

Rao, R., D. Sprague, Q.M. Ketterings, and H. Krol (2007). Cattaraugus Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-12. 33 pages.

# Soil Sample Survey

# Cattaraugus County

Samples analyzed by CNAL (2002-2006)



Cattaraugus County (photo credit: Dean Sprague, CCE of Cattaraugus County).

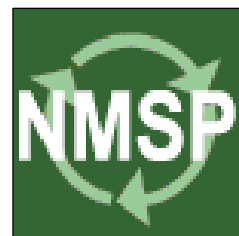
Summary compiled by

Renuka Rao, Dean Sprague, Quirine M. Ketterings, and Hettie Krol



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Summary compiled by

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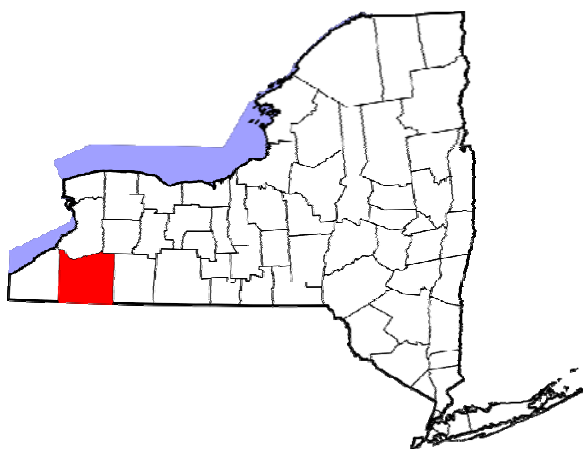


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# 1. County Introduction

Cattaraugus County is located in the southwestern part of New York State bordering Pennsylvania to the south; Chautauqua County, NY to the west; and Allegany County, NY to the east. Cattaraugus County has two cities, Olean and Salamanca. In 2003,



approximately 201,600 acres (24%) of the county's total 838,305 acres was in farm land. In 2002, Cattaraugus County ranked 5<sup>th</sup> in the state for number of farms and 11<sup>th</sup> for land in farms with 1,150 farms averaging 175 acres per farm. The northwestern most portion of the county is unique in being part of the Great Lakes grape belt without actually bordering one of the lakes.

Dairy is the number one farm product for the county accounting for 63% of the total dollar agriculture sales. The other major agricultural products for the county are: nursery and greenhouse (17% of total sales), cattle and calves (8%), hay and silage (3%), and grain and dry beans (3%).

Agriculture is a major land use and contributor to the tax base in Cattaraugus County. Farm numbers have declined at a fairly constant rate since records began being kept in the 1930's. 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. Dairy farming continues to be the primary farm enterprise in the County. The production of vegetables and specialty horticultural crops, like herbs, bedding plants, and poinsettias, is a growing sector of the industry. Agriculture is an integral part of the landscape and cultural fabric of our county.

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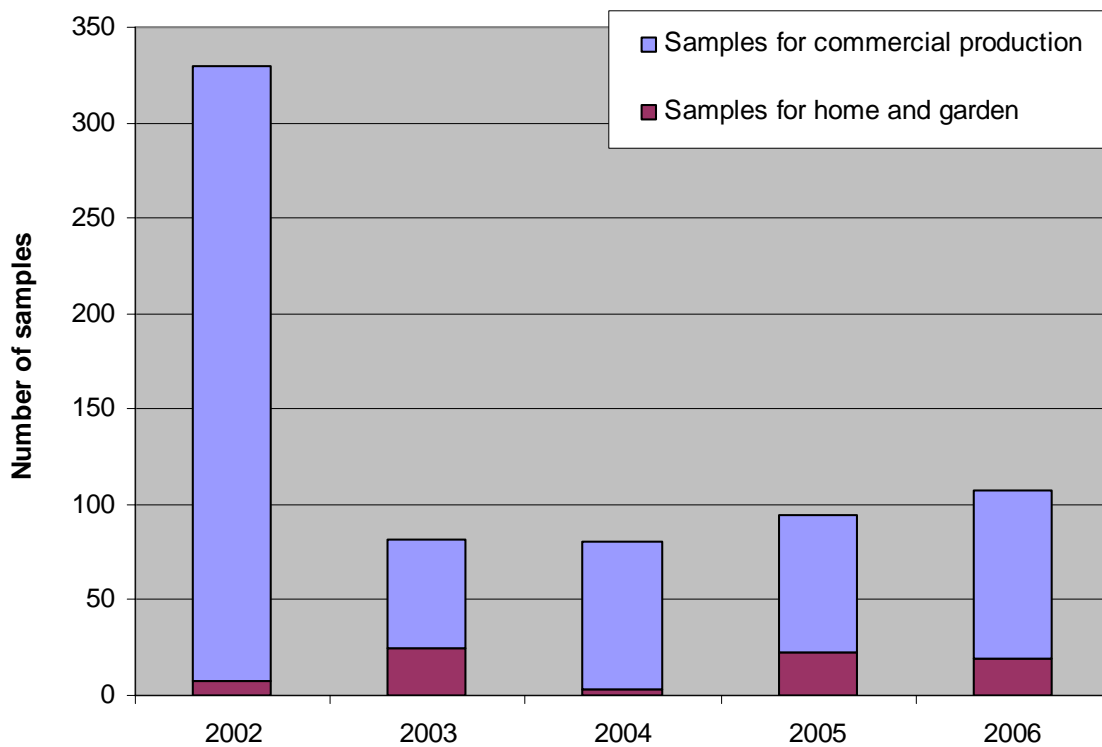
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Cattaraugus County (photo credit: Dean Sprague, CCE of Cattaraugus County).

## 2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Cattaraugus County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 694. Of these, 616 samples (89%) were submitted by commercial growers while 78 samples (11%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	8	2002	322	330
2003	25	2003	57	82
2004	3	2004	78	81
2005	23	2005	71	94
<u>2006</u>	<u>19</u>	<u>2006</u>	<u>88</u>	<u>107</u>
Total	78	Total	616	694

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 to request fertilizer recommendations for home garden vegetable production (37%) and idle land (29%) primarily. Commercial growers submitted samples to grow corn silage or grain (32%), alfalfa or alfalfa/grass mixes (25%), and grass hay production (17%) while a few growers were planning to grow clover/grass mixes, small grains and other crops.

Soils tested for home and garden in Cattaraugus County were classified as belonging to soil management group 2 (24%), group 3 (49%), group 4 (24%), or group 5 (3%). A description of the different management groups is given below.

#### 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 by commercial growers, the majority (81%) belonged to soil management group 3. There were only 9 group 1 samples (1%). Seven percent belonged to group 2. Group 4 was represented by 7% of the samples while less than 1% was from group 5 and the remainder were of unknown origin. There were no organic soils. Chenango was the most common soil series (17% of all samples), followed by Mardin (14%), Volusia (10%), Valois (9%) and Middlebury (7%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to 45%. For homeowner samples, 53% tested between 2 and 5% organic matter, 30% had between



5 and 6% organic matter and 14% was classified as soils with more than 6.9% organic matter. Of the samples submitted by commercial growers, 79% contained between 3 and 6% organic matter.

Soil pH in water (1:1 extraction ratio) varied from 4.4 to 7.9 for home and garden samples while 67% tested between 6.0 and 7.4 for pH. For the commercial samples, the highest pH was 7.7 and 50% tested between 6.0 and 7.4 with 35% testing between pH 5.0 and 6.0.

Extractable nutrients such as phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), iron (Fe), manganese (Mn), and zinc (Zn) were measured using the Morgan method (Morgan, 1941). This solution contains sodium acetate buffered at 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 anything higher is classified as very high. For homeowners, 21% of the soils tested low for P, 27% tested medium, 28% tested high and 25% tested very high. This meant that 53% tested high or very high in P. For commercial growers, 5% tested very high. In total 34% were low in P, 31% tested medium for P while 30% of the submitted samples were classified as high in soil test P. This means that 35% tested high or very high in P.

Classifications for K depend on soil management group. The fine textured soils (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 medium, 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 Table on page 6).

Potassium classifications for Cattaraugus County soils varied from very low or low (5% of the homeowner soils and 8% of the commercial growers' soils) to very high (54% of the homeowner soils and 42% of the commercial growers' soils). For homeowners, 12% tested medium, and 29% tested high for potassium. For commercial growers' soils, 17% tested medium and 30% tested high in K.

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

Soils test very low for Mg 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 Mg. 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 4000 lbs Mg/acre. There were no soils that tested very low or low for Mg within the homeowner samples while only 16 (2%) of the soil samples for commercial production tested low or very low in Mg. Most soils tested high or very high for Mg (95% of the homeowner soils and 96% of the soils of the commercial growers). In total 5% of the homeowner soils and 2% of the commercial growers' soil tested low or medium in Mg.

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 ranged from 86-87% in the normal range with 14% of the homeowner soils and 13% of the commercial grower soils testing excessive for Fe. Similarly, 85-95% of the soils tested normal for manganese. Soils with more than 100 lbs Morgan extractable Mn per acre are classified as excessive in Mn. Anything less than 100 lbs Mn per acre is classified as normal. Soils with less than 0.5 lb Zn 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 homeowner soils, 91% tested high for Zn while 6% tested medium. Of the commercial growers' samples, 5% tested low, 18% tested medium while 77% were high in Zn.

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 3.

### 3. Cropping Systems

#### 3.1 Homeowner Samples

Crops for which recommendations were requested by homeowners:

	2002-2006	%
ALG	1	1
ATF	2	3
BLU	2	3
GEN	1	1
IDL	23	29
LAW	5	6
MVG	29	37
OTH	2	3
PRK	2	3
RSP	2	3
SAG	5	6
TME	1	1
TUR	1	1
Unknown	2	3
Total	78	100

Note: See Appendix for Cornell crop codes.

### 3.2 Commercial Samples

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE	1	0	0	1	0	2	0
AGE/AGT	67	16	20	21	15	139	23
ALE/ALT	3	1	0	3	3	10	2
APP	1	0	0	0	0	1	0
BCE/BCT	8	1	0	0	0	9	1
BGE	1	0	2	0	2	5	1
BLB	1	0	0	0	0	1	0
BTT	0	0	0	0	1	1	0
BUK	1	0	1	0	0	2	0
BWS	0	1	0	0	0	1	0
CGE/CGT	9	4	3	3	8	27	4
CLE/CLT	2	0	13	1	7	23	4
COG/COS	130	19	14	12	23	198	32
GIE/GIT	53	0	1	9	5	68	11
GRE/GRT	12	6	7	7	4	36	6
IDL	0	0	1	0	0	1	0
MIX	1	2	2	3	2	10	2
OAS	12	0	0	0	3	15	2
OAT	0	0	1	0	1	2	0
OTH	3	3	1	4	0	11	2
PGE/PGT	0	0	1	1	0	2	0
PIE/PIT	2	0	0	3	4	9	1
PLE/PLT	2	0	3	0	4	9	1
PNT	1	0	0	0	2	3	0
POT	1	0	0	0	0	1	0
PUM	0	0	2	0	0	2	0
RSS	0	1	0	0	0	1	0
SOF	0	0	0	1	0	1	0
SSH	2	0	0	0	0	2	0
STS	2	0	0	0	0	2	0
SUD	0	0	0	0	1	1	0
SWC	1	1	3	1	0	6	1
TRE	0	0	0	1	0	1	0
TUR	0	1	0	0	1	2	0
WHS/WHT	1	1	3	0	2	7	1
Unknown	5	0	0	0	0	5	1
Total	322	57	78	71	88	616	100

Note: See Appendix for Cornell crop codes.

## 4. Soil Types

### 4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002-2006	%
SMG 1 (clayey)	0	0
SMG 2 (silty)	19	24
SMG 3 (silt loam)	38	49
SMG 4 (sandy loam)	19	24
SMG 5 (sandy)	2	3
SMG 6 (mucky)	0	0
Total	78	100

## 4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Almond	3	2	0	0	0	0	2	0
Arkport	4	0	0	1	1	0	2	0
Arnot	3	0	0	0	1	0	1	0
Aurora	2	1	1	0	0	1	3	0
Bath	3	1	0	0	0	0	1	0
Busti	3	2	0	0	0	0	2	0
Candice	2	1	0	0	0	0	1	0
Canandaigua	3	6	0	0	1	1	8	1
Castile	4	7	1	2	0	1	11	2
Chadakoin	3	0	0	0	0	1	1	0
Chautauqua	3	3	0	0	2	0	5	1
Chenango	3	63	6	10	15	10	104	17
Chippewa	3	0	3	0	0	2	5	1
Churchville	2	0	0	0	0	2	2	0
Collamer	3	4	1	3	3	6	17	3
Colonie	5	0	1	0	1	0	2	0
Dalton	3	0	0	0	0	1	1	0
Dunkirk	3	0	0	0	0	3	3	0
Erie	3	1	0	1	1	1	4	1
Galen	4	0	1	0	0	0	1	0
Greter	3	6	0	0	0	0	6	1
Hornellsville	3	1	0	0	0	0	1	0
Hudson	2	0	3	0	0	9	12	2
Ischua	3	7	0	0	0	0	7	1
Ivory	2	0	0	2	0	0	2	0
Langford	3	5	0	0	8	1	14	2
Lorstown	3	2	0	0	0	0	2	0
Mardin	3	55	5	13	6	8	87	14
Middlebury	3	13	7	15	6	4	45	7
Minoa	4	0	1	0	2	2	5	1
Morris	3	0	0	1	1	0	2	0
Napoli	3	1	0	0	1	0	2	0
Niagara	3	5	1	0	2	4	12	2
Olean	2	0	0	2	0	0	2	0
Pawling	4	0	0	0	3	1	4	1
Raynham	3	0	0	1	0	0	1	0

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Name	SMG	2002	2003	2004	2005	2006	Total	%
Red Hook	4	14	0	0	4	1	19	3
Rhinebeck	2	3	0	0	0	0	3	0
Rushford	3	0	0	0	0	4	4	1
Schuyler	3	1	0	0	0	0	1	0
Scio	3	1	0	0	0	0	1	0
Swormville	1	5	0	0	3	1	9	1
Teel	2	1	0	2	1	1	5	1
Tioga	3	9	1	6	3	3	22	4
Unadilla	3	9	2	3	0	0	14	2
Valois	3	33	7	1	6	10	57	9
Varysburg	2	1	0	0	0	0	1	1
Volusia	3	40	9	3	0	9	61	10
Wallington	3	2	1	0	0	0	3	0
Wayland	2	4	1	3	0	1	9	1
Wharton	2	0	0	3	0	0	3	0
Yorkshire	3	3	0	0	0	0	3	0
Unknown	-	10	5	6	0	0	21	3
Total	-	322	57	78	71	88	616	100

## 5. Organic Matter

### 5.1 Homeowner Samples

Organic matter (loss-on-ignition method) in homeowner samples (number):

	<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
Number	0	2	10	18	13	12	12	11	78
Percentage	0	3	13	23	17	15	15	14	100

	2002-2006
Lowest:	1.3
Highest:	45.1
Mean:	5.3
Median:	4.7



## 5.2 Commercial Samples

Organic matter (loss-on-ignition method) in commercial samples (number):

	<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
2002	0	4	23	58	114	82	32	9	322
2003	0	1	2	6	21	15	7	5	57
2004	0	0	3	20	27	12	8	8	78
2005	1	1	7	17	29	9	6	1	71
2006	0	0	6	15	29	29	7	2	88
Total	1	6	41	116	220	147	60	25	616

	2002	2003	2004	2005	2006
Lowest:	1.3	1.9	2.4	0.6	2.2
Highest:	8.8	20.4	9.0	7.9	8.4
Mean:	4.6	5.2	4.8	4.2	4.7
Median:	4.7	4.8	4.6	4.4	4.7

Organic matter in commercial samples (% of total number of samples):

	<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
2002	0	1	7	18	35	25	10	3	100
2003	0	2	4	11	37	26	12	9	100
2004	0	0	4	26	35	15	10	10	100
2005	1	1	10	24	41	13	8	1	100
2006	0	0	7	17	33	33	8	2	100
Total	0	1	7	19	36	24	10	4	100

## 6. pH

### 6.1 Homeowner Samples

pH of homeowner samples (numbers):

	<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
Number	1	1	13	15	18	17	9	4	0	0	78
Percentage	1	1	17	19	23	22	12	5	0	0	100

	2002-2006
Lowest:	4.4
Highest:	7.9
Mean:	-
Median:	6.2

## 6.2 Commercial Samples

pH of commercial samples (number):

	<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
2002	1	4	18	77	111	90	19	2	0	0	0	322
2003	1	4	8	13	22	9	0	0	0	0	0	57
2004	0	6	14	23	25	7	1	1	0	0	1	78
2005	3	4	6	19	34	5	0	0	0	0	0	71
2006	0	1	8	29	40	9	1	0	0	0	0	88
Total	5	19	54	161	232	120	21	3	0	0	1	616

	2002	2003	2004	2005	2006
Lowest:	4.3	4.4	4.5	4.4	4.9
Highest:	7.7	6.9	7.5	6.9	7.2
Mean:	-	-	-	-	-
Median:	6.2	6.1	5.8	6.0	6.0

pH of commercial samples (% of total number of samples):

	<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
2002	0	1	6	24	34	28	6	1	0	0	0	100
2003	2	7	14	23	39	16	0	0	0	0	0	100
2004	0	8	18	29	32	9	1	1	0	0	1	100
2005	4	6	8	27	48	7	0	0	0	0	0	100
2006	0	1	9	33	45	10	1	0	0	0	0	100
Total	1	3	9	26	38	19	3	0	0	0	0	100

## 7. Phosphorus

### 7.1 Homeowner Samples

Phosphorus (lbs/acre Morgan P) in homeowner samples (numbers):

	<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	
Number	0	16	21	22	6	3	2	1	2	5	78
Percentage	0	21	27	28	8	4	3	1	3	6	100

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

	2002-2006
Lowest:	1
Highest:	353
Mean:	41
Median:	11

## 7.2 Commercial Samples

Phosphorus (lbs P/acre Morgan extraction) for commercial samples (number):

	<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	
2002	0	111	89	101	9	1	3	8	0	0	322
2003	0	25	20	11	1	0	0	0	0	0	57
2004	0	21	29	24	2	1	0	0	0	1	78
2005	0	22	18	29	0	1	1	0	0	0	71
2006	0	32	35	21	0	0	0	0	0	0	88
Total	0	211	191	186	12	3	4	8	0	1	616

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	109	49	360	98	27
Mean:	12	7	14	11	7
Median:	6	4	6	7	5

Phosphorus in commercial samples (% of total number of samples):

	<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	
2002	0	34	28	31	3	0	1	2	0	0	100
2003	0	44	35	19	2	0	0	0	0	0	100
2004	0	27	37	31	3	1	0	0	0	1	100
2005	0	31	25	41	0	1	1	0	0	0	100
2006	0	36	40	24	0	0	0	0	0	0	100
Total	0	34	31	30	2	0	1	1	0	0	100

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

## 8. Potassium

### 8.1 Homeowner Samples

Potassium (lbs K/acre Morgan extraction) in homeowner samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	2	4	12	19
Total (%)	0	5	11	21	63	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	2	4	15	17	38
Total (%)	0	5	11	39	45	100
Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	3	4	12	19
Total (%)	0	0	16	21	63	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	1	0	0	1	2
Total (%)	0	50	0	0	50	0
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0

Rao, R., D. Sprague, Q.M. Ketterings, and H. Krol (2007). Cattaraugus Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-12. 33 pages.

Potassium classification summary for homeowners:

	Very Low	Low	Medium	High	Very High	Total
Number	0	4	9	23	42	78
Percentage	0	5	12	29	54	100

	2002-2006
Lowest:	51
Highest:	3211
Mean:	328
Median:	231

## 8.2 Commercial Samples

Potassium (lbs K/acre Morgan extraction) in commercial samples (number):

Soil Management Group 1						
	<35	35-64	65-94	95-149	>149	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	4	0	5
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	1	1	1	0	3
2006	0	0	0	1	0	1
Total (#)	0	1	2	6	0	9
Total (%)	0	11	22	67	0	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	1	3	5	11
2003	0	0	2	2	1	5
2004	0	0	0	1	11	12
2005	0	0	0	0	1	1
2006	0	0	1	5	8	14
Total (#)	0	2	4	11	26	43
Total (%)	0	5	9	26	60	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	26	56	90	103	275
2003	0	5	4	12	22	43
2004	0	2	8	17	30	57
2005	1	4	10	13	28	56
2006	0	2	11	22	33	68
Total (#)	1	39	89	154	216	499
Total (%)	0	8	18	31	43	100



Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	1	0	3	6	11	21
2003	0	1	1	0	1	3
2004	0	0	0	2	1	3
2005	0	2	3	3	2	10
2006	0	1	1	2	1	5
Total (#)	1	4	8	13	16	42
Total (%)	2	10	19	31	38	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	1	0	0	0	1
2004	0	0	0	0	0	0
2005	1	0	0	0	0	1
2006	0	0	0	0	0	0
Total (#)	1	1	0	0	0	2
Total (%)	50	50	0	0	0	100
Soil Management Group 6						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	0	0
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
2006	0	0	0	0	0	0
Total (#)	0	0	0	0	0	0
Total (%)	0	0	0	0	0	0

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	1	28	61	103	119	10	322
2003	0	7	7	14	24	5	57
2004	0	2	8	20	42	6	78
2005	2	7	14	17	31	0	71
2006	0	3	13	30	42	0	88
Grand Total	3	47	103	184	258	21	616

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	0	9	19	32	37	3	100
2003	0	12	12	25	42	9	100
2004	0	3	10	26	54	8	100
2005	3	10	20	24	44	0	100
2006	0	3	15	34	48	0	100
Grand Total	0	8	17	30	42	3	100

	2002	2003	2004	2005	2006
Lowest:	45	54	60	34	68
Highest:	903	893	644	689	477
Mean:	223	225	230	219	197
Median:	164	189	209	182	185

## 9. Magnesium

### 9.1 Homeowner Samples

Magnesium (lbs Mg/acre Morgan extraction) in homeowner samples (numbers):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
Number	0	0	4	16	58	78
Percentage	0	0	5	21	74	100

	2002-2006
Lowest:	53
Highest:	3791
Mean:	396
Median:	317

## 9.2 Commercial Samples

Magnesium (lbs Mg/acre Morgan extraction) in commercial samples (number):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	5	25	289	322
2003	0	3	1	8	45	57
2004	0	5	0	6	67	78
2005	0	3	5	8	55	71
2006	1	1	2	7	77	88
Total	1	15	13	54	533	616

	2002	2003	2004	2005	2006
Lowest:	51	36	32	24	17
Highest:	976	890	917	675	893
Mean:	441	348	351	342	359
Median:	449	309	355	356	342

Magnesium in commercial samples (% of total number of samples):

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	2	8	90	100
2003	0	5	2	14	79	100
2004	0	6	0	8	86	100
2005	0	4	7	11	77	100
2006	1	1	2	8	88	100
Total	0	2	2	9	87	100

## 10. Iron

### 10.1 Homeowner Samples

Iron (lbs Fe/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002-2006	67	11	78

Percentages:

0-49	>49	Total
Normal	Excessive	
86	14	100

	2002-2006
Lowest:	3
Highest:	77
Mean:	24
Median:	15

## 10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	307	15	322
2003	45	12	57
2004	55	23	78
2005	53	18	71
2006	74	14	88
Total	534	82	616

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	95	5	100
	79	21	100
	71	29	100
	75	25	100
	84	16	100
	87	13	100

	2002	2003	2004	2005	2006
Lowest:	1	4	3	5	3
Highest:	174	165	551	123	112
Mean:	16	34	49	36	31
Median:	10	20	30	22	23

## 11. Manganese

### 11.1 Homeowner Samples

Manganese (lbs Mn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002-2006	66	12	78

Percentages:

0-49	>49	Total
Normal	Excessive	
85	15	100

	2002-2006
Lowest:	11
Highest:	232
Mean:	62
Median:	50

## 11.2 Commercial Samples

Manganese (lbs Mn/acre Morgan extraction) in commercial samples:

Total number of samples:

	0-99	>99	Total
	Normal	Excessive	
2002	318	4	322
2003	52	5	57
2004	67	11	78
2005	66	5	71
2006	84	4	88
Total	587	29	616

Percentages:

	0-99	>99	Total
	Normal	Excessive	
	99	1	100
	91	9	100
	86	14	100
	93	7	100
	95	5	100
	95	5	100

	2002	2003	2004	2005	2006
Lowest:	5	10	18	2	15
Highest:	221	158	373	234	157
Mean:	32	44	63	49	45
Median:	25	32	45	41	41



## 12. Zinc

### 12.1 Homeowner Samples

Zinc (lbs Zn/acre Morgan extraction) in homeowner samples:

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002-2006	2	5	71	78

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
3	6	91	100

	2002-2006
Lowest:	0.1
Highest:	119.8
Mean:	9.9
Median:	3.3

## 12.2 Commercial Samples

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

Total number of samples:

	<0.5	0.5-1.0	>1	Total
	Low	Medium	High	
2002	9	59	254	322
2003	0	4	53	57
2004	4	15	59	78
2005	5	9	57	71
2006	14	23	51	88
Total	32	110	474	616

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
3	18	79	100
0	7	93	100
5	19	76	100
7	13	80	100
16	26	58	100
5	18	77	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.8	0.2	0.2	0.1
Highest:	23.5	16.4	12.5	22.2	5.8
Mean:	2.3	2.6	2.2	2.7	1.5
Median:	1.6	1.8	1.8	2.0	1.4

## Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description
<b>Alfalfa</b>	
ABE	Alfalfa trefoil grass, Establishment
ABT	Alfalfa trefoil grass, Established
AGE	Alfalfa grass, Establishment
AGT	Alfalfa grass, Established
ALE	Alfalfa, Establishment
ALT	Alfalfa, Established
<b>Birdsfoot</b>	
BCE	Birdsfoot trefoil clover, Establishment
BCT	Birdsfoot trefoil clover, Established
BGE	Birdsfoot trefoil grass, Establishment
BGT	Birdsfoot trefoil grass, Established
BSE	Birdsfoot trefoil seed, Establishment
BST	Birdsfoot trefoil seed, Established
BTE	Birdsfoot trefoil, Establishment
BTT	Birdsfoot trefoil, Established
<b>Barley</b>	
BSP	Spring barley
BSS	Spring barley with legumes
BUK	Buckwheat
BWI	Winter barley
BWS	Winter barley with legumes
<b>Clover</b>	
CGE	Clover grass, Establishment
CGT	Clover grass, Established
CLE	Clover, Establishment
CLT	Clover, Established
CSE	Clover seed production, Establishment
CST	Clover seed production, Established

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses, pastures, covercrops
CVE	Crownvetch, Establishment
CVT	Crownvetch, Established
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
RYC	Rye cover crop
RYS	Rye seed production
TRP	Triticale peas
	Small grains
MIL	Millet
OAS	Oats seeded 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

Crop Code	Crop Description
BDR/DND	Beans-dry
BLU	Blueberries
CEM	Cemetery
FAR	Fairway
FLA	Flowering annuals
GRA	Grapes
GEN	Green
HRB	Herbs
IDL	Idle land
LAW	Lawn
MIX/MVG	Mixed vegetables
PER	Perennials
PRK	Park
POT/PTO	Potatoes
PUM	Pumpkins
ROD	Roadside
ROS	Roses
RSF	Raspberries, Fall
RSP	Raspberries (homeowners)
RSS	Raspberries, Summer
SAG	Ornamentals adapted to pH 6.0 to 7.5
SQW	Squash, Winter
STE	Strawberries, Ever
STR	Strawberries (homeowners)
STS	Strawberries, Spring
SUN	Sunflowers
SWC	Sweet corn
TOM	Tomatoes
TRE	Christmas trees, Establishment
TRF	Turf
TRT	Christmas trees, Topdressing