

## Regenerative Agriculture

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Regenerative agriculture, also called agroecology, [nourishes the soil](#) on which all life depends, especially the microbial life that sequesters carbon in the earth. It is a holistic system of farms, farmers, and customers that is essential to achieve a resilient food system. It blends [regenerative vegetable production](#) with [holistic grazing](#) to supplant industrial farming, now [imperiling human ability to grow food](#). Science shows that small-holder, organic farming is the [best way to feed the world](#). It [revitalizes rural communities](#), improves food health and ecosystems on which food production depends. It links with urban agriculture, ensuring food sovereignty. What is now needed is investment in local farmers to enable them to practice the regenerative farming, [increasing employment](#).

The grasslands are the [world's second largest carbon sink](#), containing [more carbon than the atmosphere](#), and removing a quarter of annual fossil fuel emissions. Pioneered by [Savory Institute](#), regenerative grazing restores soil structure, builds healthy topsoil, nurtures soil microbes, and promotes biodiversity, all of which contribute to long-term productivity and nutritious crops. Savory Institute's [Land to Market program](#), and [Ecological Outcome Verification](#) enable producers to prosper from these replicable, verifiable practices.

We know how to do this: farmers like [Gabe Brown](#) have set forth the [principles](#): animal impact, no-till farming, living roots always in the soil, minimal mechanical disturbance, minimal chemical applications, maximized crop diversity, and most important of all, maximize soil health, especially the mycorrhizal fungi that [sequesters vast amounts of atmospheric CO<sub>2</sub>](#) as mineralized soil carbon. This approach can, [if applied broadly](#), reverse the climate crisis at a profit. Verified field trials have shown that every one percent increase in soil organic matter [increases soil carbon five tons per acre and water holding capacity 20,000 gallons](#) per acre. This latter is particularly essential in a warming, drying world. Used on all the world's grasslands regenerative grazing would, over 30 to 60 years-time, return atmospheric concentrations of carbon dioxide to 280 parts per million, the pre-industrial level. The world's permanent pasture and fodder lands amount to roughly 3.4 billion hectares. Calculations show that using [conservative carbon capture findings](#) of 3 tC/ha/yr (some studies found [8 tC/ha/yr](#) values) on the global hectares of pastureland gives 10.2 GtC/yr potential soil carbon capture via grazing. That would offset all human emissions.

Scientists debate how much carbon soils can store. A [team from Tufts argues](#): "Globally, soils have the potential to sequester up to 3.4 GtC (gigatons of carbon) per year, just enough to close the "emissions gap." If combined with other atmospheric CO<sub>2</sub> removal efforts, such as reforestation, yearly additional carbon capture in soils and forests could be as high as 5 GtC per year." [Verified claims](#) range from the capacity to [absorb all of annual emissions](#), to holding *all* of the carbon now polluting the atmosphere. In contrast, [industrial farming is decarbonizing](#) the world's soils. The world now spends [\\$1 million a minute](#) subsidizing degenerative practices. It is time to realize that smallholder farmers feed the world and we should [support them in implementing agroecology](#) and the other regenerative practices. These practices are already being deployed on [millions of hectares](#), on every continent. Precise practices differ from place to place, as every soil is different, every culture is different, and the measures used should be appropriate to the biome in which it is used, but the principles are universal.

The growing popularity of regenerative agriculture has attracted [major agricultural companies](#). General Mills is committed to help farmers on a million acres [implement regenerative practices](#). Danone, Kellogg, Nestlé, and a dozen others at the recent United Nations Climate Action Summit in New York City, [announced](#) the [One Planet Business for Biodiversity \(OP2B\)](#) coalition to promote regenerative agriculture. Land O'Lakes, the large dairy conglomerate promises to increase [sustainability on 1.5 million acres of U.S.-grown corn](#). Microsoft has pledged to go not only carbon neutral, but [carbon negative by 2030](#) using regenerative agriculture and nature-based solutions to remove all of the carbon that the company ever emitted. Even industrial giants [Cargill and McDonalds](#) have pledged to implement these practices. [Walmart has pledged to become a regenerative](#) company, though it has no idea what that means or how to do it. It is good that these giants are seeking to transform, but essential that we realize that authentic regenerative agriculture starts by [listening to the farmers](#) on the ground and supporting small holder producers.

Vegan advocates call for changes in diet to use less meat. We need to recognize that it's not the cow, it's the how. Industrial meat production is part of the problem, Regenerative grazing is part of the solution. Without it, we will not solve the climate crisis. With it, we can ensure resilient, food production the world around.

One of the best compilations of science evidence for regenerative agriculture is <https://docs.google.com/document/d/1QR9Xk3aq3soidmob6nS9PMstKclImRlIgaVDyFzRkwY/edit?fbclid=IwAR1rMRcnkXGc3pH-L9q6GaBjj-btdwFfSMpO3eU9TG6XDhIzIR4PVX-K80>

Savory Institute, which is one of the founders of this approach also has a compilation of science papers: <https://savory.global/holistic-management/science-library/>

Breakthrough Strategies compilation of research

<https://www.breakthroughstrategiesandsolutions.com/advancing-the-field>

Rodale Institute has its own compilation:

<https://rodaleinstitute.org/science/> and <https://rodaleinstitute.org/science/articles/>

Particularly important peer-reviewed papers include:

Climate change mitigation as a co-benefit of regenerative ranching: insights from Australia and the United States

<https://royalsocietypublishing.org/doi/pdf/10.1098/rsfs.2020.0027>

Paper that focuses on the significant potential of regenerative agriculture in addressing the climate

threat: <https://static1.squarespace.com/static/5c3780907c9327dc2a2e8c64/t/5edf6c3063b8cc74f6f4fff9/1591700528217/Response+to+WRI+-+FINAL.pdf>

Rodale Institute has released several papers on this topic, including the Sept 2020 [https://rodaleinstitute.org/wp-content/uploads/Rodale-Soil-Carbon-White-Paper\\_v8.pdf](https://rodaleinstitute.org/wp-content/uploads/Rodale-Soil-Carbon-White-Paper_v8.pdf) and the more recent

A.-M. Codur et al., Hope Below Our Feet: Soil as a Climate Solution. Retrieved from Global Development and Environment Institute (GDAE), Tufts University, Medford, MA,

2017, <http://ase.tufts.edu/gdae/Pubs/climate/ClimatePolicyBrief4.pdf>

Richard Teague, "Forages and Pastures Symposium: Cover Crops in Livestock Production: Whole-system Approach, Managing Grazing to Restore Soil Health and Farm Livelihoods," Journal of Animal Science, doi:10.1093/jas/skx060, 2018, <https://academic.oup.com/jas/article-abstract/96/4/1519/4833918?redirectedFrom=fulltext>

M. B. Machmuller et al., "Emerging Land Use Practices Rapidly Increase Soil Organic Matter," Nature Communications, 6, 6995, 2015,

doi:10.1038/ncomms7995, <https://www.nature.com/articles/ncomms7995#%20supplementary%20information>

Dr. David Johnson of New Mexico State University has shown how to make a mycorrhizal inoculant using dairy manure and green waste, composted, then put on crop land to sequester up to 15 tons of carbon per acre per year. Mycorrhizal fungi in the soil is what mineralizes carbon, enables the water retention capacity (up to 20,000 gallons of water per acre):

Dr. David Johnson, "Carbon Sequestration: A Practical Approach," Notes to pages 176–178

371, <http://web.nmsu.edu/~johnsoda/Carbon%20Sequestration%20with%20IP%20Agriculture.pdf>

Dr. David Johnson et al., "Development of Soil Microbial Communities for Promoting Sustainability in Agriculture and a Global Carbon Fix," Peer J Preprints, 2015, <https://peerj.com/preprints/789/>

Dr. David Johnson's Research on Fungal-Dominated Compost and Carbon

Sequestration, <https://www.csuchico.edu/regenerativeagriculture/bioreactor/david-johnson.shtml>

A very conservative, but verified third-party study of White Oak Pasture showing that his regenerative practices are offsetting all of the methane emissions (and other GHG) of his cattle operation: <https://blog.whiteoakpastures.com/hubfs/WOP-LCA-Quantis-2019.pdf>

A far better study of Will Harris' work is Ecosystem Impacts and Productive Capacity of a Multi-Species Pastured Livestock System <https://doi.org/10.3389/fsufs.2020.544984> -