

# Soil Sample Survey

# Rensselaer Co.

Samples analyzed by CNAL in 1995-2001

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Farmland in Rensselaer County.

Summary compiled by

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

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

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# 1. General Survey Summary

Rensselaer County is situated between the tidal waters of the Hudson River on the west and the 2,800-foot Taconic range shared with Vermont and Massachusetts on the east. It encompasses 665 square miles or 425,700 acres.

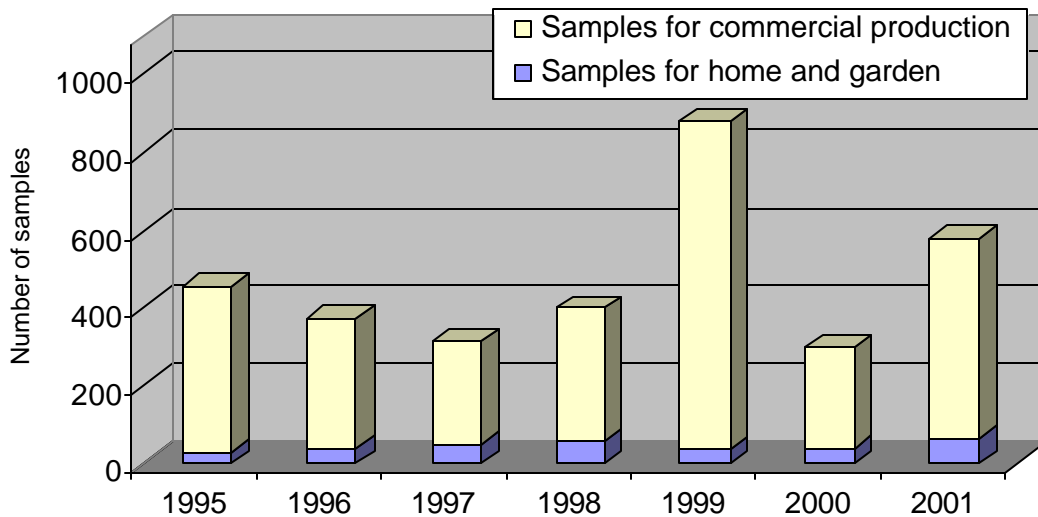
The eastern portion of the county consists of the narrow Little Hoosic River valley with its fertile river outwash soils sandwiched between steep uplands. The Rensselaer Plateau, a 1,500 foot high, gently rolling table of very resistant rock, dominates one third of the center of the county. Large boulders and numerous bogs and swamps punctuate the hemlock-beech-maple forest on the thin soil cover. The northern portion consists of the Hoosic River and its tributaries. The Hoosic River culminates in a major outwash into the Hudson River Valley in the town of Schaghticoke. The three northern townships of Hoosic, Pittstown and Schaghticoke, through which the Hoosic River flows form the major agriculture region.

The western portion of the county is a historical artifact of the extinct Lake Albany. The northwestern area formed on an extensive sand delta where the Hoosic River entered into the lake. Stagnant, melting ice left a mix of rolling glacial till interspersed with extensive gravel outwash soils in the center of the west side of the county. Poorly drained lacustrine silt and clays in very deep deposits comprise the southwestern portion of the county and the bluffs along the Hudson River.

Sixty percent of the county's agricultural sales come from dairy farming. The dairy farms are concentrated in the three northern townships mentioned above. A narrow, very productive strip of farms runs the length of the Little Hoosic valley between the Plateau and the Taconic range. There are a significant number of farms on the silty clays of the southwest, while an ever-shrinking number are located on the gravels of the west central section. Much of the agriculture in the latter section of the county has been consumed by expanding suburbs ringing the major city, Troy, and the bedroom-communities of Albany, the nearby state capital, which is rapidly expanding into the southwest along the I-90 corridor. In response to growing communities, farmers' markets, roadside stands, and specialty horticultural farms are rapidly increasing in number.

Due to competing demands for land, for agriculture to continue to survive and thrive in the region, a higher level of management is needed in order to remain competitive. With bedroom-communities dependent on wells and the Tomhannock reservoir supplying water to the city of Troy, nutrient management is becoming a more critical issue as well. Both of these factors have lead to an increase in reliance on soil testing as the basis of fertilizer recommendations and manure management.

This survey summarizes the soil test results from Rensselaer 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 3298. Of these 2989 samples (91%) were submitted to obtain fertilizer recommendations for commercial production while 309 samples (9%) were submitted as home and garden samples.



<b>Homeowners</b>		<b>Commercial</b>		<b>Total</b>
1995	27	1995	427	454
1996	39	1996	333	372
1997	52	1997	264	316
1998	55	1998	344	399
1999	35	1999	844	879
2000	40	2000	257	297
<u>2001</u>	<u>61</u>	<u>2001</u>	<u>520</u>	<u>581</u>
<b>Total</b>	<b>309</b>	<b>Total</b>	<b>2989</b>	<b>3298</b>

Of the home and garden soil samples submitted to CNAL during 1995-2001, 27% were sent in to request fertilizer recommendations for home lawns. Twenty five percent requested recommendations for home garden vegetable production and 15% of the samples were analyzed for perennial plants. People submitting samples for commercial production requested fertilizer recommendations for corn silage or grain production (43%), alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (29%), hay production (13%), or pasture (4%), while a few producers were planning on growing other crops including clover/grass mixtures and vegetables. Home and garden samples in Rensselaer County were mostly sandy loam soils belonging to soil management group 4 (39%). Twentyfive percent belonged to soil management group 2. Group 3 was represented by 24% of all samples and 12% were classified as sandy (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, 74.7% belonged to soil management group 4. Less than 1% was from soil management group 1. Group 2 and 3 were represented with 11.9 and 4.5% of the samples while 8.1% of the samples (all from

one soil series) belonged to soil management group 5. The five most common soil series were Bernardstown (27.6%), Pittstown (23.0%), Hoosic (10.8%), Windsor (7.1%), and Nassau (7.0%). These soils represent 19.9% (Bernardstown), 8.5% (Pittstown), 6.6% (Hoosic), 1.3% (Windsor), and 10.8% (Nassau) of the total 425,700 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 40% with median values ranging from 3.2 to 4.6% organic matter for home and garden samples and values ranging from 3.3 to 3.7% organic matter for samples submitted for commercial production. Fifty six percent of the home and garden samples had between 2 and 5% organic matter with 19% testing between 2 and 2.9% organic matter, 21% between 3.0 and 3.9% organic matter and 16% between 4.0 and 4.9% organic matter. Twenty eight percent of the soils submitted for home and garden tested >4.9% in organic matter while 17% had less than 2% organic matter. Of the samples submitted for commercial production, 39% contained between 3 and 4% organic matter, 24% tested between 4.0 and 4.9% while 6% had organic matter concentrations of 5.0-5.9%. In total, 31% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 2.8 to 12.7 with the median for home and garden samples ranging from pH 5.9 to pH 7.0 and for samples submitted for commercial production ranging from pH 6.2 to pH 6.5. Of the home and garden samples, 58% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, 73% tested between pH 6.0 and 7.4 while 19% 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, 16% tested low, 16% tested medium, 37% tested high and 31% tested very high. This meant that 68% tested high or very high in P.

Phosphorus levels for samples for commercial production in Rensselaer County were similar to the state average (50% tests high or very high in P). Seven percent of the samples tested very high in P. Twenty five percent was low in P, 30% tested medium for P while 38% of the submitted samples were classified as high in soil test P. This means that 45% tested high or very high in P and. 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, 4% were classified as very low or low in potassium. Eighteen percent tested medium, 22% high and 44% very high. For samples submitted for commercial production, 4% tested very low in K, 19% tested low, 22% tested medium, 28% tested high and 27% 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 4 to almost 10000 lbs Mg/acre (Morgan extraction). There were very few samples that tested very low in Mg. Most soils tested high or very high for Mg (91% of the homeowner soils and 89% of the soils of the commercial growers). No more than 26 of the homeowner soils and 11% of the commercial growers' soil tested very low, low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Rensselaer 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 93-99% in the normal range with 7% of the home and garden samples and 1% of the samples for commercial production testing excessive for Fe. Similarly, most soils (89-97%) 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 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, 85% tested high for zinc while 12% tested medium and 3% were low in Zn. Of the samples for commercial production, 8% tested low in zinc, 37% tested medium while 55% 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	1	0	1	1	1	2	4	10	3
ATF	0	8	0	2	8	5	4	27	9
BLU	0	0	1	5	1	1	1	9	3
CEM	0	0	0	1	0	0	0	1	0
FAR	1	0	0	3	0	0	0	4	1
FLA	0	1	0	2	0	2	1	6	2
GEN	1	0	1	1	0	0	0	3	1
HRB	0	0	0	0	0	1	0	1	0
LAW	7	9	11	21	10	9	17	84	27
MIX	0	0	0	0	0	1	0	1	0
MVG	7	8	16	11	11	9	14	76	25
OTH	2	0	0	2	0	2	1	7	2
PER	3	1	9	3	0	1	1	18	6
PTO	0	0	0	0	0	1	0	1	0
ROS	0	0	0	0	1	0	0	1	0
ROU	0	0	1	0	0	1	0	2	1
SAG	2	12	10	1	3	5	14	47	15
STR	0	0	0	1	0	0	0	1	0
TRF	2	0	2	1	0	0	0	5	2
Unknown	1	0	0	0	0	0	4	5	2
Total	27	39	52	55	35	40	61	309	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	13	13	0	5	7	1	0	39	1
AGE/AGT	126	77	38	87	208	65	134	735	25
ALE/ALT	11	11	4	5	45	13	9	98	3
ALG	0	0	0	0	0	0	8	8	0
APP	0	0	0	6	0	0	0	6	0
BCE/BCT	0	0	2	0	1	0	0	3	0
BGE/BGT	2	7	1	0	7	1	5	23	1
BLB	1	0	4	1	1	0	0	7	0
BSE	0	0	1	0	0	0	0	1	0
BSS	0	1	0	0	0	0	0	1	0
BTT	0	0	0	0	0	1	0	1	0
BUK	0	0	1	1	0	0	0	2	0
CGE/CGT	6	3	4	1	30	2	12	58	2
CLE/CLT	0	0	0	0	3	0	0	3	0
COG/COS	199	163	149	158	320	98	197	1284	43
CRD	0	0	0	0	0	1	0	1	0
CVE	0	1	0	0	2	0	0	3	0
GIE/GIT	9	6	0	11	7	4	13	50	2
GPA	1	0	0	0	0	0	0	1	0
GRE/GRT	9	17	26	26	171	25	56	330	11
IDL	2	0	0	0	1	0	0	3	0
MIL	0	0	3	0	0	0	0	3	0
MIX	4	3	0	1	0	4	4	16	1
MML	0	0	0	3	0	0	0	3	0
OAS	3	0	3	1	0	2	0	9	0
OAT	1	0	0	0	3	0	0	4	0
OTH	1	2	3	1	0	1	1	9	0
PEP	0	0	0	0	1	0	0	1	0
PGE/PGT	1	3	4	1	6	6	9	30	1
PIE/PIT	1	5	0	9	4	6	7	32	1
PLE/PLT	0	0	6	0	3	2	1	12	0
PNE/PNT	2	4	1	4	11	3	22	47	2
POT	1	0	0	1	0	0	0	2	0
PUM	2	1	0	5	0	1	2	11	0
RSS	1	0	1	0	0	0	1	3	0

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
RYC	2	0	0	5	0	0	0	7	0
RYS	4	1	0	1	1	4	3	14	0
SOG	0	0	0	0	2	0	0	2	0
SOY	6	2	0	1	0	2	1	12	0
SQW	0	1	0	0	0	0	0	1	0
SSH	1	0	0	3	3	6	4	17	1
STS	3	0	3	2	0	4	0	12	0
SUD	2	0	0	0	0	0	0	2	0
SUN	0	1	0	0	0	0	0	1	0
SWC	6	4	3	0	0	0	2	15	1
TOM	2	0	0	0	0	1	0	3	0
TRE/TRT	1	0	0	2	0	0	1	4	0
WHT	2	3	5	1	0	0	0	11	0
WPT	0	0	0	0	1	0	0	1	0
Unknown	2	4	2	2	6	4	28	48	2
Total	427	333	264	344	844	257	520	2989	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)	3	6	8	14	16	13	17	77
SMG 3 (silt loam)	10	11	6	14	7	10	15	73
SMG 4 (sandy loam)	10	15	29	20	11	13	23	121
SMG 5 (sandy)	4	7	9	7	1	4	6	38
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	27	39	52	55	35	40	61	309

### 3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Albrights	2	0	0	15	1	3	0	3	22
Alden	3	0	0	1	0	4	1	2	8
Bernardston	4	149	45	76	98	254	60	143	825
Brayton	4	6	8	4	0	1	1	1	21
Buckland	3	3	3	7	3	2	0	0	18
Castile	4	4	0	1	4	5	0	0	14
Chenango	3	3	4	3	7	8	1	4	30
Elmridge	5	3	2	1	10	9	0	3	28
Fredon	4	0	1	1	0	9	0	0	11
Hamlin	2	15	9	5	8	19	5	15	76
Haven	4	0	0	1	1	14	5	3	24
Hoosic	4	61	48	34	37	57	20	66	323
Hudson	2	4	3	2	2	16	2	8	37
Limerick	3	3	1	0	4	9	0	2	19
Madalin	1	2	2	1	0	3	0	0	8
Nassau	4	35	13	17	13	100	4	28	210
Occum	4	9	2	0	2	12	0	2	27
Pittstown	4	68	97	56	68	206	107	86	688
Raynham	3	1	0	3	1	3	1	1	10
Rhinebeck	2	17	23	5	16	6	3	30	100
Riverhead	4	4	5	0	11	7	0	5	32
Scio	3	4	1	0	2	20	0	2	29
Scriba	4	2	9	1	12	15	4	16	59
Shaker	2	2	2	0	5	1	0	3	13
Teel	2	5	27	5	4	34	4	30	109
Unadilla	3	5	1	0	0	3	0	11	20
Windsor	5	22	27	24	32	23	31	54	213
Unknown	-	0	0	1	3	1	8	2	15
Total	-	427	333	264	344	844	257	520	2989

## 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	1	4	5	6	1	2	7	27
1996	3	5	8	12	4	4	2	1	39
1997	2	4	9	8	15	6	2	6	52
1998	3	10	12	11	5	4	2	8	55
1999	0	4	4	6	8	8	2	3	35
2000	1	7	6	8	4	4	5	5	40
2001	3	9	15	15	6	6	3	4	61
Total	13	40	58	65	48	33	18	34	309

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.7	0.8	0.7	1.2	0.8	0.4	
Highest:	61.8	9.8	15.4	27.0	17.3	45.8	10.2	
Mean:	9.2	3.4	4.5	4.3	4.5	6.8	3.5	
Median:	4.6	3.3	4.2	3.3	4.2	3.7	3.2	

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	4	4	15	19	22	4	7	26	100
1996	8	13	21	31	10	10	5	3	100
1997	4	8	17	15	29	12	4	12	100
1998	5	18	22	20	9	7	4	15	100
1999	0	11	11	17	23	23	6	9	100
2000	3	18	15	20	10	10	13	13	100
2001	5	15	25	25	10	10	5	7	100
Total	4	13	19	21	16	11	6	11	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	15	93	173	99	34	10	3	427
1996	2	18	70	107	102	24	9	1	333
1997	1	17	47	104	80	11	1	3	264
1998	2	25	113	108	78	16	2	0	344
1999	0	27	209	377	176	43	7	5	844
2000	0	12	41	117	69	14	0	4	257
2001	0	22	134	186	112	39	11	16	520
Total	5	136	707	1172	716	181	40	32	2989

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.3	0.1	0.8	0.9	1.0	1.2	1.2	
Highest:	16.8	7.4	8.4	6.2	9.9	9.4	28.6	
Mean:	3.7	3.7	3.6	3.3	3.5	3.7	3.7	
Median:	3.6	3.7	3.7	3.3	3.4	3.7	3.5	

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	4	22	41	23	8	2	1	100
1996	1	5	21	32	31	7	3	0	100
1997	0	6	18	39	30	4	0	1	100
1998	1	7	33	31	23	5	1	0	100
1999	0	3	25	45	21	5	1	1	100
2000	0	5	16	46	27	5	0	2	100
2001	0	4	26	36	22	8	2	3	100
Total	0	5	24	39	24	6	1	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	0	4	2	2	5	10	2	1	1	27
1996	0	2	10	11	6	5	4	1	0	0	39
1997	0	1	4	10	10	8	16	3	0	0	52
1998	0	2	7	10	10	12	11	2	1	0	55
1999	1	1	2	6	7	11	6	1	0	0	35
2000	0	1	2	7	7	6	10	6	1	0	40
2001	0	2	4	8	3	17	11	12	2	2	61
Total	1	9	33	54	45	64	68	27	5	3	309

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.2	4.6	4.9	4.7	2.8	4.7	4.5	
Highest:	12.7	7.7	7.5	8.1	7.5	8.1	8.6	
Mean:	-	-	-	-	-	-	-	
Median:	7.0	5.9	6.6	6.4	6.5	6.7	6.8	

Percent of home and garden samples within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	15	7	7	19	37	7	4	4	100
1996	0	5	26	28	15	13	10	3	0	0	100
1997	0	2	8	19	19	15	31	6	0	0	100
1998	0	4	13	18	18	22	20	4	2	0	100
1999	3	3	6	17	20	31	17	3	0	0	100
2000	0	3	5	18	18	15	25	15	3	0	100
2001	0	3	7	13	5	28	18	20	3	3	100
Total	0	3	11	17	15	21	22	9	2	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	1	4	18	61	149	163	28	3	0	0	427
1996	0	4	23	58	109	106	25	7	0	1	333
1997*	2	5	18	60	95	59	19	0	1	0	259
1998	0	6	15	73	137	95	15	3	0	0	344
1999	0	13	48	177	284	223	87	11	1	0	844
2000	1	3	5	25	75	112	34	2	0	0	257
2001	1	6	35	102	173	140	56	6	1	0	520
Total	5	41	162	556	1022	898	264	32	3	1	2984

\*Five samples were not analyzed for pH in 1997.

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.4	4.8	3.5	4.6	4.6	4.4	4.4	
Highest:	7.7	12.6	8.0	7.8	8.0	7.5	8.0	
Mean:	-	-	-	-	-	-	-	
Median:	6.4	6.3	6.2	6.3	6.3	6.5	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	1	4	14	35	38	7	1	0	0	100
1996	0	1	7	17	33	32	8	2	0	0	100
1997	1	2	7	23	37	23	7	0	0	0	100
1998	0	2	4	21	40	28	4	1	0	0	100
1999	0	2	6	21	34	26	10	1	0	0	100
2000	0	1	2	10	29	44	13	1	0	0	100
2001	0	1	7	20	33	27	11	1	0	0	100
Total	0	1	5	19	34	30	9	1	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	4	2	11	2	1	1	1	2	3	27
1996	0	19	6	7	3	2	2	0	0	0	39
1997	0	5	8	18	6	3	5	2	2	3	52
1998	0	11	12	20	4	2	2	1	1	2	55
1999	0	3	4	16	2	0	4	2	1	3	35
2000	0	6	5	12	4	3	2	5	2	1	40
2001	0	2	11	30	6	2	1	4	2	3	61
Total	0	50	48	114	27	13	17	15	10	15	309

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	2	1	2	
Highest:	522	97	443	316	448	248	440	
Mean:	76	18	58	33	67	54	48	
Median:	20	4	24	14	22	33	20	

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	15	7	41	7	4	4	4	7	11	100
1996	0	49	15	18	8	5	5	0	0	0	100
1997	0	10	15	35	12	6	10	4	4	6	100
1998	0	20	22	36	7	4	4	2	2	4	100
1999	0	9	11	46	6	0	11	6	3	9	100
2000	0	15	13	30	10	8	5	13	5	3	100
2001	0	3	18	49	10	3	2	7	3	5	100
Total	0	16	16	37	9	4	6	5	3	5	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	134	139	137	9	2	2	2	0	2	427
1996	0	67	101	127	14	10	6	4	1	3	333
1997	0	71	82	97	12	1	0	1	0	0	264
1998	0	50	101	161	23	2	2	1	2	2	344
1999	1	228	255	309	26	12	9	3	0	1	844
2000	0	88	64	93	5	4	1	0	2	0	257
2001	0	112	141	223	19	9	4	5	2	5	520
Total	1	750	883	1147	108	40	24	16	7	13	2989

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	0	1	1	
Highest:	376	641	150	437	341	186	824	
Mean:	12	21	11	18	13	12	19	
Median:	6	8	7	10	7	7	9	

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

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
1995	0	31	33	32	2	0	0	0	0	0	100
1996	0	20	30	38	4	3	2	1	0	1	100
1997	0	27	31	37	5	0	0	0	0	0	100
1998	0	15	29	47	7	1	1	0	1	1	100
1999	0	27	30	37	3	1	1	0	0	0	100
2000	0	34	25	36	2	2	0	0	1	0	100
2001	0	22	27	43	4	2	1	1	0	1	100
Total	0	25	30	38	4	1	1	1	0	0	100

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

## 7. Potassium

### 7.1 Samples for Home and Garden

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	0	0	2	3
1996	0	0	0	1	5	6
1997	0	0	1	0	7	8
1998	0	0	5	4	5	14
1999	0	1	4	1	10	16
2000	0	0	3	3	7	13
2001	0	1	0	5	11	17
Total (#)	0	3	13	14	47	77
Total (%)	0	4	17	18	61	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	1	1	7	10
1996	2	2	2	3	2	11
1997	0	1	2	1	2	6
1998	3	3	1	1	6	14
1999	0	0	0	2	5	7
2000	0	0	2	2	6	10
2001	1	3	2	4	5	15
Total (#)	6	10	10	14	33	73
Total (%)	8	14	14	19	45	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	0	4	5	10
1996	0	4	3	5	3	15
1997	0	4	7	6	12	29
1998	0	4	5	5	6	20
1999	0	0	1	3	7	11
2000	0	1	5	1	6	13
2001	0	2	5	5	11	23
Total (#)	0	16	26	29	50	121
Total (%)	0	13	21	24	41	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	1	0	2	1	0	4
1996	4	2	0	1	0	7
1997	0	2	2	3	2	9
1998	0	1	2	4	0	7
1999	0	0	0	0	1	1
2000	0	2	0	1	1	4
2001	0	2	2	0	2	6
Total (#)	5	9	8	10	6	38
Total (%)	13	24	21	26	16	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Number of home and garden samples within each potassium classification:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
1995	1	3	3	6	14	27
1996	6	8	5	10	10	39
1997	0	7	12	10	23	52
1998	3	8	13	14	17	55
1999	0	1	5	6	23	35
2000	0	3	10	7	20	40
2001	1	8	9	14	29	61
Total #	11	38	57	67	136	309

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	39	19	72	37	64	80	44	
Highest:	3044	949	1381	1157	1426	3036	936	
Mean:	444	189	298	230	369	379	254	
Median:	208	145	214	147	316	184	192	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	4	11	11	22	52	100
1996	15	21	13	26	26	100
1997	0	13	23	19	44	100
1998	5	15	24	25	31	100
1999	0	3	14	17	66	100
2000	0	8	25	18	50	100
2001	2	13	15	23	48	100
Grand Total	4	12	18	22	44	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	2	2
1996	0	0	0	0	2	2
1997	0	0	0	0	1	1
1998	0	0	0	0	0	0
1999	0	0	1	0	2	3
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	1	0	7	8
Total (%)	0	0	13	0	88	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	16	14	43
1996	1	1	3	29	30	64
1997	0	5	6	12	9	32
1998	0	0	5	14	17	36
1999	1	14	21	22	21	79
2000	1	4	3	2	4	14
2001	0	2	7	25	55	89
Total (#)	3	30	54	120	150	357
Total (%)	1	8	15	34	42	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	3	8	7	19
1996	1	1	0	5	3	10
1997	0	0	7	3	4	14
1998	0	6	3	5	3	17
1999	1	16	10	11	11	49
2000	0	0	0	2	1	3
2001	3	3	3	3	10	22
Total (#)	5	27	26	37	39	134
Total (%)	4	20	19	28	29	100



Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	5	45	93	107	88	338
1996	9	42	53	67	57	228
1997	13	55	42	55	26	191
1998	13	55	50	69	59	246
1999	20	151	151	148	210	680
2000	16	38	48	53	46	201
2001	34	76	66	87	87	350
Total (#)	110	462	503	586	573	2234
Total (%)	5	21	23	26	26	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	1	9	9	3	3	25
1996	4	6	5	9	5	29
1997	2	4	7	10	2	25
1998	0	8	8	15	11	42
1999	3	7	8	9	5	32
2000	0	4	9	13	5	31
2001	1	10	17	20	9	57
Total (#)	11	48	63	79	40	241
Total (%)	5	20	26	33	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	6	59	114	134	114	0	427
1996	15	50	61	110	97	0	333
1997	15	64	62	80	42	1	264
1998	13	69	66	103	90	3	344
1999	25	188	191	190	249	1	844
2000	17	46	60	70	56	8	257
2001	38	91	93	135	161	2	520
Grand Total	129	567	647	822	809	15	2989

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	43	1	36	31	1	13	21	
Highest:	1894	1337	589	1191	2242	746	9222	
Mean:	203	210	153	201	214	180	230	
Median:	160	156	131	155	147	154	156	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	1	14	27	31	27	0	100
1996	5	15	18	33	29	0	100
1997	6	24	23	30	16	0	100
1998	4	20	19	30	26	1	100
1999	3	22	23	23	30	0	100
2000	7	18	23	27	22	3	100
2001	7	18	18	26	31	0	100
Grand Total	4	19	22	28	27	1	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	1	4	21	27
1996	4	3	2	7	23	39
1997	0	0	0	9	43	52
1998	0	4	3	10	38	55
1999	0	0	1	9	25	35
2000	0	0	2	7	31	40
2001	0	3	2	8	48	61
Total	4	11	11	54	229	309

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	62	4	101	24	68	76	26	
Highest:	2102	715	841	2076	887	2633	994	
Mean:	554	238	364	370	348	530	327	
Median:	466	229	316	287	280	360	292	

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	4	4	15	78	100
1996	10	8	5	18	59	100
1997	0	0	0	17	83	100
1998	0	7	5	18	69	100
1999	0	0	3	26	71	100
2000	0	0	5	18	78	100
2001	0	5	3	13	79	100
Total	1	4	4	17	74	100

## 8.2 Samples for Commercial Production

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	25	28	127	247	427
1996	0	22	22	80	209	333
1997	0	15	26	84	139	264
1998	0	20	15	99	210	344
1999	1	24	61	268	490	844
2000	1	10	12	84	150	257
2001	2	21	22	150	325	520
Total	4	137	186	892	1770	2989

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	21	25	26	22	3	17	18	
Highest:	756	2628	922	1652	9920	742	2718	
Mean:	241	268	232	254	267	245	273	
Median:	224	250	207	244	227	235	245	

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	7	30	58	100
1996	0	7	7	24	63	100
1997	0	6	10	32	53	100
1998	0	6	4	29	61	100
1999	0	3	7	32	58	100
2000	0	4	5	33	58	100
2001	0	4	4	29	63	100
Total	0	5	6	30	59	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	25	2	27
1996	37	2	39
1997	50	2	52
1998	47	8	55
1999	32	3	35
2000	37	3	40
2001	59	2	61
Total	287	22	309

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	93	7	100
	95	5	100
	96	4	100
	85	15	100
	91	9	100
	93	8	100
	97	3	100
	93	7	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	1	2	1	1	2	1	
Highest:	67	97	531	258	768	108	175	
Mean:	14	15	19	26	37	17	12	
Median:	7	8	6	7	8	8	5	

## 9.2 Samples for Commercial Production

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
1995	423	4	427
1996	330	3	333
1997	258	6	264
1998	340	4	344
1999	833	11	844
2000	253	4	257
2001	512	8	520
Total	2949	40	2989

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	0	1	1	
Highest:	376	133	969	90	127	163	106	
Mean:	9	8	13	7	7	6	8	
Median:	5	6	4	5	4	3	4	

## 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	22	5	27	81	19	100
1996	37	2	39	95	5	100
1997	47	5	52	90	10	100
1998	52	3	55	95	5	100
1999	30	5	35	86	14	100
2000	34	6	40	85	15	100
2001	54	7	61	89	11	100
Total	276	33	309	89	11	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	21	9	5	2	14	14	5	
Highest:	409	128	237	152	663	320	219	
Mean:	65	38	58	44	74	65	50	
Median:	41	30	45	39	44	42	36	

## 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	415	12	427
1996	321	12	333
1997	244	20	264
1998	332	12	344
1999	837	7	844
2000	253	4	257
2001	507	13	520
Total	2909	80	2989

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	97	3	100
	96	4	100
	92	8	100
	97	3	100
	99	1	100
	98	2	100
	98	3	100
	97	3	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	6	5	10	6	0	9	6	
Highest:	815	192	234	435	548	423	734	
Mean:	34	41	47	35	33	34	40	
Median:	27	35	37	28	28	26	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:					Percentages:				
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total	
	Low	Medium	High		Low	Medium	High		
1995	1	4	22	27	4	15	81	100	
1996	4	4	31	39	10	10	79	100	
1997	0	6	46	52	0	12	88	100	
1998	2	7	46	55	4	13	84	100	
1999	1	2	32	35	3	6	91	100	
2000	0	7	33	40	0	18	83	100	
2001	0	8	53	61	0	13	87	100	
Total	8	38	263	309	3	12	85	100	

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.4	0.3	0.6	0.3	0.4	0.6	0.6	
Highest:	98.3	41.7	78.5	92.9	78.2	244.6	152.7	
Mean:	12.6	3.8	9.7	8.4	7.4	19.9	7.4	
Median:	2.9	1.9	5.0	3.1	3.5	3.0	3.3	

## 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	20	168	239	427
1996	18	129	186	333
1997	33	108	123	264
1998	27	132	185	344
1999	49	346	449	844
2000	45	91	121	257
2001	43	144	333	520
Total	235	1118	1636	2989

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
5	39	56	100
5	39	56	100
13	41	47	100
8	38	54	100
6	41	53	100
18	35	47	100
8	28	64	100
8	37	55	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.2	0.1	0.1	0.0	0.1	0.1	
Highest:	111.9	55.7	75.4	102.9	37.6	13.3	68.4	
Mean:	2.0	1.8	1.9	2.1	1.5	1.5	2.0	
Median:	1.1	1.2	1.0	1.1	1.1	1.0	1.4	

## Appendix: Cornell Crop Codes

Crop codes are used in the Cornell Nutrient Analyses Laboratory.

Crop Code	Crop Description
<b>Alfalfa</b>	
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
<b>Birdsfoot</b>	
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
<b>Barley</b>	
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
<b>Clover</b>	
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
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

Crop Code	Crop Description
ATF	Athletic Field
ASP	Asparagus
BDR/BND	Beans-dry
BLU/BLB	Blueberries
CEM	Cemetery
CRD	Chard
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GPA	Grapes, American
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
ONS	Onion-seeded
OTH	Other
PAR	Pears
PEP	Peppers
PER	Perennials
POP	Popcorn
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
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring

Crop Code	Crop Description
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing
WPT	Waterways, pond dikes