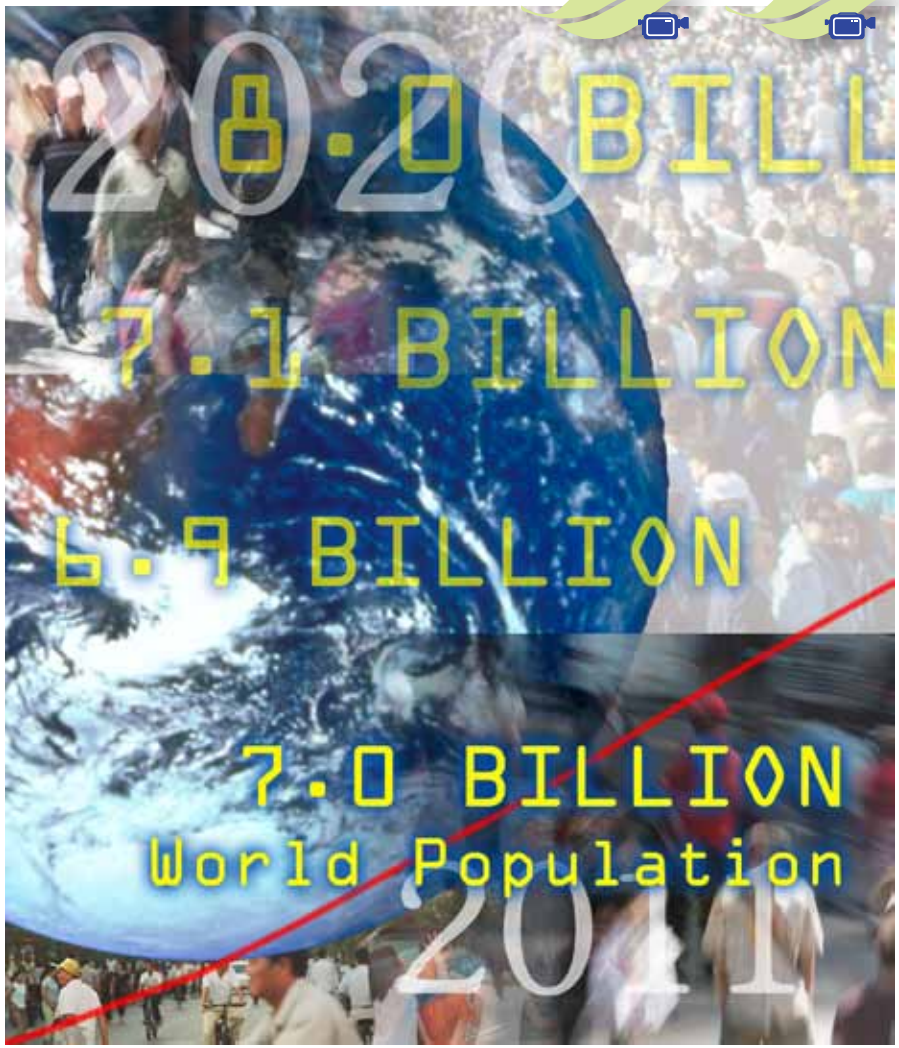
Illinois

Ag Mag

An agricultural magazine for kids

Renewable Energy



The number of people in the world is growing, and as it does, our need for energy grows. What kind of energy, you ask? All energy needs are growing; imagine what your day would look like if we took all the energy out of it. Could you ride the bus to school, play video games or order a hamburger at McDonalds? The answer is no, all of these activities require some form of energy. Currently, the United States has a large dependence on fossil fuels, coal and oil to produce our energy needs. Fossil fuels are considered nonrenewable resources, which means once we have used them all, there will be no more. So what do we do when we run out?

In 1992 Congress passed the Energy Policy Act. This act was created to reduce our country's dependency on fossil fuels and to start encouraging the use of renewable resources. Renewable resources, such as corn and soybeans, can be replenished over and over. Can you name other renewable resources? Read on to find out how Illinois is using renewable energy!

Words with POWER

Motion: the action or process of moving something.

Energy: a supply or source of power, for example wind energy.

Heat: a type of energy that is felt as a temperature.

Watt: a method of measuring power or energy.

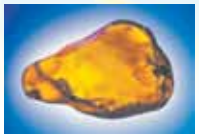
Power: the rate in which energy is used.

Shocking Moments . . .
A History Lesson with Energy

Humans have been using renewable fuels as sources of energy for thousands of years. Check out the dates below to learn more about the history of renewable fuels.

????
Wood was the main source of energy for activities like cooking and heating.

600 B.C.
Ancient Greeks found that rubbing the element of amber onto fur caused an attraction between the two. This becomes known as static electricity.



950 B.C.
The first windmills were used in Persia to grind corn into cornmeal.

1200's
Windmills were adapted to provide irrigation to farms.

1700's
Ben Franklin discovered that static electricity and lightning were the same thing.

1800's
Pioneers moving west and Native Americans used buffalo waste for campfires when no firewood was available.

1882
The world's first hydroelectric (water) power station was built in Appleton, Wisconsin.

1885
Coal replaced wood as the most important supply of energy to power homes and businesses around the world.

1908
Henry Ford produced the Model T car. The Model T car was designed to run on ethanol, gasoline or any combination of the two fuels. This was the first flex-fuel car!

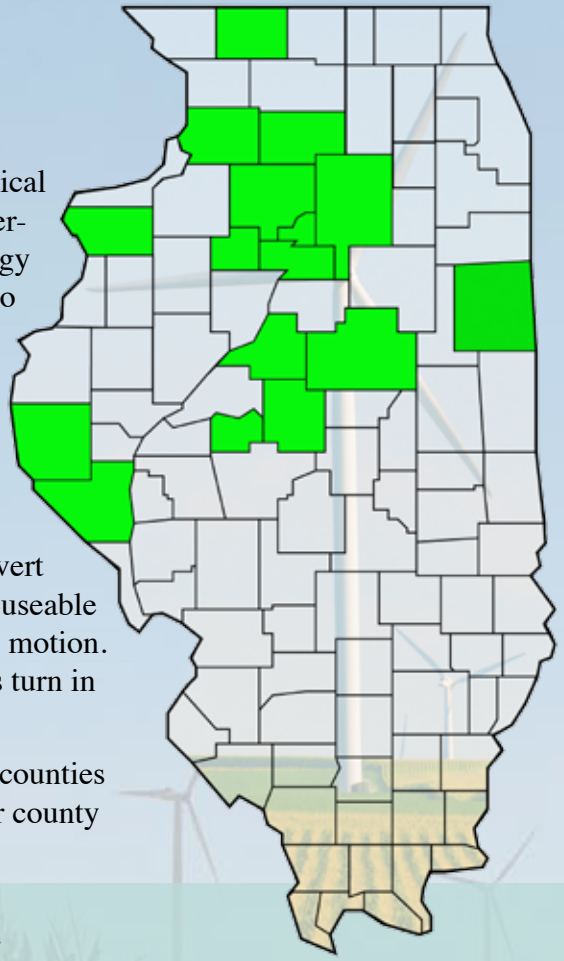
1970's
The 1973 gas shortage was a wake up call for Americans because of our dependence on imported fuels for everyday energy. This triggered governmental support of research for alternative energy sources.

2005
The Energy Policy Act created regulations to ensure all gasoline sold in the United States contains set percentages of renewable fuels (ethanol).

Wind Energy

Wind energy uses the energy in the wind for practical purposes like generating electricity, charging batteries, pumping water and grinding grain. Wind energy has been used for centuries in structures referred to as windmills. Early windmills were made from wood and used animals to supplement the wind on still days. The modern-day collection of wind energy is now done with windmill like structures called wind turbines. Modern-day wind turbines function like earlier windmills, except their main purpose is to create electricity. Wind turbines convert the kinetic energy of the wind into other forms of useable energy. Kinetic energy is energy that is created by motion. Windmills create kinetic energy when their blades turn in the wind.

Look on the map of Illinois. Can you identify the counties in green that are utilizing wind energy? Does your county have a windmill farm?



A Windfall of Information...

- In June 2011 Illinois had over 2.5 Gigawatts of operating wind farms.
- It takes less than six months for a wind turbine to make enough energy to help offset the cost of building it.
- Wind energy is collected from the blades of a windmill.
- There are two types of windmill styles, horizontal and vertical.

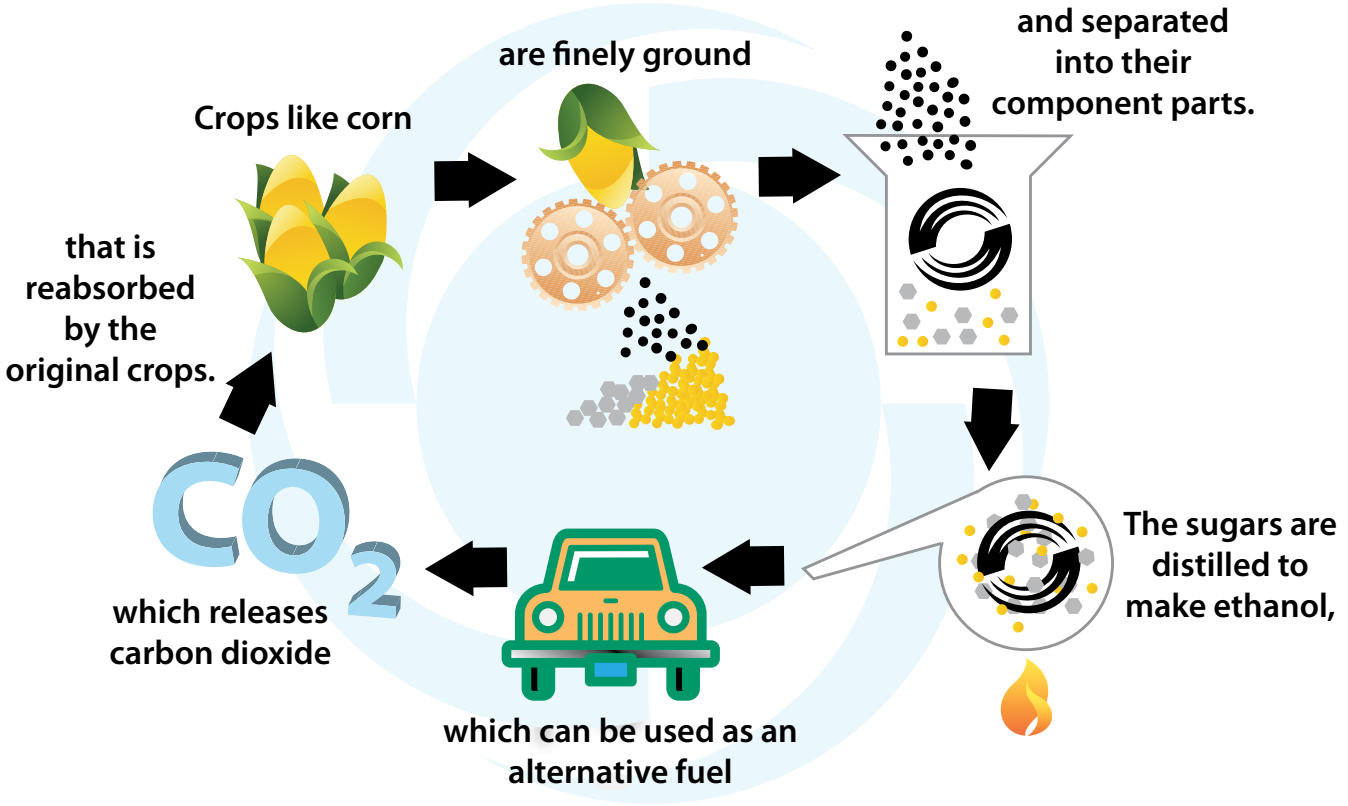
Corn Ethanol

Illinois farmers grow corn so it can be processed into several different types of products. One of those products is the "green fuel" known as ethanol. So what is ethanol? Simply put, ethanol is fuel made from the extracted sugar from a corn kernel. Ethanol can be blended with petroleum or used by itself. You may have seen fuel labeled E85; this means that the fuel is 85 percent ethanol and 15 percent petroleum, which makes it better for our environment.

Talk from the Stalk...

- One bushel of corn (56 pounds) yields about 2.8 gallons of ethanol.
- Illinois uses 333 million bushels of corn to yield 900 million gallons of ethanol.

The Ethanol Cycle



How It All Works:

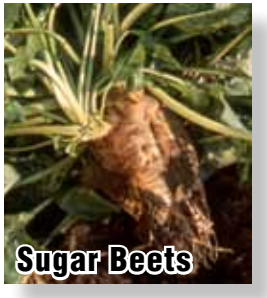
Biofuels are made from two basic sources, either sugars or oils. Ethanol is made from sugars that are harvested from corn or other starchy plants. The starch from the plant is converted into sugar and the sugar is fermented into an alcohol. The alcohol then becomes the fuel. Biodiesel is made from a chemical reaction between harvested oils, like soybeans or animal fat, and alcohol. The end product is a fuel-oil that can be used by itself or mixed with petroleum.

The need for different fuels comes from the different ways engines create energy. Extend your knowledge of fuel by researching these different engine types: internal combustion, diesel, electric, hydrogen and many others.

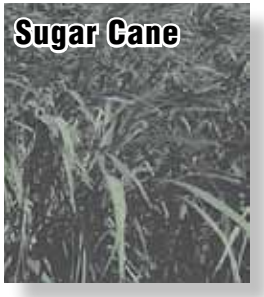
Energy from Biomass

Biomass means materials that were/are living in our environment. Did you know that we can make fuel out of biomass materials? The list of materials that can be made into fuel range from corn, soybeans, different types of grasses, recycled cooking oil, sorghum, sugar beets, sugar cane and even animal fats. Biomasses, such as corn, release the stored energy from the sun when they are burned. Scientists experiment everyday with different biomass products that can be made into fuels. Illinois farms play a big role in growing the crops that create the renewable fuels.


Soybeans


Sugar Beets


Recycled Cooking Oil


Sugar Cane

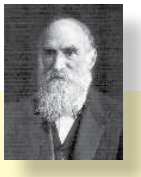

Corn


Sorgum

Solar Power

Did you know that your school or home could power itself with solar energy? Solar energy is created from collecting sunlight. The sun's rays are collected in special panels that convert the sun's heat into useable energy. Panels can be placed on roof-tops or in wide open areas to collect the sunlight. These collected rays of sunlight would be enough to run everything that is electrical in your school or home.

Solar energy has been used by man since our existence. Early Chinese and Native Americans were known to heat their living spaces by positioning them in areas so the sun would shine on them to provide natural warmth. These living spaces were placed so that the sun did not warm them during summer months but warmed them during the winter months.



Very bright ideas...

- William Adams first discovered solar energy cells in 1876.
- With the "Million Solar Roofs Initiative," the U.S. Department of Energy hopes to have one million solar powered homes and buildings in the United States by 2010.
- Greenhouses utilize the sun's light rays to heat and cool the greenhouse to create optimal growing conditions for vegetables and flowers.

Soy Biodiesel

Did you know that the first diesel engine was invented in the late 1800s? The diesel engine was actually designed to run completely on plant oils - peanut oil, to be exact! Rudolf Diesel, the inventor, designed the new engine so farmers could increase their profits by using tractors that would run completely on the crops that they grew.

Just like ethanol, soy biodiesel is used to cut our dependency on foreign oil because it is grown right here in Illinois! One bushel of soybeans, which weighs roughly 60 pounds, produces $1^1/_2$ gallons of biodiesel and 48 pounds of soybean meal for livestock feed. So what types of vehicles are using soy biodiesel? For starters, tons of Illinois schools are using it to power their school buses. Also, Illinois farmers are using this fuel in their trucks and tractors as they are plant and harvest Illinois crops.

Sprouting facts...

- Soy biodiesel burns cleaner than petroleum based diesel.
- The National Soybean Check-off has estimated that 40 million miles have been driven using soy biodiesel.
- Soy biodiesel works in any diesel engine with little to no modifications.

SOY BIODIESEL®

Careers That Energize!

Judd Hulting

Patriot Renewable Fuels, LLC
Annawan, Illinois

Please explain your job:
As Commodity Manager for Patriot Renewable Fuels, LLC, I oversee purchasing of input commodities, such as corn and natural gas for the production of ethanol. I manage our resulting co-products, including the sales of ethanol and Distillers Dried Grains (DDGS). Logistics of inbound and outbound trucks is important for corn and DDGS, as we have schedules for hundreds of trucks per week. Being located in northwestern Illinois, we are ideally situated to ship "unit trains" of ethanol to the east coast, primarily to large terminals in metropolitan areas. Our DDGS go by truck to feed local hogs and cattle in Henry County. We also export our DDGS by rail, barge and containers to worldwide destinations such as Korea, Taiwan and Thailand.

How does ethanol production impact Illinois?
Ethanol is very important to consumers in Illinois, as it is part of the solution to reducing our dependence on foreign oil and providing a lower cost alternative. Ethanol is also much better for the environment as we have a lower greenhouse gas (GHG) emission and carbon footprint than fossil fuels. Being a renewable fuel, ethanol continues to improve with technology both at our plant level and as area farmers improve production techniques. The future of ethanol is wide open as just in the last 2-3 years companies have made huge investments to really expand and grow the business. Our industry is now replacing 10% of the gasoline market in the United States with a domestically-produced renewable fuel. Ethanol production has also led to the tremendous expansion of Distillers Dried Grains (DDGS), which now displaces one billion bushels of corn in the livestock feed market.

Explain how transportation is involved in the production and shipment of ethanol:
Scheduling "power," the term used in the railroad industry for locomotives, is a part of the job I never knew about. This involves contacting the railroad to have them schedule locomotives (each with 4,000 horsepower) and dedicated crews to pick up "unit trains" as these are high priority moves for the railroad. Unit trains are a minimum 65 cars and usually over 80 cars which amount to being a mile in length when completely built and sitting ready for shipment at our facility. Crews typically arrive at night and by midnight make the move into Chicago and then are bound for rail yards in New York or New Jersey in a matter of hours.

Donna Jeschke

Illinois Corn Marketing Board
Mazon, Illinois

Explain your involvement in the Corn Industry:
My husband and I began farming in 1975 after graduating from the University of Illinois. Today we grow corn and soybeans on our farm near Mazon, Illinois, together with my brother and his family. The corn and soybeans that we grow can be used to make renewable fuels, such as ethanol or biodiesel. I also serve as District 5 Director for the Illinois Corn Marketing Board. This is a 15-member volunteer Board, consisting of Illinois corn farmers. We primarily work to develop markets for corn and corn products as well as to educate people about corn farming.

What changes do you see in the future for ethanol production?
The corn industry is experiencing the benefits of modern technology. For example, we are using GPS (global positioning systems) to help us fertilize, or "feed," our soils. This means that we can place the correct amount of fertilizer in the areas of the field where it is most needed. Those areas are determined when we test the soil in our fields to find out what nutrients are needed to grow a healthy corn plant.

In ten years, farmers will be growing more bushels of corn with fewer inputs (costs) because of technology advancements. Since my husband and I have been farming, we have seen our corn yields increase. I believe that we will grow even more bushels of corn on each acre in the future because of technology improvements in the corn seed we use. That means growing more corn to feed and fuel the world on the same acre of land.

Today, corn is the primary "feedstock" or "ingredient" used to make ethanol in the United States. One bushel of corn produces 2.8 gallons of ethanol. Along with making ethanol, that same bushel of corn produces a protein-rich feed for cattle, pigs and chickens. We are also learning to make cellulosic forms of ethanol from the corn fiber, the corncob and the corn stalk!

What part of your job do you like the best?
That's a question with many answers! I really love corn harvest. It is exciting to combine the corn and wonder whether that corn will be used to make fuels for our cars, to feed pigs in a foreign country, or to make corn flakes that I might eat for breakfast!

Careers That Energize!

Thomas P. Binder

ADM Biofuels Scientist
Decatur, Illinois

Describe your job:
At ADM research, I am responsible for leading the development of processes for converting cornstover and other biomass streams to liquid fuel. ADM has joined with ConocoPhillips in a project to directly make gasoline and diesel fuels from agricultural crops. My job is like working in the kitchen to come up with an award winning recipe for the hottest chili, but instead of chili we are working on recipes that will give us products that can be used as fuels to drive our cars, trucks and tractors. Other scientists I work with are chemists, microbiologists, genetic engineers and chemical engineers. It is exciting work and allows one to reach from the farm to the gasoline pump in building a better future for everyone.

What role does your job play in the renewable energy industry?
Agriculture is still the main occupation of most of the world. ADM researchers and other scientists are working to develop the processes to make new chemicals and fuels from current and new agricultural crops as well as from crop residue. Working with companies like Monsanto and John Deere, ADM researchers are looking at how to get the best varieties, farming practices and harvesting equipment deployed to feed the pipeline of new agricultural products from the farmer to the consumer.

What changes do you see for renewable energies in the next 10 years?
As energy supplies tighten, we will become more aware of the true cost of energy in all the things we do. Making more efficient use of all of our resources will become more and more important. Renewable energy is one of those resources that we can use again and again if we harness it. There will be a greater push to develop these resources and they will become more highly valued. Biomass is a very local resource. The job growth related with this will not only be in rural America but in other agricultural regions of the world. This economic growth worldwide could be an important tool to control and alleviate poverty.

This Ag Mag has been provided by the IAA Foundation

Bright Ideas for Going Green

- Don't put grass clippings and leaves in plastic bags. Keep them and start your own compost pile.
- Unplug chargers for cell phones and MP3 players when not in use.
- Don't toss trash out the car window. Recycle the materials.
- Turn off electronics (TV, computer & radio) when not in use.
- Take quick showers and don't run the water when brushing your teeth.
- Ride your bike or walk whenever you can.

Illinois Learning Standards: 1.B.2a; 1.B.2c; 1.C.2a; 1.C.2f; 3.A.2; 3.B.2a; 5.A.2a; 5.A.2b; 6.A.2; 10.A.2a; 10.A.2c; 12.B.2a; 12.E.2c; 13.B.2a; 13.B.2b; 13.B.2c; 13.B.2d; 13.B.2f, 15.A.2a; 15.C.2b; 15.D.2a; 15.D.2b; 15.E.2a; 17.A.2b; 17.C.2c; 18.C.2; 22.C.2

Illinois Assessment Framework: 1.4.09; 1.4.11; 1.4.12; 3.5.01; 3.5.06; 3.5.18 14.13; 6.4.05; 10.4.01; 10.4.02; 12.4.08; 12.4.30; 12.4.31; 13.4.09; 13.4.10; 13.4.12; 13.4.13

To learn more about Agriculture, visit us at www.agintheclassroom.org, or contact your County Farm Bureau® office or Illinois Agriculture in the Classroom, Illinois Farm Bureau®, 1701 Towanda Avenue, Bloomington, IL 61701.