

A Farmer's Guide to Energy Efficiency and Renewable Energy

Project Ideas and Sources of Funding

**The Institute for Energy and the Environment
Vermont Law School
PO Box 96
Chelsea Street
South Royalton, VT 05068
(802) 831-1151**

**This Guide is a publication of the Farm Energy Outreach
Project at the Institute for Energy and the Environment.**

Project Members:

**Katie Johnson
Sophia Kruszewski
Elena Mihaly**

Institute Director:

Michael H. Dworkin, J.D.

**Special thanks go to Jenny Thomas and the Research
Associates at the Institute for Energy and the Environment,
past and present. Their research, writing, and editing made
this work possible.**

©2011 The Institute for Energy and the Environment

IEE Work Product Disclaimer:

The work of the IEE Research Team is intended to assist and expedite professional assessment. It does not purport to be, and is not the equivalent of, the work of a licensed professional with expertise in this area. Before making significant decisions based on this work, it would be appropriate to consider consultation with a licensed professional with expertise in this field.

A Farmer's Guide to Energy Efficiency and Renewable Energy Project Ideas and Sources of Funding

Table of Contents

Overview	1
Part 1: Energy Efficiency	3
Energy Audits	3
Building Efficiency	4
Equipment and Operational Efficiency	8
Part 2: Renewable Energy Generation	13
Plant Biomass	15
Manure	18
Small Scale Wind and Solar	20
Large Scale Wind	22
Selling Your Energy to the Grid	23
Part 3: Resource Appendix	25
USDA Incentive Programs	25
<i>Environmental Quality Incentives Program (EQIP)</i>	26
<i>Rural Energy for America Program (REAP)</i>	29
EPA Incentive Programs	33
Federal Tax Programs	34
State Programs	35
Permitting, Zoning, and Inspection Requirements	36
Additional Useful Resources	37

Overview

In an idealized world, farmers produce crops knowing with certainty how any particular yield will turn out and what the bottom line will be. However, much of real-world farming is founded on educated guesswork; using predictions based on prior seasons about when to plant crops, how much water will be needed, what type of pests to expect, and how much money must be allocated to farm energy expenses. Each added unknown increases susceptibility to loss. The purpose of this Resource Guide is to introduce energy efficiency and energy self-reliance as means by which farmers can reduce their vulnerability to the volatile variable of on-farm energy costs.

This Resource Guide is divided into three sections: Energy Efficiency, Energy Generation and a Resource Appendix. The first two sections set forth a number of energy efficiency and energy generation techniques, as well as the incentive programs available to farmers like you to assist in the pursuit of these valuable techniques. The Appendix goes into more detail about each incentive program, explaining what the program is, who is eligible, and how to apply for funding. The Appendix ends with a section of “Additional Useful Resources,” which includes links to a variety of new and existing farm energy programs.

Whether by offering rebates for energy-efficient farm equipment, providing online energy-use calculators, on-farm audits, or lending technical or financial support, these programs play a key role in helping you reduce costs, especially through periods of high fuel prices.

While our focus is on the direct benefits to you, energy efficiency and energy self-reliance also benefit rural economies, increase food security, and help preserve the environment by moving us toward local community solutions and away from dependence on foreign energy sources.

A combination of energy efficiency and renewable energy measures creates more benefits than any one factor alone. We believe that the best path to energy self-reliance is to design a comprehensive energy plan. This means implementing not one, but multiple energy strategies in order to have the greatest impact and the surest results.

Importantly, each farm is unique. Thus, the type and scale of your enterprise will ultimately determine what strategies are best for you.

Part 1: Energy Efficiency

Energy efficiency on the farm means accomplishing the same tasks with less energy so that you can reduce your energy bills without compromising productivity. While energy savings can vary depending on the particular energy use of a farm, it is reasonable to assume that a typical farm could save up to 30 percent of its energy costs by incorporating energy efficiency measures.

Energy Audits

As you start thinking about how you can incorporate energy efficiency on your farm, consider getting a professional energy audit. An energy audit is a technical assessment of your farm's total energy use. The auditor assesses where your operation uses energy and where it loses energy, and recommends ways you can cut your overall energy use. An audit can cost between \$1,000 – 2,000. Fortunately, there are several federal incentives that can cover up to 90% the cost of an audit. See "EQIP" and "REAP" in the Appendix for information.

An audit is helpful in giving you the overall picture of your energy use and demonstrating how many small changes to your operation can, in the aggregate, make a large impact on your energy bills. However, the following efficiency tips are generally applicable to, and likely to result in significant energy savings for, farming operations of all types and sizes.

Energy Efficient Buildings

Low to No Up-Front Cost

Replacing old incandescent light bulbs with compact fluorescent light bulbs (CFLs) not only reduces energy use, but saves farmers money far beyond the original investment. CFLs can be installed in regular incandescent fixtures, last 10 times longer, and use 75% less electricity. An energy audit on one farm, for example, found that switching the farms 60-watt incandescent bulbs to five-watt CFLs required an initial cost of about \$2,000 but would save the farmer \$2,500 per year in energy costs. Given CFL's 5-8 year life span, this farmer can expect total savings of around \$15,000.

Install lighting controls such as dimmers, timers, and sensors to ensure that lights are turned on only when they are needed. Sensors are even more precise than timers because they respond to actual conditions like light, motion, or heat.

Landscaping is a simple and effective tool to reduce your energy use. Native plants can serve as windbreaks to reduce heating needs, shade trees to reduce cooling needs, or as soil stabilizers to help conserve water. In colder climates, an effective windbreak reduces wind chill, helps with snow control, and reduces heating costs by approximately 20-40%.

Insulation is an excellent way to improve indoor comfort while reducing energy consumption. For preexisting buildings, consider adding weather stripping around windows and doors where air flows out from or into buildings. Also, for only a slightly larger investment, you can blow insulation into empty crawl spaces above building ceilings, as a lot of heat is lost through a building's roof.

When purchasing new building materials, you should look for materials that have what the industry refers to as a high "R value." An "R value" is a measurement of thermal resistance (i.e., how fast heat transfers through a substance), so the higher an "R value," the more slowly heat will transfer across that material. Therefore, a wall or window with a higher "R value" will provide more insulation and increase energy efficiency, providing you with greater cost savings over time.

One study revealed that when a farmer employed these simple insulation techniques to a small room within his barn, he was able to raise the inside temperature by 20 degrees.

Passive heating and cooling with simple ventilation uses little or no energy to warm and cool your home and farm buildings. This can be done simply by having an "intake" window on the lower, windward side of a building and an "exhaust" window on the upper, leeward side. This system means that warm air will travel out of the

“exhaust” window as it rises, pulling cooler air in through the intake window. A simple attic fan can speed this process with minimal costs.

Higher Up-Front Cost

Radiant floor heating systems involve heat being supplied to the floor directly, which subsequently heats the building. Radiant floor heating is more energy efficient than baseboard heating and often outperforms forced air heating. Radiant floor heating can be installed under many floor materials.

Geothermal heating and cooling systems take advantage of the constant temperature of the ground. You can dig a large well near the building that you intend to heat and lay pipes that loop through the well. A heat-absorbing fluid continuously flows through the pipe loop and allows heat to transfer into the building during cold weather and cool fluid to transfer in the summer.

Light-emitting diodes (LED) for greenhouse lighting have dropped in price in recent years, are more energy efficient than standard greenhouse lighting, and are easier to control. For example, a greenhouse equipped with LED lighting can use sensors to determine if a cloud is passing over and immediately adjust the LED light intensity to provide plants with uniform light exposure.

Tax Incentives for Energy Efficient Buildings

Principal Residences Tax Credit

Federal tax credits are available for: biomass stoves, air source heat pumps, central air conditioning, hot water boilers, furnaces, insulation, roofs, water heaters, windows, doors, skylights, geothermal heat pumps, small residential wind turbines, solar energy systems, and residential fuel cell and micro-turbine systems. Tax credits are typically 10% of the project cost, up to \$500.

Commercial Buildings Tax Credit

A federal tax deduction from \$0.30 to \$1.80 per square foot is available for the installation of interior lighting, building envelopes, and HVAC/hot water systems as part of a plan to reduce building energy use by at least 50%. To qualify, the building must meet applicable industry standards.

If you do not want to install all three of these systems or you cannot meet the 50% reduction target, you can receive a deduction of \$0.60 per square by installing interior lighting that reduces energy use by 20%, HVAC and hot water systems that reduce energy use by 20%, or building envelope improvements that reduce energy use by 10%.

For more information on how to apply for these tax deductions see “Tax Programs” in the Appendix.

Energy Efficient Equipment and Operations

Most of the successful efficiency techniques for farm equipment and operations are routine practices that you probably are already doing. While alone these may seem trivial, when combined they can make a large impact to your farm's overall energy use.

Motors and Engines

Maintain motors at peak performance levels. Peak performance creates many benefits including higher fuel efficiency, reduced maintenance expenses, reduced downtime, and extended life.

Purchase high efficiency electric motors. The purchase price of a motor is often small relative to the electricity costs to operate it, and the payback period for a high efficiency motor can be relatively short.

Consider converting old tractors into electric using 12-volt batteries. A Vermont farmer recently made this conversion and her electric tractor ran for five hours in the field using only eight fully charged 12-volt batteries. This farmer had also started using golf carts instead of trucks for other farm tasks, substantially reducing her fuel usage.

Pay Attention to Irrigation System Efficiency. In certain areas of the US, switching from high to low-pressure sprinkler systems can save about \$55 per acre annually.

Poor pump and motor efficiency could cause a 25% loss of the electrical energy used for irrigation pumping. Energy efficiency losses of this magnitude are no small matter considering total energy expenses for irrigation pumping increased 73% between 2003 and 2008.

To achieve system efficiency, be sure to use the proper sized pumps and fittings for your system. Additionally, be sure to adjust impellers, unplug screens, replace worn nozzles, maintain engine drives, fix leaking gaskets and drains, and oil dried-out bearings and pump packing.

Vehicles

Maintain your farm vehicles and equipment in top condition to save fuel, reduce repair costs, improve reliability, and reduce exhaust emissions. Problems that can easily be prevented with routine maintenance can end up creating large, unplanned costs to an operation. For example, one faulty spark plug or stuck valve lifter can increase fuel use by 10%-15%. Blocked air filters can increase fuel consumption by as much as 20%. In addition to regularly checking these problem areas, other effective maintenance procedures include frequent checks of tire pressure, tread, and alignment.

Use the vehicle properly for the job to lower your operating costs. Good vehicle operating procedures include: gearing up and throttling down (i.e., choose the gear that provides your desired speed at a

reduced rpm to achieve maximum efficiency), minimizing idling (which can account for 15 to 20% of total fuel used), ballasting the tractor properly, and using an appropriately sized tractor for the task you are performing.

Seal your fuel storage tanks to avoid fuel loss from leaks and evaporation. A 300-gallon tank can lose roughly 120 gallons per year from evaporation. You can reduce fuel loss significantly - to roughly 15 gallons per year - with the following steps: keep fuel tanks well-shaded to lower internal temperature, paint tanks white to better reflect sunlight, and use pressure-relief caps to reduce leaks and evaporation.

Conservation Tillage

Reducing the amount you till your land can also cut your fuel costs. In conventional tillage, the operator plows, disks, and harrows before and after planting. In reduced tillage, such as ridge and mulch tilling, seedbed preparation is minimized or combined with other field operations like planting. Reduced-till, low-till, or no-till practices reduce the number of tractor passes through the field and therefore reduce fuel consumption, soil compaction, and soil erosion. Fuel savings vary, but could be as much as \$10 per acre annually.

Dairy Farming

Incorporating energy efficient appliances into your systems can significantly cut costs on dairy farms. Operation costs for dairy farms increased 35% from 2002 to 2007. The steepest increases in costs were for gas, fuels, and oil, which increased 102%. The price for fertilizers, lime, and soil conditioners increased 60%. To mitigate these costs, consider integrating more energy efficient appliances like compressor heat recovery units or plate coolers, which can save a 500-cow dairy farm as much as \$2,000 per year in electricity costs. Additionally, one farmer who installed a variable speed drive reported that his efficiency had doubled, and his electricity expenses had lowered 50-80%.

Tax Incentives for Equipment and Operations

Ordinary and necessary costs of operating a farm for profit are deductible business expenses, including the repair and maintenance of your farm property, including equipment.

Section 179 of the Internal Revenue Code allows small to mid-sized businesses to claim a \$500,000 tax deduction on qualified equipment purchases in 2010 and 2011, and a \$125,000 tax deduction in 2012. Up to \$2 million of new and used capital can be purchased in 2011, \$500,000 in 2012 and \$200,000 starting in 2013, before the deduction phases out. "Bonus Depreciation" is also available on qualified new equipment, which eases the burden of making large up-front investments in new equipment.

Farm Bill Incentives for Agriculture Efficiency

Rural Energy for America Program (REAP): REAP is the largest source of grants and loan guarantees for small to mid-sized farmers to implement most of the efficiency projects described above, including energy audits. The 2008 Farm Bill set aside \$159 million in mandatory funding for REAP, which is available through 2012 when the current Farm Bill expires. By law, 20% of REAP grants must be awarded to smaller-scale projects with total project costs under \$20,000. See “REAP” in the Appendix for more information.

Environmental Quality Incentives Program (EQIP): You can contract with NRCS for cost-share and incentive-based payments to develop and implement conservation practices on your farm. NRCS provides technical and financial assistance for these projects, with up to \$300,000 in financial assistance available over a 6-year period. NRCS allocates funds based on projects that optimize the environmental benefits to areas of natural resource concern, which includes energy efficiency.

EQIP funds are also available for energy audits: up to 75% the cost of the audit, or up to 90% for historically underserved farmers, which includes minority and beginning farmers. NRCS can connect you with a technical service provider to perform the audit, and can work with you to additionally finance the auditor’s recommendations. See “EQIP” in the Appendix for more information.

Part 2: Renewable Energy Generation

Supplying your own energy provides several key benefits:

Financial Viability and Cost Savings

The more energy you produce yourself, the less vulnerable you are to increases in energy prices. Thus, on-farm generation of fuel and electricity can translate into direct purchasing savings.

Operational Independence

Producing your own electricity or fuel and reducing your dependence on external sources of power means greater energy independence. America's food supply is highly dependent upon imported petroleum products for fuel and greater energy self-reliance reduces your susceptibility to global energy supply disruptions.

Limiting Environmental Externalities

Producing energy from fossil fuels has many environmental drawbacks. In particular, coal-fired power plants are a major source of local and global air pollution, as well as a significant contributor to carbon dioxide emissions. Ozone, a by-product of burning fossil fuels, damages crops and reduces yields. Trimming reliance on fossil fuel intensive energy sources means better environmental prospects that will help you continue to produce abundant and healthy crops.

This section approaches on-farm energy production from two perspectives: production for personal use and production for market sale. Each energy source – wind, solar, manure, and biomass – has the possibility of providing energy for both personal and market use depending on the scale of the project. The scale of the project also determines what financial assistance is available, although in some instances the same funding source provides assistance for energy generation projects regardless of the intended end user.

For all projects, however, it is essential to follow permit, zoning, and inspection requirements for renewable energy projects to avoid fines or other penalties. These requirements vary widely across states, cities, and regions. See “Permits, Zoning, and Inspection Requirements” in the Appendix for ways to obtain information for your region.

Producing Energy from Plant Biomass

Traditional wood or pellet stoves and furnaces have been around for centuries as a means of providing general heating, but newer, more efficient models reduce pollution while consuming less fuel. Pellet stoves efficiently burn small pellets made of waste wood from furniture manufacturing or logging operations.

Central heating/boiler systems are a growing segment of the wood-heating sector. There are two basic types of alternative fuel central heaters: “Stand-Alone” and “Multi-Fuel” systems. The “Stand-Alone” system burns wood, wood and coal, or corn/pellet combinations and is installed next to an existing gas or oil system. The “Multi-Fuel” system, which can burn wood, or wood and coal, has an oil or gas backup built into the same unit. See “BTEC” in the Appendix.

Cogeneration (combined heat and power) means simultaneously producing both electricity and heat. Cogeneration using forest residues or farm waste biomass is one of the most efficient ways to convert biomass into energy. Cogeneration can also be used in horticulture, greenhouses, drying crops or wood, livestock facilities, and timber processing.

Fuel made from plant waste is generally either waste vegetable oil or waste vegetable oil converted into biodiesel. With a few exceptions, waste veggie oil

requires modifying existing equipment, while waste vegetable oil biodiesel can be used in most diesel-burning engines. One Vermont farm used to consume 3,000 gallons of No. 2 oil to heat three greenhouses each winter. The farmer installed a vegetable oil system that cost \$5,000 up front. However, due to eliminating expensive fuel purchases, the farmer saved \$7,000 in fuel costs per year. With fuel prices just above \$2.00 per gallon, payback on this system could be as fast as 3.5 years.

Financial Incentives to Produce Energy for Personal Use from Plant Biomass:

Principal residence appliance tax credit provides up to \$300 for an eligible biomass home heating device, like a pellet stove or central heating unit. The biomass stove must have a 75% thermal efficiency rating to qualify.

Business Investment Tax Credit allows system owners to claim a 10% tax credit for eligible biomass systems.

Production Tax Credit allows for 2.2 cents per kilowatt-hour (kWh) credit for energy that you produce using an open-loop biomass system and/or 1.1 cents per kilowatt-hour for energy that you produce using a closed-loop biomass system for the first ten years that the project operates.

For more information on how to apply for these credits see “Tax Programs” in the Appendix.

Financial Incentives to Produce Energy for
Market Sale from Plant Biomass:

Farm Bill Tax Credits for cellulosic biofuel production are available through 2012 for up to \$1.01 per gallon, which includes fuel produced from wood chips.

Biomass Crop Assistance Program (BCAP) provides funding assistance to support production of eligible biomass crops via annual payments on a contractual basis of up to 5 years for herbaceous biomass (annual or perennial) and up to 15 years for woody biomass. See “BCAP” in Appendix for more information.

Producing Energy from Manure

Anaerobic digestion is a process that takes energy stored in manure and converts it into methane-rich biogas that can be used to generate electricity.

Most digesters in the United States are on-farm or farm-scale digester systems, which are owned and operated by the farmer or a third party. Regional digesters are systems that take manure from multiple farms and transfer it to an off-site digester that is owned cooperatively or by a third party.

Although manufacturers are exploring smaller-scale models, farmers with more than 500 cows or 2000 hogs are the most likely to produce enough manure to make a digester economically viable.

Financial Incentives to Produce Energy from Manure

REAP authorizes loan guarantees up to \$25 million and grants of up to 25% of cost for renewable energy systems. See “REAP” in the Appendix for more information.

BCAP funds are available for producers committed to eligible biomass fuel production, which includes animal waste. The biomass producer must be located within reasonable distance from a biomass conversion facility. See “BCAP” in the Appendix for more information.

EQIP grants and cost-share payments, administered through the NRCS, are available to farmers who implement conservation management plans, which can include installation of a methane digester.

To qualify for this program, you must develop a plan of operations including a comprehensive nutrient management plan. Additionally, payments are limited to \$300,000 for a six-year contract period.

AgSTAR is a government outreach program that provides information to help producers evaluate and implement methane digesters. See “AgSTAR” in the Appendix for more information.

Producing Energy for Personal Use: Small Scale Wind and Solar

Solar energy has many uses on farms: heating greenhouses, powering electrical fencing, running lighting, and pumping water. You can install solar air/space heaters into farm buildings to preheat incoming fresh air. You can also install solar water heating systems to provide medium temperature hot water for equipment and pen cleaning.

Additionally, since heating water and cooling milk can account for 40% of energy used on a dairy farm, there is a great opportunity for savings if you transition your heating and cooling processes to run off of solar energy you produce on site.

Solar photovoltaic (PV) is the most wide-spread form of solar energy production. These are the dark panels you see installed on rooftops and in fields. PV technologies directly convert energy from sunlight into electricity. PV systems include no moving parts and most manufacturers provide warranties of 25 years on their products.

A Massachusetts farm installed a 3.8 kW solar electric system that today generates enough electricity to power walk-in coolers, greenhouse fans, the office computers and lights in a 520-member community supported agriculture operation. The panels supply roughly 20-50% of the farm's electricity.

Thermal energy means using the sun's energy to heat water that can be used in space heating and cooling, and industrial process preheating. The payback period varies based on system size and location. However, solar thermal payback is generally 4 – 8 years. PV systems, on the other hand generally have a payback period of 10-15 years.

Small-scale wind electric systems are generally less than 100 kW in capacity and produce electrical power for on-site use. Installing a small wind electric system can lower your electricity bills by 50–90% and help avoid the high costs of having utility power lines extended to a remote location. You can use small wind systems for most of the on-farm applications listed above under “solar energy.”

Federal Tax Incentives to Produce Wind and Solar Energy for Personal Use

Residential Renewable Energy Tax Credits for 30% of the project cost are available to consumers who install solar thermal, solar PV, or small wind systems. There is no cap on this tax credit.

Business Investment Tax Credits are available for solar PV, solar thermal, and small wind projects (100kW). This tax credit is currently in place through 2016 and allows you to claim up to 30% of your investment. Additionally, if an individual taxpayer, as opposed to a corporation, makes the investment, then any excess credit from the year of the investment can generally be carried over to the following year.

Producing Energy for Market Sale: Large Scale Wind

Community wind power financing arrangements are popular for projects in the 100-kW to 100-MW range and involve at least part ownership by local community members, usually land owners that host turbines. Though community wind represents only 4% of the overall wind market, it is the fastest growing segment of the industry. There are several reasons why community wind power is more advantageous than individual turbines, including lower costs of transmission and connection to the grid and more community support for zoning permit applications.

Federal Tax Incentives to Produce Wind Energy for Market Sale:

Production Tax Credits are available for larger wind energy projects. You can receive 2.2 cents per kilowatt-hour (kWh) produced and sold through a power purchase agreement with a utility for the first ten years that the project operates. This tax credit is currently in place for any projects placed in service by December 31, 2012. See “Tax Programs” in the Appendix for more information.

Selling Energy You Produce to the Grid

Net metering lets you offset your electric bill by using your own power generated from on-site renewable energy systems like wind, solar or methane digestion. Your utility monitors how much electricity you put into the grid compared with how much electricity you use over a billing period. If you produce more electricity than you use, the excess is credited to your next month's bill.

State net metering policies vary. Many states require utilities to allow net metering. In some states, the utility pays you the retail price for any excess electricity you generate. However, smaller municipal or cooperatively owned utilities may not have the infrastructure in place to accept and transmit the electricity you produce. Ask your utility directly about their net metering policies, or find out online via the Database of State Incentives for Renewables and Efficiency. See "DSIRE" at the end of the Appendix for more information.

Community Net Metering makes renewable energy easier to finance by letting multiple customers share net metering credits from a cooperatively-owned renewable energy system. This means that even if you do not have ideal renewable resources on your property, you can still take advantage of net metering if you have a neighbor who does, and invest in the production together.

Selling Renewable Energy Credits (RECs) is another way to offset your energy costs. State and local laws establish REC markets in which utilities, businesses, or individuals that generate renewable energy act as REC suppliers. Generally, each REC represents one megawatt-hour (MWh) of electricity generated from a renewable energy source. The selling price of RECs varies and you should consult with a broker for REC pricing.

Leasing your land to a commercial wind or solar developer for renewable energy projects is another option. A land lease is a contract, through which you grant a wind or solar developer the right to use a portion of your farmland for renewable energy generation and you receive compensation, essentially rent, in return. Typically, the developer owns any turbines or solar panels and performs all necessary construction and maintenance. These leases are often written to cover long periods of time; 30 to 60 years is common.

Because land leases are contracts, you have the opportunity to set your own terms. However, it is important to get experienced legal help in negotiating and evaluating any agreement with a developer to ensure that issues such as liability and project decommissioning are addressed before the contract is formed.

Part 3: Resource Appendix

This appendix contains resources for informational and financial assistance relating to the efficiency and renewable projects discussed in this guide. This list is not exhaustive, but provides a general overview of federal resources and how to access state resources.

USDA Programs

The Farm Bill is a comprehensive piece of federal legislation that authorizes the USDA to carry out numerous programs, including some that benefit agricultural energy efficiency and energy generation.

Some key terms to understanding Farm Bill programs are “mandatory” and “discretionary.” Programs with mandatory funding have funding in place for the duration of the Farm Bill and do not require funding to be set aside each year through Congressional appropriations. Programs with discretionary funding have been authorized by Congress to receive up to a certain amount each year, but the actual allocation of funds depends on annual appropriations.

The current Farm Bill expires in 2012. During the summer of 2011, Congress held a series of hearings to audit current Farm Bill programs in preparation for the upcoming 2013 Farm Bill. Therefore, it is possible that existing programs may be cut in the next Farm Bill, and that no additional money will be

allocated for existing programs unless offset by reductions in other programs. In theory, additional funding is also feasible, but it seems unlikely in the current fiscal environment. However, the following programs are funded through 2012 and have the possibility of being reauthorized in the upcoming Farm Bill:

The Farm Bill Conservation Title has programs that fund both working and retired land. This guide only addresses incentives for working land.

Environmental Quality Incentives Program(EQIP)

What is EQIP?

EQIP provides technical and financial assistance to vegetable, livestock, and forestry producers to help design and implement conservation practices with positive environmental effects. This funding covers numerous conservation practices, including: reduced tillage practices, wind breaks, cover crops, irrigation systems, solar powered electric fencing, and energy audits.

How does it work?

EQIP grants or cost-share payments are based on a portion of the average cost associated with implementing conservation practices. Additional payments may be available to help you develop conservation plans, which are required to obtain financial assistance.

What is available?

Grants are available for 50-75% of approved projects, or up to 90% for historically underserved farmers, such as minority or beginning farmers.

There is also funding available for 75 – 90% of the cost of an energy audit. NRCS will provide you with contact information for technical service providers that can perform the audit and will help you obtain additional funding to implement the auditor's recommendations. Financial assistance is limited to \$300,000 over a six year period.

EQIP is administered by your own state's NRCS office. You can locate the closest NRCS specialist to you by county: <http://offices.sc.egov.usda.gov/locator/app>

You can also find EQIP application information here: http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/financial/eqip/?&cid=nrcs143_008223

Conservation Stewardship Program (CSP)

What is CSP?

CSP is a program that encourages producers to implement, or maintain and improve, existing conservation management practices that address regional resource concerns.

How does it work?

Participants enter into a five year contract and are paid annually based on performance – the higher the

conservation benefit, the higher the payment. Many of the energy efficiency and conservation strategies mentioned above can be included in calculating total conservation benefits.

Contact your local NRCS representative for more information, or visit the NRCS website:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp>

Conservation Innovation Grant Program (CIG)

What is CIG?

CIG encourages the development of new energy-conserving technologies and/or practices that demonstrate reduced greenhouse gas emissions.

How does it work?

While most grants awarded to date have gone to non-profits or governments for research into conservation-based programs, funding is available for individuals.

What is available?

Matching funds up to 50% of the project cost are available for one to three year projects. Because CIG uses EQIP funds, the same limitations apply – no more than \$300,000 in a six year period.

Contact your state or county NRCS representative, or visit the NRCS website for more information: www.nrcs.usda.gov/technical/cig/index.html

The Farm Bill Energy Title provides incentives for many efficiency and renewable energy projects on farms and in rural communities. For small and mid-sized farmers, REAP is the most important program.

Rural Energy for America Program (REAP)

What is REAP?

REAP provides grants and loan guarantees for numerous on-farm energy projects including:

- energy efficiency and energy audits
- solar thermal and solar electric
- large and small wind
- biomass
- feasibility studies, which help determine whether a particular renewable energy project makes sense for your particular enterprise.

Who can apply?

Agricultural producers and rural small business, defined as anyone living in a rural community with a population of less than 50,000.

What is available?

Loan guarantees for renewables or efficiency from \$5,000 - \$25 million, or up to 75% total project cost.

Grants for efficiency projects range from \$1,500 – 250,000, or 25% eligible project costs, whichever is less. Total project values must be at least \$6,000, and a project valued at over \$50,000 requires an energy audit by a certified party. An audit may cost \$1,000-2,000. Fortunately, funding is available through REAP and EQIP for up to 90% of the cost of the audit.

Grants for renewable energy systems range from \$2,500 – 500,000, or 25% eligible project cost, whichever is less. The minimum total project cost is \$10,000.

Project assistance requests over \$50,000 require a feasibility study; however, assistance is available for up to 25% of the feasibility study cost, or \$50,000.

Combined grants and loans are available, but cannot be more than 75% total project cost. There is a \$5,000 minimum request for combined grants and loans, with \$1,500 grant minimum and the same maximum limits as above for renewable and efficiency projects.

To learn more about the REAP application process in your state, contact your Rural Development Energy Coordinator. You can find your Energy Coordinator's contact information here:

http://www.rurdev.usda.gov/recd_map.html

You can learn more about program eligibility through the USDA's Rural Development office:
http://www.rurdev.usda.gov/BCP_ReapResEei.html

Additionally, USDA has developed a comparison chart to help you decide whether a Guaranteed Loan Program or a REAP Program Loan and Grant is a better fit for you. See:

http://www.rurdev.usda.gov/rbs/busp/9006_BI_Comparison_with_energy.doc

Biomass Crop Assistance Program (BCAP)

What is BCAP?

Administered by the Farm Service Agency (FSA), BCAP provides financial assistance to owners and operators of agricultural or forested land to assist in the development, production, and transportation of biomass feedstock.

How does it work?

Producers enter into contracts with the FSA for up to five years for herbaceous biomass and fifteen years for woody biomass. Producers must be located within a reasonable distance from a biomass conversion facility and the land under production must not already be enrolled in a conservation reserve program.

What's available?

Funding is available either via matching payments of the delivery of materials to biomass conversion facilities or by annual payments if you enter into a contract with the Commodity Credit Corporation.

USDA's Value-Added Producer Grant Program

What is a Value-Added Producer (VAP) grant?

VAP makes funding available for farm-based renewable energy planning and marketing through the USDA's Rural Development Business and Cooperative Programs office.

Relevant but Unfunded Farm Bill Programs:

The following programs were authorized by the Farm Bill for discretionary funding but have not received any funding allocation to date:

Rural Energy Self-Sufficiency Initiative is a new financial assistance program to increase energy self-sufficiency of rural communities.

How would it work? Provides grants to conduct energy assessments, formulate plans to reduce energy use from conventional sources, and install integrated renewable energy systems.

Integrated renewable energy systems are defined as community-wide systems that reduce conventional energy use and incorporate renewable energy use.

Federal-cost share for any grant is limited to 50% of project cost. The project is currently unfunded, but is authorized at \$5 million annually through 2012.

Community Wood Energy Program

How would it work?

Provides matching grants up to \$50,000 to develop and acquire community wood-based energy systems along with assistance for state and local governments to install wood energy systems in community facilities. Though currently unfunded, the project is authorized at \$5 million annually through 2012.

EPA Programs

AgSTAR is a program that the EPA administers in collaboration with the USDA and Department of Energy.

What is AgSTAR?

AgSTAR is an outreach program that provides information and tools to assist livestock producers (typically swine and dairy farms) in the evaluation and implementation of methane recovery systems, such as anaerobic digesters.

Who is eligible?

Digesters are typically most economically viable for operations with more than 500 cows or 2000 hogs.

The program offers outreach materials and project development tools, events and workshops, pre-feasibility analyses, and access to experts in the field.

What funding is available?

The AgSTAR Program does not provide project funding, but it does provide information about funding sources that may be available for anaerobic digestion projects.

Visit the AgSTAR program's funding guide for a list of federal and state-specific funding sources:

<http://www.epa.gov/agstar/tools/funding/index.html>

Federal Tax Programs

Tax incentives include various aspects of the tax code that are designed to encourage certain investments or activities. The following is a list of IRS forms and instructions to apply for various federal tax incentives for renewable energy and efficiency. Additionally, any project installer or developer you hire will most likely be able to inform you about available tax incentives. Consulting with a Certified Public Accountant or tax professional could provide you with additional opportunities to maximize tax incentives for which you are eligible.

To apply for principal residence renewable tax credits, which are available for general home improvement, biomass systems, small wind projects, and solar projects, fill out IRS Form 5695. Then enter the information from Form 5695 into line 52 of Form 1040, and submit Form 5695 with your taxes.

Both forms and more information on how to apply are available at: http://www.energystar.gov/index.cfm?c=tax_credits.tx_index

To apply for commercial building tax deductions, see IRS Notice 2006-52 and 2008-40, which together provide detailed instructions for how to do so.

Both notices are available at: http://www.energystar.gov/index.cfm?c=tax_credits.tx_comm_buildings

To apply for the business investment tax credit for cogeneration, solar thermal, solar PV, wind, or biomass, fill out IRS Form 3468.

Both IRS Form 3468 and instructions to fill it out are available at:

http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=US02F&re=1&ee=1

To apply for the production tax credit for biomass or wind, fill out IRS Form 8835 available at: <http://www.irs.gov/pub/irs-pdf/f8835.pdf>

State Programs

Many states have property, income, and sales tax credits available for renewable and efficiency projects. You can find information on your state's tax incentives here: www.dsireusa.org

Utility rebate programs may be available in your region for efficiency purchases and/or renewable energy generation. Check with your utility for more information, or locate state-specific information here: www.dsireusa.org

Permits, Zoning, and Inspection Requirements

Many cities, counties, states, and in some instances the federal government, have permitting, zoning, and inspection requirements for installing renewable energy generation systems. These government entities require permits to ensure that certain safety and technology standards are met for renewable energy generating equipment. It is essential to consult and follow all permitting, zoning, and inspection requirements, because failure to adhere to them can lead to fines and various other penalties.

To obtain more information about permitting, zoning, and inspection requirements, you can consult your local or county land authorities. You can also contact your state public utilities commission's website or call them regarding questions about permits. Additionally, if you hire an installation company or project developer to construct and/or plan your project, they will likely be able to inform you of any requirements and may process your permits for you. Even though filling out permits can seem tedious and time consuming there are many ways to obtain help with this process to get you on your way to installing your new renewable energy system.

Additional Useful Resources

American Council for an Energy-Efficient Economy (ACEEE)

ACEEE is a nonprofit organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. ACEEE maintains an agriculture efficiency project. www.aceee.org

Biomass Thermal Energy Star Council (BTEC)

BTEC is an association of biomass fuel producers, appliance manufacturers and distributors, supply chain companies and non-profit organizations that engage in research, education, and public advocacy for the biomass thermal energy industry. <http://www.biomassthermal.org/resource/>

Database of State Incentives for Renewables and Efficiency (DSIRE)

DSIRE is maintained by the North Carolina Solar Center, the Interstate Renewable Energy Council, and the Department of Energy. It contains extensive information on federal and state-specific incentives. <http://www.dsireusa.org/>

Energy Star

EnergyStar is a program of the Environmental Protection Agency & Department of Energy. The website contains information on home energy efficiency and available tax credits. http://www.energystar.gov/index.cfm?c=tax_credits

Environmental Law and Policy Center (ELPC)

ELPC's Farm Energy program website provides information on current events affecting farm energy from financing to Congressional farm policy.
<http://www.farmenergy.org>.

ELPC also maintains a comprehensive guide to the REAP funding: <http://farmenergy.org/tools/reap-faq>

Internal Revenue Service (IRS)

The IRS website provides details on tax incentives and forms to fill out to obtain these tax incentives.
<http://www.irs.gov>

The IRS also provides guides for farmers:
<http://www.irs.gov/publications/p225/index.html>

National Center for Appropriate Technology (NCAT)

NCAT manages several projects that provide substantial information on efficiency and renewable on small to mid-sized farms.
http://www.ncat.org/farm_energy.php

NCAT's Appropriate Technology Transfer to Rural Areas project maintains a State-by-State Energy directory contains detailed technical, financial, and policy-related information.
https://attra.ncat.org/attra-pub/farm_energy/search.php

Tax Incentives Assistance Project (TIAP)

TIAP is a project sponsored by a coalition of public interest nonprofits, government agencies, and other organization in the energy efficiency field. TIAP provides information for consumers and businesses to help them take advantage of federal energy efficiency tax credits <http://energytaxincentives.org/>

US Department of Agriculture

Energy Matrix

The USDA developed the Energy Matrix to serve as a one-stop-shop for all agriculture and energy related information. You can find technical information on USDA's energy programs as information on funding availability. <http://www.energymatrix.usda.gov/>

US Department of Agriculture

Natural Resources Conservation Service (NRCS)

NRCS administers several programs under the Conservation Title of the Farm Bill, including EQIP. <http://www.nrcs.usda.gov/>

Find your county NRCS contact here:

<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>

US Department of Agriculture

Rural Development

The USDA Office of Rural Development oversees REAP and other energy programs.

<http://www.rurdev.usda.gov/Energy.html>

You can find your state Rural Development Energy Coordinator here:

http://www.rurdev.usda.gov/BCP_Energy_CoordinatorList.html

US Department of Energy: Energy Efficiency and Renewable Energy

The Department of Energy (DOE) provides resources for energy efficiency and renewable energy production on farms:

http://www.energysavers.gov/your_workplace/farms_ranches/index.cfm/mytopic=30001

Windustry

Windustry is a non-profit organization that works to remove barriers to broad community ownership of wind energy. Windustry has a resource page for farmers interested in leasing their land for energy production. <http://www.windustry.org/leases>

All resources used in this publication can be accessed via our websites:

Institute for Energy and the Environment at Vermont Law School:

<http://www.vermontlaw.edu/energy>

Energy Solutions for Independent Farms, a project of the Institute for Energy and the Environment:

<http://www.agenergysolutions.org>