Ketterings, Q.M., H. Krol, W.S. Reid and J. Degni (2004). Tompkins County Soil Sample Survey 1995-2001. CSS Extension Bulletin E04-19. 37 pages.

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Tompkins Co.

Samples analyzed by CNAL in 1995-2001

Photo by Janice Degni.

Summary compiled by

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

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

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Quirine Ketterings and Hettie Krol
Nutrient Management Spear Program
Department of Crop and Soil Sciences
817 Bradfield Hall, Cornell University
Ithaca NY 14853

W. Shaw Reid
Professor Emeritus
Department of Crop and Soil Sciences

Janice Degni
Area Field Crops Specialist and Team Leader
South Central NY (TCT - Tompkins, Cortland, Tioga) Dairy and Field Crops Program

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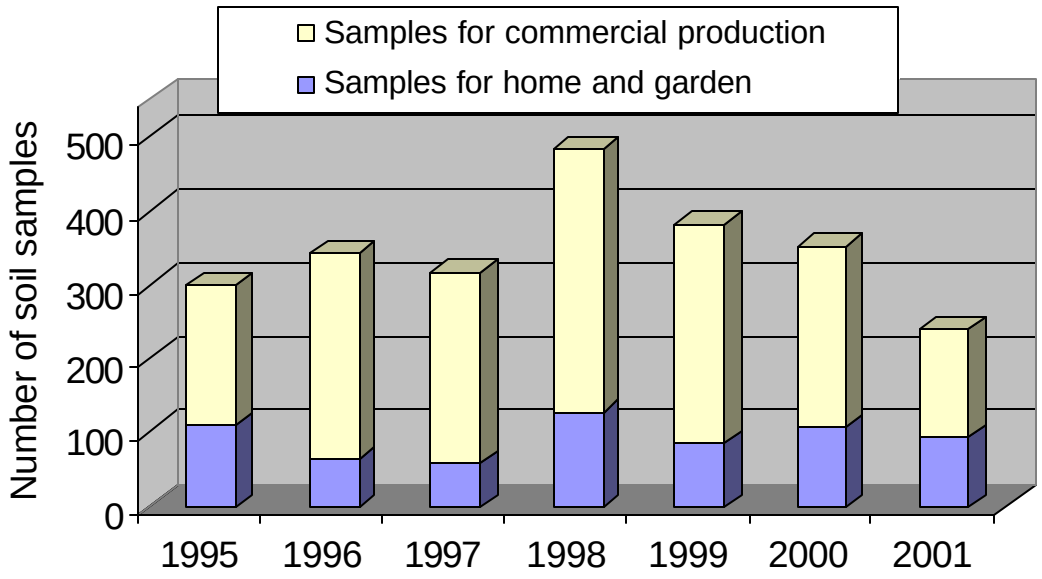
1. General Survey Summary

This survey summarizes the soil test results from Tompkins 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 2411. Of these 2411 samples, 1760 (73%) were submitted to obtain fertilizer recommendations for commercial production while 651 samples (27%) were submitted as home and garden samples.



Homeowners		Commercial		Total
1995	112	1995	188	300
1996	64	1996	278	342
1997	59	1997	256	315
1998	128	1998	354	482
1999	85	1999	296	381
2000	108	2000	243	351
2001	95	2001	145	240
Total	651	Total	1760	2411

Twenty-four percent of the home and garden samples were submitted to request fertilizer recommendations for lawns while another 24% came from mixed vegetable gardens. Other samples were sent in to request recommendations for azaleas, athletic fields, flowering annuals, greens, herbs, parks, roughs, ornamentals adapted to pH 6.0 to 7.5, and tree fruits. People submitting samples for commercial production requested fertilizer recommendations for corn silage or grain production (23%), alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (19%), pasture (10%), and mixed vegetables (8%), while the remainder of the samples was sent to the laboratory to request recommendations for other crops including clover/grass or clover/legume mixtures, hay, small grains, potatoes, soybeans and sweet corn.

Home and garden samples in Tompkins County were silty (30%), silt loams (37%), sandy loams (21%), or sandy (12%), belonging to soil management groups 2, 3, 4, and 5, respectively. 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, 51% belonged to soil management group 3 while 43% was classified group 2 and 1% was from soil management group 1. The remainder was of unknown classification. The five most common soil series were Hudson (21%), Bath (13%), Howard (12%), Langford (10%), and Erie (7%). These soils represent 5% (Hudson), 16% (Bath), 5% (Howard), 9% (Langford) and 10% (Erie) of the 314,600 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from 1% to over 66% (most likely an organic soil or amendment) with median values ranging from 4.0 to 4.5% organic matter for home and garden samples and from 2.9 to 4.1% for samples submitted for commercial production. Fourth-nine percent of the home and garden samples had between 2.0 and 4.9% organic matter with 13% testing between 2.0 and 2.9% organic matter, 17% between 3.0 and 3.9% organic matter and 19% between 4.0 and 4.9% organic matter. Thirty-eight percent of the soils submitted for home and garden tested >4.9% in organic matter while 13% of the samples had less than 2.0% organic matter. Of the samples submitted for commercial production, 34% contained between 3.0 and 3.9% organic matter, 27% tested between 4.0 and 4.9% while 9% had organic matter concentrations of 5.0-5.9%. Twenty-seven percent had less than 3.0% organic matter while 4% of the samples had 6.0% or more organic matter. In total, 83% of the samples had organic matter levels between 2.0 and 4.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 3.7 to pH 8.7 with the median for home and garden samples ranging from pH 6.7 to pH 7.3 and for samples submitted for commercial production ranging from pH 6.5 to pH 6.5. Of the home and garden samples, 60% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, this was 72% while 23% tested between pH 5.0 and pH 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 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. Of the home and garden

samples, 16% tested low, 16% tested medium, 29% tested high and 39% tested very high. This meant that 68% tested high or very high in P. Of the samples submitted for commercial production, 16% tested low in P. Twenty-five percent were medium in P, 44% tested high while 15% of the samples were very high in P. In total, 59% of the samples tested high or very high in P. There were no clear trends over the 7 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, 5% was classified as very low, 7% were low in potassium, 11% tested medium, another 22% were high and 55% were very high in potassium. For samples submitted for commercial production, 5% tested low, 15% tested medium, 32% tested high and 45% tested very high in potassium while the remainder was of unknown K classification. As with phosphorus, there were no trends over the 7 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 6 to 6729 lbs Mg/acre (Morgan extraction). There were only 4 samples in the home and garden datasets that tested very low in Mg. Most soils tested high or very high for Mg (94% of the homeowner soils and 96% of the soils of the commercial growers). Two percent of the home and garden samples and 1% of the commercial growers' soils tested low in Mg while 3% (home and garden) and less than 3% (commercial) tested medium in Mg availability.

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. Ninety-three percent of the home and garden samples were classified as normal in Fe while 98% of the commercial samples tested in the normal range for Fe. Similarly, almost all soils (90% of the home and garden samples and 99% of the commercial samples) tested normal for manganese. Anything less than 100 lbs Mn per acre is classified as normal. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. One percent of the commercial samples and 10% of the home and garden samples were excessive in Mn. 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, 2% tested low for zinc while 11% tested medium and 86% tested high for zinc. Of the samples for commercial production, 6% tested low in zinc, 35% tested medium while 59% 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	4	1	1	2	3	2	2	15	2
APR	0	0	0	0	0	0	1	1	0
ATF	0	4	0	3	0	1	2	10	2
BLU	0	0	0	0	2	0	1	3	0
FAR	19	0	0	10	3	10	0	42	6
FLA	1	0	0	2	0	3	3	9	1
GEN	19	1	1	2	1	0	1	25	4
HRB	0	2	0	3	0	0	0	5	1
IDL	0	0	0	0	0	0	1	1	0
LAW	17	19	23	27	26	21	25	158	24
MVG	15	22	21	23	17	35	26	159	24
OTH	2	3	2	16	15	2	8	48	7
PER	8	1	4	17	6	11	7	54	8
PRK	0	0	0	4	0	0	1	5	1
ROD	2	0	0	0	0	0	0	2	0
ROS	1	0	0	0	1	1	0	3	0
ROU	3	0	0	0	0	2	0	5	1
SAG	16	5	5	11	7	5	15	64	10
STR	0	0	0	1	0	0	0	1	0
STS	0	0	1	0	0	0	0	1	0
SUB	0	0	0	0	0	0	1	1	0
TRF	0	0	1	1	1	0	1	4	1
Unknown	5	6	0	6	3	15	0	35	5
Total	112	64	59	128	85	108	95	651	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	2	0	1	0	0	5	0	8	0
AGE/AGT	31	9	82	58	55	23	13	271	15
ALE/ALT	13	11	10	16	1	18	3	72	4
APP	1	1	0	1	3	1	0	7	0
ASP	0	1	0	1	0	0	0	2	0
BDR	0	0	0	0	6	0	0	6	0
BGE/BGT	2	0	0	11	1	0	3	17	1
BLB	0	0	4	0	1	0	2	7	0
BND	2	0	0	0	0	3	0	5	0
BNS	0	2	24	0	2	0	3	31	2
BSP	0	1	1	2	0	2	0	6	0
BSS	0	2	4	0	0	0	4	10	1
BUK	3	2	1	0	0	0	3	9	1
CBP	0	0	0	0	0	2	0	2	0
CGE/CGT	2	5	12	19	7	1	12	58	3
CLE/CLT	0	1	1	0	1	3	0	6	0
COG/COS	67	27	39	106	92	54	14	399	23
CUR	0	0	0	0	1	0	0	1	0
CVE	0	0	0	0	0	0	1	1	0
FLA	0	0	1	0	0	0	0	1	0
GIE/GIT	0	5	1	5	11	0	2	24	1
GPA	0	0	0	1	0	0	0	1	0
GPF	0	0	0	1	0	0	0	1	0
GRE/GRT	5	2	6	10	8	13	7	51	3
HRB	0	1	0	0	0	0	0	1	0
IDL	0	0	0	0	0	2	2	4	0
LAW	0	0	0	0	0	0	1	1	0
MIX	7	47	4	57	2	20	0	137	8
OAS	0	3	1	1	0	2	2	9	1
OAT	2	0	7	4	0	5	1	19	1
ONP	0	0	0	0	0	2	0	2	0
ONS	1	0	0	0	0	0	0	1	0
OTH	8	4	3	1	3	1	0	20	1
PCH	0	0	0	0	1	0	0	1	0
PER	0	0	0	0	2	0	0	2	0

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
PGE/PGT	0	5	2	1	10	1	1	20	1
PIE/PIT	1	30	16	11	16	2	11	87	5
PLE/PLT	1	5	9	7	1	2	3	28	2
PNE/PNT	2	7	5	1	2	5	6	28	2
POT	0	6	0	2	0	6	0	14	1
PUM	0	0	0	0	1	2	0	3	0
RSF	0	0	1	0	3	0	0	4	0
RSS	0	0	0	1	0	0	0	1	0
RYC	1	0	0	1	0	8	0	10	1
RYS	0	0	0	0	0	0	6	6	0
SOF	0	0	0	0	0	5	0	5	0
SOG	0	0	0	4	0	0	0	4	0
SOY	2	2	5	14	12	0	1	36	2
SQW	1	1	0	1	1	0	0	4	0
STS	3	0	0	1	3	0	0	7	0
SUD	0	0	0	0	2	0	0	2	0
SWC	1	1	2	4	0	4	0	12	1
TOM	0	3	1	1	0	2	0	7	0
TRE/TRT	0	0	0	5	0	0	0	5	0
TRP	0	0	0	3	0	0	2	5	0
WHT	0	1	3	0	1	5	0	10	1
WHS	0	0	5	1	0	1	5	12	1
Unknown	30	93	5	2	47	43	37	257	15
Total	188	278	256	354	296	243	145	1760	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	0
SMG 2 (silty)	21	21	22	37	15	29	52	197	30
SMG 3 (silt loam)	62	21	22	41	27	43	25	241	37
SMG 4 (sandy loam)	23	15	13	20	19	31	16	137	21
SMG 5 (sandy)	6	7	2	30	24	5	2	76	12
SMG 6 (mucky)	0	0	0	0	0	0	0	0	0
Total	112	64	59	128	85	108	95	651	100

3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total	%
Alluvial	3	1	0	0	0	0	0	0	1	0
Arkport	4	0	7	0	7	2	8	1	25	1
Bath	3	24	22	16	78	39	12	37	228	13
Canandaigua	3	0	0	0	1	0	0	0	1	0
Chenango	3	1	2	6	8	13	3	2	35	2
Chippewa	3	0	0	2	0	1	0	0	3	0
Collamer	3	0	0	0	1	1	0	0	2	0
Conesus	2	7	5	7	4	15	31	8	77	4
Darien	2	2	0	0	2	5	0	0	9	1
Erie	3	20	7	7	29	37	4	11	115	7
Fredon	4	0	0	5	0	0	0	1	6	0
Genesee	2	2	0	5	0	2	1	1	11	1
Halsey	4	1	2	0	2	0	0	0	5	0
Honeoye	2	2	9	16	7	3	2	6	45	3
Howard	3	15	45	18	57	22	44	5	206	12
Hudson	2	44	100	77	20	40	52	38	371	21
Ilion	2	1	0	0	1	1	0	0	3	0
Kendaia	2	3	0	1	3	0	10	6	23	1
Langford	3	24	10	18	50	35	22	18	177	10
Lansing	2	7	7	6	25	10	26	0	81	5
Lima	2	1	6	4	6	1	2	3	23	1
Lordstown	3	4	10	2	1	1	2	0	20	1
Madalin	1	0	0	2	0	0	0	0	2	0
Mardin	3	7	12	4	2	2	0	0	27	2
Middlebury	3	0	1	8	6	7	0	2	24	1
Niagara	3	0	0	0	1	6	0	0	7	0
Ovid	2	6	2	4	4	2	1	1	20	1
Palmyra	3	0	1	0	0	0	0	0	1	0
Phelps	3	2	8	7	3	13	1	0	34	2
Rhinebeck	2	2	2	10	4	0	1	1	20	1
Teel	2	0	12	25	14	0	16	1	68	4
Tioga	3	0	0	0	0	5	0	0	5	0
Valois	3	0	0	0	0	0	2	1	3	0
Volusia	3	3	6	0	8	3	0	1	21	1
Wayland	2	1	0	0	1	2	0	0	4	0
Unknown	-	8	2	6	9	28	3	1	57	3
Total	-	188	278	256	354	296	243	145	1760	100

4. Organic Matter

4.1 Samples for Home and Garden

Number of home and garden samples within each % organic matter range:

	<1%	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
1995	4	12	19	20	18	16	10	13	112
1996	0	6	8	14	10	14	5	7	64
1997	3	2	4	16	9	7	8	10	59
1998	10	19	9	12	26	22	15	15	128
1999	8	11	8	12	20	9	9	8	85
2000	1	4	22	14	22	21	5	19	108
2001	0	5	12	23	18	11	9	17	95
Total	26	59	82	111	123	100	61	89	651

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.4	1.3	0.1	0.4	0.5	0.9	1.5	
Highest:	16.5	10.3	30.4	19.9	16.0	54.5	37.4	
Mean:	4.4	4.5	5.5	4.6	4.2	5.9	5.7	
Median:	4.0	4.2	4.2	4.5	4.1	4.4	4.4	

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	11	17	18	16	14	9	12	100
1996	0	9	13	22	16	22	8	11	100
1997	5	3	7	27	15	12	14	17	100
1998	8	15	7	9	20	17	12	12	100
1999	9	13	9	14	24	11	11	9	100
2000	1	4	20	13	20	19	5	18	100
2001	0	5	13	24	19	12	9	18	100
Total	4	9	13	17	19	15	9	14	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	1	1	34	46	62	27	4	13	188
1996	0	18	127	49	56	22	3	3	278
1997	0	0	50	118	61	22	5	0	256
1998	0	12	65	113	108	48	5	3	354
1999	0	16	51	110	86	22	5	6	296
2000	0	12	50	109	48	18	5	1	243
2001	0	5	26	45	49	8	8	4	145
Total	1	64	403	590	470	167	35	30	1760

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.6	1.2	2.0	1.1	1.1	1.3	1.3	
Highest:	66.4	52.4	6.9	9.5	10.2	7.0	8.7	
Mean:	6.3	3.4	3.7	3.9	3.8	3.6	4.0	
Median:	4.1	2.9	3.6	3.8	3.7	3.5	3.9	

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	1	1	18	24	33	14	2	7	100
1996	0	6	46	18	20	8	1	1	100
1997	0	0	20	46	24	9	2	0	100
1998	0	3	18	32	31	14	1	1	100
1999	0	5	17	37	29	7	2	2	100
2000	0	5	21	45	20	7	2	0	100
2001	0	3	18	31	34	6	6	3	100
Total	0	4	23	34	27	9	2	2	100

5. pH

5.1 Samples for Home and Garden

Number of home and garden samples within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	6	5	16	17	15	28	24	1	0	112
1996	0	0	3	3	7	11	21	16	3	0	64
1997	0	0	3	3	7	8	24	13	1	0	59
1998	0	7	3	13	20	31	37	15	2	0	128
1999	0	0	2	8	12	25	19	19	0	0	85
2000	3	4	4	5	13	18	24	21	15	1	108
2001	1	3	4	6	15	20	17	16	13	0	95
Total	4	20	24	54	91	128	170	124	35	1	651

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.5	5.1	5.1	4.5	5.0	3.7	4.3	
Highest:	8.0	8.1	8.2	8.0	7.9	8.7	8.3	
Mean:	-	-	-	-	-	-	-	
Median:	6.9	7.1	7.3	6.7	6.9	7.2	6.9	

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	5	4	14	15	13	25	21	1	0	100
1996	0	0	5	5	11	17	33	25	5	0	100
1997	0	0	5	5	12	14	41	22	2	0	100
1998	0	5	2	10	16	24	29	12	2	0	100
1999	0	0	2	9	14	29	22	22	0	0	100
2000	3	4	4	5	12	17	22	19	14	1	100
2001	1	3	4	6	16	21	18	17	14	0	100
Total	1	3	4	8	14	20	26	19	5	0	100

5.2 Samples for Commercial Production

Number of samples for commercial production within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	1	2	8	24	61	61	23	4	1	3	188
1996	0	4	10	53	96	63	37	12	3	0	278
1997	4	2	14	43	102	70	19	2	0	0	256
1998	0	3	21	58	127	97	38	10	0	0	354
1999	0	5	23	61	77	84	44	2	0	0	296
2000	0	4	13	31	61	93	38	3	0	0	243
2001	0	1	8	31	47	21	17	17	3	0	145
total	5	21	97	301	571	489	216	50	7	3	1760

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3.9	4.6	3.4	4.7	4.6	4.7	4.9	
Highest:	8.5	8.0	7.7	7.9	7.6	7.7	8.1	
Mean:	-	-	-	-	-	-	-	
Median:	6.4	6.3	6.3	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	1	1	4	13	32	32	12	2	1	2	100
1996	0	1	4	19	35	23	13	4	1	0	100
1997	2	1	5	17	40	27	7	1	0	0	100
1998	0	1	6	16	36	27	11	3	0	0	100
1999	0	2	8	21	26	28	15	1	0	0	100
2000	0	2	5	13	25	38	16	1	0	0	100
2001	0	1	6	21	32	14	12	12	2	0	100
Total	0	1	6	17	32	28	12	3	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	42	14	29	8	3	1	4	5	6	112
1996	0	5	8	25	3	3	6	7	2	5	64
1997	0	9	8	17	8	4	2	3	2	6	59
1998	0	12	16	36	13	19	5	6	8	13	128
1999	0	4	14	27	11	6	8	8	4	3	85
2000	0	17	27	25	6	3	2	9	5	14	108
2001	0	16	16	27	4	8	8	2	2	12	95
Total	0	105	103	186	53	46	32	39	28	59	651

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:	641	555	463	730	490	2688	1075	
Mean:	44	74	67	87	57	106	84	
Median:	9	27	29	39	37	20	16	

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	38	13	26	7	3	1	4	4	5	100
1996	0	8	13	39	5	5	9	11	3	8	100
1997	0	15	14	29	14	7	3	5	3	10	100
1998	0	9	13	28	10	15	4	5	6	10	100
1999	0	5	16	32	13	7	9	9	5	4	100
2000	0	16	25	23	6	3	2	8	5	13	100
2001	0	17	17	28	4	8	8	2	2	13	100
Total	0	16	16	29	8	7	5	6	4	9	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	40	48	61	6	11	4	7	4	7	188
1996	0	32	29	104	35	17	13	21	21	6	278
1997	0	45	82	122	6	1	0	0	0	0	256
1998	0	43	100	175	23	7	3	1	0	2	354
1999	0	58	77	138	4	3	1	8	6	1	296
2000	0	25	57	110	28	6	9	3	4	1	243
2001	0	34	48	58	3	1	0	1	0	0	145
Total	0	277	441	768	105	46	30	41	35	17	1760

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:	362	214	69	216	326	243	103	
Mean:	34	52	12	18	20	26	12	
Median:	9	26	9	11	9	14	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	21	26	32	3	6	2	4	2	4	100
1996	0	12	10	37	13	6	5	8	8	2	100
1997	0	18	32	48	2	0	0	0	0	0	100
1998	0	12	28	49	6	2	1	0	0	1	100
1999	0	20	26	47	1	1	0	3	2	0	100
2000	0	10	23	45	12	2	4	1	2	0	100
2001	0	23	33	40	2	1	0	1	0	0	100
Total	0	16	25	44	6	3	2	2	2	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	1	2	5	13	21
1996	0	1	0	5	15	21
1997	0	0	6	3	13	22
1998	0	2	2	7	26	37
1999	1	1	1	1	11	15
2000	0	2	1	9	17	29
2001	0	2	1	10	39	52
Total (#)	1	9	13	40	134	197
Total (%)	1	5	7	20	68	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	4	5	14	13	26	62
1996	0	0	2	4	15	21
1997	3	0	2	7	10	22
1998	0	3	3	7	28	41
1999	0	2	8	4	13	27
2000	12	3	2	6	20	43
2001	0	3	1	10	11	25
Total (#)	19	16	32	51	123	241
Total (%)	8	7	13	21	51	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	3	8	4	8	23
1996	0	1	3	1	10	15
1997	0	1	1	5	6	13
1998	1	1	2	6	10	20
1999	0	1	3	2	13	19
2000	0	4	5	6	16	31
2001	0	0	0	2	14	16
Total (#)	1	11	22	26	77	137
Total (%)	1	8	16	19	56	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	2	2	1	1	0	6
1996	2	2	2	0	1	7
1997	0	0	0	1	1	2
1998	3	2	3	11	11	30
1999	1	1	1	9	12	24
2000	2	0	1	1	1	5
2001	1	0	0	1	0	2
Total (#)	11	7	8	24	26	76
Total (%)	14	9	11	32	34	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	6	11	25	23	47	112
1996	2	4	7	10	41	64
1997	3	1	9	16	30	59
1998	4	8	10	31	75	128
1999	2	5	13	16	49	85
2000	14	9	9	22	54	108
2001	1	5	2	23	64	95
Total #	32	43	75	141	360	651

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	40	45	14	13	34	14	53	
Highest:	1410	2375	1427	1847	1378	41720	4312	
Mean:	223	334	291	317	307	734	400	
Median:	161	223	216	242	257	190	263	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	5	10	22	21	42	100
1996	3	6	11	16	64	100
1997	5	2	15	27	51	100
1998	3	6	8	24	59	100
1999	2	6	15	19	58	100
2000	13	8	8	20	50	100
2001	1	5	2	24	67	100
Grand Total	5	7	11	22	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	0	0	0
1996	0	0	0	0	0	0
1997	0	1	0	1	0	2
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	1	0	1	0	2
Total (%)	0	50	0	50	0	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	1	3	8	24	42	78
1996	0	14	17	20	93	144
1997	0	8	57	57	36	158
1998	0	1	15	38	37	91
1999	0	1	3	43	36	83
2000	0	4	15	36	89	144
2001	0	1	6	41	17	65
Total (#)	1	32	121	259	350	763
Total (%)	0	4	16	34	46	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	2	20	28	51	101
1996	0	9	17	40	58	124
1997	0	4	18	34	32	88
1998	0	16	44	88	97	245
1999	0	1	21	62	101	185
2000	2	6	6	24	52	90
2001	0	6	15	28	28	77
Total (#)	2	44	141	304	419	910
Total (%)	0	5	15	33	46	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	1	0	1
1996	0	0	1	0	8	9
1997	0	4	1	0	0	5
1998	0	0	1	1	7	9
1999	0	0	0	2	0	2
2000	0	0	0	1	7	8
2001	0	1	1	0	0	2
Total (#)	0	5	4	5	22	36
Total (%)	0	14	11	14	61	100
Soil Management Group 5						
	<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 (%)	-	-	-	-	-	-
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	1	5	28	53	93	8	188
1996	0	23	35	60	159	1	278
1997	0	17	76	92	68	3	256
1998	0	17	60	127	141	9	354
1999	0	2	24	107	137	26	296
2000	2	10	21	61	148	1	243
2001	0	8	22	69	45	1	145
Grand Total	3	82	266	569	791	49	1760

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	39	43	50	49	52	31	50	
Highest:	2067	2316	554	963	115	994	619	
Mean:	292	302	151	194	240	240	175	
Median:	203	208	123	164	185	209	141	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	1	3	15	28	49	4	100
1996	0	8	13	22	57	0	100
1997	0	7	30	36	27	1	100
1998	0	5	17	36	40	3	100
1999	0	1	8	36	46	9	100
2000	1	4	9	25	61	0	100
2001	0	6	15	48	31	1	100
Grand Total	0	5	15	32	45	3	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	3	16	92	112
1996	0	0	0	3	61	64
1997	1	2	0	1	55	59
1998	3	3	6	14	102	128
1999	0	0	10	11	64	85
2000	0	3	1	5	99	108
2001	0	1	1	10	83	95
Total	4	10	21	60	556	651

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	53	130	15	6	68	36	53	
Highest:	1777	1556	1199	1847	2328	5177	6729	
Mean:	406	491	493	422	460	574	611	
Median:	372	447	457	383	442	458	462	

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	3	14	82	100
1996	0	0	0	5	95	100
1997	2	3	0	2	93	100
1998	2	2	5	11	80	100
1999	0	0	12	13	75	100
2000	0	3	1	5	92	100
2001	0	1	1	11	87	100
Total	1	2	3	9	85	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	0	2	28	158	188
1996	0	3	10	70	195	278
1997	0	8	13	78	157	256
1998	0	2	8	53	291	354
1999	0	2	13	41	240	296
2000	0	2	0	39	202	243
2001	0	0	0	20	125	145
Total	0	17	46	329	1368	1760

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	85	53	32	49	40	62	105	
Highest:	2532	1635	966	923	1066	1144	1190	
Mean:	460	337	321	398	354	374	397	
Median:	391	313	261	388	334	317	365	

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	0	1	15	84	100
1996	0	1	4	25	70	100
1997	0	3	5	30	61	100
1998	0	1	2	15	82	100
1999	0	1	4	14	81	100
2000	0	1	0	16	83	100
2001	0	0	0	14	86	100
Total	0	1	3	19	78	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	97	15	112
1996	61	3	64
1997	55	4	59
1998	118	10	128
1999	79	6	85
2000	104	4	108
2001	89	6	95
Total	603	48	651

Percentages:

0-49	>49	Total
Normal	Excessive	
87	13	100
95	5	100
93	7	100
92	8	100
93	7	100
96	4	100
94	6	100
93	7	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	415	102	249	194	78	162	178	
Mean:	25	12	15	17	13	15	16	
Median:	7	6	7	7	7	7	8	

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	175	13	188
1996	265	13	278
1997	251	5	256
1998	348	6	354
1999	292	4	296
2000	242	1	243
2001	144	1	145
Total	1717	43	1760

Percentages:

0-49	>49	Total
Normal	Excessive	
93	7	100
95	5	100
98	2	100
98	2	100
99	1	100
100	0	100
99	1	100
98	2	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	196	284	317	298	90	98	134	
Mean:	15	15	10	9	10	7	8	
Median:	6	9	4	5	6	4	5	

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	103	9	112
1996	57	7	64
1997	49	10	59
1998	120	8	128
1999	78	7	85
2000	96	12	108
2001	81	14	95
Total	584	67	651

Percentages:

0-99	>99	Total
Normal	Excessive	
92	8	100
89	11	100
83	17	100
94	6	100
92	8	100
89	11	100
85	15	100
90	10	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3	13	1	2	3	8	6	
Highest:	178	335	501	223	151	296	232	
Mean:	43	59	73	42	41	53	61	
Median:	32	46	59	33	34	39	46	

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	187	1	188
1996	274	4	278
1997	253	3	256
1998	351	3	354
1999	294	2	296
2000	243	0	243
2001	144	1	145
Total	1746	14	1760

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5	3	7	8	7	5	8	
Highest:	107	220	146	132	131	56	108	
Mean:	27	29	41	28	32	20	39	
Median:	2	26	40	25	32	18	38	

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	1	12	99	112
1996	0	8	56	64
1997	2	5	52	59
1998	2	17	109	128
1999	5	12	68	85
2000	2	6	100	108
2001	4	13	78	95
Total	16	73	562	651

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
1	11	88	100
0	13	88	100
3	8	88	100
2	13	85	100
6	14	80	100
2	6	93	100
4	14	82	100
2	11	86	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.7	0.4	0.3	0.2	0.4	0.3	
Highest:	294.6	875.3	140.1	105.3	75.1	1997.2	336.9	
Mean:	10.7	20.7	12.3	9.4	6.8	51.6	12.1	
Median:	2.6	3.8	4.5	3.4	3.0	3.5	2.7	

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	68	113	188
1996	6	55	217	278
1997	40	115	101	256
1998	18	159	177	354
1999	29	81	186	296
2000	6	97	140	243
2001	3	33	109	145
Total	109	608	1043	1760

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	36	60	100
2	20	78	100
16	45	39	100
5	45	50	100
10	27	63	100
2	40	58	100
2	23	75	100
6	35	59	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.3	0.1	0.1	0.1	0.2	0.3	
Highest:	116.8	120.5	6.2	9.6	67.7	17.3	14.1	
Mean:	6.3	17.2	1.1	1.4	2.3	1.6	1.9	
Median:	1.2	4.3	0.9	1.0	1.4	1.2	1.5	

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
ASP	Asparagus
ATF	Athletic Field
BDR/BND	Beans-dry
BLU/BLB	Blueberries
BNS	Beans, Snap
CBP	Cabbage, Transplanted
CEM	Cemetery
CUR	Currants
CVE	Crownvetch
EGG	Eggplants
END	Endives
FAR	Fairway
FLA	Flowering Annuals
GPA	Grapes, American
GPF	Grapes, French-American
GPV	Grapes, Vinifera
GEN	Green
GRA	Grapes
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
PCH	Peaches
PEA	Peas
PEP	Peppers
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses

Crop Code	Crop Description
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
SUB	Summer flowering bulbs
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing