

Ketterings, Q.M., H. Krol, W.S. Reid and A. Deming (2003). Essex County Soil Sample Survey 1995-2001. CSS Extension Bulletin E03-8. 36 pages.

Soil Sample Survey

Essex Co.

Samples analyzed by CNAL in 1995-2001



Willsboro Research Farm and Lake Champlain in Essex County.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid and Anita Deming



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

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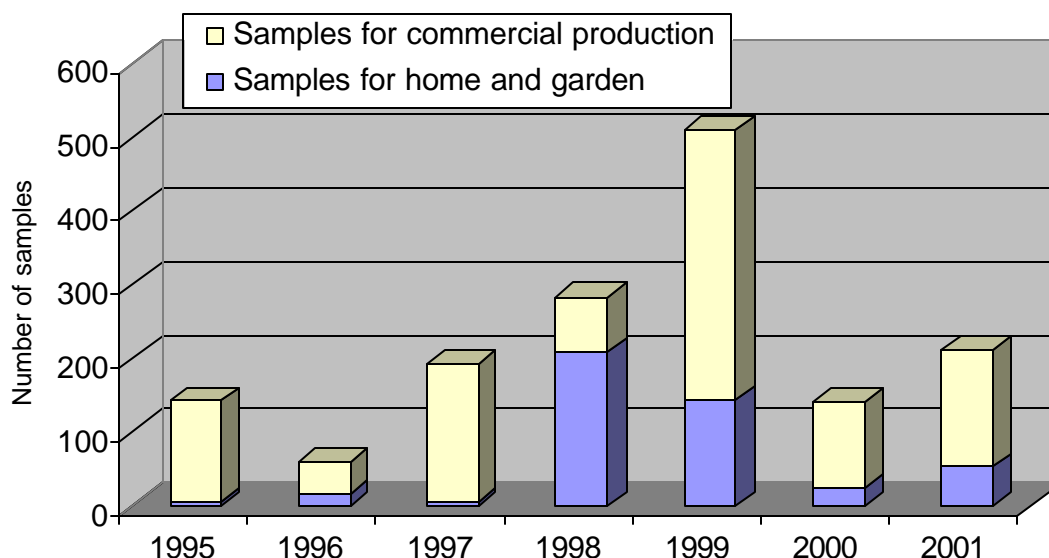
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1. General Survey Summary

This survey summarizes the soil test results from Essex County soil samples submitted for analyses to the Cornell Nutrient Analysis Laboratory (CNAL) during 1995-2001. The total number of Essex County samples analyzed in these years amounted to 1546. Of these 1082 samples (70%) were submitted to obtain fertilizer recommendations for commercial production while 464 samples (30%) was submitted as home and garden samples. The large number of samples in 1999 was a results of a Clinton County Cornell Cooperative Extension project in which 5 or more fields were sampled for each dairy farm in the county.



Home and Garden		Commercial Production		Total
1995	7	1995	136	143
1996	17	1996	45	62
1997	6	1997	187	193
1998	210	1998	74	284
1999	145	1999	365	510
2000	26	2000	115	141
<u>2001</u>	<u>53</u>	<u>2001</u>	<u>160</u>	<u>213</u>
Total	464	Total	1082	1546

The majority (52%) of the home and garden soil samples during 1995-2001 was submitted to request fertilizer recommendations for fairways although this percentages I skewed by the submission of 159 samples in 1998 and 80 in 1999. Thirteen percent of the home and garden samples were submitted for lawn recommendation while for six percent of the samples, recommendation for mixed vegetables were requested. People submitting samples for commercial production requested fertilizer recommendations to grow grass with or without clover (22%), corn silage or grain (16%), alfalfa or alfalfa/grass mixes (14%) or potatoes (12%), while a few producers were planning on growing other crops including buckwheat, apples, grass for pasture, rye cover crops, sweet corn or turf.

Of the home and garden samples in Essex County 72% were classified as coarse- to very coarse-textured soils formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas belonging to soil management group 5. Two percent belonged to soil management group 2. Group 3 was represented with 17% of all samples and 9% was classified as sandy loams of soil management group 4. 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, 41% belonged to soil management group 1 (fine-textured soils developed from clayey lake sediments and medium to fine-textured soils developed from lake sediments). Most of the Clinton County dairies are on soils that belong to management group 1. Group 4 was represented with 33% of all samples. Ten percent was classified as coarse- to very coarse-textured soil formed from gravelly or sandy glacial outwash or glacial lake beach ridges or deltas (soil management group 5). Less than 2% belonged to group 3 (moderately coarse textured soil developed from glacial outwash and recent alluvium and medium-textured acid soil developed on glacial till). Less than 1% belonged to soil management group 2 and group 6 (muck soils) were not represented. The five most common soil series were Vergennes (31%), Monadnock (22%), Kingsbury (10%), Skerry (3%), and Amenia (2%).

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to 18% with a few sampled testing very high in organic matter and mean values ranging from 3.7 to 6.5% organic matter. Home and garden samples had between 2 and 5% (31% of all samples) with 7% testing between 2 and 2.9% organic matter, 9% between 3.0 and 3.9%, and 15% between 4.0 and 4.9% organic matter. Sixty four percent of the soils submitted for home and garden tested higher than 4.9%. Of the samples submitted for commercial production, 35% contained between 3 and 4% organic matter and 28% tested between 4.0 and 4.9%. In total, 76% of the samples had organic matter levels between 2 and 5%.

Soil pH in water (1:1 extraction ratio) varied from pH 4.0 to 8.2. Of the home and garden samples, 23% tested between pH 6.0 and 7.4 and 4% tested higher than pH 7.4. Twenty six percent of the samples tested between pH 5.5 and 5.9 and 45% tested lower. The median ranged between pH 5.3 and 7.3. Sixty seven percent of the samples submitted for commercial production were between pH 6.0 and 7.4 and 4% tested higher than pH 7.4. Only 2% tested lower than pH 5.5 with 27% testing between pH 5.5 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

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lbs P/acre and anything higher is classified as very high. Of the home and garden samples, 26% tested low, 26% tested medium, 40% tested high and 9% tested very high. This meant that 49% tested high or very high in P.

Phosphorus levels for samples for commercial production in Essex County were lower than the state average (50% test high or very high in P) in the same time period. Three percent tested very high. Thirty eight percent was low in P, 41% tested medium for P while only 17% of the submitted samples were classified as high in soil test P. This means that only 20% tested high or very high in P. 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, 23% was very low and 8% was low in potassium. Eleven percent tested medium, 26% high and 32% very high. For samples submitted for commercial production, 5% tested very low, 11% was low, 14% tested medium, 28% tested high and 14% 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 10 to over 2500 lbs Mg/acre (Morgan extraction). Most soils tested very high or very high for Mg (63% of the homeowner soils and 90% of the soils of the commercial growers). Twelve percent of the home and garden soils and none of the samples submitted for commercial production tested low in magnesium. Fourteen percent of the home and garden samples and 3% of the commercial fields sampled were low in Mg while medium classifications were obtained by 10% of the home and garden samples and 6% of the samples submitted for commercial production.

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 74-96% in the normal range with 26% of the home and garden samples and 4% of the commercial production soils 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, 94% tested high for zinc while 5% tested medium and 1% tested low for zinc. Of the samples for commercial production, 5% tested low in zinc, 27% tested medium while 68% 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	%
ALG	0	1	0	0	0	0	0	1	0
ATF	0	0	0	1	1	4	1	7	2
BLU	0	0	0	0	0	0	1	1	0
FAR	0	0	0	159	80	3	0	242	52
FLA	1	0	0	14	9	0	0	24	5
GEN	0	2	0	0	16	0	0	18	4
LAW	0	3	0	5	6	6	42	62	13
MVG	0	3	2	7	7	5	6	30	6
OTH	0	0	0	2	15	0	1	18	4
PER	2	3	3	7	6	0	2	23	5
PRK	0	0	0	1	0	3	0	4	1
PTO	0	0	0	0	1	0	0	1	0
ROS	0	0	0	12	0	0	0	12	3
SAG	4	5	0	1	2	5	0	17	4
SUB	0	0	0	0	1	0	0	1	0
TRF	0	0	1	0	0	0	0	1	0
Unknown	0	0	0	1	1	0	0	2	0
Total	7	17	6	210	145	26	53	464	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	0	0	2	0	2	0	0	4	0
AGE/AGT	41	6	45	9	41	4	9	155	14
ALE/ALT	0	0	0	0	0	0	1	1	0
APP	1	0	9	2	0	1	0	13	1
BGE/BGT	0	0	0	0	1	0	0	1	0
BUK	17	16	16	17	0	0	14	80	7
CBS	1	0	0	0	0	0	0	1	0
CGE/CGT	2	0	7	2	23	4	1	39	4
COS/COG	18	0	36	6	90	11	17	178	16
GIE/GIT	0	0	0	0	29	0	0	29	3
GRE/GRT	20	0	30	5	64	21	23	163	15
ENV	1	0	0	0	0	0	0	1	0
IDL	0	0	0	0	1	0	0	1	0
MIX	1	0	0	0	3	0	0	4	0
OAS	1	0	0	0	1	0	0	2	0
OAT	0	0	0	0	1	0	0	1	0
OTH	0	0	0	0	3	0	0	3	0
PGE/PGT	1	2	7	2	1	7	0	20	2
PIE/PIT	1	0	1	0	0	0	5	7	1
PLE/PLT	0	1	1	0	2	0	0	4	0
PNE/PNT	3	0	6	0	1	1	3	14	1
POT	18	16	17	30	20	13	15	129	12
PUM	0	0	2	0	0	0	0	2	0
RSS	0	0	1	0	0	0	0	1	0
RYC	0	0	0	0	19	17	0	36	3
RYS	0	0	0	0	3	0	0	3	0
SOY	0	0	0	0	1	0	0	1	0
STS	0	0	1	0	0	0	0	1	0
SWC	0	3	5	1	2	0	0	11	1
TRE/TRT	0	1	0	0	0	0	0	1	0
TRF	0	0	0	0	6	0	0	6	1
Unknown	10	0	1	0	51	36	72	170	16
Total	136	45	187	74	365	115	160	1082	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	0	0	2	1	8	1	12
SMG 3 (silt loam)	0	3	0	6	23	6	42	80
SMG 4 (sandy loam)	1	3	4	15	7	5	5	40
SMG 5 (sandy)	6	11	2	187	114	7	5	332
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	7	17	6	210	145	26	53	464

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

SMG	Soil Series	1995	1996	1997	1998	1999	2000	2001	Total
5	Adams	0	0	0	0	4	0	0	4
4	Amenia	0	3	2	2	13	4	2	26
4	Becket	3	1	1	0	3	1	0	9
2	Cayuga	0	0	0	0	0	0	1	1
5	Champlain	4	1	8	0	4	0	0	17
4	Charlton	0	0	0	0	1	0	0	1
4	Claverack	0	0	0	0	5	0	3	8
3	Collamer	0	0	0	0	1	9	0	10
5	Colton	0	1	3	0	4	0	0	8
4	Cosad	0	0	0	0	14	0	0	14
1	Covington	0	1	1	0	0	0	7	9
5	Deerfield	0	3	1	0	0	0	0	4
3	Dunkirk	0	0	0	1	0	4	0	5
5	Elmridge	0	1	3	0	10	1	0	15
4	Georgia	0	0	0	0	1	0	0	1
4	Hartland	0	0	0	0	0	0	1	1
4	Hermon	2	0	2	6	0	0	0	10
4	Kars	0	0	0	4	0	2	0	6
1	Kingsbury	1	0	39	1	48	2	17	108
4	Malone	0	0	3	2	0	0	0	5
4	Massena	1	0	1	1	4	0	0	7
4	Monadnock	35	32	33	41	41	29	29	240
5	Naumburg	0	0	4	0	0	0	0	4
4	Nellis	0	0	0	0	4	0	1	5
3	Niagara	1	0	0	0	0	0	0	1
5	Oakville	0	0	0	0	2	0	0	2
4	Ondawa	0	0	2	0	0	0	0	2
4	Pittsfield	1	0	0	0	1	0	0	2
5	Plainfield	7	0	5	0	2	0	6	20
4	Podunk	0	0	0	0	0	1	0	1
4	Pootatuck	0	0	0	0	0	0	1	1
4	Pyrities	0	0	0	0	6	0	0	6
3	Raynham	0	0	0	0	1	0	0	1
4	Rippowam	0	0	0	0	1	0	0	1
5	Schroon	1	0	0	0	0	0	0	1
2	Shaker	0	0	1	0	0	0	0	1

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SMG	Soil Series	1995	1996	1997	1998	1999	2000	2001	Total
5	Skerry	0	0	14	1	10	2	1	28
4	Stafford	0	0	0	0	3	0	0	3
1	Vergennes	77	0	62	15	138	21	19	332
4	Waumbeck	3	0	2	0	0	2	1	8
-	Unknown	0	2	0	0	44	37	71	154
-	Total	136	45	187	74	365	115	160	1082

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	4	0	0	0	0	0	0	3	7
1996	7	1	3	1	2	0	2	1	17
1997	0	1	0	1	0	1	2	1	6
1998	0	4	19	22	29	23	13	100	210
1999	0	2	2	12	24	30	19	56	145
2000	0	3	5	2	5	5	2	4	26
2001	0	0	2	3	10	22	10	6	53
Total	11	11	31	41	70	81	48	171	464

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.1	0.1	1.3	1.0	1.4	1.7	2.5	
Highest:	9.8	32.5	7.6	17.9	17.0	8.7	9.8	
Mean:	3.7	4.1	5.0	6.5	6.4	4.4	5.5	
Median:	0.6	2.2	5.8	6.2	6.0	4.5	5.3	

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	57	0	0	0	0	0	0	43	100
1996	41	6	18	6	12	0	12	6	100
1997	0	17	0	17	0	17	33	17	100
1998	0	2	9	10	14	11	6	48	100
1999	0	1	1	8	17	21	13	39	100
2000	0	12	19	8	19	19	8	15	100
2001	0	0	4	6	19	42	19	11	100
Total	2	2	7	9	15	17	10	37	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	3	12	45	46	24	4	2	136
1996	0	1	10	11	17	4	1	1	45
1997	0	3	20	60	63	26	11	4	187
1998	0	2	7	27	19	14	4	1	74
1999	2	13	64	148	86	28	13	11	365
2000	0	1	12	45	41	5	8	3	115
2001	0	4	11	39	30	34	37	5	160
Total	2	27	136	375	302	135	78	27	1082

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.6	1.4	1.6	1.0	0.6	1.7	1.2	
Highest:	7.7	9.3	12.9	7.0	9.2	8.0	7.5	
Mean:	4.2	4.0	4.2	4.1	3.8	4.1	4.8	
Median:	4.1	4.0	4.1	4.0	3.7	3.9	4.7	

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	2	9	33	34	18	3	1	100
1996	0	2	22	24	38	9	2	2	100
1997	0	2	11	32	34	14	6	2	100
1998	0	3	9	36	26	19	5	1	100
1999	1	4	18	41	24	8	4	3	100
2000	0	1	10	39	36	4	7	3	100
2001	0	3	7	24	19	21	23	3	100
Total	0	2	13	35	28	12	7	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	1	1	0	2	0	3	0	7
1996	0	0	0	4	1	4	4	3	1	0	17
1997	0	0	0	1	2	2	1	0	0	0	6
1998	12	47	71	52	12	5	7	3	1	0	210
1999	2	24	50	20	24	13	7	5	0	0	145
2000	0	0	1	5	4	7	3	5	1	0	26
2001	0	0	2	39	3	3	6	0	0	0	53
Total	14	71	124	122	47	34	30	16	6	0	464

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.5	5.5	5.8	4.0	4.3	5.3	5.4	
Highest:	8.2	8.1	7.1	8.1	7.7	8.0	7.3	
Mean:	-	-	-	-	-	-	-	
Median:	7.3	6.9	6.5	5.3	5.3	6.7	5.6	

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	0	14	14	0	29	0	43	0	100
1996	0	0	0	24	6	24	24	18	6	0	100
1997	0	0	0	17	33	33	17	0	0	0	100
1998	6	22	34	25	6	2	3	1	0	0	100
1999	1	17	34	14	17	9	5	3	0	0	100
2000	0	0	4	19	15	27	12	19	4	0	100
2001	0	0	4	74	6	6	11	0	0	0	100
Total	3	15	27	26	10	7	6	3	1	0	100

5.2 Samples for Commercial Production

Number of samples for commercial production within each pH range :

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	3	32	52	32	15	2	0	0	136
1996	0	0	0	23	12	8	2	0	0	0	45
1997	0	0	5	54	53	53	19	3	0	0	187
1998*	0	3	8	42	13	3	4	0	0	0	73
1999	0	0	8	73	102	111	57	12	2	0	365
2000	0	0	0	30	23	34	19	9	0	0	115
2001	0	0	2	42	65	36	3	8	4	0	160
Total	0	3	26	296	320	277	119	34	6	0	1081

* One sample was not analyzed for pH in 1998.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.1	5.7	5.0	4.6	5.1	5.6	5.1	
Highest:	7.7	7.4	7.6	7.4	8.0	7.8	8.1	
Mean:	-	-	-	-	-	-	-	
Median:	6.3	5.9	6.3	5.8	6.4	6.6	6.3	

Percent of samples for commercial production within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	2	24	38	24	11	1	0	0	100
1996	0	0	0	51	27	18	4	0	0	0	100
1997	0	0	3	29	28	28	10	2	0	0	100
1998	0	4	11	58	18	4	5	0	0	0	100
1999	0	0	2	20	28	30	16	3	1	0	100
2000	0	0	0	26	20	30	17	8	0	0	100
2001	0	0	1	26	41	23	2	5	3	0	100
Total	0	0	2	27	30	26	11	3	1	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	3	0	2	1	0	0	0	0	1	7
1996	0	10	0	2	1	0	0	0	1	3	17
1997	0	1	1	1	0	0	0	1	0	2	6
1998	0	40	81	81	1	0	0	2	0	5	210
1999	0	11	34	89	4	3	0	3	1	0	145
2000	0	12	6	3	1	0	1	1	0	2	26
2001	0	42	1	6	2	0	0	1	1	0	53
Total	0	119	123	184	10	3	1	8	3	13	464

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	3	1	1	1	1	
Highest:	639	485	218	339	188	316	169	
Mean:	103	82	100	17	18	36	11	
Median:	14	3	79	8	12	4	2	

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	43	0	29	14	0	0	0	0	14	100
1996	0	59	0	12	6	0	0	0	6	18	100
1997	0	17	17	17	0	0	0	17	0	33	100
1998	0	19	39	39	0	0	0	1	0	2	100
1999	0	8	23	61	3	2	0	2	1	0	100
2000	0	46	23	12	4	0	4	4	0	8	100
2001	0	79	2	11	4	0	0	2	2	0	100
Total	0	26	26	40	2	1	0	2	1	3	100

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

6.2 Samples for Commercial Production

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

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
1995	0	54	48	29	4	0	0	0	1	0	136
1996	0	8	27	9	0	0	0	0	0	1	45
1997	0	70	64	35	11	1	0	2	1	3	187
1998	0	14	47	6	4	3	0	0	0	0	74
1999	0	141	149	66	5	3	0	0	1	0	365
2000	0	47	50	18	0	0	0	0	0	0	115
2001	0	78	54	25	1	1	0	0	0	1	160
Total	0	412	439	188	25	8	0	2	3	5	1082

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:	156	262	629	68	151	33	434	
Mean:	9	13	18	11	8	5	9	
Median:	4	7	5	6	4	5	4	

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	40	35	21	3	0	0	0	1	0	100
1996	0	18	60	20	0	0	0	0	0	2	100
1997	0	37	34	19	6	1	0	1	1	2	100
1998	0	19	64	8	5	4	0	0	0	0	100
1999	0	39	41	18	1	1	0	0	0	0	100
2000	0	41	43	16	0	0	0	0	0	0	100
2001	0	49	34	16	1	1	0	0	0	1	100
Total	0	38	41	17	2	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	0	0
1997	0	0	0	0	0	0
1998	0	0	0	1	1	2
1999	1	0	0	0	0	1
2000	0	0	1	1	6	8
2001	0	0	0	0	1	1
Total (#)	1	0	1	2	8	12
Total (%)	8	0	8	17	67	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	0	0	0
1996	1	0	0	1	1	3
1997	0	0	0	0	0	0
1998	1	1	0	1	3	6
1999	1	6	8	4	4	23
2000	1	2	1	0	2	6
2001	0	0	4	28	10	42
Total (#)	4	9	13	34	20	80
Total (%)	5	11	16	43	25	100

Ketterings, Q.M., H. Krol, W.S. Reid and A. Deming (2003). Essex County Soil Sample Survey 1995-2001. CSS Extension Bulletin E03-8. 36 pages.

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	1	1
1996	0	2	0	1	0	3
1997	0	1	0	0	3	4
1998	0	5	2	1	7	15
1999	0	0	1	1	5	7
2000	0	0	1	2	2	5
2001	2	0	0	2	1	5
Total (#)	2	8	4	7	19	40
Total (%)	5	20	10	18	48	100

Soil Management Group 5						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	4	0	0	1	1	6
1996	6	0	1	0	4	11
1997	0	1	1	0	0	2
1998	56	14	18	50	49	187
1999	34	5	10	24	41	114
2000	1	2	1	2	1	7
2001	0	0	1	0	4	5
Total (#)	101	22	32	77	100	332
Total (%)	30	7	10	23	30	100

Soil Management Group 6						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Ketterings, Q.M., H. Krol, W.S. Reid and A. Deming (2003). Essex County Soil Sample Survey 1995-2001. CSS Extension Bulletin E03-8. 36 pages.

Number of home and garden samples within each potassium classification:

Summary (#)	Very low	Low	Medium	High	Very high	Unknown	Total
1995	4	0	0	1	2	0	7
1996	7	2	1	2	5	0	17
1997	0	2	1	0	3	0	6
1998	57	20	20	53	60	0	210
1999	36	11	19	30	47	0	145
2000	2	4	4	5	11	0	26
2001	2	0	5	30	16	0	53
Total #	108	39	50	120	147	0	464

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	15	6	89	11	8	41	23	
Highest:	12771	1352	489	832	949	2124	2100	
Mean:	1921	242	268	178	175	327	222	
Median:	39	89	244	184	159	200	167	

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

Summary (%)	Very low	Low	Medium	High	Very High	Unknown	Total
1995	57	0	0	14	29	0	100
1996	41	12	6	12	29	0	100
1997	0	33	17	0	50	0	100
1998	27	10	10	25	29	0	100
1999	25	8	13	20	34	0	100
2000	8	15	15	19	42	0	100
2001	4	0	9	57	30	0	100
Grand Total	23	8	11	26	32	0	100

7.2 Samples for Commercial Production

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	3	7	17	51	78
1996	0	0	0	0	1	1
1997	0	0	14	30	58	102
1998	0	0	0	6	10	16
1999	8	30	44	69	35	186
2000	0	3	4	8	8	23
2001	0	5	5	16	17	43
Total (#)	8	41	74	146	180	449
Total (%)	2	9	16	33	40	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	1	0	1
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	1	1
Total (#)	0	0	0	1	1	2
Total (%)	0	0	0	50	50	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	0	1	1
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	1	0	0	1
1999	1	1	0	0	0	2
2000	6	2	3	1	1	13
2001	0	0	0	0	0	0
Total (#)	7	3	4	1	2	17
Total (%)	41	18	24	6	12	100

Ketterings, Q.M., H. Krol, W.S. Reid and A. Deming (2003). Essex County Soil Sample Survey 1995-2001. CSS Extension Bulletin E03-8. 36 pages.

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	3	4	3	9	6	25
1996	2	3	5	16	10	36
1997	1	6	11	18	10	46
1998	1	7	7	25	16	56
1999	11	15	21	34	16	97
2000	5	5	2	15	12	39
2001	0	4	7	18	9	38
Total (#)	23	44	56	135	79	337
Total (%)	7	13	17	40	23	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	7	2	1	2	12
1996	1	2	3	0	0	6
1997	1	10	10	8	9	38
1998	0	0	0	1	0	1
1999	13	7	4	9	3	36
2000	0	0	0	2	1	3
2001	3	1	0	0	3	7
Total (#)	18	27	19	21	18	103
Total (%)	17	26	18	20	17	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	3	14	12	27	60	0	91
1996	3	5	8	16	11	2	45
1997	2	16	35	57	77	0	187
1998	1	7	8	32	26	0	74
1999	33	53	69	112	54	44	365
2000	11	10	9	26	22	37	115
2001	3	10	12	34	30	71	160
Grand Total	56	115	153	304	300	154	1082

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	37	15	26	53	11	22	16	
Highest:	1071	364	1010	627	827	646	1597	
Mean:	230	172	209	198	162	130	162	
Median:	221	174	167	198	143	89	126	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	2	10	9	20	59	0	100
1996	7	11	18	36	24	4	100
1997	1	9	19	30	41	0	100
1998	1	9	11	43	35	0	100
1999	9	15	19	31	15	12	100
2000	10	9	8	23	19	32	100
2001	2	6	8	21	19	44	100
Grand Total	5	11	14	28	28	14	100

8. Magnesium

8.1 Samples for Home and Garden

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	3	1	0	0	3	7
1996	3	5	2	0	7	17
1997	0	0	0	1	5	6
1998	32	33	13	17	115	210
1999	18	15	8	17	87	145
2000	1	1	3	3	18	26
2001	0	12	20	10	11	53
Total	57	67	46	48	246	464

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	13	7	165	7	9	18	29	
Highest:	2116	1240	1051	701	2538	1033	1252	
Mean:	454	315	459	229	388	358	197	
Median:	20	84	374	235	325	299	93	

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	43	14	0	0	43	100
1996	18	29	12	0	41	100
1997	0	0	0	17	83	100
1998	15	16	6	8	55	100
1999	12	10	6	12	60	100
2000	4	4	12	12	69	100
2001	0	23	38	19	21	100
Total	12	14	10	10	53	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	8	6	36	86	136
1996	0	3	7	24	11	45
1997	0	1	8	38	140	187
1998	0	3	2	38	31	74
1999	0	15	26	56	268	365
2000	0	2	4	29	80	115
2001	0	4	15	30	111	160
Total	0	36	68	251	727	1082

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	40	39	63	39	21	20	26	
Highest:	1622	871	2607	988	2066	1933	1705	
Mean:	494	191	650	308	551	475	629	
Median:	293	148	555	176	489	366	793	

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	6	4	26	63	100
1996	0	7	16	53	24	100
1997	0	1	4	20	75	100
1998	0	4	3	51	42	100
1999	0	4	7	15	73	100
2000	0	2	3	25	70	100
2001	0	3	9	19	69	100
Total	0	3	6	23	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	7	0	7
1996	16	1	17
1997	6	0	6
1998	139	71	210
1999	100	45	145
2000	25	1	26
2001	51	2	53
Total	344	120	464

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	100	0	100
	94	6	100
	100	0	100
	66	34	100
	69	31	100
	96	4	100
	96	4	100
	74	26	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	2	2	2	2	2	
Highest:	41	53	17	285	334	65	87	
Mean:	9	12	10	44	43	15	19	
Median:	4	9	8	40	41	13	16	

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	133	3	136
1996	45	0	45
1997	184	3	187
1998	72	2	74
1999	341	24	365
2000	113	2	115
2001	156	4	160
Total	1044	38	1082

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	98	2	100
	100	0	100
	98	2	100
	97	3	100
	93	7	100
	98	2	100
	98	3	100
	96	4	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3	1	1	2	1	1	2	
Highest:	191	26	71	55	126	74	82	
Mean:	16	15	12	19	17	10	11	
Median:	12	17	9	15	12	6	6	

10. Manganese

10.1 Samples for Home and Garden

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

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
1995	7	0	7
1996	15	2	17
1997	6	0	6
1998	209	1	210
1999	140	5	145
2000	26	0	26
2001	53	0	53
Total	456	8	464

Percentages:

0-99	>99	Total
Normal	Excessive	
100	0	100
88	12	100
100	0	100
100	0	100
97	3	100
100	0	100
100	0	100
98	2	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	7	2	4	3	3	
Highest:	33	143	44	117	188	64	27	
Mean:	11	30	24	25	27	22	15	
Median:	4	10	23	22	20	16	15	

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	136	0	136
1996	45	0	45
1997	187	0	187
1998	74	0	74
1999	365	0	365
2000	115	0	115
2001	160	0	160
Total	1082	0	1082

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	3	2	2	4	2	4	
Highest:	74	24	81	70	71	96	48	
Mean:	16	8	19	17	23	13	21	
Median:	14	7	18	9	21	9	22	

11. Zinc

11.1 Samples for Home and Garden

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

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
1995	0	1	6	7
1996	4	4	9	17
1997	0	0	6	6
1998	1	15	194	210
1999	0	1	144	145
2000	0	0	26	26
2001	0	1	52	53
Total	5	22	437	464

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	14	86	100
24	24	53	100
0	0	100	100
0	7	92	100
0	1	99	100
0	0	100	100
0	2	98	100
1	5	94	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	0.1	1.5	0.2	0.5	1.2	0.9	
Highest:	204.5	25.6	12.6	93.5	80.1	46.7	18.2	
Mean:	37.1	5.8	8.2	11.2	13.2	6.8	4.9	
Median:	2.1	3.3	10.0	9.5	9.0	4.5	3.6	

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	3	45	88	136
1996	0	8	37	45
1997	2	36	149	187
1998	1	6	67	74
1999	33	115	217	365
2000	9	36	70	115
2001	2	47	111	160
Total	50	293	739	1082

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	33	65	100
0	18	82	100
1	19	80	100
1	8	91	100
9	32	59	100
8	31	61	100
1	29	69	100
5	27	68	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.3	0.6	0.4	0.4	0.1	0.2	0.4	
Highest:	35.7	13.3	30.8	45.2	21.6	3.8	16.7	
Mean:	2.1	2.2	2.4	4.2	1.7	1.2	1.7	
Median:	1.4	1.7	1.6	1.7	1.2	1.2	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/BND	Beans-dry
BLU	Blueberries
CEL	Celery
CEM	Cemetery
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GAR	Garlic
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
ROU	Rough
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