# Soil Sample Survey Ontario County

# Samples analyzed by CNAL (2002-2006)



Summary compiled by

Renuka Rao, Nate Herendeen, Quirine M. Ketterings, and Hettie Krol



Cornell Nutrient Analysis Laboratory <u>http://www.css.cornell.edu/soiltest/newindex.asp</u> & Nutrient Management Spear Program <u>http://nmsp.css.cornell.edu/</u>



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November 27, 2007

Correct Citation:

Rao, R., N. Herendeen, Q.M. Ketterings, and H. Krol (2007). Soil sample survey of Ontario County. Samples analyzed by the Cornell Nutrient Analysis Laboratory (2002-2006). CSS Extension Bulletin E07-30. 35 pages.

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# **1. County Introduction**

Ontario County is located in the central Finger Lakes area of New York, southeast of Rochester. It contains over 415,000 acres of land area. Roughly 46% of the area is used for farm production.

The northern two-thirds of the county lies in the Ontario Lowlands with transition to the Allegheny Plateau or Uplands in the south. The northern boundary of Ontario joins



Wayne County. The elevation is about 550 feet above sea level. The northern part of the county is dotted with drumlins, long hills oriented in a north-south direction. These plus the extensive deposits of glacial kames create most of the topography in the area. South of these, the glacial till plain is gently undulating. It extends south to the Portage Escarpment

where the elevation rises from the 600 to 800 foot level to about 1800 feet in the Allegheny Plateau. The maximum elevation is at Gannett Hill between Canandaigua and Honeoye Lakes at 2256 feet above sea level.

The eroded Allegheny Plateau and deep valleys of the Finger Lakes dominate the county's topography. These begin with Hemlock Lake on the west and include Canadice, Honeoye, and Canandaigua with Seneca Lake on the east. The glacial advance against the north flowing rivers deepened these valleys. When the ice receded, the deep valleys became the Finger Lakes. On the west side of the county, the Honeoye and Hemlock Lake watersheds drain northward into the Genesee. The central Finger Lakes drain northward and eastward into the Clyde River and eventually the Oswego River.

Ontario County soils are extremely diverse. The soils in the north are dominated by high carbonate materials developed from the limestone parent material in the northern parts of the county. This was spread southward by the last glacial action that advanced from north

to south across the county. In the southwest, soils formed from the low carbonate Devonian shale deposits.

The agriculture of Ontario County is diverse. Dairy farming is the largest single generator of farm income. Livestock farmers produce and market beef, hogs and sheep. Thousands of acres are devoted to field and forage crops to support the dairy and livestock industry and for cash sales. Processing vegetable crops comprise the next largest segment of the agricultural economy. Crops grown for processing include snap beans, sweet corn, red beets, kidney beans, cabbage, carrots and black beans. Grapes are extensively grown on the slopes adjacent to the lakes. They are processed into wine at estate wineries and commercial wineries in Canandaigua and Naples. These help make agri-tourism an important part of the agricultural economy.

Fresh vegetables produced include all of the above listed crops plus asparagus, cucumbers, tomatoes, squash, pumpkins, garlic and cole. Bedding plants and ornamentals are important commodities on farms with greenhouses and/or nursery stock. Fruits such as strawberries, grapes, apples and blueberries are grown for fresh market. Christmas trees are grown on a wide range of soils, especially the acid soils on the hills in the southwest.

Ontario County is headquarters to several of the larger dairy farms in New York plus many smaller dairy farms. Large vegetable farms are also located in the county. There is a significant horse industry supporting Finger Lakes Race Track plus farms that board horses for recreational use. There are many farms that have found niche markets for a variety of products from flowers to maple products.

All the above industries rely heavily on soil testing to maintain optimum production while protecting the agricultural environment from nutrient runoff.

Nate Herendeen Field Crops Educator North West New York Dairy, Livestock & Field Crops Team

# 2. General Survey Summary

This survey summarizes the soil test results from grower (identified as "commercial samples") and homeowner samples from Ontario County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1067. Of these, 800 samples (75%) were submitted by commercial growers while 267 samples (25%) were submitted by homeowners.



Home	owners	Comm	Total	
2002 2003 2004 2005 2006	33 51 74 58 51	2002 2003 2004 2005 2006	285 168 169 85 93	318 219 243 143 144
Total	267	Total	800	1067

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (42%) or for home garden vegetable production (23%). Commercial growers submitted samples primarily to grow corn silage or grain (23%), alfalfa or alfalfa/grass mixes (21%), cabbage (13%) and soybeans (9%).

Soils tested for home and garden in Ontario County were classified as belonging to soil management group 2 (33%), group 3 (33%), group 4 (25%), or group 5 (9%). 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, 70% belonged to soil management group 2. Four percent of all samples belonged to group 1, 19% were group 3 soils, 3% were group 4 soils and 4% were muck soils (group 6). Only one sample belonged to group 5. Lima was the most common soil series (28% of all samples), followed by Honeoye (18%), Palmyra (7%), Ontario (6%) and Kendaia (5%).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to almost 50% (muck soil). For homeowner samples, 46% had more than 4% organic matter, 43% had between 2 and 4% organic matter while 10% had less than 2% organic matter.

Of the samples submitted by commercial growers, 68% contained between 2 and 4% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from 4.4 to 9.3 for home and garden samples while 81% tested between 7.0 and 7.9 for pH. For the commercial samples, the highest pH was 8.0 and 74% tested between 6.0 and 7.4.

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, 5% of the soils tested low for P, 12% tested medium, 37% tested high and 46% tested very high. This meant that 83% tested high or very high in P. For commercial growers, 24% tested very high. In total 9% were low or very low in P, 16% tested medium for P while 51% of the submitted samples were classified as high in soil test P. This means that 74% 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 Ontario County soils varied from very low (1% of the homeowner soils and 1% of the commercial growers' soils) to very high (64% of the homeowner soils and 52% of the commercial growers' soils). For homeowners, 4% tested low in K, 6% tested medium, and 26% tested high for potassium. For commercial growers' soils, 2% tested low, 11% tested medium and 34% 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 2 3 4 5 and 6	<35 <40 <45 <55 <60	35-64 40-69 45-79 55-99 60-114	65-94 70-99 80-119 100-149 115-164	95-149 100-164 120-199 150-239 165-269	>149 >164 >199 >239 >269				

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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 24 to more than 10,000 lbs Mg/acre. There were no soils that tested very low for Mg. Most soils tested high or very high for Mg (99% of the homeowner soils and commercial grower samples).

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 were in the normal range with for 98% of the samples with 2% of homeowner and commercial grower samples testing excessive for Fe. Similarly, most soils (90-99%) 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, 89% tested high for Zn while 9% tested medium and 2% were low in Zn. Of the commercial growers' samples, 3% tested low, 25% tested medium while 72% 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

	2002	2003	2004	2005	2006	Total	%
ALG	0	0	1	0	2	3	1
APR	0	0	0	0	1	1	0
ATF	5	5	2	5	1	18	7
BLU	0	0	0	0	1	1	0
FAR	1	0	0	0	0	1	0
FLA	0	0	1	6	1	8	3
GRA	0	0	0	0	1	1	0
LAW	7	10	49	25	22	113	42
MVG	15	14	8	10	14	61	23
PER	2	7	3	3	1	16	6
PRK	0	0	0	3	0	3	1
РТО	0	1	0	0	0	1	0
ROS	0	1	0	0	0	1	0
RSP	0	0	1	0	0	1	0
SAG	2	4	6	5	4	21	8
TRF	0	0	1	1	1	3	1
Unknown	1	9	2	0	2	14	5
Total	33	51	74	58	51	267	100

Crops for which recommendations were requested by homeowners:

Note: See Appendix for Cornell crop codes.

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE	2	0	0	0	0	2	0
AGE/AGT	50	8	10	3	10	81	10
ALE/ALT	10	48	24	6	2	90	11
APP	1	0	3	9	1	14	2
ASP	0	0	0	0	1	1	0
BCE	0	0	5	0	0	5	1
BDR	0	0	1	0	0	1	0
BET	5	0	0	0	0	5	1
BGE	2	0	1	0	0	3	0
BND	4	1	2	0	0	7	1
BNS	0	5	3	0	0	8	1
BSP	0	0	0	1	0	1	0
BUK	0	0	1	4	0	5	1
BWI	1	0	0	0	0	1	0
BWS	2	0	0	0	0	2	0
CAR	6	13	0	3	3	25	3
CBP	29	0	23	24	21	97	12
CBS	0	10	0	0	0	10	1
CGE/CGT	2	0	1	1	8	12	2
CLE	0	2	0	7	2	11	1
COG/COS	86	52	25	7	11	181	23
GIT	8	0	0	0	2	10	1
GPA	1	0	0	0	0	1	0
GPF	0	2	0	0	2	4	1
GPV	0	3	0	0	0	3	0
GRE/GRT	3	3	4	3	0	13	2
IDL	1	0	0	1	0	2	0
LET	0	0	0	0	1	1	0
MIX	1	0	0	2	6	9	1
MUS	0	0	0	0	1	1	0
NUR	0	0	1	0	0	1	0
OAS	0	0	1	0	1	2	0
OAT	23	0	1	3	0	27	3
ONP	0	0	0	2	0	2	0
OTH	1	3	2	0	0	6	1
PEA	1	1	0	0	0	2	0

Crops for which recommendations were requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
PEP	0	1	0	0	0	1	0
PGE/PGT	3	0	0	0	1	4	1
PIE/PIT	7	0	0	0	0	7	1
PLE/PLT	0	3	1	0	1	5	1
PLM	0	0	0	0	1	1	0
PNT	0	1	0	0	1	2	0
PUM	4	0	3	0	0	7	1
RSS	4	0	0	0	1	5	1
RYC	2	0	0	0	0	2	0
SOY	12	4	37	7	11	71	9
SSH	1	0	0	0	0	1	0
STS	0	0	1	0	1	2	0
SWC	2	1	8	1	2	14	2
TOM	0	0	2	0	0	2	0
TRE	0	0	1	0	0	1	0
TRT	0	0	0	1	0	1	0
WHS	4	0	2	0	0	6	1
WHT	4	6	1	0	0	11	1
WPE	0	0	5	0	0	5	1
Unknown	3	1	0	0	2	6	1
Total	285	168	169	85	93	800	100

Note: See Appendix for Cornell crop codes.

# 4. Soil Types

# 4.1 Homeowner Samples

	2002	2003	2004	2005	2006	Total	%
SMG 1 (clayey)	0	0	0	0	0	0	0
SMG 2 (silty)	10	12	27	28	11	88	33
SMG 3 (silt loam)	1	22	30	14	21	88	33
SMG 4 (sandy loam)	12	14	10	13	18	67	25
SMG 5 (sandy)	10	3	7	3	1	24	9
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	33	51	74	58	51	267	100

Soil types (soil management groups) for homeowner samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Allis	3	0	0	3	0	0	3	0
Alluvial	3	0	1	0	0	1	2	0
Arkport	4	2	0	9	2	2	15	2
Aurora	2	0	0	0	3	0	3	0
Bath	3	1	1	0	0	0	2	0
Braceville	4	0	0	1	0	0	1	0
Camillus	3	1	0	11	0	0	12	2
Canadaigua	3	1	0	0	0	0	1	0
Carlisle	6	0	10	0	1	1	12	2
Cayuga	2	2	0	0	0	0	2	0
Cazenovia	2	0	0	0	0	2	2	0
Chagrin	3	0	0	1	0	0	1	0
Darien	2	5	1	3	5	0	14	2
Dunkirk	3	1	1	0	0	1	3	0
Edwards	6	6	4	0	3	3	16	2
Farmington	3	4	0	9	0	4	17	2
Fredon	4	5	0	0	0	0	5	1
Galen	4	5	0	1	0	0	6	1
Genesee	2	6	0	0	0	0	6	1
Hilton	2	0	4	0	9	0	13	2
Homer	2	0	0	3	0	0	3	0
Honeoye	2	66	25	18	18	14	141	18
Howard	3	8	0	0	0	6	14	2
Junius	5	1	0	0	0	0	1	0
Kendaia	2	12	4	8	8	5	37	5
Lakemont	1	0	1	0	0	0	1	0
Langford	3	0	0	0	1	1	2	0
Lansing	2	6	2	2	3	10	23	3
Lima	2	73	92	27	15	20	227	28
Lordstown	3	3	0	0	0	0	3	0
Lyons	2	1	0	0	0	0	1	0
Madalin	1	5	0	1	0	0	6	1
Mardin	3	2	4	2	0	3	11	1
Nunda	2	0	0	0	1	0	1	0
Odessa	2	14	2	2	0	2	20	3
Ontario	2	13	5	18	4	9	49	6

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Ovid	2	5	0	0	0	0	5	1
Palmyra	3	14	5	29	3	1	52	7
Phelps	3	9	2	3	3	0	17	2
Romulus	2	2	3	0	0	0	5	1
Schoharie	1	5	0	12	0	4	21	3
Teel	2	5	1	0	0	0	6	1
Volusia	3	0	0	6	2	0	8	1
Wayland	2	1	0	0	0	0	1	0
Woostern	3	1	0	0	1	0	2	0
Unknown	-	0	0	0	3	4	7	1
Total	-	285	168	169	85	93	800	100

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# 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
2002	1	7	8	5	3	5	2	2	33
2003	0	3	10	12	10	11	0	5	51
2004	1	7	16	15	20	7	1	7	74
2005	0	5	13	16	9	8	1	6	58
2006	1	2	9	8	17	2	6	6	42
Total	3	24	56	56	50	33	10	26	267

	2002	2003	2004	2005	2006
Lowest:	0.7	1.4	0.9	1.2	0.7
Highest:	10.8	13.1	43.5	16.3	31.5
Mean:	3.6	4.4	4.7	4.3	5.6
Median:	3.5	4.0	3.8	3.7	4.3

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	<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	3	21	24	15	9	15	6	6	100
2003	0	6	20	24	20	22	0	10	100
2004	1	9	22	20	27	9	1	9	100
2005	0	9	22	28	16	14	2	10	100
2006	2	4	18	16	33	4	12	12	100
Total	1	9	21	21	22	12	4	10	100

	<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	3	22	110	95	32	11	4	8	285
2003	0	28	102	21	2	0	3	12	168
2004	1	36	75	35	14	5	2	1	169
2005	2	17	35	20	4	2	1	4	85
2006	0	27	39	12	5	3	1	6	93
Total	6	130	361	183	57	21	11	31	800

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

	2002	2003	2004	2005	2006
Lowest:	0.2	1.3	0.7	0.6	1.0
Highest:	36.5	49.7	9.3	49.7	42.4
Mean:	3.8	4.8	2.8	4.0	4.4
Median:	3.0	2.5	2.6	2.6	2.4

#### 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	1	8	39	33	11	4	1	3	100
2003	0	17	61	13	1	0	2	7	100
2004	1	21	44	21	8	3	1	1	100
2005	2	20	41	24	5	2	1	5	100
2006	0	29	42	13	5	3	1	6	100
Total	1	16	45	23	7	3	1	4	100

# 6. pH

# 6.1 Homeowner 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	0	0	0	2	4	10	13	4	0	33
2003	0	0	0	1	0	5	17	28	0	0	51
2004	0	0	0	1	3	3	36	30	0	1	74
2005	1	0	1	1	3	5	25	22	0	0	58
2006	0	0	1	2	4	5	22	15	2	0	51
Total	1	0	2	5	12	22	110	108	6	1	267

pH of homeowner samples (numbers):

	2002	2003	2004	2005	2006
Lowest:	6.1	5.7	5.7	4.4	5.4
Highest:	8.3	7.9	9.3	7.8	8.1
Mean:	-	-	-	-	-
Median:	7.5	7.5	7.4	7.4	7.2

pH of homeowner of 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	0	0	0	6	12	30	39	12	0	100
2003	0	0	0	2	0	10	33	55	0	0	100
2004	0	0	0	1	4	4	49	41	0	1	100
2005	2	0	2	2	5	9	43	38	0	0	100
2006	0	0	2	4	8	10	43	29	4	0	100
Total	0	0	1	2	4	8	41	40	2	0	100

	<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	4	3	14	42	63	80	73	6	0	285
2003	1	0	3	5	11	42	87	18	1	0	168
2004	0	1	5	9	26	54	58	16	0	0	169
2005	0	1	4	9	11	14	30	16	0	0	85
2006	0	1	2	7	11	30	36	6	0	0	93
Total	1	7	17	44	101	203	291	129	7	0	800

pH of commercial samples (number):

	2002	2003	2004	2005	2006
Lowest:	4.6	4.4	4.9	4.9	4.9
Highest:	8.0	8.0	7.8	7.7	7.7
Mean:	-	-	-	-	-
Median:	7.0	7.1	6.9	7.0	6.9

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	1	5	15	22	28	26	2	0	100
2003	1	0	2	3	7	25	52	11	1	0	100
2004	0	1	3	5	15	32	34	9	0	0	100
2005	0	1	5	11	13	16	35	19	0	0	100
2006	0	1	2	8	12	32	39	6	0	0	100
Total	0	1	2	6	13	25	36	16	1	0	100

# 7. Phosphorus

# 7.1 Homeowner Samples

	<1	1-3	4-8	9-39	40-60	61-80	81- 100	101- 150	151- 200	>200	Total
	VL	L	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	10	1	7	4	0	3	3	1	4	33
2003	0	2	1	18	5	5	4	7	1	8	51
2004	0	1	12	32	8	9	1	4	0	7	74
2005	0	0	10	27	4	5	2	1	1	8	58
2006	0	1	8	15	4	5	2	2	2	12	51
Total	0	14	32	99	25	24	12	17	5	39	267

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

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

	2002	2003	2004	2005	2006
Lowest:	1	1	2	4	3
Highest:	406	644	1887	796	1238
Mean:	78	107	77	76	157
Median:	32	56	24	22	43

Phosphorus in homeowner 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	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	30	3	21	12	0	9	9	3	12	100
2003	0	4	2	35	10	10	8	14	2	16	100
2004	0	1	16	43	11	12	1	5	0	9	100
2005	0	0	17	47	7	9	3	2	2	14	100
2006	0	2	16	29	8	10	4	4	4	24	100
Total	0	5	12	37	9	9	4	6	2	15	100

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

	<1	1-3	4-8	9-39	40-60	61-80	81- 100	101- 150	151- 200	>200	Total
	VL	L	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	23	50	150	30	14	8	6	1	3	285
2003	0	6	14	83	40	13	2	4	2	4	168
2004	0	25	32	85	14	5	1	1	2	4	169
2005	0	14	10	42	10	7	1	1	0	0	85
2006	0	6	25	44	8	2	0	1	0	7	93
Total	0	74	131	404	102	41	12	13	5	18	800

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

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	361	251	448	101	2451
Mean:	29	40	30	26	77
Median:	17	29	16	23	17

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	Μ	Н	VH	VH	VH	VH	VH	VH	
2002	0	8	18	53	11	5	3	2	0	1	100
2003	0	4	8	49	24	8	1	2	1	2	100
2004	0	15	19	50	8	3	1	1	1	2	100
2005	0	16	12	49	12	8	1	1	0	0	100
2006	0	6	27	47	9	2	0	1	0	8	100
Total	0	9	16	51	13	5	2	2	1	2	100

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

# 8. Potassium

#### 8.1 Homeowner Samples

		Soil M	anagement G	Froup 1		
	<35	35-64	65-94	95-149	>149	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 (%)	-	-	-	_	-	_
		Soil M	anagement G	Froup 2		
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	2	3	5	10
2003	0	0	0	4	8	12
2004	0	1	1	9	16	27
2005	0	0	1	2	25	28
2006	0	0	0	2	9	11
Total (#)	0	1	4	20	63	88
Total (%)	0	1	5	23	72	100
		Soil M	anagement G	Froup 3		
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	0	1	1
2003	0	0	0	2	20	22
2004	0	1	1	11	17	30
2005	0	0	0	3	11	14
2006	0	1	0	4	16	21
Total (#)	0	2	1	20	65	88
Total (%)	0	2	1	23	74	100

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

Rao, R., N.	Herendeen, Q.M	I. Ketterings,	and H.	Krol	(2007).	Ontario	Soil	Sample	Survey
	(2002-200	5). CSS Exter	nsion B	ulletin	n E07-30	0. 35 pag	ges.		

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		Soil M	anagement C	broup 4		
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	0	2	1	5	4	12
2003	0	0	1	3	10	14
2004	0	1	1	4	4	10
2005	0	2	0	6	5	13
2006	0	0	2	2	14	18
Total (#)	0	5	5	20	37	67
Total (%)	0	7	7	30	55	100
		Soil M	anagement C	broup 5		
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	2	1	1	5	1	10
2003	0	0	2	0	1	3
2004	0	2	1	2	2	7
2005	0	0	1	2	0	3
2006	0	0	0	0	1	1
Total (#)	2	3	5	9	5	24
Total (%)	8	13	21	38	21	100
		Soil M	anagement C	broup 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 (%)	-	-	-	-	-	-

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	2	3	4	13	11	33
2003	0	0	3	9	39	51
2004	0	5	4	26	39	74
2005	0	2	2	13	41	58
2006	0	1	2	8	40	51
Grand Total	2	11	15	69	170	267

Potassium classification summary for homeowners:

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	6	9	12	39	33	100
2003	0	0	6	18	76	100
2004	0	7	5	35	53	100
2005	0	3	3	22	71	100
2006	0	2	4	16	78	100
Grand Total	1	4	6	26	64	100

	2002	2003	2004	2005	2006
Lowest:	43	107	52	61	58
Highest:	1422	1493	48600	2903	28325
Mean:	294	337	890	316	1140
Median:	200	278	198	240	288

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	5	10		
2003	0	0	0	0	1	1		
2004	0	0	0	3	10	13		
2005	0	0	0	0	0	0		
2006	0	0	0	0	4	4		
Total (#)	0	0	1	7	20	28		
Total (%)	0	0	4	25	71	100		
		Soil M	anagement G	broup 2				
	<40	40-69	70-99	100-164	>164	Total		
	Very Low	Low	Medium	High	Very High			
2002	2	2	28	81	103	216		
2003	0	1	15	31	92	139		
2004	0	2	17	33	30	82		
2005	1	1	4	23	37	66		
2006	0	1	6	34	21	62		
Total (#)	3	7	70	202	283	565		
Total (%)	1	1	12	36	50	100		
		Soil M	anagement G	froup 3				
	<45	45-79	80-119	120-199	>199	Total		
	Very Low	Low	Medium	High	Very High			
2002	0	1	4	12	28	45		
2003	0	2	5	5	2	14		
2004	0	4	5	21	34	64		
2005	0	1	1	3	5	10		
2006	0	0	0	5	12	17		
Total (#)	0	8	15	46	81	150		
Total (%)	0	5	10	31	54	100		

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

		Soil M	anagement G	broup 4		
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	1	0	4	2	0	7
2003	0	0	0	0	0	0
2004	0	0	0	4	6	10
2005	0	1	0	1	0	2
2006	0	0	2	0	0	2
Total (#)	1	1	6	7	6	21
Total (%)	5	5	29	33	29	100
		Soil M	anagement C	roup 5		
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	1	0	0	1
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	1	0	0	1
Total (%)	0	0	100	0	0	100
		Soil M	anagement G	iroup 6		
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	2	4	6
2003	0	0	0	3	11	14
2004	0	0	0	0	0	0
2005	0	0	0	0	4	4
2006	0	0	0	0	4	4
Total (#)	0	0	0	5	23	28
Total (%)	0	0	0	18	82	100

Summary (#)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	3	3	38	101	140	0	285
2003	0	3	20	39	106	0	168
2004	0	6	22	61	80	0	169
2005	1	3	5	27	46	3	85
2006	0	2	6	40	41	4	93
Grand Total	4	17	91	268	413	7	800

Summary (%)	Very Low	Low	Medium	High	Very High	Un- known	Total
2002	1	1	13	35	49	0	100
2003	0	2	12	23	63	0	100
2004	0	4	13	36	47	0	100
2005	1	4	6	32	54	4	100
2006	0	2	6	43	44	4	100
Grand Total	1	2	11	34	52	1	100

	2002	2003	2004	2005	2006
Lowest:	34	66	45	25	66
Highest:	1510	1330	1150	643	2191
Mean:	227	240	203	210	261
Median:	174	198	173	176	162

# 9. Magnesium

#### 9.1 Homeowner Samples

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	1	32	33
2003	0	0	0	1	50	51
2004	0	0	1	0	73	74
2005	0	0	1	1	56	58
2006	0	0	0	2	49	51
Total	0	0	2	5	260	267

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

	2002	2003	2004	2005	2006
Lowest:	184	136	70	73	175
Highest:	1135	1420	10242	1879	6124
Mean:	600	604	747	619	969
Median:	539	558	611	600	626

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

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	0	3	97	100
2003	0	0	0	2	98	100
2004	0	0	1	0	99	100
2005	0	0	2	2	97	100
2006	0	0	0	4	96	100
Total	0	0	1	2	97	100

	<20	20-65	66-100	101-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	2	15	267	285
2003	0	1	1	6	160	168
2004	0	0	0	13	156	169
2005	0	0	0	4	81	85
2006	0	1	1	6	85	93
Total	0	3	4	44	749	800

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

	2002	2003	2004	2005	2006
Lowest:	27	24	130	125	33
Highest:	1894	3599	1427	1537	3262
Mean:	476	536	475	434	525
Median:	447	431	445	402	405

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	0	1	5	94	100
2003	0	1	1	4	95	100
2004	0	0	0	8	92	100
2005	0	0	0	5	95	100
2006	0	1	1	6	91	100
Total	0	0	1	6	94	100

# 10. Iron

#### 10.1 Homeowner Samples

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

<del>,</del>	Total numbe	r of samples	:	]	Percentages:		
	0-49	>49	Total		0-49	>49	Total
	Normal	Excessive			Normal	Excessive	
2002	33	0	33		100	0	100
2003	50	1	51		98	2	100
2004	73	1	74		99	1	100
2005	55	3	58		95	5	100
2006	50	1	51		98	2	100
Total	261	6	267		98	2	100

	2002	2003	2004	2005	2006
Lowest:	1	1	2	1	1
Highest:	21	80	81	342	149
Mean:	5	8	9	18	11
Median:	3	6	6	7	6

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

,	Total number of samples:				Percentages:		
	0-49	>49	Total		0-49	>49	Total
	Normal	Excessive			Normal	Excessive	
2002	280	5	285		98	2	100
2003	165	3	168		98	2	100
2004	165	4	169		98	2	100
2005	82	3	85		96	4	100
2006	89	4	93		96	4	100
Total	781	19	800		98	2	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	126	308	101	99	69
Mean:	6	8	8	10	9
Median:	2	3	4	4	4

# 11. Manganese

#### 11.1 Homeowner Samples

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

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	30	3	33	91	9	100
2003	50	1	51	98	2	100
2004	65	9	74	88	12	100
2005	50	8	58	86	14	100
2006	45	6	51	88	12	100
Total	240	27	267	90	10	100

	2002	2003	2004	2005	2006
Lowest:	16	23	15	18	16
Highest:	208	128	362	187	215
Mean:	51	55	66	63	57
Median:	39	54	54	51	43

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

r	Total number of samples:					
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	283	2	285	99	1	100
2003	166	2	168	99	1	100
2004	168	1	169	99	1	100
2005	82	3	85	96	4	100
2006	90	3	93	97	3	100
Total	789	11	800	99	1	100

	2002	2003	2004	2005	2006
Lowest:	6	13	9	7	11
Highest:	199	133	145	329	299
Mean:	34	28	31	41	40
Median:	31	25	28	30	31

# 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	2	4	27	33				
2003	1	1	49	51				
2004	0	10	64	74				
2005	1	4	53	58				
2006	1	6	44	51				
Total	5	25	237	267				

Percentages:							
<0.5	0.5-1.0	>1	Total				
Low	Medium	High					
6	12	82	100				
2	2	96	100				
0	14	86	100				
2	7	91	100				
2	12	86	100				
2	9	89	100				

	2002	2003	2004	2005	2006
Lowest:	0.3	0.4	0.5	0.1	0.2
Highest:	43.1	259.8	40.0	32.8	45.9
Mean:	6.0	21.2	4.7	5.6	6.5
Median:	3.2	6.5	2.2	3.7	2.9

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

	Total number of samples:				Percentage	es:		
	<0.5	0.5-1.0	>1	Total	<0.5	0.5-1.0	>1	Total
	Low	Medium	High		Low	Medium	High	
2002	4	50	231	285	1	18	81	100
2003	2	38	128	168	1	23	76	100
2004	7	51	111	169	4	30	66	100
2005	3	28	54	85	4	33	64	100
2006	9	30	54	93	10	32	58	100
Total	25	197	578	800	3	25	72	100

	2002	2003	2004	2005	2006
Lowest:	0.3	0.3	0.3	0.1	0.1
Highest:	34.6	39.4	13.6	14.4	59.3
Mean:	2.3	2.4	1.8	1.6	2.7
Median:	1.5	1.5	1.4	1.3	1.2

# Appendix: Cornell Crop Codes

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

Crop codes used in the Cornell Nutrient Analysis Laboratory.

Crop Code	Crop Description			
	Corn			
COG	Corn grain			
COS	Corn silage			
	Grasses pastures covergrops			
CVF	Crownyetch Establishment			
CVL	Crownvetch Established			
GIF	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		