Volume 13, Number 2 March-April 2005

ATTRAnews

Newsletter of the National Sustainable Agriculture Information Service: A project of the National Center for Appropriate Technology (NCAT)

On-Farm Energy Conservation and Renewable Energy

How do we produce and use energy? Farmers across the country are paying closer attention to that question. Speaking at a farm energy conference sponsored by the National Center for Appropriate Technology (NCAT), Montana organic grain farmer Jon Tester summed up his concerns about farm energy. "Being an organic farmer," he said, "I don't worry about increased fertilizer or herbicide prices, because I have a cropping system that works well without those inputs. But if there's a big price spike or a shortage of diesel fuel, I'm up a creek without a paddle."

NCAT—ATTRA's parent organization—was founded 29 years ago to promote energy-saving techniques, many of them simple and inexpensive. The methods are pretty well worked out now, and on-farm tinkering will perfect them. The time is right to put all those great ideas to work on America's farms and get serious about energy conservation and renewable energy. You can call NCAT's specialists at 800-346-9140 for information about how to make your farm more energy efficient. – *Karen Van Epen, ATTRAnews editor*

Solar-Powered Livestock Watering Systems

Excerpted from the ATTRA publication by NCAT Program Specialists Mike Morris and Vicki Lynne. See also Freeze Protection for Solar-Powered Livestock Watering Systems. *Ordering information, page 2.*

Remote or off-grid power sources—including solar panels, mechanical windmills, and portable generators—can pump water for livestock in locations where electricity from power lines is unavailable. By encouraging animals to move away from lakes and streams, these systems give livestock greater access to forage. They also reduce livestock pressure on stream banks, preventing nutrient loading, damage to streamside vegetation, erosion, and pollution.

Solar pumping is a natural match for summer grazing applications, since it produces the greatest volumes of water in sunny weather and during long summer days—exactly when animals need water the most.

Many people who consider a solar water pumping system may balk at the initial expense. Looking at the big picture gives a better idea of the actual cost. For one thing, utility line extensions commonly cost $10,000 to $30,000 or more per mile. One rule of thumb is that remote pumping (whether solar-, wind-, or generator-powered) is worth considering whenever the distance from the utility grid exceeds about one-half mile. Where power lines are readily available, they will generally provide the cheapest source of power.

Ballard Ranch

Lavina, Montana

When their old water-pumping windmill finally died, Jim and Adele Ballard installed a solar pumping system to replace it. The new system pumps water from a 65-foot-deep well to a pair of stock tanks holding about 4,000 gallons. Four 80-watt photovoltaic modules on a tracking rack provide power to a submersible piston pump that delivers a maximum flow rate of 5.5 gallons per minute, enough to water 100 cow/calf pairs. The system produces average flows of 2,000 to 3,000 gallons per day during the summer months. 2002 solar component costs: $5,500.

(see "Solar Livestock" on page 3)

On the Ballard Ranch, the system's photovoltaic panels track the sun's movement for maximum solar exposure.

This solar pumping system on the Hirsch Ranch near Deer Lodge moves cattle away from Racetrack Creek, an important trout-spawning stream.

Inside

Reaping What We Sow: A Long-Range View of Farm-Based Renewable Energy

by Al Kurki, NCAT Program Specialist

You hear a lot of talk about the tail-pipe and light-socket benefits of renewable energy: reduced dependence on foreign oil, far less pollution, greenhouse gas reduction, regenerative production, and so on. We at NCAT want to find the answers to a new round of questions about biofuels, biomass, and to some extent, wind development.

Are these farm-based renewable energy paths really sustainable? Do they preserve soil and provide a decent livelihood for farmers? How accessible are renewable energy technologies for a wide array of farmers and ranchers? Are they suitable for small- and medium-sized farms?

What are we learning as more wind and biofuel development takes place? What is really working for farmers? Where are the energy "weak links" in our food, fiber, and biofuels systems, including organic and no-till? Are we overlooking conservation in our emphasis on renewable energy production?

NCAT's vision is that the current corn-based ethanol production will be a transition to more sustainable bio-energy production. Biofuel crops will be raised within soil-building rotations, not in extractive, industrial-style monocultures. Farmers and other rural people will see real gains in their incomes and quality of life. They will not merely provide commodity products at the lowest possible price.

There are now active models of every form of renewable energy development, of shortening food supply lines, and of farm-based carbon sequestration. At this point we should be able to learn what is working well for farmers and the environment, and what sort of trade-offs have to be rejected or accepted.

NCAT is crafting a project to make sure we fully understand and use the principles of sustainability as we develop renewable energy. The Reaping What We Sow Project will combine grassroots efforts, regional gatherings, and possibly a national conference.

We'd like to hear what you think about all this. What questions come to mind? What other factors need to be looked at? Would you like to be involved or be kept posted? Please direct your comments to Al Kurki, *alk@ncat.org*, (406) 449-0104.

ATTRA and NCAT Publications about On-Farm Energy Conservation and Renewable Energy

These publications and hundreds of others can be ordered free of charge from the ATTRA Web site, www.attra.ncat.org, or by calling 800-346-9140.

- Anaerobic Digestion of Animal Wastes: Factors to Consider (IP219)
- Biodiesel—A Primer (IP263)
- Compost Heated Greenhouses (CT137)
- Conservation Tillage (CT105)
- Efficient Agricultural Buildings: An Overview (IP220)
- Flame Weeding for Agronomic Crops (CT157)
- Flame Weeding for Vegetable Crops (CT165)
- Pursuing Conservation Tillage Systems for Organic Crop Production (IP183)
- Root Zone Heating for Greenhouse Crops (CT164)
- Season Extension Techniques for Market Gardeners (IP035)
- Solar Greenhouse Horticultural Resource List (IP142)
- Solar Greenhouse Herb Production (IP164)
- Solar-Powered Livestock Watering Systems (IP217)
- Freeze Protection for Solar-Powered Livestock Watering Systems (IP215)
- Wind-Powered Electric Systems for Homes, Farms, and Ranches (IP192)
- Water Management and Equipment Maintenance: The Montana Irrigator's Pocket Guide (IP236)

Biodiesel—A Primer

Excerpted from the 2004 publication by NCAT Program Specialist Dave Ryan. See above right for ordering information.

Biodiesel fuel can be made in any quantity, from a cup or so up to many gallons. Since it is better to make small mistakes than big mistakes, I encourage people interested in making biodiesel to start with small batches and gradually work up to making larger batches.

If you have access to inexpensive oil or grease, such as a by-product of some process, it may be quite cost-effective for you to manufacture your own fuel from these by-products. Although you may have to pay for waste vegetable oil, you can often get it free from restaurants. Shop around. Smaller restaurants may let you pick up waste oil in buckets, if you provide exchange buckets. Find out when the fryer oil is to be changed, and pick it up warm if you can. To get the best quality oil, talk to the restaurant owner and, more importantly, to the head cook, and let them know what you are doing and what you need. If you do not make a mess and are conscientious, most restaurant owners will be happy to work with you.

Photo courtesy DOE/NREL

A soybean farmer fills his truck with biodiesel.

The Realities of Wind Energy

by Corky Brittan

Corky Brittan is a Montana philosopher as well as a rancher – "the two least lucrative activities known to mankind," he says – who has long experience in the wind industry. This article is excerpted from his presentation at the recent Harvesting Clean Energy Conference in Great Falls, Montana, where he displayed the philosopher's skill to distinguish between appearance and reality.

For most people, a small (1 to 18 kilowatt) turbine is going to make little economic sense, particularly if it is connected to the grid. By my calculations, unless you can somehow factor in some very significant tax savings, a small wind turbine will not pay for itself within ten years. To do that, you need to install a wind turbine for less than $750 per kilowatt. Any good small wind turbine—and there are several on the market—will cost $1,500 to $3,000 per installed kilowatt.

But that doesn't mean that you can't have other good reasons for installing a small wind turbine. It is an excellent hobby. It provides a hedge against the inflation of retail energy prices. You know now what you will pay for fuel inputs in 100 years: nothing. It allows you the kind of independence and self-sufficiency once common in the West, and now all but disappeared. It makes a statement for renewable and clean energy production—important whatever the scale.

Many, if not most, people over-estimate the strength of the wind on their own places. I'm regularly told that "it blows like crazy around here," and occasionally that they have to fasten their seat belt when they sit down on the toilet in the winter. But in fact nothing takes the place of real data. Begin with a wind map. You can find them on the Internet (*www.nrel.gov*). Then put up an anemometer to record wind data.

There are two things you absolutely need to know when you start thinking about installing a small wind turbine. First, you need to know the quantity (how much usable wind) and the quality (wind curve, prevailing direction, sheer, turbulence) of the local wind regime. Two, you need to know what your load will be, how much electrical power you consume. Some people, very few, know how much they pay for electricity. But I have yet to meet anyone who knows how much electricity they use in the course of a year. The point is, you need to determine the load before you start thinking about turbine size. Load and size should be related.

Photo by Warren Gretz, DOE/NREL

Small wind turbines, like this grid-connected Bergey 10kW Excel, can provide supplemental power for farms and ranches.

If you want to connect to the grid, you need to know how close the electrical transmission and distribution lines are to the place where you are going to install the turbine. Most turbines require a three-phase interconnection. Running new three-phase any distance becomes very expensive very quickly.

Getting started small-scale in the wind business is much easier now than when I first installed a 65-kilowatt turbine on our ranch 21 years ago. The U.S. Department of Energy puts out all kinds of useful brochures. You have unlimited amounts of Internet information. Almost every town of any size has businesses which first advise you and then install wind and solar equipment.

Otherwise, it's just a matter of following these steps: do the basics (wind regime, load, and transmission), decide whether you want to supply all or part of your own needs (on a net-metering basis) or sell power to others (possibly a neighbor as well as the utility), contact someone knowledgeable about the details, and see your banker. With a cash flow schedule in hand, most banks will now loan you the money you need.

Solar Livestock… continued from page 1

Hirsch Ranch

Racetrack, Montana

Rick and Pam Hirsch installed a solar pumping system on a 10-foot-deep well to water 36 cow/calf pairs. The pumping system uses two 64-watt photovoltaic modules, a passive tracking rack, and a submersible diaphragm pump equipped with a sand shroud and low-water cut-off electrodes to protect the pump. The system is designed to produce flows of 2,600 to 2,800 gallons per day during the summer months. 2002 solar component costs: $2,400.

Resources for On-Farm Energy Conservation and Renewable Energy

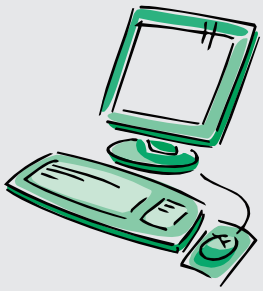
As rancher Corky Brittan points out above, there's a vast amount of information about renewable energy on the Internet. Here are some great leads, with links to more.

Alternative Fuels Data Center
www.eere.energy.gov/afdc/index.html

Climate Friendly Farming project
http://cff.wsu.edu/Project/index.html

Farm Bill Clean Energy
www.farmenergy.org

Harvesting Clean Energy
www.harvestcleanenergy.org



(see "Resources" on page 4)

National Sustainable Agriculture Information Service
PO Box 3838 Butte, MT 59702
1-800-346-9140 www.attra.ncat.org
ATTRA 1-800-411-3222 (Spanish only)

How Leaks and Worn Sprinkler Nozzles Cost You Money

Excerpted from Water Management and Equipment Maintenance: The Montana Irrigator's Pocket Guide. *This little pocket guide is overflowing with practical ways to save water, soil, and energy. The ideas are useful far beyond Montana. The guide is available free of charge from NCAT. See ordering information, page 2.*

Many producers aren't very concerned about leaks and worn nozzles because "the water ends up on the field anyway." What they don't realize is that leaks and worn nozzles reduce system pressure and pump efficiency, cause poor water distribution, and increase electrical demand and energy costs. Leaks can overload motors and shorten motor life. Just a tiny bit of nozzle wear (a few thousandths of an inch) can cause a big increase in sprinkler output. Depending on your system's efficiency and your electricity costs, those worn sprinkler nozzles can cost you hundreds of dollars over the course of a season.


Photo by Jeff Vanuga, USDA NRCS

Resources… *continued from page 3*

Minnesotans for an Energy Efficient Economy
www.me3.org

Montana Green Power
www.montanagreenpower.com

New York State Research & Development Authority
www.nyserda.org

Up with the Sun: Solar Energy and Agriculture
www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=127

Windustry: Wind Farmers Network
www.windustry.org

Wisconsin Public Service: Energy on the Farm
www.wisconsinpublicservice.com/farm/ref_brochures.asp

ATTRA New and Updated Publications

- Grazing Contracts for Livestock (IP247)
- Marketing Organic Grains (CT154)
- Oilseed Processing for Small-Scale Producers (IP134)
- Season Extension Techniques for Market Gardeners (IP035)
- Sweetpotato: Organic Production (CT128)

ATTRA*news*
Teresa Maurer, Project Manager
Karen Van Epen, Editor
Robyn Metzger, Production
March-April 2005

ATTRA*news* is the bi-monthly newsletter of the National Sustainable Agriculture Information Service. The newsletter is distributed free throughout the United States to farmers, ranchers, Cooperative Extension agents, educators, and others interested in sustainable agriculture. ATTRA is funded through the USDA Rural Business-Cooperative Service and is a project of the National Center for Appropriate Technology (NCAT), a private, non-profit organization that since 1976 has helped people by championing small-scale, local and sustainable solutions to reduce poverty, promote healthy communities, and protect natural resources.

NCAT

Printed on recycled paper