

North Central Region Sustainable Agriculture

Agricultural Educators and Clean Energy in the North Central Region



Barry Adler's bio-integrated greenhouse in Plain City, OH is powered by a wind turbine and solar array, and heated by a solar thermal, drain-back, closed-loop radiant floor system. Photo by Joan Benjamin.



Steve Flick conducts a tour for NCR-SARE of Show Me Energy, a producer-owned cooperative founded to support the development of renewable biomass energy sources in West Central, MO. Photo by Marie Flanagan.



Growing Power's urban farm in Milwaukee, WI is utilizing anaerobic digesters to produce methane suitable for energy production. They also use 30 solar panel cells to help offset their energy consumption. Photo courtesy of SARE Outreach.

Across the country, farmers and ranchers are investigating the potential economic benefits and use of energy crops to revitalize the rural landscape, and as energy prices climb, clean energy practices have become more important to their operations. From Barry Adler's bio-integrated greenhouse in Ohio, to Show Me Energy's innovative model for production of biomass-based fuels in Missouri, producers in the north central region are exploring a wide range of energy technologies. As part of its mission, NCR-SARE vigorously supports energy-use-efficiency and strives to help identify bioenergy and energy-efficient production technologies that are truly sustainable.

NCR-SARE wants to ensure that relevant data are examined, aspects of sustainability are debated, and issues of sustainability are included in the decision-making process. In 2007, NCR-SARE issued a special call for the Professional Development Grant Program (PDP) for projects to provide professional development in topics related to bioenergy and energy-efficient production. As with all NCR-SARE PDP projects, these competitive grants emphasized training agricultural educators in Extension, Natural Resources Conservation Service (NRCS), private, and not-for-profit sectors, using farmers as educators and addressing emerging issues in the farm community.

Enclosed is a summary of the results of the Professional Development Projects that were awarded grants for the special call on bioenergy and energy-efficiency. For more information on any of these projects, search the SARE project reports database using the project number at <http://mysare.sare.org>.



**United States
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SARE's vision is an enduring American agriculture of the highest quality. This agriculture is profitable, protects the nation's land and water, and is a force for a rewarding way of life for farmers and ranchers whose quality products and operations sustain their communities and society.

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Storage and Utilization of Ethanol Co-Products by Small Cattle Operations

Coordinator: Francis John Hay, Extension Educator,
University of Nebraska-Lincoln, NE
NCR-SARE Award: \$44,370
Project Number: ENC07-096

While perennial biomass crops have both environmental and energy benefits over corn ethanol, there are limited commercial-scale facilities utilizing biomass feedstocks for liquid fuel production. The expansion of corn ethanol has provided Nebraska with several million tons of animal feeds from ethanol co-products annually. According to Hay, these ethanol co-product feeds have excellent feed value and high palatability to cattle. Feeding the co-product wet has the greatest feed value and is most cost effective for the ethanol facilities, since they are high in moisture and can degrade quickly. Hay's project focused on storage techniques for wet ethanol co-products and how those co-products could be used in small cattle operations.

For his project, Hay prepared educators to teach ethanol co-products storage techniques. Conferences attracted nearly 300 educators from ten states. Written materials and videos extended the reach of this project through the internet with more than 30,000 individual downloads of educational materials. Hay noted that his project was undertaken at time when there was great interest in storage which increased the interest and impact of his educational outreach.

Integrated Alternative Energy and Livestock Production Systems

Coordinator: Michael Seipel, Assoc. Professor,
Truman State University, MO
NCR-SARE Award: \$50,000
Project Number: ENC07-099

Agricultural production capacity, as well as transportation, storage, and marketing infrastructure for alternative biomass feedstocks and other renewable energy sources often presents challenges. In some cases, farmers and ranchers can find themselves at a disadvantage, operating in a knowledge vacuum as they encounter developers moving to position themselves for future energy development.

Michael Seipel's project provided training on selected alternative energy topics, emphasizing interconnections between livestock production, renewable energy, and energy conservation. With 107 attendees, the first annual conference featured 13 speakers addressing grassy biomass, woody biomass, wind energy, financing bioenergy projects, and case studies of bioenergy enterprises. A second conference with 70 attendees addressed oilseeds for biofuels, anaerobic digestion/methane capture from livestock manure, algae for biofuel, biomass feedstocks handling, and bioenergy policy, with 12 presenters and six additional demonstrations or exhibits. A follow-up survey demonstrated the most utilized topic areas were grassy biomass, wind energy, anaerobic digesters/methane capture, alternative oilseeds, and bioenergy policy.



Ethanol co-product conferences attracted 300 educators from ten states to learn about ethanol co-product storage and techniques. Photo by Francis John Hay.

Biofuels and Community Participation: Engaging Process in the Emerging Bioeconomy

Coordinator: Sharon Lezberg, Associate Scientist,
Environmental Resources Center, WI
Project Number: ENC07-100
NCR-SARE Award: \$22,709

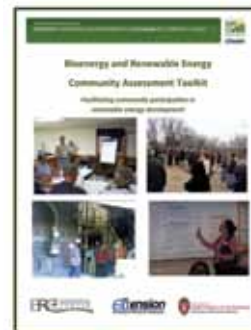
Extension and other natural resource educators can provide educational programming on renewable energy and potential impacts at the community level, and can be facilitators of community discussions about renewable energy. Lezberg provided training materials to approximately 100 extension, NRCS educators, and community stakeholders on ways to engage community members and stakeholders in assessing proposed bioenergy developments. The toolkit Lezberg developed provides a decision-making tool to guide communities toward developing their own standard of sustainability and criteria for meeting that standard. It's available online at <http://www.northcentralsare.org/energy-assessment-toolkit>

One evaluator noted, "There is strength in a tool that allows developers and communities to objectively assess a renewable energy project...Ultimately, the interaction between developer and community generated by this tool will result in citing renewable energy projects that are profitable for developers, compatible with neighbors, and consistent with local community values."

Photo by Timothy Barcus



Attendees at Seipel's first annual conference learned about grassy biomass, woody biomass, wind energy, financing bioenergy projects, and case studies of bioenergy enterprises.



Lezberg's Bioenergy and Renewable Energy Community Assessment Toolkit



Scott Sanford developed on-line tools for educators to deliver programming on energy management and conservation for greenhouse production, such as these thermal/shade curtain systems. Photo by Scott Sanford.

Greenhouse Energy Conservation Strategies and Alternative Fuels

Coordinator: Scott Sanford, University of Wisconsin, WI
NCR-SARE Award: \$33,432
Project Number: ENC07-098

Many greenhouse growers are looking for options to reduce their energy costs, but they don't always understand which options will provide the greatest return on investment. For his project, Scott Sanford developed curriculum materials, extension bulletins, resource lists, and a spreadsheet model for educators to use for delivering programming on energy management and conservation for greenhouse production.

A workshop for high school instructors and three webinars were attended by 42 participants from six different states, and 64 additional people were trained using the materials Sanford developed. Presentations covered all aspects of greenhouse energy efficiency, thermal/shade curtain systems, energy efficient plant production methods, and heating greenhouses with biomass fuel sources. Greenhouse Energy Conservation Strategies and Alternative Fuels is available online at <http://www.northcentralsare.org/Greenhouse-Energy-Conservation-Strategies>

Impact of Biomass Removal for Bioenergy on Soil and Water Quality

Coordinator: Mahdi Al-Kaisi, Professor, Iowa State University, IA
NCR-SARE Award: \$50,000
Project Number: ENC07-094

The rapid increase in ethanol production from corn grain, and the proposed use of crop residues for ethanol production poses significant challenges in increasing awareness and providing needed training to extension educators and agency staff to address the potential environmental impacts of intensive corn production and corn residue use.

Mahdi Al-Kaisi conducted an educational training program on residue management through a series of workshops, webinars, and field training sessions across Iowa for this project. Based on a 2009 survey, Al-Kaisi estimated this training would affect over 4,000 individuals and 500,000 acres across Iowa. The level of understanding the basic role of residue in improving soil and water quality improved from 37% before the training to 86% after the training was completed.

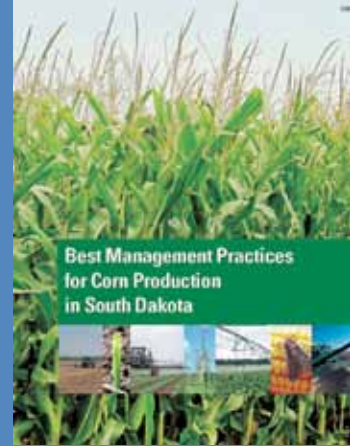
Educational Curricula and Professional Development Training for Energy Efficient Production Practices

Coordinator: David Clay,
South Dakota State University, SD
NCR-SARE Award: \$49,947
Project Number: ENC07-095

In response to the shift in some crop acres from providing food and fiber to an increased emphasis in energy farming, concerns have been raised about potential problems from crop monocultures or high rates of residue removal. David Clay's long-term goals for his project were to increase producers' awareness of the importance of determining costs of production, as well as conducting energy efficiency and environmental sustainability assessments during long-term planning. Clay edited curricula suitable for use in training sessions and conducted seven related workshops and 31 presentations, including the two reference materials below:

GIS Applications in Agriculture: Nutrient Management for Improved Energy Efficiency provides an outline of how management recommendations are developed and how a ground-based active sensor can be used. More information is available at <http://www.northcentralsare.org/GIS-Applications>

South Dakota Corn Best Management Practices provides a guide for selecting management practices that consider both production and environmental-sustainability goals. More information is available at <http://www.northcentralsare.org/corn-management-practices>



Throughout the course of his project, David Clay concentrated on writing two manuals. Chapters were designed as stand-alone training modules and were reviewed for scientific contents and readability by producers, extension educators, and scientists.



Educators attend an educational training program on residue management. Photo by Mahdi Al-Kaisi.

Sustainable Renewable Energy Training for Agriculture and Natural Resource Professionals

Co-Coordinator: Marin Byrne and Jim Kleinschmit,
Institute for Agriculture and Trade Policy (IATP), MN
NCR-SARE Award: \$50,000
Project Number: ENC07-097

The multiple benefits that a sustainable bioenergy system can provide underscore the need for its development in a manner that assures that the expansion of this sector provides not just new energy but broader environmental and community benefits as well (Kleinschmit, 2007; Jordan et al, 2007; Kleinschmit and Muller, 2005). It will require that farmers understand sustainability issues, which in turn requires educators to become more familiar with the various aspects of sustainable bioenergy and energy efficient production technologies.

Marin Byrne and Jim Kleinschmit's series of six training sessions for more than 340 attendees focused on sustainability and renewable energy for natural resource and agriculture educators throughout Minnesota and Wisconsin. Farm field days, tours, and workshops addressed topics such as alternative bioenergy crops and production methods, whole farm planning for renewable energy, and on-farm energy production and efficiency.



Paul Porter speaks to a crowd at one of the Institute for Agriculture and Trade Policy's field days. Photo courtesy of the Institute for Agriculture and Trade Policy.

Researchers and practitioners also addressed farm economics, community impacts, business models, climate change, water quality, natural resources management, and technologies such as gasification, oilseed pressing, and pelletizing. The Biomass Crops for Renewable Energy workshop in Wisconsin brought together a diverse mix of UW-Extension faculty that has continued to work together as a result. Surveys indicated that lessons from the workshops were being transferred to participants' clients, and respondents reported that they planned to add new components to their educational curricula and materials.



Dan West of Macon, MO harnesses the sun's rays to help produce ethanol from his orchard's excess fruit. Photo by Mary West.

Solar panels provide power for Lavinia McKinney's main garden house in Brixey, MO. She fills her tractor's modified fuel tank with filtered vegetable oil, an alternative to petro-diesel. Photo by Daniel Roth.

Miscanthus x giganteus (Giant Miscanthus) is a potential bioenergy feedstock. Photo by David Riecks, University of Illinois.

As energy prices climb, farmers are helping identify bioenergy and energy-efficient technologies that are truly sustainable. Through competitive grants, partnerships, and other outreach activities, NCR-SARE hopes to more clearly articulate the need to use a systems approach to identify critical questions, develop innovative solutions, and solve both on-site and offsite problems that might limit these sustainable technologies.

Learn More

Read more about NCR-SARE's Professional Development Program Grant Program's special projects on bioenergy and energy-efficient production technologies online on the SARE project reporting website. Simply search by the project numbers at <http://mysare.sare.org> or contact the NCR-SARE office for more information.

Clean Energy Farming: Cutting Costs, Improving Efficiencies, Harnessing Renewables features innovative SARE-funded research and examples of farmers who are improving energy efficiency while saving money, implementing farming practices that both save energy and protect natural resources, and producing and using renewable fuels. Download online for free, or order a copy at <http://www.sare.org/Learning-Center/Bulletins/National-SARE-Bulletins/Clean-Energy-Farming>



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