

Ketterings, Q.M., H. Krol, W.S. Reid and D. Sprague and J.S. Petzen (2003). Allegany County Soil Sample Survey 1995-2001. CSS Extension Bulletin E03-19. 38 pages.

# Soil Sample Survey

# **Allegany Co.**

**Samples analyzed by CNAL in 1995-2001**

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Dairy farming in Allegheny County

**Summary compiled by**

**Quirine M. Ketterings, Hettie Krol, W. Shaw Reid,  
Dean Sprague and Joan Petzen**

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

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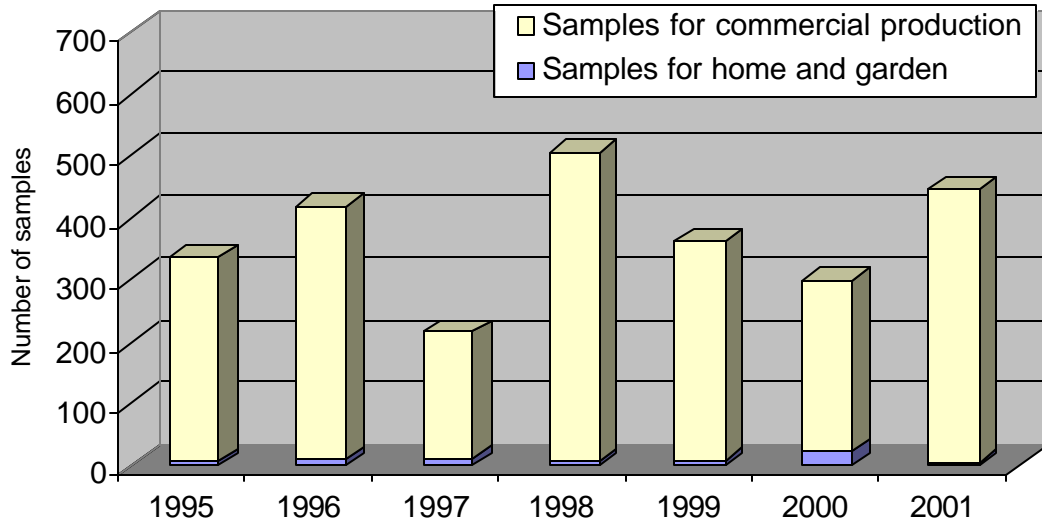
## 1. General Survey Summary

Allegany County is located in the southwestern part of New York State bordering Pennsylvania to the south; Cattaraugus County, NY to the west; and Steuben County, NY to the east. Allegany County is located in a portion of the Appalachian Region and has many unique geographic and geological features including the Genesee River (which bisects the county), a major watershed linking Lake Ontario to the Finger Lakes and continuing into Pennsylvania. Allegany County is a rural county with 61% of the counties 659,200 acres in forest and 25 % in farms.

Agriculture is a major land use and contributor to the tax base in Allegany County. The industry continues to restructure to take advantage of economies of scale and technological advances like automated milking systems, biotechnology, and integrated pest management. New concentrated animal feeding operation regulations may hasten the restructuring in the dairy sector. Dairying continues to be the primary farm enterprise in the county. The production of vegetables and specialty horticultural crops, like herbs, bedding plants, and tomatoes, is a growing sector of the industry. Small farm numbers are increasing as people from other occupations seek a lifestyle that is closer to the land. Agriculture is an integral part of the landscape and cultural fabric of Allegany County.

Allegany County ranks in the top ten counties for New York State beef production. However, dairy is the number one farm product for the county with approximately 74% of the total dollars in agriculture sales. In addition to forestry, dairy, and beef production, the other major agricultural products for the county are nursery and greenhouse (5% of total sales), hay and silage (3%), and poultry (2%).

This survey summarizes the soil test results from Allegany 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 2585 of which 2508 (97%) were submitted to obtain fertilizer recommendations for commercial production while 77 samples (3%) were submitted as home and garden samples.



Homeowners		Commercial		Total
1995	8	1995	329	337
1996	12	1996	406	418
1997	13	1997	202	215
1998	8	1998	498	506
1999	9	1999	354	363
2000	22	2000	278	300
<u>2001</u>	<u>5</u>	<u>2001</u>	<u>441</u>	<u>446</u>
Total	77	Total	2508	2585

Of the 77 home and garden samples submitted to CNAL, 33 samples were sent in to request recommendations for mixed vegetable production, 19 samples were taken from lawns, and 16 samples were from soils used to grow perennials. People submitting samples for commercial production requested fertilizer recommendations for corn silage or grain (37%), alfalfa, alfalfa/grass or alfalfa/trefoil mixtures (29%), grass hay production (9%), or clover/grass mixtures (6%), while a few producers were planning on growing other crops including small grains.

Home and garden samples in Allegany County were mostly silt loams and sandy loams belonging to soil management groups 3 and 4 (26 samples each). Nineteen samples were

classified as silty (soil management group 2) while 6 were sandy soils (soil management group 5). The table below gives descriptions of each of the soil management groups.

Soil Management Groups for New York

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

Of the samples submitted for commercial production, 92% belonged to soil management group 3. None of the samples was from soil management group 1 or 6 while 5% was classified as group 2. Only 5 samples belonged to soil management group 5. The five most common soil series, all belonging to soil management group 3, were Chenango (19%), Mardin (15%), Volusia (13%), Unadilla (8%) and Tioga (7%).

Organic matter levels, as measured by loss on ignition, ranged from less than 1% to 13% with median values ranging from 3.7 to 5.8% organic matter for home and garden samples and from 3.9 to 4.4% for samples submitted for commercial production. Eight samples had organic matter levels between 2 and 2.9%. Ten samples were between 3.0 and 3.9% organic matter, 23 samples tested between 4.0 and 4.9% and 33 samples had more than 5% organic matter. Of the samples submitted for commercial production, 24%

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contained between 3 and 4% organic matter, 29% tested between 4.0 and 4.9% while 19% had organic matter concentrations of 5.0-5.9%. In total, 54% of the samples had organic matter levels between 4.0 and 6.9%.

Soil pH in water (1:1 extraction ratio) varied from pH 3.5 to 8.4 with the median for home and garden samples ranging from pH 6.4 to pH 7.0 and for samples submitted for commercial production ranging from pH 6.1 to pH 6.3. Of the home and garden samples, 61% tested between pH 6.0 and 7.4. For the samples submitted for commercial production, 68% fell between pH 6.0 and 7.4 while 22% 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 77 home and garden samples, 16 tested low, 9 were medium in P, 24 tested high and 28 tested very high. This meant that 67% tested high or very high in P. Phosphorus levels for samples for commercial production in Allegany County were lower than the state average (50% tests high or very high in P in New York State). Four percent of the samples tested very high in P. Twenty eight percent were low in P, 31% tested medium for P while 37% of the submitted samples were classified as high in soil test P. This means that 41% tested high or very high in P and. There were no clear trends in P levels over the 6 years.

Classifications for potassium depend on soil management group. The fine-textured soils of soil management group 1 have a greater K supplying capacity than the coarse textured sandy soils (soil management group 5). Ranges for each of the management groups in the above table represent classifications as 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 77 home and garden samples, 1 sample was very low in K, 3 were low, 7 were medium, 16 were high and 50 were very high in potassium. For samples submitted for commercial production, 1% tested very low in K, 9% tested low, 20% tested medium, 34% tested high and 33% tested very high in potassium. As with phosphorus, there were no trends over the 6 years of soil sampling.

Soils test very low for magnesium if Morgan extractable Mg is less than 20 lbs Mg/acre. Low testing soils have 20-65 lbs Morgan Mg per acre. Soils with 66-100 lbs Mg/acre test medium for magnesium. High testing soils have 101-199 lbs Mg/acre while soils with more than 200 lbs Mg/acre in the Morgan extraction are classified as very high in Mg. Magnesium levels ranged from 20 to a little over 2000 lbs Mg/acre (Morgan extraction). There were no samples that tested very low in Mg. Most soils tested high or very high for Mg (95% of the homeowner soils and 99% of the soils of the commercial growers). No more than 4 of the homeowner soils and 1% of the commercial growers' soil tested low or medium in Mg. Thus, magnesium deficiency is not likely to occur in Allegany 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 91-93% in the normal range with 7 of the home and garden samples and 7% of the samples for commercial production testing excessive for Fe. Similarly, most soils (92-97%) for both groups tested normal for manganese. Soils with more than 100 lbs Morgan extractable



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Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb zinc per acre in the Morgan extraction are classified as low in Zn. Medium testing soils have between 0.5 and 1 lb of Morgan extractable Zn per acre. If more than 1 lb of Zn/acre is extracted with the Morgan solution, the soil tests high in Zn. For the home and garden samples, 92% tested high for zinc while 6 samples (8%) tested medium. Of the samples for commercial production, 8% tested low in zinc, 29% tested medium while 62% was high in zinc.

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

#### Reference

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

## 2. Cropping Systems

### 2.1 Samples for Home and Garden

Crops for which recommendations are requested by homeowners:

	1995	1996	1997	1998	1999	2000	2001	Total	%
ALG	1	0	0	0	0	0	0	1	1
ATF	0	0	1	0	0	1	1	3	4
FLA	0	0	0	0	1	0	1	2	3
GEN	0	0	1	0	0	0	0	1	1
LAW	1	1	3	0	6	4	0	15	19
MVG	3	10	5	4	2	7	2	33	43
OTH	1	0	0	1	0	1	0	3	4
PER	0	1	0	1	0	0	0	2	3
RSP	0	0	1	0	0	1	0	2	3
SAG	2	0	2	0	0	8	0	12	16
TRF	0	0	0	2	0	0	1	3	4
Total	8	12	13	8	9	22	5	77	100

Notes:

See Appendix for Cornell crop codes.

## 2.2 Samples for Commercial Production

Crops for which recommendations are requested for commercial production:

Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
ABE/ABT	5	11	0	0	0	0	1	17	1
ACT	0	0	0	0	0	0	2	2	0
AGE/AGT	107	122	63	105	75	50	106	628	25
ALE/ALT	11	9	8	3	9	25	20	85	3
APP	0	0	1	0	0	0	0	1	0
BCE/BCT	2	22	3	19	0	3	0	49	2
BGE/BGT	25	0	0	0	2	2	8	37	1
BLB	1	1	0	0	1	1	0	4	0
BNS	0	1	0	0	0	2	0	3	0
BSP	0	0	0	18	5	0	3	26	1
BSS	0	3	1	8	2	0	1	15	1
BUK	0	2	0	2	1	0	0	5	0
CGE/CGT	18	15	18	37	28	22	25	163	6
CHT	1	0	0	0	0	0	0	1	0
CLE/CLT	3	4	4	6	2	7	4	30	1
COG/COS	99	158	67	184	155	90	185	938	37
CSE/CST	0	0	0	1	0	1	0	2	0
GIE/GIT	0	0	2	0	25	3	9	39	2
GPF	2	0	0	4	0	0	0	6	0
GPV	9	0	0	10	0	0	0	19	1
GRE/GRT	8	24	2	50	14	25	41	164	7
MIX	2	0	1	6	5	2	1	17	1
OAS	17	14	10	13	13	8	10	85	3
OAT	6	1	4	6	1	3	3	24	1
OTH	0	0	10	7	0	0	0	17	1
PEA	1	0	0	0	0	0	2	3	0
PGE/PGT	1	4	0	7	2	10	7	31	1
PIE/PIT	5	2	2	2	7	6	2	26	1
PLE/PLT	0	0	2	1	2	1	0	6	0
PNE/PNT	0	1	1	1	1	1	6	11	0
POT	0	0	1	0	0	0	0	1	0
PUM	1	2	0	2	0	0	0	5	0
RSS	0	0	0	0	0	1	0	1	0
RYS	0	0	0	0	3	0	0	3	0
SOF	0	1	0	0	0	1	0	2	0

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Current year crop	1995	1996	1997	1998	1999	2000	2001	Total	%
SOG	0	0	1	0	0	0	1	2	0
SOY	0	1	0	0	0	0	0	1	0
SSH	0	0	0	0	0	0	1	1	0
SWC	1	0	0	0	0	0	0	1	0
TUR	0	0	0	0	0	0	1	1	0
TRE/TRT	3	7	0	0	1	0	0	11	0
WHT	1	1	0	3	0	1	0	6	0
Unknown	0	0	1	3	0	13	2	19	1
Total	329	406	202	498	354	278	441	2508	100

Notes:

See Appendix for Cornell crop codes.

### 3. Soil Types

#### 3.1 Samples for Home and Garden

Soil types (soil management groups) for home and garden samples:

	1995	1996	1997	1998	1999	2000	2001	Total
SMG 1 (clayey)	0	0	0	0	0	0	0	0
SMG 2 (silty)	3	3	1	3	0	6	3	19
SMG 3 (silt loam)	3	2	5	4	6	5	1	26
SMG 4 (sandy loam)	1	5	5	0	3	11	1	26
SMG 5 (sandy)	1	2	2	1	0	0	0	6
SMG 6 (mucky)	0	0	0	0	0	0	0	0
Total	8	12	13	8	9	22	5	77

### 3.2 Samples for Commercial Production

Soil series for samples submitted for commercial production:

Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Alden	3	0	0	0	2	0	0	0	2
Allard	3	0	0	0	3	0	0	2	5
Almond	3	0	0	0	0	0	0	2	2
Arkport	4	1	0	0	0	0	0	3	4
Barbour	3	11	0	0	14	0	5	0	30
Bath	3	38	22	4	25	21	10	32	152
Canadice	2	0	0	0	0	1	1	0	2
Canaseraga	3	2	0	0	4	0	0	0	6
Castile	4	1	0	0	0	0	0	0	1
Chenango	3	44	119	48	48	81	62	71	473
Chippewa	3	1	2	2	1	0	3	0	9
Erie	3	11	19	13	12	19	18	7	99
Fremont	2	5	1	0	0	1	1	43	51
Hamlin	2	0	1	0	0	0	0	0	1
Holderton	3	0	0	0	0	0	0	1	1
Hornell	2	0	0	0	1	0	0	0	1
Howard	3	2	2	6	18	7	8	12	55
Hudson	2	0	0	0	0	0	3	0	3
Ischua	3	0	0	0	0	0	0	1	1
Lackawanna	3	3	1	0	7	5	4	4	24
Langford	3	10	6	5	10	1	3	8	43
Lewbath	3	0	0	0	0	4	0	2	6
Lewbeach	3	0	8	0	102	8	0	13	131
Lordstown	3	3	6	1	4	2	3	2	21
Mardin	3	51	61	31	55	89	40	50	377
Marilla	3	0	0	0	0	0	0	1	1
Middlebury	3	0	4	7	1	2	8	9	31
Morris	3	1	1	0	4	3	0	0	9
Olean	2	0	0	0	0	0	0	8	8
Onteora	3	0	1	0	12	0	0	2	15
Rhinebeck	2	13	10	10	12	7	4	4	60
Rushford	3	0	0	0	0	0	0	1	1
Scio	3	5	4	2	9	4	4	5	33
Teel	2	0	2	0	0	0	0	0	2
Tioga	3	20	19	22	18	23	24	38	164
Tunkhannoc	3	2	0	1	4	1	0	0	8

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Name	SMG	1995	1996	1997	1998	1999	2000	2001	Total
Unadilla	3	13	42	24	19	27	39	42	206
Valois	3	0	0	0	0	1	0	3	4
Vly	3	0	4	0	4	0	0	0	8
Volusia	3	79	44	22	66	32	30	48	321
Wayland	2	0	1	0	0	3	1	1	6
Wellsboro	3	0	1	1	3	3	0	2	10
Willowemo	3	0	8	1	30	2	0	10	51
Yorkshire	3	0	0	0	0	0	0	3	3
Unknown	-	13	17	2	10	7	7	11	67
Total	-	329	406	202	498	354	278	441	2508

## 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	1	2	1	2	1	1	8
1996	1	1	1	1	3	5	0	0	12
1997	1	0	3	3	3	1	2	0	13
1998	0	0	0	0	3	2	1	2	8
1999	0	0	1	0	7	0	1	0	9
2000	0	0	2	3	3	6	6	2	22
2001	0	0	0	1	3	1	0	0	5
Total	2	1	8	10	23	17	11	5	77

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	2.4	0.9	0.8	4.1	2.5	2.2	3.0	
Highest:	13.7	5.7	6.5	8.1	6.6	13.5	5.4	
Mean:	5.6	4.0	3.8	5.8	4.7	5.5	4.4	
Median:	5.2	4.2	3.7	5.4	4.7	5.8	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	0	0	13	25	13	25	13	13	100
1996	8	8	8	8	25	42	0	0	100
1997	8	0	23	23	23	8	15	0	100
1998	0	0	0	0	38	25	13	25	100
1999	0	0	11	0	78	0	11	0	100
2000	0	0	9	14	14	27	27	60	100
2001	0	0	0	20	60	20	0	0	100
Total	3	1	10	13	30	22	14	6	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	10	35	78	107	69	22	8	309
1996	1	21	43	85	131	99	19	7	406
1997	1	10	44	55	45	36	6	5	202
1998	1	23	53	125	174	81	26	15	498
1999	0	34	39	74	95	71	31	10	354
2000	0	18	44	75	84	36	14	7	278
2001	0	34	87	106	79	96	31	8	441
Total	3	150	345	598	715	488	149	60	2508

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.5	0.2	0.3	0.8	1.1	1.2	1.5	
Highest:	9.6	8.5	9.6	9.6	8.9	8.6	8.1	
Mean:	4.3	4.2	3.9	4.2	4.2	4.0	4.0	
Median:	4.4	4.4	3.7	4.2	4.3	4.0	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	0	3	11	24	33	21	7	2	100
1996	0	5	11	21	32	24	5	2	100
1997	0	5	22	27	22	18	3	2	100
1998	0	5	11	25	35	16	5	3	100
1999	0	10	11	21	27	20	9	3	100
2000	0	6	16	27	30	13	5	3	100
2001	0	8	20	24	18	22	7	2	100
Total	0	6	14	24	29	19	6	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	0	1	1	0	2	3	1	0	0	8
1996	0	0	0	1	2	2	7	0	0	0	12
1997	0	1	1	1	5	3	0	2	0	0	13
1998	0	0	1	1	2	1	2	1	0	0	8
1999	0	0	1	1	1	2	2	2	0	0	9
2000	0	0	5	5	1	1	9	1	0	0	22
2001	0	0	0	2	1	0	1	1	0	0	5
Total	0	1	9	12	12	11	24	8	0	0	77

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	5.3	5.7	4.8	5.2	5.3	5.0	5.6	
Highest:	7.8	7.4	7.6	7.6	7.8	7.6	7.5	
Mean:	-	-	-	-	-	-	-	
Median:	6.9	7.0	6.3	6.4	6.6	6.4	6.4	

Percent of home and garden samples within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	0	13	13	0	25	38	13	0	0	100
1996	0	0	0	8	17	17	58	0	0	0	100
1997	0	8	8	8	38	23	0	15	0	0	100
1998	0	0	13	13	25	13	25	13	0	0	100
1999	0	0	11	11	11	22	22	22	0	0	100
2000	0	0	23	23	5	5	41	5	0	0	100
2001	0	0	0	40	20	0	20	20	0	0	100
Total	0	1	12	16	16	14	31	10	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	24	65	128	96	13	0	0	0	329
1996	0	6	26	106	135	105	26	2	0	0	406
1997*	0	0	14	55	80	46	2	2	0	0	199
1998	2	10	48	104	185	129	18	2	0	0	498
1999	0	2	25	72	110	99	42	3	1	0	354
2000	0	1	18	59	98	72	23	7	0	0	278
2001	0	0	23	99	168	113	32	6	0	0	441
Total	2	22	178	560	904	660	156	22	1	0	2505

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	4.8	4.8	5.1	3.5	4.9	4.7	5.0	
Highest:	7.2	7.8	7.5	7.8	8.4	7.9	7.6	
Mean:	-	-	-	-	-	-	-	
Median:	6.2	6.2	6.1	6.2	6.3	6.3	6.3	

Percent of samples for commercial production within each pH range:

	<4.5	4.5-4.9	5.0-5.4	5.5-5.9	6.0-6.4	6.5-6.9	7.0-7.4	7.5-7.9	8.0-8.4	>8.4	Total
1995	0	1	7	20	39	29	4	0	0	0	100
1996	0	1	6	26	33	26	6	0	0	0	100
1997	0	0	7	28	40	23	1	1	0	0	100
1998	0	2	10	21	37	26	4	0	0	0	100
1999	0	1	7	20	31	28	12	1	0	0	100
2000	0	0	6	21	35	26	8	3	0	0	100
2001	0	0	5	22	38	26	7	1	0	0	100
Total	0	1	7	22	36	26	6	1	0	0	100

## 6. Phosphorus

### 6.1 Samples for Home and Garden

Number of home and garden samples within each 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	3	0	2	0	0	1	0	0	2	8
1996	0	0	1	3	2	0	1	2	2	1	12
1997	0	4	2	4	0	0	1	0	1	1	13
1998	0	2	1	2	2	0	0	0	0	1	8
1999	0	0	2	4	1	0	0	0	1	1	9
2000	0	4	2	8	5	1	0	0	0	2	22
2001	0	3	1	1	0	0	0	0	0	0	5
Total	0	16	9	24	10	1	3	2	4	8	77

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	4	1	1	4	1	1	
Highest:	697	233	247	270	281	274	18	
Mean:	132	92	45	53	63	44	6	
Median:	26	70	12	21	13	19	3	

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	0	25	0	0	13	0	0	25	100
1996	0	0	8	25	17	0	8	17	17	8	100
1997	0	31	15	31	0	0	8	0	8	8	100
1998	0	25	13	25	25	0	0	0	0	13	100
1999	0	0	22	44	11	0	0	0	11	11	100
2000	0	18	9	36	23	0	0	0	0	9	100
2001	0	60	20	20	0	5	0	0	0	0	100
Total	0	21	12	31	13	1	4	3	5	10	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	151	84	82	9	2	0	1	0	0	329
1996	0	92	125	175	8	2	0	2	1	1	406
1997	0	52	56	87	4	2	0	0	1	0	202
1998	0	116	179	178	16	1	3	2	2	1	498
1999	0	92	113	133	7	5	2	0	0	2	354
2000	0	84	72	109	11	1	0	1	0	0	278
2001	0	116	136	172	12	2	0	2	1	0	441
Total	0	703	765	963	67	15	5	8	5	4	2508

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:	127	412	160	381	268	103	178	
Mean:	8	13	12	13	13	11	11	
Median:	4	8	8	6	7	6	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
1995	0	46	26	25	3	1	0	0	0	0	100
1996	0	23	31	43	2	0	0	0	0	0	100
1997	0	26	28	43	2	1	0	0	0	0	100
1998	0	23	36	36	3	0	1	0	0	0	100
1999	0	26	32	38	2	1	1	0	0	1	100
2000	0	30	26	39	4	0	0	0	0	0	100
2001	0	26	31	39	3	0	0	0	0	0	100
Total	0	28	31	37	3	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	2	1	3
1996	0	0	0	0	3	3
1997	0	0	0	1	0	1
1998	0	0	0	0	3	3
1999	0	0	0	0	0	0
2000	0	0	1	0	5	6
2001	0	0	0	1	2	3
Total (#)	0	0	1	4	14	19
Total (%)	0	0	5	21	74	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	0	0	0	2	1	3
1996	0	0	0	0	2	2
1997	0	0	1	2	2	5
1998	0	0	0	1	3	4
1999	0	0	0	1	5	6
2000	0	0	0	0	5	5
2001	0	0	1	0	0	1
Total (#)	0	0	2	6	18	26
Total (%)	0	0	8	23	69	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	0	1	1
1996	0	0	0	2	3	5
1997	0	0	1	2	2	5
1998	0	0	0	0	0	0
1999	0	1	1	1	0	3
2000	0	0	2	1	8	11
2001	0	1	0	0	0	1
Total (#)	0	2	4	6	14	26
Total (%)	0	8	15	23	54	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	1	1
1996	0	0	0	0	2	2
1997	1	0	0	0	1	2
1998	0	1	0	0	0	1
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
2001	0	0	0	0	0	0
Total (#)	1	1	0	0	4	6
Total (%)	17	17	0	0	67	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	0	4	4	8
1996	0	0	0	2	10	12
1997	1	0	2	5	5	12
1998	0	1	0	1	6	8
1999	0	1	1	2	5	9
2000	0	0	3	1	18	22
2001	0	1	1	1	2	5
Total #	1	3	7	16	50	77

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	100	176	51	95	59	78	73	
Highest:	4967	671	720	956	501	1004	508	
Mean:	959	357	282	421	260	368	195	
Median:	335	269	155	302	214	319	124	

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

Summary (%)	Very Low	Low	Medium	High	Very High	Total
1995	0	0	0	50	50	100
1996	0	0	0	17	83	100
1997	8	0	15	38	38	100
1998	0	13	0	13	75	100
1999	0	11	11	22	56	100
2000	0	0	14	5	82	100
2001	0	20	20	20	40	100
Grand Total	1	4	9	21	65	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	0	0	3	8	7	18
1996	0	0	2	7	6	15
1997	0	1	2	7	0	10
1998	0	0	2	8	3	13
1999	0	0	2	2	8	12
2000	0	3	0	3	4	10
2001	0	4	7	20	25	56
Total (#)	0	8	18	55	53	134
Total (%)	0	6	13	41	40	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
1995	1	25	43	101	126	296
1996	4	26	91	144	109	374
1997	0	10	29	94	57	190
1998	1	48	96	154	176	475
1999	6	15	58	111	145	335
2000	7	26	53	92	83	261
2001	5	73	113	100	80	371
Total (#)	24	223	483	796	776	2302
Total (%)	1	10	21	35	34	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
1995	0	1	0	1	0	2
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	1	1	0	1	3
Total (#)	0	2	1	1	1	5
Total (%)	0	40	20	20	20	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	26	46	110	133	13	329
1996	4	26	93	151	115	17	406
1997	0	11	31	101	57	2	202
1998	1	48	98	162	179	10	498
1999	6	15	60	113	153	7	354
2000	7	29	53	95	87	7	278
2001	5	78	121	120	106	11	441
Grand Total	24	233	502	852	830	67	2508

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	44	38	47	13	14	30	34	
Highest:	926	1242	946	1176	2065	1412	1706	
Mean:	215	187	185	200	226	196	165	
Median:	178	152	156	160	184	157	126	

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

% summary	Very Low	Low	Medium	High	Very High	Un-known	Total
1995	0	8	14	33	40	4	100
1996	1	6	23	37	28	4	100
1997	0	5	15	50	28	1	100
1998	0	10	20	33	36	2	100
1999	2	4	17	32	43	2	100
2000	3	10	19	34	31	3	100
2001	1	18	27	27	24	2	100
Grand Total	1	9	20	34	33	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	0	0	0	8	8
1996	0	0	0	0	12	12
1997	0	0	0	1	12	13
1998	0	0	1	1	6	8
1999	0	0	1	0	8	9
2000	0	1	1	2	18	22
2001	0	0	0	0	5	5
Total	0	1	3	4	69	77

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	272	209	122	98	92	62	253	
Highest:	2057	573	640	1075	479	828	659	
Mean:	625	349	341	481	374	320	499	
Median:	438	345	349	420	427	377	577	

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	0	0	0	100	100
1996	0	0	0	0	100	100
1997	0	0	0	8	92	100
1998	0	0	13	13	75	100
1999	0	0	11	0	89	100
2000	0	5	5	9	82	100
2001	0	0	0	0	100	100
Total	0	1	4	5	90	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	3	2	20	304	329
1996	0	1	4	29	372	406
1997	0	0	0	20	182	202
1998	0	1	13	53	431	498
1999	0	1	2	26	325	354
2000	0	3	2	23	250	278
2001	0	0	5	20	416	441
Total	0	9	28	191	2280	2508

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	41	43	110	20	65	40	66	
Highest:	1386	1378	1089	1304	2089	1156	1125	
Mean:	410	431	414	401	449	436	403	
Median:	388	406	384	390	418	417	386	

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	1	1	6	92	100
1996	0	0	1	7	92	100
1997	0	0	0	10	90	100
1998	0	0	3	11	87	100
1999	0	0	1	7	92	100
2000	0	1	1	8	90	100
2001	0	0	1	5	94	100
Total	0	0	1	8	91	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	6	2	8
1996	12	0	12
1997	12	1	13
1998	7	1	8
1999	9	0	9
2000	19	3	22
2001	5	0	5
Total	70	7	77

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	75	25	100
	100	0	100
	92	8	100
	88	13	100
	100	0	100
	86	14	100
	100	0	100
	91	9	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	3	2	2	3	4	2	4	
Highest:	82	31	53	79	35	72	35	
Mean:	31	8	15	20	15	21	13	
Median:	25	6	11	11	11	11	7	

## 9.2 Samples for Commercial Production

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
1995	311	18	329
1996	381	25	406
1997	195	7	202
1998	462	36	498
1999	320	34	354
2000	265	13	278
2001	406	35	441
Total	2340	168	2508

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	95	5	100
	94	6	100
	97	3	100
	93	7	100
	90	10	100
	95	5	100
	92	8	100
	93	7	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1	1	3	1	1	1	1	
Highest:	108	117	83	398	589	337	311	
Mean:	17	18	15	19	21	16	18	
Median:	12	11	11	11	11	8	9	

## 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	6	2	8	75	25	100
1996	11	1	12	92	8	100
1997	13	0	13	100	0	100
1998	8	0	8	100	0	100
1999	9	0	9	100	0	100
2000	20	2	22	91	9	100
2001	4	1	5	80	20	100
Total	71	6	77	92	8	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	15	13	29	19	25	25	18	
Highest:	309	137	73	79	69	937	121	
Mean:	97	42	49	38	47	91	50	
Median:	69	32	55	29	53	49	33	



## 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	320	9	329
1996	397	9	406
1997	195	7	202
1998	488	10	498
1999	341	13	354
2000	268	10	278
2001	429	12	441
Total	2438	70	2508

Percentages:

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

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	6	5	10	8	8	5	6	
Highest:	258	262	279	203	2567	183	292	
Mean:	38	38	40	37	49	36	41	
Median:	30	32	34	30	33	27	34	

## 11. Zinc

### 11.1 Samples for Home and Garden

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

Total number of samples:					Percentages:				
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total	
	Low	Medium	High		Low	Medium	High		
1995	0	0	8	8	0	0	100	100	
1996	0	1	11	12	0	8	92	100	
1997	0	2	11	13	0	15	85	100	
1998	0	1	7	8	0	13	88	100	
1999	0	1	8	9	0	11	89	100	
2000	0	0	22	22	0	0	100	100	
2001	0	1	4	5	0	20	80	100	
Total	0	6	71	77	0	8	92	100	

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	1.4	0.9	0.9	0.6	1.0	1.2	0.2	
Highest:	14.9	152.9	15.7	10.2	95.9	38.5	5.8	
Mean:	4.7	24.8	4.6	2.8	19.4	10.4	2.1	
Median:	2.6	6.8	3.6	1.4	2.3	4.7	1.3	

## 11.2 Samples for Commercial Production

Zinc (lbs Zn/acre Morgan extraction) in samples for commercial production:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
1995	29	121	179	329
1996	22	125	259	406
1997	5	72	125	202
1998	91	153	254	498
1999	41	113	200	354
2000	17	76	185	278
2001	7	70	364	441
Total	212	730	1566	2508

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
9	37	54	100
5	31	64	100
2	36	62	100
18	31	51	100
12	32	56	100
6	27	67	100
2	16	83	100
8	29	62	100

	1995	1996	1997	1998	1999	2000	2001	
Lowest:	0.2	0.2	0.2	0.1	0.1	0.1	0.3	
Highest:	499.7	74.4	14.2	257.2	19.8	59.2	116.8	
Mean:	3.6	2.2	1.5	2.1	1.8	2.1	3.2	
Median:	1.1	1.3	1.2	1.1	1.2	1.4	2.5	

## Appendix: Cornell Crop Codes

Crop codes 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
<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
<b>Corn</b>	
COG	Corn grain
COS	Corn silage

Crop Code	Crop Description
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
ATF	Athletic Field
ASP	Asparagus
BDR/BND	Beans-dry
BLU/BLB	Blueberries
BNS	Beans, Snap
CEM	Cemetery
CHT	Cherries, Tart
END	Endives

Crop Code	Crop Description
FAR	Fairway
FLA	Flowering Annuals
GPF	Grapes, French-American
GPV	Grapes, Vinifera
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
LET	Lettuce
MIX/MVG	Mixed vegetables
MML	Muskmelon
ONS	Onion-seeded
OTH	Other
PAR	Pears
PEA	Peaches
PER	Perennials
POP	Popcorn
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
ROU	Rough
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQS	Squash, Summer
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Established
TRF	Tree fruits
TRT	Christmas trees, Topdressing
TUR	Turnips