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Soil Sample Survey

Jefferson Co.

Samples analyzed by CNAL in 1995-2001

Corn harvest in Jefferson County.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid and Mike Hunter

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

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Summary compiled by

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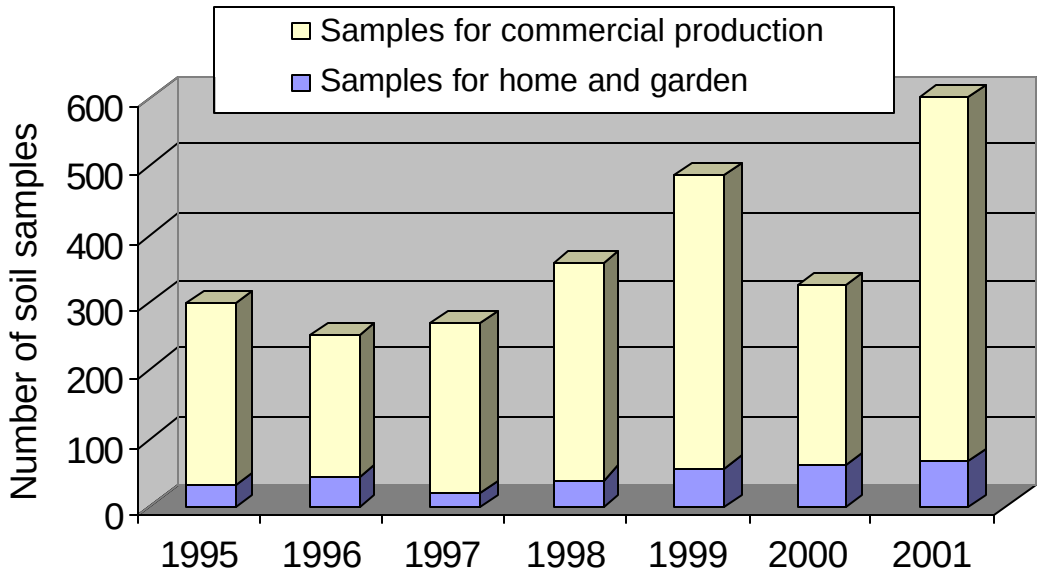
Table of Content

1. General Survey Summary

This survey summarizes the soil test results from Jefferson 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 2583. Of these 2266 samples (88%) were submitted to obtain fertilizer recommendations for commercial production while 317 samples (12%) was submitted as home and garden samples. The largest number of samples was submitted in 2001.



Homeowners		Commercial		Total
1995	32	1995	266	298
1996	41	1996	209	250
1997	21	1997	249	270
1998	40	1998	316	356
1999	55	1999	432	487
2000	61	2000	261	322
2001	67	2001	533	600
Total	317	Total	2266	2583

The majority (65%) of the home and garden soil samples during 1995-2001 were submitted to requested fertilizer recommendations for lawns or for home garden vegetable production. Samples submitted for commercial production requested fertilizer recommendations to grow alfalfa or alfalfa/grass mixes (29%), corn silage or grain (47%), and grass hay (7%) while a few producers were planning on growing other crops including barley, clover, oats and soybeans or grass for pasture.

Home and garden samples in Jefferson County were equally distributed over soil management groups 2, 3, 4 or 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, 39% belonged to soil management group 3 and 40% was from soil management group 4. A total of 7% was group 1 (fine-textured soils developed from clayey lake sediments and medium to fine-textured soils developed from lake sediments). Eight 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 6% of the samples. The five most common soil series were Collamer (22%), Galway (16%), Madrid and Nellis (6%) and Niagara (5%).

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 24%. Home and garden samples had between 2 and 5% (61% of all samples) with 23% testing between 3 and 4% organic matter. Of the samples submitted for commercial production, 34% contained between 3 and 4% organic matter. In total, 79% of the samples had organic matter levels between 2 and 5%.

Soil pH in water (1:1 extraction ratio) varied from 4.5 to over 8.3. Of the home and garden samples, 65% tested between 6.0 and 7.4 for pH. For the samples submitted for commercial production, this was 82%.

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 anything higher is classified as very high. Of the home and garden samples, 3% tested very low for phosphorus, 19% tested low, 16% tested medium, 28% tested high and 34% tested very high. This meant that 62% tested high or very high in P. Phosphorus levels for samples for commercial production in Jefferson County were lower than the state average (50% tests high or very high in P). Only 6% tested very high. Two percent was very low in P, 26% was low in P, 31% tested medium for P while 36% of the submitted samples were classified as high in soil test P. This means that 42% 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 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, 73% were classified as very low in potassium. Four percent tested medium, 7% high and 7% very high. For samples submitted for commercial production, only 3% tested very low in K, 18% tested low, 25% tested medium and 29% tested high and 25% 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 were only 29 fields that tested very low in Mg (one home or garden sample and 28 samples from fields in commercial production). Most soils tested very high or very high for Mg (93% of the homeowner soils and 92% of the soils of the commercial growers). No more than 7% of the homeowner soils and less than 8% of the commercial growers' soil tested low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Jefferson 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 94-99% in the normal range with only 6% of the home and garden samples and 1% of the samples for commercial production testing excessive for Fe. Similarly, most soils (98-100%) 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, 80% tested high for zinc while 14% tested medium. Of the samples for commercial production, 5% tested low in zinc, 26% tested medium while 69% was 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	%
APP	0	0	0	0	1	0	0	1	0
ATF	7	10	4	4	18	15	9	67	21
BLU	1	0	0	0	0	0	0	1	0
FLA	1	0	1	0	0	0	5	7	2
GEN	0	0	0	0	0	0	1	1	0
LAW	14	8	5	11	4	22	10	74	23
MVG	8	14	8	10	19	8	26	93	29
OTH	1	0	0	0	0	0	0	1	0
PER	0	5	0	2	5	11	5	28	9
PTO	0	1	1	1	1	0	0	4	1
ROS	0	0	0	4	0	0	0	4	1
RSP	0	0	0	0	0	1	1	2	1
SAG	0	2	2	8	5	3	10	30	9
STR	0	1	0	0	0	0	0	1	0
SPB	0	0	0	0	2	0	0	2	1
TRF	0	0	0	0	0	1	0	1	0
Unknown	0	0	0	0	0	0	0	0	0
Total	32	41	21	40	55	61	67	317	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	5	1	3	0	0	2	2	13	1
AGE/AGT	92	39	52	98	101	52	148	582	26
ALE/ALT	8	3	15	15	4	0	15	60	3
APP	1	1	1	0	0	0	1	4	0
BCE/BCT	1	0	0	0	0	1	0	2	0
BGE/BGT	0	5	1	0	0	0	0	6	0
BSP	2	0	5	0	1	0	0	8	0
BSS	1	0	0	0	9	0	6	16	1
BUK	0	0	0	1	0	1	0	2	0
CBP	1	0	0	0	1	0	0	2	0
CGE/CGT	0	1	5	4	12	16	8	46	2
CHC	0	0	0	0	0	0	1	1	0
CLE/CLT	0	0	0	1	1	0	0	2	0
COS/COG	96	123	124	137	230	114	230	1054	47
CSE/CST	0	0	0	0	0	2	0	2	0
GIE/GIT	1	0	6	2	1	12	28	50	2
GRE/GRT	15	8	15	4	29	27	57	155	7
IDL	1	0	0	0	0	0	0	1	0
MIX	1	0	1	2	0	0	1	5	0
OAS	18	11	9	12	11	7	13	81	4
OAT	1	2	0	2	2	2	3	12	1
PGE/PGT	2	1	0	1	2	1	1	8	0
PIE/PIT	0	5	1	4	4	1	0	15	1
PLE/PLT	0	3	0	2	3	0	0	8	0
PNE/PNT	0	0	3	9	2	2	9	25	1
POT	0	0	0	0	0	3	0	3	0
PUM	0	0	0	0	0	1	0	1	0
RSS	0	1	0	0	0	0	0	1	0
RYC	0	2	0	0	2	2	2	8	0
RYS	0	2	2	0	0	0	0	4	0
SOF	1	0	0	1	0	0	0	2	0
SOY	5	0	2	9	11	6	1	34	2
SSH	0	0	2	4	0	2	3	11	0
STS	1	0	0	0	1	0	1	3	0
SUD	0	0	0	2	1	0	0	3	0
SWC	1	1	0	4	1	6	0	13	1

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
TRP	0	0	0	1	2	1	0	4	0
TRE/TRT	3	0	1	0	0	0	0	4	0
WHS	1	0	0	0	0	0	0	1	0
WHT	3	0	0	1	1	0	0	5	0
UNKNOWN	5	0	1	0	0	0	3	9	0
Total	266	209	249	316	432	261	533	2266	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)	2	19	4	11	21	10	19	86
SMG 3 (silt loam)	15	4	8	8	5	13	9	62
SMG 4 (sandy loam)	6	3	7	10	22	30	19	97
SMG 5 (sandy)	9	15	2	11	7	8	20	72
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	32	41	21	40	55	61	67	317

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Agawam	4	0	1	0	0	0	1	0	2
Allis	3	1	0	0	2	0	0	1	4
Alton	5	0	1	1	0	0	5	6	13
Amenia	4	4	2	1	7	5	2	1	22
Angola	2	0	0	1	1	3	0	0	5
Arkport	4	2	1	0	1	5	1	6	16
Benson	4	1	4	3	1	7	2	4	22
Bice	5	3	3	3	0	3	0	1	13
Blasdell	3	6	3	13	8	10	6	9	65
Bombay	4	2	3	2	0	5	4	3	19
Canandaigua	3	0	0	2	0	1	1	1	5
Chaumont	1	7	0	6	3	5	2	23	46
Claverack	4	0	2	0	2	0	1	3	8
Collamer	3	79	44	44	101	83	51	103	505
Covington	1	1	0	0	1	0	1	10	13
Croghan	5	0	0	0	0	1	3	0	4
Danley	2	1	2	0	1	1	3	4	12
Darien	2	0	0	0	0	0	0	1	1
Deerfield	5	0	1	1	4	3	4	0	13
Dunkirk	3	0	0	0	0	1	0	0	1
Elmridge	5	2	1	0	4	2	1	1	11
Farmington	3	5	9	11	7	35	9	24	100
Fredon	4	0	0	0	0	2	5	8	15
Galen	4	1	2	0	2	6	4	4	19
Galoo	4	0	0	1	0	0	0	0	1
Galway	4	34	58	50	47	64	32	78	363
Granby	5	1	0	0	0	0	0	0	1
Groton	4	7	0	1	3	14	8	9	42
Guffin	1	1	0	1	0	1	0	2	5
Gulf	4	2	0	0	1	0	0	3	6
Haights	3	0	0	0	1	0	0	0	1
Hamlin	2	2	0	0	1	2	1	1	7
Heuvelton	2	0	0	0	0	1	0	0	1
Hinckley	5	0	0	0	0	3	0	4	7
Hollis	4	0	0	0	0	1	0	0	1
Hudson	2	3	3	10	12	9	3	13	53

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Ira	4	0	0	0	0	0	1	0	1
Kingsbury	1	3	3	6	5	7	15	14	53
Lagross	3	0	5	6	2	13	0	8	34
Lamson	4	1	0	0	0	1	0	0	2
Livingston	1	0	0	1	0	0	0	0	1
Lowville	4	0	0	0	0	5	4	4	13
Madrid	4	13	10	17	19	31	13	36	139
Manlius	3	0	0	1	0	4	2	4	11
Massena	4	1	2	1	2	4	2	7	19
Minoa	4	1	1	1	1	5	1	1	11
Nassau	4	1	0	2	1	3	0	6	13
Nellis	4	17	19	10	27	26	11	23	133
Newstead	4	1	2	1	1	0	2	5	12
Niagara	3	13	3	15	15	10	11	48	115
Phelps	3	3	3	4	1	5	6	6	28
Pinckney	3	0	0	0	1	0	2	0	3
Plainfield	5	14	5	1	5	2	9	2	38
Pittsfield	4	0	1	0	0	0	0	0	1
Rhinebeck	2	15	3	16	13	8	5	10	70
Ruse	4	0	0	0	0	1	0	0	1
Shaker	2	0	0	0	0	1	0	0	1
Sodus	4	0	2	0	0	0	5	0	7
Teel	2	2	0	1	4	10	1	6	24
Vergennes	1	1	2	3	6	1	3	12	28
Venango	3	0	0	0	0	1	0	0	1
Wareham	5	2	0	0	0	0	0	0	2
Wayland	2	0	0	0	0	1	0	0	1
Williamson	4	0	0	0	0	3	1	1	5
Wilpoint	1	2	3	5	0	1	2	9	22
Windsor	5	5	5	3	3	2	9	7	34
Unknown	-	6	0	4	0	14	6	1	31
Total		266	209	249	316	432	261	533	2266

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	4	5	4	10	7	0	2	32
1996	0	4	6	11	6	6	7	1	41
1997	0	1	4	5	8	1	1	1	21
1998	0	3	3	12	11	5	4	2	40
1999	1	9	11	11	7	2	4	10	55
2000	0	6	10	18	17	8	1	1	61
2001	0	5	16	11	8	11	2	14	67
Total	1	32	55	72	67	40	19	31	317

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.2	1.2	1.8	1.5	0.6	1.1	1.6	
Highest:	26.5	7.8	7.8	16.5	11.8	24.0	14.3	
Mean:	4.6	4.1	4.0	4.5	4.3	4.1	4.9	
Median:	4.3	3.9	4.0	4.1	3.6	3.9	4.1	

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	16	13	31	22	0	6	100
1996	0	10	15	27	15	15	17	2	100
1997	0	5	19	24	38	5	5	5	100
1998	0	8	8	30	28	13	10	5	100
1999	2	16	20	20	13	4	7	18	100
2000	0	10	16	30	28	13	2	2	100
2001	0	7	24	16	12	16	3	21	100
Total	0	10	17	23	21	13	6	10	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	7	6	35	97	87	28	4	2	266
1996	0	3	35	59	59	38	13	2	209
1997	0	4	31	78	93	29	10	4	249
1998	7	6	78	110	78	26	5	6	316
1999	0	15	65	146	138	43	15	10	432
2000	11	8	31	83	69	36	17	6	261
2001	1	11	47	190	176	82	17	9	533
Total	26	53	322	763	700	282	81	39	2266

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.1	1.6	1.8	0.4	1.0	0.1	0.7	
Highest:	7.8	8.0	7.8	8.5	9.3	13.3	10.8	
Mean:	3.8	4.2	4.1	3.7	4.0	4.0	4.2	
Median:	3.8	4.0	4.1	3.5	3.9	3.9	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	3	2	13	36	33	11	2	1	100
1996	0	1	17	28	28	18	6	1	100
1997	0	2	12	31	37	12	4	2	100
1998	2	2	25	35	25	8	2	2	100
1999	0	3	15	34	32	10	3	2	100
2000	4	3	12	32	26	14	7	2	100
2001	0	2	9	36	33	15	3	2	100
Total	1	2	14	34	31	12	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	0	2	6	9	7	8	0	0	32
1996	0	1	1	1	6	10	11	9	2	0	41
1997	0	0	1	0	4	7	6	3	0	0	21
1998	0	2	2	5	2	16	8	5	0	0	40
1999	0	0	2	4	5	20	13	10	1	0	55
2000	0	0	0	4	6	9	11	24	7	0	61
2001	0	0	1	1	10	15	27	11	2	0	67
Total	0	3	7	17	39	86	83	70	12	0	317

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.8	4.9	5.1	4.5	5.0	5.7	5.3	
Highest:	7.8	8.1	7.7	7.8	8.1	8.2	8.3	
Mean:	-	-	-	-	-	-	-	
Median:	6.9	7.0	6.8	6.8	6.9	7.5	7.1	

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	19	28	22	25	0	0	100
1996	0	2	2	2	15	24	27	22	5	0	100
1997	0	0	5	0	19	33	29	14	0	0	100
1998	0	5	5	13	5	40	20	13	0	0	100
1999	0	0	4	7	9	36	24	18	2	0	100
2000	0	0	0	7	10	15	18	39	11	0	100
2001	0	0	1	1	15	22	40	16	3	0	100
Total	0	1	2	5	12	27	26	22	4	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	3	7	15	54	112	68	7	0	0	266
1996	0	0	2	11	63	73	52	8	0	0	209
1997	0	0	6	38	74	84	35	12	0	0	249
1998	2	1	8	30	75	117	69	13	1	0	316
1999	1	0	3	38	92	139	126	33	0	0	432
2000	0	1	13	22	45	100	63	15	2	0	261
2001	0	0	5	38	122	178	142	47	1	0	533
Total	3	5	44	192	525	803	555	135	4	0	2266

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.7	5.3	5.0	2.2	4.3	4.7	5.1	
Highest:	7.7	7.8	7.9	8.0	7.9	8.1	8.0	
Mean:	-	-	-	-	-	-	-	
Median:	6.7	6.7	6.5	6.6	6.7	6.7	6.7	

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	3	6	20	42	26	3	0	0	100
1996	0	0	1	5	30	35	25	4	0	0	100
1997	0	0	2	15	30	34	14	5	0	0	100
1998	1	0	3	9	24	37	22	4	0	0	100
1999	0	0	1	9	21	32	29	8	0	0	100
2000	0	0	5	8	17	38	24	6	1	0	100
2001	0	0	1	7	23	33	27	9	0	0	100
Total	0	0	2	8	23	35	24	6	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	4	12	3	6	0	0	1	2	2	2	32
1996	3	3	3	16	5	4	1	0	4	2	41
1997	0	4	1	7	5	2	1	1	0	0	21
1998	0	3	10	13	2	0	1	4	1	6	40
1999	0	12	18	8	4	2	1	3	2	5	55
2000	2	14	11	23	2	2	1	2	1	3	61
2001	1	12	6	17	6	8	4	1	2	10	67
Total	10	60	52	90	24	18	10	13	12	28	317

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	0.9	1.8	1.0	1.0	0.9	0.8	
Highest:	1018.	504.5	144.9	289.1	381.1	437.2	564.0	
Mean:	73.9	60.5	38.1	68.0	54.0	37.7	82.5	
Median:	3.5	22.4	35.6	21.5	7.2	11.0	29.7	

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	13	38	9	19	0	0	3	6	6	6	100
1996	7	7	7	39	12	10	2	0	10	5	100
1997	0	19	5	33	24	10	5	5	0	0	100
1998	0	8	25	33	5	0	3	10	3	15	100
1999	0	22	33	15	7	4	2	5	4	9	100
2000	3	23	18	38	3	3	2	3	2	5	100
2001	1	18	9	25	9	12	6	1	3	15	100
Total	3	19	16	28	8	6	3	4	4	9	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	13	69	89	84	8	0	2	1	0	0	266
1996	2	45	68	81	6	2	2	3	0	0	209
1997	2	87	68	82	9	1	0	0	0	0	249
1998	4	56	91	150	8	3	1	2	1	0	316
1999	9	116	131	149	8	11	5	3	0	0	432
2000	3	77	85	83	5	5	0	1	0	2	261
2001	5	141	164	189	14	8	5	2	4	1	533
Total	38	591	696	818	58	30	15	12	5	3	2266

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.6	0.9	0.9	0.6	0.8	0.7	0.9	
Highest:	119.3	138.3	76.6	160.4	137.4	366.4	651.2	
Mean:	9.7	13.7	9.9	13.9	12.6	12.3	14.6	
Median:	5.8	7.3	5.5	9.0	6.6	6.1	6.7	

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	5	26	33	32	3	0	1	0	0	0	100
1996	1	22	33	39	3	1	1	1	0	0	100
1997	1	35	27	33	4	0	0	0	0	0	100
1998	1	18	29	47	3	1	0	1	0	0	100
1999	2	27	30	34	2	3	1	1	0	0	100
2000	1	30	33	32	2	2	0	0	0	1	100
2001	1	26	31	35	3	2	1	0	1	0	100
Total	2	26	31	36	3	1	1	1	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	1	0	0	1	0	2
1996	14	1	3	1	0	19
1997	4	0	0	0	0	4
1998	7	0	0	1	3	11
1999	15	3	0	0	3	21
2000	4	1	0	1	4	10
2001	12	2	3	1	1	19
Total (#)	57	7	6	5	11	86
Total (%)	66	8	7	6	13	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very low	Low	Medium	High	Very high	
1995	15	0	0	0	0	15
1996	3	0	0	1	0	4
1997	5	1	1	1	0	8
1998	8	0	0	0	0	8
1999	5	0	0	0	0	5
2000	12	0	1	0	0	13
2001	4	1	1	1	2	9
Total (#)	52	2	3	3	2	62
Total (%)	84	3	5	5	3	100

Soil Management Group 4

	<55	55-99	100-149	150-239	>239		total
	Very Low	Low	Medium	High	Very High	Un-known	
Unknown	0	0	0	0	0	1	1
1995	2	1	0	1	2	0	6
1996	3	0	0	0	0	0	3
1997	5	2	0	0	0	0	7
1998	7	1	0	2	0	0	10
1999	15	2	1	3	1	0	22
2000	28	1	0	0	0	0	29
2001	15	1	0	0	3	0	19
Total (#)	75	8	1	6	6	1	97
Total (%)	78	8	1	6	6	1	100

Soil Management Group 5

	<60	60-114	115-164	165-269	>269	Total
	Very low	Low	Medium	High	Very high	
1995	7	1	0	1	0	9
1996	9	2	0	2	2	15
1997	2	0	0	0	0	2
1998	6	0	3	2	0	11
1999	5	2	0	0	0	7
2000	7	1	0	0	0	8
2001	11	5	0	2	2	20
Total (#)	47	11	3	7	4	72
Total (%)	65	15	4	10	6	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	25	2	0	3	2	-	32
1996	29	3	3	4	2	-	41
1997	16	3	1	1	0	-	21
1998	28	1	3	5	3	-	40
1999	40	7	1	3	4	-	55
2000	51	3	1	1	4	1	61
2001	42	9	4	4	8	-	67
Total #	231	28	13	21	23	1	317

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	78	6	0	9	6	0	100
1996	71	7	7	10	5	0	100
1997	76	14	5	5	0	0	100
1998	70	3	8	13	8	0	100
1999	73	13	2	5	7	0	100
2000	84	5	2	2	7	2	100
2001	63	13	6	6	12	0	100
Grand Total	73	9	4	7	7	0	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	46	19	77	46	17	29	32	
Highest:	3810	1359	814	1616	2069	825	1130	
Mean:	403	298	245	310	312	203	279	
Median:	200	268	168	216	207	178	165	

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	4	11	15
1996	0	1	0	4	3	8
1997	0	0	1	8	13	22
1998	0	0	2	4	9	15
1999	0	0	3	8	4	15
2000	1	3	0	9	10	23
2001	0	5	13	25	28	71
Total (#)	1	9	19	62	78	169
Total (%)	1	5	11	37	46	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very low	Low	Medium	High	Very high	
1995	0	2	2	13	6	23
1996	0	1	2	2	3	8
1997	0	0	4	14	10	28
1998	0	3	3	10	15	31
1999	2	1	3	13	23	42
2000	0	3	3	4	3	13
2001	0	5	5	13	12	35
Total (#)	2	15	22	69	72	180
Total (%)	1	8	12	38	40	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very low	Low	Medium	High	Very high	
1995	0	11	24	35	38	108
1996	0	5	15	32	15	67
1997	0	16	35	30	15	96
1998	0	13	41	37	49	140
1999	6	30	43	50	33	162
2000	3	13	25	24	27	92
2001	1	24	67	61	49	202
Total (#)	10	112	250	269	226	867
Total (%)	1	13	29	31	26	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very low	Low	Medium	High	Very high	
1995	1	21	24	23	19	88
1996	3	27	41	24	15	110
1997	4	20	31	26	13	94
1998	0	21	29	42	22	114
1999	9	58	41	51	36	195
2000	6	32	22	26	15	101
2001	3	54	60	45	42	204
Total (#)	26	233	248	237	162	906
Total (%)	3	26	27	26	18	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very low	Low	Medium	High	Very high	
1995	13	9	2	4	3	31
1996	0	4	3	6	3	16
1997	0	2	3	3	1	9
1998	9	5	2	0	0	16
1999	0	4	5	4	3	16
2000	14	7	5	1	5	32
2001	0	13	7	1	0	21
Total (#)	36	44	27	19	15	141
Total (%)	26	31	19	13	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 samples submitted for commercial production within each potassium classification.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	14	43	52	79	77	1	265
1996	3	38	61	68	39	0	209
1997	4	38	74	81	52	0	249
1998	9	42	77	93	95	0	316
1999	17	93	95	126	99	2	430
2000	24	58	55	64	60	0	261
2001	4	101	152	145	131	0	533
Grand Total	75	413	566	656	553	3	2266

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	5	16	20	30	29	0	100
1996	1	18	29	33	19	0	100
1997	2	15	30	33	21	0	100
1998	3	13	24	29	30	0	100
1999	4	22	22	29	23	0	100
2000	9	22	21	25	23	0	100
2001	1	19	29	27	25	0	100
Grand Total	3	18	25	29	25	0	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	11	40	34	1	13	5	42	
Highest:	776	666	804	553	633	1201	3032	
Mean:	175	167	154	170	159	156	172	
Median:	147	136	134	143	133	121	131	

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	2	1	5	24	32
1996	0	0	1	10	30	41
1997	0	0	0	4	17	21
1998	0	3	1	10	26	40
1999	0	3	2	10	40	55
2000	0	2	2	9	48	61
2001	1	2	1	12	51	67
Total	1	12	8	60	236	317

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	55	87	141	28	28	25	19	
Highest:	2726	1428	882	1431	2027	1816	1399	
Mean:	374	408	344	353	468	358	398	
Median:	413	373	282	366	366	297	289	

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	6	3	16	75	100
1996	0	0	2	24	73	100
1997	0	0	0	19	81	100
1998	0	8	3	25	65	100
1999	0	5	4	18	73	100
2000	0	3	3	15	79	100
2001	1	3	1	18	76	100
Total	0	4	3	19	74	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	8	17	17	55	169	266
1996	0	2	5	85	117	209
1997	1	2	13	63	170	249
1998	7	3	21	97	188	316
1999	0	9	32	142	249	432
2000	12	5	18	71	155	261
2001	0	3	11	160	359	533
Total	28	41	117	673	1407	2266

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	53	12	2	23	3	49	
Highest:	1125	1276	1461	1388	1428	1954	6256	
Mean:	290	266	333	295	265	310	341	
Median:	249	218	261	230	224	242	253	

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	3	6	6	21	64	100
1996	0	1	2	41	56	100
1997	0	1	5	25	68	100
1998	2	1	7	31	59	100
1999	0	2	7	33	58	100
2000	5	2	7	27	59	100
2001	0	1	2	30	67	100
Total	1	2	5	30	62	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	5	32
1996	39	2	41
1997	20	1	21
1998	37	3	40
1999	53	2	55
2000	58	3	61
2001	65	2	67
Total	299	18	317

Percentages:

0-49	>49	Total
Normal	Excessive	
84	16	100
95	5	100
95	5	100
93	8	100
96	4	100
95	5	100
97	3	100
94	6	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	1	1.8	1	1.6	0.9	1.4	
Highest:	137.8	61.1	46.8	198.4	86.5	171.5	86.2	
Mean:	23.5	12.7	10.6	15.5	11.7	16.4	10.0	
Median:	12.4	5.6	4.2	5.8	6.9	6.8	6.0	

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	264	2	266
1996	209	0	209
1997	245	4	249
1998	313	3	316
1999	422	10	432
2000	257	4	261
2001	531	2	533
Total	2241	25	2266

Percentages:

0-49	>49	Total
Normal	Excessive	
99	1	100
100	0	100
98	2	100
99	1	100
98	2	100
98	2	100
100	0	100
99	1	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	1.1	1.0	1.0	0.9	1.0	0.7	
Highest:	61.3	47.5	73.6	97.3	870.7	97.0	69.8	
Mean:	8.0	7.4	9.2	9.1	10.9	8.6	6.7	
Median:	5.2	5.2	5.6	5.7	5.0	4.7	4.2	

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	31	1	32
1996	41	0	41
1997	20	1	21
1998	38	2	40
1999	54	1	55
2000	61	0	61
2001	67	0	67
Total	312	5	317

Percentages:

0-99	>99	Total
Normal	Excessive	
97	3	100
100	0	100
95	5	100
95	5	100
98	2	100
100	0	100
100	0	100
98	2	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.6	3.8	10.7	5.0	1.3	3.8	10.1	
Highest:	162.7	74.0	127.0	255.0	101.3	50.5	88.7	
Mean:	29.7	29.3	39.0	39.5	28.6	23.4	31.4	
Median:	20.5	26.3	29.5	28.8	19.7	21.2	27.3	

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	265	1	266
1996	209	0	209
1997	249	0	249
1998	316	0	316
1999	431	1	432
2000	258	3	261
2001	532	1	533
Total	2260	6	2266

Percentages:

0-99	>99	Total
Normal	Excessive	
100	0	100
100	0	100
100	0	100
100	0	100
100	0	100
99	1	100
100	0	100
100	0	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.7	4.8	6.4	0.6	7.2	0.6	2.6	
Highest:	199	54	67.9	97.5	206.1	182.2	930.2	
Mean:	20.8	22.8	25.8	24.8	27.6	22.3	26.5	
Median:	19.7	22.4	24.2	24.3	25.9	18.4	24.4	

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	3	5	24	32
1996	0	4	37	41
1997	0	4	17	21
1998	0	6	34	40
1999	9	6	40	55
2000	5	11	45	61
2001	2	9	56	67
Total	19	45	253	317

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
9	16	75	100
0	10	90	100
0	19	81	100
0	15	85	100
16	11	73	100
8	18	74	100
3	13	84	100
6	14	80	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.4	0.5	0.6	0.5	0.1	0.1	0.4	
Highest:	37.6	51.4	62.2	93.0	54.3	123.9	350.2	
Mean:	4.6	7.0	8.3	10.6	7.1	9.1	18.9	
Median:	1.4	3.0	4.0	5.0	2.0	3.2	4.2	

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	9	99	158	266
1996	6	47	156	209
1997	8	43	198	249
1998	23	97	196	316
1999	37	126	269	432
2000	33	66	162	261
2001	7	99	427	533
Total	123	577	1566	2266

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
3	37	59	100
3	22	75	100
3	17	80	100
7	31	62	100
9	29	62	100
13	25	62	100
1	19	80	100
5	26	69	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.1	0.3	0.4	0.1	0.1	0.1	0.3	
Highest:	22.2	18.4	4.8	114.4	18.2	44.7	18.6	
Mean:	1.6	1.7	1.5	1.9	1.6	2.2	1.7	
Median:	1.2	1.4	1.4	1.2	1.2	1.3	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
CVE	Crownvetch, Establishment
CVT	Crownvetch
GIE	Grasses intensively managed, Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
	Others
ALG	Azalea
APP	Apples
ATF	Athletic Field

Crop Code	Crop Description
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering Annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Turf
TRT	Christmas trees, Topdressing