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Soil Sample Survey

Steuben Co.

Samples analyzed by CNAL in 1995-2001

Corn in Steuben County.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid and Carl Albers

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

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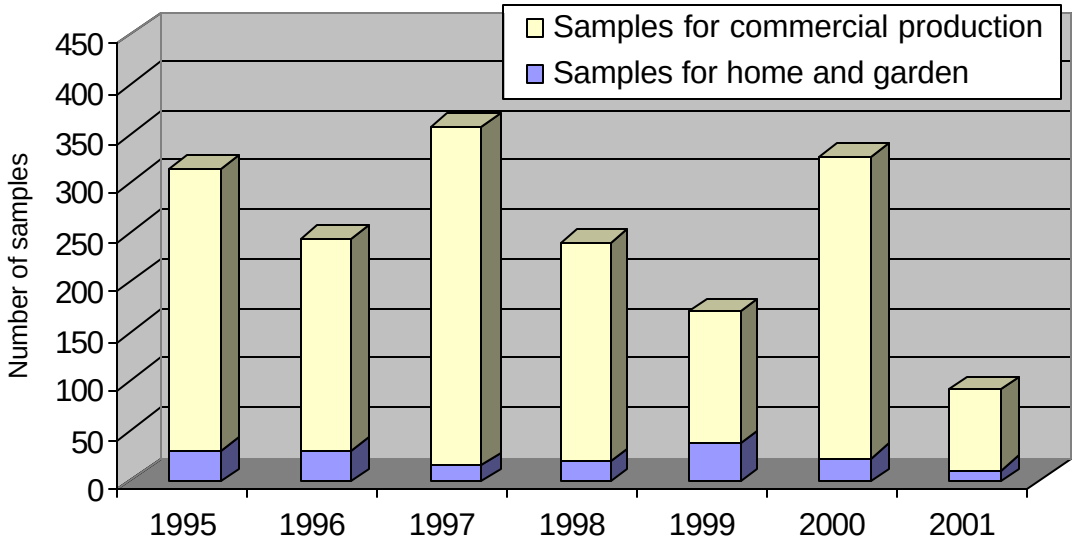
Table of Content

1. General Survey Summary

This survey summarizes the soil test results from Steuben 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 1743. Of these 1577 samples (90%) were submitted to obtain fertilizer recommendations for commercial production while 166 samples (10%) was submitted as home and garden samples.



Homeowners		Commercial		Total
1995	30	1995	285	315
1996	31	1996	213	244
1997	15	1997	341	356
1998	19	1998	220	239
1999	37	1999	133	170
2000	23	2000	304	327
2001	11	2001	81	92
Total	166	Total	1577	1743

The majority (67%) of the home and garden soil samples during 1995-2001 was submitted to request fertilizer recommendations for lawns (41%) or for home garden vegetable production (26%). People submitting samples for commercial production requested fertilizer recommendations to grow alfalfa or alfalfa/grass mixtures (22%), corn silage or grain (27%), oats (16%), clover (8%), and grass hay (7%) while a few producers were planning on growing other crops including birdsfoot trefoil-grass or clover-grass mixtures, potatoes, Christmas trees, grapes, pasture, wheat, barley, sorghum-sudangrass hybrids, blueberries and apples. Home and garden samples in Steuben County were mostly sandy loam soils belonging to soil management group 4 (46%). Twenty one percent belonged to soil management group 2. Group 3 was represented with 27% of all samples and 4% was classified as sandy (soil management group 5). 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, 88% belonged to soil management group 3. One percent was from soil management group 4. None of the samples belonged to group 1 (fine-textured soils developed from clayey lake sediments and medium to fine-textured soils developed from lake sediments). Seven percent belonged to group 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 from recent alluvium). Group 5 (coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas) was represented by 2% of the samples. Only a few samples were classified as muck soil (soil management group 6). The five most common soil series were Mardin (24%), Volusia (23%), Howard (11%), Bath (8%) and Lordstown (6%). These soils represent 21% (Mardin), 21% (Volusia), 7% (Howard), 4% (Bath) and 17% (Lordstown) of the total 903,425 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 40%. Home and garden samples had between 2 and 5% organic matter (63% of all samples) with 26% testing between 2 and 2.9% organic matter, 17% between 3.0 and 3.9% and 20% between 4.0 and 4.9%. Eighteen percent of the soils submitted for home and garden tested higher than 4.9% organic matter. Of the samples submitted for commercial production, 34% contained between 3 and 4% organic matter and 33% tested between 4.0 and 4.9%. In total, 80% of the samples had organic matter levels between 2 and 5%.

Soil pH in water (1:1 extraction ratio) varied from pH 4.8 to 8.1. Of the home and garden samples, 74% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, this was 55% while 39% 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 lbs 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, 10% tested low, 16% tested medium, 45% tested high and 29% tested very high. This meant that 74% tested high or very high in P.

Phosphorus levels for samples for commercial production in Steuben County were lower than the state average (50% tests high or very high in P). Only 6% tested very high. Twenty nine percent was low in P, 27% tested medium for P while 38% of the submitted samples were classified as high in soil test P. This means that 44% tested high or very high in P and that for 94% of the fields, there would have been a P recommendation for corn. There were no clear trends in P levels over the 6 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 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 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, 10% were classified as low in potassium. Seventeen percent tested medium, 30% high and 43% very high. For samples submitted for commercial production, 1% tested very low in K, 9% tested low, 22% tested medium, 30% tested high and 38% tested very high in potassium. As with phosphorus, there were no trends over the 6 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 less than 20 to over 6000 lbs Mg/acre (Morgan extraction). There was only one field that tested very low in Mg. Most soils tested high or very high for Mg (99% of the homeowner soils and 97% of the soils of the commercial growers). No more than 1% of the homeowner soils and 3% of the commercial growers' soil tested low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Steuben 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. Iron levels fell for 89-92% in the normal range with 11% of the home and garden samples and 8% of the samples for commercial production testing excessive for Fe. Similarly, most soils (91-96%) 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. Zinc levels were much higher. Soils with less than 0.5 lbs Zinc per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lbs of Morgan extractable Zn per acre. If more than 1 lbs of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the home and garden samples, 91% tested high for zinc while 9% tested medium. Of the samples for commercial production, 6% tested low in zinc, 35% tested medium while 60% 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	%
ALG	0	0	0	1	3	3	0	7	4
ATF	0	0	0	1	2	1	0	4	2
BLU	0	0	0	0	0	1	0	1	1
CEM	0	0	0	0	0	3	0	3	2
FLA	1	0	0	0	1	1	1	4	2
GRA	1	0	0	0	1	0	0	2	1
IDL	0	1	0	0	0	0	0	1	1
LAW	13	21	11	5	12	3	3	68	41
MVG	12	4	3	9	7	6	2	43	26
OTH	0	0	0	1	4	0	0	5	3
PER	0	1	1	2	1	3	2	10	6
PRK	2	0	0	0	0	0	0	2	1
ROD	0	0	0	0	1	0	0	1	1
SAG	0	3	0	0	0	2	1	6	4
STR	0	1	0	0	0	0	0	1	1
TRF	1	0	0	0	0	0	2	3	2
Unknown	0	0	0	0	5	0	0	5	3
Total	30	31	15	19	37	23	11	166	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	16	5	12	1	4	1	0	39	2
AGE/AGT	36	37	49	69	11	62	12	276	18
ALE/ALT	8	0	16	2	2	6	3	37	2
APP	0	0	7	0	0	0	1	8	1
BCE/BCT	1	3	0	0	2	10	0	16	1
BGE/BGT	6	9	10	1	6	7	11	50	3
BLB	2	2	0	0	1	0	4	9	1
BND	1	0	0	0	0	0	0	1	0
BSP	2	0	5	0	2	8	0	17	1
BSS	6	2	5	0	0	1	0	14	1
BTE	0	0	2	0	0	0	0	2	0
BUK	2	1	0	1	0	1	1	6	0
CGE/CGT	2	22	15	12	9	41	6	107	7
CHC	0	2	0	0	0	0	0	2	0
CLE/CLT	7	0	0	3	3	4	0	17	1
COS/COG	77	40	108	68	26	82	18	419	27
GPA	0	0	11	1	10	5	0	27	2
GPF	1	28	9	1	3	4	0	46	3
GPV	1	0	1	1	2	0	0	5	0
GIE/GIT	2	0	0	1	0	0	0	3	0
GRE/GRT	20	11	25	11	14	26	1	108	7
HRB	0	0	3	0	0	0	0	3	0
IDL	1	2	0	0	0	10	0	13	1
LAW	0	0	0	0	0	0	1	1	0
LET	1	0	0	0	0	0	0	1	0
MIX	2	2	0	0	0	2	0	6	0
OAS	48	18	16	9	7	13	9	120	8
OAT	11	7	4	3	1	3	0	29	8
OTH	0	0	7	3	0	0	0	10	1
PEA	0	0	0	1	0	3	0	3	0
PGE/PGT	1	0	2	0	5	0	0	8	1
PIE/PIT	2	5	3	0	7	0	0	17	1
PLE/PLT	3	10	15	17	8	4	3	60	4
PNE/PNT	1	0	5	1	0	0	1	8	1
POT	12	0	0	0	0	0	0	12	1
RSS	0	1	2	0	0	0	1	4	0

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
RYC	3	0	0	1	0	1	1	6	0
RYS	3	0	0	0	0	0	1	4	0
SAG	0	0	0	0	0	0	1	1	0
SOY	2	0	0	0	0	0	0	2	0
SSH	0	0	0	2	0	0	6	8	1
STS	0	0	2	1	0	0	0	3	0
SWC	0	1	0	0	0	0	0	1	0
TME	1	0	0	0	0	0	0	1	0
TRE/TRT	1	1	2	10	6	5	0	25	2
WHS	0	0	3	0	2	0	0	5	0
WHT	1	2	2	0	2	4	0	11	1
Unknown	2	2	0	0	0	2	0	6	0
Total	285	213	341	220	133	304	81	1577	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)	10	7	3	5	6	3	1	35
SMG 3 (silt loam)	4	6	6	6	14	8	4	46
SMG 4 (sandy loam)	16	16	5	5	17	11	5	76
SMG 5 (sandy)	0	2	1	1	0	1	1	6
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	30	31	15	19	37	23	11	166

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Alton	5	7	0	3	5	8	3	7	33
Arnot	3	2	6	13	17	1	4	4	47
Bath	3	26	3	13	12	0	74	3	131
Braceville	4	5	0	3	1	0	3	0	12
Canandaigu	3	2	0	0	0	0	0	0	2
Canaseraga	3	2	0	0	0	0	0	0	2
Carlisle	6	0	2	0	0	0	0	0	2
Chenango	3	1	2	14	4	2	11	4	38
Chippewa	3	0	1	0	0	0	0	0	1
Fremont	2	4	4	4	8	1	16	0	37
Hornell	2	4	3	7	8	6	1	6	35
Howard	3	53	23	49	13	12	22	6	178
Kanona	2	0	1	8	0	0	1	0	10
Lackawanna	3	7	2	3	0	2	0	0	14
Lordstown	3	12	13	15	1	5	32	11	89
Madrid	4	1	0	0	0	0	0	1	2
Mardin	3	59	65	90	64	25	60	17	380
Middlebury	3	4	1	4	5	2	10	3	29
Morris	3	0	0	3	2	1	2	0	8
Oquaga	3	9	1	0	3	1	3	1	18
Ovid	2	0	0	3	1	4	4	0	12
Palms	6	1	0	0	0	0	0	0	1
Red Hook	4	1	0	0	0	0	0	0	1
Scio	3	1	0	0	0	0	0	0	1
Tioga	3	4	1	9	1	1	0	1	17
Tuller	3	0	5	12	0	1	0	0	18
Unadilla	3	2	0	0	0	0	3	0	5
Volusia	3	56	77	70	66	35	45	15	364
Wallington	3	3	0	0	0	0	0	0	3
Wayland	2	5	0	2	3	0	0	2	12
Wellsboro	3	8	0	4	4	18	4	0	38
Unknown	-	6	3	12	2	8	6	0	37
Total	-	285	213	341	220	133	304	81	1577

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	7	6	6	4	2	2	30
1996	0	2	6	6	7	5	3	2	31
1997	0	1	3	2	3	2	1	3	15
1998	0	3	3	1	4	2	3	3	19
1999	0	2	15	5	7	4	3	1	37
2000	0	2	7	6	4	1	0	3	23
2001	0	0	2	2	2	1	0	4	11
Total	0	13	43	28	33	19	12	18	166

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.5	1.7	1.8	1.7	1.8	1.5	2.5	
Highest:	42.4	9	10.2	8	11.9	19.1	37.7	
Mean:	5.2	4.3	4.8	4.6	3.8	4.3	8.8	
Median:	3.6	4.0	4.6	4.8	3.2	3.6	4.2	

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	10	23	20	20	13	7	7	100
1996	0	6	19	19	23	16	10	6	100
1997	0	7	20	13	20	13	7	20	100
1998	0	16	16	5	21	11	16	16	100
1999	0	5	41	14	19	11	8	3	100
2000	0	9	30	26	17	4	0	13	100
2001	0	0	18	18	18	9	0	36	100
Total	0	8	26	17	20	11	7	11	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	9	35	87	102	34	11	6	285
1996	0	4	37	66	68	28	6	4	213
1997	0	7	37	132	98	45	13	9	341
1998	1	0	37	67	74	26	11	4	220
1999	1	5	20	27	45	24	6	5	133
2000	0	0	25	124	116	28	7	4	304
2001	0	0	10	27	24	14	3	3	81
Total	3	25	201	530	527	199	57	35	1577

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.6	1.7	1.3	0.9	0.5	2	2.4	
Highest:	34.5	33.1	12.6	13.7	17.5	52.9	7.8	
Mean:	4.2	4.3	4.1	4.1	4.3	4.2	4.3	
Median:	4.0	3.9	3.9	4.0	4.1	4.0	4.0	

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	3	12	31	36	12	4	2	100
1996	0	2	17	31	32	13	3	2	100
1997	0	2	11	39	29	13	4	3	100
1998	0	0	17	30	34	12	5	2	100
1999	1	4	15	20	34	18	5	4	100
2000	0	0	8	41	38	9	2	1	100
2001	0	0	15	33	30	17	4	4	100
Total	0	2	13	34	33	13	4	2	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	3	4	10	7	5	1	0	0	30
1996	0	3	0	5	7	10	5	1	0	0	31
1997	0	0	1	2	7	2	2	1	0	0	15
1998	0	0	2	3	5	6	3	0	0	0	19
1999	0	0	2	6	11	9	5	4	0	0	37
2000	0	0	0	2	4	6	8	2	1	0	23
2001	0	0	0	2	2	4	3	0	0	0	11
Total	0	3	8	24	46	44	31	9	1	0	166

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.2	4.5	5.3	5.4	5.2	5.6	5.9	
Highest:	7.5	7.5	7.6	7.4	7.7	8.1	7.2	
Mean:	-	-	-	-	-	-	-	
Median:	6.3	6.5	6.3	6.4	6.4	6.9	6.6	

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	10	13	33	23	17	3	0	0	100
1996	0	10	0	16	23	32	16	3	0	0	100
1997	0	0	7	13	47	13	13	7	0	0	100
1998	0	0	11	16	26	32	16	0	0	0	100
1999	0	0	5	16	30	24	14	11	0	0	100
2000	0	0	0	9	17	26	35	9	4	0	100
2001	0	0	0	18	18	36	27	0	0	0	100
Total	0	2	5	14	28	27	19	5	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	2	7	30	79	103	63	1	0	0	0	285
1996	4	13	28	52	68	43	5	0	0	0	213
1997	18	14	42	105	111	45	6	0	0	0	341
1998	3	6	34	67	74	30	5	1	0	0	220
1999	7	7	18	31	27	28	13	2	0	0	133
2000	3	6	30	59	103	86	12	5	0	0	304
2001	1	4	13	29	20	13	1	0	0	0	81
Total	38	57	195	422	506	308	43	8	0	0	1577

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.2	4.0	2.2	4.1	3.8	4.3	4.4	
Highest:	7.2	7.2	7.2	7.5	7.5	7.7	7.1	
Mean:	-	-	-	-	-	-	-	
Median:	6.0	6.0	5.9	5.9	6.0	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	1	2	11	28	36	22	0	0	0	0	100
1996	2	6	13	24	32	20	2	0	0	0	100
1997	5	4	12	31	33	13	2	0	0	0	100
1998	1	3	15	30	34	14	2	0	0	0	100
1999	5	5	14	23	20	21	10	2	0	0	100
2000	1	2	10	19	34	28	4	2	0	0	100
2001	1	5	16	36	25	16	1	0	0	0	100
Total	2	4	12	27	32	20	3	1	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	11	6	10	0	0	1	0	0	2	30
1996	0	1	5	15	2	2	0	4	1	1	31
1997	0	0	3	8	1	1	0	0	0	2	15
1998	0	0	1	9	1	3	0	1	1	0	19
1999	0	4	8	15	6	1	0	1	0	2	37
2000	0	0	2	17	1	0	0	1	0	2	23
2001	0	1	2	1	2	1	0	0	0	4	11
Total	0	17	27	75	13	8	1	7	2	16	166

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	2	4	6	1	4	2	
Highest:	645	241	549	377	503	708	2474	
Mean:	45	47	74	83	42	76	403	
Median:	6	20	19	39	16	12	53	

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	37	20	33	0	0	3	0	0	7	100
1996	0	3	16	48	6	6	0	13	3	3	100
1997	0	0	20	53	7	7	0	0	0	13	100
1998	0	0	5	47	5	16	0	5	5	16	100
1999	0	11	22	41	16	3	0	3	0	5	100
2000	0	0	9	74	4	0	0	4	0	9	100
2001	0	9	18	9	18	9	0	0	0	36	100
Total	0	10	16	45	8	5	1	4	1	10	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	84	68	109	13	3	4	4	0	0	285
1996	0	92	64	53	2	0	0	2	0	0	213
1997	0	92	87	136	17	2	2	2	2	1	341
1998	0	58	78	77	5	2	0	0	0	0	220
1999	0	51	30	33	5	1	0	1	1	11	133
2000	0	48	76	162	11	4	0	2	0	1	304
2001	0	33	22	23	2	0	1	0	0	0	8181
Total	0	458	425	593	55	12	7	11	3	13	1577

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:	146	126	272	67	611	207	91	
Mean:	14	8	15	10	52	17	10	
Median:	7	4	8	5	5	13	5	

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	29	24	38	5	1	1	1	0	0	100
1996	0	43	30	25	1	0	0	1	0	0	100
1997	0	27	26	40	5	1	1	1	1	0	100
1998	0	26	35	35	2	1	0	0	0	0	100
1999	0	38	23	25	4	1	0	1	1	8	100
2000	0	16	25	53	4	1	0	1	0	0	100
2001	0	41	27	28	2	0	1	0	0	0	100
Total	0	29	27	38	3	1	0	1	0	1	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	2	3	4	1	10
1996	0	0	0	0	7	7
1997	0	0	0	2	1	3
1998	0	0	0	0	5	5
1999	0	0	0	3	3	6
2000	0	0	1	0	2	3
2001	0	0	0	1	0	1
Total (#)	0	2	4	10	19	35
Total (%)	0	6	11	29	54	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	2	1	1	0	4
1996	0	2	3	0	1	6
1997	0	1	2	3	0	6
1998	0	0	0	1	3	4
1999	0	1	1	8	4	14
2000	0	1	0	2	5	8
2001	0	1	0	1	2	4
Total (#)	0	8	7	16	15	46
Total (%)	0	17	15	35	33	100

	<55	55-99	100-149	150-239	>239	total
	Very Low	Low	Medium	High	Very High	
Unknown	0	0	0	0	0	0
1995	0	1	3	4	8	16
1996	0	2	3	3	8	16
1997	0	0	1	1	3	5
1998	0	0	0	1	5	6
1999	0	2	2	7	6	17
2000	0	0	4	4	3	11
2001	0	0	1	0	4	5
Total (#)	0	5	14	20	37	76
Total (%)	0	7	18	26	49	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	2	0	0	2
1997	0	0	0	1	0	1
1998	0	0	1	3	0	4
1999	0	0	0	0	0	0
2000	0	1	0	0	0	1
2001	0	0	0	0	1	1
Total (#)	0	1	3	4	1	9
Total (%)	0	11	33	44	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	Un-known	Total
1995	0	5	7	9	9	0	30
1996	0	4	8	3	16	0	31
1997	0	1	3	7	4	0	15
1998	0	0	1	5	13	0	19
1999	0	3	3	18	13	0	37
2000	0	2	5	6	10	0	23
2001	0	1	1	2	7	0	11
Total #	0	16	28	50	72	0	166

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	0	17	23	30	30	0	100
1996	0	13	26	10	52	0	100
1997	0	7	20	47	27	0	100
1998	0	0	5	26	68	0	100
1999	0	8	8	49	35	0	100
2000	0	9	22	26	43	0	100
2001	0	9	9	18	64	0	100
Grand Total	0	10	17	30	43	0	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	55	55	76	134	57	61	88	
Highest:	5161	916	1820	569	1622	1917	4221	
Mean:	451	284	303	314	290	288	859	
Median:	147	200	164	284	177	192	621	

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	1	2	5	6	14
1996	0	0	1	4	5	10
1997	0	1	5	8	16	30
1998	0	0	2	9	10	21
1999	0	0	1	4	9	14
2000	0	0	0	3	18	21
2001	0	0	1	3	4	8
Total (#)	0	2	12	36	68	118
Total (%)	0	2	10	31	58	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	1	20	50	68	113	252
1996	4	17	51	56	72	200
1997	2	24	79	102	99	306
1998	1	11	60	65	54	191
1999	2	8	22	25	49	106
2000	0	45	55	70	102	272
2001	0	8	16	28	14	66
Total (#)	10	133	333	414	503	1393
Total (%)	1	10	24	30	36	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	2	4	7
1996	0	0	0	0	0	0
1997	0	0	0	0	3	3
1998	0	1	0	0	0	1
1999	0	0	0	0	0	0
2000	0	2	0	1	0	3
2001	0	0	0	0	0	0
Total (#)	0	3	1	3	7	14
Total (%)	0	21	7	21	50	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	4	4	9
1996	0	0	0	0	0	0
1997	0	0	1	0	1	2
1998	0	0	1	1	3	5
1999	0	0	0	4	4	8
2000	0	0	1	1	1	3
2001	0	0	3	3	1	7
Total (#)	0	0	7	13	14	34
Total (%)	0	0	21	38	41	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	1	1	2
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	1	1	2
Total (%)	0	0	0	50	50	100

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

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	1	21	54	79	127	3	285
1996	4	17	52	62	134	1	213
1997	2	25	86	111	118	0	341
1998	1	12	63	75	67	2	220
1999	2	8	23	33	62	5	133
2000	0	47	56	75	121	5	304
2001	0	8	20	34	19	0	81
Grand Total	10	138	353	467	593	16	1577

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	0	7	19	28	45	1	100
1996	2	8	24	29	37	0	100
1997	1	7	25	32	35	0	100
1998	0	5	29	34	30	1	100
1999	2	6	17	25	47	4	100
2000	0	15	18	25	40	2	100
2001	0	10	25	42	23	0	100
Grand Total	1	9	22	30	38	1	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	33	38	34	42	40	47	46	
Highest:	1193	856	1147	763	1353	1743	947	
Mean:	224	184	201	189	257	212	184	
Median:	187	148	153	142	188	160	148	

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	2	27	30
1996	0	0	0	2	29	31
1997	0	0	0	1	14	15
1998	0	0	0	1	18	19
1999	0	0	0	9	28	37
2000	0	0	1	3	19	23
2001	0	0	0	0	11	11
Total	0	0	2	18	146	166

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	82	114	196	193	113	84	287	
Highest:	2439	979	1068	840	995	2108	7105	
Mean:	429	382	481	444	382	446	1148	
Median:	313	352	473	382	298	346	428	

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	3	7	90	100
1996	0	0	0	6	94	100
1997	0	0	0	7	93	100
1998	0	0	0	5	95	100
1999	0	0	0	24	76	100
2000	0	0	4	13	83	100
2001	0	0	0	0	100	100
Total	0	0	1	11	88	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	5	8	43	229	285
1996	0	2	4	33	174	213
1997	0	6	5	44	286	341
1998	0	2	4	33	181	220
1999	1	4	3	24	101	133
2000	0	3	5	34	262	304
2001	0	0	5	10	66	81
Total	1	22	34	221	1299	1577

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	25	25	36	53	16	37	69	
Highest:	1668	1180	882	888	1168	1204	789	
Mean:	356	361	385	354	407	376	368	
Median:	336	336	396	339	405	372	354	

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	2	3	15	80	100
1996	0	1	2	15	82	100
1997	0	2	1	13	84	100
1998	0	1	2	15	82	100
1999	1	3	2	18	76	100
2000	0	1	2	11	86	100
2001	0	0	6	12	81	100
Total	0	1	2	14	82	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	27	3	30
1996	27	4	31
1997	15	0	15
1998	18	1	19
1999	30	7	37
2000	21	2	23
2001	10	1	11
Total	148	18	166

Percentages:

0-49	>49	Total
Normal	Excessive	
90	10	100
87	13	100
100	0	100
95	5	100
81	19	100
91	9	100
91	9	100
89	11	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4	2	4	1	1	1	4	
Highest:	135	192	21	89	121	123	50	
Mean:	23	25	8	13	27	17	10	
Median:	15	6	8	7	17	5	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	259	26	285
1996	195	18	213
1997	319	22	341
1998	200	20	220
1999	110	23	133
2000	292	12	304
2001	72	9	81
Total	1447	130	1577

Percentages:

0-49	>49	Total
Normal	Excessive	
91	9	100
92	8	100
94	6	100
91	9	100
83	17	100
96	4	100
89	11	100
92	8	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	2	1	1	1	
Highest:	222	260	352	325	334	156	131	
Mean:	20	21	20	23	26	16	21	
Median:	11	13	10	13	11	10	12	

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	29	1	30
1996	28	3	31
1997	14	1	15
1998	19	0	19
1999	29	8	37
2000	22	1	23
2001	10	1	11
Total	151	15	166

Percentages:

0-99	>99	Total
Normal	Excessive	
97	3	100
90	10	100
93	7	100
100	0	100
78	22	100
96	4	100
91	9	100
91	9	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	24	12	22	11	10	19	
Highest:	154	118	127	82	254	201	184	
Mean:	36	49	49	42	68	37	54	
Median:	34	41	42	38	48	28	40	

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	276	9	285
1996	204	9	213
1997	324	17	341
1998	207	13	220
1999	127	6	133
2000	296	8	304
2001	79	2	81
Total	1513	64	1577

Percentages:

0-99	>99	Total
Normal	Excessive	
97	3	100
96	4	100
95	5	100
94	6	100
95	4	100
97	3	100
98	2	100
96	4	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	7	9	8	9	13	5	15	
Highest:	635	199	445	313	182	183	115	
Mean:	40	42	45	43	45	28	45	
Median:	31	36	36	32	38	22	41	

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	7	23	30
1996	0	1	30	31
1997	0	1	14	15
1998	0	0	19	19
1999	0	3	34	37
2000	0	3	20	23
2001	0	0	11	11
Total	0	15	151	166

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	23	77	100
0	3	97	100
0	7	93	100
0	0	100	100
0	8	92	100
0	13	87	100
0	0	100	100
0	9	91	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	0.8	0.6	1.7	0.9	0.7	1.3	
Highest:	67	53	36	126	36	30	48	
Mean:	6.8	10	8.3	16.2	7.4	5.8	14.4	
Median:	2.3	5.6	3.2	3.9	4.1	3.6	7.5	

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	20	96	169	285
1996	11	86	116	213
1997	12	108	221	341
1998	9	86	125	220
1999	13	36	84	133
2000	22	110	172	304
2001	3	23	55	81
Total	90	545	942	1577

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
7	34	59	100
5	40	54	100
4	32	65	100
4	39	57	100
10	27	63	100
7	36	57	100
4	28	68	100
6	35	60	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.2	0.1	0.2	0.1	0.1	0.2	
Highest:	131	159	562	58	33	118	15	
Mean:	3.1	2.3	7.5	1.8	3.3	1.9	2.0	
Median:	1.2	1.1	1.4	1.1	1.3	1.1	1.4	

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/BLB	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, Established
TRF	Turf
TRT	Christmas trees, Topdressing