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AG INNOVATION NEWS®

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One-step fuel

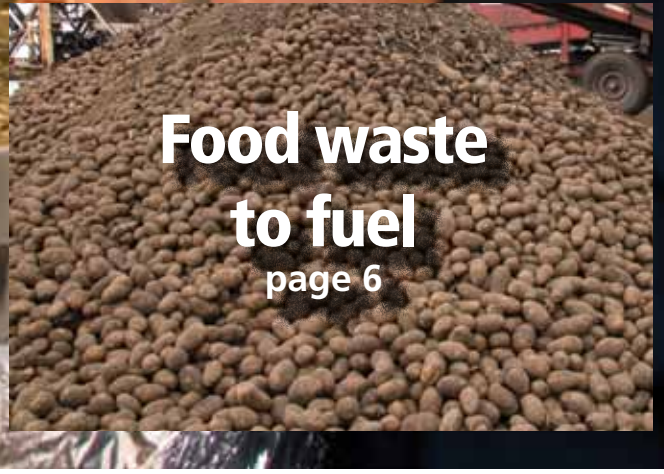
a biodiesel transformation

page 2

IN THIS ISSUE:

Berry young

page 10



Food waste to fuel

page 6

20 years of innovating

AURI begins third decade of service to Minnesota

PHOTOS BY ROLF HAGBERG

Clayton McNeff, vice president of Sar Tec Corporation in Anoka, is pictured in his company's lab where a revolutionary process to quickly convert unrefined oil into biodiesel was first tested.

PHOTOS BY ROLF HAGBERG

Zirconia — a fuel's gem

Minnesota chemists' invention quickly converts unrefined oils to biodiesel

BY CINDY GREEN

Isanti, Minn. — Biodiesel can be made from almost anything that has fats or oils — beans, pine trees, beef tallow, chicken fat, restaurant grease. With current technologies, pure soy oil is most efficiently converted to fuel. But breakthrough technology may make waste grease and even algae "pond scum" the fuels of the future.

Minnesota chemists have invented a way to use metal oxides to quickly and cleanly convert unrefined oils to biodiesel. The "Mcgyan" process will be tested commercially in a biodiesel demonstration plant opening this spring in Isanti. Ever Cat Fuels will produce 3 million gallons of biodiesel annually.

"This process can use feedstocks that the traditional biodiesel process cannot use," says Dave Wendorf, marketing director of McNeff Research Consultants, which holds intellectual property rights to the patent-pending Mcgyan process.

Traditional biodiesel processing requires first removing free fatty acids from oils or fats, adding alkali catalysts to convert triglycerides to fuel, then washing the biodiesel with water to remove the neutralized catalyst. The Mcgyan process doesn't require any of those steps.

College chemist's idea

The revolutionary process started as a college chemistry project in the summer 2006. Augsburg student Brian Krohn investigated biodiesel processes and found research on zirconium-based catalysts.

Krohn consulted his chemistry professor, Arlin Gyberg, who contacted a former student, Clayton McNeff, a zirconia expert and vice president of SarTec Corporation in Anoka. With the help of SarTec chemist Ben Yan, they added zirconia-based catalyst to some soybean oil and alcohol and added some heat to see what would happen.

It didn't work.

"Clayton then suggested, 'If you add more heat to the catalytic material and run the reaction under pressure in a continuous reactor, something might happen.' And voila

— it did. It changed color so they knew they had done something; it turned out they had made biodiesel."

After further development, the chemists titled their invention "Mcgyan," using a combination of their names. Mcgyan is a one-step process that "converts feedstock to biodiesel in seconds versus hours" that the traditional biodiesel batch process takes, Wendorf says.

The team discovered their process could convert anything with triglycerides or free fatty acids into fuel — without refining the fats and oils first. "To make biodiesel, they (current processors) have to remove fatty acids from the oil; otherwise it makes soap," Wendorf says. "With our process, it's just the opposite. We need feedstocks with fatty acids, the higher the better … beef tallow, chicken fat. … It gets us away from the food versus fuel debate. We don't have to worry about using food-grade soy oil; we can use something else."

Oil or tallow and alcohol are fed into one end of a cylinder-shaped reactor. Biodiesel comes out the other end, along with a small amount of methanol that quickly separates from biodiesel in a fractioning still. In the traditional biodiesel batch process, "you put soy oil in a big tank and add a strong-base catalyst that has to be neutralized and washed out of the biodiesel. This is a much simpler process that requires no chemicals, no washing."

Pilot to full-scale plant

A year after building an experimental reactor in SarTec's lab, McNeff decided to build a pilot plant at SarTec that can produce 50,000 gallons of diesel per year. Because the pilot plant produced almost no regulated emissions, the Minnesota Pollution Control Agency said an emissions permit wasn't needed when McNeff planned a larger facility. "Our actual footprint is very small compared to a traditional biodiesel plant, so you can put

it almost anywhere," Wendorf says.

Construction is now being completed on the10,000-square-foot Ever Cat Fuels facility. The plant will initially use extracted corn oil from distiller's dry grains, an ethanol byproduct that contains 2.5 to 5 percent rancid oil, and the defatted grains will be sold for livestock feed. Distiller's grain oil is about half the cost of soy oil.

"In our lab, we've tested probably 20 to 30 different feedstocks," Wendorf says. Tall oil from paper processing looks promising, as does palm-oil waste. But more high-oil commodities are needed to keep up with escalating demands for biodiesel. "If you took all the feedstock available today — soy oil and waste greases — and made biodiesel, you'd still only make a small percentage of our need in the United States."

Minnesota was the first state in the nation to mandate biodiesel blends, and the current two-percent biodiesel mandate will increase to 20 percent by 2015. Not only is biodiesel homegrown and renewable, it emits far less sulfur dioxide, carbon dioxide and smoke particulate than petrodiesel. It can be used like petrodiesel without any engine modifications, and gelling in cold temperatures can be prevented by using the right blends and fuel grade.

AURI has tested biodiesel fuel and low–temperature additives from all Minnesota producers, including Ever Cat Fuels. "Our tests show there shouldn't be any problems with their biodiesel in cold temperatures," says Doug Root, AURI scientist in Marshall.

Nationwide, there are now 175 biodiesel plants and markets are soaring. Annual U.S. biodiesel sales jumped from 2 million gallons in 2000 to 25 million gallons in 2004. Today demand approaches 450 million gallons.

Algae fuel

What high-oil commodity could meet growing biodiesel demands? Algae, known in the wild as pond scum, Wendorf says. Cultivated algae can produce 1,200 to 9,000 gallons of oil per acre, compared to 48 gallons per acre for soy oil. "When we get algae commercialized, that essentially could settle our biodiesel dilemma. We need something like algae that grows very rapidly."

"A decade from now, algae will be a major farming crop," Wendorf says. "All you need are shallow ponds. You don't have to take your prime land or hay fields.

"Algae has been around for millions of years; there are millions of species." While high-oil algae hybrids are being cultivated, "the ones in nature that have survived are what we're going to use. They're the winners."

ALGAE PHOTO BY ERIC GUINTHER. WIKIMEDIA COMMONS.

Modular future

Ever Cat Fuels, owned by the McNeff family, is the first licensed to use the Mcgyan process. If the facility proves successful, "we intend to increase the capacity to 10 million gallons per year, then we'll probably go to 30 million," which is feasible because Ever Cat's three-acre site is on a rail line, Wendorf says.

McNeff Research Consultants is also designing a reactor that can be fit in a truck and transported to a feedstock's location, such as a large slaughtering facility with animal tallow or an industrial plant with waste grease. "The key to this whole thing is the feedstock. If you have an adequate source, you could locate a nice plant there."

Eventually the Mcgyan process will be global, Wendorf says. "India grows jatropha, which is ideal for biodiesel. There are huge palm oil plantations in Indonesia and some South American countries that make an excellent biodiesel.

"Germany is the largest biodiesel consumer and producer in the world — 80 percent of their cars are diesel," he says.

"We see tremendous potential for biodiesel growth."

Visit www.evercatfuels.com for more information. ■

AT RIGHT: Sar Tec chemist Ben Yan pours zirconia-based catalyst into a long-tube reactor that, along with alcohol, will convert oil into biodiesel. Inventors of the one-step Mcgyan process, pictured below from the left are: Arlin Gyberg, Augusburg College professor and his former student Clayton McNeff, Yan and Brian Krohn, the Augsburg student whose chemistry project led to the Mcgyan invention.

Leading the way to cellulosic ethanol

Little Falls corn ethanol plant considering a cellulosic addition

BY DAN LEMKE

Little Falls, Minn. — The nation's first commercial cellulosic ethanol plant could be going up in central Minnesota — if a feasibility study looks favorable.

In May, Central Minnesota Ethanol Cooperative expects to complete an evaluation of building a cellulosic plant by its corn ethanol plant near Little Falls.

The locally-owned CMEC plant produces about 21 million gallons of corn ethanol annually. Kerry Nixon, CMEC general manager, says if the feasibility and financial evaluations look favorable, the cooperative could add a 10-million-gallon facility that converts wood and other biomass to ethanol.

"For us to expand (corn-ethanol production), we would have to compete for corn with other existing plants," Nixon says. "Since we're in the region of lakes and trees, it makes sense for us to look at other options."

"Central Minnesota Ethanol has been innovative since their inception," says Michael Sparby, AURI project director. "Given their location at the northern end of Minnesota's corn range, they have to be creative and innovative if they want to grow."

AURI is supporting technical and economic feasibility studies of the cellulosic facility. CMEC has also received funding from Minnesota's Next Generation Energy Board.

Since 2007, CMEC has been working with Bell Independent Power Company and SunOpta BioProcess, Inc. to jointly build, own and operate the plant that would be one of the first commercially-viable cellulosic plants in the world. Based in Toronto, SBI has more than 30 years of biomass experience and is making ethanol in Spain and finalizing plans for a large facility in China, Nixon says.

The Little Falls facility would use SBI's proprietary process for pretreatment, using heat and steam to partially hydrolyze lignocellulosic fibers so they can be fermented for ethanol. Residual lignin will be gasified to power both the new cellulosic facility and the existing ethanol plant.

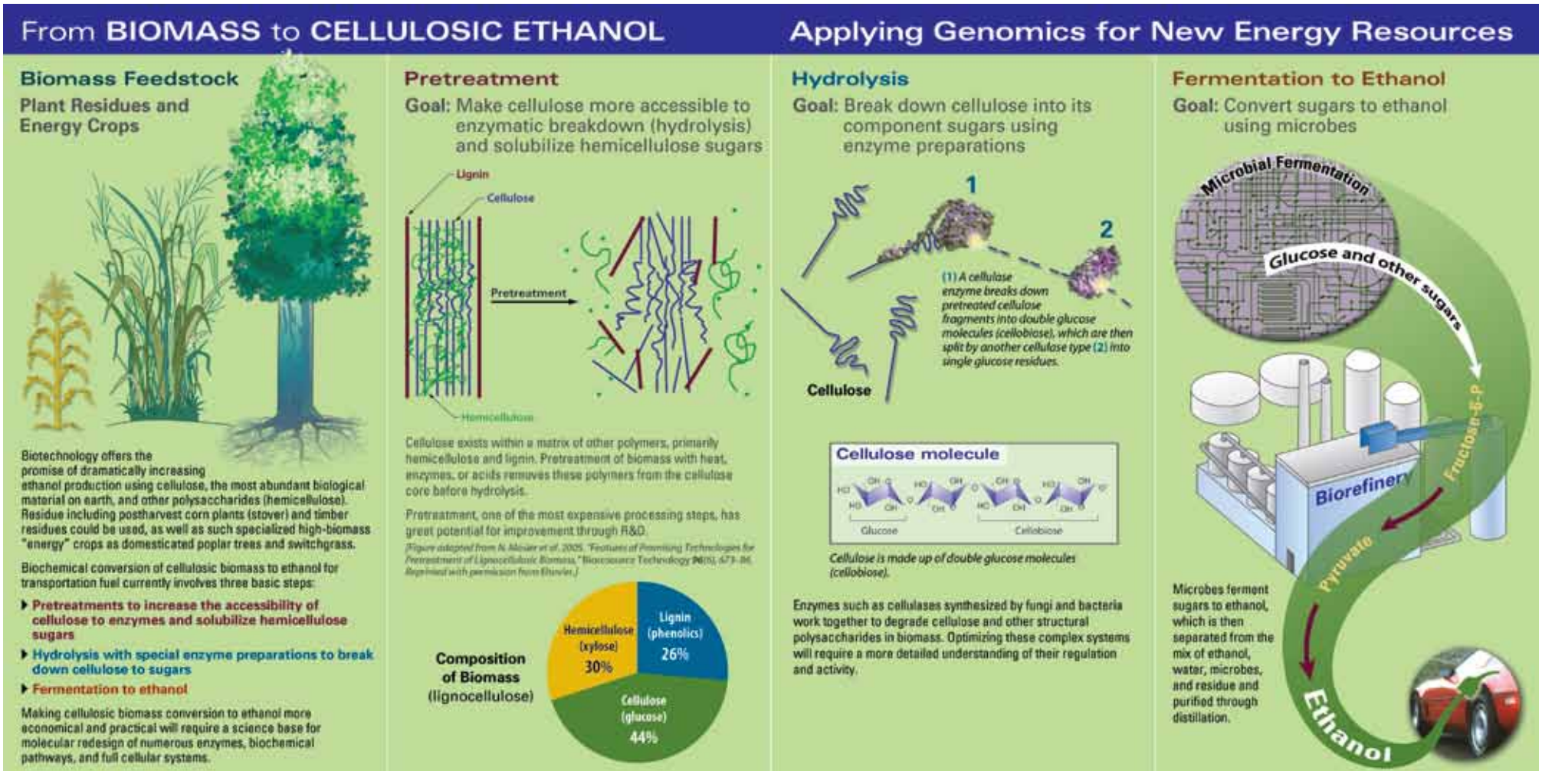
The cellulosic plant will use soft hardwoods such as poplar and aspen trees harvested in a 70-mile radius of Little Falls. Chips from green-cut trees contain about 50 percent moisture, which the SBI process captures and uses, so outside water is not needed for fermentation. Nixon says the process may capture enough moisture to offset some of the corn-ethanol plant's needs as well.

CMEC has been producing corn ethanol since 1999. "There are synergies here because we have the land, the power — plus the maintenance and marketing pieces are already in place," Nixon says.

"After the preprocessing, fermentation is about the same for starch or cellulose, but the cellulosic process resolves a lot of the energy and water issues associated with ethanol."

If CMEC decides to pursue a cellulosic plant, it will take about 16 months to complete. "They're more expensive than starch plants, but the operational costs are cheaper," Nixon says.

Sparby says a cellulosic ethanol plant will "bring Minnesota to the next level of biofuels development." ■



SOURCE: U.S. Department of Energy Genome Programs http://genomics.energy.gov

20 years of innovating

AURI begins third decade of service to Minnesota

BY DAN LEMKE

A troubled rural economy that spurred creation of the Agricultural Utilization Research Institute 20 years ago differs from today's troubles. But AURI's key tool to help rev the economy is still innovation.

The 1980s was a difficult decade for American farmers. In the Midwest, thousands of families lost their homes and farms amid a serious farm crisis.

Low commodity prices, rapidly falling land values, overwhelming debt, an economic recession and a grain embargo prohibiting farm-commodity sales to the former Soviet Union, resulted in thousands of farm foreclosures and a dramatic change in the agricultural landscape.

Technology developed in prior decades led to rapid increases in farm productivity. According to the Minnesota Agricultural Statistics Service, in 1945 one acre of Minnesota farmland could produce about 39 bushels of corn. By 1985, that same acre produced about 115 bushels. The increased production, combined with difficult export markets, yielded crop surpluses and held prices down.

Minnesota leaders recognized something innovative needed to be done to strengthen rural Minnesota's economy and to use the growing grain supplies. Discussions with commodity groups, farm organizations and legislative leaders resulted in 1987 legislation that created the Agricultural Utilization Research Institute. Initially, AURI operated under the umbrella of the Greater Minnesota Corporation, which was designed to conduct applied research and generate business development in natural resources, manufacturing and agriculture.

A steering committee of AURI's advisory board, representing ag-related organizations and businesses, led the program. In June 1989, AURI was incorporated as an independent nonprofit organization.

"There are two times when you have the inertia to seek change; one is when times are good and the other is when you can see the writing on the wall because your back is against it," says Roger Moe, former Minnesota Senate majority leader and author of the Rural Economic Development Act of 1987, which created the GMC. Jerry Schoenfeld of Waseca authored AURI founding legislation in the House.

"If you look back to the late 1970s and early 1980s, we were having difficulty in the mining industry, timber fell apart and agriculture was having problems," Moe says. "The difficulties we saw were natural-resource based."

Founded on new uses

Moe says AURI was created because there had been too much focus on agricultural production and more emphasis was needed on developing ag-based products. AURI was designed to be nimble and flexible with the ability to partner, collaborate and access other resources.

"It was focused on ways to create new products to add value," Moe says.

"We over produced, so many commodities were underpriced," says Gordon Sonstelie, an original AURI board member and former chair who represented the Minnesota Wheat Growers Association. "We had an abundance of ag products and needed to find new ways to use them."

As AURI legislation stated its location must be near a college or university, four communities vied for its site: Crookston, Waseca, Morris and Marshall. After statewide meetings, numerous community presentations and sometime heated debate, AURI's steering committee decided the institute would best serve the state in four locations. Crookston was selected for the headquarters while field offices were opened in Marshall, Morris and Waseca.

"I'll admit that I lobbied to have it here (in Crookston)," Moe says. "But spreading the organization around the state has had value."

Linking research to business

Minnesota has long been home to top-notch agricultural research institutions, including the University of Minnesota. The state's land grant university has developed copious amounts of research on agricultural production. When AURI was formed, however, some ag leaders wanted a stronger link between research and commerce.

Bob Bergland, former United States Secretary of Agriculture, is also a past member of the AURI board and University of Minnesota board of regents. "The University of Minnesota is a world-class research university, but technology transfer was a barrier," Bergland says. "AURI came along to take that research and test it commercially. It was a tremendous idea — still is."

"There was a missing link between the research that was being done and how to put it to use," adds Edgar Olson, who served in the Minnesota House of Representatives when AURI was created and was later named AURI's executive director. "There was a need for someone to help put people in a sound position to go into business using the technologies and ideas that were being generated."

"We were given a statute and told to go do it, but there really wasn't much of a template to follow," says Al Christopherson, AURI board chair and former Minnesota Farm Bureau president. "We did a lot by trial and error."

Changing with the economy

As with most organizations that have been around for 20 years, AURI has gone through growing pains and adaptations. Programs and services have changed to match the state's needs and react to emerging opportunities. AURI's work has been shaped by record fuel prices, record crop prices, a struggling economy, an explosive growth in the renewable energy industry and state and federal policies.

"What has never changed is our commitment to providing the best scientific, technical expertise and targeted network coordination to add value and long-term economic vitality to Minnesota," says Teresa Spaeth, AURI executive director.

"We work very hard to be creative, collaborative, innovative and to look at things that haven't been done before."

Even though times and AURI have changed since 1989, the need for developing innovative uses and market opportunities for Minnesota-grown agricultural commodities has not.

"If there was a reason to create this organization 20 years ago," says Moe, "there is even more of a reason for it now, given the times we have." ■

AURI leaders

Roger Moe

Gordon Sonstelie

Bob Bergland

Edgar Olson

Teresa Spaeth

WASTE makeover

Perham looks at digesting food-processing waste for fuel

BY LIZ MORRISON

Perham, Minn. — Food processors in this central Minnesota town don't want to eliminate their waste. They want to digest it.

Perham hopes to pool food-processing waste and send it to an anaerobic methane digester where it would be converted to renewable biofuel. AURI and Minnesota corn and soybean grower groups are helping evaluate the idea's technical and economic feasibility.

PHOTOS BY ROLF HAGBERG

Digesting organic waste could relieve Perham's overburdened municipal wastewater treatment system, says Chuck Johnson, Perham economic development director. A community digester could also cut industries' waste disposal costs and provide a new revenue source.

Anaerobic digestion is a microbial process that produces methane and carbon dioxide, or "biogas," from organic materials. A natural-gas substitute, biogas can be burned in a furnace or purified to power a generator.

Anaerobic digestion has long been used in food processing and waste treatment plants, says Jill Mickelson, an engineer with St. Paul-based Short, Elliot, Hendrickson, which is doing the Perham feasibility study. But those digestion systems are designed mainly for wastewater cleanup rather than fuel production, she says.

Now there is growing interest in the renewable-energy potential of anaerobic digestion, she says. Dairy farms, for example, have started digesting manure to generate electricity. Ethanol plants are looking at digesting distillery byproducts to power their dryers. Even sewage is getting a makeover. "Instead of thinking of it as waste," Mickelson says, "think of it as fuel."

Food processing town

Methane generation could be a very nice fit for Perham, says Michael Sparby, AURI project director.

The community of 2,800 boasts half a dozen food manufacturers including snack-maker Barrel O' Fun, Kenny's Candies, Nelson Confections and Tuffy's Pet Foods. Primera Foods operates an egg products plant. Potato producer R. D. Offutt has a large warehouse at Perham, and Bongards Creameries, a 413-member dairy cooperative, processes 700 million pounds of milk at its Perham cheese and whey plant.

These industries generate lots of organic waste, which is expensive to dispose of and puts a heavy load on Perham's sewage treatment system, now operating at nearly 100-percent capacity. As a result, some companies have built their own wastewater treatment systems or trucked food scraps to farms for livestock feed or fertilizer.

Chuck Johnson, Perham economic developer, says digesting waste from food processors could generate methane power and ease wastewater treatment burdens.

Barrel O' Fun is one of Perham's leading "homegrown" companies. The manufacturer makes salty snacks, including potato chips, corn and tortilla chips and gourmet popcorn. The plant generates about 36,000 gallons per day of corn and potato waste. The material is pre-treated to remove the water, which goes into the city sewer system. The remaining solids are sold as cattle feed. "We've looked at how to better use our waste stream," says CFO Wayne Caughey. Methane digestion "is something that merits further study."

Anaerobic digestion could have several advantages for the rapidly growing company, which added 100 workers last year and now employs 550, Caughey says. "It would be a local use. And we might be able to use the methane as a replacement for natural gas." Perham would benefit, too, he adds. "Anything we can do to reduce the amount of water going into the municipal system would be an advantage."

Perham-area dairy and poultry farms are also interested in supplying manure and other organic waste to a community digester, Johnson says. "We're excited about this," says Doug Huebsch, owner of NewLife Farms and an Otter Tail County commissioner. NewLife produces 8 million hatching eggs a year for the Jennie-O Turkey Store.

The farm sends most of its turkey manure to

Fibrominn, a 55-megawatt biomass electricity plant in Benson. NewLife Farms also generates a ton a day of egg parts and dead turkeys. Many poultry producers send their mortalities to a rendering plant, Huebsch says, "but we don't have a plant nearby."

Instead, he composts the waste and spreads it on cropland, but "it's a really labor-intensive job," he says. He estimates that his turkey mortalities could be worth up to $200 a day as methane, "and it would be a better way to deal with our waste."

Bench-scale tests last year looked at how much biogas might be generated from Perham's organic waste. Rough estimates suggest that a community digester could produce 360,000 cubic feet of methane per day, worth more than a half-million dollars annually, Sparby says.

More biogas markets

In addition to abundant supplies of organic waste, Perham has several potential markets for biogas, Johnson says. The gas could be burned in the city's garbage incinerator, which sells steam to Bongards and Tuffy's Pet Foods. Methane would replace natural gas, which supplies about 30 percent of the incinerator's British thermal units, Johnson says.

Another potential outlet is Perham's municipal-gas utility. "We could clean up the biogas and inject it into the natural-gas pipeline," Johnson says. Methane could also generate renewable, baseload electricity for sale to the power grid. Or the biogas could go back to local food-processing plants to cut their natural gas consumption

The solids remaining after anaerobic digestion "make a nice fertilizer," Mickelson says. The nutrients "are passed through basically intact," while the high heat of digestion destroys most pathogens and odors.

A technical challenge

Phase two of the feasibility study, now underway, will look at nuts-and-bolts questions, such as digester design and permitting, location, feedstock handling and storage, biogas markets, capital costs and economics. Preliminary estimates put the cost of a community digester at $2 to $4 million, Sparby says.

One big technical challenge, Mickelson says, is digesting a mixed waste stream of such diverse materials as liquid manure, corn-chip crumbs and turkey, chicken and beef parts. Still, she adds, methane-digestion engineering has advanced rapidly in the last five years, especially in Europe.

"There's lots of enthusiasm for the project," Johnson says. Although a similar effort fizzled in Perham several years ago, Sparby says this time, "there's an unusual willingness to come together and collaborate."

Says Huebsch, "We're looking to be part of the renewable-energy revolution." ■

Perham industries, including Tuffy's Pet Foods pictured at far left, may someday send their organic wastes to a community digester for conversion to fuel. Potential digester feedstocks pictured include waste potatoes and discarded chips from Barrel O'Fun Snack Foods and culled eggs from the NewLife Farms egg-hatching company. Above: NewLife business partners Gary Mickelson (left) and Doug Huebsch. Right: Mike Borman (left), Barrel O'Fun production manager and Chuck Johnson, Perham economic development director.

Perham area food production at a glance

Perham has an entrepreneurial culture, with many homegrown and locally-owned industries, says Chuck Johnson, city economic development director. Among the city's businesses are several large food producers, which could contribute an estimated 566,000 gallons per day of organic wastes to a community anaerobic methane digester:

Primera Foods
- Products: egg products
- Digester feedstock: liquid processing waste

Renaissance Dairy
- Product: milk
- Digester feedstock: manure

R. D. Offutt Company
- Products: potato storage and processing
- Digester feedstock: potato slurry

New Life Farms
- Products: hatching eggs
- Digester feedstocks: turkey and egg parts

Barrel O' Fun Snack Foods
- Products: chips, popcorn and other snack foods
- Digester feedstocks: corn and potato solids

Tuffy's Pet Foods
- Product: pet food
- Digester feedstocks: beef and chicken solids

Bongards Creameries
- Products: cheese and whey powder
- Digester feedstock: liquid processing waste

Source: EnviTreat Stage 1 Test Report for Bench-Scale Testing of the Conversion of Industrial Wastes to Methane, June 4, 2008.

Minnesota's Renewable Energy Roundtable

Roundtable shapes state's energy future

BY DAN LEMKE

For almost three years, hundreds of Minnesotans have come together to advance our renewable energy future.

The Minnesota Renewable Energy Roundtable has involved more than 500 individuals from 150 organizations, including private industry, utilities, higher education, state government, nonprofits and farm groups. They have a common purpose — to make Minnesota the national leader in renewable-energy knowledge and use.

"The Roundtable brings diverse folks together on a regular basis," says Ron Johnson, trade development director for the Duluth Seaway Port Authority. "We don't need to reinvent the wheel, we need to take the wheel and put it on a new wagon. The RER makes sure we are working to build the best new wagon."

Bob McLean, chief operating officer of Hunt Utilities Group in Pine River is a regular Roundtable participant who focuses on public policy and awareness. "I've been impressed with the level of participation from a broad spectrum of individuals. The people who are coming are very engaged in the issues."

That engagement goes beyond networking and attending quarterly meetings. Between sessions, participants get together for discussions and activities.

"We use the quarterly meetings to report on the things we've been doing since the last time we got together," says Carol Anderson, Morrison County economic developer and regular Roundtable participant.

The Roundtable's first gathering in the fall 2006 identified five priority areas: basic and applied research, public policy and awareness, infrastructure, economics and financing and talent development. Action teams were launched in each area.

The talent development team, for example, has worked toward developing K-12 curriculum, a biofuels-workforce needs assessment and post-secondary core curricula with certificate programs in solar, ethanol, biodiesel and wind energy that should be complete in 2010.

Other teams are creating a directory of renewable-energy finance tools and resources, a renewable-energy web portal and numerous policy change recommendations, resulting from member input. One Web site under development will link potential projects to economic developers who will in turn connect with possible funding sources for the project.

"Legislators and other leaders have taken suggestions to heart and have gotten things done," McLean says. "These sessions have been as productive as any forum I've seen."

"The work of the Roundtable doesn't stop once the sessions are done," says Teresa Spaeth, executive director of AURI, which facilitates Roundtable activities. "Many of the participants continue to communicate, collaborate and develop actions long after the meetings are done. We stress nearly every time we're together that this is not a spectator sport."

"With the economy in dire straits," Johnson says, "we need to keep ourselves, our leaders and the public focused on long-term goals." ■

Minnesota's Renewable Energy Roundtable
Action Initiative

Biofuels: bridge or dead end?

One of the nation's top business thinkers advocates interdependent approach

Editor's note: Peter Senge, Ph.D., Massachusetts Institute of Technology senior lecturer, spoke to more than 200 participants in the Renewable Energy Roundtable February 9 in St. Paul. The author and renowned business thinker told the audience that today's confluence of world economic, environmental and social conditions is unique in our history. Our increasing interdependence requires working collaboratively on a sustainable future that includes biofuels. Following are excerpts from his blog, reflecting on Minnesota's biofuels development and controversy.

BY PETER SENGE
EXCERPTS FROM FEBRUARY 11, 2009 BLOG

I spoke to the Minnesota Renewable Energy Roundtable Monday, which turned out to provide a fascinating glimpse into the dynamic and controversial world of emerging energy options in America. In the audience were business leaders as well as several members of the State Senate, including the Speaker, as well as his predecessor. Many are right in the middle of the increasingly heated debate about ethanol in our energy future.

More cars in Minnesota run on E85 blends including ethanol than in the rest of the country combined. This has created jobs and a resurgent agriculture industry. It has also enabled farmers to step forward as contributing to energy security for a country caught in the dilemmas of dependence on oil imports on the one hand and fighting oil-financed terrorists on the other.

But recently, the agriculture ethanol producers have come under a lot of heat from academic studies that say that corn-based ethanol is worse than gasoline from a CO2 viewpoint. This public debate has been fueled, not surprisingly, by media seemingly more interested in selling newspapers and airtime than helping in the transition to a long-term sustainable energy system.

At a small lunch after my talk, the head of the one of the largest growers' associations asked, "With all the heat we are taking today, is it possible to say that biofuels are a part of a sustainable energy picture?"

I responded that the answer was definitely, "Yes," from my perspective. But I told him that food-crop-based fuels must be seen as a bridge to a longer-term vision of biofuels that significantly reduce the total carbon footprint of our energy system, and that "They needed to be part of building that bridge, rather than just defending what they are doing today."

…

I left Minnesota thinking that what we need first of all is a different political climate, one that supports learning and minimizes finger pointing. Creating healthy rural economies is a priority around the world. If this can include new sources of energy that create entrepreneurial opportunity and jobs while restoring topsoil and healthy water use this can be a win for all. Energy security will surely be an increasingly central issue as well. But most of all, in my judgment, dramatically accelerating the transition away from fossil fuels and dramatically reducing the carbon footprint of our economies is urgent.

We need to stop throwing rocks at farmers converting corn to biofuels and start all working together to agree on where we want to be in 20 years. In other words, can we agree on what a truly environmentally sound energy system would look like? This is a crucial strategic task — teaching this agreement — that governments, NGOs and businesses alike must assume responsibility. Then, we could reasonably expect every player in what will be an increasingly diverse and complex field of energy producers, distributors and customers to be able to answer the simple question, "What part of the bridge are you building?" ■

Peter Senge, named one of the country's 20 most influential business thinkers by the Wall Street Journal in 2008, spoke to more than 200 participants in the Renewable Energy Roundtable in February. His latest book is "The Necessary Revolution: How Individuals and Organizations Are Working Together to Create a Sustainable World."

"We need to stop throwing rocks at farmers converting corn to biofuels and start all working together to agree on where we want to be in 20 years."

— Peter Senge

Read Peter Senge's blog at: http://blogs.solonline.org/users/psenge/

New faces at AURI's Waseca office

BY DAN LEMKE

Mary Steidler

Ag Innovation News has a new byline and Waseca's AURI office has a new voice. In November, Mary Steidler joined AURI as project and communications assistant.

Steidler, who grew up in New Richland, Minn., lives in rural Owatonna. She holds a bachelors degree in English from St. Mary's University in Winona, a master's in English from Kansas State University and a master's in philosophy from Vanderbilt University.

"I became interested in working for AURI because I understood that a lot of innovative people worked here," Steidler says. "AURI seemed like a great place to continue my education, so to speak, while using my writing, marketing and communications skills. I'm excited to be here."

Steidler taught literature and composition at Kansas State University and the University of Kansas and was a Pearson Education marketing representative.

In addition to handling administrative tasks, Steidler maintains the AURI Web site, publishes newsletters and writes for Ag Innovation News.

Kevin Hennessy

Kevin Hennessy has joined the AURI Waseca coproduct utilization program as associate scientist.

For the past three years, Hennessy has studied for a master's in biomass and renewable energy at the University of Minnesota department of biosystems and agricultural engineering. The previous 16 years he taught junior high math and science for Minneapolis Public Schools.

"I spent a summer working at 3M in research and found I really enjoyed it, reaching the point where I decided that a career change was in order," Hennessy says. "I am very pleased to be here working for AURI."

At AURI, Hennessy researches new uses for agricultural biomass and coproducts.

Ag leaders join AURI board

Two Minnesota agricultural leaders have joined the AURI board of directors.

Art Brandli

Art Brandli of Warroad represents the Minnesota Wheat Research and Promotion Council. He served on the Council's board for 15 years and has been involved with agricultural and business organizations throughout his career.

With his wife Nancy, Brandli raises wheat, sunflower and canola on their farm near the Canadian border. He was past president of the National Wheat Foods Council and the Northwest Minnesota Foundation.

Ron Obermoeller

Ron Obermoeller, who farms 800 acres of corn and soybeans near Brewster, Minn., represents the Minnesota Soybean Research and Promotion Council. He has served on the National Corn Growers board, Minnesota Biodiesel Task Force and other agricultural committees. Obermoeller was instrumental in establishing the Minnesota Soybean Processors crushing plant and biodiesel refinery in Brewster.

"Both of these individuals bring tremendous experience and passion for Minnesota agriculture to the AURI board of directors," says Teresa Spaeth, AURI executive director. "We are thrilled to have their expertise and insight working on AURI's behalf."

Pulp frequency

Scientists test energy-saving microwaves to dry beet pulp for livestock feed

BY MARY STEIDLER

Microwaves could sweeten the value of Minnesota sugar beet pulp.

An industrial microwave dryer in Iowa is being tested by AURI scientists as a potential low-energy alternative to natural-gas dryers.

Beet pulp, the vegetable matter remaining after sugar is extracted from sliced beets, is typically dried then sold as a nutritious, high-fiber livestock feed. However, because of beet pulp's high-moisture content, it is difficult to transport or store unless it is dried first.

AURI scientists Alan Doering and Kevin Hennessy recently tested a microwave dryer at Biomass Energy Conversion in Nevada, Iowa. They fed wet-pressed beet pulp from the Southern Minnesota Beet Sugar Cooperative in Renville, Minn., into a microwave system and recorded variations in pulp throughout the drying process.

Microwave drying technology could save a significant amount of energy. Traditional dryers, powered with natural gas, typically require 1,400 to 2,200 British thermal units to evaporate a pound of moisture. Microwave drying may be able to evaporate as much using only 1,000 Btus or less. Also, microwave drying could retain more of the pulp's fiber and protein available for higher-quality livestock feed.

"Microwave drying technology is also very safe," says Doering, head of AURI's coproducts lab in Waseca, Minn. The 100 kilowatt system — "about 100 times more (powerful) than the average kitchen microwave," is designed not to leak, Doering says. "The microwave uses an industrial frequency of 915 megahertz," about the same frequency as older cell phones.

In the next project phase, AURI will evaluate equipment costs and the dried pulp's nutrient content. Results will be available this summer. ■

Part of the solution

BY TERESA SPAETH

It's not hard to spot problems these days. Many sectors of the U.S. economy are struggling, millions of Americans have lost their jobs, money is tight for many families, and it appears that difficult times will be with us awhile longer.

Problems are easy to see; solutions are harder to find.

For 20 years now, AURI has identified solutions. By helping Minnesota businesses find value-added opportunities for ag products, AURI has bolstered the state's agricultural industry. Innovations have led to new jobs and economic activity that help smooth out economic peaks and valleys. That's especially important when times are tough.

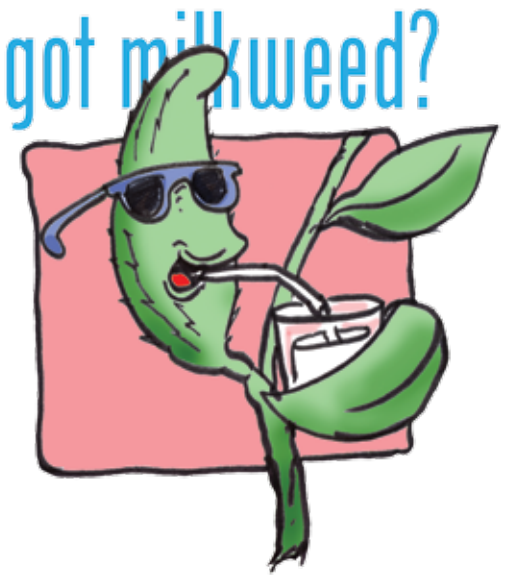
AURI has also brought people together who have a common goal. The Renewable Energy Roundtable is a collaborative effort to build Minnesota's renewable energy industry into something sustainable and beneficial for all. This effort reaches across disciplines, across industry and across the state to tap into the resources and brainpower necessary to make Minnesota a renewable energy leader.

AURI was created to catalyze real innovation in Minnesota and develop solutions. While harder to spot than problems, solutions are infinitely more rewarding.

Elsewhere in ag innovations

BY MARY STEIDLER
CARTOONS © UNCLE HYGGLY

Editor's note: As a service to our readers, we provide news about the work of others in ag utilization. Often, research done elsewhere complements AURI's work. Please note that ARS is the USDA's research division.



Milkweed suncreen

Unsaturated oil from milkweed seed could be a base for sunscreen, skincare products and paints, a study suggests. USDA-ARS scientists used zinc oxide to convert triglycerides in milkweed oil to compounds that absorb UV light, without using chemicals that are in traditional sunscreens. The clear milkweed-oil liquid could be used in gels, creams, sticks and aerosol-spray sunscreens. Skincare products, epoxies and paints could also use the UV-absorbent material.

From: USDA–ARS
February 5, 2009

Flax seed benefits

Researchers at South Dakota State University's Pharmaceutical Sciences Department studied flaxseed's effects on pre-cancerous lab mice. Flax oil and meal contain high concentrations of essential Omega-3 fatty acids that play a critical role in brain function and development. The meal also contains lignan, a chemical reported to prevent cancer. Research showed that both flax oil and meal helped prevent colon cancer.

From: The Bismarck Tribune
May 18, 2008

Weed feed

Russian thistle, pigeon grass and kochia weeds could be added to cattle feed if they are harvested and used properly. Greg Lardy at the North Dakota State University Extension Service says Russian thistle should be harvested early in the year and blended with straw, corn silage or prairie hay. Kochia can also be harvested for silage when it's 20 to 26 inches tall and before it has produced seed. Because these weeds accumulate nitrates, Lardy urges producers to have the weeds tested before using them in feed. Details are available at www.ag.ndsu.edu.

From: North Dakota State University Extension Service
May 2008

Southern wine

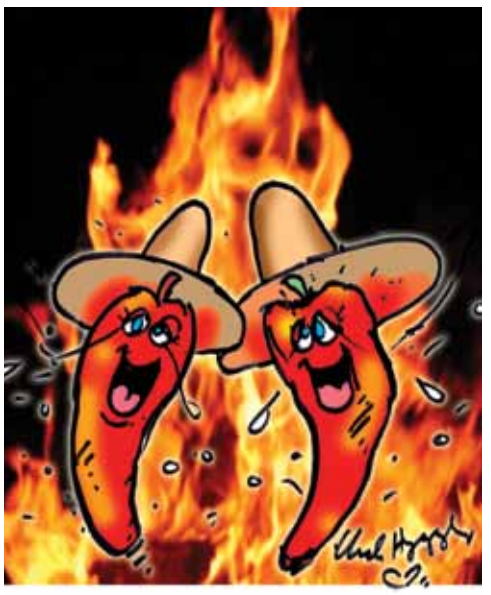
Some southern U.S. farmers have transformed former tobacco acreage into vineyards. While tobacco demand has declined, regional wine sales have increased nationwide. Most southern wineries sell directly to customers, taking advantage of a diverse topography and wide variety of grapes that can grow south of the Mason-Dixon Line.

From: Associated Press
December 22, 2008

Berry young

Grape and berry compounds reversed signs of aging in an ARS study on laboratory rats. Of seven compounds tested, pterostilbene proved the most effective in reversing cognitive decline and improving working memory in mature rats. Other berry compounds show similar potential and are being tested in animal and cell models. Scientists from the USDA Human Nutrition Research Center of Aging at Tufts University and ARS collaborated on the study.

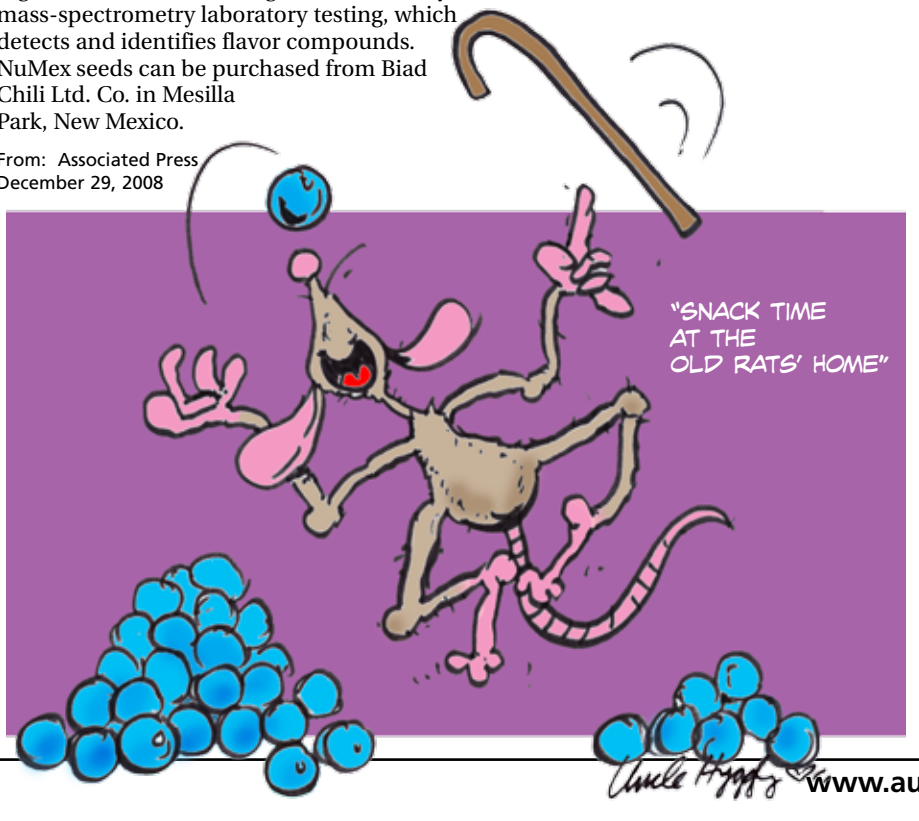
From: ARS
December 11, 2008



Hot stuff

Scientists at New Mexico State University's Chile Pepper Institute have rehabilitated two chile pepper varieties that, after years of cross-pollination, had lost their strong taste. Old flavors were rekindled in NuMex Heritage Big Jim and NuMex Heritage 6-4 varieties by mass-spectrometry laboratory testing, which detects and identifies flavor compounds. NuMex seeds can be purchased from Biad Chili Ltd. Co. in Mesilla Park, New Mexico.

From: Associated Press
December 29, 2008

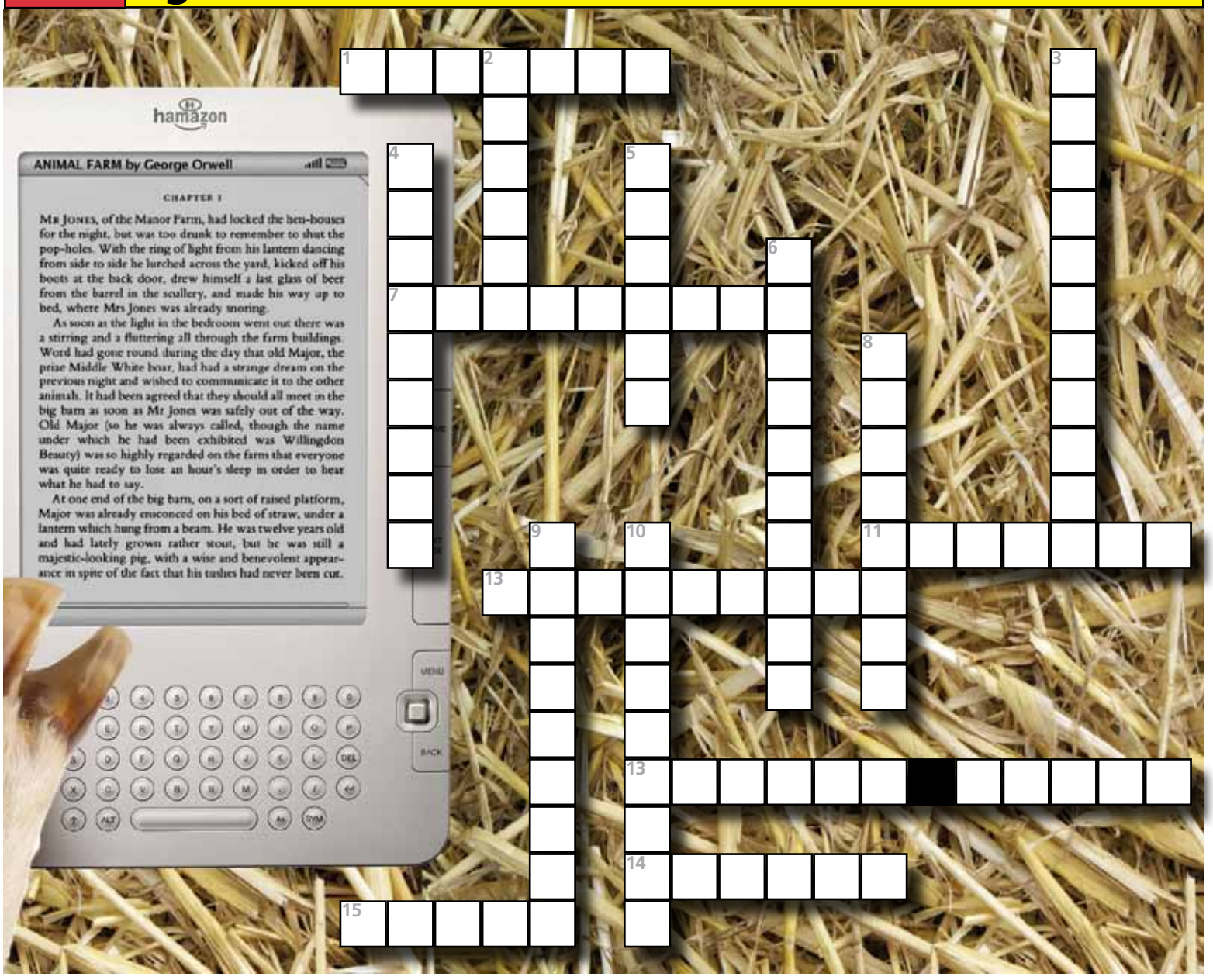


Soy tires

Although soy flour is most commonly used in cooking and baking, ARS scientists are testing soy flour as filler for tires and other natural-rubber products. Defatted soy flour is dispersed in water, added to rubber latex and freeze-dried. The material is then tested against filler-free rubber and composites that contain the "carbon black" filler of modern-day tires. Researchers will continue their soy-flour tire tests in conjunction with rubber manufacturers.

From: ARS
December 24, 2008

AURI Ag Innovation Puzzler



ACROSS

1 This country is said to be the largest biodiesel producer and user

7 What is being evaluated to combat excess sulfur in DDGS for cattle

11 Type of waste that could be digested to produce biogas

12 How Perham processors want to deal with waste

13 Community where a cellulosic ethanol plant may be built (two words)

14 This can cause trouble for feedlot cattle

15 This pond scum could be a viable source for biodiesel

DOWN

2 Unique new biodiesel process

3 What AURI was created to spur

4 Type of digester being assessed in Perham

5 Number of years AURI has been operating in Minnesota

6 What Peter Senge's latest book title says is necessary for a sustainable future

8 Better used for biodiesel than engagement rings

9 Technology being evaluated to dry biomass

10 Considered by some to be the source for the next generation of ethanol production

(UPSIDE DOWN FOR ANSWERS)

ACROSS
1 GERMANY; 7 MANGANESE; 11 ORGANIC; 12 DIGESTION; 13 LITTLE FALLS; 14 SULFUR; 15 ALGAE

DOWN
2 MCGYAN; 3 INNOVATION; 4 COMMUNITY; 5 TWENTY; 6 REVOLUTION; 8 ZIRCONIA; 9 MICROWAVE; 10 CELLULOSE

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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

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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
- Technology transfer and applied research
- Business needs evaluation
- 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

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A toxic burp

Manganese oxide added to distiller's dry grains may mitigate sulfur's effect on cattle

BY MARY STEIDLER

Belching cows may be getting some relief.

Sulfur in a popular cattle feed — the ethanol byproduct, distiller's dry grains — causes gas in cattle. If they eat too much, it could lead to brain damage and even death. But adding manganese oxide to the feed might neutralize sulfur's harmful effects.

Although corn naturally contains sulfur, the ethanol production process adds and concentrates sulfur, which remains in distiller's dry grains and solubles or DDGS. When cattle consume DDGS, sulfur reacts with hydrogen, creating hydrogen sulfide, a gas that cattle expel by belching. Prolonged inhalation of this gas can be toxic.

DDGS are used in cattle feed because they are high in protein and nutrients and cost less than whole corn. Because dairy cows are fed DDGS with hay and silage, the roughage helps process the feed and the sulfur is less toxic. But feedlot cattle require higher rations of grain-based feed.

AURI and the Minnesota Corn Growers are sponsoring research into manganese oxide's potential to mitigate sulfur's effects. Manganese is a hard element, typically used in fertilizer and alloys. Manganese may naturally oxidize hydrogen sulfide into sulfate, which cattle can easily pass without negative impact.

In the project's first phase, University of Minnesota animal scientists studied whether manganese oxide could impact hydrogen sulfide's release from distiller's grains during digestion.

Laboratory results have been encouraging, and in the project's second phase, researchers are determining the appropriate concentration of manganese oxide in cattle diets with 50 percent distiller's grains.

If manganese oxide can negate hydrogen sulfide's harmful effects, that would greatly benefit distiller's grains suppliers since "the value of DDGS can approximate that of corn more closely when sulfur is not an issue," says Jen Wagner-Lahr, AURI project director.

In 2006, about 85 percent of 13 million tons of DDGS produced in the United States went into beef and dairy cattle feed. "Given current corn prices, cattle feeders would like to use even more DDGS if possible, but the sulfur issue is a limiting factor," Wagner-Lahr says.

Results of the manganese oxide DDGS study will be available this summer at www.auri.org. ■