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PHOTOS BY ROLF HAGBERG

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prairie flour

Dry Weather Creek is one of only a handful of Minnesota mills that stone grinds organic wheat and other grains

PHOTO BY ROLF HAGBERG

BY CINDY GREEN

Milan, Minn. — A charming red Cape Cod style chicken coop, an old barn filled with goats and dome-shaped brooder houses neatly frame Mark and Wendy Lange's farmyard, surrounded by wheat and corn fields. Near the farmhouse, a shed door opens to a flour-milling facility with gleaming white walls and stainless steel equipment.

The fourth-generation farm is the Langes' realized dream — to sustain a living with a small, diversified operation.

Mark and Wendy started milling the organic wheat, corn and oats they grow on their 80-acre farm in October 2003. Then, they packaged flour in brown paper bags and delivered it to local homes and grocers. Today they have expanded to a region-wide business with the Dry Weather Creek Farm label.

The Langes' customer base now includes grocery stores, co-ops, restaurants, bakeries and direct-delivery stops within a 50-mile radius of their farm, located in Minnesota's heartland — Chippewa County. And they're negotiating with natural foods stores in the Twin Cities.

Besides their own grains, the Langes have started marketing whole and ground flax, rye and other organic grains from area farmers. "We want everything to be Minnesota grown," Mark says. They produce about 400 pounds per month of wheat flour and 100 pounds of the other grains.

There are only three other stone mills in Minnesota — in Freeport, Cook and Middle River. Dry Creek's flours are being requested by artisan bread makers more than 100 miles away, but shipping costs are prohibitively expensive.

enter auki

As Dry Weather Creek's business has grown, so has the need for nutritional labels, shelf-stable products and convenient bread and baked-good mixes. Charan Wadhawan, AURI food scientist, has helped the Langes develop from a home-based to a commercial business. She's offered "anything and everything they want to know about flour and mixes — the difference between hard and soft wheat, what is good for cake, what's good for bread," Wadhawan says.

Wadhawan has primarily tested Dry Weather Creek's flour protein, fat and moisture. "Flour can't be too wet; that will reduce the shelf stability ... But because of the heat production during stone grinding, they're actually more stable than commercial milled flours."

She is also designing nutritional labels for the flours and mixes even though that's only required for food products with 50,000 or more sale units per year. "It's a good idea because a lot of people are looking at nutritional labels," Wadhawan says. "And they don't have to hide anything bad about whole grains ... the trace minerals that our bodies need are in whole grains and not in refined flour."

the grinding way

The milling process starts with a cleaner that shakes out the chaff and seed. The grain is then piped into a bin where it is stored until ready to grind. Only red spring wheat, Dry Creek's main product, is stored in the main bin. Other grains are milled as needed. When the wheat is ready to package, it is piped into a scouring machine, then to one of two mills.

The primary mill grind grinds whole wheat flour and unbleached white, which requires a separate process to shake out most of the bran, sold separately. The second mill grinds wheat into coarse flour used in crackers and whole grain breads for a "nutty" texture.

Though stone grinding sounds like a labor-intensive, Old World process, the mills are modern and automated. Grinding stones are not visible. Both the top spinning stone and lower stationary stone disk — that work much like a mortar and pestle — are enclosed in stainless steel. As the wheat grinds, the flour works itself to the outside of the stone where it falls into a canvas-covered bin.

In smaller separate mills, the Langes process organic corn and oatmeal that they grow and rye and flax purchased from organic farmers. "The bags are stamped and logged so we can track everything back to when it was made," Mark says.

The Midwest Organic Services Association certifies both the Langes' organic grain production and milling operation. Dry Weather Creek is also licensed and annually inspected by the State of Minnesota.

farm history

Though Mark and Wendy did not farm until six years ago, the farm has been in Mark's family for nearly a century. "This

farm was originally purchased by my great-great grandparents in 1910," Mark says. His grandparents owned it when Mark was growing up in Montevideo, just 12 miles away.

"This is where I played as a kid; I spent a lot of time here," Mark says. When his grandfather died in 1988, Mark purchased the farm. But because he made a living as a tool and dye maker in Montevideo, he rented the crop land to conventional farmers, lived in the farmhouse and raised horses.

In 2000, Mark met and soon after married Wendy. Both in their early 40s, they decided to farm Mark's land themselves and return it to its original, natural condition. "We didn't want to get into conventional farming with the high costs; our farm is too small," Mark says. "And we like the organic way, the natural (farming methods) with all the advantages to soil and water."

The Langes enrolled in a local Land Stewardship Project course called Farm Beginnings, "that did wonders for us," Wendy says. The program for new sustainable farmers helped them write a business plan and figure out how to make an income on small acreage.

In 2002, they started to turn land that had been farmed conventionally for decades into organic production. "We had one section that qualified organic the first year because it had been in alfalfa," with no chemical additives, Wendy says.

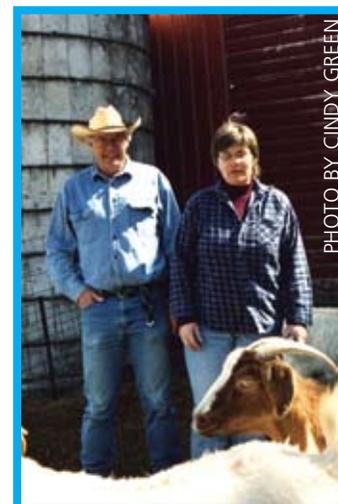
They also wanted to incorporate some small-scale dairy and livestock production. "We wanted to choose enterprises that compliment each other. We tried chickens and omega-3 eggs for awhile, thinking that would fit in. It didn't." They found more enjoyment in 13 South African Boer goats. "Through trial and error, we decided goats are our livestock of choice." They want to eventually expand a 50-goat herd to a dairy with 175 does.

growing steady

"Every year income from the mill goes up," Mark says. He would soon like to leave the tool and dye business to be a full-time farmer. "That's not the end of our goals, but it is one of them," says Wendy who quit her secretarial job at the Milan elementary school three years ago because "someone had to be home when the goats were kidding."

Mark and Wendy both emphasize that the past six years building a farm operation with biological diversity has not been easy. "It's taken a lot of work to get the land back to organic ... to recover from its chemical addiction," Mark says.

"We still have a long ways to go," Wendy says. But when the day comes that the Langes, who have no children, are ready to retire, they want an operation that could be sustained for generations. "When we're ready to leave, another young farmer can stay in farming through Farm Beginnings, so all our hard work is not wasted." ■



Mark and Wendy Lange.

PHOTO BY CINDY GREEN



BUTTER KNIFE CHUCK?

The beef industry is promoting single muscles in the chuck and round that are as tender as ribeye

BY CINDY GREEN

There is a beauty in the beast. One of the toughest cuts of meat — the chuck — contains one of the most tender — the flat iron. The national beef industry is promoting certain muscle cuts from the chuck and round that produce tender, flavorful steaks. “The second most tender cut in the carcass sells for about half the price of ribeye,” says Clint Gehrke, AURI meat technologist.

National Cattlemen’s Beef Association check-off funded research at the University of Florida and University of Nebraska analyzed 39 individual muscles from the chuck and round. Tests showed several were tender enough to be sold as steaks, rather than as ground beef or arm and shoulder roasts.

Flat iron, ranch cut, shoulder tender, petite medallion, top blade and ball tip are some of the new “beef value cuts” showing up in meat cases as low-cost alternatives to tenderloin, ribeye and New York strip.

EDUCATING MEAT EATERS

Many butchers and most consumers haven’t heard of the new value cuts, keeping the price low. “I bought a USDA Select top blade and

a USDA Choice ribeye. I gave them to my family and asked them to guess which cost \$3 a pound and which cost \$6 — they all got it wrong. I feel there needs to be some more educational efforts,” so the beef industry can realize the full value of the little-known cuts, Gehrke says.

“If I say a steak has a tenderness rating of 5.5, that doesn’t mean anything to anybody. But if I told you it was more tender than ribeye at half the cost, you would pay attention.”

CARVING OUT QUALITY

Jim Slavik, who has 40 years meat cutting experience, the past 10 at Cub Foods in Stillwater, Minn., says the “new” value cuts aren’t new. “They’ve been in restaurants for years.” But it’s a new trend in retail meat to “take each muscle and turn it into a cut of beef.”

The flat iron “is the top muscle out of a chuck. It’s a lesser-quality muscle, but it’s good if it’s prepared right. You just can’t overcook it ... it’s better on the pink side.”

The flat iron is about a six-inch long narrow cut. A tough connective tissue that runs through the filet has to be removed, so the flat iron is often butterflied or cut into smaller pieces, called “petite medallions.” Some cooks

wrap the medallions in bacon and grill them like tenderloins.

Because it’s chuck, there is very little marbling in the meat, “but it has a lot of flavor because it comes from the shoulder. You don’t get that flavor in a tenderloin,” from behind the rib where it “doesn’t get any work, so it doesn’t have a real beefy flavor.”

TENDER TESTS

Beef council research compared the tenderness of individual muscles to the primal cuts they originate from. Gehrke wants to take the analysis a step further to compare the tenderness of the new value cuts with traditional steaks. He plans to complete his analysis by the end of the year and design educational posters for consumers and meat cutters.

Gehrke will test 18 or 19 muscles that will be cooked to 160 degrees and cooled down. Then a coring device will cut six samples from each muscle. The testing machine’s quarter-inch steel plates will hit the samples to see how much force it takes to split the muscle fiber.

“After I run a mechanical test on all the different cuts ... we’ll have five new or unknown steaks that will rank fairly high,” Gehrke says. “Nothing will outrank tenderloin

for tenderness.” But he expects the second-ranking cut will be top blade or flat iron. “Lonestar Steak House is already selling these for the price of ribeye. But the Marshall Hy-Vee sells the flat iron for only \$3.19 a pound.”

RETAIL DEBUT

Customers are starting to get a taste for the value cuts, but appearance may be a problem. Petite tenderloins, for example, are dense and deep red, with little marbling. Consumers may be wary that they will cook up as juicy and tender as a well-marbled ribeye or T-bone.

Cub Foods started selling tender shoulder cuts last fall and buys the flat irons “in bulk so we can work with them more, package them ourselves. ... When Cub cooks samples, customers like them and come back and buy them,” Slavik says.

“At 3.99 a pound, they’re a real good value. The problem is, will they stay a good value,” when more consumers realize what a great steak they can get for much less.

That’s what the beef industry is counting on. ■

THE OILSEEDS OF CHANGE

An updated AURI study shows opportunities are expanding for soybean, flax and canola growers

BY DAN LEMKE

Marshall, Minn — A few years has made a big difference in the oilseed industry.

In 2000, oilseed industry expert Robert Carlson evaluated the state's oilseed production and processing industry for AURI. Back then, the state only had four major oilseed processing plants.

But in six years Minnesota has added two crushing plants, three biodiesel facilities, and a lecithin fractionation facility. At the same time, foreign countries have expanded their reach into global oilseed markets.

AURI recently updated its study to evaluate what the changes mean for Minnesota soybean, canola and flax producers.

Since 1990, global oilseed production has increased 74 percent while the worldwide population has grown by only 21 percent. Much of the oilseed growth is attributed to the rising standard of living globally, as consumers demand more fried foods as well as more meat, eggs and milk.



Soybeans are the world's dominant oilseed, accounting for more nearly 60 percent of today's production, up from 50 percent in 1990. The United States leads the world in oilseed production and processing, but other nations such as Brazil, Argentina and China are expanding their production and processing capacity.

Minnesota is the third largest soybean-producing state behind Illinois and Iowa. Soybeans make up more than 99 percent of all the oilseeds ground here. Acreage is growing

rapidly in northwestern Minnesota, replacing other oilseed crops and grains.

Minnesota is also the third largest soybean-processing state — due largely to two 100,000 bushel-per-day processing plants that opened in 2003.

"We jumped from about 37 percent processed in the state to just over 60 percent," says Mike Youngerberg of the Minnesota Soybean Growers Association. "Any processing you can do locally, where you don't have to transport the soybeans, is good. It improves the basis and helps to move product.

"But it does provide some challenges along with the opportunities," as the added crushing capacity has increased the soybean-meal supply.

Even with the production increases and oils pouring into industrial applications, there are markets yet to be tapped, says Max Norris, AURI director of projects and technology. "The challenge comes in identifying new ... opportunities for meal." Besides seeking livestock feed and export markets, that means "picking apart what's in the meal. The carbohydrates and proteins

may have applications in pharmaceuticals, nutraceuticals or industrial applications like textiles."

The study also points to identity-preserved or specialized-soybean processing as underserved markets that could have potential, such as non-genetically modified beans or low-linoleic acid oils. Such products require special handling, but in the right circumstance, it may be worth the effort.

For a copy of the updated oilseeds study, contact the AURI Marshall office at (507) 537-7440. ■

Oilseeds by the numbers

372 million metric tons worldwide oilseed production

74% increase in oilseed production since 1990

21% worldwide population increase since 1990

3.5 million metric tons soybean meal produced in MN annually

1.8 million metric tons soybean meal consumed in MN annually

BY DAN LEMKE

North Mankato, Minn. — Minnesota raises plenty of pigs — about 14 million annually — and ranks third in U.S. pork production.

The state also distills an abundance of ethanol — about 550 million gallons per year produced by 16 plants. The industry generates another 70 million bushels of the ethanol byproduct DDGS or distiller's dried grains with solubles. Between 8 and 9 million metric tons of DDGS are produced in the United States each year.

With Minnesota's leadership in both pork and ethanol production, there is interest in feeding ethanol coproducts to Minnesota hogs.

Currently, most swine diets contain a maximum 10 percent DDGS. "It's been used primarily as a fiber and energy source," says Alan Doering, AURI scientist, who is experienced in animal nutrition.

AURI has several projects with the Minnesota Pork Board and University of Minnesota evaluating DDGS in swine diets and its affect on pork quality. University researchers will be analyzing 37 different DDGS samples to determine amino-acid profiles and digestibility. There will also be ration variations among grower hogs, finishing hogs and sows to determine animal performance.

"With the tremendous expansion of the ethanol industry, (DDGS) is a byproduct that



Researchers look at putting more distiller's dried grains, an ethanol byproduct, in hog rations

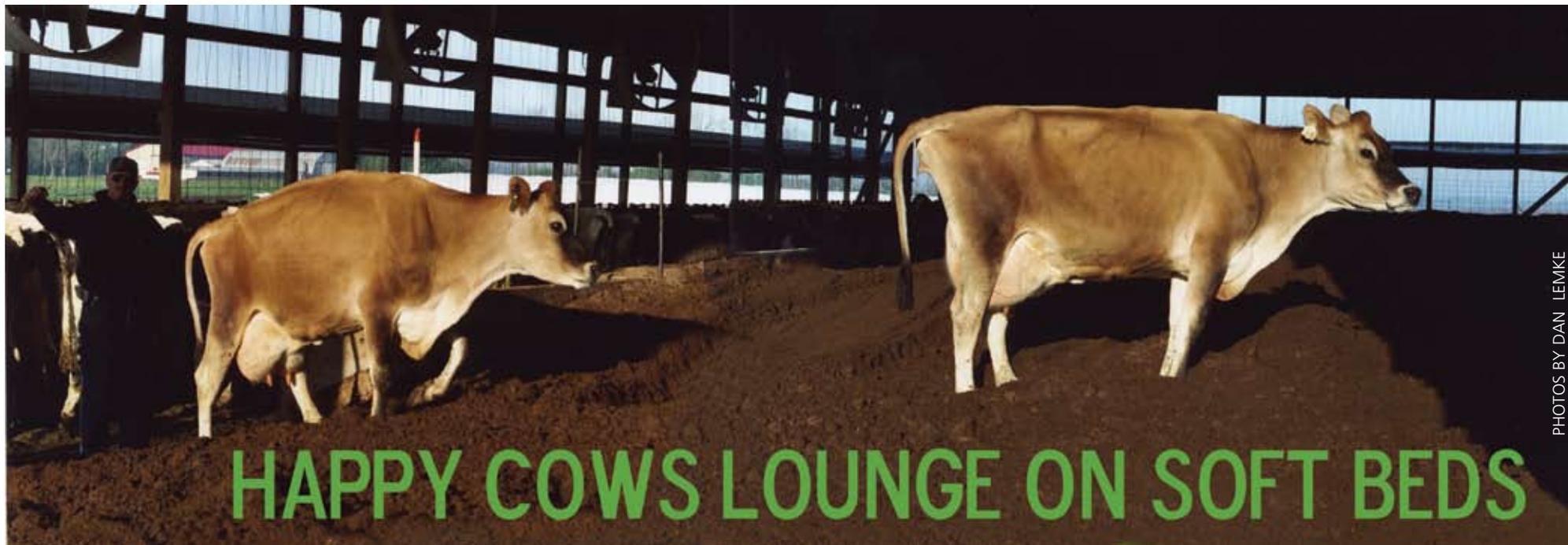
is available in mass quantities," says David Preisler, Minnesota Pork Board executive director. The industry is also interested in the byproduct because "it could help avoid competition for corn ... there could be some issues with that down the road."

While the DDGS's availability is a plus, it will only be increased in swine diets if it doesn't adversely impact pork quality, Doering says. AURI's meat lab in Marshall will be assessing pork quality and fatty acid profiles of animals fed the test diets.

"Ruminants can break down the DDGS to pull the protein out of it," Doering says. "Monogastric animals, such as pigs, can't use the protein as readily. Since the energy comes from the oil still in the DDGS, there is concern with how higher rates would impact pork quality, particularly the pork fat."

"We're looking to identify the development processes that would have to take place to allow for higher inclusion of DDGS," says Dennis Timmerman, AURI project development manager. "Economics and the rapid growth of the ethanol industry are really causing us to take a closer look to see what we can do to increase consumption of DDGS. It makes sense that the pork industry would be very interested."

After all, Minnesota has 14 million hungry pigs to feed. ■



HAPPY COWS LOUNGE ON SOFT BEDS

PHOTOS BY DAN LEMKE

Compost bedding in large open barns yields more milk production and satisfied cows

BY DAN LEMKE

New Ulm, Minn. — Steve and Kerry Hoffman know that a happy cow is a productive cow. Their southeast Minnesota dairy operation features a unique housing style that is not only gaining producer interest, it's providing nearly-unrivaled cow comfort.

Called compost-bedded pack barns, these facilities employ a minimum of 18 to 20 inches of bedding, primarily fine wood shavings or sawdust spread out in large, open barns.

Twice a day, Steve or one of his hired workers pulls a field cultivator behind a skid steer over the nearly 4-foot deep pack. It's a little extra barn management but worth the time, as the cows are more content and productive, he says.

Cows lounge on the bedding when they're not being milked. Twice daily the pack is stirred to aerate and mix in the urine and manure. The pack aeration promotes natural composting as bacteria breaks down the manure and stabilizes it. Every three to five weeks, more bedding is added and the barn is completely cleaned once a year.

The Hoffmans became interested in the concept two years ago. They visited one of the region's first compost barns near Sleepy Eye several times before initiating their own system in September 2004. They built a barn and increased their herd size to 93 cows.

"We were looking for a way to increase our cow numbers," Steve says, but they discovered other benefits. "In the first 16 months since we've had this compost barn, the herd average (for milk production) has increased 4,000 pounds per cow.

"Our somatic cell count (reflecting antibody levels) also dropped," Steve adds. Factors like stress and environment can elevate cell counts and affect milk quality. "But cow comfort was really the biggest thing for us."

Rather than spending their days standing on cement floors, cows in compost barns lie down and eat more and in general appear more content, researchers observe. The Hoffmans have spoken with other compost-barn producers who say the soft floors decreases foot and leg problems, potentially adding years to a cow's productive life.

The Hoffmans' system also simplifies manure handling and storage. With a farm perched on a hill overlooking a creek, they knew attempts to increase their herd size in other ways would meet resistance.

"We were able to increase cow numbers and combine our manure storage and cow housing into one unit," Steve says. "Plus, there was no need for (manure) lagoon permitting."

Kerry says she even warned neighbors last fall when they planned to spread compost on the fields, because they didn't know how much smell it would produce. "There was none," she says.

"Cow comfort is the primary reason producers consider a compost barn," says Mindy Spiehs, a University of Minnesota extension educator in Morris, Minn., specializing in manure management systems. "Cows have fewer hoof and leg problems which allows producers to keep cows longer and build their herds. But it's also an effective alternative manure-management system."

Spiehs says compost barns are "popping up all over," as is the interest from producers in other states and even overseas. Minnesota has become a leader in this type of livestock and manure handling system, she says.

Bedding alternatives

The Hoffmans are confident in the science behind compost barns, but face unexpected rising bedding costs. Estimated to be between 34 and 50 cents per day per cow, actual costs

are about 70 cents per animal per day. Kerry sources fine sawdust from Iowa, but as wood prices rise so does the need for alternatives.

AURI, the Minnesota Soybean Growers and the University of Minnesota Extension Service are collaborating on efforts to identify other alternative bedding sources, particularly agricultural fibers.

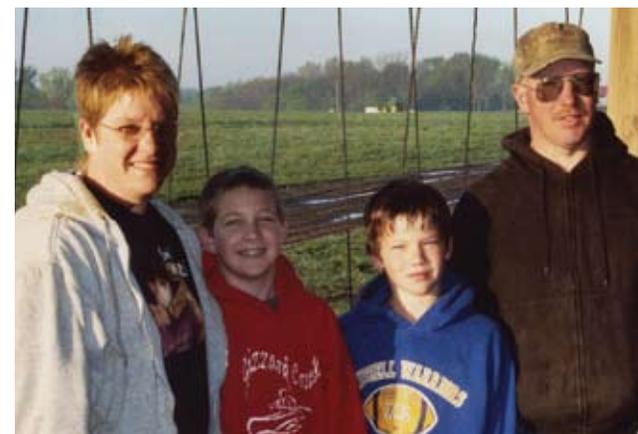
"The biggest factor for expanding compost barns is finding alternative bedding," says Spiehs. "There's only so much sawdust available and the suppliers realize there's a demand for it so the price goes up. The number one thing we hear from producers is 'isn't there anything else we can use?'"

"Straws and corn stalks generally don't work because they pack too much and don't provide structure for composting," says AURI scientist Alan Doering. "But there are other fiber sources out there that may turn out to be suitable replacements."

Producers have discovered that fine material works better than coarse, so AURI will source and prep optimal fibers for testing. University of Minnesota researchers will then test-compost the best fibers.

Bedding packs that don't compost may promote the growth of pathogens that can cause mastitis. Properly-functioning compost packs reach internal temperatures from 130 to 150 degrees Fahrenheit, killing pathogens, viruses and even insect larvae.

Doering says the project will evaluate fibers such as soybean hulls, flax straw, corn cobs, beet pulp and other materials. Tests will evaluate each bedding source for its nutrient



The Hoffman family.

value, water holding capacity, carbon dioxide emissions and more.

Small-scale problem

Minnesota ranks sixth in U. S. dairy production. A recent Dairy Herd Improvement Association survey found that more than 80 percent of the state's dairy herds had fewer than 100 cows.

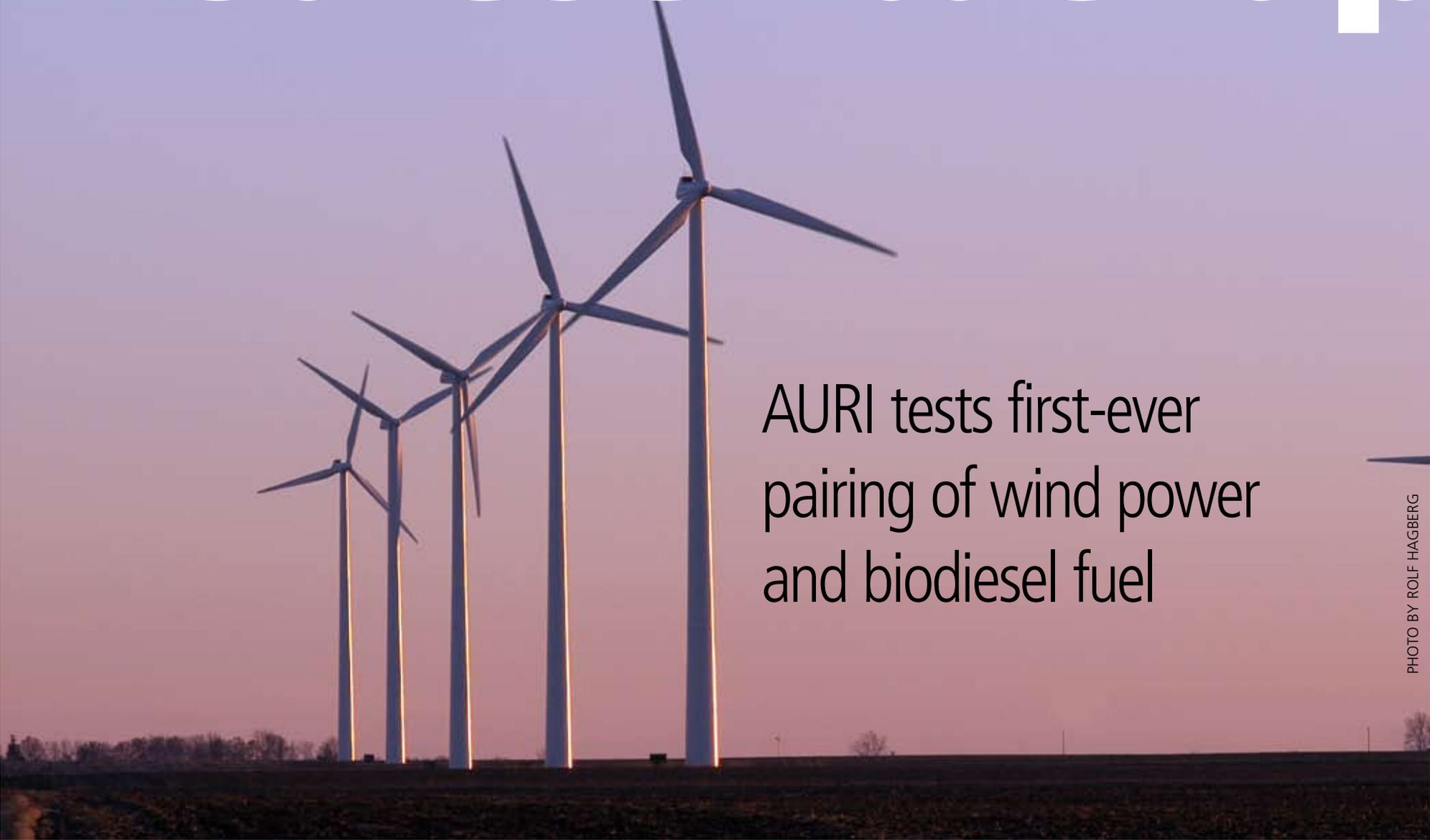
Many of these herds are in antiquated housing facilities that are too costly to modernize.

Minnesota is losing an average of two dairy farms a day. Dairy proponents are anxious to find economically-feasible solutions that allow smaller dairies to modernize their facilities. Compost barns may be one solution.

For some, the compost generated in their barns could be an additional revenue stream. Hoffman says local nurseries and landscapers have shown interest in using the compost for landscaping.

"I think it's something other farmers should consider," Steve says. "But we need to find an alternative bedding source." ■

Biodiesel backup



AURI tests first-ever pairing of wind power and biodiesel fuel

PHOTO BY ROLF HAGBERG

BY E. M. MORRISON

Beaver Creek, Minn. — Wind power is getting a boost from soybean power.

AURI is pairing two renewable energy sources — wind and biodiesel — to produce electricity even when the wind isn't blowing. The demonstration project links seven Buffalo Ridge wind turbines with a 2,800-horsepower diesel engine and generator fueled by 100 percent biodiesel. When the wind stops or drops, the biodiesel generator takes over. The goal is to guarantee two megawatts of dependable, renewable electricity.

The tandem system compensates for wind energy's main disadvantage: its variability. Having a continuous supply of wind power available during peak demand times could make the renewable more attractive to utilities — and more profitable for small producers, says Dennis Timmerman, AURI project director. Cogeneration would also provide soybean growers with another market for biodiesel, while helping Minnesota meet its

renewable energy objectives.

This is the first time that a utility-scale wind power system has been supplemented by biodiesel power. It's also the first test of pure biodiesel, or B100, in a large diesel engine. "It's an intriguing idea," says Michelle Swanson, policy analysis manager at Xcel Energy, which is buying the hybrid power. "A renewable backed up by a renewable."

The demonstration is supported by a \$760,000 research grant from the Xcel Energy Renewable Development Fund, which encourages commercialization of green-energy technology. The Fund has also supported research on wind-speed forecasting, wind-power storage and wind-tower assembly methods.

Providing firm power

The hybrid system is being tested at an 11.55 megawatt wind farm operated by Minwind Energy, LLC. The company has built 11 wind turbines in southwest Minnesota and sells

power to Alliant Energy and Xcel Energy. "We're interested in firming up wind power when wind speeds are low," says Mark Willers, Minwind CEO. "And being in an agricultural area, we are also interested in another market for biodiesel."

In May, AURI installed a leased Caterpillar V-16 diesel engine and two-megawatt generator at Minwind's Beaver Creek wind farm. The generator is connected to existing transmission lines. Minwind is operating the biodiesel system from June through September — the period when wind speeds are lowest and demand for electricity is highest. The biodiesel generator runs from 1 p.m. to 9 p.m. daily, augmenting the output from Minwind's seven 1.65 megawatt turbines. This enables Minwind to sell a guaranteed amount of continuous — or firm — power during peak-use hours.

The 120-day field trial is collecting data on power output and efficiency, equipment and software performance, biofuel handling, consumption and emissions, and costs.

Afterwards, Willers says, "we'll be able to say, here's what works, here's what needs improving, here's what we wouldn't do again."

B100 performance test

One question researchers hope to answer is how B100 functions in a large, stationary diesel engine, says Kelly Strebig of the University of Minnesota Center for Diesel Research, which is overseeing fuel analysis and emissions monitoring.

Biodiesel fuel, which can be made from vegetable oils or animal fat, is fast gaining acceptance. B2 — a mixture of two percent biodiesel and 98 percent petroleum diesel — can be used safely in any diesel engine. B5 and B20 blends are increasingly being used in farm machinery and transit bus fleets. And B30 has been approved for some engines by Caterpillar and other manufacturers, Strebig says.

But so far, no diesel engine makers have okayed the use of greater concentrations of

the renewable fuel. So this research is of great interest in Minnesota and other states that have renewable energy objectives, Strebig says.

After the demonstration, the leased diesel generator will be returned to Caterpillar, which will take apart the engine and look for B100-related damage. "We don't anticipate any big problems," Strebig says, "but we want to find out for sure."

Favorable results from this and other B100 tests could open up huge new markets for the ag-based fuel, he says. Stationary diesel generators are widely used — by industry, hospitals, small municipal power plants and others — for standby or emergency electricity. Large utilities also use diesel and natural gas to meet peak demands for electricity. In the Twin Cities, for example, power companies contract for over 300 megawatts of diesel-generated peak power, Strebig says. Those contracts could represent millions of gallons of biodiesel fuel, he says.

Does it make financial sense?

The Minwind demonstration will also provide the first hard numbers on the actual cost of generating electricity from a hybrid wind-biodiesel system.

An April, 2006 study by University of Minnesota economist Douglas Tiffany offers a detailed analysis of cogeneration economics. Tiffany's study estimates capital costs, revenues and expenses, cost per kilowatt-hour and rate of return under a variety of scenarios. (To read the full report, go to auri.org)

Tiffany's analysis suggests that it could be profitable to supplement wind power with biodiesel:

From 9 a.m. to 9 p.m., Monday through Friday, in June, July, August and September. These are the prime "on-peak" hours, when utilities have the greatest need for continuous, or firm, power.

At sites with enough wind to run turbines at 35 percent efficiency or greater.

Provided that federal tax credits keep the price of biodiesel equal to petroleum diesel.

Diesel-generated electricity is about twice as expensive as traditional sources. So "the price of biodiesel is an important variable in the feasibility," Tiffany says, "along with the number of hours that a diesel 'genset' would have to run." As the hours of generator use increase, hybrid-power costs go up and the rate of return goes down, the report shows. The same would be true as the price of diesel fuel rises.

The wind at Minwind's Beaver Creek farm blows with enough frequency and strength to produce 40 percent of the turbines' annual rated, or maximum, capacity, Willers says.

AURI is estimating that the biodiesel generator will need to run about 400 hours during the demonstration period in order to produce two megawatts of continuous on-peak power. Assuming a biodiesel fuel cost of \$2.60 per gallon, the blended price of the hybrid power would be 4.9 cents per kilowatt-hour, according to Tiffany's estimates.

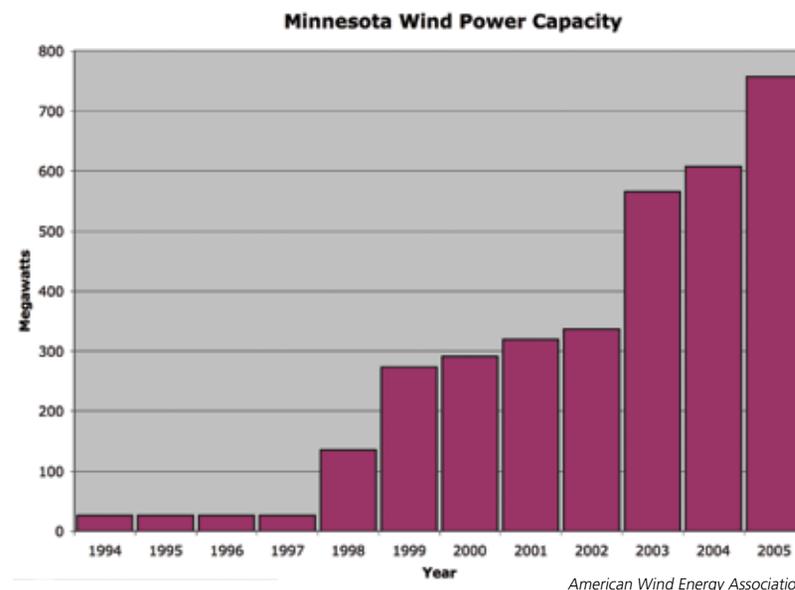
Making wind more attractive?

Minnesota utilities pay 3 to 4.5 cents per kilowatt-hour for wind power. But hybrid wind-biodiesel power may qualify for higher prices, Timmerman says. For example, from June through September 2005, Xcel Energy offered to pay 9.87 cents per kilowatt-hour for firm, on-peak renewable electricity produced through cogeneration.

The higher rates are not offered for more than a year at a time, however, Tiffany says, and the lack of longer-term agreements "reduces enthusiasm for investments in hybrid systems."

Still, Timmerman says, reliable wind-biodiesel power "might be more attractive to utilities."

Minnesota legislation requires power companies to invest more in wind, biomass and other renewables. Within a decade, the state hopes to get 20 percent of its electricity from renewable sources. "Minnesota has been a leader in developing renewable energy," Willers says. "The wind-diesel project is one more piece of this evolution." ■



Catch and hold

Minwind Energy keeps wind power profits at home

Minwind Energy does more than catch the wind — it also holds on to it.

The company operates 11 wind turbines in Rock County. Owned by 350 southwest Minnesota farmers and business people, this renewable energy company "keeps wind power revenues here at home," says Mark Willers, Minwind CEO.

Minwind is an example of how rural Minnesota communities can develop their wind resources, generate new farm income and keep energy profits local, says Jack Keers of Pipestone, chair of the Rural Minnesota Energy Board. The consortium of 15 southern Minnesota counties has been a leading voice on wind-power policy issues.

Minwind Energy started with the belief that "rural Minnesota needs to develop not only renewable energy production, but also the capacity to own it," Willers says. Keers seconds that: "If you go out on the Buffalo Ridge, who owns most of the wind turbines? Not Minnesotans."

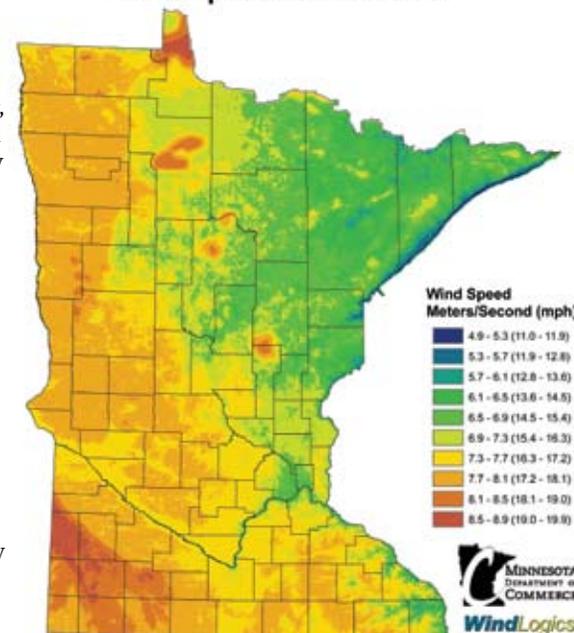
In 2002, Minwind's 66 original investors — most of them farmers — built four 0.95-megawatt wind turbines near Luverne. Two years later, a larger group of farmers put up seven more turbines at another Rock County site near Beaver Creek. Each 70-foot tower generates up to 1.65 megawatts of power. This summer, Minwind is testing the use of biodiesel generation to supplement its turbines when the wind isn't blowing.

Minwind's two wind farms have the capacity to generate nearly 16 megawatts. One megawatt of electricity can power about 300 average homes, according to the American Wind Energy Association. Alliant Energy buys the output from Minwind's first wind farm; Xcel Energy buys the power from the second facility.

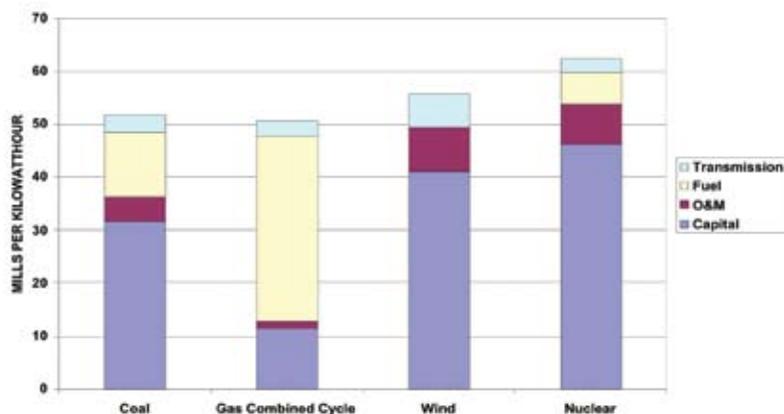
Minwind's 11 wind turbines represent a local capital investment of \$16 million, Willers says. Many of Minwind Energy's shareholders have also invested in biodiesel and ethanol plants. Like the state's ethanol businesses, Keers says, community wind farms benefit rural Minnesota; they pay property taxes and create new jobs and economic activity. Utility companies also benefit from broad ownership of wind turbines "when it comes time to build new transmission lines," Willers says.

Community wind power businesses can educate the public, too, Willers adds. Minwind encourages area high schools to use its wind farms as real-life labs to study mathematics, physics, business and other subjects. "We spend a lot of time getting kids involved so they can understand that it's up to us to get wind power going here. We can do it." ■

Minnesota's Wind Resource by Wind Speed at 80 Meters



Levelized Electricity Costs for New Plants 2015
Source: U.S. Energy Information Agency, 2005 Annual Energy Outlook





Windstruck state

Minnesota is a national leader in wind-power development

BY E. M. MORRISON

Minnesota is “amping up” its wind watts.

The state now has about 750 megawatts of wind energy capacity and could add more than 2,000 megawatts of additional capacity by 2015. Xcel Energy, Minnesota’s largest utility and the nation’s top wind-power buyer, will nearly double its supply of wind power in Minnesota over the next five years, to 1,125 megawatts.

Minnesota is aiming to generate 20 percent of the state’s electricity from renewable sources by 2015 — up from 10 percent today. At least half of that renewable power is expected to come from wind, according to a 2005 Minnesota Commerce Department report.

Wind power revival

Before rural electrification began in 1935, every Minnesota farm had a windmill to pump well water. About 1920, farmers started using windmills to power small generator-and-battery sets, bringing electric lights and radios to farmhouses for the first time. A Minnesota extension service expert wrote in 1921 that “the future possibilities of wind-driven electric plants appear to be good.”

As power lines were extended into the Minnesota countryside in the late 1930s and 1940s, windmills were abandoned. It would be decades before the state again turned its attention to “the future possibilities” of wind energy.

Interest in wind power revived in the 1990s. In 1994, Minnesota ordered Northern States Power Co. (now Xcel Energy) to add 425 megawatts of wind power to its portfolio in exchange for storing spent nuclear fuel at Prairie Island. In response, scores of wind towers went up in Lincoln, Pipestone and Murray counties, the state’s windiest region.

Little more than a decade later, nearly 800 wind turbines dot the rural Minnesota landscape.

They range in size from single turbines that power individual homes, farms or schools, to large commercial wind farms with dozens of turbines and more than 100 megawatts of capacity. Minnesota now ranks fourth in wind power, behind California, Texas and Iowa, according to the American Wind Energy Association.

Wind drivers

What’s driving this expansion?

University of Minnesota economist Douglas Tiffany, who has written extensively on renewable energy, says Minnesota’s wind industry has been spurred by several factors:

With tax breaks and other publicly-funded incentives, wind power can be a good investment on windy sites accessible to the transmission grid. The federal wind-production tax credit offers 1.9 cents per kilowatt-hour for 10 years.

Minnesota offers financial incentives, too, and has invested in wind research. Turbine design improvements are also cutting the cost of wind power.

Renewable power mandates and goals create a market for wind power. Minnesota requires utilities to offer consumers renewable power. And Xcel Energy must generate 10 percent of its power from renewables by 2015.

Backing ‘green’

In addition, consumers are demanding clean, “green” energy, says Paul Adelman, an Xcel Energy spokesman. The utility’s WindSource program has 50,000 subscribers, Adelman says, making it “the largest voluntary consumer wind-purchasing program in the nation.” Particularly in Minnesota, Adelman says, “our customers are very aware of environmental issues. They are asking for more wind power ... and it’s having an impact.” That’s one reason why Xcel Energy

has exceeded state wind power mandates, says Michelle Swanson, Xcel Energy policy analyst. “We recognize that wind is an important part of our portfolio.”

The price of wind power is dropping, too. Twenty-five years ago, when the first utility-scale turbines were installed, wind-generated electricity cost up to 30 cents per kilowatt hour, according to the American Wind Energy Association, a trade group. Today’s state-of-the-art wind power plants can generate electricity for less than 5 cents a kilowatt-hour in many parts of the United States, according to AWEA.

That compares favorably with the cost of new coal power (4.8 to 5.5 cents per kilowatt-hour) and gas combined cycle power (3.9 to 4.4 cents per kilowatt-hour), the AWEA estimates. High natural gas prices are also making wind power more competitive, Swanson says, although steel and construction costs for wind towers are up, too, she adds.

Benefits and barriers

Wind turbines generate clean, renewable energy, with no emissions and little environmental impact. Advocates say wind power also fosters rural business development, creates jobs, generates new property tax revenues and offers farmers leasehold income. Still, Tiffany says, “There are substantial economic issues, such as investments in transmission capacity, that must be surmounted before greater portions of total electrical capacity can be replaced by wind.”

Wind’s chief limitation is obvious: it’s variable. Wind-power producers can’t guarantee delivery of electricity at scheduled times. This makes the commodity worth less to utilities, which must supply power to retail customers on demand.

Wind plants can have much higher capital costs than conventional power plants, so financing can be a hurdle, Tiffany says. Transmission costs are also higher, because the

best wind resources are in rural areas, distant from population centers. Getting access to the electric grid can be a problem, too, says Jack Keers, Rural Minnesota Energy Board chair. More transmission lines will be needed to distribute wind power to customers in the Twin Cities and other markets, he says.

Windy outlook

Despite these hurdles, the outlook for Minnesota wind power is good, Keers says. Last year, the federal production tax credit was extended. Xcel Energy is investing \$160 million in new transmission infrastructure in southwest Minnesota. And new

wind-speed maps show that wind turbines are feasible not only in southern Minnesota, but also in western, northwestern and south central Minnesota.

Minnesota has made it easier for small wind power projects to get started, too. The Community-Based Energy Development program offers a new financing option, more flexible grid access and other incentives for local wind-power producers, Keers says. And Xcel Energy has agreed to buy 500 megawatts of electricity from community-based wind energy providers. ■

The Growth of Minnesota Wind Power Capacity in Megawatts

Year	MW Additions	Total MW Capacity
1994	25.55	25.55
1995	0	25.55
1996	0	25.55
1997	0.225	25.775
1998	109.23	135.005
1999	137.58	272.585
2000	17.82	290.405
2001	28.59	318.995
2002	17.35	336.345
2003	228.953	565.298
2004	41.85	607.148
2005	149.9	757.048

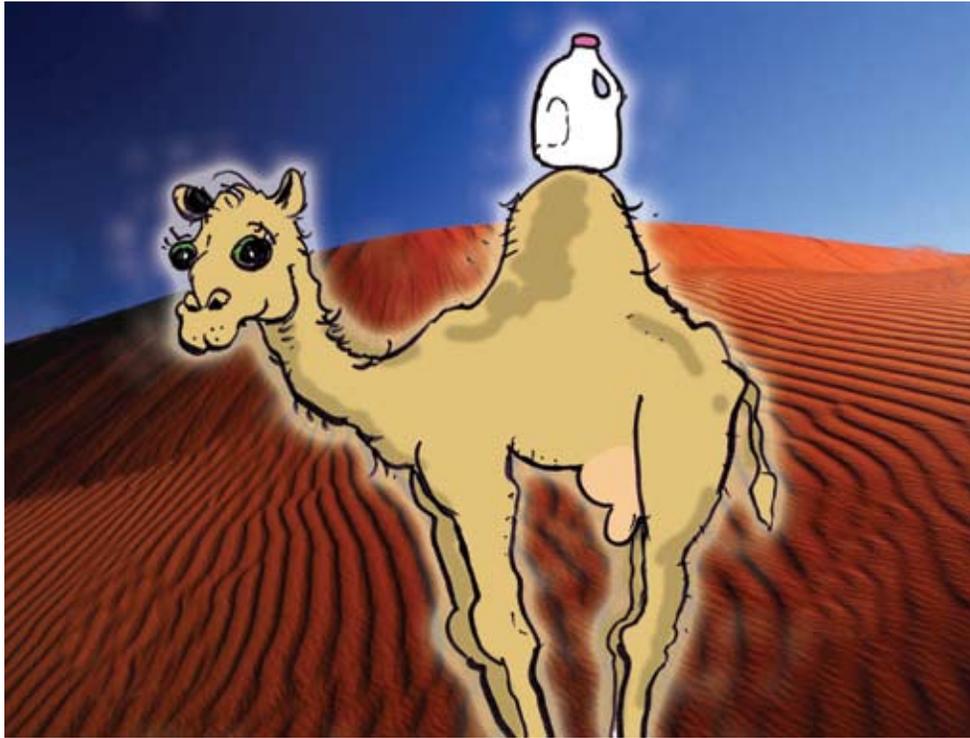
Sources: American Wind Energy Association; Minnesota Department of Commerce

Top Wind Power States, 2005

1. California	2,150 megawatts
2. Texas	1,995 megawatts
3. Iowa	836 megawatts
4. Minnesota	757 megawatts

Sources: American Wind Energy Association; Minnesota Department of Commerce

Elsewhere in ag utilization



Editor's note: As a service to our readers, we provide news from around the globe on new uses for agricultural products. Please note that ARS is the research arm of the USDA.

BY DAN LEMKE
CARTOONS BY UNCLE HYGGLY

Desert milk

Mooove over cows, there's some new competition in the dairy-product aisle. Camel's milk, cheese, ice cream — even camel chocolate — could soon hit the market.

Already sipped widely across the Arab world, the United Nations says camel's milk has untapped potential. Herders and camel dairy operators are beginning to expand, producing fermented milk called Shubat, camel's milk cheese, and an Austrian chocolatier is launching camel milk chocolate. Slightly more salty than cow's milk, camel's milk contains three times the vitamin C and up to 10 times the iron content.

A camel typically produces five liters of milk a day, but experts say that with improved feed, husbandry and veterinary care, daily yields could increase dramatically. Improved production could also provide economic opportunity for nomadic camel herders.

From: BBC News, April 28, 2006

Ethanol big in China

The Chinese like ethanol. According to the Chinese National Development and Reform Commission, 20 percent of the nation's total gasoline consumption comes from ethanol. The State Council has chosen nine provinces to burn ethanol gasoline in a pilot clean-

fuel consumption project. Plants in those provinces can produce 10.2 million tons of ethanol a year.

From: SinoCast, March 3, 2006

Feeling blue

When it comes to heart health, it may pay to think blue. Researchers at the University of Maine have discovered that blueberries help strengthen blood vessels against factors that lead to heart disease. Already touted as one of nature's super foods, blueberries have been shown to lower cholesterol, protect against cancer and help with neurodegenerative diseases such as Alzheimer's.

From: Food Navigator.com, April 27, 2006

Toast and soybeans

Toast may have a new topper. Purdue University students won first prize in the 2006 Soybean Utilization Contest for their soy-pectin jam. Soy Spreads All-Natural Jams uses soy-hull pectin developed for the Purdue and Indiana Soybean Board contest. Soybean hulls' advantage in pectin production is they are easy to transport and store. Traditional pectin sources — citrus peels and apple pomace — must be dried before they are transported. Soy Spreads come in three flavors.

From: Soyatech.com, March 28, 2006

Cancer chasing legumes

Alfalfa, peas, soybeans and other legumes may host compounds that fight cancer. Australian researchers at the ARC Center of Excellence for Integrative Legume Research have identified compounds in legumes that potentially prevent blood supplies to tumors. Without blood, the tumors stop growing and may regress. The compounds are derived from legume interaction with soil bacteria.

From: Soyatech.com, April 10, 2006

Skinny spuds

Nine years of research by British scientists has yielded a 'slimming' potato. Known as the Vivaldi, the potato contains half the calories of traditional potatoes and about one-third less carbohydrates, but still has normal levels of vitamin C and other nutrients. The Vivaldi should be popular with low-carbohydrate dieters when it starts showing up in supermarkets.

February 7, 2006, From: BBC News

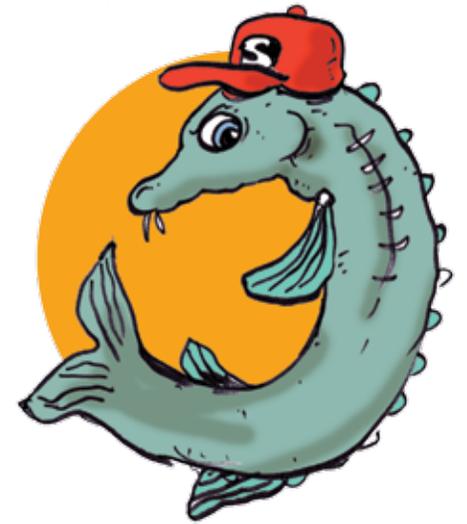
Fuel in the frig

Save those orange peels. With escalating gas prices, they may help fill up the tank on the cheap.

Researchers at the USDA-ARS Citrus and Subtropical Products Laboratory in Florida have found citrus peels may be a petroleum substitute. Citrus waste is high in pectin and cellulose that can be hydrolyzed into sugars and fermented into alcohol. Florida alone produces 1.2 million tons of dried peel residues each year. Most is used as cattle feed. Thanks to a modified process, the citrus waste may be economically processed into fruit-based ethanol.

Not to be outdone, veggies are also vying for the gas tank. ARS researchers have produced ethanol from pea starch. The legumes can be fermented to produce alcohol, although at a lower rate than corn. As with corn, the leftovers can be used as livestock feed.

From USDA-ARS, March 28, 2006



Farming for sturgeon

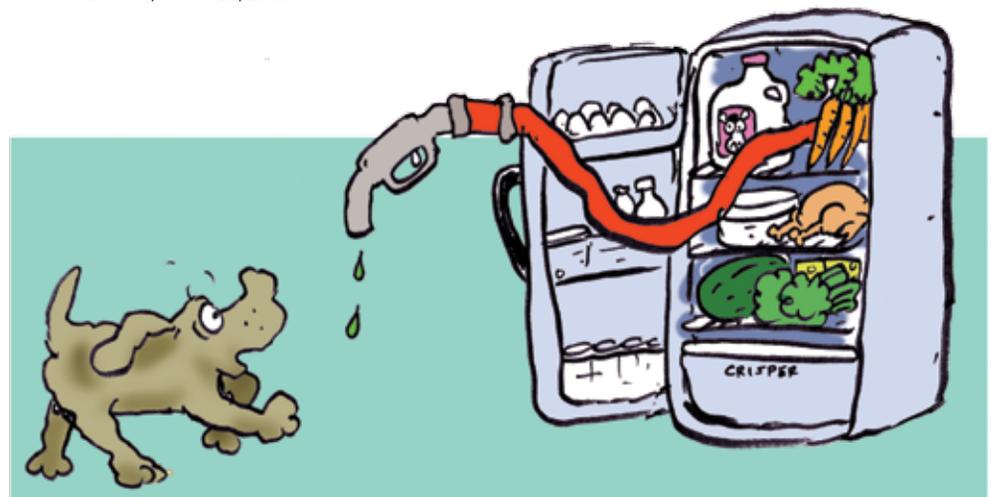
Fish farmers may finally be cashing in on years of research perfecting techniques for raising sturgeon, which produce eggs sold as caviar.

A University of California Davis marine scientist has tested a technique, which originated in the former Soviet Union, to culture and breed sturgeon under controlled conditions.

A California farm that is using the technique raises tens of thousands of sturgeon in circular tanks. Workers wash, grade, weigh and salt the precious eggs that sell worldwide for up to \$70 an ounce.

Wild sturgeon can live 100 years and don't even begin producing eggs until they are 15-20 years old. Special feeding and other methods have reduced that to 8-10 years. Farmed caviar struggles to compete with wild eggs because, among the world's elite, the rarer the caviar, the better.

From: BBC News, April 28, 2006



AURI profiles of leadership

BY DAN LEMKE

A nonprofit corporation, AURI is overseen by representatives of Minnesota's diverse agricultural industry. These board members, with their collective experience and knowledge, provide AURI direction. This is Ag Innovation News' second installment featuring those leaders.

When the USDA-supported Center for Producer-Owned Energy was established in 2004, a second board was established to provide guidance and approve projects for the new center. The Energy Center's board includes AURI board members and two other directors who are included in the following profiles.

Julie Bleyhl

Julie Bleyhl has served on AURI's board since 1989, when it became an independent nonprofit, and prior to that served on AURI's steering committee. She was AURI board chair for six years.



Bleyhl.

Raised on a farm near Madison, Minn., Bleyhl now works for AFSCME Council 6 in St. Paul and represents the Minnesota Farmers Union on the AURI board.

"AURI bridges a gap not filled by any other organization," Bleyhl says, with its "technical services, feasibility studies and laboratory services. AURI is positioned throughout Minnesota, which provides access for clients."

Bleyhl says serving family farmers and rural communities is central to AURI's mission. One of the most important emerging opportunities to boost the rural economy, she says, is renewable energy.

Richard Schieck

Richard Schieck is a full-time teacher at KMS High School in Kerkhoven, Minn., but also works on his daughter's hog farm. Schieck has represented the Minnesota Pork Producers on AURI's board for eight years.

"AURI is a group of people focused on a common goal — what opportunities can we economically aid rural Minnesota with?" Schieck says. "AURI has a unique ability to search out, locate and research new ideas."

Schieck says "out of the box" thinking exemplifies AURI uniqueness, as does the hands-on expertise offered by AURI labs and staff. Besides developing more value-added pork products, Schieck says AURI is researching ways to use manure — generated by 14 million hogs raised here annually — for energy. "The buzz today is energy needs," he says.

Richard Peterson

Richard Peterson raises corn, soybeans and sheep on his Mountain Lake, Minn. farm and represents the Minnesota Corn Research and Promotion Council and the Minnesota Corn Growers on the AURI board. He also chairs AURI's Center for Producer-Owned Energy board.

Peterson says it's important that AURI not only provide assistance to producers in an effort to find new uses for ag products, but to "keep the state involved in the number one industries in Minnesota agriculture."



Schieck.



Peterson.

Partnerships and collaboration enhance AURI's efforts to make sure Minnesota producers are profitable and remain here, he says. "AURI provides a resource to bring state and other partners together." He points to AURI's Center for Producer-Owned Energy as an example of bringing "federal, state and other partners together."

Peterson says renewable fuels, new uses and value-added opportunities are important to the thousands of Minnesota corn farmers.

Pat Lunemann

Dairy farmer Pat Lunemann and his family operate Twin Eagle Dairy, a 500-head dairy near Clarissa, Minn. He also represents the Minnesota Milk Producers Association on AURI's Center for Producer-Owned Energy board.



Lunemann.

Lunemann says the federally-supported center offers funding, support and partnership opportunities for next-generation, ag-based energy projects and "allows for independent partnering with a wide number of agricultural and commodity groups." The greatest value, he says, is "being there to support and enhance some of the great ideas that ag people are bringing forward."

"The whole field of alternative energy is wide open. We need to continue research and seek those opportunities." One area Lunemann would particularly like to see developed is capturing more energy from livestock manure.

Jim Boerboom

Jim Boerboom, Minnesota Department of Agriculture assistant commissioner, represents MDA on AURI's Center for

Producer-Owned Energy board. He says AURI and the Energy Center have "the capacity to leverage state, private and federal funds to enhance Minnesota's economy. It offers an opportunity for businesses and individuals to test the technical and financial feasibility of new agricultural products."

MDA, one of AURI's collaborating partners, oversees public health, food safety and commerce issues related to agricultural products.

Boerboom says projects that have the most potential include gasifying agricultural residues, developing coproducts, using biomass feedstocks for ethanol and promoting the biodiesel market.

Sen. Dallas Sams

Senator Dallas Sams has served on the AURI board since January of 1993 and represents the Minnesota Senate. Sams is a legislator and farmer from Staples, Minn.

Now in his 5th term, Sams lists agriculture among his top legislative concerns along with health care, education and transportation. Sams also chairs the Environment, Agriculture and Economic Development Budget division. ■



Boerboom.



Sams.

AURI Ag Innovation Quiz

- Why are compost barns gaining interest among dairy farmers?
 - Cow comfort
 - Manure management
 - Potential for increased production
 - All of the above
- How much do Minnesota utilities typically pay for wind power?
 - 3 to 4.5 cents per kilowatt-hour
 - 50 cents per kilowatt-hour
 - \$1.50 per kilowatt-hour
- What percentage of Minnesota-grown soybeans are processed in the state?
 - 11 percent
 - 60 percent
 - 83 percent
- How much distiller's dried grains can typically be added to swine diets?
 - 50 percent
 - 25 percent
 - 10 percent
- What industry has shown particular interest in larger-scale biomass burners?
 - Blacksmiths
 - Greenhouses
 - Meat packers
- What makes the windpower project with Xcel Energy, AURI and MinWind unique?
 - It's using really big turbines
 - It uses biodiesel generators for backup
 - All the blades turn counter clockwise for increased production
- About how many tons of DDGS are produced by Minnesota ethanol plants each year?
 - 7 million tons
 - 70 million tons
 - 700 million tons
- How many years has AURI presented the Ag Innovator of the year award?
 - 5
 - 2
 - 13



Answers: (1) d (2) a (3) b (4) c (5) b (6) b (7) b (8) a

Hard to explain

BY TERESA SPAETH



AURI cannot be explained in a sentence. Describing the what, how and why of what we do — and who we do it for — makes for either a long, rambling dissertation or an inadequate description.

After all, AURI has evolved and grown appreciably over the years, and it may not be clear to everyone what today's AURI offers Minnesota.

But here's a 15-second sound bite that may help:

AURI provides scientific technical expertise, feasibility reviews and targeted network coordination to add value and long-term economic viability to Minnesota agriculture and communities.

In other words, we're all about providing hands-on technical assistance in our labs and at project sites to develop innovative uses for Minnesota ag products. We have unique facilities and staff expertise to help the state's businesses get a leg up on the competition and stay on top of emerging opportunities.

While AURI offers a range of valuable services, we are not all things to all people. When a need doesn't match our resources, we can tap a network of collaborators — commodity groups, farm organizations, universities, state agencies, economic developers, business developers and research laboratories. If it's not offered by AURI, we can still help Minnesota businesses access the assistance they need.

That's what we do. Here's why:

AURI intends to create economic opportunity and vitality in Minnesota for producers and agri-businesses. We strive to give farmers, cooperatives and other ag-based enterprises advantages so they can be profitable. Financially-healthy businesses are good for more than just the agricultural economy — they benefit all of us.

AURI not only works with businesses that come through our door or are referred by our partners, we pay close attention to emerging trends. Identifying potential markets opens up possibilities.

Between AURI's resources, our network of collaborators and more than 17 years experience developing successful value-added ventures, AURI is a star resource for Minnesota value-added agriculture. ■

AURI GUIDE TO SERVICES

A nonprofit corporation created to strengthen rural Minnesota's economy, AURI helps businesses respond to market opportunities with new and value-added uses for agricultural goods. The Institute builds working partnerships with business innovators, agricultural groups and researchers, and provides technical support to clients conducting new product research and development.



AURI programs are available to legally-organized businesses or cooperatives with projects that have the potential to create new uses or new markets for Minnesota agricultural commodities. AURI assistance is designed for the early stages of a product's life cycle, while an element of feasibility is yet to be determined.

Project proposals are evaluated on the following criteria:

- Innovation/uniqueness
- Market viability
- Use of Minnesota commodities
- Number of farmer-producers impacted
- Amount of value added from further processing
- Economic impact
- Cost savings

Programs are designed to assist with:

- Identifying emerging value-added opportunities
- Developing innovative commodity-based products
- Developing production processes for feasible products
- Promoting products developed with AURI technical assistance
- Providing resources to bring new products and processes to the marketplace

Assistance may include:

- Access to AURI's scientific and business staff
- Access to laboratory and pilot plant facilities
- Product development and feasibility testing
- Process evaluation and improvement
- Business needs evaluation
- Technology transfer and applied research
- Links to available resources
- Potential for grant funds to qualifying applicants

AURI provides resources proportionate to the project's impact. Smaller-impact projects may be eligible for technical assistance only, while projects with industry-wide impact may be eligible for financial assistance.

AURI Facilities

- AURI operates several laboratories:
- Coproducts Utilization Laboratory and Pilot Plant, Waseca
 - Fats and Oils Laboratory, Marshall
 - Meat Laboratory, Marshall

AURI Offices

Headquarters
P.O. Box 599
Crookston, MN 56716
1-800-279-5010

Southeast Office
P.O. Box 251
Waseca, MN 56093
(507) 835-8990

Southwest Office
1501 State Street
Marshall, MN 56258
(507) 537-7440

For staff e-mail addresses, visit AURI on the Web: www.auri.org

ABOUT AG INNOVATION NEWS

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Address correspondence or subscription requests to:

Dan Lemke
Ag Innovation News
P.O. Box 251
Waseca, MN 56093
Telephone: (507) 835-8990
dlemke@auri.org



FUMPA Biofuels named 2006 Ag Innovator of the Year

BY DAN LEMKE

Redwood Falls, Minn. — FUMPA Biofuels, a division of Farmers Union Industries, LLC was honored as AURI's 2006 Ag Innovator of the Year at an awards luncheon June 15 in Redwood Falls.

The forward-thinking soybean processor was "the first to open the doors of a biodiesel plant in Minnesota," says Rose Patzer, scientist at AURI's oils laboratory in Marshall, Minn. The annual Ag Innovator award, now in its fifth year, recognizes a Minnesota company that has demonstrated innovation in its product or process, has achieved market success and provides a positive impact on Minnesota agriculture. Previous award recipients include Pet Care Systems, Mississippi Topsoils, Minnesota Soybean Processors and SoyMor.

FUMPA Biofuels produces Northland Choice Biodiesel from its 3 million gallon-per-year plant that uses soybean oil and rendered animal fats. Its parent company also operates Central Bi-Products, an animal products renderer; Midwest Grease, a waste grease recycler; Northland Choice, producer of pet food ingredients, Pet Care Systems, manufacturer of Swheat Scoop cat litter; and

Redwood Metal Works, a trailer manufacturing company.

FUMPA Biofuels "has been out front in developing new uses and innovative in trying to identify additional revenue streams," says Teresa Spaeth, AURI executive director. "AURI has worked with them on several projects and we're delighted to present this award to them." ■

RIGHT: Don Davis, president of Farmers Union Industries, LLC, and Teresa Spaeth, AURI's Executive Director.





AURI's energy center and corn growers investigate burners made for farms and small commercial operations

BY DAN LEMKE

Marshall, Minn. — As petroleum-based fuel prices soar, consumer interest in ag-based energy is getting hotter.

Along with renewable fuels, the buzz over biomass that can generate heat and electricity is building as well.

“Hardly a day goes by that we don’t get a call from someone looking to manufacture biomass fuels or to buy them,” says Al Doering, a scientist at AURI’s coproducts utilization lab in Waseca.

Consumers are buying corn-burning stoves to offset home heating costs, although they may be on the waiting list for months as manufacturers try to keep pace with demand.

And many large Minnesota ag processing plants have installed technology to generate power from their own coproducts.

But there are still more potential uses for biomass fuels — especially on farms and small-scale commercial operations.

“There are on-farm applications such as grain dryers, heaters for livestock confinement buildings or machine shops that could be fueled with a biomass burner,” says Wayne Hansen of AURI’s Center for Producer-Owned Energy.

“There are also smaller commercial applications in rural areas that could benefit and use resources that are available in their local area. Those fuels may vary depending upon where they’re located.”

AURI, the Center for Producer-Owned Energy and the Minnesota Corn Growers want to improve biomass use by identifying manufacturers that produce biomass burners for small farm and industrial needs. The initiative will identify what designs or features a burner needs for combustion and raw-material handling.

Hansen, who is spearheading the initiative, says he has heard the most interest from greenhouses concerned about their high heating costs. But they’re not alone in their quest for alternatives.

“I’ve gotten a number of inquiries from smaller manufacturing firms looking for direction in building burners,” Hansen says. “So there is interest on both sides — from the

user and the manufacturer.”

In rural areas, ample fuel supplies are not far away. An AURI evaluation of available biomass shows that in 19 southwestern Minnesota counties alone, there are nearly 6.8 million tons of available biomass, primarily from crop waste and residues. In other areas of the state wood waste is the principal fuel.

Fuel handling could be the biggest design difference with a mid-sized burner that handles bales of straw, corn stover, dried distiller’s grains or other large quantities of ag biomass.

Hansen expects the information on larger-scale biomass burners to be available by early fall. ■