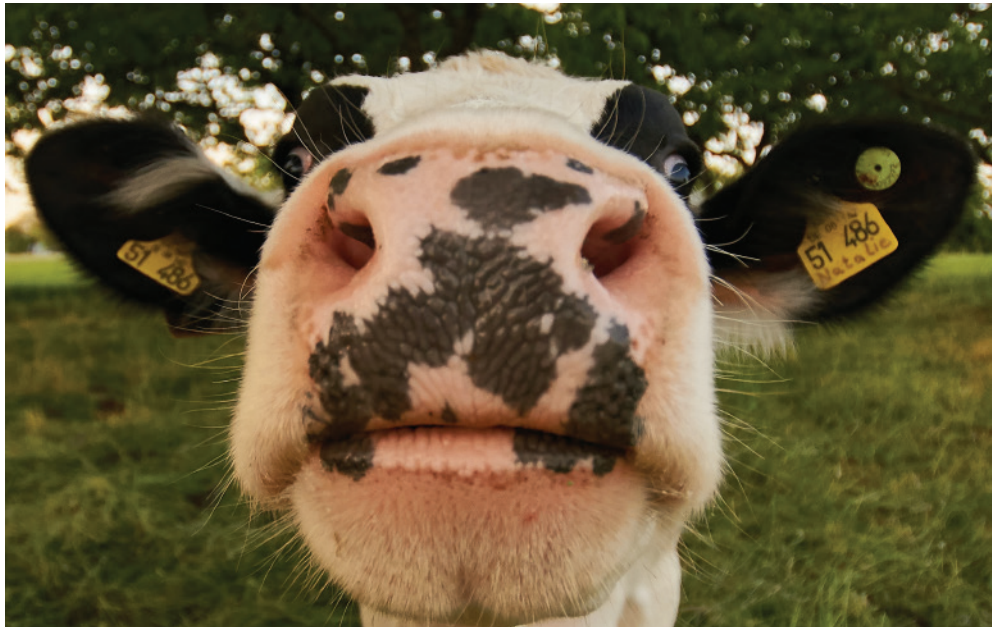

Dairy Cows

Regenerating the Landscape in Massachusetts

Making milk is a daily commitment to caring for cows. But it's also a commitment to caring for the land that our cows inhabit and that our future farmers will rely on for their livelihoods. Dairy farmers across Massachusetts are choosing farm management practices that can improve soil health, protect ecosystems, and preserve open spaces.

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Healthy Soils. Carbon Sequestration. Resilient Ecosystems.

About 33% of soil worldwide is moderately to highly degraded[1]. But dairy farmers have the ability to turn this number around and restore environmental health. Compared to other forms of agriculture, dairy farmers have a particularly wide array of soil restoring practices available to them, such as planned and management intensive grazing, reduced tillage, planting diversified cover crops, and utilizing manure for fertilization. Using these practices here in Massachusetts, dairy farmers are increasing soil health, sequestering atmospheric carbon and building resilient ecosystems.

No-till corn planted for corn silage at Rogers Farm in Warren, MA

Dairy cows on pasture at Rocky Acres Farm in Warren, MA

Cows under tree canopy at Cricket Creek Farm in Williamstown, MA

Healthy Soils

Healthy soils hold more nutrients, support plant and animal life, regulate soil moisture content, resist erosion, and clean water on its way into local waterways.

These valuable features of healthy soils are provided by the mostly-invisible living things that populate soils. As soil life increases, so do these beneficial features of soils that make crops healthier, watersheds cleaner, milk more nutrient-dense, and farming more profitable.

Carbon Sequestration

Dairy farmers can help mitigate climate change through carbon sequestration.

Carbon is sequestered in soil when plants photosynthesize, converting CO2 into carbohydrates (sugars), some of which the plant provides to their fungal and bacterial allies in the soil. The microbial allies exchange nutrients and water for the sugar the plant roots provide.

Through this process, the world's soils remove about 25 percent of fossil fuel emissions each year and store it as active carbon, which enriches microbes and plant life beneath the surface.[5] These sugars and other forms of active carbon are exchanged among the microbial community—some is used for growth and energy by the microbial population, and some is transformed into carbon-rich microbial by-products in the soil, forming stable organic matter known as "humus."

Pasture and Perennial Grasses

Pastures and grasslands contain 10-30 percent of the world's soil carbon.[6]

Compared to all other agricultural land uses, research shows that soil organic matter (SOM) and water quality are highest in grass/pasture settings and that grazing livestock on top of these pastures builds soil organic matter.

Glomalin, the essential sugar-protein compound in mycorrhizal fungi that acts like glue to hold soil together, is found in high quantities in the soils of grasslands and prairies, particularly those of which are filled with indigenous grass species.[7]

Perennial forms of agriculture can build and retain soil carbon and fertility because living roots are in place year-round and can grow very deep given the right conditions, moving carbon to greater soil depths than annual agriculture can achieve. Bob Richardson of Rocky Acres Farm, a fully grass-based dairy farm, has achieved soil organic matter levels of 7-10% on his pastures, while annual cropland typically only contains 2-4% in Massachusetts.

Planned Grazing

Grazing pastures responsibly includes allowing plant regrowth and recovery, minimizing soil compaction and limiting manure build up. Farmers can adapt their grazing plans based on goals and local conditions to specifically stimulate deeper roots and greater accumulation of soil carbon / organic matter. Soil organic matter increases water holding capacity, which reduces the risk of both flood and drought.[1]

Having a healthy root structure helps to regulate soil temperature, which is then slower to warm in the spring and slower to cool in the fall. Temperature fluctuations are less extreme, which allows for more ideal growing conditions throughout the year and a longer grazing season in general.

As cows graze, a signal is sent to the plants to excrete sugar through its roots, which feeds the microorganisms in the soil. This exchange allows nitrogen, phosphorus and carbon to become more available to surrounding plants, which in turn creates healthier pastures.[2]

"When cows bite the grass, the vibrations stimulate the whole root community to grow and there is an uptick in microbial activity. The contact between the cow and the soil is very important."

- Phyllis Van Amburgh, Dharma Lea Farm, Sharon Springs, NY

Cover Crops

Maintaining green cover over the soil year-round protects land from wind and water erosion and improves soil health by strengthening aggregates and supporting soil biology. Keeping living roots in the soil feeds microbial partners, increasing fungal and bacterial diversity, raising soil organic matter, allowing aeration, and improving the soil's capacity to regulate moisture levels.

Cover crop mixes and diverse perennial grasses can also provide high quality forage for cattle,[3] and farmers who graze their cover crops see significant economic and soil health benefits.

Reduced Tillage

Minimizing tillage on annual crop fields and in pastures preserves soil structure and soil microbial communities, especially the critically-important mycorrhizal fungi.

Examples of tillage reduction practices being used by many Massachusetts dairy farms include: reducing or eliminating moldboard plowing, terminating cover crops using a roller crimper or flail mower, and planting grain crops, cover crops, and pasture species with a no-till drill.

Manure Management

Cow manure is a good source of nitrogen, phosphorus and potassium, all of which are important minerals for future plant growth.

Unlike other fertilizers, manure includes a high percentage of lignin, or undigested solid matter, which provides vital carbon compounds that build soil structure and supplies food for the microbial population.[4]

By leaving a heavy residue of grass that has been trampled on pasture in addition to sporadic manure droppings, the cows themselves help to feed the next crop of grass.

When manure is composted with bedding and spread on fields, it returns nutrients and microbial life to the soil.

"What we're trying to do here when we grow food is preserve life, and there's more life below ground than above."

- Will Rogers, Rogers Farm, Warren, MA

Silvopasture

Integrating livestock, pastures, and trees is known as silvopasture.

Trees are incredibly efficient at storing atmospheric carbon in their trunk, leaves, and in their root system and rhizosphere (the soil ecosystem in the tree root-zone).

Incorporating trees on pastureland increases root diversity and fungal activity in the soil, which in turn increases soil organic matter and soil carbon. Combined with planned grazing, a silvopasture is widely considered to be the top carbon-sequestering agricultural land use practice by experts in agriculture, carbon and climate change.[8]

Wildlife

Pastures provide protected spaces for plants, animals and people to enjoy.

Grasslands and silvopastures can increase wildlife diversity by ensuring open space for birds and other animals to eat, drink, breed and find shelter.

Understories or brushy areas at the edge of pastures provide vital habitat for many varieties of plants and animals.

Wild animal populations are important to protect in order to maintain the predator, prey, decomposer and preserver roles of a balanced ecosystem.

Plant Biodiversity

Research has found that vegetation is more productive in the long run when more plant species are present. Every additional species in a given area increases soil fertility and biomass production.[9]

When grazing open areas, cows tend to eat the highest forage first, removing the upper canopy of the pasture and allowing sunlight to access shorter varieties of plants. These plants are then able to photosynthesize and grow faster, increasing biodiversity of the landscape.

Understories at the field edges tend to be more humid than other areas of the pasture, which allows ferns, mosses and fungi to flourish. This type of environment also encourages decomposition and nutrient recycling.

Open Spaces

Some native plant species require soil types or moisture levels commonly found in open space areas. Large areas of undeveloped land, like pastures, allow rain to be absorbed into the soil, which replenishes the groundwater that supplies our drinking water.

Open spaces also enhance the beauty and enjoyment of our communities.

Dairy farms in Massachusetts maintain 113,600 acres of open space and land preservation, about 10 percent of the total farmland in the state,[10] and are the Commonwealth's largest farms on average; with each dairy farm being nearly 355 acres in size.[11] Our state dairies play an import role in preserving land for environmental and human health.

Dairy farms can have a net environmental benefit through soil restoration and landscape diversity. As with all food choices, it's not the 'what' but the 'how' it's grown that matters. Please learn more about and support your Massachusetts dairy farmers.

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