

Soil Sample Survey

Suffolk Co.

Samples analyzed by CNAL in 1995-2001



Examples of some major areas of agricultural production are from left to right: Top - wine grapes, field and greenhouse flowers, potatoes; Bottom - mixed vegetables, nursery crops.

Summary compiled by

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

Ketterings, Q.M., H. Krol, W.S. Reid and J.B. Sieczka (2004). Suffolk County Soil Sample Survey 1995-2001. CSS Extension Bulletin E04-26. 37 pages.

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1. County Introduction by J.B. Sieczka

Suffolk County is located on Long Island and is the eastern-most county in New York. The county has a large population due to its close proximity to New York City. The population in the summer increases considerably due to tourist activities. Agriculture, through activities at farm stands and wineries, has become a major component of tourism. Suburban sprawl and tourist activities are double-edged swords. They place pressure on land availability and cost but provide a great market opportunity for agricultural products. Agricultural vistas and farm stands are important components of the appeal and the quality of life in the county. These features are important enough to the Suffolk County residents to strongly support county, town, state and federal government programs as well as private efforts to preserve agricultural and open space.

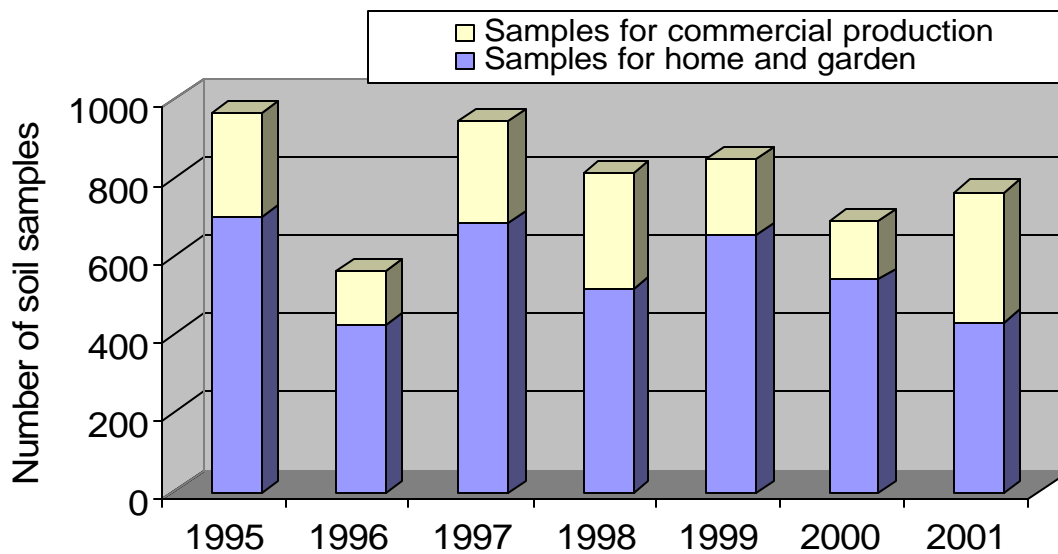
Agriculture was once prominent throughout Suffolk County. Currently, commercial agriculture is concentrated in the eastern third of the county. Soils were developed from glacial outwash and are typically coarse-textured and acidic. When properly fertilized and irrigated, they are highly productive. Surface horizons range from sands to silt loams. Subsoils are most often sands or gravelly sands although clay lenses occur in some areas. The primary agricultural soil series are Haven, Riverhead and Bridgehampton.

The influence of the Atlantic Ocean, Long Island Sound and associated bays moderates the climate. The winters are generally mild, spring temperatures are cool, and the number of frost-free days relatively long. The number of sunny days throughout the year is greater than many locations in New York. Irrigation water is abundant from underground sources.

The combination of productive soils, long growing seasons, ample irrigation, mild winters, and closeness to market is the main reason for the diversity of crops grown. Because of high land values, the land is intensively farmed with high value crops. The concentration of high value crops is the reason Suffolk County is ranked highest in the value of agricultural crops in New York. Crops grown include a wide range of vegetables (including potatoes), nursery, wine grapes, greenhouse and field-grown flowers, turf grass, and small fruits. Much of the produce is sold directly to consumers. Wholesale products are sold primarily in the Northeast although some sales extend into the South and Midwest.

2. General Survey Summary

This survey summarizes the soil test results from Suffolk 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 5584. Of these 5584 samples, 1637 (29%) were submitted to obtain fertilizer recommendations for commercial production while 3947 samples (71%) were submitted as home and garden samples.



Homeowners		Commercial		Total
1995	703	1995	265	968
1996	424	1996	141	565
1997	682	1997	260	942
1998	513	1998	298	811
1999	654	1999	192	846
2000	537	2000	150	687
<u>2001</u>	<u>434</u>	<u>2001</u>	<u>331</u>	<u>765</u>
Total	3947	Total	1637	5584

Thirty-nine percent of the home and garden samples were submitted to request fertilizer recommendations for lawns. Thirteen percent of the samples came from soils growing ornamentals adapted to pH 6.0-7.5. Twelve percent were taken from mixed vegetable gardens while other samples were sent in to request recommendations for azaleas, athletic fields, cemeteries, flowering annuals, golf fairways and greens, grapes, perennials, parks, roses, and tree fruits. People submitting samples for commercial production requested fertilizer recommendations for grapes (31%), mixed vegetables (24%), and potatoes (7%), while other samples was sent to the laboratory to request recommendations for other crops including apples, cabbage, corn, hay, peaches, pasture, pumpkins, sweet corn, tomatoes and Christmas trees.

Home and garden samples in Suffolk County were silty (8%), silt loams (19%), sandy loams (42%), or sandy (31%), 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, 73% belonged to soil management group 4. None of the samples belonged to groups 1, 2, or 6 while 23% was classified

group 3 and only 5 samples belonged to management group 5. The remainder was of unknown classification. The five most common soil series were Riverhead (33%), Haven (32%), Bridgehampton (22%), Plymouth (6%) and Montauk (3%). These soils represent 23% (Riverhead), 11% (Haven), 2% (Bridgehampton), 11% (Plymouth), and 4% (Montauk) of the 741,300 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to over 60% (most likely an organic soil or amendment) with median values ranging from 2.4 to 3.0% organic matter for home and garden samples and from 1.4 to 1.8% for samples submitted for commercial production. Fifty-nine percent of the home and garden samples had between 2.0 and 4.9% organic matter with almost 30% testing between 2.0 and 2.9% organic matter, and 20% between 3.0 and 3.9% organic matter. Eleven percent of the soils submitted for home and garden tested >4.9% in organic matter while 29% of the samples had less than 2.0% organic matter. Of the samples submitted for commercial production, 5% contained between 3.0 and 3.9% organic matter, 2% tested between 4.0 and 4.9% while only 9 samples tested higher in organic matter. Ninety-three percent had less than 3.0% organic matter with 50% of the samples testing between 1.0 and 1.9% organic matter.

Soil pH in water (1:1 extraction ratio) varied from pH 3.5 to pH 8.4 with the median for home and garden samples ranging from pH 6.2 to pH 6.4 and for samples submitted for commercial production ranging from pH 5.6 to pH 6.1. Sixty-three percent of home and garden samples tested between pH 6.0 and pH 7.4, while 48% of commercial samples were in this range. Forty-four percent of commercial samples tested between pH 5.0 and pH 5.9. For most crops, a pH between pH 6.0 and pH 6.2 would be adequate. Higher pH can lead to deficiencies in micronutrients such as manganese (Mn) and zinc (Zn) in some vegetable crops.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), Mn, and 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

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samples, 10% tested low, 14% tested medium, 46% tested high and 30% tested very high. This meant that 76% tested high or very high in P. Of the samples submitted for commercial production, 5% tested low in P. Eight percent were medium in P, 27% tested high while 61% of the samples were very high in P. In total, 88% of the samples tested high or very high in P. Suffolk County is the county with the largest percentage of commercial soils testing high or very high in P in New York State. 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 table below 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, 27% was classified as very low or low in potassium. Twenty-one percent tested medium, another 29% were high and 24% were very high in potassium. For samples submitted for commercial production, 8% were very low in K, 13% tested low, 19% tested medium, 36% tested high and 20% tested very high in potassium while the remainder was of unknown K classification. There seems to have been a decline in the percentage of soils testing high or very high in K over the years (above 70% in 1995 and 1996 to 40% in 2001).

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 5 to 6283 lbs Mg/acre (Morgan extraction) with median values for the home and garden samples ranging from 195 to 250 lbs Mg/acre and for the commercial samples from 126 to 207 lbs Mg/acre. Levels of 2000 lbs Mg/acre or higher or not often observed in soils; such levels generally identify organic amendments. There were only 23 samples in the combined home and garden and commercial agriculture datasets that tested very low in Mg. Most soils tested high or very high for Mg (88% of the homeowner soils and 78% of the soils of the commercial growers). Eleven percent of the home and garden samples and 21% of the commercial growers' soils tested low or 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-four percent of the home and garden samples were classified as normal in Fe while 99% of the commercial samples tested in the normal range for Fe. Similarly, almost all soils (all but 14 of the home and garden 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. The soil test results cannot readily identify Fe and Mn deficiencies but if soil pH is maintained between 6.0 and 6.2, such deficiencies should not occur as, most New York soils contain adequate quantities of both micronutrients. Tissue testing may be done to identify such deficiencies.

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, 3% tested low for zinc while 9% tested medium and 88% tested high for zinc. Of the samples for commercial production, almost 6% tested low in zinc, 18% tested medium while 76% 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. Percentage summations over multiple categories may not always add to 100% due to

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rounding errors. Also, samples with very high levels of organic matter and/or nutrients generally indicate organic and/or synthetic amendments rather than soils.

Reference

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



Vegetable production on Long Island (photo courtesy of J.B. Sieczka).

3. Cropping Systems

3.1 Samples for Home and Garden

Garden plants and crops* for which recommendations are requested by homeowners:

	1995	1996	1997	1998	1999	2000	2001	Total	%
ALG	35	26	19	21	23	17	12	153	4
APR	0	0	2	0	1	0	0	3	0
ATF	4	1	4	18	10	7	13	57	1
BLU	1	3	1	0	1	3	1	10	0
CEM	2	46	46	45	47	0	54	240	6
CUR	0	0	0	1	0	0	0	1	0
FAR	1	30	55	19	35	31	6	177	4
FLA	13	5	9	13	8	16	9	73	2
GEN	11	2	33	3	51	17	1	118	3
GRA	4	5	7	1	2	3	2	24	1
HRB	3	2	0	1	1	2	1	10	0
IDL	0	1	1	2	0	2	0	6	0
LAW	323	120	242	200	254	216	181	1536	39
MVG	79	88	87	64	52	65	39	474	12
OTH	28	2	5	5	15	13	7	75	2
PER	32	23	50	29	62	42	35	273	7
PRK	17	2	3	1	0	0	0	23	1
PTO	0	0	1	0	1	1	0	3	0
PUM	0	0	0	0	1	0	0	1	0
ROD	2	0	1	1	0	0	1	5	0
ROS	11	9	26	7	13	24	17	107	3
ROU	5	0	0	2	4	1	0	12	0
RSP	1	3	1	1	2	1	0	9	0
SAG	118	45	83	68	62	71	48	495	13
SOD	0	1	0	0	0	0	1	2	0
SPB	0	0	1	0	0	0	0	1	0
STR	1	1	0	1	2	0	0	5	0
SUB	4	1	0	1	3	0	0	9	0
SWC	0	0	0	1	0	0	0	1	0
TRF	7	5	5	4	1	2	2	26	1
Unknown	1	3	0	4	3	3	4	18	0
Total	703	424	682	513	654	537	434	3947	100

*See Appendix for Cornell crop codes.

3.2 Samples for Commercial Production

Crops for which recommendations are requested for commercial production:

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
ACT	0	1	0	0	0	0	0	1	0
AGE/AGT	0	0	0	0	5	0	1	6	0
ALE/ALT	0	0	0	0	0	0	1	1	0
APP	3	12	6	1	0	1	0	23	1
ASP	1	1	1	1	0	0	0	4	0
BET	0	0	1	0	0	0	0	1	0
BGE/BGT	1	0	0	1	0	0	0	2	0
BNS	0	0	0	0	0	1	0	1	0
BRP	0	0	1	0	0	0	0	1	0
BUK	1	1	1	0	2	2	2	9	0
CBP	2	5	1	0	0	0	0	8	0
CBS	0	2	8	0	0	0	0	10	1
CGE/CGT	0	0	0	2	0	0	0	2	0
CHC	0	0	0	6	0	0	0	6	0
CHS	0	0	2	0	0	0	0	2	0
CLE/CLT	0	0	2	1	0	1	0	4	0
COG/COS	26	14	17	8	14	6	9	94	6
GPA	0	1	0	0	0	4	0	5	0
GPF	0	1	0	0	0	2	0	3	0
GPV	25	5	78	74	57	63	207	509	31
GRE/GRT	5	2	2	3	1	32	0	45	3
IDL	2	0	0	0	2	1	0	5	0
LET	1	1	0	0	1	0	0	3	0
MIL	0	0	1	0	0	0	0	1	0
MIX	71	38	87	78	40	9	65	388	24
MML	0	1	1	0	1	0	0	3	0
NEC	0	1	0	0	0	0	0	1	0
OAS	0	0	2	2	0	0	0	4	0
OAT	1	1	0	0	0	0	0	2	0
OTH	1	0	1	0	2	1	0	5	0
PAR	0	2	2	0	0	0	0	4	0
PCH	3	3	2	0	0	2	0	10	1
PEP	2	0	0	1	0	0	0	3	0
PGE/PGT	6	1	3	8	1	0	0	19	1
PIE/PIT	3	3	0	0	0	0	2	8	0
PLE/PLT	0	0	0	1	1	0	0	2	0

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
PLM	0	1	0	0	2	0	0	3	0
PNE/PNT	1	0	0	0	0	0	4	5	0
POT	44	13	7	38	5	1	0	108	7
PUM	2	2	1	5	0	2	4	16	1
RSF	1	0	0	0	1	0	0	2	0
RSS	0	2	1	0	1	0	2	6	0
RYC	1	1	5	0	50	0	1	58	4
RYS	0	0	0	10	1	1	0	12	1
SAG	0	0	1	0	0	2	0	3	0
SOF	11	0	1	0	0	0	0	12	1
SOG	0	6	4	6	0	0	0	16	1
SPF	0	0	0	0	1	0	0	1	0
SPS	0	0	0	0	1	0	2	3	0
SQS	0	1	0	0	0	0	0	1	0
SSH	10	0	2	32	0	0	4	48	3
STS	1	1	1	2	0	0	0	5	0
SUD	2	0	0	0	0	6	0	8	0
SWC	18	7	9	4	0	0	11	49	3
TME	0	0	0	2	0	0	0	2	0
TOM	3	1	3	5	0	0	0	12	1
TRE/TRT	5	9	2	5	3	1	7	32	2
WHT	0	0	1	1	0	3	0	5	0
Unknown	12	1	3	1	0	9	9	35	2
Total	265	141	260	298	192	150	331	1637	100

Notes:

See Appendix for Cornell crop codes.

4. Soil Types

4.1 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)	57	35	69	34	55	52	26	328
SMG 3 (silt loam)	85	85	116	107	94	135	132	754
SMG 4 (sandy loam)	284	164	302	218	325	189	165	1647
SMG 5 (sandy)	277	140	195	154	180	161	111	1218
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	703	424	682	513	654	537	434	3947

4.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Bridgehampton	3	91	28	134	62	15	26	12	368
Carver	5	1	0	0	0	2	0	0	3
Haven	4	52	35	35	115	70	50	162	519
Montauk	4	12	5	6	7	6	5	8	49
Plymouth	4	16	8	12	19	10	8	19	92
Raynham	3	0	0	1	0	0	0	0	1
Riverhead	4	82	57	68	92	77	51	114	541
Scio	3	0	0	0	2	2	0	0	4
Sudbury	4	0	0	0	0	0	2	0	2
Unknown	-	11	8	4	1	10	8	16	58
Total	-	265	141	260	298	192	150	331	1637

5. Organic Matter

5.1 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	17	152	182	158	78	50	30	36	703
1996	24	104	116	76	55	19	13	17	424
1997	36	149	227	160	53	24	18	15	682
1998	27	152	150	86	34	30	15	19	513
1999	23	177	228	104	67	24	17	14	654
2000	21	131	137	125	53	29	10	31	537
2001	28	118	126	77	45	17	9	14	434
Total	176	983	1166	786	385	193	112	146	3947

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.5	0.1	0.2	0.1	0.1	0.2	0.1	
Highest:	26.1	24.0	30.8	21.6	26.1	24.6	60.4	
Mean:	3.4	3.1	2.9	2.9	2.8	3.2	3.4	
Median:	3.0	2.7	2.6	2.4	2.5	2.8	2.5	

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

	<1%	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
1995	2	22	26	22	11	7	4	5	100
1996	6	25	27	18	13	4	3	4	100
1997	5	22	33	23	8	4	3	2	100
1998	5	30	29	17	7	6	3	4	100
1999	4	27	35	16	10	4	3	2	100
2000	4	24	26	23	10	5	2	6	100
2001	6	27	29	18	10	4	2	3	100
Total	4	25	30	20	10	5	3	4	100

5.2 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	19	122	80	30	13	1	0	0	265
1996	21	69	42	6	3	0	0	0	141
1997	42	137	72	5	3	1	0	0	260
1998	59	135	96	5	2	1	0	0	298
1999	48	91	41	10	2	0	0	0	192
2000	7	87	34	14	2	2	0	4	150
2001	93	179	52	5	2	0	0	0	331
Total	289	820	417	75	27	5	0	4	1637

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.1	0.5	0.1	0.1	0.1	0.1	0.1	
Highest:	5.6	4.7	5.6	5.3	4.6	14.2	4.5	
Mean:	2.0	1.8	1.7	1.7	1.5	2.2	1.4	
Median:	1.8	1.7	1.6	1.7	1.4	1.8	1.4	

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	7	46	30	11	5	0	0	0	100
1996	15	49	30	4	2	0	0	0	100
1997	16	53	28	2	1	0	0	0	100
1998	20	45	32	2	1	0	0	0	100
1999	25	47	21	5	1	0	0	0	100
2000	5	58	23	9	1	1	0	3	100
2001	28	54	16	2	1	1	0	0	100
Total	18	50	25	5	2	0	0	0	100

6. pH

6.1 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	4	25	64	104	160	243	86	17	0	0	703
1996	7	25	50	75	108	111	39	9	0	0	424
1997	9	29	71	133	161	219	55	5	0	0	682
1998	8	22	54	98	158	135	33	5	0	0	513
1999	6	22	67	170	167	153	55	14	0	0	654
2000	6	30	56	95	132	144	60	13	1	0	537
2001	8	8	54	83	110	116	43	10	2	0	434
Total	48	161	416	758	996	1121	371	73	3	0	3947

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3.9	3.9	3.8	3.5	4.0	3.7	3.8	
Highest:	7.8	7.6	7.6	7.9	7.9	8.4	8.0	
Mean:	-	-	-	-	-	-	-	
Median:	6.4	6.2	6.3	6.2	6.2	6.2	6.3	

Percent of home and garden samples within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	1	4	9	15	23	35	12	2	0	0	100
1996	2	6	12	18	25	26	9	2	0	0	100
1997	1	4	10	20	24	32	8	1	0	0	100
1998	2	4	11	19	31	26	6	1	0	0	100
1999	1	3	10	26	26	23	8	2	0	0	100
2000	1	6	10	18	25	27	11	2	0	0	100
2001	2	2	12	19	25	27	10	2	0	0	100
Total	1	4	11	19	25	28	9	2	0	0	100

6.2 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	2	13	41	69	94	32	10	4	0	0	265
1996	1	12	19	31	56	20	2	0	0	0	141
1997	3	18	45	85	77	29	3	0	0	0	260
1998	1	11	75	100	86	23	2	0	0	0	298
1999	2	15	40	34	70	23	8	0	0	0	192
2000	7	15	45	24	27	24	6	2	0	0	150
2001	7	15	38	82	118	59	12	0	0	0	331
Total	23	99	303	425	528	210	43	6	0	0	1637

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.3	4.4	4.2	4.4	4.3	3.9	4.1	
Highest:	7.7	7.3	7.0	7.0	7.4	7.5	7.2	
Mean:	-	-	-	-	-	-	-	
Median:	6.0	6.0	5.8	5.8	6.0	5.6	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	1	5	15	26	35	12	4	2	0	0	100
1996	1	9	13	22	40	14	1	0	0	0	100
1997	1	7	17	33	30	11	1	0	0	0	100
1998	0	4	25	34	29	8	1	0	0	0	100
1999	1	8	21	18	36	12	4	0	0	0	100
2000	5	10	30	16	18	16	4	1	0	0	100
2001	2	5	11	25	36	18	4	0	0	0	100
Total	1	6	19	26	32	13	3	0	0	0	100

7. Phosphorus

7.1 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	46	92	375	77	34	15	27	13	24	703
1996	0	40	51	173	64	26	16	27	5	22	424
1997	0	54	94	329	115	31	14	16	10	19	682
1998	0	55	67	225	68	41	18	15	9	15	513
1999	0	72	112	299	76	44	17	18	6	10	654
2000	0	50	59	250	82	31	15	25	7	18	537
2001	0	90	58	175	39	20	12	11	6	23	434
Total	0	407	533	1826	521	227	107	139	56	131	3947

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:	992	497	615	812	627	4566	1618	
Mean:	44	52	40	43	34	48	48	
Median:	23	30	26	26	19	27	17	

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	7	13	53	11	5	2	4	2	3	100
1996	0	9	12	41	15	6	4	6	1	5	100
1997	0	8	14	48	17	5	2	2	1	3	100
1998	0	11	13	44	13	8	4	3	2	3	100
1999	0	11	17	46	12	7	3	3	1	2	100
2000	0	9	11	47	15	6	3	5	1	3	100
2001	0	21	13	40	9	5	3	3	1	5	100
Total	0	10	14	46	13	6	3	4	1	3	100

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

7.2 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	3	7	54	90	74	8	23	6	0	265
1996	0	0	7	65	25	29	12	2	0	1	141
1997	0	14	16	79	60	29	22	35	3	2	260
1998	0	16	32	56	74	59	25	31	3	2	298
1999	0	5	16	49	36	43	12	21	9	1	192
2000	0	20	17	54	31	22	3	0	1	2	150
2001	0	21	28	87	62	49	28	52	4	0	331
Total	0	79	123	444	378	305	110	164	26	8	1637

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	5	1	1	2	1	1	
Highest:	171	358	252	277	252	299	180	
Mean:	58	49	57	56	60	36	54	
Median:	56	37	43	51	56	28	50	

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	1	3	20	34	28	3	9	2	0	100
1996	0	0	5	46	18	21	9	1	0	1	100
1997	0	5	6	30	23	11	8	13	1	1	100
1998	0	5	11	19	25	20	8	10	1	1	100
1999	0	3	8	26	19	22	6	11	5	1	100
2000	0	13	11	36	21	15	2	0	1	1	100
2001	0	6	8	26	19	15	8	16	1	0	100
Total	0	5	8	27	23	19	7	10	2	0	100

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

8. Potassium

8.1 Samples for Home and Garden

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

Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	2	2	5	19	29	57
1996	0	3	7	11	14	35
1997	2	2	3	24	38	69
1998	0	2	1	12	19	34
1999	1	4	3	16	31	55
2000	2	1	1	14	34	52
2001	0	5	4	8	9	26
Total (#)	7	19	24	104	174	328
Total (%)	2	6	7	32	53	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	2	5	9	27	42	85
1996	0	6	20	28	31	85
1997	7	16	27	47	19	116
1998	2	7	27	43	28	107
1999	5	7	27	28	27	94
2000	10	11	15	46	53	135
2001	4	12	41	46	29	132
Total (#)	30	64	166	265	229	754
Total (%)	4	8	22	35	30	100

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Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	4	37	59	100	84	284
1996	5	37	38	44	40	164
1997	18	57	89	67	71	302
1998	7	33	42	80	56	218
1999	7	58	96	117	47	325
2000	7	27	41	56	58	189
2001	16	33	38	45	33	165
Total (#)	64	282	403	509	389	1647
Total (%)	4	17	24	31	24	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	36	86	60	65	30	277
1996	25	42	24	30	19	140
1997	29	68	51	35	12	195
1998	26	55	33	30	10	154
1999	16	44	41	61	18	180
2000	35	47	25	31	23	161
2001	29	34	18	16	14	111
Total (#)	196	376	252	268	126	1218
Total (%)	16	31	21	22	10	100

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Number of home and garden samples within each potassium classification:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
1995	44	130	133	211	185	703
1996	32	87	78	112	115	424
1997	56	143	170	173	140	682
1998	35	97	103	165	113	513
1999	29	113	167	222	123	654
2000	54	86	82	147	168	537
2001	49	84	101	115	85	434
Total #	299	740	834	1145	929	3947

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	20	1	4	25	1	14	21	
Highest:	5415	2452	4565	6493	5961	7114	6842	
Mean:	242	193	189	215	183	236	216	
Median:	161	147	135	149	151	162	128	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	6	18	19	30	26	100
1996	8	21	18	26	27	100
1997	8	21	25	25	21	100
1998	7	19	20	32	22	100
1999	4	17	26	34	19	100
2000	10	16	15	27	31	100
2001	11	19	23	26	20	100
Grand Total	8	19	21	29	24	100

8.2 Samples for Commercial Production

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

Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	1	2	8	24	56	91
1996	0	0	5	11	12	28
1997	15	20	28	52	20	135
1998	0	0	1	31	32	64
1999	0	0	0	8	9	17
2000	4	3	3	7	9	26
2001	1	1	2	6	2	12
Total (#)	21	26	47	139	140	373
Total (%)	6	7	13	37	38	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	3	24	26	78	31	162
1996	2	4	19	49	31	105
1997	3	10	22	60	26	121
1998	28	37	57	86	25	233
1999	11	26	40	61	25	163
2000	13	26	31	31	15	116
2001	41	66	72	93	31	303
Total (#)	101	193	267	458	184	1203
Total (%)	8	16	22	38	15	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	0	0	0	1
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	2	0	0	0	0	2
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	2	1	0	0	0	3
Total (%)	67	33	0	0	0	100

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

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	4	27	34	102	87	11	265
1996	2	4	24	60	43	8	141
1997	18	30	50	112	46	4	260
1998	28	37	58	117	57	1	298
1999	13	26	40	69	34	10	192
2000	17	29	34	38	24	8	150
2001	42	67	74	99	33	16	331
Grand Total	124	220	314	597	324	58	1637

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	13	16	18	14	1	1	4	
Highest:	543	743	854	539	375	1848	449	
Mean:	202	204	164	163	165	163	143	
Median:	198	199	157	193	165	129	131	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	2	10	13	38	33	4	100
1996	1	3	17	43	30	6	100
1997	7	12	19	43	18	2	100
1998	9	12	19	39	19	0	100
1999	7	14	21	36	18	5	100
2000	11	19	23	25	16	5	100
2001	13	20	22	30	10	5	100
Grand Total	8	13	19	36	20	4	100

9. Magnesium

9.1 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	25	67	187	424	703
1996	1	26	34	113	250	424
1997	3	27	41	203	408	682
1998	6	25	42	174	266	513
1999	0	23	41	211	379	654
2000	5	23	31	142	336	537
2001	5	27	35	155	212	434
Total	20	176	291	1185	2295	3947

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	30	11	17	9	34	10	8	
Highest:	6283	3418	5614	1826	2370	4140	6099	
Mean:	301	295	289	272	273	303	294	
Median:	250	233	226	207	226	244	195	

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	10	27	60	100
1996	0	6	8	27	59	100
1997	0	4	6	30	60	100
1998	1	5	8	34	52	100
1999	0	4	6	32	58	100
2000	1	4	6	26	63	100
2001	1	6	8	36	49	100
Total	1	4	7	30	58	100

9.2 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	2	22	30	89	122	265
1996	0	7	11	49	74	141
1997	0	12	24	98	126	260
1998	1	14	33	112	138	298
1999	1	9	25	98	59	192
2000	3	31	18	44	54	150
2001	5	45	61	131	89	331
Total	12	140	202	621	662	1637

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	10	32	23	16	7	5	14	
Highest:	588	687	468	1616	778	1756	551	
Mean:	204	226	209	207	181	197	148	
Median:	193	207	187	193	156	144	126	

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	8	11	34	46	100
1996	0	5	8	35	52	100
1997	0	5	9	38	48	100
1998	0	5	11	38	46	100
1999	1	5	13	51	31	100
2000	2	21	12	29	36	100
2001	2	14	18	40	27	100
Total	1	9	12	38	40	100

10. Iron

10.1 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	680	23	703
1996	405	19	424
1997	652	30	682
1998	474	39	513
1999	598	56	654
2000	507	30	537
2001	410	24	434
Total	3726	221	3947

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	97	3	100
	96	4	100
	96	4	100
	92	8	100
	91	9	100
	94	6	100
	94	6	100
	94	6	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	190	166	132	452	337	198	247	
Mean:	12	14	13	18	17	14	14	
Median:	7	8	7	8	8	8	7	

10.2 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	265	0	265
1996	141	0	141
1997	259	1	292
1998	297	1	298
1999	190	2	192
2000	145	5	150
2001	329	2	331
Total	1626	11	1637

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	100	0	100
	100	0	100
	100	0	100
	100	0	100
	99	1	100
	97	3	100
	99	1	100
	99	1	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	48	35	132	109	75	316	220	
Mean:	9	8	9	9	8	13	8	
Median:	7	7	8	8	7	7	6	

11. Manganese

11.1 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	700	3	703
1996	424	0	424
1997	680	2	682
1998	511	2	513
1999	654	0	654
2000	535	2	537
2001	429	5	434
Total	3933	14	3947

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	2	
Highest:	165	80	349	136	89	189	321	
Mean:	15	12	14	12	12	14	14	
Median:	9	9	11	8	10	10	9	

11.2 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	265	0	265
1996	141	0	141
1997	260	0	260
1998	298	0	298
1999	192	0	192
2000	150	0	150
2001	331	0	331
Total	1637	0	1637

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	66	39	50	49	41	65	87	
Mean:	12	11	9	8	11	8	11	
Median:	9	9	7	7	9	5	8	

12. Zinc

12.1 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	15	41	647	703
1996	19	51	654	424
1997	29	60	593	682
1998	31	48	434	513
1999	5	59	590	654
2000	25	43	469	537
2001	10	53	371	434
Total	134	355	3458	3947

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	6	92	100
4	12	83	100
4	9	87	100
6	9	85	100
1	9	90	100
5	8	87	100
2	12	85	100
3	9	88	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.2	0.1	0.1	0.2	0.1	0.1	
Highest:	173.5	1446.2	268.1	291.0	174.1	235.9	359.3	
Mean:	8.6	12.1	6.8	8.7	7.2	9.6	8.5	
Median:	4.7	4.1	3.7	3.6	4.3	4.0	3.1	

12.2 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	4	31	230	265
1996	0	25	116	141
1997	9	56	195	260
1998	33	56	209	298
1999	10	43	139	192
2000	19	37	94	150
2001	15	52	264	331
Total	90	300	1247	1637

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	12	87	100
0	18	82	100
3	22	75	100
11	19	70	100
5	22	72	100
13	25	63	100
5	16	80	100
5	18	76	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.3	0.5	0.2	0.1	0.1	0.1	0.1	
Highest:	87.5	50.0	31.0	22.3	23.9	28.1	108.4	
Mean:	4.5	4.2	2.3	2.6	2.4	2.4	3.4	
Median:	2.4	2.3	1.6	1.7	1.8	1.5	1.9	

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
ACT	Apricots
ALG	Azalea
APP	Apples

Crop Code	Crop Description
APR/ASP	Asparagus
ATF	Athletic Field
BDR/BND	Beans-dry
BET	Beets
BLU/BLB	Blueberries
BNS	Beans, Snap
BRP	Broccoli, Transplanted
CBP	Cabbage, Transplanted
CBS	Cabbage, Seeded
CEM	Cemetery
CHC	Chinese cabbage
CHS	Cherries, Sweet
CUR	Currants
EGG	Eggplants
END	Endives
FAR	Golf fairway
FLA	Flowering Annuals
GPA	Grapes, American
GPF	Grapes, French-American
GPV	Grapes, Vinifera
GEN	Golf greens
GRA	Grapes
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
NEC	Nectarines
NUR	Nursery
ONS	Onion-seeded
OTH	Other
PAR	Pears
PCH	Peaches
PEA	Peas
PEP	Peppers
PER	Perennials
PLM	Plums
POP	Popcorn

Crop Code	Crop Description
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
ROU	Golf roughs
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SOD	Sod production
SPB	Spring flowering bulbs
SPF	Spinach, Fall
SPS	Spinach, Spring
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUB	Summer flowering bulbs
SUN	Sunflowers
SWC	Sweet corn
TME	Tomatoes, Early
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing