 94-95% in the normal range with 5% of the home and garden samples and 6% of the samples for commercial production testing excessive for Fe. Similarly, most soils (96% for both groups) 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, 77% tested high for zinc while 20% tested medium and 3% were low in zinc. Of the samples for commercial production, 3% tested low in zinc, 21% tested medium while 76% 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	0	26	5	8	9	6	54	27
BLU	0	0	0	0	1	0	0	1	1
CEM	0	0	0	0	0	2	0	2	1
FAR	0	0	0	0	0	0	3	3	2
GEN	0	0	0	1	0	0	0	1	1
GRA	0	0	0	0	1	0	0	1	1
LAW	4	0	8	0	11	14	10	47	24
MVG	9	6	10	6	16	7	9	63	32
OTH	0	0	1	0	3	1	6	11	6
PER	1	2	1	1	1	0	0	6	3
SAG	3	2	1	2	0	0	0	8	4
STR	0	0	0	0	1	0	0	1	1
Total	17	10	47	15	42	33	34	198	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	4	1	1	2	2	0	1	11	1
AGE/AGT	35	15	6	2	3	7	5	73	10
ALE/ALT	5	7	2	0	5	3	0	22	3
APP	1	0	1	2	1	1	0	6	1
ASP	1	0	0	0	0	0	0	1	0
BCE/BCT	0	0	1	0	2	0	0	3	0
BGE/BGT	3	1	1	0	0	2	0	7	1
BLB	1	6	9	10	4	17	0	47	6
BNS	0	0	0	0	0	0	2	2	0
BRP	1	0	0	0	0	2	0	3	0
BSE	1	0	0	0	0	0	0	1	0
BUK	0	0	0	0	0	0	2	2	0
CAR	0	0	1	0	0	0	0	1	0
CGE/CGT	4	2	2	1	0	1	1	11	1
CHC	1	3	0	0	0	0	0	4	1
CKP	0	0	0	0	0	0	1	1	0
CKS	1	0	0	0	0	0	0	1	0
CLE/CLT	4	2	2	0	0	1	3	12	2
COG/COS	32	33	14	22	7	7	6	121	16
GIE/GIT	0	0	0	1	1	0	0	2	0
GPA	0	0	0	0	0	0	1	1	0
GPF	0	0	0	0	1	0	0	1	0
GRE/GRT	7	3	8	2	6	4	6	36	5
IDL	2	0	2	0	0	6	0	10	1
LET	16	0	6	0	0	10	0	32	4
MIX	1	2	1	0	0	1	1	6	1
MML	0	0	0	0	0	0	1	1	0
OAS	7	15	5	3	3	0	1	34	5
OAT	6	2	0	1	0	0	0	9	1
ONP	0	7	1	0	0	0	0	8	1
ONS	43	9	45	18	0	12	17	144	19
OTH	0	5	1	0	0	3	0	9	1
PEA	1	0	0	0	0	0	0	1	0
PGE/PGT	0	0	0	0	0	0	1	1	0
PIE/PIT	0	0	9	0	0	0	0	9	1

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
PLE/PLT	0	0	0	0	0	0	1	1	0
PNE/PNT	3	0	2	0	1	2	0	8	1
POT	5	1	0	0	0	0	1	7	1
PUM	2	1	0	0	2	2	0	7	1
RHU	1	0	0	0	0	0	0	1	0
RSF	0	0	2	0	0	0	0	2	0
RSP	0	0	0	1	0	1	0	2	0
RSS	1	0	0	3	0	0	0	4	1
RYC	1	44	0	0	0	0	0	45	6
RYS	1	0	0	0	0	0	0	1	0
SOY	0	0	0	0	1	0	0	1	0
SQW	0	0	0	1	2	0	0	3	0
SSH	0	0	2	0	1	0	0	3	0
STS	2	3	0	0	1	0	0	6	1
SWC	3	1	2	1	2	0	0	9	1
TOM	0	0	1	0	0	0	1	2	0
TRE/TRT	0	4	4	2	1	0	2	13	2
TRP	0	0	0	2	0	0	0	2	0
TUR	0	0	0	0	2	0	0	2	0
Unknown	2	0	0	1	0	0	0	3	0
Total	198	167	131	75	48	82	54	755	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)	4	1	24	1	7	5	3	45
SMG 3 (silt loam)	4	0	8	1	3	7	5	28
SMG 4 (sandy loam)	3	4	10	7	14	13	12	63
SMG 5 (sandy)	6	5	5	6	18	8	14	62
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	17	10	47	15	42	33	34	198

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Adams	5	0	0	2	1	0	0	0	3
Alton	5	22	24	10	4	0	0	2	62
Amboy	4	6	8	2	3	2	4	1	26
Canandaigua	3	1	11	1	0	0	2	0	15
Carlisle	6	59	43	49	19	0	20	17	207
Colton	5	0	2	0	0	3	1	0	6
Deerfield	5	5	0	0	0	1	0	1	7
Empeyville	4	4	1	0	2	0	1	0	8
Fredon	4	0	0	1	0	0	0	0	1
Herkimer	3	0	1	0	0	0	0	0	1
Hinckley	5	0	7	2	5	3	0	0	17
Hudson	2	0	1	0	0	0	0	0	1
Ira	4	14	5	5	4	6	0	4	38
Lamson	4	0	1	1	1	0	0	0	3
Madalin	1	0	0	0	0	0	1	0	1
Middlebury	3	0	0	1	0	0	0	0	1
Minoa	4	4	1	0	1	0	1	0	7
Naumburg	5	2	2	0	1	2	0	0	7
Oakville	5	3	1	9	9	5	11	1	39
Palms	6	2	4	0	0	0	16	0	22
Raynham	3	6	11	5	7	3	7	1	40
Rhinebeck	2	2	2	1	1	1	0	0	7
Scriba	4	4	4	4	0	3	1	5	21
Sodus	4	4	5	1	2	0	0	1	13
Sun	4	0	0	1	0	0	0	0	1
Williamson	4	38	9	4	9	9	4	13	86
Windsor	5	11	15	6	1	0	1	4	38
Worth	4	0	8	6	1	2	4	4	25
Unknown	-	11	1	20	4	8	8	0	52
Total	-	198	167	131	75	48	82	54	755

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	3	2	1	7	0	1	3	17
1996	0	0	1	7	0	1	1	0	10
1997	1	1	4	7	10	16	3	5	47
1998	0	1	3	2	4	2	1	2	15
1999	0	1	9	15	8	7	2	0	42
2000	1	3	5	9	10	2	2	1	33
2001	0	5	9	10	5	3	1	1	34
Total	2	14	33	51	44	31	11	12	198

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.6	2.1	0.2	1.8	1.7	0.9	1.3	
Highest:	12.0	6.1	12.7	21.4	6.9	19.7	19.2	
Mean:	4.7	3.8	4.9	5.6	3.9	4.2	3.8	
Median:	4.2	3.8	5.0	4.5	3.8	3.8	3.2	

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	18	12	6	41	0	6	18	100
1996	0	0	10	70	0	10	10	0	100
1997	2	2	9	15	21	34	6	11	100
1998	0	7	20	13	27	13	7	13	100
1999	0	2	21	36	19	17	5	0	100
2000	3	9	15	27	30	6	6	3	100
2001	0	15	26	29	15	9	3	3	100
Total	1	7	17	26	22	16	6	6	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	1	18	44	38	24	9	3	61	198
1996	3	15	31	38	31	13	3	33	167
1997	0	17	11	16	14	12	7	54	131
1998	0	8	12	13	11	7	3	21	75
1999	0	7	12	13	13	0	0	3	48
2000	1	9	9	19	7	3	0	34	82
2001	0	6	4	14	10	2	0	18	54
Total	5	80	123	151	110	46	16	224	755

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.9	0.4	1.1	1.4	1.1	0.9	1.4	
Highest:	60.9	58.5	75.6	58.6	18.3	56.0	57.9	
Mean:	18.5	3.6	22.5	15.2	3.8	16.6	19.1	
Median:	3.8	3.4	5.7	4.3	3.7	4.2	4.1	

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	1	9	22	19	12	5	2	31	100
1996	2	9	19	23	19	8	2	20	100
1997	0	13	8	12	11	9	5	41	100
1998	0	11	16	17	15	9	4	28	100
1999	0	15	25	27	27	0	0	6	100
2000	1	11	11	23	9	4	0	41	100
2001	0	11	7	26	19	4	0	33	100
Total	1	11	16	20	15	6	2	30	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	0	0	0	1	2	6	4	4	0	0	17
1996	0	1	2	1	2	1	2	0	1	0	10
1997	0	1	1	3	5	15	19	2	1	0	47
1998	0	0	0	2	2	5	6	0	0	0	15
1999	0	0	0	5	7	11	13	6	0	0	42
2000	0	1	3	4	6	10	5	3	1	0	33
2001	0	1	4	6	9	4	8	2	0	0	34
Total	0	4	10	22	33	52	57	17	3	0	198

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.9	4.8	4.9	5.6	5.6	4.9	4.9	
Highest:	7.9	8.0	8.1	7.3	7.9	8.0	7.8	
Mean:	-	-	-	-	-	-	-	
Median:	6.9	6.1	6.9	6.9	6.9	6.6	6.4	

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	0	0	0	6	12	35	24	24	0	0	100
1996	0	10	20	10	20	10	20	0	10	0	100
1997	0	2	2	6	11	32	40	4	2	0	100
1998	0	0	0	13	13	33	40	0	0	0	100
1999	0	0	0	12	17	26	31	14	0	0	100
2000	0	3	9	12	18	30	15	9	3	0	100
2001	0	3	12	18	26	12	24	6	0	0	100
Total	0	2	5	11	17	26	29	9	2	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	2	23	60	55	44	12	2	0	0	198
1996	6	1	18	26	57	33	22	4	0	0	167
1997*	7	10	32	53	14	10	4	0	0	0	130
1998	0	3	19	29	8	13	3	0	0	0	75
1999	2	3	8	12	16	4	3	0	0	0	48
2000	1	5	10	18	14	18	7	9	0	0	82
2001	0	0	19	13	9	7	6	0	0	0	54
Total	16	24	129	211	173	129	57	15	0	0	754

*One sample was not analyzed for pH in 1997.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.9	4.0	4.0	4.8	3.9	4.3	5.0	
Highest:	7.9	7.8	7.2	7.1	7.2	7.9	7.4	
Mean:	-	-	-	-	-	-	-	
Median:	6.0	6.4	5.6	5.7	5.9	6.2	5.8	

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	1	12	30	28	22	6	1	0	0	100
1996	4	1	11	16	34	20	13	2	0	0	100
1997	5	8	25	41	11	8	3	0	0	0	100
1998	0	4	25	39	11	17	4	0	0	0	100
1999	4	6	17	25	33	8	6	0	0	0	100
2000	1	6	12	22	17	22	9	11	0	0	100
2001	0	0	35	24	17	13	11	0	0	0	100
Total	2	3	17	28	23	17	8	2	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	1	3	5	3	1	0	1	1	2	17
1996	0	3	3	1	0	0	1	1	0	1	10
1997	0	4	6	20	7	5	3	2	0	0	47
1998	0	1	4	4	0	4	0	2	0	0	15
1999	0	4	14	15	3	2	1	2	0	1	42
2000	0	14	7	10	1	0	0	1	0	0	33
2001	0	11	10	12	0	0	0	0	0	1	34
Total	0	38	47	67	14	12	5	9	1	5	198

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	2	1	2	1	1	1	
Highest:	648	246	127	142	212	140	751	
Mean:	102	48	39	42	28	13	31	
Median:	27	7	34	25	11	6	7	

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	6	18	29	18	6	0	6	6	12	100
1996	0	30	30	10	0	0	10	10	0	10	100
1997	0	9	13	43	15	11	6	4	0	0	100
1998	0	7	27	27	0	27	0	13	0	0	100
1999	0	10	33	36	7	5	2	5	0	2	100
2000	0	42	21	30	3	0	0	3	0	0	100
2001	0	32	29	35	0	0	0	0	0	3	100
Total	0	19	24	34	7	6	3	5	1	3	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	36	32	65	4	4	4	19	24	10	198
1996	0	34	42	64	10	4	1	9	3	0	167
1997	0	13	29	37	4	3	1	29	14	1	131
1998	0	12	20	23	2	2	1	4	9	2	75
1999	0	19	15	13	1	0	0	0	0	0	48
2000	0	11	9	26	13	2	4	6	2	9	82
2001	0	19	7	10	0	0	0	12	5	1	54
Total	0	144	154	238	34	15	11	79	57	23	755

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:	241	181	223	768	58	300	1458	
Mean:	55	11	57	52	8	62	75	
Median:	16	6	17	12	5	21	12	

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
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
1995	0	18	16	33	2	2	2	10	12	5	100
1996	0	20	25	38	6	2	1	5	2	0	100
1997	0	10	22	28	3	2	1	22	11	1	100
1998	0	16	27	31	3	3	1	5	12	3	100
1999	0	40	31	27	2	0	0	0	0	0	100
2000	0	13	11	32	16	2	5	7	2	11	100
2001	0	35	13	19	0	0	0	22	9	2	100
Total	0	19	20	32	5	2	1	10	8	3	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	1	3	4
1996	0	0	0	1	0	1
1997	0	0	0	3	21	24
1998	0	0	0	1	0	1
1999	0	0	0	1	6	7
2000	1	0	0	1	3	5
2001	0	0	1	2	0	3
Total (#)	1	0	1	10	33	45
Total (%)	2	0	2	22	73	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	2	0	1	4
1996	0	0	0	0	0	0
1997	0	1	0	1	6	8
1998	0	0	0	0	1	1
1999	0	1	0	1	1	3
2000	0	2	1	3	1	7
2001	0	1	2	1	1	5
Total (#)	0	6	5	6	11	28
Total (%)	0	21	18	21	39	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	1	2	3
1996	0	1	1	2	0	4
1997	0	1	2	3	4	10
1998	0	0	1	2	4	7
1999	2	3	4	5	0	14
2000	2	2	2	3	4	13
2001	2	2	3	3	2	12
Total (#)	6	9	13	19	16	63
Total (%)	10	14	21	30	25	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	2	0	3	1	6
1996	1	2	1	0	1	5
1997	1	1	1	2	0	5
1998	1	0	1	3	1	6
1999	1	7	3	3	4	18
2000	4	2	1	1	0	8
2001	0	9	3	2	0	14
Total (#)	8	23	10	14	7	62
Total (%)	13	37	16	23	11	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	3	2	5	7	17
1996	1	3	2	3	1	10
1997	1	3	3	9	31	47
1998	1	0	2	6	6	15
1999	3	11	7	10	11	42
2000	7	6	4	8	8	33
2001	2	12	9	8	3	34
Total #	15	38	29	49	67	198

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	64	34	25	54	35	11	37	
Highest:	1010	419	3306	526	784	462	764	
Mean:	324	158	310	250	189	160	140	
Median:	205	139	262	218	147	123	101	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	18	12	29	41	100
1996	10	30	20	30	10	100
1997	2	6	6	19	66	100
1998	7	0	13	40	40	100
1999	7	26	17	24	26	100
2000	21	18	12	24	24	100
2001	6	35	26	24	9	100
Grand Total	8	19	15	25	34	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	1	0	0	1
2001	0	0	0	0	0	0
Total (#)	0	0	1	0	0	0
Total (%)	0	0	100	0	0	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	1	1	2
1996	0	0	1	0	2	3
1997	0	0	0	1	0	1
1998	0	0	0	1	0	1
1999	0	0	0	0	1	1
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	1	3	4	8
Total (%)	0	0	13	38	50	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	1	2	0	0	4	7
1996	0	14	2	2	5	23
1997	0	1	2	3	1	7
1998	0	0	1	5	1	7
1999	0	0	2	0	1	3
2000	0	3	2	2	2	9
2001	0	1	0	0	0	1
Total (#)	1	21	9	12	14	57
Total (%)	2	37	16	21	25	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	5	16	22	15	16	74
1996	2	13	13	11	3	42
1997	1	11	9	3	1	25
1998	0	4	5	9	5	23
1999	1	4	9	4	4	22
2000	0	7	1	5	2	15
2001	9	10	5	1	3	28
Total (#)	18	65	64	48	34	229
Total (%)	8	28	28	21	15	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	4	12	9	11	7	43
1996	3	11	11	14	12	51
1997	0	13	7	5	4	29
1998	1	5	5	9	1	21
1999	5	5	2	1	1	14
2000	1	5	4	3	0	13
2001	2	1	3	0	2	8
Total (#)	16	52	41	43	27	179
Total (%)	9	29	23	24	15	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	1	60	61
1996	15	3	2	5	22	47
1997	0	0	0	2	47	49
1998	0	0	0	3	16	19
1999	0	0	0	0	0	0
2000	0	1	2	5	28	36
2001	0	0	0	0	17	17
Total (#)	15	4	4	16	190	229
Total (%)	7	2	2	7	83	100

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

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	10	30	31	28	88	11	198
1996	20	41	29	32	44	1	167
1997	1	25	18	14	53	20	131
1998	1	9	11	27	23	4	75
1999	6	9	13	5	7	8	48
2000	1	16	10	15	32	8	82
2001	11	12	8	1	22	0	54
Grand Total	50	142	120	122	269	52	755

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	32	28	43	35	17	7	34	
Highest:	1487	1351	1570	3902	502	1350	21070	
Mean:	383	164	310	355	149	312	718	
Median:	223	120	188	187	134	187	127	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	5	15	16	14	44	6	100
1996	12	25	17	19	26	1	100
1997	1	19	14	11	40	15	100
1998	1	12	15	36	31	5	100
1999	13	19	27	10	15	17	100
2000	1	22	12	18	39	10	100
2001	20	22	15	2	41	0	100
Grand Total	7	19	16	16	36	7	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	2	2	13	17
1996	0	1	1	6	2	10
1997	1	0	0	5	41	47
1998	0	0	0	3	12	15
1999	0	1	1	12	28	42
2000	2	1	2	7	21	33
2001	0	5	5	10	14	34
Total	3	8	11	45	131	198

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	72	25	13	141	56	7	27	
Highest:	1491	484	2133	1064	750	1118	1351	
Mean:	423	174	471	404	303	291	217	
Median:	315	156	455	308	274	232	163	

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	12	12	75	100
1996	0	10	10	60	20	100
1997	2	0	0	11	87	100
1998	0	0	0	20	80	100
1999	0	2	2	29	67	100
2000	6	3	6	21	64	100
2001	0	15	15	29	41	100
Total	2	4	6	23	66	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	14	16	44	124	198
1996	0	20	12	33	102	167
1997	2	15	9	22	83	131
1998	0	9	8	13	45	75
1999	2	9	8	12	17	48
2000	0	11	5	4	62	82
2001	1	6	7	12	28	54
Total	5	84	65	140	461	755

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	21	21	15	22	7	24	18	
Highest:	9180	5787	5678	5649	549	3593	6598	
Mean:	1219	286	1225	956	180	947	1016	
Median:	292	232	331	248	138	437	220	

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	7	8	22	63	100
1996	0	12	7	20	61	100
1997	2	11	7	17	63	100
1998	0	12	11	17	60	100
1999	4	19	17	25	35	100
2000	0	13	6	5	76	100
2001	2	11	13	22	52	100
Total	1	11	9	19	61	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	17	0	17
1996	8	2	10
1997	46	1	47
1998	14	1	15
1999	41	1	42
2000	31	2	33
2001	31	3	34
Total	188	10	198

Percentages:

0-49	>49	Total
Normal	Excessive	
100	0	100
80	20	100
98	2	100
93	7	100
98	2	100
94	6	100
91	9	100
95	5	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	3	2	2	2	3	1	
Highest:	37	149	57	55	88	79	80	
Mean:	10	37	12	10	11	15	19	
Median:	6	19	10	7	7	8	9	

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	192	6	198
1996	160	7	167
1997	122	9	131
1998	64	11	75
1999	42	6	48
2000	76	6	82
2001	51	3	54
Total	707	48	755

Percentages:

0-49	>49	Total
Normal	Excessive	
97	3	100
96	4	100
93	7	100
85	15	100
88	13	100
93	7	100
94	6	100
94	6	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	1	2	2	3	2	2	
Highest:	120	353	190	140	1949	423	219	
Mean:	13	14	16	23	65	20	17	
Median:	8	10	10	12	17	9	9	

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:

	0-99	>99	Total
	Normal	Excessive	
1995	16	1	17
1996	10	0	10
1997	47	0	47
1998	15	0	15
1999	40	2	42
2000	32	1	33
2001	31	3	34
Total	191	7	198

Percentages:

0-99	>99	Total
Normal	Excessive	
94	6	100
100	0	100
100	0	100
100	0	100
95	5	100
97	3	100
91	9	100
96	4	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5	4	9	5	10	4	2	
Highest:	100	89	87	50	404	116	114	
Mean:	35	31	48	22	39	32	31	
Median:	34	20	51	20	26	24	26	

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	187	11	198
1996	161	6	167
1997	123	8	131
1998	70	5	75
1999	48	0	48
2000	81	1	82
2001	54	0	54
Total	724	31	755

Percentages:

0-99	>99	Total
Normal	Excessive	
94	6	100
96	4	100
94	6	100
93	7	100
100	0	100
99	1	100
100	0	100
96	4	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4	4	5	4	3	4	6	
Highest:	290	194	143	515	95	205	76	
Mean:	35	30	45	47	31	27	31	
Median:	23	25	38	26	28	22	26	

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	2	15	17
1996	0	0	10	10
1997	1	10	36	47
1998	1	1	13	15
1999	2	12	28	42
2000	0	9	24	33
2001	2	6	26	34
Total	6	40	152	198

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	12	88	100
0	0	100	100
2	21	77	100
7	7	87	100
5	29	67	100
0	27	73	100
6	18	76	100
3	20	77	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.7	1.1	0.4	0.4	0.1	0.5	0.4	
Highest:	57.3	8.9	27.8	16.7	18.0	23.7	55.6	
Mean:	9.4	3.5	3.4	5.4	3.5	5.3	5.5	
Median:	4.1	3.0	1.9	3.8	1.7	2.7	1.9	

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	11	38	149	198
1996	6	42	119	167
1997	1	23	107	131
1998	1	11	63	75
1999	2	12	34	48
2000	0	14	68	82
2001	1	18	35	54
Total	22	158	575	755

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
6	19	75	100
4	25	71	100
1	18	82	100
1	15	84	100
4	25	71	100
0	17	83	100
2	33	65	100
3	21	76	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.3	0.2	0.3	0.4	0.2	0.5	0.4	
Highest:	32.7	375.9	23.1	20.5	186.1	22.6	21.9	
Mean:	6.6	1.3	6.4	4.7	11.0	5.6	5.6	
Median:	1.9	1.2	2.4	2.1	1.8	2.5	1.7	

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
ATF	Athletic Field

Crop Code	Crop Description
ASP	Asparagus
BDR/BND	Beans, Dry
BLU/BLB	Blueberries
BNS	Beans, Snap
BRP	Broccoli, Transplanted
CAR	Carrots
CEM	Cemetery
CHC	Chinese cabbage
CKP	Cucumber, Transplanted
CKS	Cucumber, Seeded
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GPA	Grapes, American
GPF	Grapes, French-American
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
ONP	Onions, Transplanted
ONS	Onions, Seeded
OTH	Other
PEA	Peas
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
RHU	Rhubarb
ROD	Roadside
ROS	Roses
ROU	Rough
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer

Crop Code	Crop Description
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
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing
TUR	Turnips