

Successful Wind Farming

The number of farmers and ranchers benefiting from wind power is growing. Here are some examples:

I think it's one of the greatest things that ever happened. It's good for my pocketbook. It's good for the environment. And wind is replenishable; we're not digging it out of a hole in the ground.

Chuck Goodman, retired farmer near Alta, Iowa, as quoted in *Successful Farming*. Goodman has three turbines that take up about 1.3 acres of land, including an access road. Goodman gets \$750 per year per turbine, plus two percent of the revenue, for a total income of about \$6,000 per year.

From our winter pasture near the Wyoming border, we used to be able see all the way to Denver. Now all we see is air pollution. We believe it's time to begin using pollution-free energy in the West. That's why our winter range now boasts a wind farm.

Keith & Myrna Roman, ranchers in Weld County, Colorado.

[The wind turbines] are clean and they are noiseless. We just love them. Everybody around here likes them as far as I know. I hope in the future that more people get them. The wind's free and it's here.

Donald and Irene Decker, farmers in Pennsylvania, quoted in *Environmental News Network*, June 21, 2000. The Deckers have four 200-foot-tall wind turbines installed on their family farm.

Becoming a wind power developer has some important challenges, however. Purchasing one or more large wind turbines can be a substantial investment for even a large farm operation. And smaller wind farms may have to compete with larger, multiple-turbine wind farms, which often have lower production costs due to economies of scale in manufacturing and installation. While green markets may create a place for niche products, the market for green power is still young and profit margins are small.

Farmers willing to take the risk could become wind investors as well. Pooling resources with other farmers can be an attractive option for reducing risk and lowering costs. Cooperative ownership of one or more turbines is common in Europe and is starting to take hold in the United States. In Minnesota, farmers have begun to develop wind co-ops with the help of additional state incentives that are available for small wind projects. Farmers may also be able to team up with a rural electric co-op to finance a project and sell the wind power to its customers. Some rural electric co-ops are far more active than others. Encourage your co-op to be active in wind energy development.

For More Information

U.S. Department of Energy
Wind Energy Program
Forrestal Building
1000 Independence Ave. SW
Washington, DC 20585
www.eren.doe.gov/wind

U.S. Department of Agriculture
2002 Farm Bill
Renewable Energy Incentives
www.rurdev.usda.gov/rd/farbill/9006resources.html

American Wind Energy Association
122 C Street NW, Suite 380
Washington, DC 20001
(202) 383-2504
www.awea.org

National Renewable Energy Laboratory
National Wind Technology Center
1617 Cole Boulevard
Golden, CO 80401
(303) 384-6979
www.nrel.gov/wind

National Wind Coordinating Committee
1255 23rd Street NW
Washington, DC 20037
(888) 764-WIND
www.nationalwind.org

Windustry
2105 First Avenue
S. Minneapolis, MN 55404
(800) 946-3640
www.windustry.org

To find out more about renewable energy and agriculture, visit the Clean Energy section of the UCS website at www.ucsusa.org/clean_energy. Or, write to: Clean Energy Program, Union of Concerned Scientists, Two Brattle Square, Cambridge, MA 02238, or call (617) 547-5552.



Union of
Concerned
Scientists

FACT SHEET

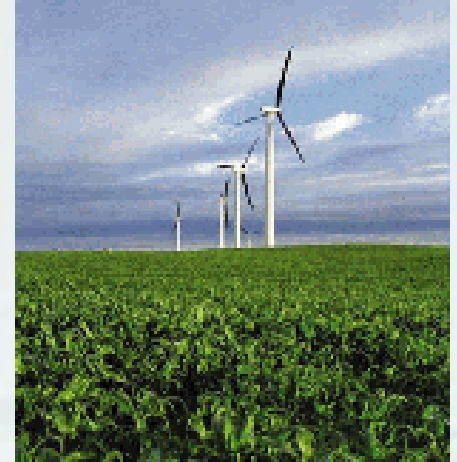
Farming the Wind: Wind Power and Agriculture

"I didn't really expect them to come all the way out here in northern Iowa to start a wind farm. But this is really great. Now we grow corn on the ground and generate power in the air—all on the same piece of property."

Delbert Watson, farmer near Clear Lake, Iowa, quoted in the *Christian Science Monitor*

The first heyday of wind power in America lasted from 1870 to 1930, when thousands of farmers used the wind to pump water and generate power. The second heyday is just beginning. Wind power is the fastest-growing energy source in the world, with annual average growth of 32 percent between 1998 and 2002. In the United States alone, nearly two billion dollars' worth of wind turbines are projected to come on line in 2003—enough to power 800,000 homes.

The U.S. Department of Energy's (DOE) "Wind Powering America" initiative has set a goal of producing five percent of the nation's electricity from wind by 2020. DOE projects meant to achieve this goal will provide \$60 billion in capital investment to rural America, \$1.2 billion in new income to farmers and rural landowners, and 80,000 new jobs during the next 20 years.



Farmers can plant crops right to the base of wind turbines.

Photo: Warren Gretz, NREL

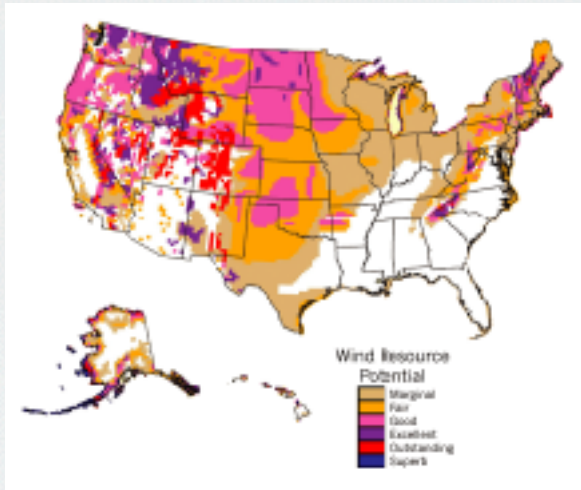
Until recently, wind power was concentrated in California. Now it can be found in most states. Farming regions in the Midwest, Great Plains, and West have emerged as major growth areas. Wind power is growing partly as a result of technology improvements and cost reductions and partly in response to state and federal laws and incentives.

While many people will benefit indirectly from the clean air and economic growth brought about by wind power development, farmers can benefit directly. Wind power can provide an important economic boost to farmers. Large wind turbines typically use less than half an acre of land, including access roads, so farmers can continue to plant crops and graze livestock right up to the base of the turbines.

Wind resource potential

Source: NREL

State maps available at www.eere.energy.gov/windpoweringamerica/wind_resources.html.



The Wind Resource

In theory, the wind could produce five times more electricity than the United States currently uses. Some of the best wind resources in the country are on farmland, especially in the plains states. However, the wind resource varies greatly from one location to another. Many states have developed wind resource maps and have been measuring the wind and collecting data that farmers could find useful for determining the wind potential on their land.

The market potential for wind also depends on the cost. The cost of producing wind power has fallen by as much as 90 percent since 1980. By 2010, electricity from new wind power projects will be cheaper than electricity from new conventional power plants, according to the DOE.

How the Wind Can Help Farmers

Farmers and ranchers are in a unique position to benefit from the growth in the wind industry. To tap this market, farmers can lease land to wind developers, use the wind to generate power for their farms, or become wind power producers themselves.

Working with Wind Developers

One of the easiest and most attractive ways for farmers to benefit from wind

power is to allow developers to install large wind turbines on their land. The royalties are typically around \$2,000 to \$5,000 per year for each turbine, depending on its size. These payments can provide a stable supplement to a farmer's income, helping to counteract swings in commodity prices.

Wind developers may offer landowners a fixed annual lease payment, a single up-front payment, a share of revenues from a wind project, or some combination of these. Although fixed payments may be lower than a share of revenues, they offer less risk to the landowner. Up-front payments may be attractive too, but if the property is sold within the timeframe of the contract, it could complicate the sale. A new landowner who doesn't receive any income from the wind turbines may want to pay a lower price for the property. Also, up-front payments are often structured so that the developer receives a perpetual lease to the wind resource rights on the property. This can be a disadvantage, as the value of wind power is expected to increase over time. Basing the lease on a share of revenues is likely to be the best option for capturing future increases in the value of wind power.

Owning a Turbine

Farmers and ranchers can generate their own power from the wind, just as their predecessors did in the 1930s and 1940s. Small wind generators, ranging from 400 watts to 40 kilowatts or more, can meet the needs of an entire farm or can be targeted to specific applications. In Texas and the West, for example, many ranchers use wind generators to pump water for cattle. Electric wind generators are much more efficient and reliable than the old water-pumping fan-bladed windmills. They may also be cheaper than extending power lines and are more convenient and cheaper than diesel generators.

"Net metering" enables farmers to get the most out of their wind turbines. When a turbine produces more power than the farm needs at that moment, the extra power flows back into the electricity system for others to use, turning the

electric meter backwards. When the turbine produces less than the farm is using, the meter spins forward, as it normally does. At the end of the month or year, the farmer pays for the net consumption or the electric company pays for the net production. Net metering rules and laws are in place in most states.

The Farmer as Wind Developer

A third opportunity for a farmer or group of farmers is to become a wind developer who produces power to sell to others. Electric companies increasingly buy their power from independent power producers rather than generating it themselves. They are also increasingly offering "green" or environmentally friendly power products and may be looking for suppliers of wind power. In addition, a number of states and the federal government provide incentives for wind power development.

Typical Expenses for a Wind Turbine

The economics of owning a turbine depend on many factors, including wind speeds, the size and cost of the wind turbine, interest rates, taxes, and electricity prices. One key issue is how much of the power the farm uses and how much is sold back to the utility. A study by the Izaak Walton League found that a wind turbine investment pays for itself most quickly when most or all of the power is used on the farm, since the farmer is saving power at the retail price, rather than selling it at a wholesale price.

With smaller wind turbines, most farm operations can use all of the power. But the cost per unit of electricity generated from smaller turbines is higher than that from larger turbines, so the payback period is longer. Since a well-maintained wind turbine can last 30 years, it can be a profitable investment. Like any other long-term investment, a thorough engineering and financial analysis is important before making the investment.

Costs and payback of typical wind turbines

System Size	Capital or up-front cost	Annual energy production	Payback using all farm power needs
10 kW	\$32,000	20,000–28,000 kWh	18–27 years
50 kW	\$130,000	100,000–150,000 kWh	12–18 years
225 kW	\$325,000	425,000–600,000 kWh	9–13 years
660–750 kW	\$800,000–\$900,000	1,500,000–2,300,000 kWh	6–8 years

Assumes a retail electricity cost of 7.5 cents per kilowatt-hour, increasing three percent per year, and annual average wind speeds of 15 mph to 17.4 mph at 50 meters above the ground. Source: Based on data from wind turbine manufacturers and estimates from Thomas A. Wind, Wind Utility Consulting.