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Soil Sample Survey

Lewis Co.

Samples analyzed by CNAL in 1995-2001

Forage chopper in Lewis County.

Summary compiled by

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

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

Soil Sample Survey

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Samples analyzed by CNAL in 1995-2001

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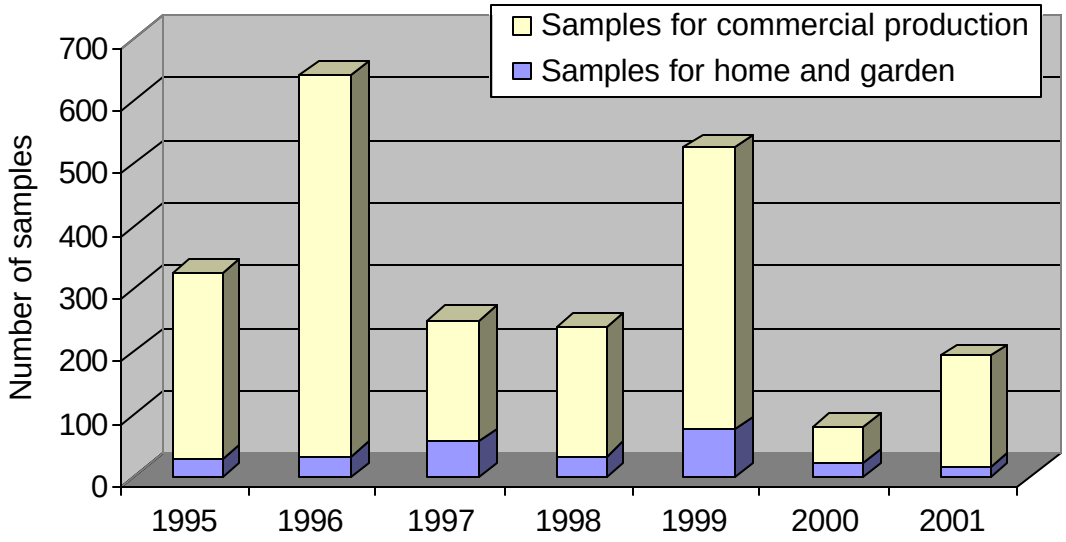
1. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Lewis County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) during 1995-2001. The total number of samples analyzed in these years amounted to 2055. Of these 1993 samples (97%) were submitted by commercial growers while 62 samples (3%) were submitted by homeowners. The number of samples has been fluctuating over the past years.



Homeowners		Commercial		Total
1995	4	1995	297	301
1996	8	1996	609	617
1997	12	1997	196	208
1998	10	1998	205	215
1999	6	1999	451	457
2000	13	2000	58	71
2001	9	2001	177	176
Total	62	Total	1993	2055

The majority (74%) of the homeowners that submitted soil samples to the Cornell Nutrient Analysis Laboratory during 1995-2001 requested fertilizer recommendations for lawns or for home garden vegetable production. Commercial growers submitted samples to grow alfalfa or alfalfa/grass mixes (36%), corn silage or grain (32%), and grass hay production (21%) while a few growers were planning growing clover, oats or grass for pasture.

Soils tested for home and garden in Lewis County were classified as belonging to soil management group 4 (30%), group 5 (14%), group 2 (10%), or group 3 (8%). A description of the different management groups is given below.

Soil Management Groups for New York

1	Fine-textured soils developed from clayey lake sediments and medium- to fine-textured soils developed from lake sediments.
2	Medium- to fine-textured soils developed from calcareous glacial till and medium-textured to moderately fine-textured soils developed from slightly calcareous glacial till mixed with shale and medium-textured soils developed in recent alluvium.
3	Moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till.
4	Coarse- to medium-textured soils formed from glacial till or glacial outwash.
5	Coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas.
6	Organic or muck soils with more than 80% organic matter.

Of the samples submitted by commercial growers, the majority (42%) belonged to soil management group 4. Only one sample belonged to group 1 (fine-textured soils developed from clayey lake sediments and medium to fine-textured soils developed from lake sediments). Eighteen 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 11% of the samples while 5% was of unknown origin and there were no organic soils. Nellis was the most common soil series (19% of all samples), followed by Galway (8%), Herkimer (7%), Farmington (6%) and Colton (4%).

Organic matter levels, as measured by loss on ignition, ranged from less than 3% to over 10%. For homeowners most samples had between 2 and 5% (71% of all samples) with 33% testing between 3 and 6% organic matter although 19% was classified as soils with more than 6.9% organic matter. Of the samples submitted by commercial growers, 78% contained between 3 and 6% organic matter.

Soil pH in water (1:1 extraction ratio) varied from less than 4.6 to over 8.2 for home and garden samples while 60% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 8.0 and 84% tested between 6.0 and 7.4.

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. For homeowners, 9% tested low for phosphorus, 15% tested medium, 18% tested high and 20% tested very high. This meant that 38% tested high or very high in P. Phosphorus levels for commercial grower soils in Lewis County were lower than the state average (50% tests high or very high in P). For commercial growers, only 4% tested very high. In total 29% was low in P, 32% tested medium for P while 35% of the submitted samples were classified as high in soil test P. This means that 39% tested high or very high in P and that for 96% of the soils, 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 (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 Table below).

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

Potassium classifications for Lewis County soils varied from very low (5% of the homeowner soils and 4% of the commercial growers' soils) to very high (47% of the homeowner soils and 30% of the commercial growers' soils). For homeowners, 13% tested low in K, 18% tested medium, and 18% tested high for potassium. For commercial growers' soils, 17% tested low, 23% tested medium and 24% tested high in potassium.

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 a little over 10 to almost 1500 lbs Mg/acre (Morgan extraction). There were no soils that tested very low for Mg within the homeowner samples while 1% of the samples for commercial production tested very low in Mg. Most soils, however, tested very high or very high for Mg (95% of the homeowner soils and 92% of the soils of the commercial growers). In total 5% of the homeowner soils and 7% of the commercial growers' soil tested low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Lewis County provided the soil pH is maintained in a 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 92-93% in the normal range with only 8% of the homeowner soils and 7% of the commercial grower soils testing excessive for Fe. Similarly, most soils (94-99%) 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 homeowner soils, 85% tested high for zinc while 15% tested medium. Of the commercial growers' samples, 4% tested low in zinc, 29% tested medium while 67% 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	%
ATF	0	0	3	1	0	0	4	8	13
BLU	0	0	0	0	0	1	0	1	2
FLA	0	0	2	0	0	0	0	2	3
GEN	0	0	0	1	0	0	0	1	2
LAW	3	0	2	2	2	5	4	18	29
MVG	1	8	4	5	3	6	1	28	45
PER	0	0	1	1	0	0	0	2	3
SAG	0	0	0	0	1	1	0	2	3
Unknown	0	0	0	0	0	0	0	0	0
Total	4	8	12	10	6	13	9	62	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	3	0	1	2	0	0	1	7	0
AGE/AGT	131	193	55	66	185	7	55	692	35
ALE/ALT	4	1	0	3	0	0	4	12	1
BGE/BGT	2	1	0	0	0	0	0	3	0
BLB	0	1	0	0	0	1	0	2	0
BSP	2	2	0	0	0	0	0	4	0
BSS	0	0	0	1	2	0	0	3	0
BUK	0	0	0	0	0	0	3	3	0
BWI	0	1	0	0	0	0	0	1	0
BWS	1	1	0	0	0	0	0	2	0
CGE/CGT	5	18	6	7	8	2	8	54	3
CLE/CLT	0	0	1	0	1	22	17	41	2
COG/COS	84	213	56	67	157	5	56	638	32
GIE/GIT	1	0	0	0	0	0	0	1	0
GRE/GRT	38	163	56	50	66	9	29	411	21
MIX	0	0	1	0	2	2	1	6	0
OAS	6	4	4	2	6	0	0	2	0
OAT	5	5	1	3	0	0	0	14	1
OTH	0	0	2	0	3	6	0	11	1
PGE/PGT	2	1	5	0	0	0	1	9	0
PIE/PIT	0	0	1	0	0	0	0	1	0
PLE/PLT	0	1	0	3	0	0	0	4	0
PNE/PNT	9	1	1	0	3	2	1	17	1
POT	1	0	0	0	0	0	0	1	0
RYC	0	1	0	0	0	0	0	1	0
SOF	1	0	0	0	0	0	0	1	0
SOG	0	0	0	0	0	1	0	1	0
SSH	0	0	3	0	0	0	0	3	0
SWC	0	0	1	0	1	0	0	2	0
TRE/TRT	0	0	0	0	1	0	0	1	0
WHT	0	1	0	0	0	0	0	1	0
Unknown	2	1	2	1	16	1	1	24	1
Total	297	609	196	205	451	58	177	1993	100

Notes:

See Appendix for Cornell crop codes.

3. Soil Types

3.1 Samples for Home and Garden

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

	1995	1996	1997	1998	1999	2000	2001	Total
SMG 1 (clayey)	0	0	0	0	0	0	0	0
SMG 2 (silty)	0	4	0	1	2	3	0	10
SMG 3 (silt loam)	2	1	0	4	1	0	0	8
SMG 4 (sandy loam)	0	2	4	3	2	10	9	30
SMG 5 (sandy)	2	1	8	2	1	0	0	14
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	4	8	12	10	6	13	9	62

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	5	10	6	2	5	1	5	34
Alden	3	0	0	0	0	0	0	1	1
AlluvialLand	3	1	2	0	0	0	0	0	3
Amenia	4	22	37	14	8	26	0	14	121
Angola	2	0	5	0	0	0	0	0	5
Atherton	3	2	9	4	3	7	0	1	26
Arkport	4	0	0	0	2	0	0	0	2
Belgrade	3	0	1	1	2	4	2	1	11
Buxton	2	6	9	2	8	9	0	3	37
Camroden	3	12	10	7	2	16	0	3	50
Canandaigua	3	0	0	2	1	0	0	0	3
Charlton	4	0	8	3	0	0	1	21	33
Colonie	5	2	0	0	0	0	0	0	2
Colton	5	7	28	7	11	8	2	16	79
Croghan	5	5	33	2	4	11	6	15	76
Darien	2	6	4	7	9	6	0	3	35
Duane	4	3	11	0	1	3	0	1	19
Dunkirk	3	1	0	5	4	4	0	0	14
Elmwood	4	0	1	0	0	0	1	0	2
Empeyville	4	0	0	0	0	1	0	0	1
Farmington	3	15	36	23	15	20	0	1	110
Fonda	2	6	1	0	0	0	1	0	8
Galen	4	0	1	0	0	0	0	0	1
Galway	4	22	51	33	23	36	1	0	166
Genesee	2	1	5	0	1	0	0	0	7
Gloucester	4	4	0	0	0	0	0	0	4
Granby	5	0	0	0	0	0	0	1	1
Hamlin	2	4	11	0	2	2	0	0	19
Hartland	4	5	2	1	1	3	1	11	24
Herkimer	3	17	14	15	27	64	1	9	147
Homer	2	0	0	0	0	10	0	0	10
Houseville	2	9	0	0	0	0	0	0	9
Howard	3	0	7	0	0	6	0	0	13
Hudson	2	0	7	1	0	0	0	1	9
Ilion	2	1	1	0	0	0	1	0	3
Junius	5	1	3	0	0	0	0	0	4
Kars	4	1	8	0	0	2	0	0	11

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Kendaia	2	4	11	3	7	6	0	2	33
Lansing	2	3	4	1	6	10	1	2	27
Lyons	2	1	1	0	0	0	0	0	2
Manheim	2	3	0	1	0	0	1	0	5
Manlius	3	1	0	0	1	0	0	0	2
Marcy	3	4	2	1	0	4	0	0	11
Melrose	4	3	4	0	0	4	0	1	12
Merrimac	4	1	0	0	0	0	0	0	1
Minoa	4	1	0	0	1	0	0	0	2
Mohawk	2	0	2	8	0	1	5	0	16
Nellis	4	72	109	19	28	98	3	41	370
Occum	4	0	9	0	1	1	0	0	11
Ondawa	4	0	3	0	0	7	0	0	10
Paxton	4	0	2	3	0	0	0	2	7
Petoskey	4	1	0	0	0	0	0	0	1
Pinckney	3	11	4	5	17	19	0	1	57
Pittfield	4	0	5	0	0	2	0	0	7
Plainfield	5	1	10	3	2	12	0	0	28
Podunk	4	0	1	0	0	1	0	0	2
Poland	2	2	0	0	0	0	0	0	2
Raynham	3	0	0	0	0	0	0	2	2
Rhinebeck	2	10	26	3	3	6	1	7	56
Rumney	2	3	0	0	0	1	2	0	6
Saugatuc	5	0	2	0	0	0	0	0	2
Scantic	2	7	17	8	2	10	0	5	49
Scarboro	4	0	12	1	0	4	0	0	17
Scituate	4	0	0	1	3	0	0	0	4
Sloan	3	0	9	0	0	0	0	0	9
Swanton	4	3	4	0	2	1	0	0	10
Teel	2	1	9	0	4	1	0	0	15
Tughill	4	1	0	0	0	0	0	0	1
Tuller	3	1	5	1	0	0	0	0	7
Turin	2	2	0	0	0	0	0	0	2
Walpole	4	0	0	2	0	0	0	1	3
Wayland	2	0	11	0	0	1	0	0	12
Worth	4	2	0	0	0	1	0	0	3
Unknown	-	1	32	3	2	18	27	6	89
Total	-	297	609	196	205	451	58	177	1993

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	0	0	2	1	0	0	1	4
1996	0	0	1	1	1	2	2	1	8
1997	0	0	1	2	4	1	1	3	12
1998	0	0	1	0	3	3	2	1	10
1999	0	0	1	2	0	1	0	2	6
2000	0	0	0	3	1	3	2	4	13
2001	0	0	0	6	3	0	0	0	9
Total	0	0	4	16	13	10	7	12	62

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3	2.9	2.8	2.9	2.6	3.1	3.4	
Highest:	11.6	7	20.1	10	8.9	8.3	4.5	
Mean:	5.8	5.1	6.2	5.4	5.3	5.9	3.8	
Median:	4.2	5.1	4.5	5.1	4.3	5.8	3.6	

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	0	0	50	25	0	0	25	100
1996	0	0	13	13	13	25	25	13	100
1997	0	0	8	17	33	8	8	25	100
1998	0	0	10	0	30	30	20	10	100
1999	0	0	17	33	0	17	0	33	100
2000	0	0	0	23	8	23	15	31	100
2001	0	0	0	67	33	0	0	0	100
Total	0	0	6	26	21	16	11	19	100

4.2 Samples for Commercial Production

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

	<1	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
1995	0	2	15	67	93	71	39	10	297
1996	3	6	51	115	203	145	59	27	609
1997	0	0	4	27	65	71	21	8	196
1998	0	1	6	31	81	57	18	11	205
1999	0	6	20	85	148	121	50	21	451
2000	1	1	3	4	10	14	10	15	58
2001	0	1	5	35	63	51	14	8	177
Total	4	17	104	364	663	530	211	100	1993

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.4	0.3	2	1.7	1.5	0.8	1.4	
Highest:	8.7	16.6	9.9	9.3	49.3	11.3	15.6	
Mean:	4.7	4.7	5.0	4.8	5.0	5.8	4.8	
Median:	4.7	4.6	5.0	4.8	4.8	5.7	4.6	

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	1	5	23	31	24	13	3	100
1996	0	1	8	19	33	24	10	4	100
1997	0	0	2	14	33	36	11	4	100
1998	0	0	3	15	40	28	9	5	100
1999	0	1	4	19	33	27	11	5	100
2000	2	2	5	7	17	24	17	26	100
2001	0	1	3	20	36	29	8	5	100
Total	0	1	5	18	33	27	11	5	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	0	0	2	0	0	0	4
1996	0	0	0	0	1	1	2	2	2	0	8
1997	0	0	2	0	1	5	3	1	0	0	12
1998	0	0	0	1	2	3	2	2	0	0	10
1999	0	0	0	1	0	1	0	3	1	0	6
2000	0	2	0	1	1	2	3	4	0	0	13
2001	0	0	0	0	1	4	3	1	0	0	9
Total	0	2	2	5	6	16	15	13	3	0	62

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.5	6.4	5.0	5.9	5.9	4.6	6.3	
Highest:	7.1	8.2	7.7	7.9	8.0	7.9	7.7	
Mean:	-	-	-	-	-	-	-	
Median:	6.3	7.3	6.7	6.7	7.6	7.3	6.8	

Percent of home and garden samples within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	0	50	0	0	50	0	0	0	100
1996	0	0	0	0	13	13	25	25	25	0	100
1997	0	0	17	0	8	42	25	8	0	0	100
1998	0	0	0	10	20	30	20	20	0	0	100
1999	0	0	0	17	0	17	0	50	17	0	100
2000	0	15	0	8	8	15	23	31	0	0	100
2001	0	0	0	0	11	44	33	11	0	0	100
Total	0	3	3	8	10	26	24	21	5	0	100

5.2 Samples for Commercial Production

Number of samples for commercial production within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	6	25	91	129	42	4	0	0	297
1996	1	0	7	58	152	284	101	6	0	0	609
1997	5	2	4	26	73	73	11	2	0	0	196
1998	0	0	9	23	69	79	21	4	0	0	205
1999	13	5	8	44	120	164	80	16	1	0	451
2000	1	0	3	10	18	19	9	3	0	0	58
2001	4	1	0	14	62	72	22	2	0	0	177
Total	24	8	37	195	585	820	286	37	1	0	1993

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.1	4.4	2.2	5.0	3.5	4.4	3.6	
Highest:	7.6	7.6	7.5	7.7	8.0	7.9	7.7	
Mean:	-	-	-	-	-	-	-	
Median:	6.5	6.6	6.4	6.5	6.6	6.5	6.5	

Percentage of samples for commercial production within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	2	8	31	43	14	1	0	0	100
1996	0	0	1	10	25	47	17	1	0	0	100
1997	3	1	2	13	37	37	6	1	0	0	100
1998	0	0	4	11	34	39	10	2	0	0	100
1999	3	1	2	10	27	36	18	4	0	0	100
2000	2	0	5	9	31	33	16	5	0	0	100
2001	2	1	0	8	35	41	12	1	0	0	100
Total	1	0	2	10	29	41	14	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	2	0	1	0	0	1	0	0	0	4
1996	0	0	0	4	2	1	0	0	0	1	8
1997	0	1	4	3	2	0	0	1	0	1	12
1998	0	1	1	4	0	1	0	1	0	2	10
1999	0	0	1	2	0	1	1	0	1	0	6
2000	0	4	3	3	0	0	0	2	0	1	13
2001	0	1	6	1	1	0	0	0	0	0	9
Total	0	9	15	18	5	3	2	4	1	5	62

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	22	2	3	5	2	3	
Highest:	85	271	357	252	166	396	42	
Mean:	24	69	52	75	58	61	10	
Median:	5	42	11	20	40	8	5	

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	50	0	25	0	0	25	0	0	0	100
1996	0	0	0	50	25	13	0	0	0	13	100
1997	0	8	33	25	17	0	0	8	0	8	100
1998	0	10	10	40	0	10	0	10	0	20	100
1999	0	0	17	33	0	17	17	0	17	0	100
2000	0	31	23	23	0	0	0	15	0	8	100
2001	0	11	67	11	11	0	0	0	0	0	100
Total	0	15	24	29	8	5	3	6	2	8	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	135	67	82	12	0	0	1	0	0	297
1996	0	126	180	268	21	8	2	3	1	0	609
1997	0	52	69	69	5	0	1	0	0	0	196
1998	0	37	64	93	6	3	0	1	0	1	205
1999	0	131	172	129	13	4	1	0	1	0	451
2000	0	28	22	8	0	0	0	0	0	0	58
2001	0	60	72	40	2	2	0	1	0	0	177
Total	0	569	646	689	59	17	4	6	2	1	1993

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:	105	151	88	231	185	34	140	
Mean:	9	14	10	15	10	5	9	
Median:	4	8	6	9	6	4	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
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
1995	0	45	23	28	4	0	0	0	0	0	100
1996	0	21	30	44	3	1	0	0	0	0	100
1997	0	27	35	35	3	0	1	0	0	0	100
1998	0	18	31	45	3	1	0	0	0	0	100
1999	0	29	38	29	3	1	0	0	0	0	100
2000	0	48	38	14	0	0	0	0	0	0	100
2001	0	34	41	23	1	1	0	1	0	0	100
Total	0	29	32	35	3	1	0	0	0	0	100

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

7. Potassium

7.1 Samples for Home and Garden

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very low	Low	Medium	High	Very high	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very low	Low	Medium	High	Very high	
1995	0	0	0	0	0	0
1996	0	0	0	0	4	4
1997	0	0	0	0	0	0
1998	0	0	0	0	1	1
1999	0	0	0	0	2	2
2000	0	0	0	0	3	3
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	10	10
Total (%)	0	0	0	0	100	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very low	Low	Medium	High	Very high	
1995	0	0	0	1	1	2
1996	0	0	0	0	1	1
1997	0	0	0	0	0	0
1998	0	0	2	0	2	4
1999	0	0	1	0	0	1
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	3	1	4	8
Total (%)	0	0	38	13	50	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	0	0	0
1996	0	0	0	0	2	2
1997	1	0	0	1	2	4
1998	0	0	0	0	3	3
1999	0	0	0	0	2	2
2000	1	0	3	2	4	10
2001	0	2	4	2	1	9
Total (#)	2	2	7	5	14	30
Total (%)	7	7	23	17	47	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very low	Low	Medium	High	Very high	
1995	1	1	0	0	0	2
1996	0	0	0	1	0	1
1997	0	3	0	4	1	8
1998	0	2	0	0	0	2
1999	0	0	1	0	0	1
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	1	6	1	5	1	14
Total (%)	7	43	7	36	7	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	1	1	0	1	1	4
1996	0	0	0	1	7	8
1997	1	3	0	5	3	12
1998	0	2	2	0	6	10
1999	0	0	2	0	4	6
2000	1	0	3	2	7	13
2001	0	2	4	2	1	9
Grand Total	3	8	11	11	29	62

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	25	25	0	25	25	100
1996	0	0	0	13	88	100
1997	8	25	0	42	25	100
1998	0	20	20	0	60	100
1999	0	0	33	0	67	100
2000	8	0	23	15	54	100
2001	0	22	44	22	11	100
Grand Total	5	13	18	18	47	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	41	192	50	70	98	53	76	
Highest:	330	632	998	1130	465	800	292	
Mean:	164	412	246	387	272	281	144	
Median:	143	409	195	259	232	231	116	

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	1	0	0
Total (#)	0	0	0	1	0	1
Total (%)	0	0	0	100	0	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very low	Low	Medium	High	Very high	
1995	0	2	13	14	40	69
1996	0	18	31	47	40	136
1997	0	2	12	9	14	37
1998	0	1	5	12	24	42
1999	0	5	10	15	33	63
2000	2	2	6	6	1	17
2001	2	0	5	8	13	28
Total (#)	4	30	82	111	165	392
Total (%)	1	8	21	28	42	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very low	Low	Medium	High	Very high	
1995	0	4	13	14	34	65
1996	0	14	30	20	35	99
1997	0	7	12	16	29	64
1998	0	0	8	17	47	72
1999	1	9	22	45	69	146
2000	0	0	2	1	0	3
2001	0	1	4	4	10	19
Total (#)	1	35	91	117	224	468
Total (%)	0	7	19	25	48	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very low	Low	Medium	High	Very high	
1995	2	26	38	41	35	142
1996	21	67	76	62	62	288
1997	1	20	29	19	8	77
1998	1	11	15	22	23	72
1999	15	58	44	35	35	187
2000	2	1	2	2	0	7
2001	8	28	21	21	14	92
Total (#)	50	211	225	202	177	865
Total (%)	6	24	26	23	20	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very low	Low	Medium	High	Very high	
1995	5	7	3	6	0	21
1996	8	27	19	18	14	86
1997	2	6	4	4	2	18
1998	1	3	9	4	2	19
1999	3	11	10	9	4	37
2000	4	1	2	2	0	9
2001	3	12	10	11	1	37
Total (#)	26	67	57	54	23	227
Total (%)	11	30	25	24	10	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	7	39	67	75	109	0	297
1996	29	126	156	147	151	0	609
1997	3	35	57	48	53	0	196
1998	2	15	37	55	96	0	205
1999	19	83	86	104	141	18	451
2000	8	4	12	11	1	22	58
2001	13	41	40	45	38	0	177
Grand Total	81	343	455	485	589	40	1993

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	2	13	23	25	37	0	100
1996	5	21	26	24	25	0	100
1997	2	18	29	24	27	0	100
1998	1	7	18	27	47	0	100
1999	4	18	19	23	31	4	100
2000	14	7	21	19	2	38	100
2001	7	23	23	25	21	0	100
Grand Total	4	17	23	24	30	2	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	26	33	43	49	23	27	25	
Highest:	1023	1302	869	697	905	327	1199	
Mean:	205	175	173	232	186	115	174	
Median:	170	129	141	202	148	100	132	

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	0	2	2	4
1996	0	0	0	2	6	8
1997	0	0	1	1	10	12
1998	0	0	0	2	8	10
1999	0	0	0	2	4	6
2000	0	0	0	3	10	13
2001	0	0	2	4	3	9
Total	0	0	3	16	43	62

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	136	184	75	101	111	150	74	
Highest:	869	441	736	1497	843	948	394	
Mean:	416	336	365	438	335	403	185	
Median:	329	383	395	376	248	308	155	

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	0	50	50	100
1996	0	0	0	25	75	100
1997	0	0	8	8	83	100
1998	0	0	0	20	80	100
1999	0	0	0	33	67	100
2000	0	0	0	23	77	100
2001	0	0	22	44	33	100
Total	0	0	5	26	69	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	2	7	19	92	177	297
1996	1	6	27	155	420	609
1997	0	5	14	52	125	196
1998	0	3	9	46	147	205
1999	6	14	18	130	283	451
2000	1	1	3	6	47	58
2001	2	4	4	25	142	177
Total	12	40	94	506	1341	1993

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	14	17	26	32	11	10	11	
Highest:	886	1008	934	825	833	1365	1124	
Mean:	270	298	275	339	278	472	328	
Median:	232	277	248	323	250	431	285	

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	1	2	6	31	60	100
1996	0	1	4	25	69	100
1997	0	3	7	27	64	100
1998	0	1	4	22	72	100
1999	1	3	4	29	63	100
2000	2	2	5	10	81	100
2001	1	2	2	14	80	100
Total	1	2	5	25	67	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	3	1	4
1996	8	0	8
1997	12	0	12
1998	9	1	10
1999	5	1	6
2000	11	2	13
2001	9	0	9
Total	57	5	62

Percentages:

0-49	>49	Total
Normal	Excessive	
75	25	100
100	0	100
100	0	100
90	10	100
83	17	100
85	15	100
100	0	100
92	8	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5	1	3	2	2	1	2	
Highest:	98	10	48	59	71	674	9	
Mean:	29	4	11	13	17	80	6	
Median:	7	3	5	6	7	8	5	

9.2 Samples for Commercial Production

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
1995	291	6	297
1996	567	42	609
1997	189	7	196
1998	194	11	205
1999	423	28	451
2000	39	19	58
2001	159	18	177
Total	1862	131	1993

Percentages:

0-49	>49	Total
Normal	Excessive	
98	2	100
93	7	100
96	4	100
95	5	100
94	6	100
67	33	100
90	10	100
93	7	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	92	256	152	142	385	632	559	
Mean:	11	16	12	15	19	53	24	
Median:	7	7	6	8	9	25	8	

10. Manganese

10.1 Samples for Home and Garden

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

Total number of samples: Percentages:

	0-99	>99	Total		0-99	>99	Total
	Normal	Excessive			Normal	Excessive	
1995	4	0	4		100	0	100
1996	8	0	8		100	0	100
1997	10	2	12		83	17	100
1998	9	1	10		90	10	100
1999	6	0	6		100	0	100
2000	12	1	13		92	8	100
2001	9	0	9		100	0	100
Total	58	4	62		94	6	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5	11	10	5	16	6	14	
Highest:	36	40	137	158	75	103	40	
Mean:	15	27	41	46	40	38	30	
Median:	10	26	21	38	37	25	32	

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	295	2	297
1996	606	3	609
1997	195	1	196
1998	204	1	205
1999	449	2	451
2000	56	2	58
2001	177	0	177
Total	1982	11	1993

Percentages:

0-99	>99	Total
Normal	Excessive	
99	1	100
100	0	100
99	1	100
100	0	100
100	0	100
97	3	100
100	0	100
99	1	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	2	4	2	3	2	2	
Highest:	225	112	281	149	210	474	56	
Mean:	22	22	27	24	27	28	18	
Median:	20	19	24	23	25	10	17	

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	0	4	4
1996	0	0	8	8
1997	0	1	11	12
1998	0	0	10	10
1999	0	0	6	6
2000	0	5	8	13
2001	0	3	6	9
Total	0	9	53	62

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	0	100	100
0	0	100	100
0	8	92	100
0	0	100	100
0	0	100	100
0	38	62	100
0	33	66	100
0	15	85	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.8	1.8	0.9	1.3	4.5	0.5	0.5	
Highest:	291	10.3	82.9	137	18.1	39.8	12.3	
Mean:	76.9	5.2	17.5	24.8	10.2	7.7	2.9	
Median:	7.2	4.1	7.4	8.8	8.8	3.5	1.5	

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	13	111	173	297
1996	7	139	463	609
1997	12	71	113	196
1998	10	55	140	205
1999	22	173	256	451
2000	2	9	47	58
2001	6	26	145	177
Total	72	584	1337	1993

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	37	58	100
1	23	76	100
6	36	58	100
5	27	68	100
5	38	57	100
3	16	81	100
3	15	82	100
4	29	67	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.3	0.2	0.1	0.1	0.2	0.1	
Highest:	35.5	12.3	13.4	8.5	19.2	5.8	15.8	
Mean:	1.9	2.1	1.7	1.6	1.7	2.3	2.2	
Median:	1.2	1.6	1.1	1.4	1.2	2.1	1.8	

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
BDR/DND	Beans-dry

Crop Code	Crop Description
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