

# The OrganicA Project - Evaluation of Soil Health in Two Vermont Organic Apple Orchards

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## Project Background

After extensive grower input, the multi-state, multi-disciplinary OrganicA Project was initiated in 2006 through a USDA OREI grant to examine the opportunities and challenges of organic production within two major orchard systems growers are using to change to new cultivars and with five of the top apple cultivars that growers identified as important to the future of the industry in New England (Ginger Gold, Honeycrisp, Liberty, Macoun, Zestar!). The orchard systems are: (i) a new orchard planted with young trees purchased from a nursery and (ii) a “top-grafted” orchard, i.e., an established, older orchard onto which new cultivars are grafted. Orchard 1 was planted in April 2006 and Orchard 2 was originally planted in 1988 with the cultivars Liberty and McIntosh and was top-grafted to the five new cultivars in 2006. Orchards were managed organically during the establishment years 2006 – 2008, with organic certification received in 2008. The orchards began to produce significant crops of fruit in 2009.



## Methods

Soil health sampling is conducted at the end of April each year. Soils are sampled from the tree row throughout each orchard. One composite sample is taken per experimental orchard. Soils are sampled using a trowel to remove the top 6-inches of soil. The surface is scraped off to remove surface debris and the sample is placed into a plastic bucket. Ten trowel samples were taken per orchard. Once the samples were collected, the soil was thoroughly mixed and a 1.5 quart subsample was placed in a plastic bag. Soil penetrometer readings were also taken at the 10 sample sites to measure surface (0-6 inches) and subsurface (6-18 inches) compaction. The samples were shipped immediately with dry ice to the Cornell Soil Health Testing Laboratory in Geneva, NY for analysis. At the lab biological, physical, and chemical soil health measurements were conducted according to methods reported by Guigino et al.(2009). Soil biological measurements included organic matter, active carbon, and potentially mineralizable nitrogen. Soil physical property measurements included aggregate stability, available water capacity, surface and subsurface hardness. Chemical properties measured included pH, extractable phosphorus, extractable potassium, and minor elements. No statistical analysis was conducted on the data presented. Data is presented as an average across Orchard 1 and 2 by year and by year for each Orchard 1 and 2.

## Results

Table 1. Physical and biological properties of organic orchards, OrganicA Project.

Year	Aggregate stability	Available water capacity	Surface hardness	Subsurface hardness	Organic matter	Active carbon	Potentially Mineralizable-N
	%	m/m	psi	psi	%	ppm	ugN/gdwsoil/week
2006	35.4	0.258	178	375	3.08	527	6.60
2007	68.3	0.078	145	334	2.73	501	12.45
2008	54.7	0.095	176	356	2.83	483	13.98
2009	62.8	0.078	218	377	2.48	681	21.18
2010	62.5	0.093	251	383	3.73	476	12.35
2011	58.9	0.068	113	336	2.83	721	54.45

Table 2 Physical and biological properties of organic orchard 1 and 2, OrganicA Project.

Year	Aggregate stability	Available water capacity	Surface hardness	Subsurface hardness	Organic matter	Active carbon	Potentially Mineralizable-N
	%	m/m	psi	psi	%	ppm	ugN/gdwsoil/week
<b>Orchard 1</b>							
2007	74.2	0.10	100	308	3.8	724	19.6
2008	59.6	0.10	84.0	230	4.3	604	14.0
2009	62.0	0.10	176	348	3.1	680	26.9
2010	65.4	0.11	72.0	358	5.0	562	12.8
2011	64.3	0.08	50.0	290	3.7	879	48.1
<b>Orchard 2</b>							
2007	69.4	0.08	47.0	314	2.2	358	8.8
2008	54.8	0.08	98.0	266	1.9	381	11.4
2009	73.0	0.07	107	321	1.9	568	13.5
2010	64.4	0.08	78.0	350	2.8	363	11.5
2011	50.5	0.07	54.0	407	2.7	742	59.6

🍏 Overall soil health in the rows has remained relatively consistent over the 5 year period. There has been a slight increase in active carbon and potentially mineralizable nitrogen over the period. Organic matter has increased slightly in the older orchard 2. The newer orchard 1 had higher levels of organic matter due to high levels of compost being applied to soil prior to planting.

For additional and more specific research results, please visit the OrganicA Project website: <http://www.uvm.edu/organica>

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