



UVM CENTER FOR SUSTAINABLE AGRICULTURE GRASS FARMING RESEARCH: ROTATIONAL GRAZING, MORE ROOTS, LESS PLOWING

BUILDING SOIL HEALTH ON A CHAMPLAIN VALLEY RESEARCH FARM

ABOUT THE RESEARCH

Our project is taking place on a 400-acre Champlain Valley diversified beef farm with long previous use as a dairy operation. Its recent history includes heavy tillage and synthetic inputs, and the increased frequency of extreme weather events, which both have contributed to soil erosion and disaggregation and resulted in degraded fields. The Center's research team is helping the current farmers recover the soils by monitoring and researching soil health and pasture forage ecosystems as they relate to the production of high-quality, grass-fed, grass-finished beef.

We see pasture-based farming as an inseparable triad of well-functioning soils, abundant and high quality forages, and healthy livestock animals in a constant and balanced rotation. In viewing the farm ecosystem in this way, we recognize the complexities involved in regenerative practices, and see cows as drivers of resiliency and sustainability in the process.

The assumption we are testing is that having high stock density animals graze on hayfields for short intervals will improve the health of the soil. Preliminary results indicate that well-managed grazing can improve soils and a farm's productivity without synthetic fertilizers, and without great additional expense - as many grass-based farmers have believed for years.

KEY RECOMMENDED PRACTICES FOR BUILDING SOIL HEALTH



Soils are kept well covered with a diverse vegetated sward, with plants at least 4" tall.



Animals graze all fields at least once per year, so that microorganisms and nutrients can contribute to soil health.



Organic amendments (on-farm bedded pack compost and low formulation Pro-Gro*) can support overall improvement.

Questions?

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WHAT IS HEALTHY SOIL ON A PASTURE-BASED FARM?

Here are some of the ways we measure it.

Soil organic matter

Soil organic matter is made up of plant and animal residues in different stages of decomposition, cells of soil microorganisms, and substances that are so well-decomposed it's impossible to tell what they were to begin with. Soil organic matter makes up only a few percent of most soils, but it has a great deal of influence on soil properties, and in turn, agricultural productivity.¹ Soil organic matter can also improve soil's water holding capacity.²

Cation exchange capacity

Soil particles are negatively charged and attract positively charged molecules. These molecules can be nutrients, water, herbicides and other soil amendments. A soil particle's ability to react with these molecules is called the cation exchange capacity. If the CEC number is low, not many molecules are able to bind (react) to the particle surface. If the number is high, a larger number of molecules can bind to the particle's surface.³

Stabilized pH

Getting pH closer to a measurement of 7 provides a more neutral soil, which will tolerate a wider variety of forage crops. But whatever the field's numbers, pasture farmers can find some grasses, legumes and forbs that will thrive in Vermont's typical slightly acidic conditions..

1. Definition courtesy UVM Extension Veg. & Berry Program: <https://www.uvm.edu/vtvegandberry/factsheets/soilorganicmatter.html>

2. From NRCS: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050965.pdf

3. Definition courtesy Michigan State Extension at https://www.canr.msu.edu/news/what_is_your_soil_cation_exchange_capacity

METHODS & PRELIMINARY FINDINGS

In 2018, we compiled the results of 25-30 composite samples collected and processed from 13 fields and compared them to 2015 soil tests to see how the fields were responding to reduced tilling, cover cropping and intensively managed grazing. Since 2015, most fields increased organic matter levels, cation exchange capacity, and stabilized pH. A new round of samples will be taken again in 2019 to verify this positive trend.

- We see that improvement to degraded soils is possible when we adopt a soil conservation approach.
- Soil improvements can be slow, and require time, inputs and/or energy.
- From 2015 to 2017, all soils on the farm have been slowly improving in most attributes.
- Data collected to date suggests that in coming years we will see increased yield of bales, forage production and animal performance.

With the right set of practices, improvement can be relatively fast, and can increase over time. From 2015 to 2017, all soils on the farm have been slowly improving in most attributes – especially organic matter, pH and cation exchange capacity. The trends seem to conform to the ways the fields have been managed: those depleted fields that now have rotational grazing on them are recovering the most dramatically.

