



Ag Innovation News

Oct-Dec 2017, Vol. 26, No.4

The newspaper of the Agricultural Utilization Research Institute



POP!

Business is popping
for AURI client, Smude
Sunflower Oil!

Pages 6-7

PHOTO BY ROLF HAGBERG



AURI Residence Program
Pages 4-5



Craft Brewery Field Day
Page 8



Responding to Growing Demand
Page 9



Rebuilding an Industry
Page 10



BY SHANNON SCHLECHT
AURI EXECUTIVE DIRECTOR

Minnesota: An Unparalleled Ecosystem of Innovation

The state of Minnesota has a long and storied history when it comes to food innovation. From developing the first truly winter hardy grape for wines that ushered in the state's first vineyards, to the first commercial freight-cooling system, which allowed food delivery routes to increase exponentially, Minnesota is no stranger to finding food and ag solutions for some of the toughest problems. Today, I'm proud to report that tradition continues to thrive throughout the state. So much so, that that it would be accurate to refer to Minnesota's innovative culture as a robust ecosystem, with various organizations and groups supporting entrepreneurs and each other for the good of the state.

In this edition of the *Ag Innovation News*, I'd like to highlight a number of organizations, competitions and events throughout Minnesota that play a meaningful role in the food and ag innovation ecosystem. Each of them have been good partners for AURI and I hope you will spend some time learning more about them.



Midwest Pantry

Established in 2010, Midwest Pantry is a frequent AURI partner dedicated to formalizing Minnesota's food creator community to make the state the best place to start and run a food business. Having worked with more than 300 local food companies to increase their sales through educational and networking opportunities, it is no surprise that Midwest Pantry was a recipient of the Minneapolis Business Journal's 2015 EUREKA! Award for Innovation.

Learn more: midwestpantry.com



University Enterprise Laboratories (UEL)

UEL is a valuable resource in Minnesota's innovation ecosystem. Its vision is to facilitate the growth of Minnesota's next generation of life-science and complementary technology companies. As a non-profit organization with first-class facilities, coupled with targeted programming and services, UEL serves entrepreneurs and others throughout the region's greater life science ecosystem.

Learn more: uelmn.org



CleanTech Open Midwest

This is a non-profit clean-tech accelerator program, for startups and veteran companies, with the mission to find, fund, and foster entrepreneurs with novel ideas to solve our greatest environmental challenges. It is a 6-9 month business accelerator program which connects clean-tech companies with the people and resources that will provide a national platform for public visibility and accelerate their success. Companies accepted include water, energy generation/storage and efficiency, advanced materials and chemistry, green construction, agriculture (food and fiber), mobility/transportation and information technology. Since its inception in 2010 the 13 state Midwest Region, headquartered in Minnesota, has worked with more than 100 start-up companies that have gone on to raise over \$25 million in external capital.

Learn more: midwest.cleantechopen.org



MN Cup

The MN Cup is the largest state startup competition. Four years ago, the MN Cup launched a food /ag/ beverage division which grown from 62 entrants in 2014 to 92 in 2017. AURI is a proud supporter of MN Cup, providing expert staff as judges in various categories.

Learn more: carlsonschool.umn.edu/mn-cup



Grow North

Grow North is a resource and connection for Minnesota's food and ag entrepreneurial ecosystem. It works to accelerate growing startups and the organizations that support them through large scale events, education and mentorship programming, as well as providing tools, resources and support. Their goal is fewer clicks and coffees so entrepreneurs can focus on growing their business.



AURI Innovation Network Programs

AURI is behind some of the most frequently held events supporting Minnesota's innovation ecosystem. From its long-standing Renewable Energy Roundtable events to its recent New Uses Ag Innovation Forum, AURI is dedicated to leading and collaborating in the development of innovation opportunities throughout the state and the Midwest. Thanks to the Innovation Network Programs, Minnesota entrepreneurs and visionaries always have resources, networking opportunities and facilities at their fingertips.

In closing, I hope you will take some time to learn more about these organizations and the many other vital partners and the role they play in supporting Minnesota's food and ag innovation ecosystem.

In the meantime, I hope you enjoy the articles in this quarter's edition of *Ag Innovation News* that highlight a number of local innovators contributing to the areas of food, renewable energy and more!

Board Spotlight

Q&A with board member,
Ron Obermoller.



BY AURI

This edition of the *Ag Innovation News* brings you an interview with AURI's Board Chair, Ron Obermoller. Ron is a dedicated leader for the organization and brings a wealth of agricultural knowledge to the board, thanks to his many years as a farmer and leader in other commodity groups. As you will see, his insight into value-added agriculture and vision for the future of AURI will play a major role in the organization's direction in the near future.

AIN

Which commodity group do you represent?

I represent the Minnesota Soybean Council.

RO

AIN

Please give us some highlights around your ag background.

RO

I'm a fourth generation farmer on a century-old farm near Brewster MN. I've worked on research for ten years with the state corn growers and on the national level for corn. On soybeans most of my efforts have been with New Uses and Production teams. I've been lucky to be able to work with lawmakers both on the state and federal levels. I have worked with the startup of the Minnesota Soybean Processors, which put me in a position to help develop the biodiesel industry.

AIN

With your background, which of AURI's focus areas offer the greatest opportunities for soybeans?

RO

It really depends—They are all great opportunities. In **Food** there are advances being made on several fronts for soybeans from gene splicing to change the amino acid mix to better quality oils, to processing to make the meal more digestible and desirable. **Coproducts** are very important to soybeans because twenty percent of the bean after processing is a coproduct. It all increases the value of a commodity grown in Minnesota, which in turn improves Minnesota both rural and metro. **Biobased** might have the most potential of all, but it is going to take time both for the technology and markets to be developed to reach some of its potential. There is no better place to develop a center of excellence than in Minnesota. **Renewable Energy**: Is a growth area by improving the product and the public acceptance, but it will be a very competitive world competing with the new technology developing in the oil fields.

That being said, I like coproducts in the near term for opportunities with biobased and food for the long term.

AIN

What direction do you see value-add agriculture going over the next three years?

RO

I see value-added agriculture becoming more specialized. In soy, for example, a protein profile for a specific market, for aquaculture, starter diets for baby pigs or newly hatched pullets.

AIN

What would you like to see AURI accomplish during your term on the board?

RO

In one word GROW: there are so many opportunities out there and we need to work with more of them.

AIN

As a leader of Minnesota Soy, what kind of future collaboration would you like to see with AURI?

RO

I'm impressed with the collaboration the two organizations have developed over the past few years. There are times when AURI pushes the soybean organization and times when they push AURI, which I see as healthy for both organizations. It would be advantageous for the two organizations to work together more on legislative opportunities.

AIN

What do you hope to accomplish during the next two to three years?

RO

There is so much demand for AURI's services I hope to grow our capacity to do more projects in a timely manner. Plus use our labs also for our own initiatives that benefit MN. All of which takes money, so a large part of expanding AURI involves widening our financial base.

AIN

What kinds of projects/initiatives do you feel have the best opportunities in MN today?

RO

It seems like a lot of the exciting projects come from people who have been working in their jobs for years and have had this idea in the back of their mind and now have the time or money to move their idea forward. I don't feel like we can tell the future well enough to make the call which opportunities are the best so we need to work with as many as we can.

AIN

What are your goals in leading the AURI Board of Directors?

RO

My goals are to keep the board engaged. I hope for an active board, not a board of yes men/women. The board's job is to set direction for the organization. To accomplish this we need a knowledge base to work from, I hope to accomplish this by engaging the board with the staff and education on topics needed for future decisions.

AIN

What do you see as the AURI Board of Directors' greatest strength as a group?

RO

As a group, it is our love of Minnesota agriculture. A close second is our diversity of thought.

PHOTO BY ROLF HAGBERG



Filling An Unmet Need

PHOTOS BY ROLF HAGBERG

AURI's Entrepreneur in Residence Program Provides Vital Resources for Innovators

BY DAN LEMKE

It's not easy being on the cutting edge. Entrepreneurs and startup business face numerous hurdles on their path to success, but generating an innovative idea worth investigating isn't usually one of those roadblocks. The challenge comes in having the right resources to take the concept to commercialization.

Having worked with innovative businesses for more than 25 years, AURI leadership recognized that Minnesota faced a void that was limiting the development opportunities for some businesses.

"We looked at the challenges facing entrepreneurs and most of them weren't about having good ideas with merit," says Rod Larkins, AURI senior director of science technology, "they had to do with facilities and expertise."

Larkins says that for entrepreneurs, especially those whose products or processes are heavily science-based, affordable resources to help further develop their product or process are often lacking or nonexistent. Because AURI already provides scientific and technical assistance to innovative companies, Larkins had an "a-ha" moment.

"The more I looked, the more I saw the opportunity to make AURI lab space available to these scientists," Larkins says.



An Innovative Approach

AURI responded by creating the Entrepreneur in Residence program. Approved clients whose projects are vetted and are seen as providing a benefit to Minnesota agriculture from AURI involvement can gain access to AURI's facilities and the accompanying expertise available at laboratories in Marshall, Waseca and Crookston under this program. Potential projects can fall under any of AURI's four focus areas including biobased products, food, renewable energy or coproduct utilization.

"It's a perfect fit for AURI's mission because our job is to help make entrepreneurs successful," Larkins says. "We're here to work on increasing the volume and value of commodity utilization—the Entrepreneur in Residence program helps us fill that role in a unique way."

Scientific laboratory facilities can be very expensive to build and few opportunities exist for Minnesota start-up companies to access standing facilities or supporting expertise needed to help develop their products or process.

"Laboratory space and equipment can be major barriers to moving technical innovations forward due to the high cost of rent and equipment," says AURI Executive Director Shannon Schlecht. "There are a limited number of wet laboratory spaces available in Minnesota for new businesses to utilize in their early stages. AURI is fortunate to have those resources. The idea is to provide space to conduct the initial bench scale experiments to show proof of concept and then have a company graduate to their own facility if the first stage is successful."

Approved companies are trained on safety procedures and equipment operation as part of their Entrepreneur in Residence agreement. In addition to the tools and equipment, entrepreneurs gain access to the technical expertise of AURI staff who work in the laboratories.

"The entire organization has embraced it," Larkins says. "They see the value. It is a work in progress, but we've seen success from it already and we hope to grow the program."



The First

Goutham Vemuri knows the challenges technology-based innovators face. Vemuri is founder and chief technologist for Sasya, a Minnesota-based startup company that focuses on producing chemicals and nutraceuticals. Vemuri says those products are typically produced from petroleum, which make them susceptible to oil price volatility and socio-political fluctuations.

“We are developing sustainable technology to produce chemically and structurally identical counterparts to oil-derived products that use agricultural residues and waste as the starting material,” Vemuri says.

Vemuri became the first AURI Entrepreneur in Residence, working in AURI’s Marshall facility. Given Sasya’s focus on adding value to agriculture products and waste, and AURI’s mission to enhance and incentivize agriculture products, Vemuri says there was a natural synergy in the partnership between his company and AURI.

“Hands down, the biggest value of being in the program is the access to the lab space, which is a very precious commodity in Minnesota,” Vemuri says. “As a startup, we are always looking to stretch our dollars without taking too many short-cuts. AURI opened their doors for us and allowed us to work shoulder-to-shoulder with their scientists. We have access to the considerable capital equipment infrastructure as well as technical and industry resources. Such a resource would not have been available for us in the Twin Cities even if we could have afforded it.”

Many entrepreneurial efforts fail because they lack the resources to demonstrate the feasibility of a new concept, particularly in research and development-intensive fields. Vemuri says having access to AURI resources means that Minnesota high-tech businesses and entrepreneurs now have a very credible means of demonstrating their ideas.

“Transitioning from ‘hand waving’ to having a tangible product is all the difference between success and failure,” Vemuri adds.



Opening the Door

Access to facilities like the AURI labs can help innovators prove their concept on a benchtop scale. That proof of concept is often necessary to attract investors and business grant funds.

“This program is a perfect complement to AURI’s current efforts of technical and financial assistance,” Schlecht says. “AURI operates laboratory facilities and the Entrepreneur in Residence program provides greater utilization of those spaces and equipment. The program can also help businesses attract additional research dollars from other sources by leveraging AURI resources and expertise to advance the concept to the next stage.”

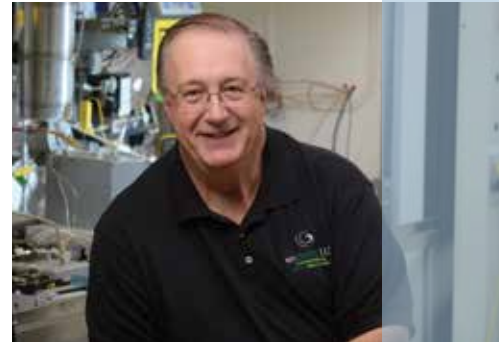
In addition to achieving Entrepreneur in Residence status, Vemuri is also receiving assistance through a program delivered by the Minnesota Department of Employment and Economic Development (DEED). The Innovation Voucher Pilot Program provides financing to small businesses to purchase technical assistance and services from public higher education institutions and nonprofit entities to assist in the development or commercialization of innovative new products or services. Vouchers can be used by a small business to access technical assistance and other services.

“One of benefits of the Voucher program is connecting entrepreneurs developing innovative new technologies with our publicly supported research and commercialization infrastructure,” says DEED’s Brandon Toner. “Public supported research is a foundation for future innovations and industries that will continue to make Minnesota competitive in the changing world economy. Based on the demand we’ve seen for the Innovation Voucher program, there is need to lower the cost and risk to commercializing innovations to accelerate market entry. Affordable and accessible lab space and expertise is a key part of that.”

“Through the Entrepreneur in Residence program at AURI, we were able to reduce our ideas to practice and file patents,” Vemuri adds. “We were able to attract federal and state funding.”

For Larkins, Vemuri’s success is an example why the Entrepreneur in Residence program was developed.

“Goutham is creating intellectual property and putting together the core of a new business,” Larkins says.



The Next Innovator

Minneapolis-based enVerde is the second start-up company approved to operate through the Entrepreneur in Residence program. It is working to commercialize breakthrough technology acquired from the University of Minnesota that can convert a wide range of organic material into synthetic gas, or syngas.

“Anywhere that natural gas or propane is used, we can use the syngas we produce,” enVerde CEO and Founder Dave Goebel says. “We can take a waste product and upgrade it to a clean energy source.”

enVerde will also utilize laboratory facilities in Marshall to further develop their sophisticated gasification process. Proving the concept on a larger scale will help to push the process toward commercialization.

“This really is a breakthrough that can reduce waste and transform it into clean energy without adding to our carbon footprint,” Goebel says.

The proprietary process has the potential to not only reduce waste and produce energy, but Goebel says there is a strong economic component. “It works economically,” Goebel explains, “which allows us to have a strong economic development component. We will be able to work with companies to employ people.”

Goebel says AURI’s reputation for helping foster innovation and commercialization made applying to participate in the Entrepreneur In Residence program an easy sell. “We will be doing scale-up work in clean energy technology,” Goebel says. “Scale-up is the missing piece that we need to get our process perfected. AURI is key to that pre-engineering work.”

enVerde expects to push the limits of the technology in order to apply what the company learned to the engineering of its first commercial plant.



Filling a Need

Goebel agrees that laboratory space for emerging companies like enVerde is difficult to find. AURI provides the added benefit of delivering technical expertise to help smooth out the scale-up process and set the course for commercial success.

As with other AURI programs, the Entrepreneur in Residence program is designed to increase the likelihood that entrepreneurial companies will find success in the marketplace and add value to Minnesota crops or coproducts.

“Due to the continuing support from the state, the program is able to provide a low cost, low risk option to entrepreneurs for moving an idea to the market,” Schlecht says. “These ideas have the potential to create new demand for Minnesota crops and processing coproducts through new value-added uses, and this program provides a critical first step to help take those ideas to reality.”

Vemuri says his company is moving forward in development. They have made advancements in some of the critical portions of their technology while identifying new challenges. Sasya is addressing the challenges and Vemuri says each step brings them closer to commercial fruition.

“We just took the first few steps in the proverbial commercialization journey of a thousand miles,” Vemuri says.

To learn more about the AURI Entrepreneur in Residence Program, visit www.auri.org.

To learn more about the Entrepreneur in Residence program, or any of AURI’s other programs, visit auri.org.



POPCORN

Smude's introduces microwave popcorn heart-healthy sunflower oil

BY LIZ MORRISON

Business is popping at Smude's Sunflower Oil in Pierz.

Seven years ago, Tom and his wife, Jenni, central Minnesota cattle farmers, began working with AURI to develop Minnesota's first cold-press sunflower oil manufacturing company. Now, Smude's Sunflower Oil is expanding into microwave popcorn.

The fast-growing company's newest product is made with Smude's heart-healthy sunflower oil. Tom and Jenni Smude launched Smude's Brand Microwave Popcorn in August and it's already available at major grocery store chains, including Coborn's and Lunds & Byerlys.

Smude's Brand also includes cold-pressed, high-oleic sunflower oil and flavored sunflower dipping oils. Their cold-press process uses no chemicals or heat, which maintains the oil's natural flavor and nutrients, says Tom Smude.

AURI has worked with the energetic Smudes since 2010, when they founded their on-farm sunflower crushing enterprise. "Tom and Jenni are true entrepreneurs," says Michael Sparby, AURI senior project strategist. "Food ventures are particularly challenging," he adds. "They've done a good job at building their brand."

A FAVORITE SNACK

Popcorn is one of America's favorite snacks. In fact, Americans consume about 14 billion quarts of popped popcorn a year, according to industry group, the Popcorn Board. That translates to roughly 43 popped quarts per person, annually!

Sunflower oil is a natural for popcorn, Tom says. Like olive oil, sunflower oil is high in monounsaturated fat and Omega fatty acids, which help lower "bad" cholesterol. It's also high in Vitamin E, a natural preservative. It holds up under high cooking temperatures and has a light, buttery taste. Mann Movie Theatres already use Smude's Sunflower Oil in their commercial corn poppers.

With the majority of popcorn, 70 percent, consumed at home, microwave popcorn was a logical way to extend the market for Smude's sunflower oil, Tom says. "People kept telling us we should make a microwave popcorn. We all lead such busy lifestyles, so microwave popcorn has an advantage."

WHOLESOME SNACK

Smude's Brand Microwave Popcorn contains just three ingredients: popcorn seeds, sea salt, and premium sunflower oil. That appeals to today's health-conscious consumers who want convenient, wholesome snacks with ingredients they recognize, says Ben Swanson, AURI food scientist.

Most microwave popcorn contains primarily saturated fat from palm or coconut oil, Swanson says. Because Smude's popcorn uses sunflower oil, it has far less saturated fat per bag than other brands, Swanson says — only about one percent, and the liquid oil coats the seeds uniformly for more even popping, he says. It reminds me of popcorn my grandma made on the stovetop. It has a very clean taste — no oily, fake butter taste.

Engineering a paper bag for popping that wouldn't leak liquid sunflower oil took some doing, Tom says. He worked with a packaging technology company to develop a patented bag design and seal. "We use a chemical-free bag without a wax coating."

AURI HELP

AURI provided nutritional analysis and labeling, shelf life testing, and salt content guidance. Those services are a great boon to start-up food companies, Swanson says. "The people we work with have great passion and belief in their products, but they don't have a lot of money for research and development activities."

To begin with, Tom and Jenni expect to process one semitrailer-load of popcorn a week. Smude's works with five Midwest food distributors and sells nationwide through its website.

Their target market is "the natural foods market and high-end grocery stores," Tom says. Smude's brown paper popcorn bag really captures "the natural foods vibe," Swanson says. "They are launching at a good time," he adds, "when the natural and local foods trends are in full swing."

Sparby seconds that. "The local foods movement is a bright spot for small food companies" like Smude's, which are commanding growing sections of supermarkets. "Many retailers are clamoring for local food products."



Smude Sunflower Oil is pressed and packaged at their Pierz, Minnesota facility.



Smude's Brand Microwave Popcorn is already available at major grocery store chains, including Coborn's and Lunds & Byerlys.

PAIR

Popcorn made with flower oil

AN ENTREPRENEUR'S STORY

Persistence wears down resistance.

BY LIZ MORRISON

Tom Smude remembers a bit of advice he received early in his career: "Persistence wears down resistance."

That counsel guides him now as he works 90-hour weeks to build a new food brand.

"It takes a lot of work to bring a food product to market," says Michael Sparby, AURI senior project strategist — and, of course, there's no guarantee of success. However, "Tom is determined and relentless."

"My wife would say crazy!" Smude jokes.

Seven years ago, Tom and his wife, Jenni, central Minnesota cattle farmers, started Minnesota's first cold-press sunflower oil manufacturing company. It all started with droughts in 2007 and 2008, which hammered crop yields, and forced the Smudes to buy expensive cattle feed. So they looked for an alternative crop to diversify risk on their sandy soils.

Sunflowers require much less water than corn or soybeans. In 2010, they set up a cold press on their farm near Pierz, Minnesota to crush their first sunflower harvest for livestock feed and oil.

Initially, the Smudes viewed sunflower meal as their primary product. It's a nutritious feedstuff, comparable to soybean meal in protein and energy content. The oil was a secondary commodity, which they planned to sell in bulk for biofuel production.

But when oil prices plunged, they quickly changed direction. With help from AURI, they set up a bottling plant and started selling food-grade sunflower oil in retail outlets.

Beginning with farmers' markets and a handful of local stores, they widened distribution to major chain grocery stores, restaurants, and movie theaters across the Midwest. They also supply bulk sunflower oil to Barrett Petfood Innovations, a rapidly growing premium pet food manufacturer in Brainerd. "We expect to grow along with them," Tom says.

Tom and Jenni "have done a tremendous job of marketing their oil and moving it into a variety of products," says Al Doering, AURI co-products scientist. Doering provided nutritional analysis of the leftover sunflower seed meal and hulls, which helps the Smudes boost their crushing plant efficiency. The Smude's Brand line now includes six varieties of flavored sunflower oil, such as garlic-pepper and tomato-basil; eight kinds of scented massage oils; and sunflower-oil soap and lotion.

Many challenges

Tom and Jenni, busy entrepreneurs, also operate Midwest Sales and Construction, which builds grain bins and distributes grain-handling equipment in three states, as well as a gravel business and a trucking company. Their combined ventures employ 14 people and generate annual gross revenues in the millions, Tom says.

What's the hardest part about being an entrepreneur?

"No sleep!" says Tom, 42. In the start-up phase, "There's not enough cash to hire all the people you need to help, so you have to do everything yourself." Tom still handles all the sunflower oil sales and marketing.

Later, he says, the challenge shifts to managing growth. For example, "We had to turn down a half-a-million-dollar contract for sunflower oil because we don't yet have enough supply."

In 2017, Smude's Brand will press four million pounds of sunflower oil from 4,500 acres of sunflowers — up from just 60 acres the first year. The company contracts with local farmers to grow sunflowers. Next up for the Smudes is an expansion of their 3,000-square-foot, on-farm oilseed crushing plant.

About a year ago, Tom and Jenni, who have two kids, considered pulling the plug on the sunflower oil venture — long hours and low returns were taking a toll.

But "I'm very determined," Tom says. And lots of folks "encouraged us to keep going. It's rewarding to connect with people and hear how much they enjoy our products."

AURI adds cold press

AURI's new cold-press oil extractor will help small food companies like Smude's Sunflower Oil develop new, value-added products from Minnesota oilseeds.

The single-barrel screw press, made by Oil Press Company in Mondovi, Wisconsin, is housed at AURI's co-products lab in Waseca. Unlike most commercial methods, a cold-press extracts oil without using heat or chemicals, says Al Doering, senior scientist, coproducts.

"We've had a lot of calls about cold pressing oilseeds without chemicals," Doering says.

A number of alternative oilseed crops, such as flax, pennycress, cuphea, and camelina, hold promise for Minnesota farmers, says Michael Sparby, AURI senior project strategist. The new oil press will let AURI test process and explore new uses for these and other oilseeds, Sparby says. It will also let

AURI help companies like Smude's improve their processing efficiency and profitability, he adds.

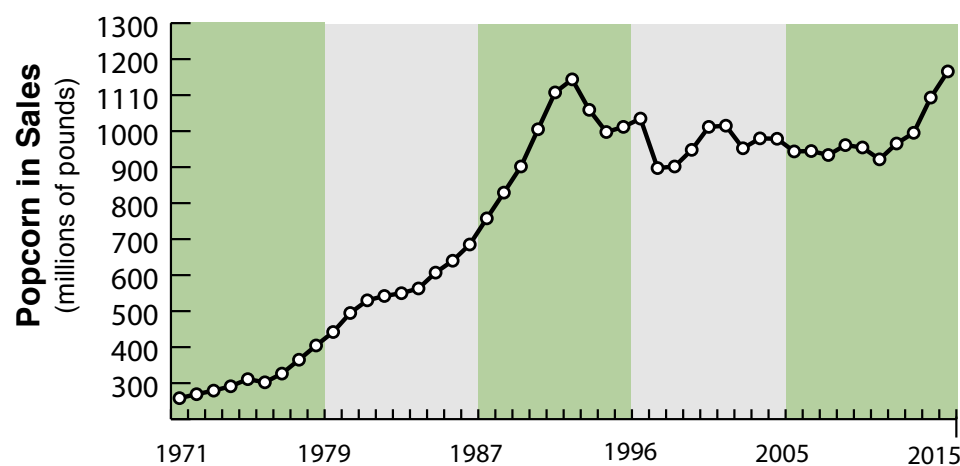


Smude's Brand cold-pressed, high-oleic sunflower oil and flavored sunflower dipping oils are cold-pressed, using no chemicals or heat, which maintains the oil's natural flavor and nutrients

Americans love popcorn!

Sales topped 1.1 billion pounds in 2015. About 70 percent of popcorn is eaten at home, according to the Popcorn Board, an industry group.

U.S. Popcorn Consumption



Source: The Popcorn Board



Craft Brewery Field Day



Craft Brewery Field Day attendees learned first-hand about AgriMax seed cleaning processes and facilities from business owner Steve Ross.

BY AURI

This past July, AURI and its client, Vertical Malt, hosted a Craft Brew Field Day in Crookston, MN, that brought together groups from throughout the craft brewing industry, from farmers to brewers. AURI saw it as an opportunity to highlight the successes of the project and the business itself, as well as offer an educational component for a targeted sector of the craft brewing industry, including partners, stakeholders, and local malting leaders. “The event was an excellent opportunity for AURI to create awareness of a new business in the region and related facilities and research while promoting and educating on AURI’s services,” said AURI Project Manager Becky Philipp.

The new businesses, facilities and research centers included the AgriMax seed cleaning facility and the University of Minnesota’s Barley Variety plot in Crookston, MN.

Participants agreed that the highlight of this first-time event was its all-around educational focus. It provided the opportunity to network with a cross-section of the craft brewing industry and helped entrepreneurs and business owners build new relationships and increase their networks. This was mostly thanks to the event format, which covered services to the industry and new applied research. The program also included a presentation of great interest to attendees on the current state of the industry as well as the evolution and history of barley production and brewing. This tied in to current barley varieties and new variety research in the field, as well as how barley is processed and cleaned.

New information

Attendees to the full day event enjoyed a variety of presentations that shared new information available to the industry. These included

- The new barley varieties nearing release and the research process and testing conducted prior to release.
- New seed cleaning equipment utilized by Agrimax and its seed cleaning services.
- Vertical Malt’s new roasters and its facility.
- Outcomes of the AURI Hops Initiative.

New Trends

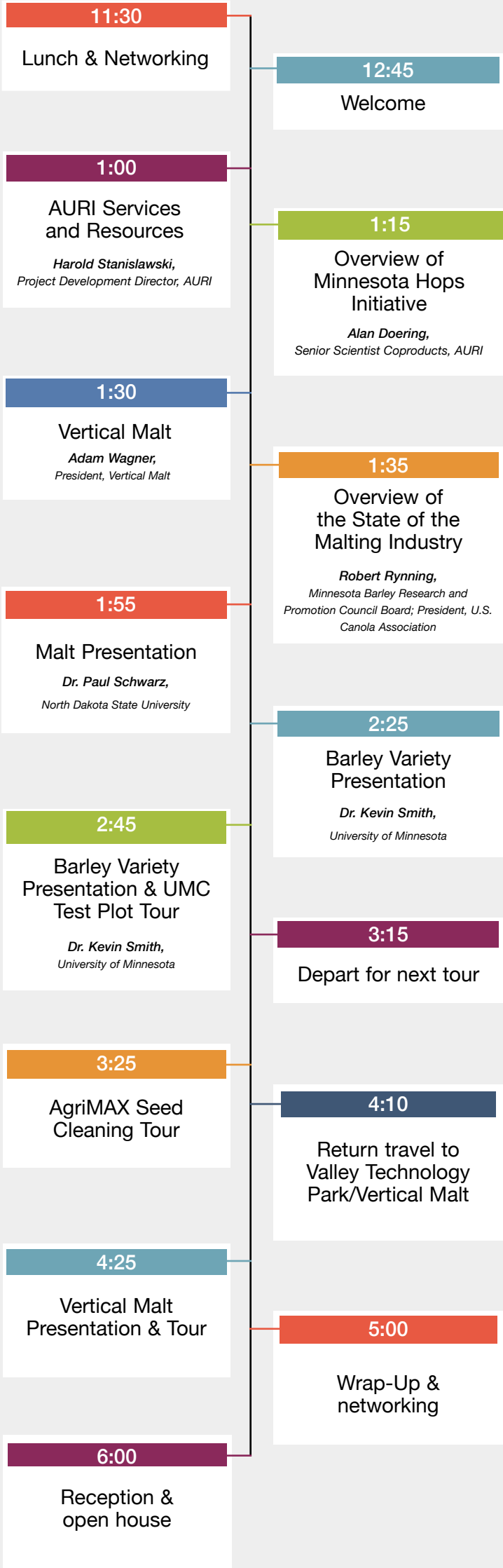
One of the most interesting trends discussed was that of craft breweries’ taking a larger share of available barley production. According to Robert Rynning of the Minnesota Barley Research and Promotion Council Board, craft malt usage is 3.4 times the amount of malt used by volume brewers. However, even though the number of craft breweries in the United States has doubled over the past five years it doesn’t appear to be spurring more barley production as barley acres are projected to stay in a range of two to three million acres in the United States.

What does the future hold?

AURI staff and partners at Vertical Malt are passionate about building upon the event and making it a regular offering, though the format for future events is still being determined. Currently discussions are underway to host next year’s field day with Vertical Malt and possibly another contributor along the supply or innovation chain. “A lot of good ideas are percolating for the short and long-term, so we’ll just have to wait and see what surfaces,” said Philipp. “It provides a great opportunity for the craft brewers to network with each other, which I heard they don’t get a lot of opportunities to do within their regions, and with other folks in the industry. Events like this have the potential for building long-term, mutually beneficial business relationships.”

To learn more about current AURI events, and receive alerts for future events, sign up for the monthly e-newsletter, *Ag Innovation Update*, at auri.org.

Field Day Program



AURI invests in new positions, science and technology to respond to growing demand

WRITTEN BY JONATHAN EISENTHAL

More than ever before, Minnesotans need the unique suite of services AURI offers. Thanks to an additional \$150,000 in funding from the Minnesota Legislature, AURI has been able to increase its personnel to nine-and-a-half science and engineering positions. Bonding approved by the legislature will also allow AURI to purchase equipment and technology necessary for handling the higher demand for services.

“The thing that differentiates AURI from other organizations in the state is the research support we supply to clients and innovators across the state,” says Rod Larkins, senior director of science & technology at AURI. “Over the last four years, the technical capacity at AURI has increased from five people to nine positions to better meet the technical demands from Minnesota’s entrepreneurs. We have added a microbiologist, 1.5 food scientist positions, a full-time engineer, and a half-time chemical engineer.”

AURI has facilities and personnel located in Crookston, Marshall, Waseca and the Twin Cities. These include:

- A full-time microbiologist in Crookston,
- A half-time technician, a full-time materials scientist, and a full-time engineer in Waseca,
- A full-time meat scientist who also does food science, a half-time chemical engineer, a food scientist—devoting half time to food science and the other half to analytical work on food and food products, and a full-time analytical chemist, who also performs organic chemistry tasks.
- A full-time food scientist in the Twin Cities who works in various food labs and commercial kitchens, to offer on-site consultation

“It gives you a sense for how versatile our staff is—with a small group we are covering a range of technical services,” says AURI executive director Shannon Schlecht. “The expansion of our staff is a response to a surge in demand: local food entrepreneurs and the local food movement are moving full speed ahead in Minnesota. We also brought back an engineer after several years to bring a different perspective to problem solving to better serve our clients.”

State bonding will help AURI make investments in capital equipment, potentially including new drying technology at Waseca, and safety/security upgrades for Marshall’s entrepreneur-in-residence program, as well as food sensory capabilities.

Increasing the efficiency of the services AURI offers is a big part of these investments, according to Larkins.

“We will be adding a developmental kitchen to provide new commercialization opportunities for our food clients,” Larkins says. “It will help food entrepreneurs explore and fine tune their recipes and bring their products to market sooner and with higher potential for success.”

On the project side of the equation, Ashley Harguth, previously engaged in communications for AURI, now shepherds incoming projects, helping entrepreneurs and innovators understand what information is necessary to determine which AURI services will best suit their project’s needs.

With the legislative support, AURI has also been able to further themed convening sessions, which have been a great hit across many different segments of the food and agriculture industries of Minnesota. Seminars about “Proteins, plant and animal,” “Bio-based Materials,” as well as a larger New Uses Innovation Forum were among 17 Innovation Networking events held this year that provided information and networking assistance to over 400 participants to advance innovative ideas.

In addition, AURI launched its Ag Innovation Partnership program in March. A novel approach, it reverses the usual model of companies going to AURI requesting services and instead AURI requests companies to propose development-worthy ideas to leverage their business resources with AURI’s unique knowledge and capabilities to help accelerate those ideas.

‘ The thing that differentiates AURI from other organizations in the state is the research support we supply to clients and innovators across the state ’

Rod Larkins, senior director of science & technology at AURI.



Rebuilding an Industry

AURI Investigating Potential for Industrial Hemp

BY DAN LEMKE

After an absence of more than half a century, industrial hemp is making a limited return to Minnesota farm fields.

In 2015, the Minnesota Industrial Hemp Development Act was passed allowing the Minnesota Department of Agriculture (MDA) to create an industrial hemp research pilot program to study the growth, cultivation, and marketing of industrial hemp. In 2016, there were six Minnesota pilot participants who grew industrial hemp. Approximately 40 acres of hemp was harvested, giving Minnesota its first hemp crop in 60 years. In 2017, there are nearly 2,000 acres under cultivation by about 40 growers.

Industrial hemp isn't a new crop for Minnesota, but it hasn't been legal to plant since the 1950s. According to the Minnesota Hemp Industries Association, during World War II the U.S. government formed the War Hemp Industries Department and subsidized hemp cultivation to replace imported "manila hemp" fiber. During the war, U.S. farmers grew about a million acres of hemp across the Midwest as part of that program.

After the war ended, industrial hemp production decreased and later stopped because hemp was no longer officially recognized as distinct from marijuana after the passage of the Controlled Substances Act of 1970.

A New Day

For years hemp proponents argued hemp production should be allowed because it produces a strong fiber, seeds with multiple potential uses and doesn't contain the psychoactive ingredients of marijuana, despite being in the same plant family. That message has been widely received as 28 states, including Minnesota, now have hemp pilot projects. "The Minnesota Department of Agriculture (MDA) has now worked for two years to support producers who want to grow, process, and market industrial hemp. We've already seen great potential, and we hope to continue to expand the program by increasing acreage and bringing processors to Minnesota," said MDA Assistant Commissioner Andrea Vaubel.

Growing hemp is one thing, but developing viable commercial markets for hemp products is another challenge altogether. AURI is working with industry leaders including growers, economic developers, processors and regulators to identify the hurdles and opportunities hemp presents.

AURI Project Development Director Harold Stanislawski says there is interest in finding value added uses for the fiber and seeds. The fiber has potential uses as animal bedding or absorbents. Fibers could also be used to strengthen existing products including packaging materials. Meanwhile, hemp seeds are a potential source of protein for human use in snack bars, protein shakes and other products.

AURI is helping to clarify what uses have market potential and what commercialization roadblocks exist.

"There is a tremendous amount of innovation that could occur in the next 10 to 20 years," Stanislawski says. "It's a matter of finding the right mainstream and niche markets to make it a viable industry."

One current roadblock is processing. Minnesota used to be home to numerous facilities that processed hemp into products like rope. That capacity faded when farmers could no longer plant hemp, leaving the state with a void.

"There is no hemp processing for end products in Minnesota," says Alan Doering, AURI senior scientist for coproducts.

Doering and other AURI staff are researching hemp characteristics to identify the most readily accessible markets and value-added opportunities.

Stanislawski says the industry's momentum is building thanks in large part to visionary and committed growers. They face unique challenges, however. Unlike mainstream crops like corn, soybeans or sugar beets, hemp is currently regulated by the government. Stanislawski is hopeful that a successful 2017 harvest will provide enough seed and fiber to give researchers and farmers the critical mass to rebuild a Minnesota hemp industry.

"If viable market opportunities are found and value-added processing is established, a Minnesota hemp industry will again become a reality, Stanislawski says.

ELSEWHERE IN AG INNOVATIONS

BY AURI *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.*



Turning Pollen into a Low-Cost Fertilizer

As the world population continues to balloon, agricultural experts puzzle over how farms will produce enough food to keep up with demand. One tactic involves boosting crop yields. Toward that end, scientists have developed a method to make a low-cost, biocompatible fertilizer with carbon dots derived from rapeseed pollen. The study, appearing in *ACS Omega*, found that applying the carbon dots to hydroponically cultivated lettuce promoted its growth by 50 percent.

The researchers synthesized carbon dots by breaking apart and heating rapeseed pollen. The high-yield process was relatively inexpensive, costing 3 cents per gram. Testing the material as fertilizer on lettuce showed that at a concentration of 30 milligrams per liter of a nutrient solution, the plant biomass was nearly 50 percent greater in treated plants than those that didn't receive the carbon dots. Additionally, because carbon dots are fluorescent, the researchers could track the materials under ultraviolet light. They saw that the materials were distributed mainly in the leaves. Further analysis also demonstrated that the levels of vitamin C, and soluble sugars and proteins weren't affected.



Bikers Turn to Ethanol at Sturgis

For the first time this year, motorcycle enthusiasts staying at the Buffalo Chip Campground for the Sturgis Motorcycle Rally have a place to buy 93 octane, 10 percent ethanol fuel as they head out for a ride in the Black Hills.

The single pump fuel station was donated by the Renewable Fuels Association (RFA) which has been sponsoring events at the campground and rally for nine years now and the station did a brisk business as RFA sponsored Free Fuel Happy Hours at the rally, providing a free tank of 93 octane E10 for motorcycles.



Potential cocoa substitute: Jackfruit seeds create chocolate aroma, say researchers


Recent research conducted by the University of Sao Paulo has shown potential for using Jackfruit seeds as a replacement for cocoa. By roasting jackfruit seeds, they imparted an aroma similar to chocolate.

This finding could help manufacturers meet the demand for chocolate flavor in the event of cocoa demand outstripping supply. It also means a potential value-added market for Brazilian farmers.

Following the discovery, researchers conducted a sensory panel of various forms/post harvest processing routines. Participants showed the highest interest/aroma to be found in fermented jackfruit seed flour, rather than only roasted. Researchers plan to continue the project in order to better refine the process and develop enhanced products for commercial use.

AURI'S FOCUS AREAS QUIZ

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

Food Products

What is the number one consumed red meat in the world?


a. Beef

b. Goat

c. Turkey

d. Bison

Answer: b

Renewable Energy


What fuel can be produced by fermenting sugar cane, sawdust, corn, or wood chips?

a. Gasoline

b. Diesel

c. Alcohol

Answer: c

Coproducts

One acre of soybeans can produce how many crayons?


a. 82,368

b. 10,102

c. 522

d. 100,000

Answer: a

Biobased Products

What percent of America's daily newspapers use soy ink?

a. 20%

b. 50%

c. 90%

d. 100%

Answer: c

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 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.

 Join the conversation on Facebook at [AgriculturalUtilizationResearchInstitute](https://www.facebook.com/AgriculturalUtilizationResearchInstitute)

 Follow us on Twitter at [@AURIconm](https://twitter.com/AURIconm)

Contact Us

auri.org

Crookston
510 County Road 71
Suite 120
Crookston, MN 56716
800.279.5010

St. Paul
U of M Biological
Sciences Center
1445 Gortner Avenue
(physical address)
1475 Gortner Avenue
(mailing address)
St. Paul, MN 55108
612.624.6055

Marshall
1501 State Street
Marshall, MN 56258
507.537.7440

Waseca
PO Box 251
Waseca, MN 56093
507.835.8990



PHOTO BY ROLF HAGBERG

ABOUT AG INNOVATION NEWS

Erik Evans, managing editor
Rolf Hagberg, photography
Design by,



Electronic pdf copies of current and previous *Ag Innovation News* issues are available on the website: auri.org.

Address correspondence or
subscription requests to:

Ag Innovation News
PO Box 251
Waseca MN 56093
507.835.8990
news@auri.org



BOARD OF DIRECTORS

Ron Obermoller, Chair
Minnesota Soybean Research &
Promotion Council

John Gilbertson, Vice Chair
Minnesota Farm Bureau Federation

Art Brandli, Secretary/Treasurer
Minnesota Wheat Research & Promotion
Council

Sen. Rich Draheim
Minnesota Senate

Jerry Hasnedl
Minnesota Farmers Union

Larry Johnson
Agribusiness

Rep. Deb Kiel
Minnesota House of Representatives

John Schafer
Minnesota Beef Council

Jill Zullo, Ph.D.
Agribusiness

RENEWABLE Energy Profile:

BY AURI

Renewable energy is important to Minnesota and the world at large because it offers the ability to power society from a clean and diverse set of sources. AURI understands its importance and plays a meaningful role in the exciting opportunities it offers by developing renewable energy from agricultural products.

Even though AURI does not have a lab or facility devoted solely to renewable energy, it uses each of its labs and research facilities throughout the state of Minnesota to provide a unique resource for renewable energy entrepreneurs who are investigating new options for sustainable alternatives to petroleum-based fuel sources. From transportation fuels to heat to electricity, AURI's renewable energy team is constantly working on ways for ag based bioenergy to contribute to the Midwest's economy and our nation's energy future.

For example, there is AURI's coproducts laboratory, which produces biomass and wood pellets destined for various heating and combined heat and power applications. The analytical and bioproducts laboratory has equipment such as a number of gas chromatographs capable of compositional characterizations for liquid fuels. This lab also offers flashpoint and heat of combustion testing, which are useful when conducting long-and-short-term analysis of solid fuels.

AURI's renewable energy endeavors and supporting facilities are unique to Minnesota and the Midwest. It's coproducts utilization laboratory is a rare value-added pilot laboratory. This means solid fuel, renewable energy projects have a unique resource available in the pilot scale pelleting capacity available at AURI. Combining the supporting pilot scale grinding, milling and drying capabilities with the advanced analytical laboratory in Marshall allows AURI to provide direct hands-on expertise, as well as access to an extensive network of industry leaders through its Innovation Networking Program.

Biomass Heating for Poultry Barns

AURI in conjunction with Minnesota's Clean Energy Resource Teams (CERTS) and Minnesota poultry farmer, Bill Koenig of Viking Company endeavored upon a 23-month study on biomass heating in chicken broiler barns. The study, which included the use of a 1.6 million BTU forced air furnace to heat the barn for raising 12 flocks of chickens at Koenig's Viking, MN farm, showed positive results for fuel costs, ash efficiency and flock characteristics.



Minnesota Renewable Energy Roundtable (MNRER)

This is one of AURI's innovation networks that has been ongoing for several years. It brings together a diverse network of industry participants ranging from business and industry leaders to nonprofit and government representatives. The MNRER goal is to offer insight into the challenges and priorities for advancing Minnesota's renewable energy industry. In addition, participants are encouraged to take action on the challenges and opportunities in the area of renewable energy.

Non-profit
Organization
U.S. Postage
PAID
Permit No. 14
Detroit Lakes,
MN 56501

 **AG INNOVATION NEWS**
The newspaper of the Agricultural Utilization Research Institute
510 County Road 71
Suite 120
Crookston, MN 56716
Change Service Requested