

# Soil Sample Survey

# Otsego Co.

Samples analyzed by CNAL in 1995-2001

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Summary compiled by

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

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

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Ketterings, Q.M., H. Krol, W.S. Reid and K. Ganoë (2004). Otsego County Soil Sample Survey 1995-2001. CSS Extension Bulletin E04-9. 37 pages.

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**February 26, 2004**

Correct Citation:

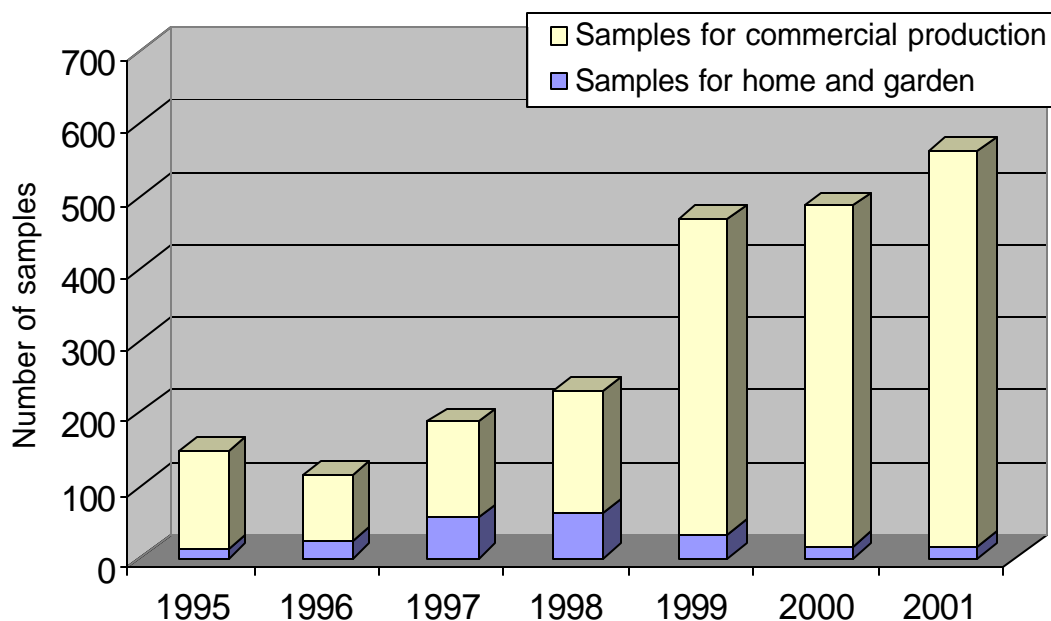
Ketterings, Q.M., H. Krol, W.S. Reid, and K. Ganoë (2004). Soil samples survey of Otsego County. Samples analyzed by the Cornell Nutrient Analysis Laboratory in 1995-2001. CSS Extension Bulletin E04-9. 37 pages.

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# 1. General Survey Summary

This survey summarizes the soil test results from Otsego 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 2199. Of these 2199 samples, 1979 (90%) were submitted to obtain fertilizer recommendations for commercial production while 220 samples (10%) were submitted as home and garden samples. There has been a steady increase in the number of samples submitted for commercial agriculture since 1996.



<b>Homeowners</b>		<b>Commercial</b>		<b>Total</b>
1995	13	1995	135	148
1996	24	1996	92	116
1997	55	1997	131	186
1998	62	1998	169	231
1999	34	1999	435	469
2000	16	2000	471	487
<u>2001</u>	<u>16</u>	<u>2001</u>	<u>546</u>	<u>562</u>
<b>Total</b>	<b>220</b>	<b>Total</b>	<b>1979</b>	<b>2199</b>

Twenty-two percent of the home and garden samples were submitted to request fertilizer recommendations for mixed vegetable gardens. Fourteen percent of the samples came from lawns while a few additional samples were sent in to request recommendations for athletic fields, perennials, grapes, flowering annuals, herbs, ornamentals and fruit trees. For 32% of the samples, the crop or plants grown were not specifically identified. People submitting samples for commercial production requested fertilizer recommendations for alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (33%), corn silage or grain production (29%), or hay (17%), while a few producers were planning on growing other crops including blueberries, birdsfoot trefoil and clover/grass mixes, pasture, ryegrass for seed and soybeans.

Home and garden samples in Otsego County were in order of abundance: sandy loams (49%), silt loams (19%), sandy (17%), or silty (15%), belonging to soil management groups 4, 3, 5, and 2 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, 43% belonged to soil management group 3 while 42% of the samples were classified as soil management group 2. Ten percent were from soil management group 4 while for 5% of the samples, the soil management group was unknown. The five most common soil series were Lansing (17%), Honeoye (10%), Wassaic (8%), Lordstown and Chenango (both 7%). These soils represent 3% (Lansing), 1% (Honeoye), 1% Wassaic), 13% (Lordstown), and Chenango (6%) of the total 649,200 acres in the county.

Organic matter levels, as measured by loss on ignition, ranged from 1% to slightly over 25% with median values ranging from 5.5 to 8.0% organic matter for home and garden samples and from 4.5 to 5.1% for samples submitted for commercial production. Thirty-one percent of the home and garden samples had between 2.0 and 4.9% organic matter with 5% testing between 2.0 and 2.9% organic matter, 10% between 3.0 and 3.9% organic matter and 16% between 4.0 and 4.9% organic matter. Sixty-seven percent of the soils submitted for home and garden tested >4.9% in organic matter while 2% of the samples had less than 2.0% organic matter. Of the samples submitted for commercial production, 16% contained between 3.0 and 3.9% organic matter, 42% tested between 4.0 and 4.9% while 23% had organic matter concentrations of 5.0-5.9%. Two percent had less than 3.0% organic matter while 17% of the samples had 6.0% or more organic matter. In total, 75% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 3.4 to 8.4 with the median for home and garden samples ranging from pH 5.1 to pH 6.6 and for samples submitted for commercial production ranging from pH 6.0 to pH 6.6. Of the home and garden samples, 46% 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, 20% tested low, 23% tested medium, 31% tested high and 26% tested very high. This meant that 57% tested high or very high in P. Four percent of the samples tested for commercial production in Otsego County tested very high in P. Thirty-four percent of the samples were low in P, 32% tested medium for P while 30% of the submitted samples were classified as high in soil test P. This means that 34% tested high or very high in P and. There were no clear trends in P levels 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, 11% was classified as very low or low in potassium. Fifteen percent tested medium, 29% high and 45% very high. For samples submitted for commercial production, 1% tested very low in K, 9% tested low, 19% tested medium, 30% tested high and 36% tested very high in potassium with the remainder being of unknown soil type classification (and hence unknown potassium fertility status). 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 17 to almost 2000 lbs Mg/acre (Morgan extraction). There was only one sample that tested very low in Mg. Most soils tested high or very high for Mg (82% of the homeowner soils and 94% of the soils of the commercial growers). No more than 30 of the homeowner soils and 6% of the commercial growers' soil tested low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Otsego 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 74-95% in the normal range with 26% of the home and garden samples and 5% of the samples for commercial production testing excessive for Fe. Similarly, 86% of the home and garden samples and 97% of the commercial samples tested normal for manganese with the remainder being excessive in Mn. 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, 94% tested high for zinc while 1% was low in Zn and 5% tested medium. Of the samples for commercial production, 9% tested low in zinc, 37% tested medium while 55% 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	%
APR	0	0	0	1	0	0	0	1	0
ATF	0	3	4	0	7	0	0	14	6
BLU	0	0	0	0	2	0	0	2	1
FLA	0	1	0	0	1	0	0	2	1
GRA	0	1	0	1	1	1	0	4	2
HRB	0	0	0	0	0	2	0	2	1
IDL	0	0	1	0	0	0	0	1	0
LAW	2	5	13	7	2	2	0	31	14
MVG	3	6	8	11	11	6	4	49	22
OTH	8	2	26	29	3	1	1	70	32
PER	0	2	1	2	2	1	2	10	5
PUM	0	0	0	1	0	0	0	1	0
SAG	0	3	1	6	4	0	2	16	7
SPB	0	1	0	0	0	2	0	3	1
TRF	0	0	0	2	1	0	0	3	1
Unknown	0	0	1	2	0	1	7	11	5
Total	13	24	55	62	34	16	16	220	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	7	2	4	1	1	6	0	21	1
AGE/AGT	40	37	24	23	130	154	184	592	30
ALE/ALT	5	1	0	6	5	13	1	31	2
APP	0	0	0	0	0	0	2	2	0
BGE/BGT	2	1	1	0	1	1	1	7	0
BLB	0	0	0	1	0	0	9	10	1
BSE	1	0	0	0	0	0	0	1	0
BSP	0	0	2	6	0	3	10	21	2
BSS	0	0	0	1	0	1	1	3	0
BUK	1	0	0	2	0	0	0	3	0
CGE/CGT	5	5	34	14	12	3	7	80	4
CLE/CLT	2	1	1	0	0	0	0	4	0
COG/COS	39	28	33	64	157	127	128	576	29
GIE/GIT	1	0	0	0	11	27	60	99	5
GRE/GRT	9	2	13	16	69	69	68	246	12
HRB	0	0	0	0	0	2	0	2	0
IDL	0	1	0	5	0	6	2	14	1
MIX	0	2	0	1	0	2	0	5	0
OAS	12	0	0	5	3	2	10	32	2
OAT	0	0	0	1	5	2	0	8	0
OTH	0	1	6	0	7	1	0	15	1
PGE/PGT	2	4	0	2	1	3	28	40	2
PIE/PIT	7	6	2	6	4	11	18	54	3
PLE/PLT	0	0	1	3	2	0	1	7	0
PNE/PNT	1	0	0	3	2	3	3	12	1
PUM	0	0	0	1	1	0	0	2	0
RSS	0	0	0	1	0	0	0	1	0
RYC	0	0	0	0	1	1	1	3	0
RYS	0	0	4	0	5	3	3	15	1
SOF	1	0	0	1	3	1	0	6	0
SOY	0	0	4	5	1	0	0	10	1
SSH	0	0	0	0	0	0	1	1	0
TRP	0	0	0	0	3	0	2	5	0
WHT	0	0	1	0	0	0	0	1	0
Unknown	0	1	0	1	11	30	6	50	3
Total	135	92	131	169	435	471	546	1979	100

### 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)	1	3	6	10	8	2	3	33
SMG 3 (silt loam)	1	2	7	11	7	4	9	41
SMG 4 (sandy loam)	7	18	24	33	14	8	4	108
SMG 5 (sandy)	4	1	18	8	5	2	0	38
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	13	24	55	62	34	16	16	220

### 3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Bath	3	1	9	0	12	1	6	5	34
Burdett	2	0	0	0	5	0	0	0	5
Canandaigua	3	0	0	0	0	0	0	3	3
Castile	4	0	1	1	0	2	7	5	16
Chenango	3	8	3	7	12	33	45	36	144
Chippewa	3	0	0	0	0	0	0	2	2
Conesus	2	1	0	0	2	21	30	61	115
Danley	2	0	0	0	0	32	11	2	45
Darien	2	0	0	0	0	0	0	3	3
Farmington	3	4	2	4	1	31	24	27	93
Fonda	2	0	0	0	0	2	0	0	2
Greene	3	0	0	0	0	0	1	0	1
Hamplain	2	0	0	0	0	3	0	3	6
Herkimer	3	0	0	0	0	4	15	8	27
Honeoye	2	3	6	7	9	65	57	53	200
Howard	3	2	1	1	0	13	22	11	50
Lackawanna	3	1	2	4	0	7	5	0	19
Lansing	2	51	29	11	21	69	70	93	344
Lewbath	3	0	0	0	0	0	0	1	1
Lima	2	2	1	5	0	18	11	3	40
Lordstown	3	28	11	18	39	17	16	16	145
Lyons	2	0	0	1	0	0	4	1	6
Manheim	2	2	0	0	0	7	11	12	32
Manlius	3	0	3	0	1	0	7	5	16
Mardin	3	15	14	14	29	5	27	25	129
Mongaup	3	0	2	1	1	1	3	3	11
Morris	3	0	0	3	0	6	0	0	9
Oquaga	3	0	0	2	0	0	0	0	2
Otego	2	0	0	2	2	2	0	1	7
Raynham	3	0	0	1	0	7	12	14	34
Red hook	4	0	0	3	1	1	4	8	17
Rhinebeck	2	0	0	0	4	3	1	7	15
Riverhead	4	0	0	0	14	1	0	0	15
Scio	3	0	0	0	4	10	4	9	27
Towerville	3	0	0	0	0	0	0	6	6
Trestle	3	0	1	1	2	2	2	4	12

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Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Tunkhannock	3	0	1	0	0	0	0	0	1
Unadilla	3	0	0	0	0	0	0	7	7
Valois	3	0	0	3	2	2	3	34	44
Volusia	3	1	0	4	0	0	0	2	7
Wakeville	3	0	0	2	0	2	2	0	6
Wassaic	4	6	3	10	3	48	48	37	155
Wayland	2	0	0	3	1	1	0	6	11
Wellsboro	3	0	2	2	0	0	0	0	4
Willdin	3	0	0	1	0	1	0	5	7
Unknown	-	10	1	20	4	18	23	28	104
Total	-	135	92	131	169	435	471	546	1979

## 4. Organic Matter

### 4.1 Samples for Home and Garden

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

	<1%	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
1995	0	0	0	0	2	1	1	9	13
1996	0	0	1	3	4	6	5	5	25
1997	0	1	5	6	7	10	8	18	55
1998	0	2	2	5	12	8	11	22	62
1999	0	1	2	6	6	5	4	10	34
2000	0	0	0	2	1	5	2	6	16
2001	0	0	0	1	3	1	3	8	16
Total	0	4	10	23	35	36	34	78	220

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.0	2.4	1.4	1.2	1.6	3.4	3.6	
Highest:	22.1	9.8	18.0	18.9	18.0	12.3	17.6	
Mean:	9.6	5.8	6.3	7.0	6.3	6.6	8.3	
Median:	8.0	5.7	5.8	6.2	5.5	5.9	7.2	

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	0	0	0	0	15	8	8	69	100
1996	0	0	4	13	17	25	21	21	100
1997	0	2	9	11	13	18	15	33	100
1998	0	3	3	5	19	13	18	35	100
1999	0	3	6	18	18	15	12	29	100
2000	0	0	0	13	6	31	13	38	100
2001	0	0	0	6	19	6	19	50	100
Total	0	2	5	10	16	16	15	35	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	3	1	15	59	30	17	10	135
1996	0	0	2	22	37	13	10	8	92
1997	0	0	1	23	41	22	21	23	131
1998	0	0	8	32	45	41	28	15	169
1999	0	0	1	80	216	92	22	24	435
2000	1	1	12	76	216	88	38	39	471
2001	0	2	8	70	222	162	55	27	546
Total	1	6	33	318	836	448	191	146	1979

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.0	2.7	2.9	2.1	2.8	0.1	1.9	
Highest:	9.1	16.6	11.5	10.8	24.7	25.7	9.7	
Mean:	5.0	5.0	5.5	5.0	4.9	5.1	4.9	
Median:	4.8	4.5	5.1	4.9	4.6	4.6	4.8	

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

	<1%	1.0-1.9	2.0-2.9	3.0-3.9	4.0-4.9	5.0-5.9	6.0-6.9	>6.9	Total
1995	0	2	1	11	44	22	13	7	100
1996	0	0	2	24	40	14	11	9	100
1997	0	0	1	18	31	17	16	18	100
1998	0	0	5	19	27	24	17	9	100
1999	0	0	0	18	50	21	5	6	100
2000	0	0	3	16	46	19	8	8	100
2001	0	0	1	13	41	30	10	5	100
Total	0	0	2	16	42	23	10	7	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	3	0	0	2	2	4	2	0	0	0	13
1996	0	3	1	1	6	3	7	3	0	0	24
1997	16	6	7	3	5	12	6	0	0	0	55
1998	11	10	7	9	7	11	7	0	0	0	62
1999	1	2	3	10	5	3	5	5	0	0	34
2000	2	0	0	4	3	2	4	1	0	0	16
2001	3	3	0	3	2	2	1	2	0	0	16
Total	36	24	18	32	30	37	32	11	0	0	220

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.1	4.5	4.0	3.4	3.8	3.7	4.1	
Highest:	7.2	7.7	7.4	7.2	7.8	7.8	7.6	
Mean:	-	-	-	-	-	-	-	
Median:	6.2	6.6	5.1	5.6	6.1	6.2	5.5	

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	23	0	0	15	15	31	15	0	0	0	100
1996	0	13	4	4	25	13	29	13	0	0	100
1997	29	11	13	5	9	22	11	0	0	0	100
1998	18	16	11	15	11	18	11	0	0	0	100
1999	3	6	9	29	15	9	15	15	0	0	100
2000	13	0	0	25	19	13	25	6	0	0	100
2001	19	19	0	19	13	13	6	13	0	0	100
Total	16	11	8	15	14	17	15	5	0	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	0	3	11	35	48	32	5	1	0	0	135
1996	0	5	6	17	35	25	4	0	0	0	92
1997*	3	4	14	39	50	14	4	0	0	0	131
1998	0	1	12	44	69	34	7	2	0	0	169
1999	5	8	5	52	117	134	99	15	0	0	435
2000	11	6	18	53	117	160	92	13	1	0	471
2001	0	2	35	125	180	151	46	7	0	0	546
Total	19	29	101	365	616	550	257	38	1	0	1976

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.6	4.6	3.9	4.9	3.6	3.5	4.7	
Highest:	7.8	7.4	7.2	7.8	7.9	8.4	7.7	
Mean:	-	-	-	-	-	-	-	
Median:	6.2	6.2	6.0	6.1	6.6	6.6	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	2	8	26	36	24	4	1	0	0	100
1996	0	5	7	18	38	27	4	0	0	0	100
1997	2	3	11	30	39	11	3	0	0	0	100
1998	0	1	7	26	41	20	4	1	0	0	100
1999	1	2	1	12	27	31	23	3	0	0	100
2000	2	1	4	11	25	34	20	3	0	0	100
2001	0	0	6	23	33	28	8	1	0	0	100
Total	1	1	5	18	31	28	13	2	0	0	100

## 6. Phosphorus

### 6.1 Samples for Home and Garden

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

	<1	1-3	4-8	9-39	40-60	61-80	81-100	101-150	151-200	>200	Total
	VL	L	M	H	VH	VH	VH	VH	VH	VH	
1995	0	4	3	2	3	0	0	0	0	1	13
1996	0	3	1	10	2	1	1	1	0	5	24
1997	0	15	15	15	5	2	2	0	0	1	55
1998	0	18	17	17	0	1	0	2	1	6	62
1999	0	1	8	15	2	3	0	1	0	4	34
2000	0	0	3	6	0	2	1	0	1	3	16
2001	0	3	4	4	1	0	0	1	3	0	16
Total	0	44	51	69	13	9	4	5	5	20	220

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	2	1	1	1	4	1	
Highest:	315	529	327	660	773	250	195	
Mean:	42	104	22	60	91	75	48	
Median:	8	30	7	8	16	17	9	

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	31	23	15	23	0	0	0	0	8	100
1996	0	13	4	42	8	4	4	4	0	21	100
1997	0	27	27	27	9	4	4	0	0	2	100
1998	0	29	27	27	0	2	0	3	2	10	100
1999	0	3	24	44	6	9	0	3	0	12	100
2000	0	0	19	38	0	13	6	0	6	19	100
2001	0	19	25	25	6	0	0	6	19	0	100
Total	0	20	23	31	6	4	2	2	2	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	58	41	35	1	0	0	0	0	0	135
1996	0	32	26	29	4	1	0	0	0	0	92
1997	0	38	44	47	2	0	0	0	0	0	131
1998	0	38	71	56	3	1	0	0	0	0	169
1999	0	152	134	136	9	2	2	0	0	0	435
2000	0	163	133	141	16	10	4	3	1	0	471
2001	0	198	174	154	10	5	2	3	0	0	546
Total	0	679	623	598	45	19	8	6	1	0	1979

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:	55	69	53	62	93	188	109	
Mean:	7	10	9	9	10	12	10	
Median:	4	6	6	6	6	6	5	

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	43	30	26	1	0	0	0	0	0	100
1996	0	35	28	32	4	1	0	0	0	0	100
1997	0	29	34	36	2	0	0	0	0	0	100
1998	0	22	42	33	2	1	0	0	0	0	100
1999	0	35	31	31	2	0	0	0	0	0	100
2000	0	35	28	30	3	2	1	1	0	0	100
2001	0	36	32	28	2	1	0	1	0	0	100
Total	0	34	32	30	2	1	0	0	0	0	100

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

## 7. Potassium

### 7.1 Samples for Home and Garden

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

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	1	1
1996	0	0	0	0	3	3
1997	0	0	0	1	5	6
1998	0	1	0	5	4	10
1999	0	0	0	2	6	8
2000	0	0	0	0	2	2
2001	0	0	1	0	2	3
Total (#)	0	1	1	8	23	33
Total (%)	0	3	3	24	70	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	0	0	1
1996	0	0	0	1	1	2
1997	0	0	0	4	3	7
1998	0	1	1	5	4	11
1999	0	1	0	2	4	7
2000	0	0	0	2	2	4
2001	0	1	4	2	2	9
Total (#)	0	3	6	16	16	41
Total (%)	0	7	15	39	39	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	0	6	7
1996	0	1	1	3	13	18
1997	0	6	3	7	8	24
1998	0	4	4	12	13	33
1999	0	0	3	3	8	14
2000	0	0	1	4	3	8
2001	0	0	0	0	4	4
Total (#)	0	11	13	29	55	108
Total (%)	0	10	12	27	51	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	1	2	1	4
1996	0	0	0	1	0	1
1997	2	7	4	2	3	18
1998	0	1	3	2	2	8
1999	0	0	2	0	3	5
2000	0	0	0	1	1	2
2001	0	0	0	0	0	0
Total (#)	2	8	10	8	10	38
Total (%)	5	21	26	21	26	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	-	-	-	-	-	-

Number of home and garden samples within each potassium classification:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
1995	0	0	3	2	8	13
1996	0	1	1	5	17	24
1997	2	13	7	14	19	55
1998	0	7	8	24	23	62
1999	0	1	5	7	21	34
2000	0	0	4	9	3	16
2001	0	1	5	2	8	16
Total #	2	23	33	63	99	220

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	96	99	28	67	71	106	53	
Highest:	920	1018	1602	1749	4543	1163	666	
Mean:	345	327	244	303	462	339	308	
Median:	299	250	173	185	277	211	225	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	0	23	15	62	100
1996	0	4	4	21	71	100
1997	4	24	13	25	35	100
1998	0	11	13	39	37	100
1999	0	3	15	21	62	100
2000	0	0	25	56	19	100
2001	0	6	31	13	50	100
Grand Total	1	10	15	29	45	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	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	1	2	10	18	28	59
1996	0	4	10	11	11	36
1997	0	1	4	14	10	29
1998	0	0	8	12	24	44
1999	4	9	41	90	79	223
2000	5	17	34	61	78	195
2001	2	19	84	84	56	245
Total (#)	12	52	191	290	286	831
Total (%)	1	6	23	35	34	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	1	3	13	15	28	60
1996	0	6	13	12	20	51
1997	1	4	7	29	27	68
1998	1	4	11	45	42	103
1999	1	10	31	44	56	142
2000	10	31	24	48	81	194
2001	0	32	40	50	101	223
Total (#)	14	90	139	243	355	841
Total (%)	2	11	17	29	42	100

Ketterings, Q.M., H. Krol, W.S. Reid and K. Ganoë (2004). Otsego County Soil Sample Survey 1995-2001. CSS Extension Bulletin E04-9. 37 pages.

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	2	3	1	6
1996	0	2	1	1	0	4
1997	0	2	4	5	3	14
1998	0	2	4	7	5	18
1999	0	5	17	14	16	52
2000	2	9	6	17	25	59
2001	0	14	11	13	12	50
Total (#)	2	34	45	60	62	203
Total (%)	1	17	22	30	31	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	2	5	25	36	57	10	135
1996	0	12	24	24	31	1	92
1997	1	7	15	48	40	20	131
1998	1	6	23	64	71	4	169
1999	5	24	89	148	151	18	435
2000	17	57	64	126	184	23	471
2001	2	65	135	147	169	28	546
Grand Total	28	176	375	593	703	104	1979

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	38	46	34	44	31	23	35	
Highest:	925	1036	940	628	842	1378	1752	
Mean:	223	194	196	213	188	215	195	
Median:	176	137	168	179	149	161	130	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	1	4	19	27	42	7	100
1996	0	13	26	26	34	1	100
1997	1	5	11	37	31	15	100
1998	1	4	14	38	42	2	100
1999	1	6	20	34	35	4	100
2000	4	12	14	27	39	5	100
2001	0	12	25	27	31	5	100
Grand Total	1	9	19	30	36	5	100

## 8. Magnesium

### 8.1 Samples for Home and Garden

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	2	2	8	13
1996	0	0	1	8	15	24
1997	1	7	9	10	28	55
1998	0	4	10	21	27	62
1999	0	2	0	12	20	34
2000	0	0	0	4	12	16
2001	0	4	0	4	8	16
Total	1	8	22	61	118	220

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	52	79	17	39	38	137	50	
Highest:	816	962	1948	1639	1809	734	1330	
Mean:	372	385	331	303	345	359	301	
Median:	400	242	216	180	237	346	250	

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	8	15	15	62	100
1996	0	0	4	33	63	100
1997	2	13	16	18	51	100
1998	0	6	16	34	44	100
1999	0	6	0	35	59	100
2000	0	0	0	25	75	100
2001	0	25	0	25	50	100
Total	0	8	10	28	54	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	6	10	53	66	135
1996	0	1	8	31	52	92
1997	0	1	3	48	79	131
1998	0	0	11	57	101	169
1999	0	1	12	82	340	435
2000	0	6	31	126	308	471
2001	0	3	26	191	326	546
Total	0	18	101	588	1272	1979

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	37	28	24	71	57	44	33	
Highest:	769	605	739	949	934	1438	861	
Mean:	223	253	270	256	328	307	252	
Median:	195	218	236	232	321	272	227	

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	4	7	39	49	100
1996	0	1	9	34	57	100
1997	0	1	2	37	60	100
1998	0	0	7	34	60	100
1999	0	0	3	19	78	100
2000	0	1	7	27	65	100
2001	0	1	5	35	60	100
Total	0	1	5	30	64	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	10	3	13
1996	21	3	24
1997	33	22	55
1998	42	20	62
1999	32	2	34
2000	14	2	16
2001	10	6	16
Total	162	58	220

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	77	23	100
	88	13	100
	60	40	100
	68	32	100
	94	6	100
	88	13	100
	63	38	100
	74	26	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2	1	1	2	4	3	2	
Highest:	564	244	621	362	361	310	242	
Mean:	69	24	98	64	28	45	67	
Median:	10	5	34	16	12	9	27	

## 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	124	11	135
1996	86	6	92
1997	120	11	131
1998	156	13	169
1999	413	22	435
2000	450	21	471
2001	537	9	546
Total	1886	93	1979

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	92	8	100
	93	7	100
	92	8	100
	92	8	100
	95	5	100
	96	4	100
	98	2	100
	95	5	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	1	1	1	1	1	
Highest:	165	255	412	163	352	548	163	
Mean:	18	18	26	18	15	17	10	
Median:	8	9	12	11	4	5	6	

## 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	12	1	13	92	8	100
1996	23	1	24	96	4	100
1997	44	11	55	80	20	100
1998	54	8	62	87	13	100
1999	31	3	34	91	9	100
2000	15	1	16	94	6	100
2001	10	6	16	63	38	100
Total	189	31	220	86	14	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	26	14	1	9	12	8	15	
Highest:	121	183	739	351	282	110	256	
Mean:	56	40	76	56	57	35	92	
Median:	55	30	35	37	45	28	52	

## 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	135	0	135
1996	88	4	92
1997	119	12	131
1998	165	4	169
1999	427	8	435
2000	455	16	471
2001	540	6	546
Total	1929	50	1979

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	100	0	100
	96	4	100
	91	9	100
	98	2	100
	98	2	100
	97	3	100
	99	1	100
	97	3	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	6	12	11	10	9	4	9	
Highest:	85	189	424	240	391	438	164	
Mean:	25	41	51	31	33	34	33	
Median:	23	32	36	26	28	26	29	

## 11. Zinc

### 11.1 Samples for Home and Garden

Zinc (lbs Zn/acre Morgan extraction) in samples for home and garden:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
1995	0	1	12	13
1996	0	3	21	24
1997	0	3	52	55
1998	1	2	59	62
1999	1	2	31	34
2000	0	0	16	16
2001	0	0	16	16
Total	2	11	207	220

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
0	8	92	100
0	13	88	100
0	5	95	100
2	3	95	100
3	6	91	100
0	0	100	100
0	0	100	100
1	5	94	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.8	0.8	0.5	0.3	0.4	1.2	1.2	
Highest:	28.4	1054.2	62.6	167.1	277.6	399.1	108.8	
Mean:	6.7	56.3	10.6	10.6	23.9	31.1	19.9	
Median:	3.4	5.3	7.3	6.2	4.3	7.6	10.4	



## 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	6	51	78	135
1996	2	29	61	92
1997	3	31	97	131
1998	15	55	99	169
1999	54	187	194	435
2000	46	179	246	471
2001	45	191	310	546
Total	171	723	1085	1979

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	38	58	100
2	32	66	100
2	24	74	100
9	33	59	100
12	43	45	100
10	38	52	100
8	35	57	100
9	37	55	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.3	0.1	0.1	0.1	0.1	0.1	
Highest:	762.0	373.8	22.9	29.2	25.7	565.6	587.7	
Mean:	9.1	7.5	2.2	1.7	1.5	3.1	3.0	
Median:	1.3	1.4	1.5	1.2	1.0	1.1	1.2	

## 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
	<b>Corn</b>
COG	Corn grain
COS	Corn silage
	<b>Grasses, pastures, covercrops</b>
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
	<b>Small grains</b>
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
	<b>Others</b>
ALG	Azalea
APP	Apples
APR	Apricots

Crop Code	Crop Description
ASP	Asparagus
ATF	Athletic Field
BDR/BND	Beans-dry
BLU/BLB	Blueberries
CEM	Cemetery
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
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
ROU	Rough
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5

Crop Code	Crop Description
SPB	Spring flowering bulbs
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing