

Soil Sample Survey

Chautauqua Co.

Samples analyzed by CNAL in 1995-2001



Farmland and forest in Chautauqua County, NY.

Summary compiled by

Quirine M. Ketterings, Hettie Krol, W. Shaw Reid and Dean Sprague



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

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1. General Survey Summary

Chautauqua County is the southwestern most county in New York State. It is bordered by Pennsylvania on the southern and western sides and by Lake Erie on the north. Chautauqua County was named after its largest lake, which was called “Jad-dad-gwah” by the Seneca Indians. The lake is 20 miles long and is 1,308 feet above sea level, which makes it one of the highest navigable freshwater inland lakes in the United States. Just over one third of the county’s 679,690 acres are in farm production.

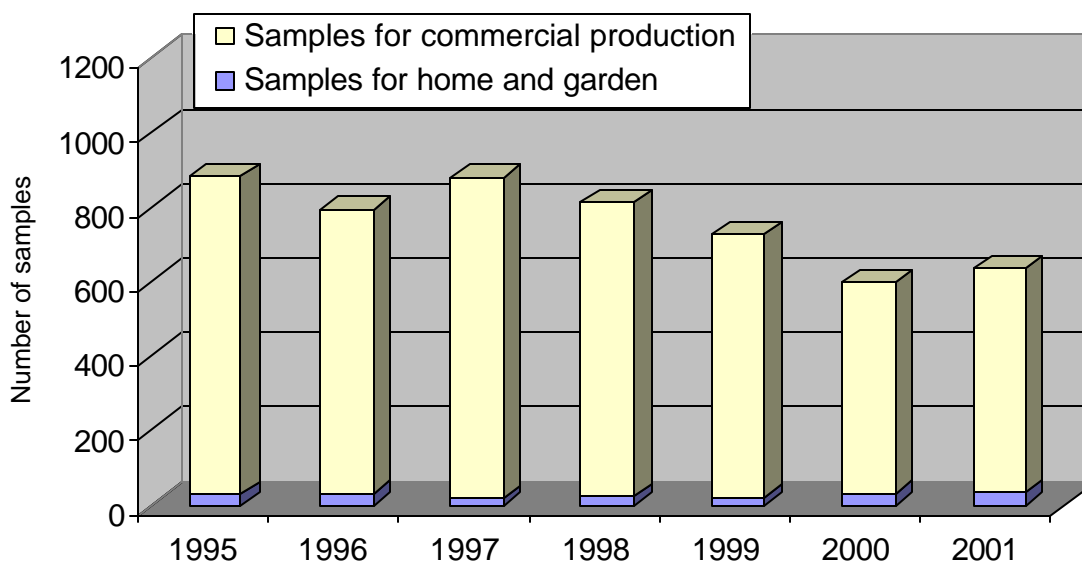
Two different farming enterprises are supported in the county as a result of two different physiographic providences in the county. The Erie-Ontario Plain is a belt 2 to 6 miles wide along Lake Erie ranging in elevation from 572 feet at the base of Lake Erie to about 850 feet at the base of the bordering escarpment. The Allegheny Plateau covers the remaining 80 percent of the county. Elevations in the Plateau area range from 1,300 feet in the valleys to 2,100 feet. Less than 2,000 acres in the southeastern corner of the county are the only acres of the county that were not covered by ice at some point during the glacial period. This area also includes the highest point in the county at 2,190 feet.

The main agriculture enterprise in the Plain area is grape production; however, substantial areas are used for vegetables, orchard crops, or small fruits, as well as dairy production. Chautauqua County is the leading County for grape production in New York State. The Plateau region focuses mainly on corn and hay crops for the main agricultural enterprise of dairy farming. Chautauqua County ranks in the top ten counties of New York for production of grapes, peaches, sweet cherries, tomatoes, milk production, and beef cows.

This survey summarizes the soil test results from Chautauqua 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 was 5322. Of these, 5135 samples (96%) were submitted to obtain fertilizer recommendations for commercial production while 187 samples (4%) were submitted as home and garden samples.

Most of the home and garden samples submitted during the period 1995-2001 were submitted to request fertilizer recommendations for lawns (33%) or vegetable production

(27%). People submitting samples for commercial production requested fertilizer recommendations for grapes (27%), corn silage or grain (24%), hay production (18%), or alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (11%), while a few producers were planning on growing other crops including clover/grass mixtures, birdsfoot trefoil, beans, oats and tomatoes.



Homeowners		Commercial		Total
1995	29	1995	852	881
1996	33	1996	761	794
1997	17	1997	862	879
1998	22	1998	787	809
1999	19	1999	707	726
2000	32	2000	565	597
<u>2001</u>	<u>35</u>	<u>2001</u>	<u>601</u>	<u>636</u>
Total	187	Total	5135	5322

Home and garden samples in Chautauqua County were mostly silt or sandy loams belonging to soil management groups 3 (43%) and 4 (33%). Eighteen percent belonged to soil management group 2. Group 5 was represented by 6% of all samples. 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, 74% belonged to soil management group 3. Eighteen percent were from soil management group 2 while 5% were classified group 4. Only one percent of the samples belonged to soil management group 1. The five most common soil series were Chenango (19%), Busti (8%), Fremont (8%), Chautauqua (6%), and Volusia (5%). These soils represent 5.6% (Chenango), 17.0% (Busti), 12.8% (Fremont), 12.5% (Chautauqua), and 2.3% (Volusia) of the total 679,690 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to a little over 17% with median values ranging from 4.4 to 5.9% organic matter for home and garden samples and values ranging from 4.2 to 4.7% organic matter for samples submitted for commercial production. Fifty percent of the home and garden samples had between 2 and 5% organic matter with 11% testing between 2 and 2.9% organic matter, 20% between 3.0 and 3.9% organic matter and 19% between 4.0 and 4.9% organic matter. Forty eight percent of the soils submitted for home and garden tested >4.9% in organic matter. Of the samples submitted for commercial production, 24% contained

between 3 and 4% organic matter, 33% tested between 4.0 and 4.9% while 24% had organic matter concentrations of 5.0-5.9%. In total, 63% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 3.4 to 10 with the median for home and garden samples ranging from pH 5.7 to pH 6.6 and for samples submitted for commercial production ranging from pH 5.9 to pH 6.0. Of the home and garden samples, 54% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, this was 50% while 33% tested between pH 5.0 and 5.9.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan solution and extraction method (Morgan, 1941). This solution contains sodium acetate buffered at a pH of 4.8.

Soil test P levels of <1 lbs P/acre are classified as very low. Between 1-3 lbs P/acre is low. Medium is between 4-8 lbs P/acre. High testing soils have P levels between 9 and 39 lbs P/acre and soils with >39 lbs P/acre are classified as very high. Of the home and garden samples, 17% tested low, 27% tested medium, 30% tested high and 26% tested very high. This meant that 56% tested high or very high in P. Phosphorus levels for samples for commercial production in Chautauqua County lower than the state average (in New York about 50% tested high or very high in P in 1995-2001). Only one percent of the samples tested very high in P. Thirty eight percent were low in P, 30% tested medium for P while 31% of the submitted samples were classified as high in soil test P. This means that 32% 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, 7% was classified as very low or low in potassium. Thirteen percent tested medium, 25% were high and 55% of the samples were very high in potassium. For samples submitted for commercial production, 1% tested very low in K, 8% tested low, 18% tested medium, 32% tested high and 40% 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 41 to a little over 4000 lbs Mg/acre (Morgan extraction). There were only very few samples that tested very low in Mg. Most soils tested high or very high for Mg (96% of the homeowner soils and 90% of the soils of the commercial growers). No more than 7 of the homeowner soils and 9% of the commercial growers' soil tested low or medium in Mg.

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 86-77% in the normal range with 14% of the home and garden samples and 23% of the samples for commercial production testing excessive for Fe. Most soils (95-97%) 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

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classified as normal. 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, 90% tested high for zinc while 9% tested medium and 1% was low in Zn. Of the samples for commercial production, 2% tested low in zinc, 19% tested medium while 79% 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	0	0	0	0	1	0	1	1
ATF	1	4	4	3	4	2	2	20	11
FAR	0	1	0	0	0	0	0	1	1
FLA	0	4	1	2	2	1	1	11	6
HRB	1	1	0	0	1	0	0	3	2
LAW	13	7	1	5	3	14	18	61	33
MVG	9	12	8	4	4	3	10	50	27
OTH	1	1	0	0	0	0	0	2	1
PER	1	1	2	4	0	6	0	14	7
PRK	0	0	0	2	5	0	3	10	5
ROS	3	1	0	1	0	0	1	6	3
SAG	0	0	1	1	0	5	0	7	4
STR	0	1	0	0	0	0	0	1	1
Total	29	33	17	22	19	32	35	187	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	8	13	7	5	0	2	0	35	1
AGE/AGT	97	56	83	92	59	18	53	458	9
ALE/ALT	19	24	14	1	7	2	1	68	1
APP	0	1	0	0	0	1	0	2	0
ASP	0	0	0	0	1	1	0	2	0
BCE/BCT	7	4	5	1	0	2	2	21	0
BGE/BGT	27	20	3	2	1	1	0	54	1
BLB	0	0	4	0	0	0	0	4	0
BKB	0	4	1	0	0	0	0	5	0
BND	1	0	0	0	0	0	0	1	0
BNS	49	13	0	0	0	44	0	106	2
BSE	0	2	0	0	0	0	0	2	0
BTE	0	1	0	0	0	0	0	1	0
BUK	1	1	1	1	5	0	0	9	0
CBP	6	0	6	0	1	0	0	13	0
CBS	0	0	0	2	0	0	0	2	0
CGE/CGT	56	48	33	52	16	17	21	243	5
CKP	0	0	0	0	1	0	0	1	0
CLE/CLT	1	0	1	3	1	3	0	9	0
COG/COS	182	219	215	168	175	135	154	1248	24
CSE/CST	0	1	0	0	0	0	0	1	0
GIE/GIT	38	41	82	95	117	96	213	682	13
GPA	256	200	270	187	159	182	63	1317	26
GPF	3	6	2	10	5	3	5	34	1
GPV	2	0	1	2	2	5	2	14	0
GRA	0	0	0	0	3	0	0	3	0
GRE/GRT	17	51	62	70	10	11	15	236	5
IDL	5	0	1	0	1	0	0	7	0
MIL	0	0	1	2	0	0	0	3	0
MIX	0	3	3	5	2	11	3	27	1
NUR	0	0	0	1	3	0	5	9	0
OAS	14	18	26	19	29	12	7	125	2
OAT	0	0	0	2	0	1	0	3	0
OTH	1	0	1	22	27	2	2	55	1
PCH	0	0	0	0	1	0	0	1	0

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
PGE/PGT	5	4	5	4	1	1	4	24	0
PIE/PIT	1	6	8	13	2	0	10	40	1
PLE/PLT	1	2	0	3	0	0	2	8	0
PNE/PNT	1	3	3	1	0	0	0	8	0
POT	3	0	0	1	1	0	1	6	0
PUM	2	3	1	0	2	1	0	9	0
RAD	1	0	0	0	0	0	0	1	0
RSS	0	0	1	0	0	0	0	1	0
RYC	2	0	0	0	1	1	0	4	0
RYS	3	0	0	0	0	0	0	3	0
SAG	0	0	0	0	1	0	0	1	0
SOF	0	0	0	1	0	0	0	1	0
SOY	0	0	0	1	2	0	0	3	0
SSH	1	0	1	0	0	0	1	3	0
STE	0	0	0	0	3	0	0	3	0
STS	2	0	0	0	1	0	0	3	0
SQS	0	0	1	0	0	0	0	1	0
SQW	0	0	0	0	0	1	0	1	0
SWC	2	5	7	5	0	3	2	24	0
TOM	17	1	9	0	0	3	0	30	1
TME	0	1	0	0	0	0	0	1	0
TRE/TRT	0	0	0	1	1	1	0	3	0
WAT	0	0	1	0	0	0	0	1	0
WHT	13	0	0	0	0	0	0	13	0
Unknown	8	10	3	15	66	5	35	142	3
Total	852	761	862	787	707	565	601	5135	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)	9	7	9	1	2	1	5	34
SMG 3 (silt loam)	10	13	6	17	7	14	13	80
SMG 4 (sandy loam)	6	13	2	4	8	15	13	61
SMG 5 (sandy)	4	0	0	0	2	2	4	12
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	29	33	17	22	19	32	35	187

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Allard	3	29	18	47	81	30	15	21	241
Alton	5	1	0	1	1	2	0	0	5
Arkport	4	0	0	0	1	5	0	0	6
Ashville	3	0	0	6	1	0	1	0	8
Barcelona	3	2	6	1	11	3	3	1	27
Blasdell	3	1	3	21	1	48	26	18	118
Busti	3	51	73	81	59	62	37	71	434
Canadice	2	2	2	1	0	1	1	0	7
Canandaigu	3	101	17	20	7	3	14	3	165
Chadakoin	3	0	0	1	1	1	0	2	5
Chautauqua	3	16	32	57	66	37	22	95	325
Chenango	3	231	133	104	136	128	138	90	960
Churchville	2	0	2	2	0	1	2	0	7
Collamer	3	2	18	23	4	22	3	2	74
Colonie	5	0	0	2	1	0	1	0	4
Cosad	4	0	0	0	0	0	0	1	1
Dalton	3	2	7	3	1	3	5	2	23
Darien	2	2	1	5	2	2	1	1	14
Dunkirk	3	1	9	14	15	4	9	2	54
Elnora	5	4	2	3	2	0	3	5	19
Erie	3	46	37	22	10	4	6	24	149
Farnham	4	0	10	51	3	41	5	2	112
Fremont	2	49	72	49	66	58	78	32	404
Frewsburg	3	0	0	7	5	8	1	5	26
Galen	4	0	2	0	0	0	0	0	2
Getzville	3	0	2	0	0	0	1	2	5
Hamlin	2	10	7	3	2	1	5	4	32
Hinesburg	4	3	0	4	6	2	0	8	23
Holderton	3	0	1	0	0	4	0	0	5
Hornell	2	1	15	5	2	0	20	0	43
Hudson	2	0	17	26	2	29	8	2	84
Ivory	2	0	0	0	1	1	0	1	3
Lamson	4	4	5	0	2	0	0	0	11
Langford	3	26	24	53	11	24	10	29	177
Manlius	3	0	0	0	0	0	0	3	3
Mardin	3	11	15	10	18	21	2	2	79

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Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Marilla	3	0	4	0	0	0	0	0	4
Middlebury	3	3	15	6	1	9	4	1	39
Mineola	4	4	0	0	0	0	0	0	4
Minoa	4	7	3	2	2	1	1	1	17
Niagara	3	20	19	17	58	14	15	3	146
Orpark	2	4	7	2	1	6	2	5	27
Phelps	3	0	2	0	0	0	0	0	2
Prompton	4	13	9	3	8	11	3	10	57
Raynham	3	10	3	2	7	6	1	7	36
Red Hook	4	4	11	6	2	5	4	5	37
Rhinebeck	2	68	43	46	18	13	13	36	237
Schuyler	3	3	2	5	15	3	10	9	47
Scio	3	13	11	2	11	1	4	4	46
Swormville	1	4	5	9	7	5	0	4	34
Teel	2	11	3	9	1	2	17	3	46
Tioga	3	10	0	0	4	5	3	5	27
Towerville	3	2	1	2	2	0	1	2	10
Unadilla	3	6	8	15	6	13	5	3	56
Valois	3	33	26	36	24	36	21	46	222
Volusia	3	33	41	44	51	29	31	26	255
Wakeville	3	0	0	0	3	0	3	1	7
Wayland	2	0	0	0	1	0	0	0	1
Unknown	--	9	18	34	47	3	10	2	123
Total	-	852	761	862	787	707	565	601	5135

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	2	2	4	5	6	5	5	29
1996	0	0	5	9	5	4	4	6	33
1997	1	0	0	2	4	4	1	5	17
1998	0	1	1	8	2	3	3	4	22
1999	0	0	6	4	2	4	1	2	19
2000	0	0	0	5	7	10	1	9	32
2001	0	1	7	5	10	4	5	3	35
Total	1	4	21	37	35	35	20	34	187

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.4	2.4	0.8	1.5	2.1	3.0	1.2	
Highest:	8.4	17.1	9.6	12.2	12.6	11.7	7.5	
Mean:	5.0	5.5	5.5	5.1	4.4	5.9	4.5	
Median:	5.2	4.5	5.2	4.1	3.7	5.4	4.5	

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	7	7	14	17	21	17	17	100
1996	0	0	15	27	15	12	12	18	100
1997	6	0	0	12	24	24	6	29	100
1998	0	5	5	36	9	14	14	18	100
1999	0	0	32	21	11	21	5	11	100
2000	0	0	0	16	22	31	3	28	100
2001	0	3	20	14	29	11	14	9	100
Total	1	2	11	20	19	19	11	18	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	16	80	195	297	208	36	20	852
1996	2	8	68	199	246	178	47	13	761
1997	2	10	94	224	296	190	34	12	862
1998	1	6	81	180	245	213	53	8	787
1999	0	17	76	193	246	139	31	5	707
2000	0	14	73	149	168	131	20	10	565
2001	0	8	52	91	202	160	80	8	601
Total	5	79	524	1231	1700	1219	301	76	5135

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.4	0.7	0.6	0.7	1.2	1.3	1.7	
Highest:	16.9	9.3	7.9	10.2	8.0	10.0	8.3	
Mean:	4.4	4.4	4.3	4.4	4.2	4.2	4.7	
Median:	4.4	4.4	4.3	4.6	4.3	4.3	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	23	35	24	4	2	100
1996	0	1	9	26	32	23	6	2	100
1997	0	1	11	26	34	22	4	1	100
1998	0	1	10	23	31	27	7	1	100
1999	0	2	11	27	35	20	4	1	100
2000	0	2	13	26	30	23	4	2	100
2001	0	1	9	15	34	27	13	1	100
Total	0	2	10	24	33	24	6	1	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	3	2	8	2	6	7	1	0	0	29
1996	1	0	4	3	10	7	6	2	0	0	33
1997	0	1	0	3	1	6	5	1	0	0	17
1998	1	0	7	5	5	3	0	1	0	0	22
1999	0	0	4	3	4	4	2	1	0	1	19
2000	0	1	7	7	5	5	7	0	0	0	32
2001	0	0	3	12	4	6	4	4	2	0	35
Total	2	5	27	41	31	37	31	10	2	1	187

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.7	4.4	4.9	4.3	5.2	4.7	5.2	
Highest:	7.8	7.8	7.5	7.7	10.0	7.3	8.2	
Mean:	-	-	-	-	-	-	-	
Median:	6.3	6.4	6.6	5.7	6.3	6.0	6.3	

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	10	7	28	7	21	24	3	0	0	100
1996	3	0	12	9	30	21	18	6	0	0	100
1997	0	6	0	18	6	35	29	6	0	0	100
1998	5	0	32	23	23	14	0	5	0	0	100
1999	0	0	21	16	21	21	11	5	0	5	100
2000	0	3	22	22	16	16	22	0	0	0	100
2001	0	0	9	34	11	17	11	11	6	0	100
Total	1	3	14	22	17	20	17	5	1	1	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	37	62	116	200	274	147	14	2	0	0	852
1996	37	80	109	197	193	128	14	3	0	0	761
1997*	134	80	71	173	283	108	7	1	0	0	857
1998*	67	90	77	144	271	122	13	0	0	0	784
1999	53	85	79	138	202	134	16	0	0	0	707
2000	30	64	81	85	166	113	22	4	0	0	565
2001	37	22	52	176	191	114	8	0	0	1	601
Total	395	483	585	1113	1580	866	94	10	0	1	5127

* Five and three samples were not analyzed for pH in 1997 and in 1998, respectively.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3.8	3.5	3.4	3.5	3.6	3.5	3.7	
Highest:	7.7	7.8	7.7	7.4	7.3	7.8	8.9	
Mean:	-	-	-	-	-	-	-	
Median:	6.0	5.9	5.9	6.0	5.9	6.0	6.0	

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	4	7	14	23	32	17	2	0	0	0	100
1996	5	11	14	26	25	17	2	0	0	0	100
1997	16	9	8	20	33	13	1	0	0	0	100
1998	9	11	10	18	35	16	2	0	0	0	100
1999	7	12	11	20	29	19	2	0	0	0	100
2000	5	11	14	15	29	20	4	1	0	0	100
2001	6	4	9	29	32	19	1	0	0	0	100
Total	8	9	11	22	31	17	2	0	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	5	11	6	1	1	1	2	1	1	29
1996	0	6	11	5	3	1	0	2	2	3	33
1997	0	2	3	6	4	1	0	0	1	0	17
1998	0	6	7	2	1	1	1	2	0	2	22
1999	0	2	8	6	1	1	0	0	0	1	19
2000	0	4	4	15	3	1	1	1	0	3	32
2001	0	7	6	17	1	2	0	0	1	1	35
Total	0	32	50	57	14	8	3	7	5	11	187

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	2	1	
Highest:	213	783	171	464	789	362	374	
Mean:	36	84	34	55	56	52	32	
Median:	7	8	22	5	7	20	12	

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	17	38	21	3	3	3	7	3	3	100
1996	0	18	33	15	9	3	0	6	6	9	100
1997	0	12	18	35	24	6	0	0	6	0	100
1998	0	27	32	9	5	5	5	9	0	9	100
1999	0	11	42	32	5	5	0	0	0	5	100
2000	0	13	13	47	9	3	3	3	0	9	100
2001	0	20	17	49	3	6	0	0	3	3	100
Total	0	17	27	30	7	4	2	4	3	6	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	321	247	270	8	3	1	1	0	1	852
1996	0	310	210	233	8	0	0	0	0	0	761
1997	0	286	270	285	13	5	2	0	1	0	862
1998	0	260	265	254	8	0	0	0	0	0	787
1999	0	308	203	187	6	1	1	1	0	0	707
2000	0	200	175	182	2	3	0	1	0	2	565
2001	0	274	161	160	3	1	0	2	0	0	601
Total	0	1959	1531	1571	48	13	4	5	1	3	5135

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:	392	54	164	54	112	550	148	
Mean:	8	8	9	8	7	10	7	
Median:	6	5	6	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	38	29	32	1	0	0	0	0	0	100
1996	0	41	28	31	1	0	0	0	0	0	100
1997	0	33	31	33	2	1	0	0	0	0	100
1998	0	33	34	32	1	0	0	0	0	0	100
1999	0	44	29	26	1	0	0	0	0	0	100
2000	0	35	31	32	0	1	0	0	0	0	100
2001	0	46	27	27	0	0	0	0	0	0	100
Total	0	38	30	31	1	0	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	2	2	1	4	9
1996	0	0	0	2	5	7
1997	0	1	0	1	7	9
1998	0	0	0	1	0	1
1999	0	0	0	1	1	2
2000	0	0	0	0	1	1
2001	0	0	2	0	3	5
Total (#)	0	3	4	6	21	34
Total (%)	0	9	12	18	62	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	2	8	10
1996	0	0	0	4	9	13
1997	0	0	0	1	5	6
1998	0	1	3	2	11	17
1999	0	0	0	2	5	7
2000	0	0	2	4	8	14
2001	0	2	2	1	8	13
Total (#)	0	3	7	16	54	80
Total (%)	0	4	9	20	68	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	2	3	1	6
1996	0	1	2	4	6	13
1997	0	0	1	0	1	2
1998	0	0	0	2	2	4
1999	1	1	0	3	3	8
2000	0	0	2	5	8	15
2001	0	1	4	5	3	13
Total (#)	1	3	11	22	24	61
Total (%)	2	5	18	36	39	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	0	1	2	4
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	2	0	0	2
2000	0	1	0	1	0	2
2001	0	1	1	0	2	4
Total (#)	0	3	3	2	4	12
Total (%)	0	25	25	17	33	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Number of home and garden samples within each potassium classification:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
1995	0	3	4	7	15	29
1996	0	1	2	10	20	33
1997	0	1	1	2	13	17
1998	0	1	3	5	13	22
1999	1	1	2	6	9	19
2000	0	1	4	10	17	32
2001	0	4	9	6	16	35
Total #	1	12	25	46	103	187

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	52	96	63	67	48	89	58	
Highest:	1324	2179	930	1819	1577	721	788	
Mean:	343	345	331	346	291	278	254	
Median:	220	229	238	234	197	234	194	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	10	14	24	52	100
1996	0	3	6	30	61	100
1997	0	6	6	12	76	100
1998	0	5	14	23	59	100
1999	5	5	11	32	47	100
2000	0	3	13	31	53	100
2001	0	11	26	17	46	100
Grand Total	1	6	13	25	55	100

7.2 Samples for Commercial Production

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	1	3	4
1996	0	0	2	0	3	5
1997	0	0	1	2	6	9
1998	0	0	2	2	4	8
1999	0	0	0	3	2	5
2000	0	0	0	0	0	0
2001	0	0	1	0	3	4
Total (#)	0	0	6	8	21	35
Total (%)	0	0	17	23	60	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	4	9	44	90	147
1996	0	5	18	58	88	169
1997	1	8	24	41	74	148
1998	0	4	7	35	50	96
1999	1	8	18	23	64	114
2000	1	13	11	43	79	147
2001	0	7	17	22	38	84
Total (#)	3	49	104	266	483	905
Total (%)	0	5	11	29	53	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	2	41	119	249	241	652
1996	4	40	104	187	192	527
1997	1	56	118	218	206	599
1998	0	17	112	192	288	609
1999	8	54	81	164	211	518
2000	3	33	79	122	154	319
2001	2	73	112	125	167	479
Total (#)	20	314	725	1257	1459	3775
Total (%)	1	8	19	33	39	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	5	10	17	3	35
1996	0	6	14	12	8	40
1997	0	9	10	26	21	66
1998	0	0	8	9	7	24
1999	0	5	11	21	28	65
2000	1	3	2	2	5	13
2001	0	6	7	8	6	27
Total (#)	1	34	62	95	78	270
Total (%)	0	13	23	35	29	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	1	1	2	5
1996	1	1	0	0	0	2
1997	1	3	0	0	2	6
1998	0	1	1	0	1	3
1999	0	1	0	1	0	2
2000	0	0	2	1	1	4
2001	1	1	2	0	1	5
Total (#)	3	8	6	3	7	27
Total (%)	11	30	22	11	26	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	2	51	139	312	339	9	852
1996	5	52	138	257	291	18	761
1997	3	76	153	287	309	34	862
1998	0	22	130	238	350	47	787
1999	9	68	110	212	305	3	707
2000	5	49	94	168	239	10	565
2001	3	87	139	155	215	2	601
Grand Total	27	405	903	1629	2048	123	5135

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	33	25	28	49	17	35	40	
Highest:	1705	853	948	2128	1188	2090	10131	
Mean:	204	198	194	228	212	214	205	
Median:	171	162	169	190	180	176	144	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	0	6	16	37	40	1	100
1996	1	7	18	34	38	2	100
1997	0	9	18	33	36	4	100
1998	0	3	17	30	44	6	100
1999	1	10	16	30	43	0	100
2000	1	9	17	30	42	2	100
2001	0	14	23	26	36	0	100
Grand Total	1	8	18	32	40	2	100

8. Magnesium

8.1 Samples for Home and Garden

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	2	2	24	29
1996	0	0	1	7	25	33
1997	0	0	1	0	16	17
1998	0	1	0	4	17	22
1999	0	0	1	2	16	19
2000	0	0	0	7	25	32
2001	0	0	0	4	31	35
Total	0	2	5	26	154	187

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	63	93	69	41	83	104	136	
Highest:	767	1906	955	1592	1735	1062	1200	
Mean:	345	442	441	397	408	413	420	
Median:	350	310	399	271	304	312	322	

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	3	7	7	83	100
1996	0	0	3	21	76	100
1997	0	0	6	0	94	100
1998	0	5	0	18	77	100
1999	0	0	5	11	84	100
2000	0	0	0	22	78	100
2001	0	0	0	11	89	100
Total	0	1	3	14	82	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	6	28	37	167	614	852
1996	1	32	44	139	545	761
1997	1	60	43	143	615	862
1998	2	39	37	123	586	787
1999	2	22	29	131	523	707
2000	1	24	44	82	414	565
2001	0	14	17	105	465	601
Total	13	219	251	890	3762	5135

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	16	17	12	13	18	21	
Highest:	1186	1182	1092	755	894	2051	888	
Mean:	305	312	290	308	301	329	315	
Median:	285	299	287	320	293	314	308	

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	3	4	20	72	100
1996	0	4	6	18	72	100
1997	0	7	5	17	71	100
1998	0	5	5	16	74	100
1999	0	3	4	19	74	100
2000	0	4	8	15	73	100
2001	0	2	3	17	77	100
Total	0	4	5	17	73	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	23	6	29
1996	30	3	33
1997	15	2	17
1998	15	7	22
1999	16	3	19
2000	29	3	32
2001	32	3	35
Total	160	27	187

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	79	21	100
	91	9	100
	88	12	100
	68	32	100
	84	16	100
	91	9	100
	91	9	100
	86	14	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	3	3	5	7	3	1	
Highest:	244	137	139	177	137	136	182	
Mean:	34	24	26	44	31	23	23	
Median:	22	14	16	22	18	13	13	

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	694	158	852
1996	548	213	761
1997	619	243	862
1998	595	192	787
1999	534	173	707
2000	424	141	565
2001	523	78	601
Total	3937	1198	5135

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	81	19	100
	72	28	100
	72	28	100
	76	24	100
	76	24	100
	75	25	100
	87	13	100
	77	23	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	3	1	2	3	2	
Highest:	354	309	336	359	299	382	276	
Mean:	35	39	45	39	39	38	28	
Median:	21	24	24	24	20	18	15	

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	26	3	29	90	10	100
1996	32	1	33	97	3	100
1997	14	3	17	82	18	100
1998	21	1	22	95	5	100
1999	18	1	19	95	5	100
2000	32	0	32	100	0	100
2001	34	1	35	97	3	100
Total	177	10	187	95	5	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	16	8	22	17	20	17	8	
Highest:	222	193	207	156	119	92	115	
Mean:	61	47	69	51	42	47	50	
Median:	44	43	43	44	37	44	50	

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	827	25	852
1996	726	35	761
1997	833	29	862
1998	755	32	787
1999	684	23	707
2000	558	7	656
2001	573	28	601
Total	4956	179	5135

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	97	3	100
	95	5	100
	97	3	100
	96	4	100
	97	3	100
	99	1	100
	95	5	100
	97	3	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5	6	9	4	7	6	8	
Highest:	253	281	239	339	190	154	237	
Mean:	39	46	48	47	45	39	51	
Median:	34	42	44	41	39	37	46	

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	28	29
1996	1	6	26	33
1997	0	2	15	17
1998	0	2	20	22
1999	0	0	19	19
2000	0	1	31	32
2001	1	5	29	35
Total	2	17	168	187

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	3	97	100
3	18	79	100
0	12	88	100
0	9	91	100
0	0	100	100
0	3	97	100
3	14	83	100
1	9	90	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.7	0.3	0.8	0.9	1.1	0.9	0.4	
Highest:	90.7	70.8	22.7	179.0	25.2	189.2	62.1	
Mean:	12.3	8.6	6.0	24.9	4.8	25.2	6.8	
Median:	5.4	2.6	5.0	5.3	2.3	8.2	3.1	

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	15	205	632	852
1996	10	145	606	761
1997	8	145	709	862
1998	9	144	634	787
1999	30	140	537	707
2000	20	102	443	565
2001	12	98	491	601
Total	104	979	4052	5135

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	24	74	100
1	19	80	100
1	17	82	100
1	18	81	100
4	20	76	100
4	18	78	100
2	16	82	100
2	19	79	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.3	0.3	0.2	0.1	0.1	0.1	
Highest:	156.6	68.4	94.4	89.5	14.0	85.4	41.3	
Mean:	2.3	2.3	2.4	2.3	2.3	2.4	2.2	
Median:	1.5	1.7	1.8	1.6	1.7	1.8	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	
GIE	Grasses intensively managed, Establishment
GIT	Grasses intensively managed, Established
GRE	Grasses, Establishment
GRT	Grasses, Established
PGE	Pasture, Establishment
PGT	Pasture improved grasses, Established
PIE	Pasture intensively grazed, Establishment
PIT	Pasture intensively grazed, Established
PLE	Pasture with legumes, Establishment
PLT	Pasture with legumes, Established
PNT	Pasture native grasses
PNE	Pasture native grasses, Established
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
Small grains	
MIL	Millet
OAS	Oats with legume
OAT	Oats
SOF	Sorghum forage
SOG	Sorghum grain
SOY	Soybeans
SSH	Sorghum sudan hybrid
SUD	Sudangrass
WHS	Wheat with legume
WHT	Wheat
Others	
ALG	Azalea
APP	Apples
ATF	Athletic Field

Crop Code	Crop Description
APP	Apples
ASP	Asparagus
BDR/BND	Beans-dry
BKB	Blackberries
BLU/BLB	Blueberries
BNS	Beans, Snap
CBP	Cabbage, Transplanted
CBS	Cabbage, Seeded
CEM	Cemetery
CKP	Cucumber, Transplanted
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GPA	Grapes, American
GPF	Grapes, French-American
GPV	Grapes, Vinifera
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
NUR	Nursery
ONS	Onion-seeded
OTH	Other
PAR	Pears
PCH	Peach
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
RAD	Radishes
ROD	Roadside
ROS	Roses
ROU	Rough
RSF	Raspberries, Fall

Crop Code	Crop Description
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TME	Tomato, Early
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing
WAT	Watermelon