



## Grazing As A Vermont Climate Solution

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All sectors of the economy - agriculture, transportation, industry, manufacturing, etc. - must reduce greenhouse gas emissions. Agriculture, alone, can do better than this, by reducing emissions below zero and extracting excess carbon from the air.

Soil restoration is an essential part of climate change mitigation. Soils hold 5 times the amount of carbon in the atmosphere, so even small increases in soil organic matter remove significant amounts of carbon from the atmosphere and help to cool the planet.

The world's agricultural soils have lost half or more of their original carbon since the dawn of farming some 10,000 years ago, the result of deforestation, plowing, burning, and mismanaged grazing (and, more recently, application of synthetic fertilizers and pesticides). Although atmospheric carbon cannot readily be converted back into coal, oil, and natural gas, it can be returned to soil by regenerative cropping and grazing practices that improve soil health.

Industrial livestock management is harmful to human and animal health, and the environment, but it's not the only option. New forms of grazing management, where animals are on pasture their entire lives, restore fertility to soil. As soil becomes carbon-rich, it captures and holds more rain. This reduces flooding while replenishing dried-up rivers, helping to create a safer and more resilient climate future.

Farmers in Vermont putting this new approach to work need our support. The Vermont Grass Farmers Association advocates for grazing in a way that, by mimicking nature, grows soil carbon and improves water retention. Published, peer-reviewed scientific studies show effective grazing management can capture, or "draw down," 1 to 3 tons of carbon per acre each year. Properly done, grazing removes more than enough carbon from the air to compensate for an animal's enteric methane emissions. As well, healthy soil contains methanotroph bacteria that metabolize (consume) methane. Methane from ruminants is only an issue of concern in the context of concentrated animal feeding operations (CAFO), not when livestock are living naturally on pasture, managed in ways that improve soil health and biodiversity.

Soil4Climate Inc., a Vermont-based organization, estimates that with proper grazing management, Vermont could annually capture in its pastureland soils approximately 200,000 tons of carbon and boost its rainfall holding capacity by nearly a billion gallons. As climate extremes increase, healthy soils will be essential. Pastures, with proper grazing management, are vital to our climate future.



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## Annotated References

- Texas A&M study finds 1.2 tons of carbon per acre per year (1.2 tC/ac/yr) drawdown via properly-managed grazing, and that the drawdown potential of North American pasturelands is 800 million tons (megatonnes) of carbon per year (800 MtC/yr).  
Teague, W. R., Apfelbaum, S., Lal, R., Kreuter, U. P., Rowntree, J., Davies, C. A., R. Conser, M. Rasmussen, J. Hatfield, T. Wang, F. Wang, Byck, P. (2016). The role of ruminants in reducing agriculture's carbon footprint in North America. *Journal of Soil and Water Conservation*, 71(2), 156-164. doi:10.2489/jswc.71.2.156  
<http://www.jswconline.org/content/71/2/156.full.pdf+html>
- University of Georgia study finds 3 tons of carbon per acre per year (3 tC/ac/yr) drawdown following a conversion from row cropping to regenerative grazing.  
Machmuller, M. B., Kramer, M. G., Cyle, T. K., Hill, N., Hancock, D., & Thompson, A. (2015). Emerging land use practices rapidly increase soil organic matter. *Nature Communications*, 6, 6995. doi:10.1038/ncomms7995  
<https://www.nature.com/articles/ncomms7995>
- Michigan State University study finds 1.5 tons of carbon per acre per year (1.5 tC/ac/yr) drawdown via proper grazing methods, and shows in a lifecycle analysis that this more than compensates for a cow's enteric emission of methane.  
Stanley, P. L., Rowntree, J. E., Beede, D. K., DeLonge, M. S., & Hamm, M. W. (2018). Impacts of soil carbon sequestration on life cycle greenhouse gas emissions in Midwestern USA beef finishing systems. *Agricultural Systems*, 162, 249-258.  
doi:<https://doi.org/10.1016/j.agsy.2018.02.003>
- Natural Resource Defense Council (NRDC) document, "Climate-Ready Soil: How Cover Crops Can Make Farms More Resilient to Extreme Weather," shows soil organic matter (SOM) holds ten times its weight in water. See appendix.  
<https://www.nrdc.org/sites/default/files/climate-ready-soil-appendix.pdf>