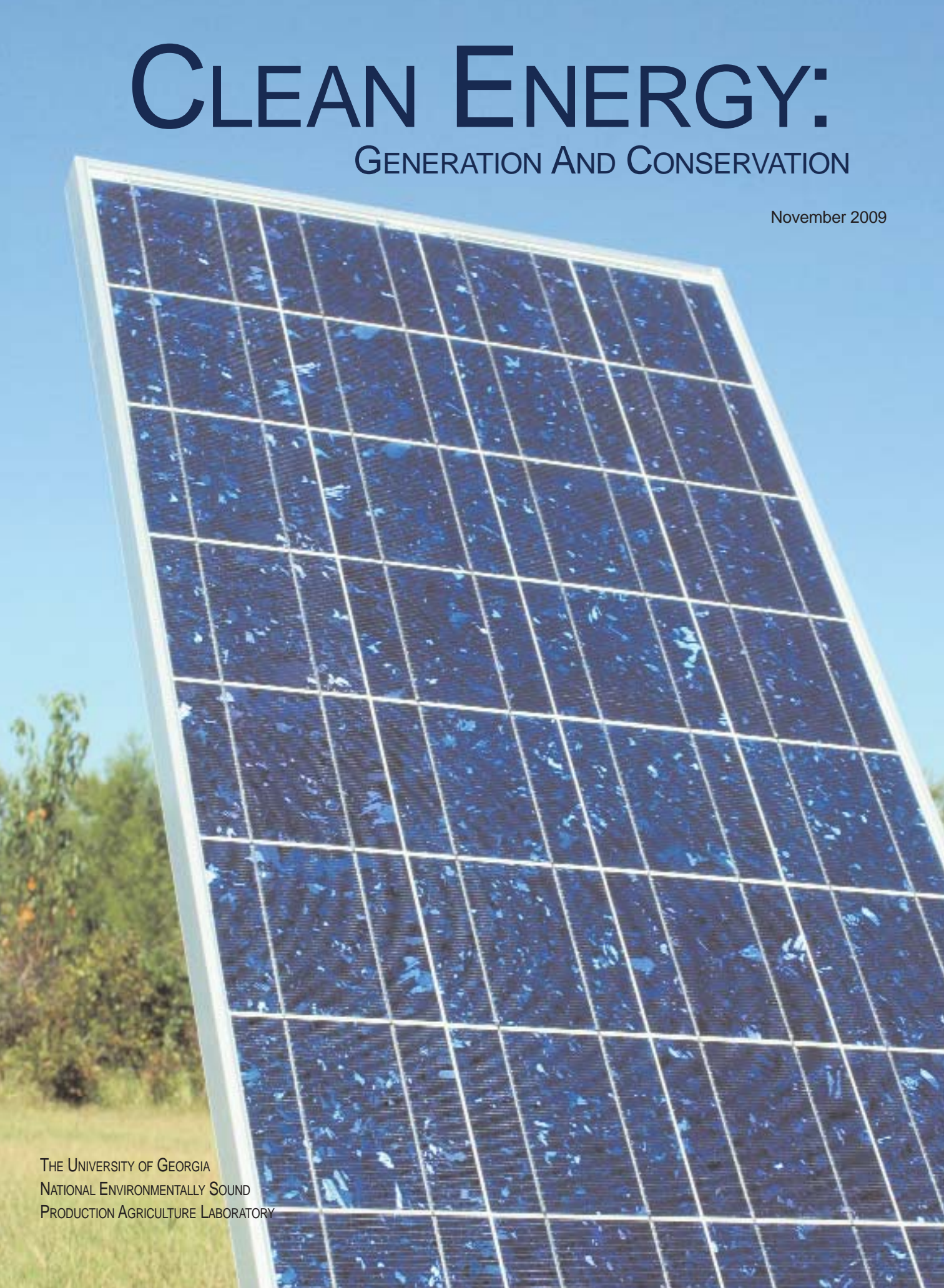


# CLEAN ENERGY:

GENERATION AND CONSERVATION

November 2009

A large, rectangular solar panel is the central focus, tilted at an angle. The panel is dark blue with a grid of white lines. It is set against a clear blue sky. In the background, there is a green field and some trees.

THE UNIVERSITY OF GEORGIA  
NATIONAL ENVIRONMENTALLY SOUND  
PRODUCTION AGRICULTURE LABORATORY

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# Tomorrow's Agriculture: Full Of Energy

By Craig Kvien, Chair of the National Environmentally Sound Production Agriculture Laboratory

This summer, I attended the SE-Bioenergy Conference in Tifton, Ga. The keynote speaker was Robert Zubrin, author of "Energy Victory." His presentation was excellent and his information sobering. He pointed out that last year we spent more money on imported oil than on defense, and that the percentage of our income going towards oil has increased dramatically over the past few years. We all recognize this means we have less money for everything else.

Zubrin also pointed out that when our economy tanks, in part because of high oil prices, those holding the oil dollars can buy large portions of our companies at bargain rates and a portion of our public debt, making our nation less capable of acting in our own best interest. James Woolsey, former head of the CIA, presents similar facts in his speeches.

Wayne Keith, Alabama farmer, inventor and speaker at the conference, brought his wood-burning pickup. Keith has developed a gasifier to power his pickups on wood instead of gasoline. These are not toys; his wood-burning pickups can maintain highway speed and have literally traveled coast to coast on wood. His last 60,000 miles have been on wood. Keith says he gets about 5,000 miles on a cord (about 1 cent a mile for fuel). What a great use for junk mail!

The conference made it obvious that we have an abundance of creative minds in this country, and we need to take advantage of them. To get to where we need to be, we must make significant investments in public and private research, development and education programs. These investments will make possible a more efficient food, fiber and renewable energy production system and turn our nation into a net exporter of energy along with

food and fiber. R&D is key. Along with advancements in the production and conversion of renewable energies, we will also see major gains in energy efficiency. I expect over the next 15 years farm equipment and farming practices will become more energy, natural resource and people efficient. The autosteer tractors are a good example of this type of advancement. Who would have bet on this 10 years ago?

Agriculture is helping to transform our economy, and it is critical that this transformation accelerate. While we hear switchgrass or miscanthus or algae is the solution, it is clear that our next generation of energy will come from a variety of sources – tailored to regional and individual strengths and preferences.

In this insert, you will read about harvesting solar and wind energy directly through photovoltaic panels and wind turbines and the utilization of on-farm waste streams to produce fuel.

A number of articles talk about advances in efficiency and energy production. Cadmus Construction discusses their holistic approach to building a "green" home, and you will learn about a "green" John Deere dealership in Greensburg, Kan. Also, there is a section on government programs that are helping agriculture conserve and produce energy and a case study highlighting some of these advancements. You will find an article discussing edible landscapes – what a great way to improve what you eat and save the amount of energy going into our food. Finally, you will find an article on the use of broadband Internet and how we can utilize this technology to enhance our children's education while maintaining our rural lifestyle.

# Rural High Speed Internet: What Are The Options?

By Vickie Garrick

A high-speed Internet connection is becoming a necessity. We depend on the Internet for communication, education, shopping and social networking.

I live in rural South Georgia and have been looking for a solution for fast Internet for more than five years.

In 2008, the Center for Rural Affairs said that, "Only 38 percent of rural Americans have access to a high-speed Internet connection." I am part of the 38 percent and pay dearly for the privilege of a satellite connection which offers 1.2 Mbps download and 200 Kbps upload speeds for \$70 per month. The installation and equipment costs were around \$400, which sounds excessive, but it was and still is my only option.

## What Are The Options?

What are the options for fast Internet in most areas?

### 1. Digital Subscriber Line (DSL):

Cheap, high speed and very reliable; best option if available. Download: 256Kbps - 12Mbps; upload: 64Kbps - 1Mbps; Price: \$30 - \$70.

### 2. Cellular Wireless Networks:

Becoming reasonably ubiquitous and offers a new solution for high-speed Internet connectivity in rural areas. Typical speeds: download 600 Kbps - 1.4 Mbps. Some companies offer a cellular modem and more than one device (computers, iPods, cameras, etc.) can be connected. This makes the plan economically appealing. Modem: \$99 and monthly service fee: \$70.

### 3. Satellite Internet:

The only option for fast Internet for most of rural America. Download: 256 Kbps - 5 Mbps. Satellite has a big price tag for

the limited amount of service you receive and has transmission problems during inclement weather. Additionally, installation and equipment costs are high. Installation: \$400; monthly service fee: \$60- \$300 (depending on data rates).

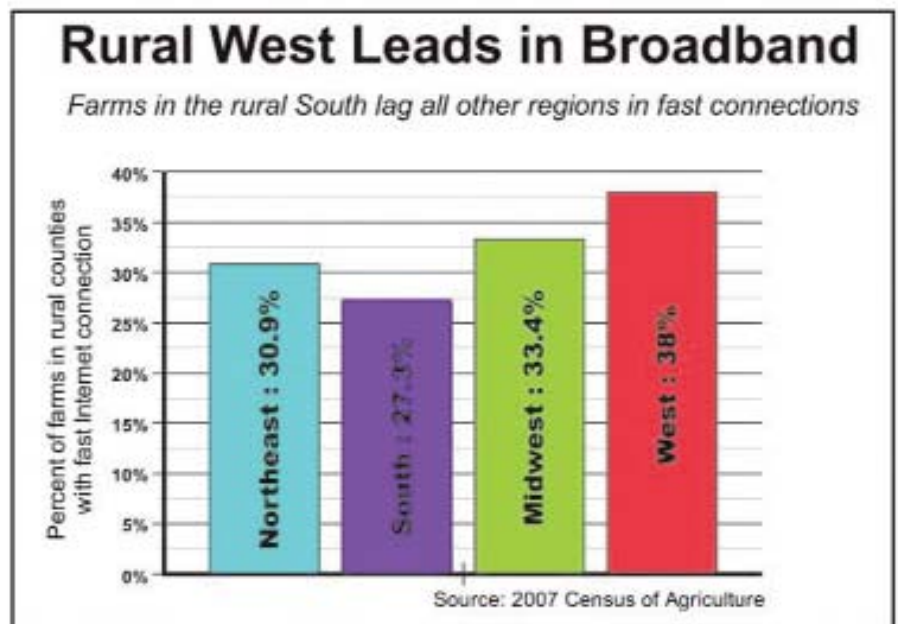
### 4. White Space:

This is the 700-MHz range formerly used for transmitting analog signals for radio and television. In June 2009, the United States' switch to digital TV freed up this part of the spectrum. The free space, now referred to as "White Space," is expected to be used for high-speed Internet and holds the most exciting possibility for rural America to finally get into mainstream communications and become globally connected. In this spectrum, signals can travel

longer distances than the higher frequencies used by many other wireless systems. A network in the 700-MHz range will require fewer cell towers to provide coverage of the same geographic area, making it a good solution for rural areas. Prototype radios and devices have already been developed and are being tested.

Although many of these options may not be currently available to you, I have renewed hope that White Space may help to close the divide between rural and urban America and that my satellite dish will become a relic of the past.

*For more information, contact the author at [garrick@uga.edu](mailto:garrick@uga.edu).*



*This graphic shows the percent of farms in rural counties across the United States with a high-speed Internet connection. Source: 2007 Agricultural Census*

# Home And Farm Energy Audits

By Brad Buchanan

No doubt, anyone who owns a home, drives a vehicle, buys a plane ticket, pays for gas, diesel or an electric bill, makes things, breaks things, heats things, cools things, pumps water – essentially, anyone who lifts a finger to do anything productive at all – has sat and pondered the impact energy has on their life, business and wallet.

Eventually, renewable energy technologies that work will wean us off dwindling fossil fuel supplies. However, until these technologies are developed, we are at the mercy of the energy market. What you can do now is reduce the amount of energy you use.

## Use Less Energy

Your home, a big energy consumer, can benefit from a range of improvements, such as better insulation, more efficient HVAC system, shading windows from the summer heat or changing your thermostat to a programmable model. On the

road, carefully planned trips eliminate unnecessary miles. Easing up on the throttle burns less fuel.

On the farm, a wide range of technologies can help you improve efficiency. Remote sensing and field mapping allow precision application of fertilizer, water and pest control measures. Well thought out cropping systems can reduce the number of trips through the field. Yet, to make the most of these improvements, you need to know where to start.

That's where the energy audit comes in. An energy audit is a great tool to guide your energy efficiency improvements. An energy audit is simply a precise accounting of how much energy you use. This process also identifies areas of waste and will give you specific areas of improvement.

## Do It Yourself Or Hire An Expert

You can conduct your own energy audit or you can hire a professional auditor. Experts that can perform an energy audit

of your home, farm or business using an array of sophisticated tools such as thermal imaging and power metering represent a growing professional field. Some power companies or electric cooperatives offer home energy audits as a free service to their consumers.

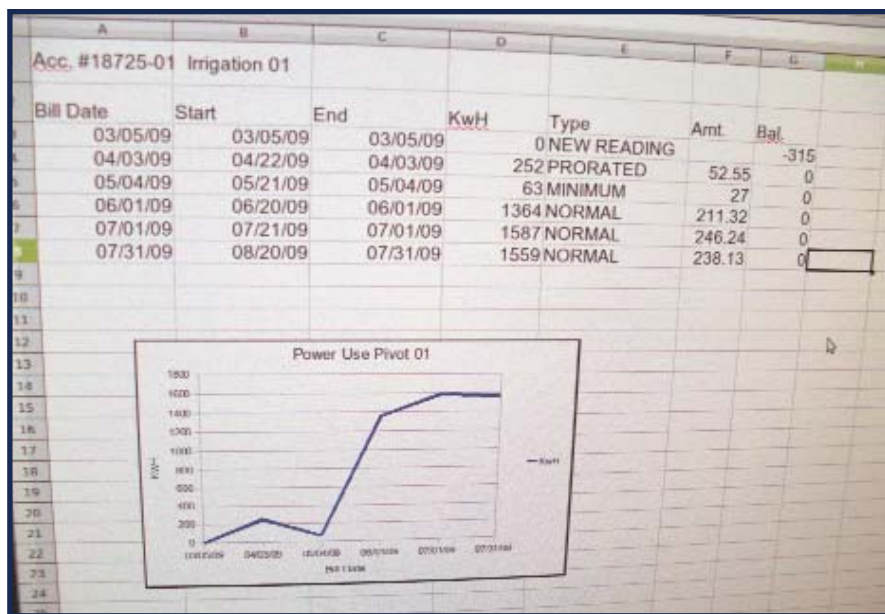
You can also conduct an energy audit that will get you on the path to maximum efficiency. Start with a checklist of all the items to rate, measure or inspect. A quick online search offers dozens of such lists. Again, your utility provider or electric cooperative is a good resource for information. Online power calculators will help you estimate your power consumption. See the box on page 5 for a list of Web sites with energy audit information.

## Around The Home

For the home, one of the greatest uses of electricity is heating, cooling and conditioning air. One of the easiest ways to improve the efficiency of your HVAC is to make sure the system is free of any air leaks. A check of your insulation for the R-rating may indicate where you need more. HVAC systems should be well maintained, and if your audit shows that you have an older unit, it may save you money to invest in a new, more efficient unit.

Lighting is another big user of electricity. Check all fixtures for bulb ratings and use compact fluorescent or LED light sources where possible.

All appliances should be checked for proper operation, and once again, if it's an older model, you might save by buying a new, more efficient unit. Check products for the Energy Star rating. A quick way to tell how much power an appliance is using is with a power-metering device such as the Kill A Watt brand meter. These devices plug in between the electrical outlet and your appliance. This is a good tool to



A spread sheet can help you monitor power use of an irrigation system and analyze energy-use patterns.

measure how much power you are using on a circuit. If you are more familiar with electrical work, you can also measure power use with a clamp meter.

### What About The Farm?

Around the farm, many items on your checklist will be similar to what you check in your home. Heating and cooling of structures and lighting are again important areas to inspect.

Farm operations include other energy uses that need a close look. Irrigation is one area where energy can be saved. Proper timing and scheduling of irrigation along with good maintenance of the system will go a long way to improving water-pumping efficiency. How you pump water deserves a close look also. A careful analysis of costs associated with diesel pumps versus electric systems may show that you could save money by changing the pump.

Field equipment and road vehicles, too, will be at their most efficient when properly maintained and adjusted. Accurate fuel and field logs allow you to calculate how much energy you use during a season. Careful study of records may show that different production methods have a cost benefit. Consider tillage practices, spray regimens, anything that involves going up and down the rows, to see what you can do to reduce trips through the field. One less trip can offer significant savings. Make moving from farm to farm more efficient with a well thought out plan to eliminate backtracking, saving time and fuel.

The main purpose of an energy audit is to identify areas where waste can be reduced and power used more efficiently. Once you have found the areas of improvement, take action. Start with the big energy users first, then move on to less significant items and fine tuning your systems. Good monitoring and record keeping will show the changes you've made, and perhaps more importantly, so will your electric bill.

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## Energy Smart On A Small Scale

By Vickie Garrick

Going "green" and becoming "energy smart" makes good sense, but where do you start? Begin on a small scale and take advantage of the many user friendly tools to help you get started.

One place to begin is with your electronic devices. You may be surprised how much your media center and office equipment is contributing to your electric bill. Purchase an electricity monitor, such as a Kill A Watt EZ, which costs around \$50, and allows you to enter your electric rate into the monitor then plug in any device and it will display the power cost of the device by the hour, day, week, month or year.



### Know Your Power Usage

For around \$100, you can monitor your entire house using the Blue Line Powercost Monitor.

Most electronic devices, such as computers, printers, DVD Players, televisions and other small appliances, use small amounts of power even when not in use. The electronic components draw power and keep your electric meter turning. The amount of waste for one device is not much, but when you include all the devices in your home, shop and office, the power usage adds up.



Who has the time to unplug all the devices not in use? Several products on the market today can help control power use of electronic devices. One product is the smart power strip which features circuitry that is able to "sense" the flow of electrical current through the strip's control outlet and turn off selected equipment when it's not in use. The BITS Smart Strip ranges in price from the low \$30s to the mid \$40s, depending on your required configuration.

These products are an inexpensive way to become more aware of your energy usage and in time can help you modify your habits to be more "energy smart."

*For more information, contact the author at [garrick@uga.edu](mailto:garrick@uga.edu).*

### More Information On The Web

- [www.georgiapower.com/residential/energyCheckUp.asp](http://www.georgiapower.com/residential/energyCheckUp.asp) - Energy audit information from Georgia Power
- [www.energysavers.gov/](http://www.energysavers.gov/) - Tips and information from the U.S. Department of Energy
- [www.fcs.uga.edu/ext/housing/wew.php](http://www.fcs.uga.edu/ext/housing/wew.php) - Energy information for homeowners from the University of Georgia's Family and Consumer Science Extension service
- [www.ag.ndsu.edu/pubs/ageng/structu/ae1366.pdf](http://www.ag.ndsu.edu/pubs/ageng/structu/ae1366.pdf) - A farm energy audit guide published by North Dakota State University
- [www.agpowermag.com/articles/articles.php?articleid=1156](http://www.agpowermag.com/articles/articles.php?articleid=1156)
- [farmindustrynews.com/tractors/calculate\\_tractors\\_fuel\\_1108/](http://farmindustrynews.com/tractors/calculate_tractors_fuel_1108/)
- [tractortestlab.unl.edu/](http://tractortestlab.unl.edu/) - Resources pertaining to tractor efficiency

# Components Of A Solar System - Decisions, Decisions, Decisions

By Gary Hawkins and Tasha Wells

Solar energy systems are becoming more popular and are used to power anything from a calculator to an entire home.

Flat solar modules can be mounted on the roof of your house, shed or in a field and convert energy from sunlight into direct current (DC) energy. A device called an inverter then changes the DC energy into alternating current (AC) electricity. This can be used to power your household appliances. A grid-connected system

can feed excess energy into the electricity network (grid), while a stand-alone system needs a battery to store excess energy.

## Where Do I Start?

Solar panels work best when they are facing south, pointed directly at the sun, installed at the correct angle and are not blocked by trees or shading. The effectiveness of solar panels also depends on where you live and the weather. When designing a system to meet a particular need,

the first step is to determine the amount of energy in kilowatt hours (kWh) the application requires. The second step is to design a system capable of capturing the required amount of energy from the sun.

Once the requirements are known, you can look at what panels are available. There are many different panel manufacturers and their products range in output from less than one watt to 175 watts per panel. If you have a company help you design a system, they may prefer to use one man-



Solar panels on the roof of this shed will capture energy that will be used to operate an irrigation system.

manufacturer over another. In order to make an informed decision, it is important to discuss the cost, efficiency and features with the designer.

### Can I Design The System?

If you design the system yourself, you will need to know the wattage, amps and voltage requirements of your application. You will also need to account for the loss in power that will occur if you are saving the power in batteries, as well as losses associated with the direct use of solar power.

A check on the Internet shows no less than 15 manufacturing companies who all have the same basic size panel or selection of panel sizes. Manufacturer warranties or guarantees range from five to 25 years. Solar systems should last at least 25 years, so obviously a warranty or guarantee for that length is best.

### How Do I Choose A Panel?

The best way to choose a solar panel is to compare the dollar-per-watt ratio. As of August 2009, a ratio ranging from \$1.85 per watt for a 50-watt panel to \$4.76 per watt for a 125-watt panel could be found. The price varies by distributor, so it is worth checking around.

For example, a quick Internet search for a 125-watt panel returned prices ranging from \$660 to \$1,100 (for the identical panel), depending on the distributor. You may also be able to find panels on sale and get a better dollar-per-watt price. In this situation, you may be tempted to buy more panels than you need with the idea of expanding the system later. Although a good idea, it is important to note that as panels are used, they lose some of their efficiency for converting solar energy into DC power. So panels that have been used may not have the same output (amps and volts) as one that has been stored in a box.

Manufacturers and suppliers use energy efficiency claims to market their photovoltaic (PV) systems. The most important parameters to examine are how much energy the system will produce each year versus the money spent.

### What Should I Pay?

Along with the panel, your purchase may include a tracking system that moves

the solar panels to optimize solar energy capture. Trackers are designed to operate with different size and numbers of solar panels (mainly on a square foot area basis). Trackers may be single or dual axle. These systems, like the panels, will vary in price and features depending on the distributor and installer. To give you a rough idea of costs, an \$800 tracking system may only hold one to two panels (22 square feet) whereas a \$3,500 system (from the same company) may hold as many as 12 panels (131 square feet).

The price of an inverter and battery charge controller, if used, will depend on the amount of power you are producing from your PV panels. As you would expect, a small charge controller (10s of watts) will be less expensive than a larger controller (100s of watts). The same also holds true for inverters.

Another feature of the charge controller that will influence price is the capability to monitor the voltage and watt output from the system.

### When Will My Investment Pay Off?

An average American household's electricity consumption varies from 38,000 kWh in New England to 21,000 kWh in the Pacific Northwest in 2005. This represents a 55 percent increase of household consumption in New England and an 8 percent decrease in the Pacific Northwest as reported by a 2001 Department of Energy survey. To get an accurate idea of your own household consumption, check your monthly utility bills. This will enable you to run the cost analysis on converting either partially or completely to solar power.

Domestic solar PV panels are currently the most expensive way to reduce your energy bill and greenhouse gases. Making your home more energy efficient is much cheaper. Payback using PVs is generally of the order of 15 to 20 years. But payback times vary widely depending on a range of variables. See box for factors affecting payback time.

This article does not provide you with sufficient information as to which panel, tracker, inverter and charge controller to use, as this will depend on your particular application and location. Given the many

different panel manufacturers and distributors, knowing what you want in a system and what you expect as a final output is a critical starting point. Once you know the required parameters, search the Internet, trade magazines, alternative energy periodicals and design companies to find the necessary components for your system to optimize the capture of solar energy.

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## Factors that affect payback time include:

1. Up-front cost of the panels and installation
2. Government rebates and tax credits
3. Availability of a South-facing site for the installation
4. Local net-metering system and price paid by utility company to add power to the grid
5. Cost of upkeep. System components should require minimal maintenance, occasional cleaning and replacement of the inverter once during the life of the system
6. Future power costs. Almost certain to rise, making producing your own energy more attractive



## Using Farm Waste To Produce Fuel

By Tasha Wells

**D**an West is a farmer who has grown to love waste. Operating a 1,300-tree orchard in Macon, Mo., West saw an opportunity to use the waste fruit from his orchard and distill it into high-octane fuel.

Agriculture can adapt to supply its own sources of liquid fuels for farm equipment and machinery, and this is exactly what West set out to achieve. The beauty of West's plan is that it did not reduce his fruit yield entering the market, but simply took advantage of the waste stream generated on the farm.

### Waste To Wine To Fuel

The West family orchard covers 10 acres of the 175-acre farm and is comprised of apples, peaches, apricots, nectarines, plums and pears. Frustrated by the amount of waste left on the orchard floor after harvest, Dan decided to try his hand at producing wine, and in 2003, he realized this was an opportunity to produce his own power – ethanol, which is used as a substitute for gasoline.

“We always have waste fruit, and one particular variety of apple literally piles up under the tree as it is a summer variety and few people like to pick apples in the summer,” West says. “I decided to make a natural wine out of the waste apples and other fruit and then extract the alcohol from the wine as inexpensively as possible.”

This required permits from the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) as well as state agencies. West's permit allows him to produce up to 10,000 gallons of alcohol/ethanol per year for his own use, free of taxes. His goal was to reduce his reliance on fossil fuels and increase self-sufficiency on the farm by supplying his own fuel for mowing and tree pruning operations.

### Ethanol: 190-Proof

To supply gasoline energy demands, alcohols such as methanol, ethanol and butanol can be produced using on-farm waste streams such as corn stover, cotton gin trash and culled fruits and vegetables. West

uses a traditional sugar fermentation process.

His original still consisted of a 15-gallon stainless steel beer keg with a three-inch diameter copper tube condenser packed with glass marbles that caught the distillate and allowed it to recondense more than once for added purity before flowing out of the condenser tube. The fractionating still produced approximately one gallon per hour of 190-proof ethanol.

After his initial success, Dan built a second 500-gallon fractionating still in 2004 using a brand new propane tank that had been rejected at the factory due to a minor flaw. This still has been calculated to produce four to five gallons of ethanol per hour.

“At the time of our studies,” West says, “the extraction process, using electricity to power the still, could produce 190-proof ethanol for about 64 cents per gallon.”

### Work On The Weak Link

This figure does not take into account the labor-intensive collection of the waste

(At left) West's fruit collection machine, sweeps waste fruit from the orchard floor into a hopper.

(At right) A 500-gallon fractionating still with a stripping column.

(Below) West's latest venture uses a solar concentrator to capture solar energy to provide the power needed to convert fruit to ethanol.



fruit from the orchard, which was the weak link in the process. This challenge prompted West to draw on his background in machine design and mechanics to develop a piece of equipment to collect the fruit by sweeping and picking the floor of the orchard.

"With the assistance of a SARE (Sustainable Agricultural Research and Education) grant, we built a large pull-behind apparatus that is powered by the PTO of the tractor and sweeps the apples up into a hopper which are then easily dumped at a strategic location ready for the production of juice," West says. "The extracted juice is fermented into wine and some of the pulp is applied back to the orchard as a fertilizer."

### Sun-Boiled System

Another refinement to the system is the incorporation of a solar concentrator, a parabolic dish that reduces the electricity required to heat the still. The prototype system consists of a four-and-a-half foot fiberglass dish, skinned in two-inch mirrors with an integrated tracking device that follows the sun throughout the day. The device enhances

solar energy by focusing it onto a smaller area through mirrored surfaces and channels the energy to the backside of a distillery, heating the copper base and boiling the wine inside the two-gallon tank.

According to West, "This prototype concentrator has produced 170-proof ethanol after three tweaks to the design that refined the section of the still, which condenses the alcohol vapor back into liquid form."

As to whether the solar concentrator has lowered the cost of the ethanol production, West says, "Most definitely. The concentrator eliminates the need for an external heat source like other distilleries use. Even the tracking device is direct current (DC) controlled and uses 12 volts DC input, which on the next generation concentrator will be powered by an electrical solar collector and 12-volt battery."

### Challenges Are Opportunities

What challenges has West faced in producing his own energy? According to West, the main challenge has been the availability of time to research, develop and implement these projects.

"We still aren't producing enough ethanol to run the farm and orchard fully, but we are experimenting with other avenues and grant projects to do this off the grid," he says.

West encourages other growers in their attempts to produce energy on the farm and recommends grants to help fund the development. "The winning of several SARE grants has allowed me to finance my experiments."

Dan West's innovative ventures highlight the potential for small-scale on-farm bio-fuel operations. Says West, "Without a doubt, a small scale renewable energy operation is viable. In my case, I produce the raw materials, generally as waste, and convert that into fuel. There are many other innovative farmers and ranchers that have other sources of energy on their farms to utilize. It may take some time to produce the fuel, but with fuel prices rising, it becomes much more worthy to pursue these avenues."

# Tax Incentives To Improve Energy Efficiency

By Jessica Kirk

**A**re you renovating or buying a new home? If so, now would be the time to take advantage of tax incentives to make your home more energy efficient.

According to the Department of Energy, the average home loses 25 percent of its energy from old windows alone. This is in addition to the energy lost from a lack of weather sealing or stripping, poor HVAC ducts and many other culprits.

Both federal and state governments are trying to take the sting out of replacing these high-cost items with tax credits as well as offering tax-free shopping periods in many states. These cost savings are in addition to what you will find on your monthly utility bill. Increasing home energy efficiency will save you money and reduce the drain on energy demand as we slowly transition to a more renewable energy future.

## Look For Tax-Free Times

In Georgia, consumers had the opportunity to purchase eligible energy efficient products with no state or local sales tax from Oct. 1, through Oct. 4, 2009. Goods that cost up to \$1,500 were marked with the Energy Star logo and that were purchased for personal use were part of this program. In particular, the sales tax exclusions pertained to Energy Star dishwashers, clothes washers, air conditioners, ceiling fans, compact fluorescent light bulbs, dehumidifiers, programmable thermostats, refrigerators, doors and windows. There were also some water conservation products with the Water Sense logo that were

available tax free.

In 2008, legislation in Georgia created personal tax credits for clean energy equipment installed for single family homes. The tax credit is equal to 35 percent of

through Georgia Power, and many electric cooperatives offer cash rebates for replacing old gas water heaters with more efficient electric units and converting from a gas furnace to a heat pump. Check with your energy provider for its current programs and any special offers.

## Tax Credits Also Available

The federal government is also offering tax credits for many of the same products. However, the program is administered slightly differently. For 2009 and 2010, tax credits are available for 30 percent of the cost of the item with a limit of \$1,500 for existing homes. This pertains to windows and doors, insulation, roofs (metal and asphalt), HVAC systems, water heaters (non-solar) and biomass stoves.

Tax credits are available until 2016 for geothermal heat pumps, solar panels, solar water heaters, small wind energy systems and fuel cells. These tax credits are 30 percent of the total cost, with no upper limit, available to both existing homes and new construction.

For more information about current tax credits, eligibility and how to apply, go to the Web site [www.energystar.gov/taxcredits](http://www.energystar.gov/taxcredits). You can find answers on everything from detailed lists of Energy Star-rated products to where to buy

these products.

Although most of the products discussed here require you to spend money up front to make your home more energy efficient, there is often an immediate energy savings, and you will see green in more ways than one.



*Tax credits for clean energy equipment installation helps reduce the amount of time for the investment to pay off.*

the cost of the system (including installation). The credit limits are as follows: \$2,500 per residence for domestic solar water heating; \$10,500 per residence for photovoltaic (PV), active space heating and wind energy systems; \$2,000 per installation for Energy Star-certified geothermal heat pumps.

There are also numerous programs

# Stimulating Renewable Energy In Ag

By Craig Kvien and Kim Cutchins

Grants and loans are available to help revitalize the U.S. economy. Agriculture is a base industry with new opportunities in renewable energy. Agriculture is poised to grow with the proper investments in your operation, in your state land-grant system and in the United States Department of Agriculture's Agricultural Research Service. Make your voice heard on the local, state and federal level.

## Where To Look

A number of existing programs and stimulus programs are available that could help you in your operation and that of your research partners.

Here are a few:

- USDA - Rural Development has a

number of grant and loan programs including Business and Industry Guaranteed Loans, Rural Business Enterprise and Opportunity Grants, Renewable Energy and Energy Efficiency Grants and Value-Added Producer Grants. Start on the Web with your home state's page. In Georgia, it would be [www.rurdev.usda.gov/ga](http://www.rurdev.usda.gov/ga). In Texas, it is [www.rurdev.usda.gov/tx](http://www.rurdev.usda.gov/tx).

- USDA - The Farm Service Agency is home to the recently announced Biomass Crop Assistance Program (BCAP). BCAP assists agricultural and forest land owners and operators with matching payments for the amount paid for the collection, harvest, storage and transportation of eligible material by a qualified Biomass Conversion Facility, and promises to support the establishment and production of eligible

crops for conversion to bioenergy. For information, go to [www.fsa.usda.gov/FSA](http://www.fsa.usda.gov/FSA).

- Grants.gov offers a listing of grants at [www07.grants.gov/applicants/find\\_grant\\_opportunities.jsp](http://www07.grants.gov/applicants/find_grant_opportunities.jsp). Be sure to look at their helpful search tips. Consider a free subscription for grant opportunity notices to be sent directly to you.

Many times federal agencies pass money along to the states for allocation. Alabama has set up a special Web site to inform people of where the stimulus money is going. It can be found at [recovery.alabama.gov/](http://recovery.alabama.gov/). A similar site for Georgia is [stimulusaccountability.ga.gov](http://stimulusaccountability.ga.gov). Research programs available through your state.

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# Homegrown Green

By Simone du Boise

As any farmer knows, when you combine sun and rain just right, you can have a bountiful harvest. Water and energy working together is what the EcoCraft Hybrid Building approach is all about. EcoCraft Hybrid Buildings collect and control the power of the sun and rain, which grows the energy and water savings.

## Save Water And Energy

When Cadmus Construction in Roswell, Ga., began work on its Solar Community of Weatherford Place, the design-build firm's goals were to build super energy efficient homes, to bring the cost of net-zero energy buildings down, making them affordable even for low-income housing, and to build healthier, safer, more comfortable environments with greatly reduced or nonexistent utility bills.

Weatherford Place is the first certified Platinum Leadership in Energy and Environmental Design (LEED) for Homes project in Georgia. Cadmus Construction, LLC designed and built Weatherford Place in their signature EcoCraft Hybrid Building Style.

With the best Home Energy Rating System (HERS) score on record anywhere in the United States, these super efficient yet elegant homes, require less than one-third and, in some cases one-fourth, of the energy of a typical home. The homes reach net-zero with their own fully integrated solar photovoltaic (PV) and solar thermal power generating systems. The system's power is metered back to the grid, generating income as it generates clean, green, renewable energy.

Net-zero energy means a zero net energy consumption and zero carbon emis-

sions annually. This is achieved through a holistic approach to responsible design, development and building science, both energy and water efficiency, conservation and integrating clean/green, renewable energy systems. Efficiency + Conservation + Solar Power = Net-Zero Energy.

## Rain Harvesting

The EcoCraft Rain Harvesting System integrates commercial grade standing seam metal roofs with custom oversized gutters and downspouts all connected under-



Weatherford Place homes include energy efficiency with renewable energy generation systems.

ground to a series of cisterns. Each system is designed for site-specific requirements. Homeowners at Weatherford Place have the capacity to meet outdoor watering needs, including irrigation with an automated, drip system sensed for soil moisture content.

## Natural Light Harvesting

The EcoCraft Passive Solar Designs control the illuminating and thermal aspects of the sun with design and construction that shade, deflect or collect, absorb and capture as much natural light as possible without adding to the UV light/thermal solar heat gain. EcoCraft Hybrid Homes are filled with natural light, yet energy efficient. The design also in-

cludes a series of solartubes to capture additional sunlight from the rooftops and channel it to interior spaces that would typically have little or no natural light.

## Efficiency From Start To Finish

The net-zero energy goal is reached by supplementing efficiency with an EcoCraft Hybrid Alternative Energy System. Passive solar heating in winter and summer shading provided by roof overhangs and cantilevered balconies, coupled with solar PV and solar thermal systems, provide hot water, meeting at least 50 percent of the hot water needs, and enough solar electric power to reduce the building's electricity demand to zero or near zero. Consequently, the building saves tons of carbon emissions and could actually eliminate the carbon footprint of occupants.

The EcoCraft Hybrid Building System includes pre-cast foundations that come with a lifetime warranty against sidewall water penetration and

Icynene foam insulation with an average R-value of 32. Low-maintenance exteriors include brick, stone, cement board and commercial grade standing seam metal roofs with cool roof coatings to reflect heat.

## Healthy Home Indoors And Out

High-performance insulated windows and doors protect against 73 percent or more of UV solar heat gain without diminishing natural light.

The frame of the building uses 99.9 percent of the tree and, with the Weatherguard treatment, prevents mold, mildew and pest infiltration. Selected wood complies with the Forest Stewardship Council guidelines for harvesting, reforestation,

milling and manufacturing methods.

EcoCraft Hybrid Buildings are built to the American Lung Association's Healthy Home Standard so that anyone with allergies or respiratory issues can breathe easy. Building materials and finishes are selected for their extremely low or no volatile organic compounds, toxins or off-gassing compounds.

### Conservation Matters

Unlike typical construction sites, EcoCraft Hybrid Building sites have practically no waste. Everything is designed so that off-cuts have a place in the plan, take-offs for materials are precisely calculated, crews are trained to sort and save off-cuts for future use and everything else is recycled. Wood scraps are mulched for ground cover, drywall scraps are ground up and turned into the soil as an amendment, metal scraps, plastics, cardboard, paper, even styrofoam is recycled. EcoCraft Hybrid Building sites average less than one-half pound per square foot, compared to as much as 69 pounds per square foot as is typically found in Georgia.

Electrical and plumbing systems and fixtures conserve energy and water and include Energy Star appliances, low-flow fixtures and smart home features with an Internet-based interface to track and modify energy usage and building operations – even remotely.

### Past, Present And Future

Weatherford Place, dedicated to Louie Weatherford who homesteaded the land for more than 60 years, is thriving with drought tolerant, native species, creating 400 percent more green space than before.

Wildlife habitat restoration has brought a healthier stream with fish nests, wild heron, bluebirds and red-tailed hawks all living and nesting in the park. The future for Weatherford Place and EcoCraft Hybrid Building looks healthy, sustainable and prosperous.

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For more information, contact the author at [info@weatherfordplace.com](mailto:info@weatherfordplace.com) or visit the following Web sites: [www.weatherfordplace.com](http://www.weatherfordplace.com) and [www.cadmusconstruction.com](http://www.cadmusconstruction.com).

## Rethinking Conventional Landscapes

By Julie Roberts

With the rise of commercialized agriculture, home gardens were not needed. However, in recent years, with a growing green movement and a concern for food safety, edible landscapes have gained interest.

Edible landscaping is the growing of any plants that can be eaten, from a pecan tree in yard to an herb garden in the median of a public road. Often, however, edible landscapes refer to a more complex arrangement serving both an edible and aesthetic function.

By growing foods locally, consumers decrease their carbon footprint while providing food needed for the family.

### How To Get Started

To get started, visit a farmers' market or learn from neighbors what plants grow best in your area. County Extension agents can make recommendations and diagnose problems. Books are also a possible source.

Robert Hart, author of "*Forest Gardening: Cultivating an Edible Landscape*," developed a garden based on his observations from nature. His "forest garden" is a variety of permaculture that offers a "maximum output for minimum input" approach. He identifies seven different "stories" in an effective garden, which include trees, plants, shrubs, vines, and roots. These all work together to make a rich and productive garden.

Anyone with access to open space can create an edible landscape. A well-designed landscape offers added benefits to the home, such as when trees are planted on the southern aspect provide shade from sun.

### A Case Study

Warren Wilson College (WWC), a small, private college in Asheville, N.C., is on its way to being totally self-sufficient. Their newest addition is the Eco-Dorm, which makes use of a variety of scavenged materials from train tankers to fence posts. The best feature is the Eco-Dorm's edible landscape.



Warren Wilson College's EcoDorm, solar panels are used to shade the interior from the summer sun while fresh fruits and vegetables grow ripe on the vine.

The landscape is a rich and abundant garden with paths that lead from squash, to sunflowers, to blackberry bushes, and then around to the asparagus crowns. Students get hands-on experience in the garden, and their innovative ideas and passion for living and learning in a sustainable environment are refreshing.

### The Bottom Line

Living sustainably can be a great and rewarding process. No matter how large or small the area, growing your own fruits and vegetables results in fuel savings that would have been incurred through production and transport of commercial operations.

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# The New 'Green' John Deere: A Model For Future Dealerships

By Julie Roberts

Life changed in a big way for residents of Greensburg, Kan. In May 2007, an F-5 tornado decimated 95 percent of the town. One of the hardest hit businesses was BTI Greensburg Inc., the local John Deere tractor company. After 63 years of service, the Estes family, owners of BTI, were determined to rebuild. In fact, nearly everyone in Greensburg decided to rebuild, but this time the town wanted to build their homes and businesses as environmentally friendly as possible.

## Creating Energy

The first step of rebuilding consisted of installing two 5-kilowatt wind turbines. The turbines provided energy in rebuilding and now provide 10 percent of the dealership's electrical load. The local hospital and high school have recently purchased wind turbines from BTI to generate their own power, as well.

BTI chose a sustainable site and kept site disturbance to a minimum. The building has recycled concrete pervious paving, which helps with storm-water runoff. They also used white roofing and reflective paving to rebound as much of the sun's rays as possible.

## Conserving Energy

BTI Greensburg also recycles wastes. Used oil from the many tractor oil changes is burned in its waste-oil boiler to reduce the use of natural gas. A mixture of water and anti-freeze is heated by the waste-oil boiler and run through tubing in the concrete of the mechanics bay. This radiant floor system heats the room better than conventional forced-air systems because of the heat lost from the tractor-sized doors being opened and closed. The radiant floor system quickly generates heat to get the room comfortable again. Motion



The new platinum LEED certified John Deere BTI building in Greensburg, Kan., is unlike any other John Deere dealership in the world.



The BTI Greensburg facility uses solar tubes and skylights for much of their lighting.

detectors and individual controls also decrease the amounts of energy consumed.

The energy of the building is reduced in several different ways. The building is naturally lit with 23 skylights and 12 solar tubes. Sensors accompany the space to automatically turn on and off high-efficiency T5 fluorescent lights in a room when it is in use or when the lighting gets too low.

Insulation on new and salvaged wall panels, garage doors, the roof and under the cement slab ensures minimal heat loss.

## Water Reduction

Water efficiency includes waterless urinals, drought-tolerant landscapes and low-

flow fixtures. They also irrigate with reclaimed water, using a solar-powered irrigation pump. Estimates show that they have a water reduction of 50 percent.

BTI Greensburg, which reopened in January 2009, has made a monumental impact on the way future John Deere facilities are constructed, and all new construction of John Deere facilities will be modeled after BTI Greensburg. John Deere and BTI Greensburg are doing a great job at bringing sustainability to the farming community.

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# Using Technology To Enhance Education

By Tasha Wells

Creating the right atmosphere to enhance your children's education is just as important as the curriculum they are taught. Technology can create an environment that promotes education, stimulates students and challenges them to learn.

In 2002, after a successful career in telecommunications, Vickie Davis returned to Westwood Schools in Camilla, Ga., as Information Technology Director and teacher of business and technology-related courses.

"I wanted to create a world-class technology program at Westwood," Davis says, "In 2005, I began pulling Web tools like wikis, blogs and social networks into our curriculum."

Davis transformed the meaning of distance education through the integration of revolutionary developments in communication, thereby removing any isolation of students in rural America.

## Awarding-Winning Opportunities

High-speed Internet has delivered many opportunities: video conferencing, Voice over IP (VOIP), online tutoring and international online classrooms. These tools have enabled the resources that are so often associated with the city to be delivered to the rural community. Internet-based distance learning, collaboration and mentoring programs offer incredible educational opportunities to children, regardless of their geographic location.

Davis has been a pioneer in using the Internet to enhance education in the classroom. In 2005, she began blogging about technology at the Cool Cat Teacher blog, which has won various international awards.

Another innovation and success was co-creation of the Flat Classroom Project, a global collaboration project. The Flat Classroom Project was included in Thomas



Vickie Davis (far left), her four students and the curriculum director (right) represented Westwood Schools at the Flat Classroom Project in Qatar earlier this year.

Friedman's book "*The World is Flat*" as a best practice for global education and has won various international awards for best online learning project in education.

Some of Davis' other global collaboration projects include:

- The Digiteen Project - a study of digital citizenship
- NetGenEd project - a study of emerging technology trends and how it's shaping education
- Eracism - a project teaching fact-based argument and debate with global classrooms in partnership with leading debate coaches in the United States.

To date, these projects have been run with free tools and a massive international grassroots group of teachers who believe in effectively connecting students globally to teach their curriculum and to promote an understanding and appreciation of different cultures.

## Global Learning

"My students can travel globally without traveling," Davis says. "They are well versed in working with people from Asia, the Middle East, Europe and Australia, and anywhere around the world because they work with them in class every day."

What is the future for education? Davis doesn't believe it will be a total e-learning environment. "In globally collaborative classrooms like mine, the teacher is still essential, not as a lecturer, more as a coach and facilitator. I believe that the best schools will be both – virtual and bricks and mortar and will evolve in both their understanding of the class day and will join global networks for learning. I do not think that this model exists yet, but we're committed to be part of this change."

For more information, go to [www.westwood-schools.org](http://www.westwood-schools.org) or visit Davis' blog at [coolcat-teacher.blogspot.com](http://coolcat-teacher.blogspot.com).