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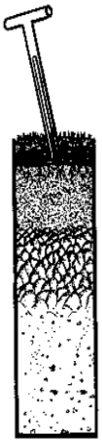


# THE SOIL PROFILE

**A newsletter providing information on issues relating to soils and plant nutrition in New Jersey**

**Volume 25 2020**

## Grass Farming Puts Carbon in Soil

Pasture-based farming systems are among the oldest forms of agriculture and as such underappreciated as a sustainable source of natural products for human health, nutrition, and ecosystem services.

One focus of my soil fertility research program has been concerned with how cows outside on pasture helps put carbon in its place. A ten-year study was conducted on dairy named Bobolink Farm and Bakehouse in Milford, New Jersey that makes raw milk cheese from a herd of dairy cows grazing on permanent pasture.

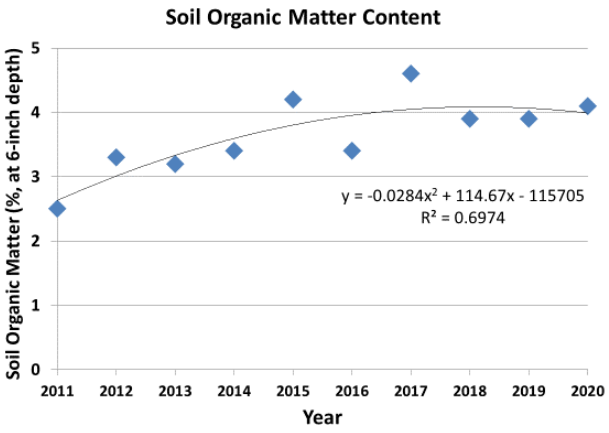
The farm was purchased by Jonathan and Nina White in 2010.

Soil health was reportedly very poor, badly eroded, and low in soil organic matter/carbon content after many years of annual cropping to corn and soybean. Old tillage implements now abandoned at this site suggests that plowing was a routine part of crop production.

After conversion to permanent pasture, I began annually collecting soil samples from the 0 to 6-inch layer of the soil profile for the purpose of measuring changes in soil organic matter content.

The soil samples were analyzed for organic carbon at the Rutgers University Soil Test Laboratory. Soil organic matter is assumed to contain about 58% carbon. A conversion factor of 1.72 is commonly used to convert organic carbon to percent soil organic matter content.

Organic matter % = Total organic carbon % x 1.72




From the data plotted in the above figure, it is apparent that conversion of annual tilled row crop farmland into permanent pasture is an effective way to rapidly rebuild soil organic matter content. The pasture grasses and forbs harvest carbon from the atmosphere via photosynthesis and feed it into soil. The organic matter thus created improves soil quality and acts like a sponge to hold onto moisture.

From the data collected, it appears that conversion to pasture builds soil organic most rapidly in the early years of transition. Soil organic matter continues to accumulate but at with a slower rate as the soil sampling period approaches the end of a decade since transition to pasture.

This study, along with previous research in the Mid-Atlantic region, finds that soil under permanent pasture on average contain about 60% more organic matter than soils under annual crops (Heckman, 2015).

Soils associated with native grasslands, or prairie soils, typically have dark organic matter-rich surface layers. The higher levels of organic matter are generally attributed to the influence of grass vegetation. However, the grazing animals also likely play a role in the ecology of soil organic matter accumulation, as in the case of prairies where there were large herds of bison. Ecologists studying this question suggest that when grasses and forbs are pruned by grazing animals, the plants compensate with additional growth, some of which is pumped into the soil root zone and supports microbial activity.

Besides building soil organic matter content, pasturing livestock has numerous other positive attributes as an ecologically friendly farming system. The soil is better protected from erosion and the organic matter serves as a reservoir for storage of water and plant nutrients, especially nitrogen, phosphorus, and sulfur.

Not only does this system of farming build soil fertility to nourish pasture plants to feed livestock, an increasing body of research shows that foods such as milk, meat, and eggs from animals raised on pasture provide superior nutrition for people (Heckman 2015). Milk, for example, produced by grazing dairy cows, in contrast to confinement feeding operations, have higher levels of conjugated linoleic acid (CLA), and fat-soluble vitamins. Also, the milk has a more favorable balance of omega-3 to omega-6 fatty acids.

In summary, pasture based dairy farming is a sustainable and ecologically friendly agricultural system. It sequesters carbon, prevents soil erosion, builds soil fertility, and produces nutrient rich foods to feed people.

On certified organic farms there is a program (USDA-NOP) requirement that ruminate animals must be kept on pasture and fed for at least 120 days and this feed must account for 30% or more of their intake. This pasture feeding influence tends to differentiate organic dairy products from conventional. Organic milk, especially during the grazing season, typically contains higher concentrations of omega-3 and fewer omega-6 fatty acids than conventional milk. Also because of the pasture requirement, organic dairy foods typically have higher levels of CLA and fat-soluble vitamins.

Many conventional dairy farmers after converting to an organic pasture feeding system, find to their surprise that dairy herd health improves. Thus, well managed grazing systems with cows outside on pasture is good for animal welfare too.

When people look for the most nutritious foods to feed their family, they have good reason to look for farmers that produce animal foods on pasture. The benefits of pasture are not limited to dairy products. The nutritional quality of other animal foods such meat and eggs are similarly enhanced.

Purchasing pasture raised dairy, meat, and poultry products directly from local farms allows one to see that the animals are raised on pasture. One can also be assured that procuring nutritious pasture raised foods are builds soil fertility, is environmentally sound, and animal welfare friendly. (Heckman, 2015, Heckman 2017).

**References:**

Heckman, J.R. 2015. The Role of Trees and Pastures in Organic Agriculture. Sustainable Agriculture Research. 4:47-55.

Heckman, J.R. 2017. Securing fresh food from fertile soil, challenges to the organic and raw milk movements. Journal Renewable Agriculture and Food Systems. 34: 472-485

# The Soil Profile Newsletter

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