Agroecology

Sustainable & Successful Agricultural Practices in the United States

Agroecology provides a robust set of solutions to the environmental and economic pressures and crises facing American agriculture in the 21st century.

Agroecology is an economically viable and socially just approach to sustainable agriculture and food systems, grounded in ecological and social principles and the integration of science with local and Indigenous knowledge and practice, emphasising farming in harmony with natural cycles and processes, and the political approach of food sovereignty—including the right to produce and access nutritious and culturally appropriate food.

Agroecological farming builds ecological and economic resilience through practices that maintain healthy ecosystem function instead of reliance on external inputs such as synthetic chemical pesticides and fertilizers. The approach strengthens farmers' capacity to withstand environmental and economic stresses posed by climate change, shifting pest pressures and volatility in petroleum and commodity prices. U.S. farmers recognize the importance of resilient production systems, as they face more frequent dramatic weather events such as floods, droughts, fire and big temperature changes.

In the U.S. heartland, weeds have developed widespread resistance to herbicides in response to "Roundup-ready" commodity cropping systems based on herbicide-tolerant genetically engineered seeds. Roundup-resistant weeds have been found on an estimated 90 million crop-acres in the U.S., and resistance to Roundup replacements is rapidly developing.

Faced with these growing challenges, farmers across the U.S. are employing agroecological practices, showing these methods to be productive and viable, leading to economic resilience and success.

Co-benefits of Agroecology

Agroecological farming supports the multifunctional dimensions of agriculture, which include not only food, fiber, jobs and economic well-being, but also cultural, social and environmental benefits, and important ecosystem services such as pollination, natural pest control, nutrient, carbon and water cycling, and erosion control.

In study after study, agroecological farming has been shown to:

- **Improve health and nutrition** through more diverse, nutritious and fresh diets and reduced incidence of pesticide poisonings and pesticide-related diseases;
- **Conserve biodiversity and natural resources** (e.g. soil organic matter, water quality and quantity, crop genetic diversity, natural enemies of pests, pollinator protection, and other ecosystem services);
- **Improve economic stability** and rural livelihoods with increased productivity and more diverse sources of income over extended growing seasons, creating greater job opportunities and reducing vulnerability associated with single commodity price swings;
- **Mitigate climate change and its impacts on farmers** through reduced reliance on fossil fuel and fossil fuel-based agricultural inputs, increased carbon sequestration and improved soil health that enhances efficiency of nutrient cycling and water capture.

Cover crops planted between vine rows reduce erosion, suppress weeds, build soil organic matter, improve soil fertility, reduce nutrient leaching, improve water use efficiency and provide habitat for natural enemies and grazing for livestock. Aurora Fendentz

Case Studies

Agroecological Farming

Native hedgerows provide pollinator habitat & pest control

Singing Frogs Farm, Sebastopol, California

Singing Frogs Farm is an island of biodiversity in a sea of grape monoculture. Paul Kaiser, the farmer, grows fruits and vegetables for the 110 members of his Community Supported Agriculture (CSA) program.

Throughout his fields, Paul has planted flowering hedgerows, comprising thousands of native perennials from several dozen species, selected to ensure blooms year round that provide forage for honeybees and native pollinators. Singing Frogs Farm receives support from the USDA Pollinator Campaign, an initiative designed to assist farmers who diversify their landscapes and restore native pollinator habitat.

As an added benefit, the hedgerows on Paul's farm slow run-off, control erosion, improve soil permeability and infiltration, and help to recharge his aquifer.

Flowering hedgerows provide resources for pollinators and natural enemies. Aurora Fendentz

Hedgerows are also key to Singing Frogs Farm's pest control strategy. As Paul says, "one of the easiest ways to control pests is to create a diverse habitat for natural enemies in your fields." When he first started farming his property, the farm suffered huge outbreaks of aphids and cucumber beetles. These days it has "essentially zero pest issues of any kind." Because his farm is a functioning diverse ecosystem, "Pests never get elevated to the status of being pests. They always stay in low-level populations."

These low-level "pest" populations are a food resource helping to maintain natural enemy populations. On Singing Frogs Farm, even pest insects are beneficial.

Pesticide-free & profitable corn and soy farming

A-Frame Farm, Madison, Minnesota

Carmen Fernholz has grown organic corn and soybean on his 450 acres near Madison, Minnesota, since before there was a market for them. Initially motivated by his aversion to chemical pesticides, his goal was to prove that his organic fields could match the productivity and profitability of his neighbors' conventional cornfields.

Intercropping and crop rotations are key strategies used to maximize nutrient efficiency and fight pests. Aurora Fendentz

To achieve the long-term productivity he sought, he employed agroecological strategies like cover cropping and crop rotation to build soil and soil fertility and to diversify his crops and landscape.

For four decades, his enterprise—A-Frame Farm—has proven remarkably resilient. This is in part because Carmen relies on human resources rather than capital inputs that are vulnerable to price swings and erode soil and water quality and other essential farm resources. His knowledge- and labor-intensive organic system prevented the indebtedness that typically accompanies over-expansion. Meanwhile, the organic premium on his crops—including flax and alfalfa—has grown faster than the price of their conventional counterparts.

Carmen says his highest benchmark of success came ten years ago when a neighbor stopped by and asked him if he would help him transition to organic. "In your own neighborhood, you're never an expert," Carmen said. "I thought that after that many years, if people who have seen my system and watched me over time were willing to sit down and try it themselves, that to me was the beginning of what I felt was a success story."

Building healthy soils for healthy cows

Choiniere Family Farm, Highgate Center, Vermont

"My job is to feed people," says organic dairy farmer Guy Choiniere. In order to feed people, Guy begins by feeding his soil. As a conventional farmer, he had to use increasing amounts of fertilizer to maintain yields and pharmaceuticals to treat his cows. His gut told him none of this was sustainable. "All I wanted was healthier cows," he said.

Guy uses cover crops of deep-rooted radish and rotations of alfalfa to address soil compaction and provide space for air and water to permeate. He also produces 800 tons of composted manure every year to spread onto his pasture and fields. This

organic matter moderates drought and flood, improving both infiltration and water holding capacity. The dry, sandy soils in his very hilly corner of Vermont now retain moisture after rain "like a sponge."

Composted manure supplies microbial life that soils need for nutrient cycling and stable forms of nitrogen that are slowly released to plants. Legumes in Guy's pastures and in his field rotations add both nitrogen and organic matter to his soils.

Manure plays a critical role in recycling mineral nutrients into his soils. Soil organic matter holds onto mineral nutrients better than his sandy soils would have, and balances soil pH so that these mineral nutrients are efficiently taken up by plants. His cover crops draw up nutrients that his grasses cannot access and are left as mulch, feeding his grasses as they decay. The grasses, legumes and small grains all have different root depths enabling them to capture nutrients from different parts of the soil. Together these plants provide a balanced diet for his cows, boosting their immune systems.

There is a direct connection between soil health and animal health. "As soon as I concentrated on building these soils, I started seeing better crops." After two years of employing these methods, Guy started seeing healthier animals. Disease was reduced by 75%. For Guy, managing the fertility of his soils and the health of his cows are the same process.

Animals are used on farms to close ecological loops and improve ecosystem function, while their manure supplies nutrient rich fertilizer.

Crop rotation: Fumigant-free strawberries

Swanton Berry Farms, Davenport, California

Organic strawberry grower Jim Cochran has been growing strawberries along the central coast of California for nearly thirty years. Jim uses agroecological methods to combat the plant fungus, *Verticillium dahliae*, which can devastate strawberry production. Crop rotation enables Jim to avoid dangerous soil fumigants such as cancer-causing methyl iodide and ozone-depleting methyl bromide, which nearly all conventional strawberry producers in California rely on.

The fungus can survive ten years or more in soil without a host. When strawberries are planted in infected soil, the fungus chokes strawberry plants of water and nutrients, resulting in wilting and death. However, Jim discovered that seasonal rotations of broccoli in strawberry fields suppress the fungal disease, thus maintaining competitive organic strawberry yields while safeguarding the health of farmworkers, rural communities and the environment.

Broccoli and other *Brassica* crops are used in rotation with strawberries to fight soil-borne pathogens without toxic fungicides. Aurora Fendentz

The possible mechanisms controlling *V. dahliae* include biofumigation, decomposition and induction of disease resistance. Broccoli and other members of the *Brassica* family produce glucosinolates, which have a suppressive effect on soil-borne pathogens. This biofumigation reduces *V. dahliae* populations in the soil. Jim's soil is rich in organic matter from composts, green manures and cover crops. Soil managed in this way is known to have greater diversity of soil microbes. Diverse soil microbial communities may keep *V. dahliae* in check, preventing any large outbreak of the disease in the strawberry crop. Crops grown in such soil are known to exhibit stronger disease resistance properties.

A rotational planting schedule is another key management strategy. Jim plants fields with strawberries only once every three years, preventing *V. dahliae* populations from building up. The remainder of the time the fields are planted in broccoli or a cover crop. Organic broccoli provides an additional source of income and crop residues are incorporated into the soil as green manure, providing the pathogen-fighting benefits of decomposition and biofumigation.

Productive & Profitable

Farmers adopting agroecological methods have produced equal and sometimes substantially increased yields per unit area compared to those using conventional methods in many parts of the world, although research challenges in specific crops and some agroecosystems remain.

A comprehensive examination of nearly 300 studies worldwide by the University of Michigan concluded that organic agriculture could produce enough food, on a per capita basis, to provide 2,640 to 4,380 kilocalories per person per day (more than the suggested intake for healthy adults). Organic farms in developing countries were found to outperform conventional practices by 57%.

These promising findings may underestimate the full potential of agroecological farming to contribute to increased farm-level productivity, household income and food security, as only a very small fraction of public and private sector agricultural investment has thus far gone towards agroecological research.

U.S. Policy Recommendations

How to build local & national capacity in sustainable farming

Sustainable agriculture in the 21st century requires redirection of policy frameworks to support stronger and enforceable policies that protect farmers, rural communities and workers, and reverse the damaging effects of chemical-intensive, resource-extractive agriculture. This transition will also require significant new investments in on-farm agroecological innovations as well as farmer-directed approaches to research, extension and education.

Concrete actions toward these goals include:

Invest in a food system for the future

- *Support on-farm innovation for agroecology:* Direct significant investment towards farmer innovation and development of agroecological practices. This includes incentive programs, farmer-to-farmer training, public funding for farmer-centered collaborative research and improved extension capacity to support farmers transitioning to agroecological production.
- *Invest in healthy soil:* Support and incentivize adoption of practices that build healthy soils and diversified cropping systems. Healthy soils are a vital solution to climate chaos, increase the resilience of agriculture and food systems in the face of weather events, and provide the basis for healthy and thriving rural communities.
- *End dependence on fossil fuels:* Enact agricultural policies that support reduced use of petroleum-derived pesticides, fertilizers and fuel at local, state and federal levels.
- *Support beginning and historically disadvantaged farmers:* Enact federal and state policies and programs to support the next generation of farmers, ranchers and workers while breaking down barriers to entry, especially for people of color and Indigenous people.
- *Ensure public research institutions serve the public interest:* Increase and redirect federal and state funding to prioritize public research, extension and education programs that center the needs of family farmers and public health, rather than corporate profit.

Transition to fair farm economies

- *Create income opportunities for small and mid-sized family farms:* Adopt supply management policies, including parity pricing, grain reserves, secure contracts and fair market access for livestock and other agricultural products.
- *Provide income protections for losses due to natural disasters:* Support whole farm revenue recovery for crop and job loss related to natural disasters and include significant subsidies for those employing agroecological practices that protect the environment, improve system resilience and reduce risk of loss.
- *Conserve agricultural land:* In partnership with land trusts, states and tribal entities, ensure that protected farmland will remain affordable and viable for future generations, especially for Indigenous people and people of color.
- *Reverse agricultural industry consolidation:* Adopt, implement and enforce measures that protect farmers' access to diverse markets, locally adapted seeds and breeds, and other farm inputs.
- *Revitalize local and regional food systems:* Establish democratic food policy councils, adopt measures to shorten farm-to-consumer supply chains and localize or regionalize food procurement from small and medium-scale farms practicing agroecology.

Adopt policies that protect rural communities and promote worker justice

- *Protect workers and families from pesticide exposure:* Strengthen national policies to protect workers and families from pesticide exposure to health-harming pesticides, establish pesticide-free buffer zones around schools and other sensitive sites and rapidly withdraw highly hazardous pesticides (HHPs) from use.
- *Create just immigration laws:* Eliminate exploitative guest worker programs and provide a pathway to citizenship to all who desire it.
- *Support living wages in the food system and beyond:* Adopt living wage policies that will ensure that all workers, on and off the farm, can fulfill their rights to livelihood and health, including the means to access an adequate supply of diverse and nutritious food.

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