Biodiversity for a Livable Climate

Restoring Ecosystems to Reverse Global Warming

Restoration Agriculture

#7 in a series of

Climate Restoration Solutions

A partnership of the Moral Action on Climate
and Biodiversity for a Livable Climate
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"Every human society that has relied on annual crops as staple foods in their diet has collapsed. Every single one". [1]

Our current food system is fundamentally flawed. It not only provides unhealthy diets, while contaminating air, water, and soil, but also contributes to climate instability. Yet rarely is the conventional agricultural system discussed in the context of climate change. Much like the fossil fuel industry, our current approach to food production is extractive and destructive. Restoration Agriculture calls for a paradigm shift from a food production system based largely on annual crops to one based primarily on perennials – from a system dependent on external inputs and continuous battling against nature to one that is largely self-contained, cyclical, and collaborative with natural systems.

Several core themes emerge in this alternative vision:

- Working with nature, not against it, is required for sustainability
- Long-term vision is necessary to make good land management decisions
- Healthy ecosystems remain productive for centuries without external inputs
- Change is a constant, and requires flexibility and adaptability
- Individual and small-scale organic food production is important, but will never displace the need for large-scale production of staple foods, fibers, and possibly energy sources for a growing world population

Restoration agricultural systems require deep transformations in how we interact with the land, with resources, and with each other. The aesthetic sense that neat and orderly monocrops are attractive must give way to the reality that they are unhealthy. Biodiverse systems with varied species of trees, shrubs, vines and groundcover growing in close proximity are healthier, more resilient, and more productive over the long run. Economic systems that rely on the linear "extract, produce, consume, and discard" model must be replaced with circular models based on continuous reuse and recycling, as in nature. Conventional agriculture depends on endless supplies of fossil fuels, fertilizers, and pesticides. Restoration agriculture may use fossil fuels sparingly to get the newly-designed system started, but ultimately seeks to develop alternative sources of fuels for transportation, heavy equipment, heating and other human needs.

Restoration agriculture is a type of permaculture, but applied on a large scale. Permaculture design principles and ethics pervade this type of farming. Care of earth, care of people, and an equitable distribution of resources and surplus production are core values. Cooperation, not competition, is key to the permaculture ethic.

Among the central design principles are:

- Observe and imitate natural patterns as appropriate for desired functionality
- Each element in the system should serve two or more functions
- Important functions should be served in two or more ways
- Create cyclical resource flows
- Make the smallest input that will create the biggest long-term impact, such as land-shaping to affect water flows
- Make use of natural succession patterns and stacking (multiple crops growing at different heights to optimize photosynthesis)

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- Create diverse polycultures with emphasis on perennials to minimize disturbance of soils and to keep soils covered
- Incorporate domesticated animals to optimize ecosystem functions
- Enhance habitats for wild species of all kingdoms

Transitioning from traditional farming to this alternative model can proceed in phases. For example, a large conventional corn operation can be gradually converted to a more restorative farming model by planting rows of large trees as windbreaks, using cover crops to feed and protect the soils, and gradually decreasing external fertilizer and pesticide use. Over time, parts of the corn operation can be converted to polycultures that may be a mix of perennial and annual crops. In the long run, adding diversity will make the farm more resilient to both natural and economic stresses. Alley cropping, silvopasture, holistic grazing and other techniques are beyond the scope of this summary, but are all practices that can help restore degraded ecosystems.

Nutrition for both humans and animals would improve by transitioning away from our current corn-based system. A wide variety of nuts, fruits, and vegetables would provide all the carbohydrates, proteins, fats, minerals, and vitamins required. For meat-eaters, the nutritional quality of meats and poultry raised in a restoration agriculture system would far exceed what is currently available in confined animal feeding operations. Food-borne illnesses and antibiotic resistances which result directly from the way animals are raised in the current high-volume operations would also decrease.

Given that soil degradation and deforestation are major causes of climate instability, this alternative agricultural system would reverse those impacts. The use of pesticides and other biocides in conventional agriculture kills soil microbes which play a vital role in sequestering carbon pulled from the atmosphere by plants during photosynthesis. Fertilizer production and distribution, and food transportation systems in conventional agriculture are heavily dependent on fossil fuels. In restoration agriculture, fertilization occurs through synergistic plant and animal relationships. No external inputs are needed. Transportation of food products would still be required, but biodiesel production can easily be incorporated into these alternative models.

The benefits of transforming our agricultural practices to Restoration Agriculture systems include:

- No toxic inputs in the form of pesticides, fungicides, herbicides, or any other biocides
- Fewer expensive inputs such as fertilizers and fossil fuels
- Less work required once systems are established; crop yields naturally increase over time, rather than decreasing
- Creation of habitat for other species (birds, amphibians, mammals, etc.)
- Improved resilience – if a single crop fails, many others exist to keep overall farm production sustainable and viable
- Less dependence on large corporations or government subsidies
- More opportunity to experiment to identify and propagate new disease resistant varieties
- More nutrient-dense foods, as well as herbs and natural medicinal products
- A healthier ecosystem for future generations, including a more stable climate

New Forest Farm in Wisconsin
"a 106-acre commercial-scale perennial agricultural ecosystem
that was converted from a row-crop grain farm"

Additional Resources:
Bill Mollison, *Introduction to Permaculture*
Mark Shepard, *Restoration Agriculture*
https://www.youtube.com/watch?v=kb_t-sVVzF0 Mark Shepard video

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[1] Mark Shepard, *Restoration Agriculture*, Acres U.S.A., 2013, p. xix (introduction by David Connor)

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