



Farm Energy Calculators: Tools for saving money on the farm

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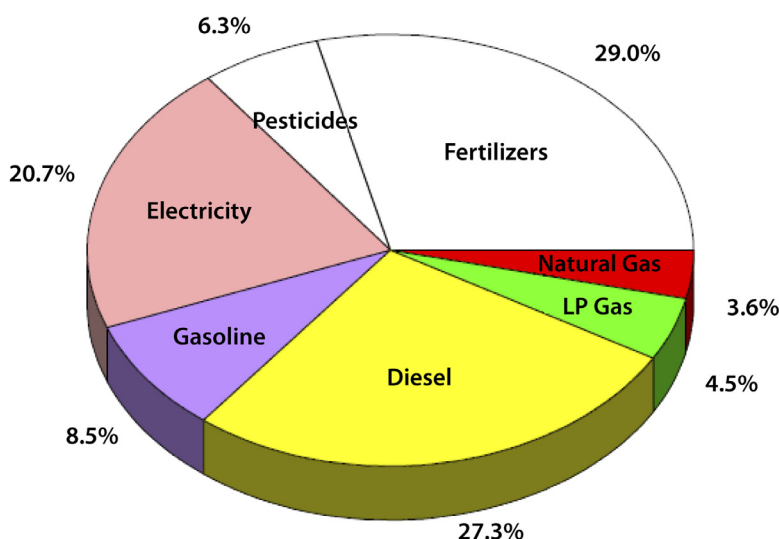
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Contents

Farm energy calculators.....	2
General farm calculators.....	4
Renewable energy calculators.....	4
Biofuels and biomass calculators.....	5
Energy efficiency calculators.....	6

Agricultural producers depend on energy, an important input to production. Direct costs of energy, such as fuel and electricity, paired with indirect energy costs in the form of fertilizers and chemicals, can significantly affect farm net revenues, especially as the price of energy continues to rise. Minimizing direct and indirect energy consumption on farms in the United States can lead to considerable savings.

Figure 1. Total energy directly and indirectly consumed on U.S. farms in 2002 was 1.7 quadrillion Btu.



Source: John Miranowski, *Energy Consumption in US Agriculture*. In Joe Outlaw, Keith Collins, and James Duffield, eds., *Agriculture as a Producer and Consumer of Energy*, CABI Publishing, Cambridge, MA, pp. 68-111, 2005.

Introduction

The first step to reducing farm energy costs is determining where you use energy in your operation. One way to gauge energy use is to have an accredited agency perform an energy audit on your farm. Several organizations provide farm energy audits, which examine existing energy consumption and determine opportunities for savings through energy efficiency improvements and equipment upgrades.

Farm energy calculators are another set of tools to estimate energy consumption and calculate the cost of various energy inputs on your farm.

This publication provides links to a variety of farm energy calculators available on the Internet. This list is a cross section of Web-based calculators and is not comprehensive. Keep in mind that each tool has its own limitations and does not provide farm-specific recommendations.

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However, by changing user input you can begin to evaluate options for simple, cost-effective solutions that can cut input costs and save money. For more information on how to increase energy efficiency on your farm, see the following ATTRA publications: *Efficient Agricultural Buildings: An Overview*, *Energy Saving Tips for Irrigators*, *Maintaining Irrigation Pumps, Motors and Engines* and *Conserving Fuel on the Farm*.

Farm energy calculators

USDA-NRCS Energy Estimator: Nitrogen

The Energy Estimator for Nitrogen, developed by the U.S. Department of Agriculture's Natural Resources Conservation Service, enables you to calculate the potential cost savings related to nitrogen use on your farm or ranch. NRCS agronomists developed this model to integrate general technical information on nitrogen use with farm-specific information on fertilizer types, costs, timing and placement.

<http://nfat.sc.egov.usda.gov>

USDA-NRCS Energy Estimator: Tillage

This tool estimates diesel fuel use and costs in the production of key crops in your area and compares potential energy savings between conventional tillage and alternative tillage systems.

<http://ecat.sc.egov.usda.gov>

USDA-NRCS Energy Estimator: Irrigation

This tool enables you to estimate the energy costs of pumping water for irrigation on your farm or ranch. The estimator is based on your specific crops, energy prices and pumping requirements. It estimates energy savings from implementing a selection of system improvements.

<http://ipat.sc.egov.usda.gov>

USDA-NRCS Energy Estimator: Animal Housing

This tool calculates energy use and costs associated with swine, poultry or dairy

cow operations on your farm or ranch. The tool estimates savings from efficiency improvements to lighting, ventilation and heating systems for swine, poultry and dairy cow housing. The tool also estimates savings for more efficient ways to heat water and cool and harvest milk.

<http://ahat.sc.egov.usda.gov>

Farm Assessment Toolkit

This online toolkit assesses your farm operation's energy efficiency, identifies areas for improvement and suggests energy-efficient equipment and management options. The University of Wisconsin-Extension and Wisconsin's Focus on Energy, a group that works to install cost-effective, energy-efficiency and renewable energy projects, jointly developed the toolkit. Each assessment will take about 10 to 20 minutes to complete. The assessments collect general information about your operation to help determine if you may be able to save energy. At the end of each assessment, you will get a report with your responses and any appropriate energy tips. After completing an assessment, you can print out the report and use it to guide decisions you make to improve the energy efficiency of your operation. You may also wish to contact a Focus on Energy representative or partner for additional assistance.

www.soils.wisc.edu/foe/login

Alliant Energy Farm Energy Audit

This calculator, from Alliant Energy, a public utility holding company in Madison, Wisconsin, estimates the electric energy use of equipment and appliances that you operate on your farm. The calculator recommends energy-saving alternatives and estimates potential savings. Additional calculators from Alliant Energy analyze potential savings for electric motors, grain dryers, heat reclaimers, irrigation systems, lighting equipment, milking equipment, scroll compressors and ventilation systems.

<http://alliantenergy.com/docs/groups/public/documents/pub/p010003.hcsp>

Related ATTRA publications

Efficient Agricultural Buildings: An Overview

Energy Saving Tips for Irrigators

Maintaining Irrigation Pumps, Motors and Engines

Conserving Fuel on the Farm

Oregon Tilth and Oregon State University Organic Fertilizer Calculator

This organic fertilizer calculator will help you choose soil amendments based on cost effectiveness and soil and crop requirements. The file download includes a Microsoft Excel calculator and instructions. Note that there are several worksheets within the calculator.

<http://smallfarms.oregonstate.edu/organic-fertilizer-calculator>

Wisconsin Public Service Corporation Savings Calculators

These calculators estimate savings from installing energy-efficient equipment for these specific applications: tractor engine block heaters, vacuum pumps, ventilation systems and milk pre-coolers.

www.wisconsinpublicservice.com/farm/calculators.aspx

Montana State University Farm Energy Calculator

This energy calculator helps you examine the costs and energy used in three different tillage systems for a range of crops including winter wheat, spring wheat, barley, canola, flax, lentils and camelina. In addition to crop acres, the calculator requires some summer fallowed acres be included in the crop mix. This calculator also helps you compare the costs of biodiesel and ethanol to petroleum diesel.

www.montana.edu/extensionecon/software/CropMixTillageEnergyPriceBioD.swf

Central Iowa Power Cooperative Average Farm Energy Calculator

This calculator allows you to input the types of electrical equipment you use on your farm and provides your farm's typical monthly electric use. The calculator lists ways to save energy specific to your equipment.

www.cipco.org/energyFarm.asp

Genesis Energy Dairy Energy Calculator

This tool, from Genesis Energy, an energy retailer in New Zealand, provides calculators

for water heating, milking systems, milk chilling and lighting specific to dairy farms, as well as case studies of cost savings and payback time.

www.dairysavings.co.nz

DLtech, Inc., Dairy Farm Energy Calculators

This page includes milk harvesting, milk cooling, lighting, ventilation and equipment calculators. DLtech is a New York-based company that serves agriculture through engineered electro-technology that enables farmers to produce a better product, conserve energy and improve profitability. These calculators complement DLtech's Dairy Farm Energy Management Guide, which discusses how to manage energy costs effectively.

www.dairyfarmenergy.com/Chapter_PDFs/Calculators.doc

Nitrogen Management on Dairy Farms

This Web site, a partnership of Cornell University, the University of Vermont and the USDA, is designed to deliver background information and management guidelines for efficient nitrogen use throughout the dairy farm system. It covers crop and soil nitrogen management, feed storage nitrogen management, herd nitrogen management and manure storage nitrogen management.

www.dairyn.cornell.edu

Poultryhouse.com Electronic Calculator for Broiler House Minimum Ventilation Fan Timer Settings

This PDF calculator is designed to help you do the best possible job of setting fan timers used in cold weather minimum ventilation. Poultryhouse.com, a project of Auburn University, provides practical, up-to-date information on the design and management of modern poultry environmental control systems and housing that is useful to poultry producers, flock supervisors and industry managers.

www.aces.edu/poultryventilation/documents/MinVentTimerCalculator.pdf

General farm calculators

Alberta Agriculture Food and Rural Development Crop Calculators

This calculator offers you a large selection of agricultural calculators including a fertilizer cost estimator and a farm machinery calculator, among many others.

www.agric.gov.ab.ca/app19/calc/index.jsp?type=Crop

NRCS Tools by Landuse

This is a large list of planning tools and spreadsheets including fuel-use estimators, various irrigation systems cost tools and fencing cost calculators, among many others.

www.economics.nrcs.usda.gov/technical/tools/index.html#Irrigation

Martindale's Calculators Online Center: Agriculture

This Web site, developed by Martindale's Reference Desk, includes an extensive collection of online calculators and design tools, including many with relevance to farm energy usage.

www.martindalecenter.com/Calculators1_2_A.html

Iowa State University I-FARM

I-FARM is a database-driven farming systems simulation model that predicts economic returns and ecosystem impacts of farm operations, integrating both crop and livestock components.

<http://i-farmtools.org>

Agriculture Cost Estimator

The Agriculture Cost Estimator, hosted by AgWeb.com, a division of Farm Journal Media, Inc., allows you to quickly compare the cost of using propane gas to the cost of using other energy sources for grain drying and irrigation pumping in your operation.

www.agweb.com/Propane_Calc.aspx

California Agricultural Pumping Efficiency Program Pumping Cost Analysis

This tool analyzes the potential cost savings for retrofitted electric-powered water pumps.

www.pumpefficiency.org/Pumptesting/costanalysis.asp#assumed

C-Plan Carbon Footprint Calculator

The C-Plan Carbon Calculator, created by farmers in central Scotland, allows you to quickly and easily enter the data for the land you manage and obtain an estimate of the greenhouse gas emissions for your business.

www.cplan.org.uk/calculator.asp

Noble Foundation Agricultural Tools

This page contains links to several agriculture-related tools including calculators for estimating fertilizer spread rates and costs, feeding rations and grazing carrying capacities, among many other topics. The Noble Foundation is an Oklahoma-based nonprofit organization conducting agricultural, forage improvement and plant biology research.

www.noble.org/Tools/index.html

Renewable energy calculators

National Renewable Energy Laboratory Wind Energy Finance Calculator

This online tool allows you to enter wind and power data to calculate a wind project's capacity factor. The calculator provides a quick, detailed economic evaluation of potential utility-scale wind energy projects.

<http://analysis.nrel.gov/windfinance/login.asp>

Windustry Wind Project Calculator

This spreadsheet assists you in evaluating the economics of installing a wind turbine to provide electricity for your farm and home. The program estimates the cash flows for

investing in a wind turbine and the rate of return on cash investments. This is a Microsoft Excel spreadsheet that uses macros.

www.windustry.com/calculator/default.htm

RETScreen International Wind Energy Project Model

The RETScreen Clean Energy Project Analysis Software is a unique decision support tool developed with the contribution of numerous experts from government, industry and academia. The software, provided free of charge, can be used worldwide to evaluate the energy production and savings, costs, emission reductions, financial viability and risk for various types of renewable-energy and energy-efficient technologies, or RETs. The RETScreen Wind Energy Project Model can be used worldwide to easily evaluate the energy production, life-cycle costs and greenhouse gas emissions reduction for central-grid, isolated-grid and off-grid wind energy projects ranging in size from large-scale, multi-turbine wind farms to small-scale, single-turbine wind and diesel hybrid systems.

www.retscreen.net/ang/g_win.php

Bergey Windpower Small Wind Project Calculator

This cash flow spreadsheet model, from Bergey Windpower, a supplier of small wind turbines, can be used for both residential and commercial applications. It is a useful tool for determining payback and rate of return.

www.bergey.com/Technical.htm

National Renewable Energy Laboratory PV Watts

Researchers at the National Renewable Energy Laboratory developed PVWATTS to help non-experts quickly obtain performance estimates for grid-connected photovoltaic systems.

<http://rredc.nrel.gov/solar/calculators/PVWATTS/version2/#directions>

The Solar Estimator

This resource, offered by the U.S. Department of Energy, the American Solar Energy Society and the Solar Electric Power Association, provides an idea of price, savings and system size specific to your geographic location.

www.findsolar.com/index.php?page=rightforme

Texas State Energy Conservation Office Energy Calculators and Software

This site includes a photovoltaic system economics calculator, a solar water heating calculator and two greenhouse gas pollution calculators.

www.infinitepower.org/calculators.htm

Biofuels and biomass calculators

Biodiesel Cash Flow/Income Statement Worksheet

This worksheet, developed by the Montana State University Agricultural Marketing Policy Center, allows you to compare small-scale oilseed processing and biodiesel production options based on their specific situation.

www.ampc.montana.edu/energyinformation.html

West Midlands Biodiesel Economic Evaluation Calculator

This calculator helps you assess the potential economic viability of producing biodiesel and oilseed rape oil in farm operations. Bioenergy West Midlands aims to promote activity in, and markets for, bioenergy in the West Midlands area of the United Kingdom. BioenergyWM encompasses three main market areas, namely biomass, biogas and biofuel (bioethanol and biodiesel).

www.bioenergywm.org/documents/Biofuels%20Calculator.xls

EERE Theoretical Ethanol Yield Calculator

This tool, from the U.S. Department of Energy's Federal Energy Management Program, approximates the theoretical ethanol yield in gallons per dry ton of feedstock based on the dry mass percentage of the material that is sugar components.

www1.eere.energy.gov/biomass/ethanol_yield_calculator.html

California Biomass Collaborative Cost of Energy Calculator

The Cost of Energy Calculator computes the annual cost of energy in both current and constant dollars for a generic biomass power plant using a revenue-requirements methodology. The calculator includes spreadsheet models for combined heat and power operations, biomass gasification operations and biogas operations.

<http://faculty.engineering.ucdavis.edu/jenkins/CBC/Calculator/index.html>

Energy efficiency calculators

Alliant Energy Energy Efficiency Calculators

This Web page provides a list of energy efficiency calculators for residential, small business, commercial and industrial equipment that includes air conditioning and lighting.

www.alliantenergy.com/docs/groups/public/documents/pub/p013446.hcsp

EERE Energy Cost Calculators

These calculators, developed by the U.S. Department of Energy's Federal Energy Management Program, allows you to enter your own input values, such as utility rates and hours of use, to estimate the energy cost savings from buying a more efficient product.

www1.eere.energy.gov/femp/procurement/eep_eccalculators.html

USDA Fuel Value Calculator

The Fuel Value Calculator is a tool in PDF format that can be used to compare typical unit costs of various fuels including wood, natural gas, electricity, switchgrass and propane, among others.

www.fpl.fs.fed.us/documnts/techline/fuel_value_calculator.pdf

Penn State University Energy Cost Calculator

The Energy Cost Calculator is an Excel spreadsheet with two worksheets. By entering the unit price for various fuels, you can determine the cost per million British thermal units. It also provides the energy content and heat conversion efficiency information for varying fuels.

<http://energy.cas.psu.edu/costcomparator.html>

Notes

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This publication is available on the Web at:

www.attra.ncat.org/attra-pub/farmenergycalc.html

or

www.attra.ncat.org/attra-pub/PDF/farmenergycalc.pdf

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