Let Them Eat Grass

At Open Book Farm in Middletown, Maryland, cattle graze rotationally.

Grazing in the Chesapeake Bay Watershed

Farmers play a critical role with water quality in local streams, rivers, and the Chesapeake Bay. The same management practices that keep fertilizers, manure, and sediment out of the water can also increase profitability, improve soil health, increase farm resilience to severe weather, and help fight global climate change, benefiting farmers, environmental restoration efforts and communities.

One of the farming practices most effective for achieving these benefits is rotational grazing. By frequently moving livestock between diverse pastures and allowing plants and roots time tov regenerate, the plants and roots act like a sponge to soak up rainfall, trap nutrients and soil on the land, require less fertilizer, and store carbon-rich organic material in the ground.

With support from both the National Fish and Wildlife Foundation (NFWF) and the Natural Resources Conservation Service (NRCS), the Chesapeake Bay Foundation has increased adoption of rotational grazing in Virginia, Maryland, Virginia, and West Virginia by enhancing outreach efforts, leveraging agency and private funding to assist farmers, and quantifying the environmental and economic benefits of regenerative practices on farms across the Bay watershed.

Farm Case Study: Open Book Farm

Farm: Open Book Farm, a 192-acre diversified farm that grows organic vegetables and raises 100 percent grass-fed beef, pastured poultry, and swine.

Owner: Andrew and Mary Kathryn Barnet

Baseline Practices: Prior to the Barnets purchasing this farm, Open Book Farm was a conventional dairy operation with confined animals and roughly 133 acres grown in soybean, corn, and winter wheat.

On-Farm Changes: The Barnets purchased the farm in 2015 and have progressively taken over its management from the previous owner. They converted 116 acres into rotationally grazed pasture and raise approximately 10 beef steers, 2,000 broiler chickens, 200 laying hens, 100 turkeys, and 20 swine each year.

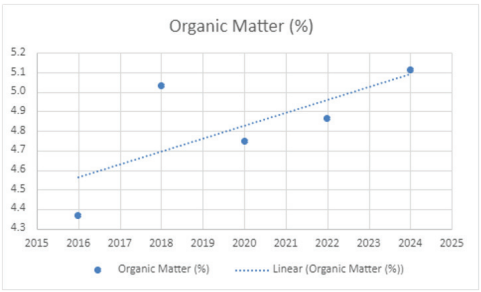
Environmental Benefits of Rotational Grazing

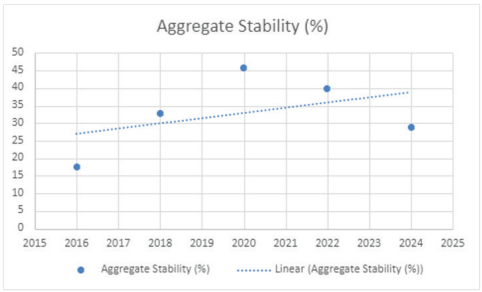
Water Quality: A regional modeling tool was used to estimate water-quality benefits from the implementation of six acres of riparian buffer and 116 acres of pasture establishment and rotational grazing.

Pollutant	Pounds reduced per year from riparian buffer implementation	Pounds reduced per year from pasture establishment and grazing implementation	Total (pounds reduced/year)
Nitrogen	393	2,240	2,632
Phosphorus	4	30	34
Sediment	12,561	140,368	152,929

Soil Health is determined by measuring several physical, biological, and chemical indicators. These indicators result in a rating from zero to 100, where higher scores are better. From 2016 to 2024, Open Book Farm's average soil health rating increased from 72 to 88, following pasture establishment and rotational grazing implementation. Key indicator improvements on farm were seen in organic matter and aggregate stability.

Organic Matter improves soil structure, water infiltration and holding capacity, and nutrient cycling.



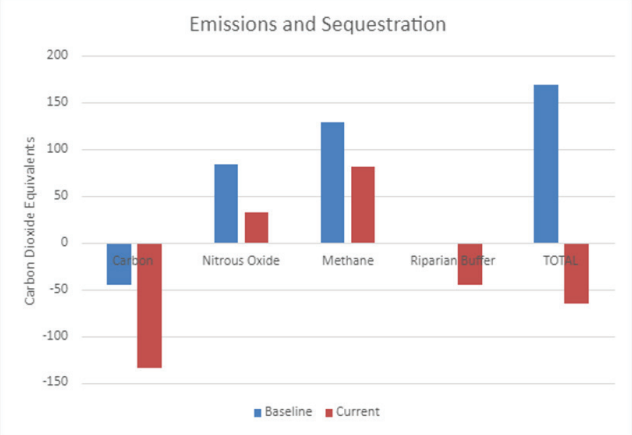


Aggregate Stability reduces erosion and improves water infiltration and drought resistance.

Greenhouse Gases

A farm-scale tool was used to estimate changes in greenhouse gas emissions at Open Book Farm. Overall, emissions from the farm decreased roughly 106 percent, transitioning the farm from a carbon emission source to a carbon sink.

CARBON DIOXIDE (CO2) is the most abundant greenhouse gas, but the least potent in terms of its ability to trap heat in the atmosphere. CO2 enters the atmosphere primarily through the burning of fossil fuels. It is removed from the atmosphere (or sequestered) when it is absorbed by plants and soils.	Converting from cropland to rotational grazing increases soil organic matter. Organic matter is directly related to soil organic carbon, so higher values indicate higher amounts of soil carbon sequestration. There is national and global interest in building healthy soils because of the huge capacity of soils to sequester carbon. Fossil fuel use can also be lower in grazing systems due to reduced use of farm equipment for planting and harvesting.
NITROUS OXIDE (N2O) is 265 times[1] as potent as CO2. N2O is predominately produced in the soil by microbial processes and is heavily influenced by nitrogen fertilizer and manure application. The storage and handling of livestock manure is another source of on-farm emissions.	Converting fields from grain crops to pasture usually means less use of nitrogen fertilizer. As a result, on-farm emissions of N2O can decrease substantially.
METHANE (CH4) is 28 times as potent as CO2 in terms of its ability to trap heat. Emissions of methane from livestock are a by-product of the fermentation process cows use to extract nutrition from the food they eat. Methane is also emitted from manure management systems. Manure releases methane when it decomposes in anerobic, oxygen free, systems found in manure storage lagoons.	Enteric emissions of methane typically increase when cows are converted to a grass-based diet. Fortunately, these increases are often offset by increases in carbon sequestration and decreases in N2O emissions. On pasture-based farms, cows defecate on grass and decompose aerobically, with oxygen, therefore their manure releases significantly less methane.



In addition to cattle, Open Book Farm also has 2,000 broiler chickens and 200 laying hens.

In addition to the working lands, Open Book Farm also maintains 41 acres of land in established forest. Preventing forest loss ensures an additional 5,831 metric tons of CO2e remains sequestered on the land instead of being released into the atmosphere.[2] These trees also sequester and additional 0.78 metric tons of carbon per acre per year in living biomass.

Farmer's View

In a conversation with MK Barnet, she shared that they were able to realize the dream they had for their farm and the land much more quickly with the help of federal cost-share programs and one technical assistance staff.

One of the transformations the Barnets have observed at Open Book is that during rain events there is no muddy water running down their driveway anymore. The soil is staying on their land and much more water is being retained in their soils, which has been critical given the recent drought.

"Our farm would have looked totally different. It's possible we would have done all of these changes but they would have been on a smaller scale, and a much longer timeline. Establishing pasture is very expensive, and fencing was only affordable through these cost-share programs."—MK Barnet

For Open Book, timing was key, and by investing the money in their practices up front, they had to time their projects with their farm's cashflow. The potential of a turnkey forest buffer program excited Barnet, because having funding up front and three years of built-in maintenance for projects would ease the physical and financial burden on the farmer. Having up-to-date cost-share values that reflect the actual cost of practices is also critical to reduce the farmer's burden and make these management changes more accessible. Perimeter fencing to establish grazing pasture is a huge financial barrier to entry and cost sharing this practice at 100 percent will make regenerative grazing more accessible to next generation farmers.

1. https://ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf
2. https://extension.psu.edu/the-economic-value-of-private-forests-and-climate-change-mitigation