

Soil Sample Survey

Erie Co.

Samples analyzed by CNAL in 1995-2001



Soil testing is the basis for environmentally sound nutrient management.

Summary compiled by

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



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

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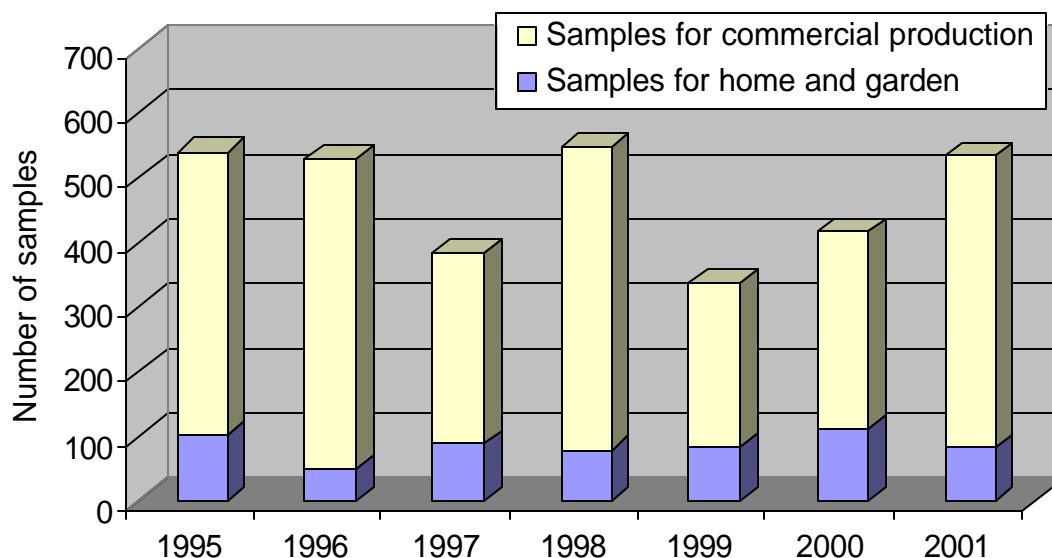
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1. General Survey Summary

This survey summarizes the soil test results from Erie County soil samples submitted for analyses to the Cornell Nutrient Analysis Laboratory (CNAL) during 1995-2001. The total number of samples analyzed in these years amounted to 3291. Of these 3291 samples, 2693 (82%) were submitted to obtain fertilizer recommendations for commercial production while 598 samples (18%) were submitted as home and garden samples.



Homeowners		Commercial		Total
1995	102	1995	439	541
1996	49	1996	479	528
1997	90	1997	295	385
1998	80	1998	467	547
1999	83	1999	255	338
2000	112	2000	305	417
<u>2001</u>	<u>82</u>	<u>2001</u>	<u>453</u>	<u>535</u>
Total	598	Total	2693	3291

Of the home and garden soil samples, 36% were submitted to request fertilizer recommendations for lawns while 19% of the samples were submitted for recommendations for vegetable production. People submitting samples for commercial production requested fertilizer recommendations for corn silage or grain (32%), alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (26%), or grapes (8%) while a few producers were planning on growing other crops including clover/grass mixtures, hay, small grains and vegetables.

Home and garden samples in Erie County were mostly silty (34%), silt loams (32%) and sandy loams (27%) belonging to soil management group 2, 3, and 4, respectively. Seven percent of the samples belonged to soil management group 5. The table below gives descriptions of each of the soil management groups.

Soil Management Groups for New York

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

Of the samples submitted for commercial production, 57% belonged to soil management group 3. One percent was from soil management group 1, 22% were from group 2, 14% from group 4 and 2% from group 5 while for 4% of the samples, the soil management

group was unknown. The five most common soil series were Blasdel (15%), Chenango (8%), Mardin (7%), Farnham (6%), and Volusia (5%). These soils represent 2% (Blasdel), 3% (Chenango), 7% (Mardin), 2% (Farnham), and 5% (Volusia) of the total 659,400 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 45% with median values ranging from 4.4 to 6.0% organic matter for home and garden samples and values ranging from 3.6 to 4.0% for samples submitted for commercial production. Forty-nine percent of the home and garden samples had between 2 and 5% organic matter with 8% testing between 2 and 2.9% organic matter, 18% between 3.0 and 3.9% organic matter and 23% between 4.0 and 4.9% organic matter. Forty-six percent of the soils submitted for home and garden tested >4.9% in organic matter while 5% has less than 2% organic matter. Of the samples submitted for commercial production, 35% contained between 3 and 4% organic matter, 32% tested between 4.0 and 4.9% while 11% had organic matter concentrations of 5.0-5.9%. In total, 45% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 3.7 to 8.6 with the median for home and garden samples ranging from pH 7.1 to pH 7.4 and for samples submitted for commercial production ranging from pH 6.1 to pH 6.6. Of the home and garden samples, 94% had a pH of 6 or higher with 23% testing between pH 6 and 7. For the samples submitted for commercial production, 70% tested pH 6 or higher with 60% testing between pH 6 and pH 7.

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 lb 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 in P. Of the home and garden samples, 14% tested low, 15% tested medium, 34% tested high and 37% tested very high. This meant that 71% tested high or very high in P.

Phosphorus levels for samples for commercial production in Erie County were similar to the state average (50% of New York samples submitted to CNAL tested high or very high in P in the 1995-2001 period). Seven percent of the samples tested very high in P. Twenty-six percent was low in P, 24% tested medium for P while 43% of the submitted samples were classified as high in soil test P. This means that 50% 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 low in potassium. Fourteen percent tested medium, 30% high and 49% very high. For samples submitted for commercial production, 1% tested very low in K, 7% tested low, 18% tested medium, 33% tested high and 38% tested very high in potassium (for 2% the K classification was unknown). 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 almost 6000 lbs Mg/acre (Morgan extraction). There were only 6 samples that tested very low in Mg. Most soils tested high or very high for Mg (almost 100% of the homeowner soils and 93% of the soils of the commercial growers). No more than 3 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 Erie County provided the soil pH is maintained in the desirable range.

Soils with more than 50 lbs Morgan extractable Fe per acre test excessive for Fe. Anything lower than 50 lbs Fe/acre is considered normal. Iron levels fell for 88-93% in the normal range with 7% of the home and garden samples and 12% of the samples for commercial production testing excessive for Fe. Similarly, most soils (88-99%) 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. Soils with less than 0.5 lb zinc per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the home and garden samples, 92% tested high for zinc while 7% tested medium and 1% was low in zinc. Of the samples for commercial production, 2% tested low in zinc, 20% tested medium while 78% of the samples were high in zinc.

In the following sections, the summary tables for each of the soil fertility indicators described above are given. The appendix contains the crop codes used in section 2.

Reference

- Morgan, M.F. 1941. Chemical soil diagnosis by the universal soil testing system. Connecticut Agricultural Experimental Station. Bulletin 450.

2. Cropping Systems

2.1 Samples for Home and Garden

Crops for which recommendations are requested by homeowners:

	1995	1996	1997	1998	1999	2000	2001	Total	%
ALG	7	0	10	6	7	0	1	31	5
APR	0	1	0	0	0	0	0	1	0
ATF	3	5	0	11	2	22	9	52	9
BLU	0	1	1	0	0	0	0	2	0
CEM	1	0	0	0	0	0	0	1	0
FLA	2	3	2	2	3	2	4	18	3
GEN	0	0	0	0	0	3	3	6	1
HRB	0	0	0	0	0	0	2	2	0
LAW	39	3	43	29	29	58	13	214	36
MVG	23	24	17	13	15	8	16	116	19
OTH	1	2	0	2	4	1	2	12	2
PER	3	1	3	5	6	2	7	27	5
PRK	0	0	0	0	0	0	1	1	0
PTO	0	1	0	0	0	0	1	2	0
ROD	0	0	0	0	0	7	0	7	1
ROS	1	2	0	0	0	4	6	13	2
ROU	4	0	0	0	0	0	0	4	1
RSP	0	0	2	0	0	0	0	1	0
SAG	18	6	10	12	12	5	10	73	12
SPB	0	0	1	0	0	0	0	2	0
TOM	0	0	0	0	0	0	1	1	0
TRF	0	0	1	0	2	0	2	5	1
Unknown	0	0	0	0	3	0	4	7	1
Total	102	49	90	80	83	112	82	598	100

Notes:

See Appendix for Cornell crop codes.

2.2 Samples for Commercial Production

Crops for which recommendations are requested for commercial production:

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
ABE/ABT	5	4	1	4	1	0	3	18	1
AGE/AGT	60	79	54	157	39	92	95	576	21
ALE/ALT	41	50	8	10	0	3	0	112	4
APP	1	4	2	2	0	3	0	12	0
BCE/BCT	5	2	0	0	1	1	1	10	0
BGE/BGT	2	7	3	1	1	0	1	15	1
BLB	17	22	3	0	0	0	0	42	2
BRP	0	0	0	1	0	0	0	1	0
BRS	0	2	0	0	24	0	0	26	1
BSP	2	6	0	0	0	0	3	11	0
BSS	0	0	0	1	0	0	0	1	0
BTE	2	0	0	0	0	0	0	2	0
BWI	0	2	0	2	0	0	2	6	0
BWS	0	0	0	0	1	0	0	1	0
CBP	1	0	0	3	0	2	0	6	0
CFP	1	0	0	0	0	0	0	1	0
CGE/CGT	12	7	17	10	8	14	16	84	3
CHC	0	0	0	0	0	0	1	1	0
CHS	0	0	0	0	0	2	0	2	0
CKP	0	0	2	0	0	0	0	2	0
CLE/CLT	0	0	0	0	1	0	1	2	0
COG/COS	129	138	93	155	97	84	159	855	32
CSE/CST	0	7	0	0	0	0	0	7	0
EGG	0	0	0	0	0	0	1	1	0
GIE/GIT	2	3	14	25	8	24	67	143	5
GPA	22	33	30	24	36	42	13	200	7
GPF	0	1	0	0	0	0	26	27	1
GRE/GRT	60	4	6	20	3	13	8	114	4
HRB	0	0	1	0	0	0	0	1	0
IDL	0	0	0	1	2	2	2	7	0
LET	0	1	0	1	0	0	0	2	0
MIX	11	4	2	5	2	3	0	27	1
NUR	0	0	0	5	0	0	0	5	0
OAS	8	10	13	13	12	6	17	79	3
OAT	1	0	7	6	2	0	0	16	1

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
ONP	0	0	0	0	0	1	0	1	0
OTH	1	0	0	1	1	0	0	3	0
PEA	0	0	1	0	0	0	0	1	0
PCH	0	2	0	0	0	1	0	3	0
PEP	2	0	2	1	0	0	0	5	0
PGE/PGT	0	0	0	1	0	0	5	6	0
PIE/PIT	4	0	5	0	0	2	16	28	1
PLE/PLT	2	0	2	1	0	0	0	5	0
PNE/PNT	2	0	0	0	2	0	0	4	0
POT	4	24	4	5	0	0	0	37	1
PUM	6	10	4	0	1	1	2	24	1
RSF	5	1	0	0	0	0	0	6	0
RYC	0	14	0	0	1	0	0	15	1
RYS	0	2	0	0	0	0	0	2	0
SOY	0	0	0	0	0	0	1	1	0
SPS	0	0	0	1	0	0	0	1	0
SQS	0	0	0	0	0	0	1	1	0
SQW	0	0	0	1	0	0	2	3	0
SSH	2	0	0	0	0	0	1	3	0
STE	2	0	0	0	0	0	0	2	0
STS	2	7	1	0	0	0	0	10	0
SUD	0	1	0	0	0	0	0	1	0
SUN	0	0	4	0	0	0	0	4	0
SWC	2	12	1	6	2	2	3	28	1
TOM	0	3	1	2	0	0	1	7	0
TRE/TRT	10	1	0	1	0	0	0	12	0
TRP	0	1	0	0	0	0	0	1	0
WHS	4	0	0	0	0	0	0	4	0
WHT	2	13	12	0	3	1	2	33	1
Unknown	7	2	2	1	7	5	3	27	1
Total	439	479	295	467	255	305	453	2693	100

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)	23	13	20	37	42	43	27	205
SMG 3 (silt loam)	35	12	52	15	22	36	18	190
SMG 4 (sandy loam)	34	21	14	18	16	28	28	159
SMG 5 (sandy)	10	3	4	10	3	5	9	44
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	102	49	90	80	83	112	82	598

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name		1995	1996	1997	1998	1999	2000	2001	Total
Allard	3	2	1	0	1	0	0	3	7
Alton	5	4	8	2	7	2	6	7	36
Angola	2	3	1	5	3	0	5	7	24
Arkport	4	0	12	16	10	7	5	12	62
Aurora	2	0	0	1	0	0	0	0	1
Benson	4	0	0	1	0	0	0	0	1
Blasdell	3	95	114	30	66	27	39	41	412
Brockport	1	0	0	0	2	0	0	0	2
Canadice	2	1	0	1	0	0	0	0	2
Canandaigua	3	1	3	0	6	3	2	1	16
Castile	4	3	14	7	20	2	0	7	53
Cayuga	2	0	4	0	0	0	0	0	4
Cazenovia	2	0	0	0	0	1	0	0	1
Chenango	3	8	44	29	85	7	18	17	208
Chippewa	3	2	1	0	0	0	0	1	4
Churchville	2	3	2	1	2	0	0	6	14
Collamer	3	2	4	0	0	1	0	0	7
Colonie	5	0	0	0	0	0	1	2	3
Cosad	4	2	0	2	0	0	1	1	6
Danley	2	2	6	1	1	0	2	0	12
Darien	2	8	14	7	19	21	18	21	108
Derb	3	16	5	9	6	11	8	15	70
Elnora	5	0	0	0	2	0	1	3	6
Erie	3	5	3	4	13	4	12	4	45
Farmington	3	0	0	1	0	0	0	0	1
Farnham	4	20	20	25	31	15	23	34	168
Galen	4	0	17	8	2	3	5	1	36
Halsey	4	1	0	0	0	0	0	1	2
Hamlin	2	0	4	2	2	0	1	2	11
Honeoye	2	0	0	3	0	0	0	0	3
Hornell	2	1	5	2	6	3	3	3	23
Hudson	2	10	0	0	0	3	3	3	19
Ilion	2	0	0	0	0	0	1	0	1
Lamson	4	0	0	0	1	0	1	1	3
Langford	3	65	23	6	17	5	9	4	129
Manlius	3	9	7	5	7	16	8	11	63

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Name		1995	1996	1997	1998	1999	2000	2001	Total
Mardin	3	26	17	14	47	4	7	59	174
Marilla	3	61	9	6	12	14	15	11	128
Middlebury	3	2	7	1	2	5	3	3	23
Minoa	4	3	4	2	0	1	4	1	15
Newstead	4	0	0	0	0	0	0	1	1
Niagara	3	1	2	3	2	2	1	10	21
Odessa	2	6	1	2	1	3	6	3	22
Orpark	2	11	21	21	13	18	19	20	123
Ovid	2	2	0	0	0	0	0	0	2
Palmyra	3	2	4	4	2	0	2	1	15
Patchin	3	4	0	0	4	0	0	4	12
Phelps	3	3	5	6	4	4	1	5	28
Raynham	3	0	0	0	2	0	1	1	4
Red Hook	4	1	1	3	5	1	5	12	28
Remsen	2	4	7	0	3	0	5	7	26
Rhinebeck	2	3	14	15	9	8	2	20	71
Schoharie	1	0	1	0	2	24	1	2	30
Schuyler	3	1	0	3	0	2	6	0	12
Scio	3	2	1	0	2	0	1	1	7
Swormville	1	0	0	0	0	0	0	2	2
Teel	2	4	37	6	8	9	4	15	83
Tioga	3	0	1	0	0	0	0	12	13
Valois	3	0	0	0	1	0	0	0	1
Varysburg	2	0	10	0	3	5	0	16	34
Volusia	3	30	17	18	24	12	14	26	141
Wassaic	4	0	1	0	0	0	0	0	1
Wayland	2	0	0	0	0	0	0	1	1
Williamson	4	0	0	0	2	0	2	2	6
Unknown	-	10	7	23	10	12	34	10	106
Total	-	439	479	295	467	255	305	453	2693

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	1	9	12	17	25	15	6	17	102
1996	1	0	6	7	6	11	3	15	49
1997	0	1	9	16	22	20	8	14	90
1998	1	5	5	17	18	16	4	14	80
1999	0	2	3	9	18	9	12	30	83
2000	2	4	8	28	34	23	5	8	112
2001	1	3	3	11	16	14	7	27	82
Total	6	24	46	105	139	108	45	125	598

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.7	0.8	1.6	0.8	0.7	0.6	0.7	
Highest:	38.2	19.4	23.7	30.0	40.6	9.5	44.6	
Mean:	5.5	6.7	5.4	5.4	8.7	4.6	9.7	
Median:	4.5	5.2	4.8	4.6	6.0	4.4	5.6	

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	1	9	12	17	25	15	6	17	100
1996	2	0	12	14	12	22	6	31	100
1997	0	1	10	18	24	22	9	16	100
1998	1	6	6	21	23	20	5	18	100
1999	0	2	4	11	22	11	14	36	100
2000	2	4	7	25	30	21	4	7	100
2001	1	4	4	13	20	17	9	33	100
Total	1	4	8	18	23	18	8	21	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	66	140	163	55	10	3	439
1996	3	19	84	210	115	36	6	6	479
1997	1	3	45	99	96	35	7	9	295
1998	1	13	60	164	163	58	3	5	467
1999	2	8	29	95	89	19	4	9	255
2000	0	22	67	94	89	23	9	1	305
2001	0	18	67	137	153	60	15	3	453
Total	7	85	418	939	868	286	54	36	2693

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.6	0.2	0.9	0.7	0.1	1.2	1.0	
Highest:	8.5	12.2	36.0	13.8	11.8	43.6	8.2	
Mean:	4.0	3.7	4.3	3.9	4.0	3.8	3.9	
Median:	4.0	3.6	3.9	3.9	3.9	3.6	4.0	

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

	<1%	1.0- 1.9	2.0- 2.9	3.0- 3.9	4.0- 4.9	5.0- 5.9	6.0- 6.9	>6.9	Total
1995	0	0	15	32	37	13	2	1	100
1996	1	4	18	44	24	8	1	1	100
1997	0	1	15	34	33	12	2	3	100
1998	0	3	13	35	35	12	1	1	100
1999	1	3	11	37	35	7	2	4	100
2000	0	7	22	31	29	8	3	0	100
2001	0	4	15	30	34	13	3	1	100
Total	0	3	16	35	32	11	2	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	5	1	11	16	30	33	3	0	102
1996	0	1	2	1	4	6	22	13	0	0	49
1997	0	1	2	3	5	14	36	28	1	0	90
1998	0	1	0	1	6	23	29	18	2	0	80
1999	0	0	2	2	4	14	31	26	4	0	83
2000	0	0	2	4	10	13	30	49	4	0	112
2001	0	2	3	2	3	18	23	25	6	0	82
Total	0	8	16	14	43	104	201	192	20	0	598

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.5	4.8	4.9	4.6	5.1	5.2	4.6	
Highest:	8.1	7.8	8.1	8.1	8.1	8.2	8.2	
Mean:	-	-	-	-	-	-	-	
Median:	7.2	7.1	7.2	7.2	7.3	7.4	7.3	

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	3	5	1	11	16	29	32	3	0	100
1996	0	2	4	2	8	12	45	27	0	0	100
1997	0	1	2	3	6	16	40	31	1	0	100
1998	0	1	0	1	8	29	36	23	3	0	100
1999	0	0	2	2	5	17	37	31	5	0	100
2000	0	0	2	4	9	12	27	44	4	0	100
2001	0	2	4	2	4	22	28	30	7	0	100
Total	0	1	3	2	7	17	34	32	3	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	10	17	31	68	149	113	33	18	0	0	439
1996	9	17	56	110	123	132	31	1	0	0	479
1997	13	16	20	47	107	86	6	0	0	0	295
1998*	9	11	24	77	175	137	27	3	1	0	464
1999	20	15	14	23	60	86	29	6	1	1	255
2000	9	17	13	21	64	109	52	15	5	0	305
2001	21	17	25	107	143	111	24	5	0	0	453
Total	91	110	183	453	821	774	202	48	7	1	2690

* Three samples were not analyzed for pH in 1998.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3.8	4.0	3.9	3.7	3.8	4.1	3.7	
Highest:	7.7	7.8	7.3	8.3	8.6	8.2	7.8	
Mean:	-	-	-	-	-	-	-	
Median:	6.2	6.2	6.3	6.3	6.4	6.6	6.1	

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	2	4	7	15	34	26	8	4	0	0	100
1996	2	4	12	23	26	28	6	0	0	0	100
1997	4	5	7	16	36	29	2	0	0	0	100
1998	2	2	5	17	38	30	6	1	0	0	100
1999	8	6	5	9	24	34	11	2	0	0	100
2000	3	6	4	7	21	36	17	5	2	0	100
2001	5	4	6	24	32	25	5	1	0	0	100
Total	3	4	7	17	31	29	8	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	23	12	44	7	2	1	3	3	7	102
1996	0	7	6	12	6	1	2	1	1	13	49
1997	0	11	17	28	17	3	2	4	0	8	90
1998	0	13	20	25	5	3	0	0	3	11	80
1999	0	7	5	31	9	5	1	7	2	16	83
2000	0	20	23	36	14	5	2	3	3	6	112
2001	0	1	9	28	7	4	5	7	4	17	82
Total	0	82	92	204	65	23	13	25	16	78	598

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	3	
Highest:	1511	961	717	542	1748	912	1532	
Mean:	57	126	60	74	131	46	156	
Median:	14	36	25	15	37	16	47	

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	23	12	43	7	2	1	3	3	7	100
1996	0	14	12	24	12	2	4	2	2	27	100
1997	0	12	19	31	19	3	2	4	0	9	100
1998	0	16	25	31	6	4	0	0	4	14	100
1999	0	8	6	37	11	6	1	8	2	19	100
2000	0	18	21	32	13	4	2	3	3	5	100
2001	0	1	11	34	9	5	6	9	5	21	100
Total	0	14	15	34	11	4	2	4	3	13	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	140	78	166	21	10	7	12	2	3	439
1996	0	91	93	241	26	7	0	5	3	13	479
1997	0	72	73	127	16	1	0	2	0	4	295
1998	0	86	102	250	14	6	1	1	1	6	467
1999	0	87	64	95	8	0	0	1	0	0	255
2000	0	84	103	106	10	1	0	0	0	1	305
2001	0	128	133	162	7	11	3	7	2	0	453
Total	0	688	646	1147	102	36	11	28	8	27	2693

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:	332	617	1185	688	118	651	191	
Mean:	20	29	25	21	11	12	14	
Median:	9	13	9	11	6	7	7	

Percent of samples submitted for commercial production within each Morgan P range:

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
1995	0	32	18	38	5	2	2	3	0	1	100
1996	0	19	19	50	5	1	0	1	1	3	100
1997	0	24	25	43	5	0	0	1	0	1	100
1998	0	18	22	54	3	1	0	0	0	1	100
1999	0	34	25	37	3	0	0	0	0	0	100
2000	0	28	34	35	3	0	0	0	0	0	100
2001	0	28	29	36	2	2	1	2	0	0	100
Total	0	26	24	43	4	1	0	1	0	1	100

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

7. Potassium

7.1 Samples for Home and Garden

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	12	10	23
1996	0	1	0	3	9	13
1997	0	1	5	6	8	20
1998	0	0	3	15	19	37
1999	0	2	1	15	24	42
2000	0	1	4	15	23	43
2001	0	1	5	4	17	27
Total (#)	0	6	19	70	110	205
Total (%)	0	3	9	34	54	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	4	11	20	35
1996	0	1	2	2	7	12
1997	0	3	12	19	18	52
1998	0	0	4	3	8	15
1999	0	1	1	4	16	22
2000	0	4	3	9	20	36
2001	0	2	3	3	10	18
Total (#)	0	11	29	51	99	190
Total (%)	0	6	15	27	52	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	10	9	14	34
1996	0	3	1	6	11	21
1997	0	1	3	5	5	14
1998	0	2	4	7	5	18
1999	0	1	2	4	9	16
2000	0	3	9	13	3	28
2001	0	1	2	5	20	28
Total (#)	0	12	31	49	67	159
Total (%)	0	8	19	31	42	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	5	2	1	2	10
1996	0	0	0	0	3	3
1997	0	1	1	2	0	4
1998	0	2	2	2	4	10
1999	0	0	0	1	2	3
2000	0	2	2	0	1	5
2001	0	0	0	5	4	9
Total (#)	0	10	7	11	16	44
Total (%)	0	23	16	25	36	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	6	17	33	46	102
1996	0	5	3	11	30	49
1997	0	6	21	32	31	90
1998	0	4	13	27	36	80
1999	0	4	4	24	51	83
2000	0	10	18	37	47	112
2001	0	4	10	17	51	82
Total #	0	39	86	181	292	598

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	62	46	41	79	61	48	47	
Highest:	7408	3068	2736	1337	17241	2188	9202	
Mean:	339	363	245	257	600	226	652	
Median:	193	235	166	169	222	176	282	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	6	17	32	45	100
1996	0	10	6	22	61	100
1997	0	7	23	36	34	100
1998	0	5	16	34	45	100
1999	0	5	5	29	61	100
2000	0	9	16	33	42	100
2001	0	5	12	21	62	100
Grand Total	0	7	14	30	49	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	0	0	0
1996	0	0	1	0	0	1
1997	0	0	0	0	0	0
1998	0	0	1	0	3	4
1999	11	5	4	3	1	24
2000	0	0	1	0	0	1
2001	0	0	2	1	1	4
Total (#)	11	5	9	4	5	34
Total (%)	32	15	26	12	15	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	8	22	28	58
1996	0	3	23	55	45	126
1997	0	5	3	18	41	67
1998	0	1	8	27	34	70
1999	2	5	8	23	33	71
2000	1	1	13	21	39	75
2001	0	14	27	37	46	124
Total (#)	3	29	90	203	266	591
Total (%)	1	5	15	34	45	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	16	71	138	112	337
1996	0	8	31	114	115	268
1997	0	8	27	54	60	149
1998	0	18	50	107	129	304
1999	2	6	20	36	59	123
2000	0	22	47	38	53	160
2001	0	20	49	71	91	231
Total (#)	2	98	295	558	619	1572
Total (%)	0	6	19	35	39	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	7	11	9	12	39
1996	1	7	10	22	29	69
1997	2	8	10	26	19	65
1998	0	15	18	24	14	71
1999	0	2	6	8	14	30
2000	0	4	18	17	7	46
2001	1	13	20	21	18	73
Total (#)	4	56	93	127	113	393
Total (%)	1	14	24	32	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	2	0	1	4
1996	0	0	3	2	3	8
1997	0	0	0	1	1	2
1998	0	2	0	3	4	9
1999	0	0	0	0	2	2
2000	0	3	0	0	5	8
2001	0	5	5	1	1	12
Total (#)	0	11	10	7	17	45
Total (%)	0	24	22	16	38	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	0	24	92	169	153	1	439
1996	1	18	68	193	192	7	479
1997	2	21	40	99	121	12	295
1998	0	36	77	161	184	9	467
1999	15	18	38	70	109	5	255
2000	1	30	79	76	104	15	305
2001	1	52	103	131	157	9	453
Grand Total	20	199	497	899	1020	58	2693

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	51	47	40	50	1	36	41	
Highest:	890	4932	1960	2318	943	6361	1887	
Mean:	189	218	212	210	203	202	203	
Median:	157	173	180	178	169	148	156	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	0	5	21	38	35	0	100
1996	0	4	14	40	40	1	100
1997	1	7	14	34	41	4	100
1998	0	8	16	34	39	2	100
1999	6	7	15	27	43	2	100
2000	0	10	26	25	34	5	100
2001	0	11	23	29	35	2	100
Grand Total	1	7	18	33	38	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	0	10	91	102
1996	0	0	1	2	46	49
1997	0	0	0	3	87	90
1998	0	1	0	2	77	80
1999	0	0	0	0	83	83
2000	0	0	0	2	110	112
2001	0	0	0	0	82	82
Total	0	2	1	19	576	598

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	63	88	122	32	258	105	214	
Highest:	2855	3079	2318	2069	5752	1526	5666	
Mean:	560	815	688	622	996	606	1027	
Median:	457	785	633	548	796	600	653	

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	1	0	10	89	100
1996	0	0	2	4	94	100
1997	0	0	0	3	97	100
1998	0	1	0	3	96	100
1999	0	0	0	0	100	100
2000	0	0	0	2	98	100
2001	0	0	0	0	100	100
Total	0	0	0	3	96	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	3	11	16	61	348	439
1996	0	10	25	101	343	479
1997	0	8	8	43	236	295
1998	0	5	15	78	369	467
1999	1	19	9	37	189	255
2000	0	12	16	35	242	305
2001	2	8	16	69	358	453
Total	6	73	105	424	2085	2693

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	6	41	37	45	7	22	13	
Highest:	798	1434	3019	1900	860	1365	835	
Mean:	308	290	358	330	324	349	339	
Median:	309	281	340	321	313	337	325	

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	14	79	100
1996	0	2	5	21	72	100
1997	0	3	3	15	80	100
1998	0	1	3	17	79	100
1999	0	7	4	15	74	100
2000	0	4	5	11	79	100
2001	0	2	4	15	79	100
Total	0	3	4	16	77	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	93	9	102
1996	48	1	49
1997	82	8	90
1998	74	6	80
1999	81	2	83
2000	100	12	112
2001	78	4	82
Total	556	42	598

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	91	9	100
	98	2	100
	91	9	100
	93	8	100
	98	2	100
	89	11	100
	95	5	100
	93	7	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	2	2	2	1	2	2	
Highest:	318	99	235	114	127	237	125	
Mean:	20	14	18	15	13	19	15	
Median:	9	10	9	8	8	6	7	

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	401	38	439
1996	439	40	479
1997	258	37	295
1998	421	46	467
1999	193	62	255
2000	266	39	305
2001	386	67	453
Total	2364	329	2693

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	91	9	100
	92	8	100
	87	13	100
	90	10	100
	76	24	100
	87	13	100
	85	15	100
	88	12	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	2	3	2	1	1	1	
Highest:	236	170	635	288	640	166	227	
Mean:	21	22	29	21	52	21	28	
Median:	11	13	15	13	13	9	14	

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	86	16	102
1996	42	7	49
1997	77	13	90
1998	72	8	80
1999	80	3	83
2000	103	9	112
2001	65	17	82
Total	525	73	598

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	84	16	100
	86	14	100
	86	14	100
	90	10	100
	96	4	100
	92	8	100
	79	21	100
	88	12	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	13	4	9	8	9	8	
Highest:	190	139	282	279	357	318	259	
Mean:	50	58	63	52	53	44	71	
Median:	38	55	45	35	45	29	62	

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	433	6	439
1996	473	6	479
1997	291	4	295
1998	466	1	467
1999	251	4	255
2000	298	7	305
2001	443	10	453
Total	2655	38	2693

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	7	6	5	8	1	2	3	
Highest:	150	187	116	114	165	180	290	
Mean:	38	35	39	32	33	27	39	
Median:	34	32	35	28	28	21	34	

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	2	12	88	102
1996	0	3	46	49
1997	0	3	87	90
1998	0	6	74	80
1999	1	2	80	83
2000	1	14	97	112
2001	0	4	78	82
Total	4	44	550	598

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	12	86	100
0	6	94	100
0	3	97	100
0	8	93	100
1	2	96	100
1	13	87	100
0	5	95	100
1	7	92	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.3	0.8	0.5	0.7	0.1	0.4	0.7	
Highest:	285.6	159.7	240.9	51.2	103.5	150.3	222.6	
Mean:	18.3	17.9	19.2	7.3	14.3	10.0	21.7	
Median:	5.2	8.3	7.0	3.5	8.2	4.4	8.8	

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	7	85	347	439
1996	4	86	389	479
1997	7	46	242	295
1998	5	106	356	467
1999	6	54	195	255
2000	12	102	191	305
2001	2	59	392	453
Total	43	538	2112	2693

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	19	79	100
1	18	81	100
2	16	82	100
1	23	76	100
2	21	76	100
4	33	63	100
0	13	87	100
2	20	78	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.3	0.3	0.3	0.1	0.1	0.4	
Highest:	86.9	139.4	44.9	12.2	12.3	15.0	23.5	
Mean:	2.5	3.1	2.6	1.8	2.0	1.7	2.7	
Median:	1.5	1.7	1.8	1.5	1.6	1.3	2.1	

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
APR	Apricots

Crop Code	Crop Description
ATF	Athletic Field
ASP	Asparagus
BDR/BND	Beans-dry
BLU/BLB	Blueberries
BRP	Broccoli, Transplanted
BRS	Broccoli, Seeded
CBP	Cabbage, Transplanted
CEM	Cemetery
CFP	Cauliflower, Transplanted
CHC	Chinese cabbage
CKP	Cucumber, Transplanted
EGG	Eggplant
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GPA	Grapes, American
GPF	Grapes, French-American
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
NUR	Nursery
ONP	Onions, Transplanted
ONS	Onion-seeded
OTH	Other
PAR	Pears
PEA	Peas
PCH	Peaches
PEP	Peppers
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside

Crop Code	Crop Description
ROS	Roses
ROU	Rough
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SPB	Spring Flowering Bulbs
SPS	Spinach, Spring
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing