

ATTRAnews

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

Keeping Energy Costs Down

In these tough times it makes a great deal of sense to reduce energy use and costs. This issue of *ATTRAnews* offers tools to help farmers and ranchers evaluate and improve their energy systems.

Farm Energy Saving Tips

Energy saving on farms and ranches should begin with an inventory or assessment of energy use. Mentally prepare yourself to take charge and get to the bottom of things. Start by reviewing your energy bills – there's no better investment of your time. Some utility companies offer energy audits tailored for agricultural customers. If your provider does not offer audits, they may be able to refer you to someone who does. A number of Web sites offer agricultural energy calculators to begin this process. See page 2 for more on these tools.

Maintain tractors and stay up on injector and filter schedules.

Use the proper viscosity oils and seasonal fuels. Make fewer passes over fields by using tillage calculators, and keep ground implements sharp. Avoid excessive idling. Keep tire pressure at the lowest recommended level and avoid over-balling. Tillage is a main fuel use for many operations. Tillage calculators are available at this site: <http://ecat.sc.egov.usda.gov>.

Reduce synthetic fertilizer use. Nitrogen fertilizers are particularly heavy users of natural gas in the manufacturing process. When these fertilizers are applied in excess or at the wrong time, they can pollute surfacewater and groundwater.

Consider conservation tillage and no-till management strategies. These approaches reduce diesel fuel consumption, preserve topsoil structure, and conserve soil carbon. Conservation tillage has demonstrated measurable reductions in carbon emissions over the past decade.

Change lighting strategies. Switch incandescent lighting to compact fluorescent lamps in barns, calving sheds, and outbuildings. Consider changing out yard lamps with more

focused fixtures that save energy. Motion detectors on lights work well for many applications.

Irrigate efficiently. This usually means a combination of mechanical and management up-

grades to your system. Lowering pressures on pivot irrigation systems can save considerable energy. Use pressure gauges, monitor soil moisture to avoid overwatering, and examine sprinkler nozzles regularly for wear. Studies in Western states indicate that about 25 percent of electrical energy used in irrigation is wasted due to poor pump and motor efficiency.

Increase electric motor efficiency. Rebuild older motors and gain several percentage points in motor efficiency. Experts advise considering premium efficiency motors (2 to 4 percent more efficient than standard motors) in all new installations, or when the cost of rebuilding exceeds 65 percent of the price of a new motor. Match the new motor output to the task at hand and consider variable-speed drives as appropriate.

Manage stock tanks to reduce electrical use during winter. Earth-bermed or super-insulated stock tanks require smaller heaters to prevent freezing. Some designs require no electricity.

Manage stored fuel. A 300-gallon unsheltered above-ground tank can lose up to 10 gallons per month through evaporation during warm months, particularly when painted a dark color. Silver-coat the tanks and put up a rudimentary shelter to keep them shaded. Pressure relief caps also reduce evaporation loss.



USDA's REAP Program: A Great Opportunity for Producers

Among the provisions of the 2008 Farm Bill is the Rural Energy for America Program (REAP). Managed by USDA Rural Development, this program authorizes \$225 million in grants and loan guarantees for energy efficiency and renewable energy projects. Farms, ranches, and rural businesses are eligible. A simplified application process is available for projects costing less than \$200,000. To learn more about how the program works, see www.farmenergy.org, Web site of the Environmental Law and Policy Center. To find your state contact person for the REAP program, visit www.farmenergy.org/incentives/contacts.php

ATTRA is now offering farm energy technical assistance. We are ready to take your farm energy questions when you call our toll-free line, 1-800-346-9140 (English) or 1-800-411-3222 (Spanish). Our staff members have hands-on experience with a wide range of energy-saving approaches and renewable energy technologies. For more technical questions and requests, we can also draw on the extensive engineering expertise within our parent organization, the National Center for Appropriate Technology (NCAT).

Inside:

 www.attra.ncat.org

Farm Energy CalculatorsPage 2
Publications about Farm EnergyPage 2

Reduce Farm Lighting Costs.....Page 3
Improving Light in Dairy BarnsPage 3

Pest Management Strategies that Save Energy.....Page 4

See ATTRA's Farm Energy Web page at www.attra.ncat.org/energy. You will find extensive resources, including publications to download and links to other organizations working to increase energy efficiency on farms and ranches.

Farm Energy Calculators

The first step in reducing farm energy costs is to figure out where you use energy in your operation. One way to do this is to have someone perform an energy audit on your farm. The auditor will look at your energy consumption, suggest energy-efficient improvements and equipment upgrades, and estimate paybacks on these investments.

You don't need a professional energy audit to get started, though. An amazingly diverse variety of farm energy calculators are freely available on the Internet. You can examine the energy consumption and costs of various tillage systems, crops, fertilizers, irrigation, animal housing, lighting, drying, cooling, heating, and milk harvesting and chilling. Other calculators allow you to estimate whether it would make sense to install a wind turbine or photovoltaic system, or to produce your own biofuel.

Farm Energy Calculators: Tools for Saving Money on the Farm

This ATTRA publication provides links to a variety of farm energy calculators on the Internet. Numerous calculators are listed with brief descriptions. Each has a specific focus, such as irrigation and pumps, electrical use, and fertilizer application. www.attra.ncat.org/attra-pub/PDF/farmenergycalc.pdf

Farm Energy Search Tool

www.attra.ncat.org/farmenergysearchtool

Are you looking for energy-related equipment, funding, and technical assistance in your state? ATTRA's online search tool makes it easy.

Businesses are generally listed under the state where they are located, although many companies provide regional or national service. Contact businesses to see if they serve your area. Energy-related businesses, agencies, and nonprofit organizations serving agriculture are welcome to submit listings using a simple self-listing form. This search tool was developed with funding from the USDA Risk Management Agency.

Farm Energy Publications



In addition to the publications listed here, ATTRA offers hundreds more that provide general information and specific details about all aspects of sustainable and organic agriculture. They are available to download for free from ATTRA's Web site: www.attra.ncat.org. Or call 1-800-346-9140 to order a free paper copy.

Energy Conservation and Efficiency

Conserving Fuel on the Farm
Efficient Agricultural Buildings: An Overview
Energy Saving Tips for Irrigators
Farm Energy Calculators: Tools for Saving Money on the Farm
Maintaining Irrigation Pumps, Motors, and Engines
Root-Zone Heating for Greenhouse Crops

Renewable Energy Options

Anaerobic Digestion of Animal Wastes: Factors to Consider
Biodiesel – A Primer
Biodiesel: The Sustainability Dimensions
Biodiesel Production for On-Farm Use: A Curriculum for Agricultural Producers
Biodiesel Use, Handling, and Fuel Quality
Compost Heated Greenhouses
Ethanol Opportunities and Questions
Food Dehydration Options
Freeze Protection for Solar-Powered Livestock Watering Systems
Locally Owned Renewable Energy Facilities
Oilseed Processing for Small-Scale Producers
Renewable Energy Opportunities on the Farm
Small-Scale Wind Energy on the Farm

Solar Greenhouse Resources
(online only)
Solar-Powered Livestock Watering Systems
Switchgrass as a Bioenergy Crop
Wind-Powered Electric Systems for Homes, Farms, and Ranches: Resources

Reducing Nitrogen Fertilizer and Indirect Energy Usage

Alternative Soil Amendments
Brief Overview of Nutrient Cycling in Pastures
Conservation Tillage
Farm-Scale Composting Resource List (online only)
Foliar Fertilization
Notes on Compost Teas
Nutrient Cycling in Pastures
Overview of Cover Crops and Green Manures
Pursuing Conservation Tillage Systems for Organic Crop Production
Sources of Organic Fertilizers and Amendments
(online only)
Sustainable Soil Management

Reducing Food Miles and Transportation Energy

Bringing Local Food to Local Institutions: A Resource Guide for Farm-to-School and Farm-to-Institution Programs
Community-Supported Agriculture
Direct Marketing
Farmers' Markets
Food Miles: Background and Marketing
Local Food Directories (online only)

Bright Ideas to Reduce Farm Lighting Costs Holly Michels, NCAT Editor

Lighting isn't always a farm owner's first concern when it comes to energy efficiency — until they have an energy audit.

"It isn't so much on the customer's mind until we do an audit," said Richard Peterson, who runs Northeast Agriculture Technology in New York and conducts farm energy audits in the state. "Then they realize how much lighting systems cost."

Peterson said agriculture lighting costs are significant. Lights consume 10 to 20 percent of electricity costs on the average dairy farm, but that figure can be much higher, he said. "I did an audit on one farm where lighting was 40 percent of their annual electricity purchases. It's such a high figure and doesn't have to be."

That's why Peterson and others are helping farmers switch to more efficient lighting systems.

Scott Sanford, a senior outreach specialist with the Department of Biological Systems Engineering at the University of Wisconsin-Madison, said lighting systems are the "low-hanging fruit" of farm energy efficiency — a fix that's often easy and inexpensive to install and recoups great energy and cost benefits.

"It's something that doesn't cost a lot to implement to save a good portion on your bill," Sanford said. He added that lighting is also the first energy issue to address for many farmers because quite a few American farms have outdated

systems. "In many cases (farmers) need to replace the lighting anyway because it's basically worn out," he said. "They might as well put in new fixtures that are the most efficient available."

Peterson said a good place to start is by changing out incandescent bulbs to compact fluorescents (CFLs). "Many farms are still using incandescent lighting, which is the least efficient of all light sources," he said. "A switch to CFLs is a very simple way to improve efficiency. It's just a matter of pulling the old lamp out and screwing in the new one."

Both Peterson and Sanford said farmers can expect to recover the cost of switching to CFL bulbs within a year. "The savings is upward of 60 percent," Peterson said. "It's very significant."

Sanford said making farms brighter has plenty of non-monetary benefits too. "When we increase the amount of light on a farm, it makes the farm a safer place to work because you can see where you're stepping. And it makes it a happier place to be, for workers and animals alike."

Several types of lights can improve the energy efficiency of your farm's lighting systems, as shown in the table below. For information on how to increase your farm's lighting efficiency, contact your local utility for an energy audit or use one of the calculators in the ATTRA publication Farm Energy Calculators, described on page 2.

Improving Light in Dairy Barns

Long-day dairy lighting can bump up milk production and help cows grow faster. The technique involves providing up to 20 foot-candles of light for dairy cows for 16 to 18 hours a day. "It creates an ideal seasonal lighting structure for cows so they think they're in the longest months of the year," Peterson said. "It can increase milk production by up to 5 percent."

Farm owners who already use long-day lighting can save on their electricity bills by switching to efficient light bulbs like fluorescents, Peterson said. "In those situations, lighting becomes a lot more significant in terms of energy use," he said. "If farmers are going to do (long-day lighting), they need to do it with the highest efficiency lights they can put in."

Sanford said the payback time for efficient fixtures, which cost about \$100 apiece, is less than a year. He also said the technique is especially helpful for farmers who don't use hormones to increase milk production and cattle growth. "For an organic producer who can't give a hormone like bST (bovine somatotropin) to increase milk production or even for a farm that's not organic, long-day lighting works on every cow."

Lamp type	Avg. life (hrs)	Color	Starting temp.	Instant on	Wattage range	Pro	Con
Incandescent	750-1000	White	> -40°F	Yes	25-200	Cheap, instant light in cold weather	Least efficient
Halogen	2-6000	White	> -40°F	Yes	45-500	Bright white light	High heat output
Mercury Vapor	24,000	Bluish	-22°F	No	50-1000	Fits into most existing fixtures	Least efficient high-intensity discharge bulb
Compact Fluorescent	6000-10,000	White	32°F or 0°F	Yes*	14-29	Use 75% less power, last six to 10 times longer than incandescents	May not provide instant light in very cold climates
Metal Halide	10,000-20,000	Bluish	-22°F	No	150-1000	Good color rendering, high light output	Light fades as bulb ages
Pulse Start Metal Halide	15,000-30,000	Bluish	-40°F	No	100-750	Faster warm-up, longer life than metal halide	Not interchangeable with old fixtures
T-12 Fluorescent	9000-12,000	White	50°F	Yes	30-75	Long life	Not suitable for cold temps., sealed fixtures are a must
T-12 High Output Fluorescent	9000-12,000	White	-20°F	Yes	25-110	Long life, suitable for cold weather	Sealed fixtures are a must
T-8 High Output Fluorescent	18,000	White	-20°F	Yes	86	Long life, suitable for cold weather	Sealed fixtures are a must
High Pressure Sodium	24,000	Yellow-orange	-40°F	No	35-1000	Highest light production, long life, high output	Poor color rendition
T-8 Fluorescent	15,000-20,000	White	50°F or 0°F	Yes	25-59	Long life	Sealed fixtures are a must

*Requires warm-up to reach full output at cooler temperatures

Note: Fluorescent and high-intensity discharge lamps all contain mercury, an environmental pollutant that requires proper disposal.

Excerpted in part from University of Wisconsin Extension, with permission.



Pest Management Strategies that Save Energy

Rex Dufour, NCAT Technical Specialist

Routine use of synthetic chemicals represents significant energy inputs into the agricultural system, and carries both obvious and hidden costs to the farmer and society. Many studies indicate that synthetic fertilizers and pesticides are the largest fossil energy input into farming in the United States.

Pest management is an ecological matter. The size of a pest population and the damage it inflicts is, to a great extent, a reflection of the design and management of a particular agricultural ecosystem.

We humans compete with other organisms for food from our crops. We wish to secure a maximum amount of food by using a minimum of resources and energy. However, if the agricultural system design or management is faulty, it becomes easy for pests to expand their populations. And it becomes difficult for the natural enemies of pests to exist. Badly designed systems make us expend unnecessary resources for pest

management. Attempting to implement an ecology-based discipline like integrated pest management (IPM) in large monocultures – which substitute chemical inputs for ecological design – can be an exercise in futility and inefficiency.

So the first step in sustainable and effective pest management is to look at the design of the agricultural ecosystem. Farmers and ranchers need to consider what ecological concepts they can use to better manage pests and their parasites and predators.

Ecologically based practices can save energy. Use good soil management and crop rotations. Provide habitat for beneficial organisms, and increase the biological diversity both above and below ground on the farm. Over time, these techniques are likely to reduce the need for chemical fertilizers and pesticides, conserving energy that would otherwise be needed to produce and apply these chemicals.

Where to Learn More About Energy-Saving Pest Management Strategies

Farmscaping to Enhance Biological Control, ATTRA publication CT065
www.attra.ncat.org/attra-pub/PDF/farmscaping.pdf

Attracting Beneficial Insects with Native Flowering Plants, MSU Extension Bulletin 2873. <http://web2.msue.msu.edu/bulletins/Bulletin/PDF/E2973.pdf>

Flower Flies (Syrphidae) and other Biological Control Agents for Aphids in Vegetable Crops, UC Publication 8285, by Robert Bugg, 2008
www.anrcatalog.ucdavis.edu/items/8285.aspx

New and Updated Publications from ATTRA

An Illustrated Guide to Sheep and Goat Production

Peanuts: Organic Production

Organic Materials Compliance – Materials for Organic Production, Handling, and Processing: Planning for Compliance with USDA's National Organic Program

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