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# Ag Innovation News

The newspaper of the Agricultural Utilization Research Institute



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2016

# AURI announces research initiatives

Thirteen projects will create new and improved uses for Minnesota's agriculture commodities

BY ASHLEY HARGUTH

AURI recently announced thirteen research initiatives for 2016. The projects in the organization's core four focus areas—renewable energy, biobased products, coproducts and food— all aim to create new and improved products and processes in order to utilize its commodities, grow the economy and create new jobs.

"As we evaluate our potential initiatives, we know that they fit a number of criteria, including that the information is important to the industry, that the projects are technically and commercially near term, and that there is a promising partnership or team to do the work," explains Jen Wagner-Lahr, AURI senior director of innovation and commercialization. "Most importantly,

we evaluate whether businesses and entrepreneurs will be interested in the information. If they are, then there is reason to move forward in deploying it into the market, translating to jobs and wealth creation."

AURI partners with commodity groups, economic development organizations, foundations and others across the state

to ensure that the information available through these research initiatives is put into the hands of the businesses, entrepreneurs and producers who will bring these ideas to commercialization

The following is a brief summary of the projects, with more information available at [auri.org](http://auri.org).



## Coproducts



### Nutrient recovery systems for agricultural applications

AURI will focus on identifying and evaluating new technologies that can assist with separating valuable nutrients from manure streams to allow for more efficient nutrient distribution.

### Evaluate the value of pennycress oil and meal

Pennycress is a potential cover crop for Minnesota agricultural lands. The oil has been utilized to make biodiesel and pennycress meal could be used as a potential feed ingredient for livestock. AURI will measure and report the properties of both the oil and the meal from University of Minnesota pennycress trials.

### Small-scale shrimp feed trial

The intent of this project is to incorporate a low oligosaccharide soybean meal mix with dried distillers grains with solubles (DDGS) and wheat bran to conduct feeding trials with two small-scale shrimp producers in Minnesota.

### Improving nutritional value of low quality fibers

AURI will work with the University of Minnesota on technical innovation and research related to production and usage of high-quality animal feed by utilizing a calcium-hydroxide biomass processing technology. The technology and equipment already exist, but the project would focus on applying the technology.

### Small scale hops densification in Minnesota

AURI will work with the Minnesota Hop Growers Association to provide scientific technical assistance addressing the need for small scale, and possibly portable, densification systems for hops.



## Food



### Utilization of Minnesota grown commodities as protein ingredients in food

Minnesota produces a variety of agricultural commodities that have the potential to be utilized as high protein ingredients in food products. AURI will work to better understand which commodities grown in Minnesota have potential use as high protein ingredients in food products.

### Developing new markets for soy protein in food allergen free soybean varieties

In order to develop new markets and improved utilization of soybeans in food products, AURI will work to study the barriers that limit the broad use of soy including allergenic components, and work to identify solutions to these barriers.

### Clean labels

AURI staff will develop a reference guide that clients and industry can use to make decisions on alternative ingredients for clean label food products. This guide would include information on substitute ingredients in the bakery, meat and beverage categories.

### Food safety/ appropriate food handling training for AURI clients

As AURI is assisting clients to develop their products and move their products to the marketplace, a need exists to provide appropriate guidance and training as it pertains to food safety, regulations and food handling techniques.



## Biobased Products/ Renewable Energy



### Benefits of co-location of indoor facilities

Opportunities, challenges and potential strategies exist for indoor agriculture and aquaculture. AURI will look at these opportunities and assess heat, market, labor and infrastructure synergies with the agricultural processing industries and other potential co-location opportunities.

### BioPreferred Label program

This will be a two phase initiative. In phase one, AURI will develop a one-stop resource for clients to understand the USDA BioPreferred program requirements. In the second phase, AURI will review previous projects and identify businesses and products that could benefit from the USDA BioPreferred program.



### Biomass for cooling

The purpose of this initiative is to assess the potential of utilizing biomass for cooling systems. AURI will investigate current small to medium scale biomass cooling technologies and evaluate its economic feasibility.

### Barriers and opportunities of eco-friendly agricultural wraps and nets

AURI will identify barriers to eco-friendly agricultural wraps and nets and potential solutions. The research will be provided to companies in the industry that can pursue biodegradable materials projects.



# Not Just For Vehicles Anymore

BY DAN LEMKE

Minnesota has long been a leader in the development and acceptance of biodiesel. AURI scientists were among the first to research biodiesel's potential back in the early 1990s. After decades of work, biodiesel became accepted as a viable alternative fuel and was designated by the U.S. Environmental Protection Agency as the nation's first advanced biofuel. It's currently blended at a 10 percent level with diesel sold in Minnesota during the summer months and 5 percent year round.

While its primary focus in the Midwest has been as a transportation fuel, home heating is potentially an equally exciting biodiesel opportunity.

Bioheat® is a blend of biodiesel and heating oil. Even low biodiesel blends substantially reduce particulates and other emissions often equated with heating oil. Use of low sulfur fuel and biodiesel puts Bioheat on par with natural gas when it comes to emissions.

Heating oil is widely used throughout the northeastern United States. Because of competition from other fuels perceived as cleaner than heating oil, its consumption was dwindling rapidly. With the advent of Bioheat, the industry now offers consumers an environmentally-friendly fuel alternative that has resurrected heating oil.

"There is a tremendous opportunity for Bioheat," says Doug Root, AURI senior scientist of biomass and renewable products technologies. "New England states use about 6 billion gallons of heating oil annually." Root's views on the Bioheat opportunity were recently presented at the Bioheat forum hosted by the Minnesota Soybean Growers Association.

Bioheat blends typically range from 2 percent to 5 percent biodiesel. New York City, for example, has a 2 percent biodiesel requirement and is considering a move to a 5 percent blend by 2016 and 20 percent by 2030.

"Bioheat becomes an even bigger opportunity as the percentages move up," Root adds. "Thirty percent of a 6 billion gallon market is 1.8 billion gallons, which is about how much biodiesel is produced nationally right now. Those gallons would be on top of what we already use for transportation fuel."

The U.S. produces about 2 billion gallons of biodiesel each year, largely from vegetable oils like soybean and corn oil. Minnesota's annual production is about 64 million gallons.

Proponents call this a "match made in heaven". Biodiesel use for transportation is highest in the warm weather months while Bioheat is in demand in the winter. This additional year-round biodiesel demand could benefit Minnesota processors and farmers.

"If the demand for biodiesel, either in diesel fuel here in Minnesota or heating oil in the Northeast continues to grow, that holds up soybean prices so they're more stable and less prone to dips when South American soybeans hit the market during our winter," says Mike Youngerberg, senior director of field services for Minnesota Soybean. "Economic studies show that biodiesel continues to deliver a return on investment of 74 cents per bushel of soybeans."

Many New England heating oil providers are small, family businesses. Bioheat has breathed new life into many businesses by giving consumers a cleaner option.

"It's the perfect opportunity to reinvent the industry with a fuel you have in abundance," says Paul Nazzaro, president of the Nazzaro group and petroleum liaison to the National Biodiesel Board.

Root says technical requirements for home heating are less demanding than for transportation fuels. Fuel is stored indoors, burners are fixed instead of mobile and they have different thermal cycles. AURI is expecting to be actively involved in supporting the utilization of Minnesota produced biodiesel in the U.S. Bioheat markets.

"It provides another use to grow our production capacity," Root adds.

**"Economic studies show that biodiesel continues to deliver a return on investment of 74 cents per bushel of soybeans."**

*Mike Youngerberg, senior director of field services for Minnesota Soybean*



# New meal deal

Marshall feed company introduces soybean alternative to fishmeal



John Pollock and Jim Moline of Midwest Ag Enterprises are manufacturing NutriVance, a soybean meal feed aimed at young pigs, turkeys and aquaculture.

BY LIZ MORRISON

A Minnesota feed company has a new meal deal.

Midwest Ag Enterprises in Marshall is making a high-protein soybean meal to replace expensive fishmeal in livestock diets. NutriVance, introduced last spring, is designed for young pigs, young poultry, and fish, which need a high-protein, low-fiber diet.

The new soy protein concentrate adds more value to soybean meal and opens up new markets for Minnesota soybeans, especially in the aquaculture sector, says Harold Stanislawski, AURI project director.

Soybeans are an excellent protein source, but they also contain “anti-nutritional” components, such as fiber and complex sugars, which inhibit nutrient absorption in animals that have a single-chambered stomach. (Think gas!) That limits the amount of soybean meal that can be fed to young animals.

With help from AURI, Midwest Ag Enterprises developed a cost-competitive process to remove most of these indigestible elements, leaving a high-protein meal that is easier for baby animals to digest, says Jim Moline, founder and president of Midwest Ag Enterprises. Moline’s company makes specialty livestock feed ingredients for domestic and overseas markets.

NutriVance has about the same amount of protein as fishmeal with a real value in animal and aqua feed diets of approximately 20 percent less, Moline says. Fishmeal, which is made from fish trimmings and small ocean fish, such as anchovies and menhaden, is a dwindling resource, he says. Substituting renewable soy protein for fishmeal eases stress on wild fisheries. And because NutriVance is concentrated, “we can ship more protein in a smaller package. That’s important for export markets.”



## Scaling up

Midwest Ag Enterprises began manufacturing NutriVance last April in partnership with American Natural Soy, Cherokee, Iowa. The joint venture operates a processing plant in Galva, Iowa.

The company starts with high-quality soybean meal from Minnesota Soybean Processors in Brewster, Minnesota. Using a proprietary water and enzymatic treatment, “we remove some of the indigestible parts,” Moline says. “Our

process is quite complicated and perfecting it has been a challenge.” There are rival soy protein concentrates on the market, which use alcohol-based processing, Moline says, “but we feel they aren’t as good as ours.”

The company is now scaling up manufacturing and expects to produce about 2,000 tons of NutriVance per month by the end of 2016. “We’re streamlining production and building inventory.”



## Feeding trials underway

Meanwhile, AURI and the Minnesota Soybean Research & Promotion Council are sponsoring livestock feeding trials of NutriVance, supplementing earlier nutrition studies. These studies are essential for commercialization, Moline says. “People who formulate livestock diets need third party research” to validate new product claims.

“We’re seeing positive results on digestibility,” Moline says.

A recent study on weanling pigs at the University of Illinois, for example, found that NutriVance was just as easy for baby pigs to digest as diets containing less soybean meal and protein, AURI’s Stanislawski says. That means growers can feed piglets a higher level of soybean protein with no digestibility penalty.

Turkey feeding trials are scheduled to begin in 2016 at the University of Minnesota.



## Aquaculture opportunities

AURI and the Minnesota Soybean Research & Promotion Council are sponsoring nutrition studies of NutriVance in farm-raised trout and shrimp. In addition, the U.S. Soybean Export Council is arranging aquaculture feeding trials in Latin America, which is a major player in global fish farming.

Aquaculture, the fastest-growing feed industry sector, “is a huge opportunity for NutriVance,” Moline says. The aqua feed industry, which accounts for half of annual fishmeal consumption, is working to increase the amount of vegetable protein in aquaculture feed — a market that is expected to reach \$123 billion worldwide by 2019, according to AquaFeed Market.

Minnesota’s abundance of high-quality feed is one factor spurring the development of shrimp aquaculture in the state, says Michael Sparby, AURI senior project strategist. Minnesota has several small shrimp farms producing Pacific white shrimp indoors, including Four Seasons in Little Falls and Northern Tide in Elgin.

Ralco®, a privately-held animal feed company based in Marshall, Minnesota, plans to raise shrimp on a large scale. The company has licensed patented shrimp farming technology developed at Texas A & M University, and recently completed a shrimp research and pilot plant in Balaton, Minnesota.

Ralco’s research facility will be used to commercialize the new technology — an intensive shallow-water raceway system called a Tidal Basin™. Ralco is developing a model shrimp farm that is projected to produce 8.5 million pounds of shrimp annually.

Commercial production is expected to begin by 2017, says Mike Ziebell, general manager of trū Shrimp Systems, Ralco’s aquaculture brand. The company plans to build a hub-and-spoke network of processing plants and production barns — or Harbors™, as the shrimp farms are called — much like the poultry industry uses.



## Minnesota’s shrimp advantage

The United States imports over 1.5 billion pounds of shrimp. Currently, 80 percent of the imports come from seacoast farms in Southeast Asia.

Why cultivate shrimp in landlocked Minnesota?

“The feed is here!” Ziebell says. Shrimp eat a complex diet including soybeans, wheat and fishmeal. “Our goal is to eliminate fishmeal from the feed and replace it with renewable, plant-based ingredients”, Ziebell says.

“People think of shrimp farming as a warm weather and coastal enterprise. But inland technology can be located anywhere.” Instead of moving the feed to the shrimp, “we’re moving the shrimp to the feed.”

“Similiar to cattle, hogs, and poultry,” Ziebell says, “shrimp are another species that can add value to our abundant Minnesota commodities.”



# AURI's long game

When it comes to economic development, AURI plays a long game, says Michael Sparby, AURI senior project strategist.

NutriVance is a good example. The branded, high-protein soy concentrate grew out of nearly a decade of research and development, and could help foster a whole new livestock sector in Minnesota.

The effort began in the mid-2000s, as profit-strapped hog and poultry producers called for a lower-cost replacement for fishmeal in starter diets. A high-protein, low-fiber soybean product, called low-oligosaccharide soybean meal, looked like a good substitute — if an economical method for removing the fiber could be developed.

The first step was to find out how “low-O” soybean meal performed in livestock diets. AURI and the Minnesota Soybean Research & Promotion Council sponsored nutrition trials at the University of Minnesota, comparing low-oligosaccharide soybean meal with fishmeal in nursery pig and turkey diets. The research found that low-O soybean meal boosted feed efficiency in young animals.

“We put on industry forums where we presented this research to people in the feed business,” Sparby says. Jim Moline, president of Midwest Ag Enterprises in Marshall, Minnesota, attended one of the forums and thought low-O soybean meal would be a good fit for his company, which manufactures specialty feed ingredients.

AURI scientists worked with Moline's company to develop a cost-competitive method for manufacturing low-O soybean meal. Last spring, Midwest Ag Enterprises began commercial production of NutriVance soy protein concentrate.

Now, AURI is helping the company test a new use for NutriVance — farmed fish and shrimp diets. This work, in turn, could propel Minnesota's emerging aquaculture sector, Sparby says.

NutriVance could be “a perfect marriage with aquaculture opportunities right here at home,” Moline says. Today, “we send our feed products to Asia, and they send their fish back here. I think we could be a significant partner for Minnesota's new aquaculture farmers.”



**AURI and  
NutriVance**

## **Idea to reality:**

Midwest Ag Enterprises wanted to develop a high-protein soybean meal to replace expensive fishmeal in livestock diets.

## **AURI's role:**

AURI scientists worked with Midwest Ag Enterprises to develop a cost-competitive method for manufacturing low-O soybean meal, and along with the Minnesota Soybean Research & Promotion Council is sponsoring feeding trials.

## **Outcomes:**

Production of NutriVance is scaling up and they expect to produce about 2,000 tons of the feed per month by the end of 2016.



PHOTOS BY ROLF HAGBERG

Midwest Ag Enterprises developed a process to remove most of the indigestible elements of soybeans, leaving a high-protein meal that is easier for animals to digest.



# Can agriculture resid



PHOTOS BY ROLF HAGBERG

Gary Feyereisen and Todd Schumacher of USDA-ARS work to test agricultural fibers in a denitrifying bioreactor along with Elizabeth Selvik, University of Minnesota student.

## Research finds residues could remove nitrate from water

BY JONATHAN EISENTHAL

Since the beginning of agriculture, farmers have prided themselves on leaving nothing to waste.

A research project funded by AURI, Minnesota Corn Research & Promotion Council and the U.S. Department of Agriculture's Agricultural Research Service (USDA-ARS) could lead to farmers making use of agricultural residue in a device called a denitrifying bioreactor, which reduces runoff of nitrate from farm fields.

Bioreactor technology has been developing for a few decades, using wood chips as a medium. The Minnesota research project tested materials even closer to hand for the average farmer. Initial results show materials like corn cobs can be even more effective than wood chips in reducing nitrate run-off.

Nitrate is a vital food for plants. Manufactured nitrogen fertilizer has revolutionized modern agriculture, helping farmers to grow five times more corn, wheat, potatoes and other produce on the same amount of land.

The problem with nitrate comes when it escapes from farm fields. Scientists believe that high nitrogen levels in the surface waters of the Mississippi River Basin are a major contributing factor in the occurrence of a seasonal dead zone in the Gulf of Mexico, which harms marine life as well as the fishing and tourism industries that depend on it.

Since 2011, USDA-ARS agricultural engineer Gary Feyereisen has built a number of prototype bioreactors to test the denitrifying potential and flow characteristics of barley straw, corn stover and corn cobs, alongside the more conventional choice of wood chips.

"We found that these materials, corn cobs specifically, performed better than wood chips," said Feyereisen. "Ag residues offer carbon in a more labile form than wood chips, a form that's more easily broken down and provided to the denitrifying microbes. With wood chips, the carbon is tied up in lignins and longer molecular chains, which are harder to break down.

"Unfortunately, the ag residues are going to be used up quicker. We saw that particularly with barley straw and corn stover. Even after five months they were starting to be used up, and the rates of denitrification were dropping. The results suggest that if we could design a modular bioreactor—one that could easily be emptied of the exhausted medium and then refilled—we could achieve the kind of nitrate reduction we are hoping for."

Another key finding of the research is that these agricultural residues perform better than wood chips under cold temperature conditions.

"We wanted to test [ag residues] at colder temperatures," explains Feyereisen. "There hasn't been much work done on that. We know that in the Upper Midwest, especially in Minnesota, much of the farm field drainage occurs during April and May when the ground temperatures are cold and the water is cold. In places south of here, they are not quite as cold, and they do quite well with wood chip-filled bioreactors. We wanted to see if there is any advantage to using these agriculture residues under the cold temperature regime."

Feyereisen and his graduate student assistants set up bioreactor columns in a room that could be chilled to 35 degrees Fahrenheit.

The reason temperature is a critical factor for bioreactor performance is that the chemical mechanism for denitrification is, as the name suggests, a biological one. Microbes establish colonies on the media inside the bioreactor. Water containing nitrate drains from the farm field and flows through the bioreactor where the microbes use the nitrate for respiration and convert it to gaseous nitrogen. This nitrogen gas is released harmlessly into the atmosphere, which is 78 percent nitrogen.

"The good news is that agricultural residue works better than wood chips under those cold weather conditions," says Alan Doering, senior associate scientist at AURI, who played a supporting role in Feyereisen's project—sourcing and preparing the ag residues so that they would match what a farmer would use.



# Can we help clean water?

“The other critical performance parameter for bioreactors is the hydraulic properties of the materials,” says Feyereisen. “Wood chips work well in terms of flow, so we used that as a standard for comparison to these other materials. We don’t want to have things that are too tight, restricting the flow of water. On the other hand, we don’t want spaces that are too big. That wouldn’t provide the intimate contact between the biofilm and the water passing through the bioreactor bed. So we built a ‘permeameter’ specifically to test flow.”

“We thought corn stover and corn cobs might stop up the bioreactor, but we were pleasantly surprised to see that both of these media have good flow characteristics,” says Doering, who noted that the cobs remained whole, while they put the stover through a chopper that any farmer might use, to create particle lengths of several inches for the stover and straw media.”

Feyereisen’s project now moves into a field testing phase. “We are hoping that by using a new modular design for bioreactors, they will be more user-friendly for the farmer,” explains Becky Philipp, who serves as project manager for AURI. “Once the material has been depleted, it can be taken out and placed back on the land. We won’t know how well that works until we conduct the field trials, but we’re hopeful that the spent media will provide organic matter and additional fertility to the soil.” Experts evaluating the adverse effect of nitrate runoff have set a goal of 45 percent reduction in nitrate loss from farm fields, Feyereisen notes.

Philipp noted that projects like this are an ideal form of public-private partnership. AURI served as the fiscal agent, funding partner and project partner, providing technical and laboratory assistance as well as project management resources. The Minnesota Corn Research & Promotion Council provided funding and USDA-ARS provided research expertise and in-kind funding. The University of Minnesota provided space and materials at its St. Paul campus.

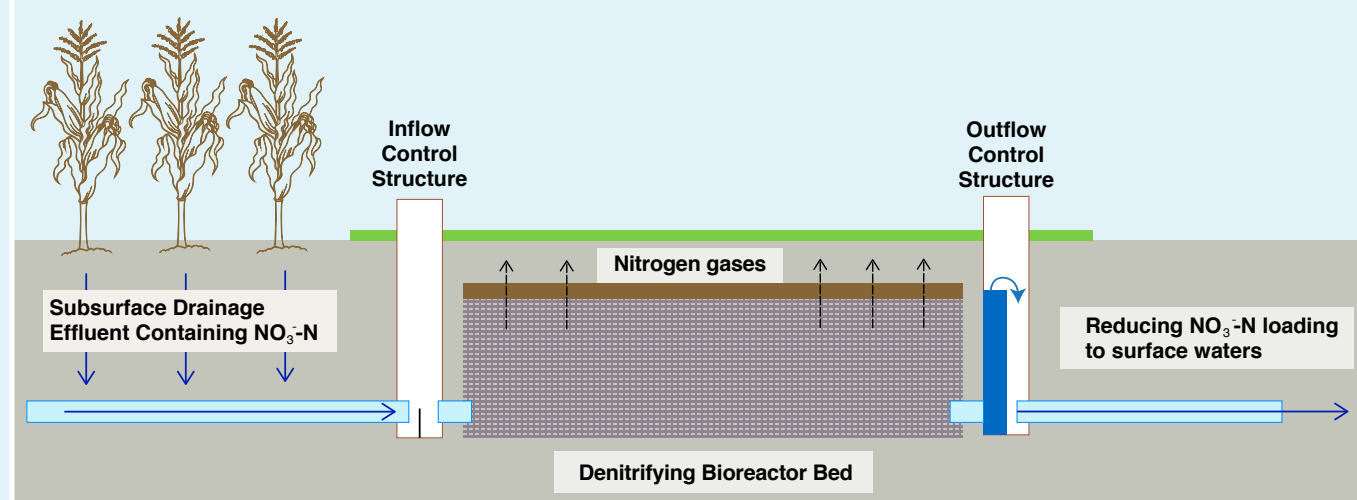
“As the project developed, conference calls brought this diverse team together,” Philipps says. “The result can be a benefit for farm producers and the general public.”

“Nitrate fits the farmer’s definition of a weed. As they say, it’s like a plant out of place. When it’s in the right place it plays an essential role, but outside of that context, nitrate becomes a problem,” concludes Feyereisen. “We’re hoping bioreactors can be part of the solution.”



Initial results show materials like corn cobs (pictured above) can be even more effective than wood chips at removing nitrates.

## Schematic of a denitrifying bioreactor



Traditionally, bioreactors have utilized media as such as wood chips, while this new project tested materials even more readily available to farmers.



# Sweet Success

New gourmet honey butter spread continues to expand its market and appeal to consumers



Velvet Bees Gourmet Honey Butter spread will soon be available in 22 states with plans to continue reaching new markets.

BY BRITTANY GILBERTSON

A new Minnesota food product is finding its way into stores nationwide thanks to production improvements for Velvet Bees Gourmet Honey Butter. Created by Krista and Steve Aspinwall in 2011, the honey butter will soon be available in 22 states with plans to continue reaching new markets.

The founders were living in New Mexico and looking for their next job opportunity when they landed on a move to Minnesota. Krista's mother urged the couple to consider creating a business with her honey butter recipe. Throughout its growth, the company has remained family-owned.

When the Aspinwalls first began production, they produced five jars per batch. Since moving into a commercial production space, the company now produces 40 jars per batch. To support developing a plan for increased production, Velvet Bees contacted the Agricultural Utilization Research Institute (AURI).

"We felt reaching out to AURI would be beneficial. We are at a place in our growth where we need advice about how to scale up production, to determine if our process lends itself to a co-packer, to identify equipment to improve our current fully hand-crafted process and to expand our line to include other flavors," said Krista Aspinwall, cofounder of Velvet Bees Gourmet Honey Butter.

"AURI's technical consulting team serves food entrepreneurs who are developing and commercializing new products for retail outlets," said Donna O'Connor, scientist of food & nutrition. "For the honey butter, AURI has provided assistance with nutrition facts labeling, regulatory review, local ingredient suppliers, scaling-up batches and new flavor development. Scientists are also assisting with various aspects of stability assessment, product analytical testing and equipment evaluations."

A proprietary process blends five ingredients – honey, butter, cream, sugar and vanilla – to create a delicious product with the right texture for easily smearing on toast as well as drizzling over cheese and adding into sauces. The sweet and savory uses helped fuel growth. The company, with AURI's support, is conducting taste test panels to assess consumer acceptance and competitive brand comparisons.

The all-natural product first sold in Minnesota farmer's markets. Introduction to specialty food retailers brought the product out-of-state. Now, Velvet Bees Gourmet Honey Butter has saturated the Twin Cities market with 75 regional locations including local co-ops, Kowalski's, Lunds & Byerlys, Surdyk's and other retailers.

"The refrigerated dips and spreads category is growing," said O'Connor. "Market trends indicate that the consumer is buying unique flavors with natural, clean-label ingredients. Velvet Bees Gourmet Honey Butter fits into this trend given its versatility in use, whipped full-fat texture and delicious honey-vanilla flavor."

Especially around the holiday season, unique artisanal products are in high demand. Velvet Bees Gourmet Honey Butter just finished one of its busiest production seasons and is looking to achieve greater growth throughout 2016.

"We make a product that is well received and enjoyed by thousands of people. The feedback we get is encouraging and inspiring," said Aspinwall. "We hope to expand nationally and be available at large grocery store chains – without losing that hand-crafted nature of a very special product. We are thrilled to be included in the work and resources that AURI provides that will assist us in taking our little company to the next level and beyond."



## AURI and Velvet Bees

### Idea to reality:

Krista and Steve Aspinwall's move to Minnesota turned a family recipe for honey butter into a whipped, creamy gourmet spread and a national business.

### AURI's role:

AURI scientific staff Donna O'Connor, Ranae Jorgenson and Carissa Nath helped with labeling, sourcing ingredients and suppliers, product testing and stability, scale-up and regulatory review. Sensory panels are currently being conducted.

### Outcomes:

The company has a large regional presence in specialty markets and grocery stores, and will soon be sold in 22 states. The Aspinwalls just finished one of its busiest production seasons and is looking to achieve greater growth throughout 2016.



PHOTOS BY ROLF HAGBERG

Krista and Steve Aspinwall, cofounders of Velvet Bees Gourmet Honey Butter.



# New national program a complement to AURI



JENNIFER WAGNER-LAHR

The 2014 Farm Bill authorized the creation of an independent foundation designed to catalyze innovation to solve pressing challenges in food and agriculture. The Foundation for Food and Agriculture Research (FFAR) was created in part because there has been a steady decline of dollars invested globally into agriculture research.

When announcing the creation of the FFAR, Agriculture Secretary Tom Vilsack said “Studies have shown that every dollar invested in agriculture research creates \$20 in economic activity. Investments in innovation made over the past several decades have developed new products and new procedures that have been critical to the growth of American agriculture.”

The Foundation will fund cutting-edge research and development; create public-private partnerships; convene stakeholders and thought leaders to foster collaboration; and build human capacity to advance innovation. The FFAR is a public-private partnership that will fund research into issues such as plant and animal health; food safety, nutrition and health; renewable energy, natural resources and environment; agricultural and food security; and agricultural systems and technology.

If the principles behind FFAR sound familiar, they should. More than 25 years ago AURI was created by the Minnesota legislature to foster long-term economic benefit for Minnesota through value-added agricultural products. AURI’s mission and that of the FFAR are very complementary.

AURI leadership has met with FFAR staff on several occasions to discuss opportunities for collaboration, to provide feedback and to offer support. In October, AURI board chair

Ron Obermoller addressed the FFAR board of directors at their first public session about the link between research, entrepreneurship and economic development.

“Research is the beginning,” Obermoller said. “We need great ideas coming out of our nation’s research institutions and we need those innovations to be successfully applied by businesses to capture their economic impact. Providing creative mechanisms to entice businesses and entrepreneurs to assume risks associated with innovation is vitally important. The Foundation’s support of businesses and entrepreneurs as they endeavor to commercialize new technologies could be an important component of catalyzing innovation to solve pressing challenges in food and agriculture.”

The FFAR has announced their first programs. The first is a New Innovator in Food and Agriculture Research Award in which FFAR will support up to 10 early-career scientists with up to \$200,000 per year. The award is designed to give recipients three years of financial support to pursue highly innovative research in one or more of FFAR’s focus areas and to act as mentors to the next generation of standout scientists in food and agriculture.

The second program is the establishment of a Rapid Response Program that will identify critical issue areas where research needs to be done quickly.

We are very excited about FFAR because it recognizes the value and the importance of applied research as a way to generate economic growth, something that has been an AURI focus for many years. Having a renewed commitment to research on a nationwide level can only help spur agricultural innovation in the future.

*Learn more about FFAR at [foundationfar.org/](http://foundationfar.org/)*

“Studies have shown that every dollar invested in agriculture research creates \$20 in economic activity.”

—Tom Vilsack







BY SHANNON SCHLECHT  
AURI EXECUTIVE DIRECTOR

Thank you to all who have welcomed me during my first months as Executive Director for the Agriculture Utilization Research Institute (AURI). It has been a pleasure to meet so many of you who make up the innovation network that

# Continued innovation can help enable a bright future for Minnesota's food sector

turns Minnesota agricultural products into growing businesses, new products and jobs for our state.

AURI helps develop new uses for agricultural products through science and technology, partnering with businesses and entrepreneurs to bring ideas to reality. Our work in the four focus areas (biobased products, renewable energy, coproducts and food) assists entrepreneurs and growing businesses navigate the demands of entering the marketplace.

One industry undergoing a dramatic transformation right now is food production and processing – as consumer preference changes and retailers work to accommodate their needs. As an example, consumers increasingly want a local, sustainable and healthy product.

More than 200 food-related enterprises have turned to AURI in recent years for guidance on recipe review, reformulation, scale-up, nutritional labeling, food safety and regulatory guidance. One way to support these innovators and entrepreneurs is with a commitment to state-of-the-art facilities. AURI asked

for funding from the state bond fund to complete facility upgrades to laboratories located on the Southwest Minnesota State University (SMSU) campus.

Upgraded infrastructure will help address impediments facing the industry, such as:

- **Consumer Preference:** Building a new sensory lab and developmental kitchen will allow AURI clients and scientists to conduct taste tests with consumers, improving feedback throughout the entire product development phase.
- **Scale and Production Demand:** The transition from seasonal farmer's markets to stocking retailer shelves year-round is often a major challenge. Improvements will help with product development functions such as recipe batching and reformulations.
- **Industry Knowledge:** Our staff have extensive background in the food industry. AURI training provides entrepreneurs with regulatory and labeling guidance, food safety planning and more.

With the proposed upgrades to communications infrastructure at the Marshall facility, staff will have the ability to record, preserve and transmit training and provide greater assistance to our geographically diverse clients.

The facility upgrade will increase AURI's ability to both serve more clients as well as provide better service to bring ideas to reality in this developing area. In the past year alone, AURI has seen a 25 percent increase in food client work.

In addition to meeting growing client needs, the expansion at SMSU will serve as an important resource to train the next generation of food scientists and innovators as students from the Culinary and Hospitality Management program gain hands-on experience in the upgraded labs.

AURI's work in its focus areas is continuously underway to positively impact Minnesota's economy and we hope to be able to expand AURI's offerings to Minnesota's food entrepreneurs and businesses in the food area with a successful bonding outcome.

## ELSEWHERE IN AG INNOVATIONS

BY ASHLEY HARGUTH

*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.*



### New ethanol plant on the block

DuPont has opened its newest \$225 million cellulosic ethanol plant in Nevada, Iowa which will produce ethanol from cornstalks, leaves and cobs instead of the kernel, which is most common in production methods. DuPont has integrated new technologies into the plant, which is being billed as the largest cellulosic plant in the world. The company plans to use the same bacteria distillers use to make tequila to produce 30 million gallons of ethanol per year as opposed to using yeast as is done across the wider industry.

Oilseedandgrain.com, November 2015

### "Berry" good meat

An EU-funded research project is aiming to make sausages, patties and other meat products healthier. Researchers at Lund University in Sweden, the Swedish University of Agricultural Sciences and four other European research institutions have launched a joint project to reduce the risk of colon cancer.

This project involves extracting antioxidants from plants and berries, and then adding them to meat products. Testing will be done afterwards to show whether or not this reduces the occurrences of cancer.



According to the reserachers hypothesis, minimizing the oxidization in processed meat products will lead to the reduction of colon cancer.

Medical News Today, November 2015



### Catching toxins on film

Digital cameras have been incorporated into a new system to detect pathogens that can cause foodborne illnesses. The new system, developed at the U.S. Department of Agriculture's Agricultural Research Service, measures active and inactive Shiga toxin activity as effectively as equipment that costs 100 times more. Shiga toxin

is a product of E.coli O157:H7, and is a major concern for the food industry, as it causes an estimated 73,000 cases of food poisoning each year. This new system is easy and affordable to use and will be useful in developing countries where the risk of foodborne illness is greater.

USDA-ARS, September 2015

### Growing more oil

Plant-derived oils are widely used all over the world both for food and industrial purposes. In recent years they have also attracted attention as raw materials for potential biofuels and bioplastics that are friendly to the environment. Because of these new uses, the demand for vegetable oils is expanding year by year. Researchers in Japan have succeeded in inducing the genes involved in oil synthesis in seeds to work for longer periods of time, thereby allowing them to accumulate more seed oil. The study showed that the length of the oil synthesis phase in seed formation is one of the primary factors in determining final oil content. By suppressing protein synthesis while extending the oil synthesis period, researchers also succeeded in achieving further increase in oil production.

Dr. Kanai of the research group, said "By applying the current results to crop breeding, prolonging the period of oil synthesis will generate many new crops with high oil content."

Sciencedaily.com,  
November 2015





## AURI'S CORE FOUR QUIZ

How much do you know about AURI's core four areas: food, renewable energy, coproducts, and biobased products? Take the below quiz.

### Food Products

What are reasons salt is added to food?

- a. Preservative
- b. Flavor
- c. Both a and b

Answer : c

### Renewable Energy

What is biogas?

- a. A short biography on how gas is made
- b. Gas produced by the breakdown of organic matter in the absence of oxygen
- c. Gas made from biotin

Answer : b

### Coproducts

How many tons of DDGS, Dried Distillers Grains with Solubles, are produced each year in the U.S.?

- a. 192,000
- b. 2 million
- c. 30 million

Answer : c

### Biobased Products

The biobased products industry contributes how much to the American economy?

- a. \$369 billion
- b. \$2.7 million
- c. \$852,000

Answer : a

## ABOUT AURI

The Agricultural Utilization Research Institute (AURI) helps develop new uses for agricultural products through science and technology, partnering with businesses and entrepreneurs to bring ideas to reality. AURI staff are skilled at walking clients through the entire development journey of bringing a new product or process from idea to reality.

## Service Areas: What AURI Provides

### Applied Research

Through practical, applied research we identify emerging opportunities to add value to agriculture products. This information is publicly available in order to help entrepreneurs and businesses generate ideas for new products and processes.

### Hands-on Scientific Assistance

Scientists are available to provide consulting and technical services in the areas of:

- Product and process development
- Product evaluation and testing
- Sourcing materials equipment and services

### Innovation Networks

When deciding the feasibility of a new product or process, it is critical to have access to industry experts and a science-based network of people. With a broad range of networks, AURI can help bring together the right people at the right time to help bring new products and processes to market.

## Learn More

- Contact one of the AURI Offices to speak with a project development director about your business.
- Visit [auri.org](http://auri.org) to see the latest research and learn about upcoming events.
- Sign up to receive the *Ag Innovations News* or the AURI electronic newsletter to stay informed about AURI projects and clients.
- Become a fan on Facebook or follow us on Twitter



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PHOTO BY ROLF HAGBERG

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# earthclean

## Company honored with 2015 award for its cornstarch-based fire suppressant



AURI, with the help of the Minnesota Corn Research & Promotion Council and Minnesota Soybean Research & Promotion Council, is currently working to help EarthClean develop TetraKO as a Class A fire retardant and obtain USDA Forest Service certification.



AURI Executive Director Shannon Schlecht (left) and Board Chair Ron Obermoller (right) present Jim Grabek of EarthClean with the 2015 Ag Innovator of the Year award.

BY BRITTANY GILBERTSON

EarthClean Corporation was selected as the 2015 Ag Innovator of the Year – given annually by the Agricultural Utilization Research Institute (AURI) – for TetraKO™, a cornstarch-based fire suppressant with unique physical properties and dispersion methods.

“EarthClean Corporation exemplifies the ingenuity and excellence in innovation we look for when awarding Ag Innovator of the Year. They are to be commended,” said Shannon Schlecht, AURI executive director. “Honors such as this underscore the fact that the utilization of agricultural commodities and coproducts not only expands market opportunities for Minnesota’s crops, but also creates new business opportunities and jobs in the state.”

“With TetraKO, our starch-based biodegradable fire suppressant, we have developed a product that uses simple, natural ingredients effectively,” said acting CEO Jim Grabek. “It’s a better way of fighting fires – particularly wildfires – since toxic products can’t be dropped near water or can harm wildlife.”

TetraKO was developed in collaboration by two chemists, a manufacturing engineer and a firefighter. It is a cornstarch-based granulate product added to a water tank to form a gel. The gel can be sprayed using typical firefighting equipment. When the solution exits the nozzle, it re-forms into a gel that adheres to trees, brush or structures, holding water molecules in place and absorbing the heat of the fire. The fire is extinguished more effectively than water alone.

The research was also supported by the Minnesota Soybean Research & Promotion Council and Minnesota Corn Research & Promotion Council. “We are very pleased that TetraKO is coming forward in development. With the drought related fires we saw in the western U.S. this past summer, having a biodegradable product that can be used to control large scale fires, as well as have the

potential for smaller scale use, is very exciting for Minnesota corn growers,” said Paul Meints, PhD, Minnesota Corn research director. “Minnesota Corn is proud to be a partner in the development of this product as another innovative use for Minnesota grown corn.”

Though the product has been evaluated by a number of the world’s leading firefighting institutions with impressive results, it is the addition of TetraKO to the U.S. Forest Service Qualified Products List (QPL) sometime in the spring of 2016 that will be a significant milestone for the company because it will allow TetraKO to be used on all federally managed land. The QPL protocols evaluate products for toxicity, corrosiveness, biodegradability and stability under typical outdoor storage conditions. EarthClean also intends to expand the introduction of TetraKO with trials in the southern hemisphere during its 2016 firefighting season, in countries such as Colombia, Argentina and Brazil.

Though market expansion will take EarthClean worldwide, the company is Minnesota-based. “Any time you’re recognized by the state you live in and love, and by the industry that supplies and delivers a major component of your product, it’s a major honor,” said Grabek, speaking about the Ag Innovator of the Year Award. “We couldn’t be more thankful for AURI and the state’s support. We’re solving problems utilizing resources Minnesota is known for.”

“AURI helps industries find new uses for traditional, unexplored or overlooked products,” said Michael Sparby, senior project strategist with AURI. “By supporting new and expanding companies, we work to foster long-term economic benefit to the state. It was an honor to assist EarthClean during the U.S. Forest Service testing trials and provide product development guidance for the reformulated liquid version of TetraKO. EarthClean Corporation is a wonderful example of a company poised for long-term success.”

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