



# AG INNOVATION NEWS<sup>®</sup>

*The newspaper of the Agricultural Utilization Research Institute*

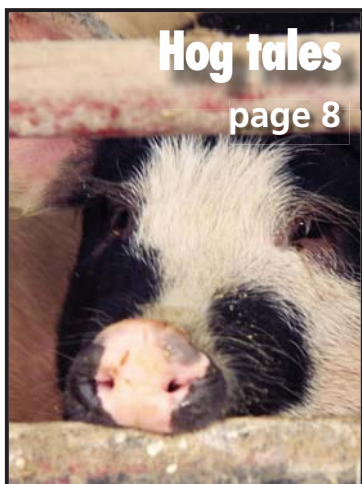
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# AURI – a good buy

BY EDGAR OLSON

There is nothing quite like the satisfaction of finding a bargain — especially saving on a big ticket item getting way more than you paid for.

AURI is a bargain for Minnesota.

In our past fiscal year, AURI provided more than 15,000 hours of technical service to 245 different value-added projects. Based on a survey of those clients, nearly 200 new jobs were created and over \$16 million was invested in equipment, infrastructure and other items.

Thousands of producers were directly impacted by AURI's work. And we didn't even figure in the jobs, investments and producers indirectly affected by this value-added activity.

Our survey asked clients about the impact of AURI's assistance: 55 percent said they saved money, 40 percent realized increased revenue, and 60 percent avoided costly mistakes because of AURI guidance. We, like our clients, believe this service is valuable to Minnesota.

Nearly 90 percent of respondents reported AURI lab and pilot plant facilities were valuable to their projects. AURI significantly addressed business concerns for 85 percent, and improved a product or process for 70 percent.

And 60 percent say AURI services are more valuable now than when they first began working with us. More than 80 percent say AURI is needed by rural Minnesota businesses and processors.

This client feedback tells us that the vast majority of our clients have received something of value from AURI that increased their chance at success. And it's more likely their projects will positively impact producers.

AURI services are a bargain that offer Minnesota businesses a competitive advantage.



*A recent survey of AURI clients showed 55 percent saved money, 60 percent avoided costly mistakes and 40 percent increased revenue because of AURI assistance.*



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

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## AURI Ag Innovation Quiz

After perusing all the information about value-added uses for Minnesota crops, test your recall with the following quiz. Good luck!

Hint: If you get stumped, the answers are at the bottom of this quiz.

1. What is 70 percent of the soybean oil refined in Minnesota used for?

- Food
- Biodiesel
- Ink



2. Where does the name Six Point Berkshire come from?

- When carried across the goal line, the pig scores 6 points
- The white tips of a hog's feet, nose and tail
- The Berkshire constellation



3. What disease afflicts people who can't tolerate wheat gluten?

- Silica
- Cilia
- Celiac



4. How much of the U.S. sugar beet production is in Minnesota?

- One-third
- 10 percent
- 50 percent



5. How many resealable milk cartons does McDonald's sell per week?

- 500,000
- 2 million
- 4.2 million



6. How much corn stover is produced in the United States each year?

- 10 million dry tons
- 220 million dry tons
- 1 billion dry tons

7. According to the USDA Dietary Guidelines, how many beans should Americans consume each week?

- Two tablespoons
- One cup
- Three cups



8. What does the Japanese word "kurobuta" mean?

- When's dinner?
- Supreme black hog
- Tastes like chicken
- Dude, where's my car
- I am serious, and don't call me Shirley

### ANSWERS:

ANSWERS: 1) a 2) b 3) c 4) a 5) c 6) b 7) c 8) b

### ABOUT AG INNOVATION NEWS



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Design by [pounce.com](http://pounce.com)

Published by the Agricultural Utilization Research Institute to inform the food, agriculture and business communities and the general public about developments in ag-based products.

For information on AURI, call 1-800-279-5010 or visit our Web site: [www.auri.org](http://www.auri.org)

Out-of-state subscriptions are \$10 per year; Minnesota subscriptions are free. To save AURI mailing and printing costs, order an electronic version at [www.auri.org/news/subscribe.htm](http://www.auri.org/news/subscribe.htm)

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## Special section:

# A vision for Minnesota commodities

A vision for  
Minnesota commodities

## dry edible beans



## The bean fitness plan

*Dry bean growers tout health benefits and search for nonfood uses*

BY E.M. MORRISON

Americans should eat up to three cups of beans a week.

That's according to the 2005 USDA Dietary Guidelines for Americans, which recommends that adults triple the amount of beans they now consume. And a new FDA-approved dietary guidance message says that "diets including beans may reduce your risk of heart disease and certain cancers."

Bean growers hope to make the most of this good news about one of nature's healthiest foods. "It provides a unique opportunity to really get the message out about dry beans," says Tim Courneya, executive director of Northarvest Bean Growers Association, which represents 3,000 farmers in Minnesota and North Dakota. "Nutrition speaks nationwide."

Northarvest is leading a national effort to craft a marketing campaign that promotes the health benefits of eating beans. "We want a unified message" that will allow the entire bean industry to speak with one voice, Courneya says.

### Beans for better health

Navy, kidney, pinto, black and other dry beans are high in protein, contain no saturated fat or cholesterol, and pack more fiber than many whole grain foods, according to the American Dry Bean Board. They also provide important nutrients, such as calcium, iron, potassium, selenium, magnesium and folic acid. "In many parts of the world, beans are an important dietary staple," says Stacey Zawel, executive director of the Beans for Health Alliance, which promotes beans worldwide, "but Americans are not eating enough."

### More beans on the table

By spreading the word about beans' contribution to good health, growers aim to lift consumption, Courneya says. After peaking in the 1940s at 11 pounds per person, annual U.S. bean use fell steadily until the mid-1970s, bottoming out at about four pounds per person. In the late 1970s, consumption began to rise, but has now plateaued at just under eight pounds per person.

American farmers grow nearly a dozen types

of dry beans. About 80 percent of the crop is sold for domestic use. Minnesota, one of the top five dry bean states, produces about 115 million pounds of dry beans a year, worth more than \$40 million in farm cash receipts.

Virtually the entire bean crop is processed into food products, such as canned and dry-packaged beans and soups, chili, baked beans and Mexican dishes.

AURI's food scientist, Charan Wadhawan, has helped many Minnesota entrepreneurs develop and test new bean products, such as bean dips, burritos, chili, tamales and specialty bean flours.

### Exploring new uses

Taking a cue from the corn and soybean industries, growers are looking for nonfood bean uses, as well. "The corn and soybean people have really paved the way," Courneya says, "by creating a model of what can be done as far as industrial uses for crops."

In January, Northarvest Bean Growers commissioned North Dakota State University to review scientific literature on the composition and alternative uses of dry beans. Growers expect this review to spark research on industrial applications for dry bean extracts at the USDA National Center for Agriculture Utilization Research in Peoria, Ill. Potential new-use opportunities could include:

- Insect and fungi control
- Black plastic
- Starch-digestion inhibitors
- Oxidation inhibitors
- Pharmaceuticals

AURI is also working on nonfood uses, including burning damaged beans for energy.

Dry beans are a small agricultural sector, accounting for just 1.5 million acres nationally, compared to more than 73 million acres each for corn and soybeans. That makes it hard for dry bean growers to compete for value-added research money, Courneya says. Still, he adds, "We've started the search. And we may find a component in beans that could be used in a new way." ■



PHOTO BY ROLF HAGBERG

A vision for  
Minnesota  
commodities

# sugar beets



# Keeping Minnesota Sweet

## Maintaining domestic sugar markets a top priority

BY E. M. MORRISON

You've heard of "Minnesota Nice?" Well, there is also "Minnesota Sweet."

Minnesota is the nation's leading producer of sugar beets — a sturdy root crop that pumps plenty of sweetness into Minnesota's economy. Sugar beets generate almost \$2 billion in economic activity for Minnesota, and account for some 20,000 jobs and more than \$40 million in state tax revenue, according to a 2004 study by North Dakota State University.

Minnesota farmers — who last year planted nearly 500,000 acres of sugar beets — are working to keep the local beet industry sweet. Growers are supporting research to boost sugar beet yields and improve sugar refining. They are also backing trade agreements that cap sugar imports. And they are planning a new public relations campaign that explains sugar's place in a healthy diet.

"If there is one message we want to get out to people, it's to understand the role sugar plays in the economy of the Upper Midwest," says Nick Sinner, executive director of the Red River Valley Sugar Beet Growers Association, which represents 2,500 beet growers in Minnesota and eastern North Dakota. Minnesota last year produced one-third of the country's sugar beets: just under 10 million tons, worth more than \$310 million in farm cash receipts.

State growers process their sugar beets at farmer-owned cooperative refineries in Minnesota and North Dakota. The largest, 900-member American Crystal Sugar, based in Moorhead, last year manufactured three billion pounds of sugar — about 18 percent of the domestic sugar supply — and reported revenues of \$1 billion. The state's beet refineries also make high-quality livestock feed from beet pulp, most of it for export markets.

### Tenuous trade policy

But the thriving Midwest sugar industry could turn sour if American trade policies change, allowing more cheap foreign sugar into the country, Sinner says. U.S. trade agreements now allow domestic producers to market about 85 percent of the sugar consumed here. The rest is imported from around the world at well below U.S. sugar prices.

### Competing alternatives

Lower sugar consumption and alternative sweeteners also pose challenges for Midwest sugar beet growers, says Jeff Schweitzer, a spokesman for American Crystal Sugar.

Sugar use dropped sharply in the early 1980s,



PHOTO BY ROLF HAGBERG

Minnesota leads the nation in sugar beet production, which generates about \$2 billion in annual economic activity for the state. Competing with low-carb diets, high-fructose corn syrup and alternate sweeteners, a beet growers association is promoting sugar as an all-natural sweetener with only 15 calories per teaspoon.

when cheaper high-fructose corn syrup replaced sugar in soft drinks and some bakery products. In the 1990s, sugar consumption grew at a small but steady pace, Schweitzer says, and "there is a small move now to beverages sweetened with sugar." However, alternative sweeteners, low-carb diets and the loss of confectionary manufacturing continue to weigh on sugar use, he says.

### All-natural sweetener

To bolster demand, the sugar industry has launched an image campaign promoting sugar as an all-natural sweetener with just 15 calories per teaspoon. "We think it's necessary to get the facts about sugar out there," Sinner says. "Everything in moderation: sugar, in moderation, can be part of a healthy diet."

### Few new uses

Midwest sugar beet farmers have focused their research and development efforts on

improving crop quality, varieties, yields and sugar content. "Our average ton-per-acre yields and our average sugar content have increased gradually, and that's a trend we hope to see continue," Schweitzer says. On the refining side, American Crystal is focusing on improving efficiency and boosting the amount of extracted sugar.

But so far, there have been only a handful of attempts to come up with new sugar beet uses, says Michael Sparby, AURI project director. Scientists at the University of Minnesota, for example, are refining beet pulp and other crop fibers for polymers. AURI has helped growers research beets' potential for biomass energy and pharmaceutical sugars such as ribose.

AURI has also helped beet farmers explore using beet sugar to boost ethanol production. A 2000 research project showed that adding crystallized sugar to the corn slurry speeded fermentation, says Wayne Wagner, a Crookston farmer and legislative liaison for the Red River Valley Sugar Beet Growers

Association. Future research will evaluate using less-refined sugar beet syrup to make ethanol.

In the current market, it doesn't make economic sense to use beet sugar in ethanol manufacturing, Wagner says. He estimates that ethanol would return less than one-third the current domestic sugar price. However, ethanol could offer an alternative use for excess sugar in bumper-crop years, when U.S. sugar production exceeds government trade quotas, he says.

In addition, U.S. sugar-cane farmers are showing an interest in manufacturing ethanol, Sinner says. "If they are successful, that could move cane sugar out of U.S. sugar markets to ethanol. So the sugar beet industry could receive some indirect benefit from that."

Meanwhile, Sinner says, "We're fighting to keep sugar here in the Midwest because it's a profitable crop for growers, provides jobs and helps keep our main streets open." ■





# Bean there, doing that

*Soybeans present a myriad of value-added opportunities*

BY DAN LEMKE

Only 50 years ago, the U.S. soybean crop was relatively minor. Today, it is one of the most widely planted crops in the nation.

Minnesota soybean production ranks third in the nation. In 2003, about 7.5 million acres were planted to soybeans, producing nearly 230 million bushels. Only Illinois and Iowa grow more beans.

The prolific oilseed has become popular with farmers because of the myriad value-added uses for soy oil and meal — paints, inks, adhesives, lubricants, plastics. Soybeans are part of our everyday life. Recent advances in soy-based biodiesel and dust control products are spurring even greater demand.

Already the number one vegetable-protein source in the world, soybeans are “very adaptable to new uses,” says Jim Palmer, Minnesota Soybean Growers executive director.

However, foreign competition and yield improvement are keeping the soybean supply high, forcing producers to continue pursuing new uses.

“There are more soybeans on the market from places like South America with higher oil and protein contents, so we need to find new uses to open markets to keep prices up,” says Sue Meyer, a New Prague farmer and Minnesota Soybean Research and Promotion Council director.

Palmer says every commodity gravitates to its greatest and best use first — food — then to industrial applications. As supplies increase, so do opportunities.

AURI has worked collaboratively with the Minnesota Soybean Growers on dozens of projects that have led to new products, services and businesses, says Max Norris, AURI director of projects and technology. “That includes a great deal of work on biodiesel.”

## Livestock feed

About 50 percent of Minnesota’s annual soybean production is exported. The other 50 percent is processed for meal and oil. Some of the meal is sold to Canada and Mexico, but most is fed to Minnesota livestock.

Livestock is estimated to be a \$28 billion industry in Minnesota. Farm-raised animals consume about 1.8 million tons of soybean meal per year, or about 74 million bushels of soybeans. Soybean producers, tied to the livestock industry’s health and growth, support projects such as on-farm processing of soy meal.

## Biodiesel

A legislative mandate, requiring a 2-percent biodiesel blend in every gallon of diesel fuel sold in Minnesota, is scheduled to take effect in June — opening a vast new industrial market for soybean oil.

In the United States, biodiesel demand is estimated to increase by as much as 850 percent over the next 10 years. Only about 150 million gallons are now produced in the country annually, including about 3 million gallons in Minnesota. However, with two biodiesel refineries under construction and others planned, the state’s capacity should grow significantly.

Currently 70 percent of the soybean oil refined in Minnesota is for food uses — vegetable oil, shortening and margarine, Palmer says. “Biodiesel will cause a shift in use for some of that oil.”

Besides increased demand for biodiesel, health concerns could prompt some changes. To make margarine and shortening, soybean oil is hydrogenated, creating trans fatty acids that can be detrimental to heart health. “What was a premium use for oil may mean that oil now moves into an industrial market. The oil will still go to its highest and best use, but industrial applications will increase as it becomes more plentiful.”

## Industrial uses

Most consumers have no idea how prevalent soy products are in both consumer and industrial applications. From flexible foams and rigid soy plastics used in carpet backing, insulation, furniture, auto parts, shoes, roof coatings, mattresses and pillows — to cleaners, lotions, personal care products, candles, paints, adhesives and lubricants — soy-based products are widely available and accepted.

Palmer says value additions don’t always come from new products, but rather renewable replacement for products that already exists.

“How fast (a soy-based replacement) is accepted will depend on how it compares to what’s being used.”

“To replace an existing ingredient, it can’t just be equal, it has to be better,” Palmer says. “It used to be that cost, quality and consistent availability were the only considerations for ingredients. Now, I think environment is a key factor.”

Soy-based lubricants and bioplastics are some of the newest developments. Soy oil is also being investigated in electrical transformers.



PHOTO BY ROLF HAGBERG

Soybeans are part of our everyday life — in paints, inks, adhesives, cosmetics, plastics — as well as food and feed. The fastest growing market is soy-based biodiesel; demand could increase by 850 percent over the next decade.

## Soy foods and nutraceuticals

Traditionally, soy foods have been most widely used in Asia. However, soy is increasingly popular across the globe. While sometimes roasted or boiled in whole form, soybeans are more commonly used as food ingredients in breads, cereals, meat products and in meat substitutes. More homes are using products such as soy milk and texturized vegetable protein.

Soy’s high-protein, low-carbohydrate content is appealing — and it has nutraceutical benefits. In 1999, the Food and Drug Administration said a diet including soy foods reduces the risk of heart disease. Isoflavone,

a soy component, has been shown to reduce cancer risk.

Producers are pursuing opportunities for soy-based components and extractions that can be used in nutraceutical and medicinal applications. While these uses may not consume large quantities of beans, they could provide profitable niche markets for producer-driven enterprises.

“Every new use we find for soybeans increases the value,” says Jim Call, MSRPC chair, “which means more profit for Minnesota farmers.” ■

A vision for  
Minnesota commodities

# dairy



## Dairy's new design

Smart merchandising, new products and farm improvements

BY E.M. MORRISON

Ronald McDonald is leading the dairy industry's new approach to milk merchandising.

Last summer, McDonald's restaurants introduced a colorful plastic milk jug featuring Ronald McDonald surfing on a sea of milk. The resealable jug has supercharged McDonald's milk sales from 625,000 to 4.2 million units a week, according to Dairy Foods Magazine, an industry trade journal.

McDonald's Milk Jug is one example of dairy's new focus on consumer appeal, says Alan Terwedo, a program manager at Midwest Dairy Association, which represents 17,000 Midwestern farmers.

Annual consumption of dairy products has risen slowly since 1975, to nearly 600 pounds per person, according to the USDA. While cheese use has nearly doubled during this period, fluid milk consumption has fallen, mainly because of competition from other beverages, Terwedo says. The lesson for the dairy industry: "We can't look at milk as a commodity any more. We have to look at it as a value-added beverage."

### Youth appeal

McDonald's isn't the only place where milk is getting a new look. Wendy's restaurants are selling milk in colorful plastic bottles. "They've had great success with it, as well," Terwedo says.

Schools are also interested in dairy products with packaging panache. In a recent pilot test at 146 schools in 12 different markets, traditional paper milk cartons were replaced with single-serving plastic bottles. Milk consumption jumped an average of 28 percent after the new packaging was introduced, Terwedo says.

Milk in flavors such as cherry, strawberry, banana, orange crème and vanilla made a big hit with students, too. Keeping milk ice-cold and installing see-through dairy vending machines, like those that sell sodas and sports drinks, also boosted milk consumption in pilot test schools, he says.

### Why more uses

Dairy ingredients offer another marketing opportunity.

Milk components, such as whey, nonfat dry milk, lactose, calcium and milk fat, are used in many processed foods to improve flavor, consistency and nutrition.

The dairy-ingredients market, now more than four-billion pounds, is growing about 3 percent a year, says Mary Higgins, ingredient marketing manager for Midwest

Dairy Association. "This area represents a new, under-tapped avenue we can pursue to further expand the market for dairy products," she says.

Beverages are one of the fastest-growing segments of this market, she says. New offerings include drinkable yogurt, fruit smoothies made with dry milk, low-lactose milk drinks, and "meal replacement" drinks made with whey protein concentrate.

Whey, which used to be treated as a worthless byproduct of cheese manufacturing, is now being processed into protein concentrate and added to all kinds of foods, including infant formula, bakery goods, energy bars and candy. It's even being extruded into crunchy snack bits. Long a favorite of body builders for its nutritional value and flavor, "Whey is going mainstream," Higgins says.

### More opportunity

Another emerging opportunity is "functional foods," which are tailored to specific nutrition needs. New research is shedding light on the health benefits of specific dairy components, sparking additional demand, Higgins says.

Other promising dairy uses coming up:

- Fat-free aseptic-formula puddings for school lunch programs.
- Oxygen-barrier coatings for snack peanuts and nuts.
- Gloss coatings for candy.

### Combating decline

Dairy is Minnesota's second-largest livestock sector (just behind hogs), generating more than \$1 billion in farm cash receipts. Still, Minnesota dairy has suffered a decades-long decline. Cow numbers have dropped by nearly half since 1970, according to the Minnesota Department of Agriculture. During the same period, the state's milk production fell by almost a quarter, even as total U.S. milk output climbed 40 percent.

To combat this decline, state milk producers are supporting a variety of development initiatives, says Bob Lefebvre, executive director of the Minnesota Milk Producers Association. These include:

- Access to capital and investment credits to modernize or expand dairy facilities.
- Workable environmental regulations and land use laws.
- Effective quality improvement programs
- Public relations efforts that promote the benefits of animal agriculture for society and the environment.



PHOTO BY ROLF HAGBERG

McDonald's milk sales jumped from 625,000 to 4.2 million servings per week after the company introduced colorful milk jugs in three flavors.

### Positive signs

Despite Minnesota dairy's slump, there are signs of vitality, says Pat Lunemann, 45, who runs a 530-cow dairy farm near Clarissa, Minn. and serves on the boards of the Minnesota Milk Producers Association and the Agri-Growth Council.

Milk prices have been strong for the last 18 months, and the state continues to have a robust dairy infrastructure, he says. "We still have the cheese plants; we still have the feed mills, veterinarians, consultants." Minnesota has 10 large dairy processors and several small processors that make niche-market products such as kefir, creamline milk, grass-fed butter, and organic milk and ice cream. AURI has worked with many of these specialty processors.

Minnesota also has ample water and land for animal agriculture, Lunemann says. And the state's ethanol, beet and soybean plants provide abundant supplies of inexpensive, high-quality feed. "These plants need livestock so they don't have to put their byproducts on a rail."

### Cow power

As fertilizer and energy costs rise, the state's dairy manure is an increasingly valuable resource. "I've had my neighbors arguing over who gets more manure from me," Lunemann says. Some day, he adds, methane

digestion could let farmers add even more value to dairy manure.

### Milking change

In another encouraging sign, the region's dairy science programs are full. "We now have more kids ready and willing to go into dairy than we've had in a long time," Lefebvre says. As younger farmers enter the business, "we're seeing some early signs that the decline in dairy may be leveling off."

Efficiency is improving, too, Lefebvre says, as more Minnesota dairy operators modernize their facilities or undertake modest expansions — "going from, say, 80 cows to 200." And a few are "jumping to the next level," he says, milking 1,000 cows or more.

Lunemann, for one, is optimistic about Minnesota's dairy future: "The key thing for our industry is for dairy producers to be able to adapt," he says. "I see us being able to turn the corner if we embrace changes." ■



## AURI News Briefs

### Dauids joins AURI board

St. Paul, Minn.— State Representative Greg Davids (R-Preston) has been appointed by Minnesota House Speaker Steve Sviggum to serve on AURI's board of directors. Davids, a southeastern Minnesota farmer, is serving his eighth term in the House of Representatives and chairs the House Agriculture and Rural Development Committee.

"My goal as chair (of the House committee) is to add value to Minnesota agriculture," Davids said. "Whether through the development of ethanol, biodiesel or other agricultural products, one of my primary goals at the Legislature has always been to create opportunities for producers to broaden the market for their agricultural products. I look forward to serving on the AURI board."

Davids grew up on a Fillmore County farm and was first elected to the state legislature in 1991. Prior to being named Ag and Rural

Development Committee chair, Davids chaired the Commerce committee. He authored a measure that would require a 20-percent ethanol blend in gasoline sold in the Minnesota by 2012.

"With Rep. David's interest in value-added agriculture, we believe he will be a great asset to AURI," says Edgar Olson, AURI executive director.

Davids succeeds Elaine Harder as the Minnesota House representative on AURI's board.



Dauids.

### Crawford retires

Marshall, Minn. — AURI chemist Jerry Crawford has for years worked to develop new uses for ag products. Now he is finding new uses for his time.

After nine years as analytical chemist at AURI's fats and oils lab in Marshall, Crawford retired in March. He has been involved with numerous research projects, ranging from road dust control products to Omega-3 fatty acids in eggs and pork.

"Jerry has contributed greatly to AURI and his success over the years ... I thank him for his hard work, dedication and loyalty," says Edgar Olson, AURI executive director.

Prior to joining AURI, Crawford worked for Allied Mills in Peoria, Illinois and Supersweet Research Farm in Courtland, Minn.

Aldo Handojo, a 2004 graduate of Southwest Minnesota State University, has been hired to fill the analytical chemist position.



Crawford.

## Elsewhere in ag utilization

BY DAN LEMKE  
CARTOONS © UNCLE HYGGLY / POUNCE.COM

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

### Paper, plastic or both?

A Japanese paper company has designed a composite made from used paper and corn starch-based plastic that could be used to make tableware and other plastic goods. The company plans to start manufacturing and marketing pellets of the material, which tests show is stronger and more heat resistant than polypropylene.

Source: Soyatech.com, February 10, 2005

### Had your limonoids?

We know citrus fruits are rich in vitamin C, but they also offer a lesser-known nutritional bonus called citrus limonoids. The body derives limonoids from citrus fruits and juices. In ARS laboratory tests with animals and human cells, limonoids have been shown to fight cancers of the mouth, skin, lungs, breast, stomach and colon. Researchers are also investigating limonoids capacity to lower cholesterol.

Source: USDA-ARS, February 8, 2005



### The tea to exercise

Green tea may soon be giving sports drinks a stamina boost. Researchers from the Japanese healthcare company Kao found that mice fed a green tea extract regularly for 10 weeks increased their exercise endurance by about 24 percent. The extract appears to stimulate muscle's fatty acid use, reduce carbohydrate use and allow for longer exercise times. Researchers also maintain that the green tea's effect on fatty-acid uptake, which speeds fat breakdown, helps with weight loss.

Source: Foodnavigator.com, January 31, 2005

### Spiked chips

Tortilla chips may not be health food, but scientists may have found a way they can help lower cholesterol. Brandeis University

researchers are frying chips in oil spiked with a plant-based ingredient called phytosterols, which can soak up cholesterol without influencing taste. Other sterol-enriched foods, such as margarine and salad dressings, are already on the market. Phytosterols, which can be extracted from plants such as soybeans, have been shown to block the absorption of LDL, the so-called 'bad' cholesterol.

Source: Soyatech.com, February 2, 2005

### Sea-weeding-out cancer

Chowing on kelp may help keep cancer at bay. University of California, Berkeley researchers have found that kelp, a brown seaweed, lowers the concentration of the female hormone estradiol in laboratory rats. This evidence suggests that kelp may decrease the risk of

estrogen dependent diseases such as breast cancer. The research team began investigating kelp because rates of hormone-dependent cancer are significantly lower in Japan where kelp consumption is high.

Source: University of California, Berkeley, February 2, 2005

### A must-see film

A Welsh university has developed a biodegradable food-packaging film for perishable produce. The University of Wales Bangor's BioComposites Centre developed the film, derived from corn and potato starch blended with vegetable oil molecules to produce a thin gas barrier that functions like plastic films. The film is being tested in Italy on pasta that is kept fresh from the factory.

Source: Soyatech.com, February 11, 2005



## Six Point Renaissance

A Minnesota pork producer group is marketing the almost-forgotten Berkshire breed to global markets

Ruth and Jeff Goldenstein, who raise Berkshire hogs on their farrow-to-finish operation near Kerkhoven, Minn., are members of Six Point Berkshire, a producer group that markets the hogs globally.

STORY AND PHOTO BY DAN LEMKE

*Cottonwood, Minn.* — Six Point Berkshire is grateful that not all pork chops are created equal. The 33-member hog producer group from southwest Minnesota is among a tiny minority in the nation producing Berkshire hogs. The slow-growing breed produces meat that's more flavorful but also higher in fat than most American-raised pork.

Six Point Berkshire drew its name from the breed's distinctive characteristic — four white feet, white nose and white-tipped tail. The handsome hogs have been in the United States for nearly two centuries, but the breed

almost vanished a few years ago. (See the sidebar story: A Berkshire History) "When we started raising Berkshires eight years ago, there were only about 700 females in the country," says Gene Goldenstein, Six Point Berkshire manager.

The breed fell out of favor with producers who want to raise lean pork quickly and efficiently. Berkshires produce small litters — only five to seven baby pigs per farrowing. They gain weight slowly and have a higher percentage of intramuscular fat than most breeds grown on a large scale today.

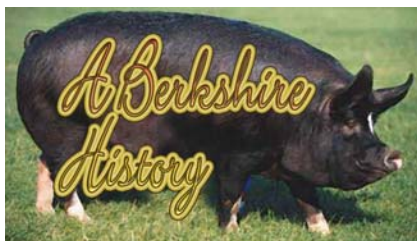
Six Point Berkshire produces the largest

concentration of purebred Berkshires in the country — 36,000 annually. It hopes to repopulate the breed while reaching pork-hungry people around the globe who prefer the more flavorful meat. "We market most of our pork to Japan," Goldenstein says. "Consumers there are most interested in taste. They tend to eat smaller portions than Americans, so they are less concerned with having a lean product and more interested in how their food tastes."

All Berkshires are bred from one genetic nucleus, guaranteeing a consistent breed and quality. Berkshire meat is strong-flavored, tender and dark — desired by a growing

number of consumers, Goldenstein says. U.S. and Canadian markets are showing more promise, so he wants Six Point Berkshire to increase production to 40,000 animals annually. "The market is there, but we will only grow more if we have secured the market."

"They've exercised a tremendous amount of due diligence," says Dennis Timmerman, AURI project director. "They've set up a detailed business plan that follows up on their market research. This will help them keep their production and the market demand in balance." ■



BY DAN LEMKE

Though a decade ago the Berkshire hog was nearly extinct in the United States, it has a long and storied pedigree.

Legend has it, the breed was discovered by the British army at its winter quarters in England's shire of Berks more than 300 years ago. Army veterans told of the remarkable hogs, larger than other swine, which produced hams and bacon of rare quality

and flavor. It became favored by upper-class English farmers. Even the Royal Family kept a large Berkshire herd at Windsor Castle.

The original Berkshire was reddish or sandy colored, sometimes spotted. The sandy hair is still sometimes seen in the white areas of modern Berkshires. Later this basic stock was crossed with Siamese and Chinese breeds, resulting in the black-and-white color pattern we

see today. This is the only known outside blood that went into the Berkshire breed, which records say has been pure for the last 200 years.

It is believed Berkshires came to the United States in the early 1820s. They were quickly absorbed into the general hog population because they improved common stock.

In 1875, the American Berkshire Association, the first

swine registry, was created to safeguard the breed's purity. Only hogs directly imported from established English herds, or traced directly back to imported Berkshires, are accepted for registration.

Berkshire meat is especially enjoyed by the Japanese who call it "kurobuta," meaning "supreme black hog." Berkshires' high-quality meat is darker, tastier and contains more

marbling than most other types of pork.

Once out of favor with American pork producers because of smaller litter size and slower-growing characteristics, the Berkshire is rebounding due to its popularity in gourmet cuisine and a growing U.S. ethnic market. ■

Source: Oklahoma State University swine breed directory



# Loving the lightweight

Hog producers collectively market hogs — too light for most U.S. packers — to ethnic consumers.

BY DAN LEMKE

*Marshall, Minn.* — Lightweight Minnesota hogs are not pulling their load.

Pork producers in Minnesota raise about 14 million hogs per year — more than three times the state's human population. Nearly 5 percent of those pigs are considered lightweight, below the range packers want. Hogs that weigh less than 220 pounds earn considerably less than their market-ready littermates and may actually cost producers money.

Minnesota is the country's third-largest hog producer. Most producers operate on tight margins, requiring peak efficiency. Dennis Timmerman, AURI project director, says producers will turn over an entire population of hogs in a finishing barn at least twice a year. When most are at market weight, all are sold at once. However, some won't meet the minimum-weight market requirements.

"If a producer has a 1,000-head barn and sells all those animals at the same time, for a variety of reasons, 30 to 50 of those hogs won't be as big," Timmerman says. "Packers call them a 'sort loss' and pay much less."

Many producers can't afford to hang on to



PHOTO BY ROLF HAGBERG

lightweight pigs because barns need to be cleaned and readied for the next batch, so they endure the losses. An underweight hog is typically sold at 40 percent of market value.

Based on production costs and 2002 market prices, a 200-pound hog was sold at a \$34 loss, a 210-pound hog at a \$12 loss, and a 220-pound pig at a \$7 loss.

"It's a challenge for everyone," says Minnesota Pork Producers Executive Director Dave Preisler. "It doesn't matter what size you are, a certain number of hogs won't meet packers' specs. There are places to go with them — the challenge is: what are you going to get paid?"

Some processors have identified niche opportunities for lighter hogs, including Hispanic, Asian, Hmong and Hawaiian markets. "There are ethnic markets for underweight hogs, but the processors serving those markets need volume for economy of scale," Timmerman says.

A market study sponsored by AURI and the Minnesota Pork Producers shows the state produces more than 1,000 underweight hogs each day. But they are located throughout the state, making collective marketing a challenge.

A possible solution is a centralized buying station that serves processors, such as Sioux Preme Packing, which specializes in lighter hogs. The Sioux Center, Iowa processor

has established distribution channels for lightweight hogs; many are shipped to Mexico where consumers prefer the smaller animal.

Some processors are actively looking for lightweight hogs because they have carved out specialty-product market niches and need more volume.

Producers may also be able to collectively reach direct markets without a processor. For example, Minnesota Pork Board President Dale Stevermer of Easton says he has been able to find local markets for lightweight hogs. If it increases farm income, it's worth investigating, he says.

"Each producer needs to look at their situation to see how much money they are losing" on lightweight hogs, Stevermer says. "And what are the best ways to change that?" ■

# Well-fed pork

Full-fat soy diet yields pork with higher Omega 3s

BY DAN LEMKE

*Minneota, Minn.* — The old phrase, 'you are what you eat,' holds true even for hogs.

Pigs fed a full-fat extruded-soybean diet yield meat high in Omega 3s and Vitamin E, according to a meat analysis conducted by AURI chemist Jerry Crawford last fall.

Bruce Bot and eight other southwest Minnesota hog producers requested the study. Bot's cousin and business partner Eric Bot opened Custom Extruding LLC in Minneota, Minn., which annually processes 60,000 to 70,000 bushels of soybeans into full-fat meal. With soy oil's health benefits, Bruce and Eric wondered if feeding the meal to hogs would enhance the meat's quality.

AURI tests proved them right. Vitamin E and Omega 3 fatty acids — known to reduce heart-attack risk and fight cancer — were 250 percent higher in soy-meal fed pork versus conventional. Also, a South Dakota State University sensory panel found the taste and texture compared favorably to traditionally-produced pork.

Full-fat extruded soybeans have long been fed to hogs, but mostly to lactating sows and young pigs because farmers have been leery of adding excess fat to market hogs, bred for leanness. However, a common problem with

today's hogs is that "they can't eat enough to grow optimally," Bruce Bot says.

The Bots say the high-energy soy ration is better used by hogs. "Even if the cost of the extruded beans is higher, the feed efficiency is improved, so it takes less feed to put on a pound of pork," Bruce Bot says.

Custom Extruding's process uses pressure and friction to raise soybeans' temperature to about 300 degrees, which fractures cell membranes and releases oil to blend with the meal. To make conventional meal, oil is removed from the soybean. Extruding doesn't remove anything but a small percentage of water.

The process also negates certain trypsin inhibitors present in raw soybeans that can keep animals from digesting soy meal. Most monogastric animals cannot digest raw soybeans and may lose weight from eating them. Hogs can fully use the deactivated meal.

"Today's pigs perform better on extruded soybeans," Eric Bot contends. "We want to process feed so that it can be used most optimally by the animal."

Now that farmers know the extruded meals' health benefits, "we're helping to determine if



PHOTO BY ROLF HAGBERG

there's a market that will allow them to receive a premium for their pork," says Dennis Timmerman, AURI project development director. The producer group, which markets about 5,000 extruded-soy-fed hogs annually,

is looking at various distribution channels and could possibly design its own label.

"We're adding value twice," Eric Bot adds, "first to the soybeans, then to the pork." ■

# Free to eat cookies again



PHOTO BY ROLF HAGBERG

Karla Suckling of Minneapolis enjoys a carrot muffin made at BitterSweet Bakery in Eagan, the only 100-percent gluten-free bakery in Minnesota that caters to people who cannot tolerate wheat, barley or rye in their diets.

*BitterSweet Bakery offers fresh confections to consumers with celiac disease*



BY CINDY GREEN

*Eagan, Minn.* — Lareen Narva started the 2004 new year by opening Minnesota's only 100-percent gluten-free bakery — one of a handful in the United States. Just over a year later, BitterSweet Bakery is not only drawing customers from throughout the Twin Cities, but remote communities like Madison, Wisc. and Fargo, N.D. In December, the Minneapolis Star Tribune included BitterSweet in its "A to Z list of where to find good things to eat."

Narva brushes off accolades for her quick accomplishments: "I should be shot for what I'm doing. I've never been in business before, never been in the food industry before."

But she is an accomplished baker of gluten-free treats, as Narva and her three children have celiac disease and cannot tolerate the gluten in wheat, rye, barley and their derivatives. After 20 years of experimenting with non-traditional baking ingredients — rice, cornmeal, potato flour, chickpeas — Narva has designed baked goods that fool the palate as well as they eye: pumpkin bars, chocolate chip cookies, lemon-poppysseed muffins, to name a few.

"What sets me apart from others is my chocolate-cherry muffin tastes like a regular chocolate-cherry muffin." "We do a ton of birthday cakes and wedding cakes," the only

gluten-free bakery to do so, Narva says. "And we get the comment all the time, 'my family doesn't know the difference, everyone loved it, no one knew it was gluten free.'"

Packaged gluten-free foods are often "dry, grainy, with no flavor or a pungent flavor," Narva says. "I wish I could taste those products when they're fresh." For example, white rice, which keeps better than brown, must be stored in a cool, dry place to maintain quality. "There is only so much you can do with rice."

Customers can select from cookies, muffins, bars and cakes in a wide variety of flavors. BitterSweet also sells cornbread and pancake/waffle mix, breads, buns and will soon introduce breadstick and dinner rolls. Later this year, the bakery will launch online ordering.

## The gluten attack

Narva discovered she had celiac disease during her third pregnancy. She became severely ill with stomach pains, vomiting, diarrhea, and lost 10 pounds in her fourth month. "They thought it might be an intestinal virus or parasites. You get so depressed when you've tried everything under the sun and nothing works." Narva wondered why she felt better when she ate nothing at all.

"I went to a kinesiologist — a chiropractor who does muscle testing to see how foods affect your health." That day she found out that "things like sandwiches were killing me."

"I come from a German heritage — every meal had bread. Every day there were cookies and bars." After eliminating gluten foods, "I couldn't believe I wasn't vomiting anymore."

Because the disease is hereditary, she had her three children tested, including her 7-year-old daughter and 5- and 3-year-old sons (now 26, 24 and 21). All were diagnosed with celiac disease. Her husband had a related condition, colitis, which he treated with a gluten-free diet. Of her five siblings, "four have the condition." Two of those are not on a special diet and "live on antacids," she says. "We can trace it back four generations — my grandma had it; her parents had it too."

The family had to give up favorites like cookies, macaroni, burger buns and many snack foods. It was difficult for her children. "When they teach the five basic food groups in school, they need to say that not everyone can eat wheat."

## Kitchen creations

Narva went to work in the kitchen creating replacements. "I've always cooked; our family made everything from scratch. My sister made

the meat and potatoes; I made the sweets."

She tried recipes from gluten-free cookbooks. "Some things did not turn out the way I thought they would. My first failure was a loaf of bread — it probably weighed 10 pounds. Her family had to try everything because "I don't like to throw things away," Narva says. "My family was very honest with me — they'd say, 'don't do that again.'"

"This is a whole new world of experimenting — nothing that you could ever imagine."

Narva wrote her own recipes, taking pointers from gluten-free publications and even used her sister's Weight Watcher's trick: "I substituted fat with pumpkin or apple sauce and got a moister, better-quality batter."

The cakes and cookies coming out of Narva's oven started receiving raves from family and friends. "But I didn't have a thought about starting a bakery. I had to get three kids through high school."

## SCOREing a business

A couple years ago, Narva's son grabbed a package of gluten-free cookies off the counter and said, "Mom, what is this stuff? Your cookies are so much better. Don't you get the hint? You've got to start a bakery." I grew up in a family-owned business — my father owned a plumbing company. But I didn't really know



what that meant.”

“I decided to enroll in a four-night class: ‘How to start a business in Minnesota,’ offered by SCORE,” a nationwide organization of active and retired business people who volunteer to counsel small businesses and entrepreneurs.

“By the end of the last class, I decided I could not do it — they had scared me to death.”

“Life is too short,” Narva told the instructor. “He said, ‘You’re right where we want you to be. The reality is you don’t make money the first 5 years.’ ” Too many start a business thinking they’ll get rich quick, he explained, and they aren’t ready for the challenges.

“I said, ‘this is still not encouraging,’ and waited almost six months to call him back.”

When she told the SCORE counselor she was ready, he connected her to Charan Wadhawan, AURI food scientist, who helped Narva standardize her recipes, scale them up for retail, maximize the baked goods’ shelf life, and design nutritional labels. “She had all the resources I needed.”

“When Lareen came to AURI, I thought she was the perfect person to start such a business,” Wadhawan says. “She is knowledgeable about gluten-free foods and food choices limitations. There is a niche market for her to fill.”

Narva was able to keep start-up expenses low because family and friends offered services, such as plumbing, at discounted rates. Her only employees have been her three children, although her daughter’s first baby is due soon “which means I have to hire an employee; I’m not looking forward to it.”

## A celiac’s dream shop

BitterSweet’s opening has been met with applause by celiacs “who are grateful for a fresh product,” Narva says. Most have been purchasing only pre-packaged products at food co-ops, specialty stores or on-line.

Although more than two million Americans have celiac disease, there are few bakeries to serve them. “There is one in New York, one in Michigan, another in Florida, but for the most part, you can’t find them.” A few Minnesota bakeries make gluten-free products, but only one day per week. Because of high cross-contamination potential, gluten and non-gluten products cannot be made at the same time in the same facility.

“Gluten-free products are more expensive — that’s one thing that shocks people who aren’t gluten free.”

The bakery is near an automotive shop and people will often come in for a treat while their car is being serviced. “They look at the price and say, ‘I’m not paying \$3 for a muffin,’ and they go to Cub. ... The majority of people (with celiac disease) don’t bat an eye.”

Because she uses such ingredients as tapioca flour, xanthan gum and psyllium seed, her confections cost more to make. “Why do I do that? Because I get the end results that I need.”

## Gut-felt disease

Many of BitterSweet’s customers “come right from the doctors office” because customers leave BitterSweet brochures at their clinic and tell their doctors about the bakery.

Celiac disease, also known as gluten intolerance, is a genetic disorder that affects 1 in 133 people in the United States — primarily those of northern European descent. Symptoms range from mild weakness, bone pain and upset stomach to abdominal bloating, severe diarrhea and weight loss. It can be diagnosed with a medical blood test or intestinal biopsy. Holistic doctors use other methods for diagnosis.

The disease damages villi in the intestines of people who eat wheat, rye and barley. Some celiacs also avoid oats, although it is disputed whether oats cause damage. The only treatment is a strict 100-percent gluten-free diet.

A number of related conditions — fibromyalgia, irritable bowel, migraines, acne, acid reflux, juvenile diabetes, depression — can be helped with a gluten-free diet. “Gluten can inflame the liver, brainstem, joints.”

Narva responded to the disease not only with a diet change, but the life change entailed in starting a new business. “I’m the kind of person who likes to jump in with both feet soaking wet.” ■

For more a complete list of BitterSweet products and ingredients, visit [www.bittersweetgf.com](http://www.bittersweetgf.com)



ABOVE: Lareen Narva, at right, started baking gluten-free treats about 20 years ago, after she and her children were diagnosed with celiac disease. Her sons Seth, at left, and Tyrel encouraged Lareen to open her own bakery, BitterSweet, where all of her children now work.

BELOW: Chocolate batter rolls into a brownie pan at BitterSweet Bakery, which features gluten-free cakes, cookies, muffins, breads and, for the home baker, cornbread and other mixes.



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# STALKING FOR BIOMASS

## Corn stover has many potential uses, but costs can hinder opportunity

STORY AND PHOTO BY DAN LEMKE

*Harlan, Iowa* — The John Deere combine's deep drone fills the damp fall air as it creeps forward, gobbling up row after row of tall Iowa corn. But this harvest is gleaming more than kernels.

The big green machine has been modified to include a silage chopper. The rear addition blows stalks, leaves, husks and cobs, which normally end up on the ground, into a covered, mechanized, unloading wagon. The corn stover is bound for a nearby facility where it will be used for fibers and research.

Tom Schechinger, who operates Iron Horse Farms near Harlan, Iowa, is monitoring the harvest. For almost 10 years, he has conducted corn stover research projects for the U.S. Department of Energy, National Renewable Energy Lab, Iowa State University, Cargill/Dow and others.

### Masses of bio

Mention "biomass" and many Midwesterners think "corn residue," with good reason. Corn stover is the most abundant biomass available in the United States — about 220 million dry tons annually, or three tons of stover per corn acre.

Schechinger knows people are enthusiastic about corn stalks' potential — from biomass energy to fibers to chemical extractions. But he is realistic about the economics.

"Every time you change the stover, it adds cost," Schechinger says. "Drying and pelleting for example, add to the cost. The more you can use the stover as is, the better off you are."

### Costly ventures

Cost often foils ventures that feature corn stalks. While the raw material is abundant, it's also bulky and wet. And the northern Corn Belt's harvest window is relatively short. Storage issues, transportation and drying costs can suddenly make this relatively inexpensive and available biomass appear less attractive.

"It depends upon what it's competing against," Schechinger says.

Alan Doering, AURI technical services specialist, hears regularly from producers, grower groups and businesses interested in using stover for building materials, hog mats, fuel pellets, paper fiber and endless other uses.

"For any of these projects to work, you have to look at the true costs and methods of harvest and handling," Doering says. "Sometimes there are misconceptions that stover is inexpensive, but once you factor in all the costs, sometimes they are too high."

But that's not to say there aren't significant opportunities or potential value in corn stover.

### A barrel of stover

Schechinger says it's time producers start looking at stover like a barrel of crude oil.

Refiners don't automatically convert the crude to gasoline, rather the oil is processed into whatever will bring the highest value, be it tar, grease or diesel fuel.

Farmers should look at stover the same way, he says. Separated components, such as the silks, cob or fibers, or fractions converted through biorefining or distillation, may offer the best market.

"It all depends on the end use," Schechinger says. For example, a company that makes horse bedding doesn't want cob in the stover because it can be irritating to step on. But a chemical manufacturer that impregnates herbicides with cob particles "will pay a good price if they can get significant volume."

As the axiom goes, Schechinger says, "One man's trash is another man's treasure." ■

