

Rao, R., S.D. Mallozzi, Q.M. Ketterings, and H. Krol (2007). Dutchess Soil Sample Survey (2002-2006). CSS Extension Bulletin E07-27. 34 pages.

Soil Sample Survey

Dutchess County

Samples analyzed by CNAL (2002-2006)



Dutchess County (photo credit: Stephanie D. Mallozzi, CCE of Dutchess County).

Summary compiled by

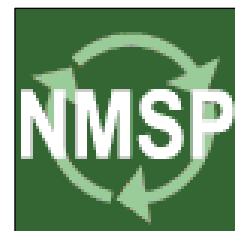
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Cornell Nutrient Analysis Laboratory
<http://www.css.cornell.edu/soiltest/newindex.asp>

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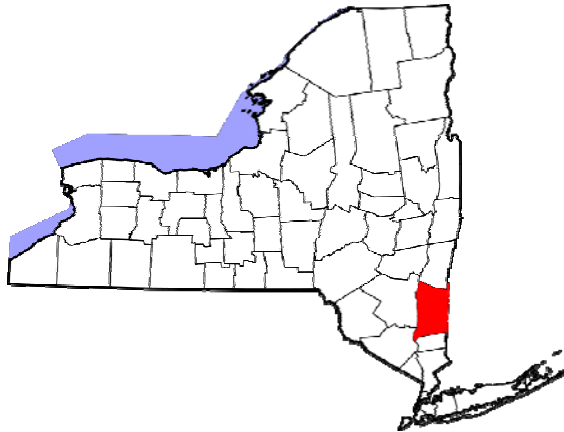


Dutchess County (photo credit: Stephanie D. Mallozzi, CCE of Dutchess County).



1. County Introduction

Dutchess County is in the easternmost part of the mid-Hudson Valley in New York State. It is bounded to the north by Columbia County, to the west by the Hudson River, to the south by Putnam County and to the east by the state of Connecticut. The county covers 514,600 acres (804 square miles). The city of Poughkeepsie is the county seat located in



the west-central portion along the Hudson River. Dutchess County is divided into two major physiographic units: the Valley and Ridge Province, and the New England Province. The Valley and Ridge Province includes the Hudson Lowlands and the Low Taconics. The New England Province includes the High Taconics, the Housatonic Highlands, and the Hudson Highlands.

Winters are cold and summers are warm in Dutchess County. In most years, precipitation is near normal and it is usually adequate for most crops. Generally, the first frost occurs around October 1st and that last frost occurs around May 15th. Winter temperatures average 26°F (average daily minimum temperature is 16°F) and summer temperatures average 68°F (average highest temperatures is 80°F).

Dutchess County has an adequate supply of groundwater and surface water supplied by numerous streams, wetlands, aquifers, and ponds. Water uses include agricultural, industrial, commercial, municipal and domestic. The largest source of water is the Hudson River.

Soil units found in Dutchess County include ten major types. They vary from moderately well drained to very poorly drained and can be sandy to clay. According to the US Department of Agriculture Soil Survey, Dutchess County contains about 65,621 acres of prime farmland. This is about 12% of the total acreage. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland can be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. Another 50,000 plus acres are farmed on marginal or less than prime

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farmland. The top five agricultural commodities in the County include: dairy products, nursery and greenhouse crops, horses and ponies, vegetables, and cattle and calves.

With a population of almost 250,000 people, Dutchess County is a county in transition. Whereas farmland was the predominant form of land use as little as 50 years ago, today the county struggles to maintain and preserve existing farmland. According to the Dutchess County Agricultural and Farmland Protection Board, there were 275 dairy farms in 1972. Today there are less than 30. Dutchess farm operators are engaged in an increasingly diverse variety of agricultural activities. While there are significant numbers of farmers in the more traditional categories identified by the New York State Department of Agriculture and Markets, there are also a large number whose activities fall into the “Other” category. This is an indication that Dutchess County farmers are responding positively to changes and challenges in the industry by seeking specialty and niche markets. Diversity and adaptability are among the keys to the continued viability of Dutchess County’s agriculture industry. With close proximity to urban centers such as New York City and Westchester County, the southern part of Dutchess County has become very suburban/urban, while the northern parts of the county remain somewhat rural. Throughout the county however, housing developments have sprouted with alarming frequency and thus the county is faced with many issues such as water quality, soil erosion, invasive insect pests and weed plants, deterioration of open space, poor planning, traffic congestion and overcrowded schools.

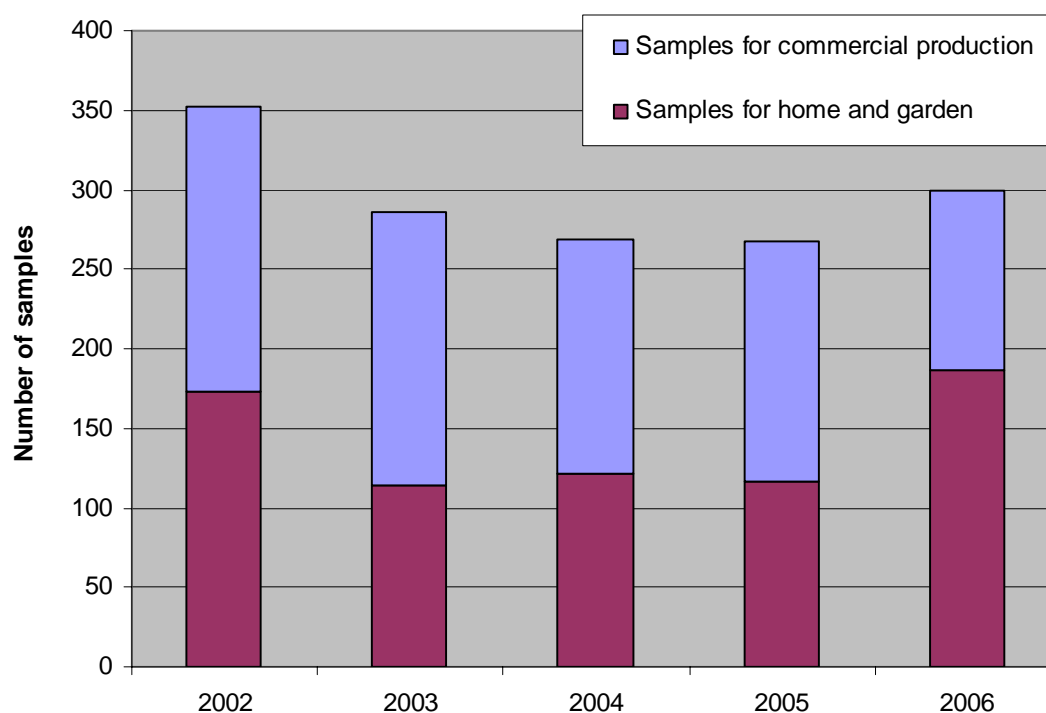
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Dutchess County (photo credit: Stephanie D. Mallozzi, CCE of Dutchess County).

2. General Survey Summary

This survey summarizes the soil test results from grower (identified as “commercial samples”) and homeowner samples from Dutchess County submitted to the Cornell Nutrient Analysis Laboratory (CNAL) from 2002 to 2006. The total number of samples analyzed in these years amounted to 1474. Of these, 762 samples (52%) were submitted by commercial growers while 712 samples (48%) were submitted by homeowners.



Homeowners		Commercial		Total
2002	173	2002	179	352
2003	114	2003	172	286
2004	122	2004	147	269
2005	117	2005	151	268
<u>2006</u>	<u>186</u>	<u>2006</u>	<u>113</u>	<u>299</u>
Total	712	Total	762	1474

Homeowners submitted soil samples to the Cornell Nutrient Analysis Laboratory during 2002-2006 primarily to request fertilizer recommendations for lawns (33%), for home garden vegetable production (32%), perennials and ornamentals (10% each). Commercial growers submitted samples primarily to grow alfalfa or alfalfa/grass mixes (17%), for grass hay production (17%), pasture (16%), and corn silage or grain (14%).

Soils tested for home and garden in Dutchess County were classified as belonging to soil management group 2 (14%), group 3 (43%), group 4 (30%), or group 5 (14%). 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 4. Groups 1, 2, 3, and 5 were represented with 1, 2, 14, and 1% of all samples. There were no organic soils. Dutchess was the most common soil series (16% of all samples), followed by Pittstown (15%), Stissing (10%), Stockbridge and Barnardston (9% each).

Organic matter levels, as measured by loss-on-ignition, ranged from less than 1% to 60% (most likely a topsoil or organic amendment). For homeowners most samples had between 2 and 5% organic matter (58% of all samples), 11% testing between 5 and 6% organic matter and 20% was classified as soils with more than 6% organic matter. Of the

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samples submitted by commercial growers, 60% contained between 3 and 5% organic matter.

Soil pH in water (1:1 soil:water extraction ratio) varied from less than 4.1 to 8.3 for home and garden samples while 64% tested between pH 6.0 and 7.4. For the commercial samples, the highest pH was 7.9 and 81% tested between pH 5.5 and 7.0.

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, 14% of the soils tested low for P, 13% tested medium, 37% tested high and 36% tested very high. This meant that 72% tested high or very high in P. For commercial growers, 5% tested very high. In total 32% were low in P, 29% tested medium for P while 34% of the submitted samples were classified as high in soil test P. This means that 39% 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 Dutchess County soils varied from very low (2% of the homeowner soils and 4% of the commercial growers' soils) to very high (49% of the homeowner soils and 32% of the commercial growers' soils). For homeowners, 9% tested low in K, 13% tested medium, and 28% tested high for potassium. For commercial growers' soils, 17% tested low, 21% tested medium and 25% 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 12 to more than 10000 lbs Mg/acre (most likely topsoil samples). There were only two soils that tested very low for Mg. Most soils tested high or very high for Mg (96% of the homeowner soils and 96% of the soils of the commercial growers).

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 96-97% in the normal range with only 4% of the homeowner soils and 3% of the commercial grower soils testing excessive for Fe. Similarly, most soils (88% of homeowner soils and 96% of commercial grower samples) 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, 87% tested high for Zn while 10% tested medium and 5% were low in Zn. Of the commercial growers' samples, 7% tested low, 22% tested medium while 71% 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 are requested by homeowners:

	2002	2003	2004	2005	2006	Total	%
ALG	9	7	4	3	4	27	4
APR	1	0	0	0	0	1	0
ATF	1	1	0	3	11	16	2
BLU	1	4	2	4	2	13	2
CUR	0	0	0	0	10	10	1
FAR	3	2	4	0	0	9	1
FLA	4	2	0	1	1	8	1
GEN	3	0	7	2	0	12	2
GRA	5	1	1	1	5	13	2
HRB	4	0	1	1	1	7	1
IDL	0	0	0	0	3	3	0
LAW	44	50	35	41	65	235	33
MVG	39	25	26	27	40	157	22
OTH	6	0	5	5	4	20	3
PER	23	9	13	15	10	70	10
PRK	0	2	0	0	0	2	0
PTO	0	0	1	0	0	1	0
PUM	0	1	0	0	0	1	0
ROS	5	0	2	2	1	10	1
RSP	3	1	0	1	0	5	1
SAG	17	5	17	8	24	71	10
SOD	1	0	0	0	0	1	0
SPB	1	0	0	0	0	1	0
STR	1	0	2	2	1	6	1
TRF	2	3	2	1	4	12	2
Unknown	0	1	0	0	0	1	0
Total	173	114	122	117	186	712	100

Note: See Appendix for Cornell crop codes.

3.2 Commercial Samples

Crops for which recommendations are requested in commercial samples:

Current year crop	2002	2003	2004	2005	2006	Total	%
ABE	3	0	1	0	0	4	1
AGE/AGT	15	40	14	20	12	101	13
ALE/ALT	7	9	3	3	1	23	3
ALG	0	0	0	0	1	1	0
APP	0	0	0	8	12	20	3
ASP	0	0	0	0	1	1	0
BCE	1	0	0	0	0	1	0
BGE	1	0	2	0	0	3	0
BUK	0	0	0	0	1	1	0
CGE/CGT	6	7	6	0	1	20	3
CHT	1	0	0	0	0	1	0
CLE/CLT	19	3	14	7	3	46	6
COG/COS	20	41	25	13	4	103	14
CSE/CST	6	0	0	0	0	6	1
CUR	0	0	0	0	2	2	0
GIE	0	1	0	0	0	1	0
GPF	0	2	0	4	0	6	1
GPV	5	2	0	0	0	7	1
GRE/GRT	22	25	37	12	30	126	17
IDL	2	0	0	4	0	6	1
MIX	6	0	0	17	7	30	4
OAT	1	3	0	2	0	6	1
OTH	1	8	0	11	0	20	3
PAR	0	0	0	1	1	2	0
PGE/PGT	26	16	20	29	12	103	14
PIE/PIT	2	0	0	1	2	5	1
PLE/PLT	2	3	6	0	0	11	1
PNT	8	4	7	9	5	33	4
PUM	3	0	1	0	4	8	1
RSF	1	1	0	0	0	2	0
RYC	2	0	0	2	1	5	1
SOF	3	0	0	0	0	3	0
SOG	13	1	9	0	0	23	3
SOY	2	0	1	0	1	4	1
SSH	0	0	0	0	8	8	1
SUD	0	0	0	2	0	2	0

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Current year crop	2002	2003	2004	2005	2006	Total	%
SUN	0	0	0	0	1	1	0
SWC	0	2	0	2	1	5	1
TOM	0	0	0	2	1	3	0
TRP	0	1	1	0	0	2	0
WHS	0	3	0	0	0	3	0
Unknown	1	0	0	2	1	4	1
Total	179	172	147	151	113	762	100

Note: See Appendix for Cornell crop codes.

4. Soil Types

4.1 Homeowner Samples

Soil types (soil management groups) for homeowner samples:

	2002	2003	2004	2005	2006	Total	%
SMG 1 (clayey)	0	0	0	0	0	0	0
SMG 2 (silty)	13	14	34	16	20	97	14
SMG 3 (silt loam)	62	45	44	51	104	306	43
SMG 4 (sandy loam)	65	33	27	38	50	213	30
SMG 5 (sandy)	33	22	17	12	12	96	14
SMG 6 (mucky)	0	0	0	0	0	0	0
Total	173	114	122	117	186	712	100

4.2 Commercial Samples

Soil series for commercial samples:

Name	SMG	2002	2003	2004	2005	2006	Total	%
Basher	3	3	0	0	0	0	3	0
Bernardston	4	13	6	15	22	10	66	9
Blasdell	3	2	0	0	0	0	2	0
Charlton	4	0	3	9	0	2	14	2
Copake	4	8	17	3	0	3	31	4
Dutchess	4	25	27	16	33	18	119	16
Farmington	3	3	2	2	0	0	7	1
Fredon	4	2	2	3	0	0	7	1
Georgia	4	0	8	4	5	4	21	3
Halsey	4	2	0	0	0	0	2	0
Haven	4	0	0	0	11	25	36	5
Hero	4	1	5	1	0	0	7	1
Hoosic	4	18	17	9	16	3	63	8
Hudson	2	0	0	0	2	2	4	1
Knickerbocker	5	3	0	0	2	0	5	1
Leicester	4	8	0	0	0	0	8	1
Linlithgo	3	2	0	0	0	0	2	0
Madalin	1	2	0	0	2	1	5	1
Mardin	3	0	5	0	0	0	5	1
Massena	4	1	5	0	1	0	7	1
Middlebury	3	5	2	0	1	0	8	1
Nassau	4	1	9	14	9	1	34	4
Pawling	4	4	2	1	2	0	9	1
Paxton	4	1	0	0	0	0	1	0
Pittstown	4	28	30	15	23	19	115	15
Raynham	3	0	0	0	1	0	1	0
Rhinebeck	2	1	0	2	2	0	5	1
Ridgebury	4	2	1	0	0	0	3	0
Scio	3	0	0	0	6	0	6	1
Stissing	4	37	5	13	4	15	74	10
Stockbridge	3	1	25	38	4	3	71	9
Sun	4	0	0	1	0	0	1	0
Sutton	4	0	0	0	0	2	2	0
Wappinger	3	0	0	0	2	0	2	0
Wayland	2	3	0	0	2	1	6	1
Woodbridge	4	0	1	0	0	0	1	0
Unknown	-	3	0	1	1	4	9	1
Total	-	179	172	147	151	113	762	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
2002	1	16	23	42	34	16	17	24	173
2003	3	16	21	30	21	11	6	6	114
2004	5	6	23	27	20	11	8	22	122
2005	2	7	17	19	15	22	12	23	117
2006	2	23	28	50	41	17	6	19	186
Total	13	68	112	168	131	77	49	94	712

	2002	2003	2004	2005	2006
Lowest:	0.4	0.4	0.6	0.8	0.3
Highest:	60.2	8.7	27.2	27.6	56.5
Mean:	5.4	3.7	4.9	5.6	5.1
Median:	4.1	3.5	4.0	4.8	3.7

Organic matter in homeowner 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	9	13	24	20	9	10	14	100
2003	3	14	18	26	18	10	5	5	100
2004	4	5	19	22	16	9	7	18	100
2005	2	6	15	16	13	19	10	20	100
2006	1	12	15	27	22	9	3	10	100
Total	2	10	16	24	18	11	7	13	100

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	1	17	55	49	33	10	14	179
2003	0	1	21	83	46	12	5	4	172
2004	0	3	15	50	38	20	4	17	147
2005	1	13	32	36	44	16	6	3	151
2006	0	16	26	18	34	12	3	4	113
Total	1	34	111	242	211	93	28	42	762

	2002	2003	2004	2005	2006
Lowest:	1.6	1.1	1.3	0.5	1.2
Highest:	53.5	9.8	12.9	8.1	8.8
Mean:	4.9	3.9	4.6	3.7	3.7
Median:	4.2	3.8	4.1	3.9	3.7

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	9	31	27	18	6	8	100
2003	0	1	12	48	27	7	3	2	100
2004	0	2	10	34	26	14	3	12	100
2005	1	9	21	24	29	11	4	2	100
2006	0	14	23	16	30	11	3	4	100
Total	0	4	15	32	28	12	4	6	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
2002	0	4	11	23	32	27	40	27	9	0	173
2003	1	5	7	15	13	38	22	12	1	0	114
2004	0	4	10	22	14	29	30	10	3	0	122
2005	1	3	10	9	14	31	36	13	0	0	117
2006	0	4	11	24	26	43	56	18	4	0	186
Total	2	20	49	93	99	168	184	80	17	0	712

	2002	2003	2004	2005	2006
Lowest:	4.2	4.1	4.5	4.4	4.5
Highest:	8.3	8.0	8.2	7.9	8.3
Mean:	-	-	-	-	-
Median:	6.7	6.7	6.7	6.8	6.8

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	2	6	13	18	16	23	16	5	0	100
2003	1	4	6	13	11	33	19	11	1	0	100
2004	0	3	8	18	11	24	25	8	2	0	100
2005	1	3	9	8	12	26	31	11	0	0	100
2006	0	2	6	13	14	23	30	10	2	0	100
Total	0	3	7	13	14	24	26	11	2	0	100

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	0	10	16	45	48	40	19	1	0	0	179
2003	0	3	8	32	61	47	18	3	0	0	172
2004	1	2	13	31	44	42	14	0	0	0	147
2005	0	1	7	27	50	49	16	1	0	0	151
2006	0	0	6	25	41	37	4	0	0	0	113
Total	1	16	50	160	244	215	71	5	0	0	762

	2002	2003	2004	2005	2006
Lowest:	4.7	4.8	4.4	4.9	5.1
Highest:	7.5	7.9	7.4	7.5	7.4
Mean:	-	-	-	-	-
Median:	6.1	6.3	6.3	6.4	6.3

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	6	9	25	27	22	11	1	0	0	100
2003	0	2	5	19	35	27	10	2	0	0	100
2004	1	1	9	21	30	29	10	0	0	0	100
2005	0	1	5	18	33	32	11	1	0	0	100
2006	0	0	5	22	36	33	4	0	0	0	100
Total	0	2	7	21	32	28	9	1	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	
2002	0	35	20	65	10	4	7	4	6	22	173
2003	0	14	17	41	16	8	5	4	1	8	114
2004	0	14	16	45	12	6	5	5	5	14	122
2005	0	12	11	35	9	7	3	10	4	26	117
2006	0	27	32	74	8	9	8	7	5	16	186
Total	0	102	96	260	55	34	28	30	21	86	712

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	713	587	537	719	1992
Mean:	69	54	76	114	89
Median:	19	24	23	40	18

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	M	H	VH	VH	VH	VH	VH	VH	
2002	0	20	12	38	6	2	4	2	3	13	100
2003	0	12	15	36	14	7	4	4	1	7	100
2004	0	11	13	37	10	5	4	4	4	11	100
2005	0	10	9	30	8	6	3	9	3	22	100
2006	0	15	17	40	4	5	4	4	3	9	100
Total	0	14	13	37	8	5	4	4	3	12	100

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

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	86	43	38	9	1	0	0	2	0	179
2003	0	44	49	71	6	1	1	0	0	0	172
2004	0	61	43	39	1	2	0	1	0	0	147
2005	0	26	50	63	8	2	1	0	1	0	151
2006	0	27	36	45	1	0	3	0	1	0	113
Total	0	244	221	256	25	6	5	1	4	0	762

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

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	171	86	111	166	168
Mean:	10	12	8	16	14
Median:	4	7	5	8	7

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	48	24	21	5	1	0	0	1	0	100
2003	0	26	28	41	3	1	1	0	0	0	100
2004	0	41	29	27	1	1	0	1	0	0	100
2005	0	17	33	42	5	1	1	0	1	0	100
2006	0	24	32	40	1	0	3	0	1	0	100
Total	0	32	29	34	3	1	1	0	1	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	
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 Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	3	4	6	13
2003	0	2	2	4	6	14
2004	0	2	7	7	18	34
2005	0	0	2	4	10	16
2006	0	0	2	8	10	20
Total (#)	0	4	16	27	50	97
Total (%)	0	4	16	28	52	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	2	5	8	18	29	62
2003	0	4	3	12	26	45
2004	0	3	7	10	24	44
2005	0	2	4	16	29	51
2006	3	12	12	35	42	104
Total (#)	5	26	34	91	150	306
Total (%)	2	8	11	30	49	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	1	4	6	13	41	65
2003	1	5	3	12	12	33
2004	1	2	5	7	12	27
2005	0	2	5	7	24	38
2006	0	7	9	14	20	50
Total (#)	3	20	28	53	109	213
Total (%)	1	9	13	25	51	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	3	1	1	9	19	33
2003	0	4	4	8	6	22
2004	0	3	5	4	5	17
2005	1	3	1	3	4	12
2006	1	1	3	2	5	12
Total (#)	5	12	14	26	39	96
Total (%)	5	13	15	27	41	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 (%)	-	-	-	-	-	-

Potassium classification summary for homeowners:

Summary (#)	Very Low	Low	Medium	High	Very High	Total
2002	6	10	18	44	95	173
2003	1	15	12	36	50	114
2004	1	10	24	28	59	122
2005	1	7	12	30	67	117
2006	4	20	26	59	77	186
Grand Total	13	62	92	197	348	712

Summary (%)	Very Low	Low	Medium	High	Very High	Total
2002	3	6	10	25	55	100
2003	1	13	11	32	44	100
2004	1	8	20	23	48	100
2005	1	6	10	26	57	100
2006	2	11	14	32	41	100
Grand Total	2	9	13	28	49	100

	2002	2003	2004	2005	2006
Lowest:	28	35	36	54	34
Highest:	3883	1322	28141	1719	22761
Mean:	368	249	575	327	546
Median:	244	199	216	255	185

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	0	0	2	2
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	0	0	2	0	2
2006	0	0	0	0	1	1
Total (#)	0	0	0	2	3	5
Total (%)	0	0	0	40	60	100
Soil Management Group 2						
	<40	40-69	70-99	100-164	>164	Total
	Very Low	Low	Medium	High	Very High	
2002	0	1	0	1	2	4
2003	0	0	0	0	0	0
2004	0	0	1	1	0	2
2005	0	2	1	3	0	6
2006	0	0	0	0	3	3
Total (#)	0	3	2	5	5	15
Total (%)	0	20	13	33	33	100
Soil Management Group 3						
	<45	45-79	80-119	120-199	>199	Total
	Very Low	Low	Medium	High	Very High	
2002	0	0	6	5	5	16
2003	0	8	7	8	11	34
2004	5	9	9	6	11	40
2005	0	1	4	1	8	14
2006	0	0	1	2	0	3
Total (#)	5	18	27	22	35	107
Total (%)	5	17	25	21	33	100

Soil Management Group 4						
	<55	55-99	100-149	150-239	>239	Total
	Very Low	Low	Medium	High	Very High	
2002	8	21	40	39	43	151
2003	8	32	30	33	35	138
2004	9	27	21	14	33	104
2005	1	14	26	49	36	126
2006	2	10	16	23	51	102
Total (#)	28	104	133	158	198	621
Total (%)	5	17	21	25	32	100
Soil Management Group 5						
	<60	60-114	115-164	165-269	>269	Total
	Very Low	Low	Medium	High	Very High	
2002	0	3	0	0	0	3
2003	0	0	0	0	0	0
2004	0	0	0	0	0	0
2005	0	1	0	0	1	2
2006	0	0	0	0	0	0
Total (#)	0	4	0	0	1	5
Total (%)	0	80	0	0	20	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 (%)	-	-	-	-	-	-

Potassium classification summary for commercial samples.

Summary (#)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	8	25	46	45	52	3	179
2003	8	40	37	41	46	0	172
2004	14	36	31	21	44	1	147
2005	1	18	31	55	45	1	151
2006	2	10	17	25	55	4	113
Grand Total	33	129	162	187	242	9	762

Summary (%)	Very Low	Low	Medium	High	Very High	Un-known	Total
2002	4	14	26	25	29	2	100
2003	5	23	22	24	27	0	100
2004	10	24	21	14	30	1	100
2005	1	12	21	36	30	1	100
2006	2	9	15	22	49	4	100
Grand Total	4	17	21	25	32	1	100

	2002	2003	2004	2005	2006
Lowest:	36	34	24	30	46
Highest:	1179	1068	1729	718	990
Mean:	212	200	203	202	248
Median:	156	145	120	172	223

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	
2002	0	2	5	18	148	173
2003	0	1	3	18	92	114
2004	0	2	8	11	101	122
2005	0	2	0	6	109	117
2006	1	2	6	22	155	186
Total	1	9	22	75	605	712

	2002	2003	2004	2005	2006
Lowest:	52	47	30	31	12
Highest:	2320	1391	18346	2183	23276
Mean:	576	433	641	589	689
Median:	484	394	400	499	392

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	1	3	10	86	100
2003	0	1	3	16	81	100
2004	0	2	7	9	83	100
2005	0	2	0	5	93	100
2006	1	1	3	12	83	100
Total	0	1	3	11	85	100

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	1	6	7	24	141	179
2003	0	1	2	22	147	172
2004	0	1	6	17	123	147
2005	0	0	4	18	129	151
2006	0	1	2	15	95	113
Total	1	9	21	96	635	762

	2002	2003	2004	2005	2006
Lowest:	18	38	64	74	33
Highest:	1911	1133	1428	1317	1262
Mean:	405	420	421	399	365
Median:	387	402	381	355	319

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	1	3	4	13	79	100
2003	0	1	1	13	85	100
2004	0	1	4	12	84	100
2005	0	0	3	12	85	100
2006	0	1	2	13	84	100
Total	0	1	3	13	83	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	170	3	173
2003	111	3	114
2004	114	8	122
2005	112	5	117
2006	177	9	186
Total	684	28	712

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	98	2	100
	97	3	100
	93	7	100
	96	4	100
	95	5	100
	96	4	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	68	128	423	74	139
Mean:	9	12	19	11	14
Median:	5	6	8	6	8

10.2 Commercial Samples

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

Total number of samples:

	0-49	>49	Total
	Normal	Excessive	
2002	173	6	179
2003	168	4	172
2004	139	8	147
2005	150	1	151
2006	111	2	113
Total	741	21	762

Percentages:

	0-49	>49	Total
	Normal	Excessive	
	97	3	100
	98	2	100
	95	5	100
	99	1	100
	98	2	100
	97	3	100

	2002	2003	2004	2005	2006
Lowest:	1	1	1	1	1
Highest:	108	106	297	61	53
Mean:	9	7	14	7	7
Median:	4	4	6	5	5

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	152	21	173	88	12	100
2003	106	8	114	93	7	100
2004	101	21	122	83	17	100
2005	100	17	117	85	15	100
2006	164	22	186	88	12	100
Total	623	89	712	88	13	100

	2002	2003	2004	2005	2006
Lowest:	12	11	18	17	9
Highest:	675	285	239	377	557
Mean:	61	55	65	70	61
Median:	43	47	53	57	48

11.2 Commercial Samples

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

Total number of samples:				Percentages:		
	0-99	>99	Total	0-99	>99	Total
	Normal	Excessive		Normal	Excessive	
2002	167	12	179	93	7	100
2003	169	3	172	98	2	100
2004	138	9	147	94	6	100
2005	146	5	151	97	3	100
2006	110	3	113	97	3	100
Total	730	32	762	96	4	100

	2002	2003	2004	2005	2006
Lowest:	11	8	16	17	5
Highest:	379	119	405	222	228
Mean:	52	36	50	44	42
Median:	42	31	39	37	34

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	3	12	158	173
2003	1	10	103	114
2004	0	13	109	122
2005	1	14	102	117
2006	19	23	144	186
Total	24	72	616	712

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
2	7	91	100
1	9	90	100
0	11	89	100
1	12	87	100
10	12	77	100
3	10	87	100

	2002	2003	2004	2005	2006
Lowest:	0.2	0.2	0.5	0.1	0.1
Highest:	225.6	451.1	50.9	254.6	355.5
Mean:	9.5	13.6	8.2	11.6	10.9
Median:	3.6	3.2	5.2	4.7	3.1

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	8	35	136	179
2003	5	32	135	172
2004	13	34	100	147
2005	6	34	111	151
2006	21	34	58	113
Total	53	169	540	762

Percentages:

<0.5	0.5-1.0	>1	Total
Low	Medium	High	
4	20	76	100
3	19	78	100
9	23	68	100
4	23	74	100
19	30	51	100
7	22	71	100

	2002	2003	2004	2005	2006
Lowest:	0.1	0.2	0.2	0.1	0.1
Highest:	69.8	11.6	14.1	15.0	20.8
Mean:	3.0	2.0	2.0	2.0	1.8
Median:	1.7	1.7	1.5	1.5	1.1

Appendix: Cornell Crop Codes

Crop codes used in the Cornell Nutrient Analysis Laboratory.

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

Crop Code	Crop Description
	Corn
COG	Corn grain
COS	Corn silage
	Grasses, pastures, covercrops
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