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CLIMATE FRIENDLY FARMING™

Is Organic Farming Climate Friendly?

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Background:

What's the relationship between farming and greenhouse gases? Washington State University's Center for Sustaining Agriculture and Natural Resources is beginning a 5-year "Climate Friendly Farming" research project to help understand this. The project will document greenhouse gas (GHG) emissions from three important farming systems in the state - dairy, dryland and irrigated –and test whether alternative practices such as direct seeding and anaerobic digestion can reduce emissions and/or sequester (tie up) CO_2 from the atmosphere as soil organic matter. Our goal is to simultaneously reduce GHG emissions (the source) while increasing carbon sequestration (the sink).

Climate change is caused in part by the build up of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), in the atmosphere. This build up of GHGs traps additional heat within the earth's atmosphere, leading to the long-term warming trends that we have seen over the past 150 years. Responses to global climate change are urgently needed. The Intergovernmental Panel on Climate Change (IPCC, 2001) states that the current rate of global warming is the fastest in recorded history and has already started to disrupt many biological and ecological systems on the planet, which has significant ecological and economic ramifications. Recent predictions by the University of Washington's Climate Impacts Group (as published in *Science* magazine) indicate that climate change could have severe consequences for water resources in the Pacific Northwest (Service, 2004). The Cascade snow packs could be reduced by as much as 60% in the next 50 years, reducing the reservoir of stored water for irrigation, hydro-electric power, fish and residential needs. This disruption is occurring at a time when agriculture is expected to provide multiple benefits, such as environmental quality and bioenergy resources, while still increasing food output for a growing human population.

Agriculture holds significant potential to help mitigate GHGs. Conservation practices have the potential to mitigate over 300 million tons of CO_2, similar to what the U.S. reduction under the Kyoto protocol would be (Lal et. al., 1998). For instance, if half of the dryland acres in Washington State alone were direct seeded, over 500,000 tons of carbon would be mitigated per year. There are nearly 2 million irrigated acres in Washington that could make even more significant impacts on carbon sequestration through reduced tillage in addition to a reduction of N_2O emissions (which are 296 times as potent a greenhouse gas as CO_2) through improved irrigation management. Capture of methane (which is 23 times as potent a greenhouse gas as CO_2) from half of Washington's dairy cows would result in a reduction of 3.15 million tons of C equivalent emissions.

Climate Friendly and Organic:

Organic farming systems that focus on increasing soil organic matter can help "the sink" side of the equation. An organic system is included in the dryland part of the study. A new report (Hepperly 2004) from the Rodale Institute® in Pennsylvania discusses findings from their 23-year long Farming Systems Trial® demonstrating that organic farming systems can tie up atmospheric carbon dioxide, the primary greenhouse gas linked to global climate change. They cite two primary differences between organic and conventional cropping systems that lead to this reduction: (1) lower use of fossil fuel energy and (2) greater sequestration of atmospheric carbon in the soil. In addition to reducing the concentration of CO_2 as a greenhouse gas in the atmosphere, increased soil carbon provides other benefits well-understood by organic farmers, such as improved water and nutrient holding capacity of the soil. However, in another study in Michigan, the organic system did not perform as well as no-till systems, primarily because of increased N_2O emissions of the organic system (Robertson, et. al. 2000). Thus, following organic standards alone does not guarantee a reduction in GHG.

One of the key contributions of organic agriculture to this project concerns the characteristics of "living" biological systems. Increased soil organic matter through carbon sequestration practices literally changes the characteristics of the soil – which organic farmers already know. One dryland grain farmer recently told us that his direct-seed cropping system has created a whole new complex set of management opportunities and challenges for him. He mentioned that he learns something new each and every day from his now "living" biological system, and he emphasized the need for further research that will increase our understanding about the complex interactions between the soil, crops and microbial life. He made it clear that the challenge for researchers is to learn enough about these systems that farmers can be successful in adopting them. He cautioned that early efforts by farmers to adopt direct-seeding were unsuccessful because there was not sufficient understanding of the biological complexities of the systems. Researchers from the Climate Friendly Farming team have incorporated field-scale organic trials into the dryland cropping system component of the project for comparison with conventional cropping systems, native prairie and other alternative cropping systems.

Another way that organic agriculture fits in with the Climate Friendly Farming Project is through the development of value-added products and "sustainability" packaging of products and farm practices. Producers have told us that making clear linkages between market-place rewards for sustainable production practices is the key to widespread adoption of climate-friendly production practices. These rewards could be through the development of new "products" to sell, such as carbon credits or by-products from technologies like anaerobic digestion of dairy manure or they could be from capturing market share and premium prices for stewardship or sustainability. Carbon credits can be sold or leased to GHG "emitters" (such as power plants) by farmers for the adoption of long-term carbon sequestration or GHG mitigation practices on their farms. Another potential new product that could facilitate the adoption of anaerobic digesters by dairies is the potential for fiber and nutrient by-products from digesters that, in theory, could be added to the approved materials lists for certified organic producers. Perhaps the most important value-added avenue for climate-friendly products is sustainability packaging. Many organic producers have benefited from increased market-share and/or premium prices for products that consumers hold in higher regard than conventional products. We have seen early successes by some producers at marketing the "sustainability" package or environmental benefits of their production practices through special labeling and marketing strategies. There is clearly potential for marketing multiple components of sustainability, such as organic *AND* climate-friendly. As the organic marketplace becomes more crowded, additional unique identities may well be needed to retain product differentiation and profitability.

Conclusion:

The Climate Friendly Farming Project is evaluating a variety of scientific, technological and socio-economic elements necessary to create the foundation for a large-scale shift toward more sustainable production practices that will mitigate greenhouse gas emissions, sequester carbon, protect water quality and quantity and provide many of the other environmental and economic benefits that have previously been linked with organic agriculture. The Climate Friendly Farming project will likely produce new knowledge about carbon sequestration within our state, and this may be helpful to organic growers in meeting the soil quality criteria of the National Organic Standards while also addressing another resource (air) sustainability issue. We hope to learn more about how to combine the best attributes of organic and direct seed systems to maximize soil quality.

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