



Ag Innovation News

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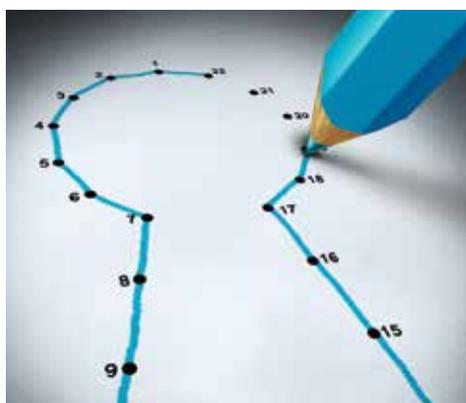
The newspaper of the Agricultural Utilization Research Institute



PHOTO BY ROLF HAGBERG

Vertical Malt Reaches New Heights

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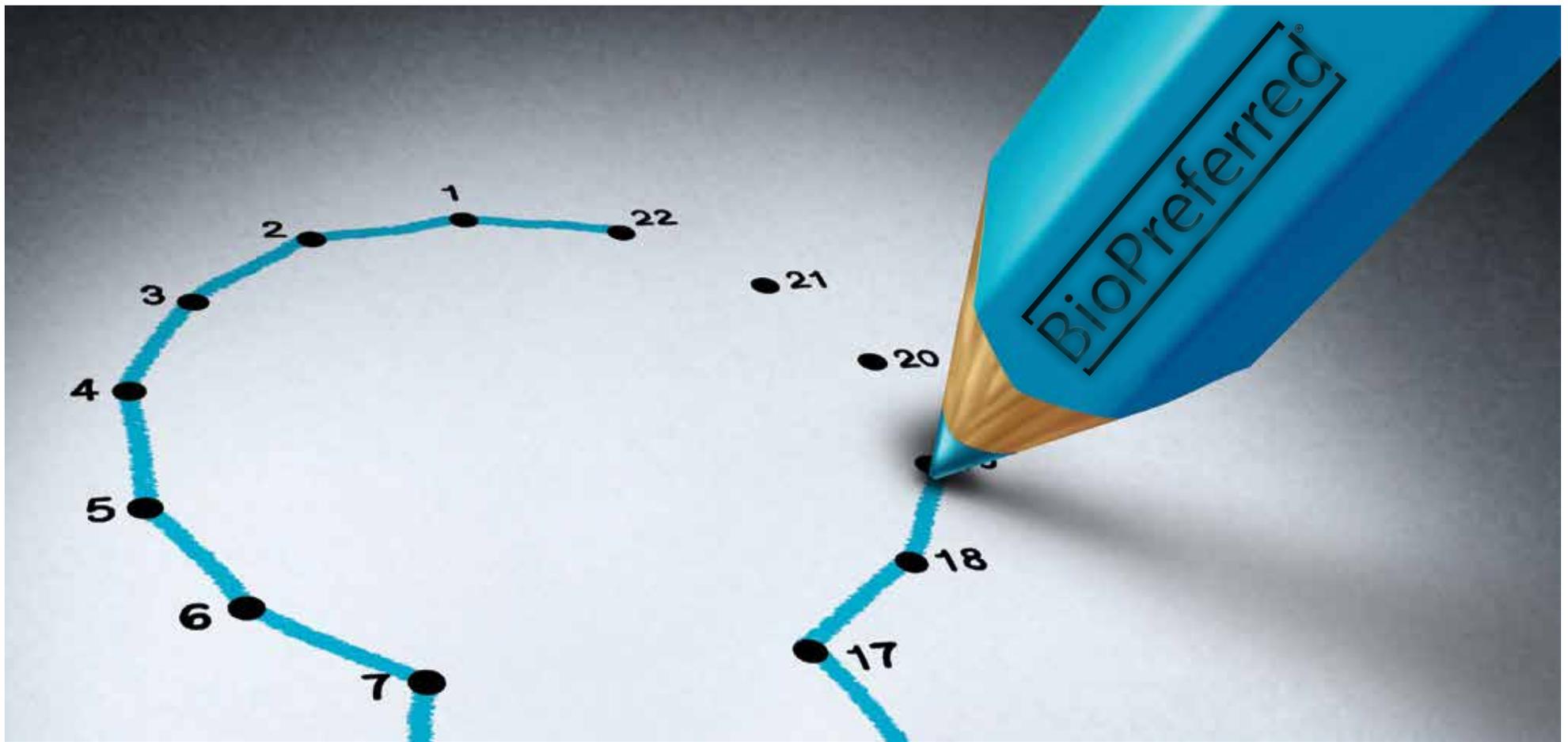
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Connecting the **Biobased** Dots

“Biobased products present a massive opportunity that doesn’t influence just one industry.” — Jennifer Wagner-Lahr

BY DAN LEMKE

Numerous surveys show that when given the choice, consumers would rather purchase products made from renewable, biobased ingredients than those from non-renewable products like petroleum. AURI collaborates with the U.S. Department of Agriculture (USDA) to help give consumers access to information on biobased products while helping Minnesota businesses take advantage of market opportunities.

The BioPreferred program was established by the 2002 Farm Bill to increase the purchase and use of renewable, biobased products while providing “green” jobs and new markets for farmers, manufacturers and vendors. Biobased products derived from plants and other renewable agricultural, marine, and forestry materials encompass a wide range of products, including lubricants, cleaning products, inks, fertilizers, and bioplastics.

“The BioPreferred program’s purpose is to spur economic development, create new jobs and provide new markets for farm commodities, which makes it a logical match for AURI,” says Becky Philipp, AURI project manager.

USDA estimates biobased products nationwide contribute \$369 billion to the economy, support 4 million jobs and add \$126 billion in value.

“It’s remarkable how big the biobased footprint could be,” says Jennifer Wagner-Lahr, AURI senior director of innovation and commercialization.

Wagner-Lahr says AURI conducted a study in 2010 that showed biobased products would become an important and growing opportunity, though one that could be challenging to understand. AURI’s connection to USDA is helping to draw those opportunities into focus.

The USDA BioPreferred program has two major parts; voluntary biobased product labeling and mandatory purchasing requirements for federal agencies and their contractors.



The USDA Certified Biobased Product label can be displayed on a product certified by USDA as meeting certain criteria. This can provide useful information to consumers about the product’s content. There are over 2,250 Certified Biobased Products on the market. More than 100 Minnesota companies and 125 Minnesota-made products are on that list, including many produced by current and former AURI clients says Philipp.

“This program is a good fit for AURI and our clients, which is why we make clients aware of the program and encourage many of them to consider participating,” Philipp says. The potential benefit for them is increased use of their products and expanded market opportunities.”

The Federal Acquisition Regulation, and Presidential Executive Orders direct that all federal agencies purchase biobased products in categories identified by the USDA. Currently, there are 97 categories for which agencies and their contractors have purchasing requirements. They include cleaners, carpet, lubricants and paints. Companies with products approved for mandatory federal purchasing can then market their products to the federal government and its contractors.

AURI has long focused on biobased products, working with clients on a wide range of products from sorbents and packaging materials to fertilizers and personal care products. AURI recently held an event focused on soy-based road sealants.

“Biobased products present a massive opportunity that doesn’t influence just one industry,” Wagner-Lahr adds. “It has broad impact potential.”

AURI recently met with USDA BioPreferred representatives to collaborate on ways to get more businesses familiar with the program and to seek certification. Meanwhile, AURI is encouraging its clients to pursue the program as a way to tap into growing markets for biobased products. For more information on the USDA BioPreferred Program, please visit: <http://www.biopreferred.gov/BioPreferred/>.

AURI Labs Meeting Minnesota's Needs

BY DAN LEMKE

Great ideas might remain just a concept without the resources necessary to make them real. AURI has been a unique Minnesota resource for more than 25 years, delivering a combination of innovative laboratories, pilot facilities and scientific expertise. AURI's facilities provide businesses and entrepreneurs working to develop agriculturally-based products with valuable technical resources for unbiased testing and development.

"Our concept is to have a broad representation of science that supports AURI's entire efforts," says Rod Larkins, AURI senior director of science and technology. "There also needs to be specialized expertise like food scientists, microbiologists and chemists."

Whether for a new food, biobased, coproduct or renewable energy product, AURI staff and facilities combine to give Minnesota businesses key ingredients for success.



Crookston Microbiology Lab

AURI's Crookston location features a microbiology lab that offers analysis for food, biobased and bioenergy-related projects. It has the capacity to provide multiple services ranging from organic chemistry to sterilization as well as routine wet lab work.

Through practical and applied research, the microbiology laboratory improves and expands the way in which microbes can add value, treat waste and develop new products.

"As consumers want to know more about what's in the products they buy, entrepreneurs need more analytics and information behind their products," says Jimmy Gosse, AURI microbiologist. "This is happening more often and earlier in the process. We help businesses hone in on all the components of their product."

AURI's facilities provide businesses and entrepreneurs working to develop agricultural based products with valuable technical resources for unbiased product testing and development.



Marshall Meat/Food Lab

AURI's meat lab offers a broad array of product development assistance ranging from meat processing and product formulation to cooking, packaging and process troubleshooting. AURI also provides training and guidance on food safety and regulatory issues.

The hands-on capabilities and access to scientific experts trained to help with product development and analysis is in increasing demand.

"Food companies and entrepreneurs show lots of interest in having cleaner labels and more natural products, so we are working with those client's to determine the best alternative ingredients for their products," says AURI Meat Scientist Carissa Nath.



Marshall Analytical Chemistry Lab

AURI's analytical chemistry lab doesn't help make new items, but it gives entrepreneurs and businesses detailed analysis of what's in their products. Having the general characteristics for food, feed, biobased materials or other value-added agricultural products as well as specific product attributes such as fat, protein, moisture, ash content and energy level is vital information.

"We also do microbiological testing to determine how much bacteria and microbes are in a product," says Ranae Jorgenson, AURI analytical chemist. "That's important for things like determining a product's shelf stability."

The analytical data is also useful for helping clients decide on future steps and equipping them with analytical information about their product.

AURI has committed to make space available to entrepreneurs who have demonstrated solid scientific concepts.



Marshall Bioproducts Lab

The bioproducts lab is equipped for chemical processing, extraction and characterization of oils, distillation and evaporation, biodiesel processing, fermentation and digestion for fuel production and more.

The bio-conversion of molecules can help move naturally-derived resources into products currently made from fossil sources. This includes bioplastics, fuels and other ingredients.

"For anything currently sourced from fossil fuels, there are biobased alternatives," Larkins says.



Waseca Coproducts Utilization Lab

AURI's coproduct utilization pilot lab in Waseca provides unique equipment and expertise for particle screening, sizing, milling, drying, pelleting and characterizing agricultural coproducts. Uses for these plant and animal-derived products are wide-ranging, from renewable energy and feed to sorbents.

"There is growing interest in utilizing coproducts as feed ingredients," says Alan Doering, senior associate scientist for coproducts. "We are also seeing increased interest in all natural and organic fertilizers for home and commercial use."

Recently, laboratories in Marshall and Crookston designated facilities for entrepreneurs in residence. Larkins says AURI has committed to make space available to entrepreneurs who have demonstrated solid scientific concepts. Through a formal agreement, those businesses can utilize AURI labs and expertise to further develop their ideas.

PHOTOS BY ROLF HAGBERG

MINNESOTA-MADE BEVERAGES

Coming To A Cocktail Or Juice Drink Near You



Jon and Sue Roisen launched their own brand of juice from grapes grown on their Dawson, Minnesota farm.

BY JONATHAN EISENTHAL

First came craft beer, then craft spirits and now craft soft drinks will be quenching thirsty people on their patios, after their workouts and giving them a nice lift after work. They can be sipped or gulped, enjoyed on their own or blended into a cocktail to create a unique taste.

AURI has proven itself a great partner to help entrepreneurs take their craft drink ideas from the kitchen to the grocery store shelves and tables of local restaurants and bars. Two new drinks have become reality this way; King of the North grape juice and Saint Paul Switchel.

Some of these trendy beverages have lineages that reach back into Minnesota's history. Laura Ingalls Wilder enjoyed a drink she called 'ginger water,' which was elsewhere called switchel or haymaker's punch.

Colleen Schlieper, a stay-at-home mom looking for an economic opportunity first tasted switchel a few years back—several companies on the East Coast manufacture it, but at the time no one made it in Minnesota.

"I thought, I can be the vendor here," said Schlieper. But she has a background in biological sciences, not food science.

"I didn't know what was involved in safely bottling a drink product—that's where AURI came into the picture for me," says Schlieper. "They helped me develop the process. They also got the nutritional facts printed and ready to go, and then did the testing for the nutrition facts label to assure its accuracy."

Traditionally, switchel is a beverage made of ginger, apple cider vinegar and a sweetener: honey, sweetened molasses or maple syrup.

"I'm the grand-daughter of a bee keeper so I decided to use honey for my sweetener," says Schlieper. "People would typically drink switchel when they were cutting the hay. This would be their lemonade or Gatorade, because it's a really refreshing and hydrating drink. It has the side benefit that it helps the respiratory system. Those hay cutters would breathe easier after a glass of switchel—it counteracts the cold-like symptoms of the hay fever brought on by all the dirt and the dust."

But Schlieper updated the taste by switching from using ginger powder and distilled vinegar to fresh ginger and fermented apple cider vinegar, creating a more vibrant taste profile.

"It's a little bit sweet, a little bit sour. Some people say it's spicy but I prefer to say it's flavorful. It's got that special little kick from the ginger," she says.

While it's an excellent stand-alone drink, served in Saint Paul restaurants like Naked Nina's juice bar and Colossal Café, Saint Paul Switchel is also part of the trend in the use of craft beverages as mixers used to create cocktails.

Du Nord Craft Spirits in Minneapolis serves Saint Paul Switchel, both mixed with its small batch gin, and as a straight soft drink.

For about fifteen years Susan Roisen has grown grapes on a corner of her family's corn and soybean farm in Dawson, producing Frontenac, Frontenac Gris, Marquette grapes for a vineyard in St. Peter called Chankaska. But then Susan realized that not everyone drinks wine, so they decided to plant grapes for eating and grapes for juice as well, and King of the North grape juice was born.



PHOTOS BY ROLF HAGBERG

Colleen Schlieper produces St. Paul Switchel, a beverage made of ginger, apple cider vinegar and a sweetener.



“My husband put in 38 table grapes and juice grape plants (in 2009) and for a few years we kind of ignored them. We’d make jam, and the pickers would come out and we would give the grapes away,” says Roisen. “But the 38 plants started producing so much I said to myself, we just can’t let this go to waste. When we picked (and crushed) the entire 38 plants, they produced 50 gallons of juice.

Roisen hit on the idea of selling her juice during ‘The Meander’—an art crawl along the upper Minnesota Valley that takes place every fall.

“There are about forty artists along the Minnesota River, from Ortonville to Granite Falls, who take part in the Meander,” says Roisen. “I sold everything I had that first year—200 quart containers.”

During the Meander sale she discovered her juice wasn’t just a juice beverage. A woman from St. Cloud has come every year since she started bottling King of The North, and buys two or three cases, reporting to Roisen that she likes to mix it with vodka.

“What I like to do when I am serving it is to dilute it with water, or mix it with club soda as a kind of sparkling juice beverage for kids,” says Roisen. “I’ve sold it in farmer’s markets now, but the most success I’ve had is just selling it off the farm.”

Roisen, who is a nurse, is used to working in sterile environments, but felt she needed help figuring out how to make a thoroughly safe commercial product. She remembered back to when her husband and son got interested in winemaking in the early 2000s—the inspiration was a pamphlet put out by AURI, so Roisen decided to go back to AURI for help launching her new juice product.

Now she’s ready to ramp production up to 300 gallons a year, and who knows what the limit will be? Roisen describes the feed stock as a jammy, purple fruit, like a Concord grape. Rich in anti-oxidant riboflavins, flavonoids that lower blood pressure and increase heart health, it fits the trend—people are looking for drinks that are both delightful and healthy.

“Canned” in old-fashioned mason jars, and sporting an image of their red-headed, long-bearded farm truck mechanic, the quart jars of King of the North have a homespun visual appeal declared ‘totally Amish,’ by Susan’s son Aaron, who is now an award-winning vintner (known for his dry Rieseling) in upstate New York.

“What we process is one hundred percent natural grape juice,” says Roisen. “We don’t put any water or preservatives, or sugars—nothing is added to the product. It’s pure grape juice. When I called AURI, they helped me to develop a label, did a bench trial and compared it to the number one brand of commercial unfiltered grape juice. Our juice actually came up with more potassium per serving than this popular brand name grape juice. AURI helped me to understand and now I know how to become commercial. As part of this plan, I have spoken to the state juice specialist and sent a letter to Cornell University, regarding thermal processing, so they can be our third-party authority to say this product has been processed correctly and is safe for human consumption.”

Crookston's CRAFT MALT

Northwest Minnesota entrepreneurs launch small-batch malting company



Dr. Jimmy Gosse (left) and Becky Philipp (right) of AURI worked with Adam and Tim Wagner (center) to launch an independent craft malting company.

BY LIZ MORRISON

You've heard of craft beer. Now, there's CRAFT MALT.

Beer lovers Adam Wagner of Fisher and his father, Tim Wagner, a fourth-generation Red River Valley farmer, have launched an independent craft malting company. Last December, Vertical Malt opened a "micro" malt house in Crookston to malt small batches of barley grown on the Wagner Family's 2,100-acre farm in Polk County.

The start-up currently makes 250 pounds of malt, the foundation of beer, every week. Over the next nine months, Vertical Malt plans to scale up production to 4,000-pound batches. By late 2017, the company hopes to be producing about 20,000 pounds of malt per week.

The malting venture adds value to locally-grown barley, says Harold Stanislawski, AURI project development director. And it's well-timed to complement the local foods movement and Minnesota's booming craft beer industry.

Local and distinctive

"Craft brewing is one of the biggest economic success stories of the decade," Stanislawski says. Since the passage of the "Surlly Bill" in 2011, which permitted small Minnesota breweries to serve pints of beer on site, dozens of microbreweries, brew pubs and taprooms have popped up around the state. By 2015, Minnesota boasted 105 craft breweries.

Nationally, growth is in the double digits rising by 13 percent by volume from 2014 to 2015, and 16 percent by retail sales, according to the Brewers Association, a trade group representing small and independent brewers. In Minnesota, which ranks 12th among the states in craft beer production, the sector represents more than \$1.3 billion in annual economic activity, the association reports.

Craft beer's hallmark is its local connection, Stanislawski says. "Beers are often named for the region, and feature interesting local flavors." Now, brewers looking to differentiate their products are sparking demand for distinctive local malts, Stanislawski says. "The Wagners recognized an opportunity in niche malt processing."

Most of the malt used to make beer is produced by large, centralized maltsters.

By contrast, small maltsters, like Vertical Malt, are able to put a local spin on malt, offering brewers unique flavors, says Adam Wagner. Regional barley varieties, location, weather, malting methods — all influence a malt's flavor profile, he says. "Our real advantage is small batches. We can do what the large maltsters can't," like customizing varieties, kernel size, germination time, heat, and other factors to produce subtle flavor variations.

In addition, Vertical Malt "can supply the provenance of our malt — the year it was grown, the growing conditions," Adam says. "You can see what farm, what field, even provide the day our grain was harvested." Craft brewers can use this information to market an all-local pint of beer, he says, letting beer lovers trace their beverage's heritage from "field to glass."

Consumers are "more interested than ever in where their food and drink come from," says Tom Hill, cofounder of Bemidji Brewing Company, a craft brewery and taproom that opened in 2013 in downtown Bemidji. "The more information we can provide, the better."

Love of beer prompts start-up

The Wagners, who were longtime homebrewers, initially planned to start their own craft brewery, using barley and hops they grew themselves.

Good, small-batch beer brewing equipment is readily available, but the Wagners soon discovered that nobody in North America manufactured small-scale malting equipment. "Without malt, there's no brewing," Adam says. So he and his dad decided to devise their own malting system.

Malt is made by soaking cereal grains in water to start germination, then halting germination by drying the sprouted grain with hot air. This process develops the enzymes needed to convert the grain's starches into fermentable sugars.

The Wagners modified a traditional malting technique from the early 20th century, which uses small rotating drums for steeping, germinating and drying. They experimented with several prototypes before settling on a design, which was then fabricated at Young Manufacturing in East Grand Forks. Along the way, they dropped their brewery plan to focus entirely on malting. "Malt turns out to be an interesting product," Adam says, "and a real challenge."

Help for entrepreneurs

In 2015, the Wagners' craft malting concept won a \$10,000 award in the Northwest Minnesota Foundation's IDEA competition, which helps entrepreneurs turn good ideas into fast-growing businesses. Soon after, the Wagners were connected with AURI Project Manager Becky Philipp. "That's when things really got going," Adam says.

Philipp and Stanislawski steered the young company to experts in business planning and economic development, licensing and permitting, grants funding, and marketing. "At AURI, we have a vast network of resources," Philipp says.

Once the Wagners set up their prototype malt house, they worked closely with AURI Microbiologist Jimmy Gosse to test and refine the malting process and develop food safety and quality controls. "AURI has been very important in helping us to get the pilot system going and preparing to take the next steps," Adam says.

AURI will help Vertical Malt carry out a five-state marketing survey later this year. If all goes well, planning for a full-scale regional malt house will begin. "This business would provide a positive economic boost to the northwest region of the state," Philipp says.



ALTSTERS



Vertical Malt is planning for a full-scale regional malt house that would provide a positive economic boost to northwest Minnesota.



PHOTOS BY ROLF HAGBERG



AURI and Vertical Malt

Idea to reality:

The local foods movement and the rise of local craft beer brewing created an opportunity for local craft malt production. Malt is a primary beer ingredient.

AURI's role:

AURI helped entrepreneurs Adam and Tim Wagner of Fisher, Minn. test a small-batch malting system. AURI also connected the Wagners to business and technical resources.

Outcomes:

The Wagners' start-up company, Vertical Malt, is making small quantities of custom craft malt at its Crookston malt house and preparing to increase production.



"This business would provide a positive economic boost to the northwest region of the state," Philipp says.

This season, the Wagners planted 120 acres of two-row barley on their farm. In the short-run, they plan to raise all the barley they need for their operation, but eventually, "we hope to create a new outlet for malting barley in northwest Minnesota," Adam says. North Dakota and Minnesota rank first and fourth in barley production, growing more than 76 million bushels in 2015.

Old fashioned marketing

Adam, 34, grew up on the family farm east of Crookston and studied music and computer science in college. He left a telecommunications career to launch Vertical Malt, which is self-financed at this point. That's been the hardest part of being an entrepreneur, he says, "giving up a good income to start a business with a lot of unknowns and zero income! It's an uncomfortable place to be — but it's also a good motivator."

"Adam Wagner is an excellent example of untapped talent and ingenuity that is out there waiting to be encouraged and nurtured by organizations such as AURI. Adam's passion for farming, barley and beer along with the back room support of organization's such as ourselves and Minnesota barley growers and the university system are ingredients for likely success," said Jerry Hasnedl, AURI Board of Directors.

When it comes to marketing, Adam's strategy is an "old fashioned one," he says. "We go out and shake hands and meet people. It's been a lot of fun getting to know the brewers. It's a fantastic industry," he says, with lots of friendly folks who are passionate about great beer.

Local brewers are already calling, Adam says, even though the company's supplies of malt are still limited.

Vertical Malt made its first sale in April to Bemidji Brewing Company, which recently expanded from a three-barrel capacity to 15 barrels. "To have access to locally-grown barley that Adam and his family grew and malted is really attractive to us," says Hill. "The local hops scene has been growing, and it's nice to see local malt coming to fruition.

"We're really excited to be working with Vertical Malt," Hill adds. "Adam and his dad are so enthusiastic about their product. It's fun to see that excitement from the supplier's side."



Small maltsters, like Vertical Malt, are able to put a local spin on malt, offering brewers unique flavors, says Adam Wagner.

THE CRAFT BEER SCENE

Craft beer production has boomed in the past five years.

NATIONALLY



4,225

Craft breweries in the U.S. in 2015 — up from 1,977 in 2011

12.2%

Craft beer's market share in 2015 — up from 5.7% in 2011

24.5 million barrels

Craft beer brewed in 2015 — up from 11.5 million in 2011

\$22.3 billion

Retail value of craft beer in 2015

IN MINNESOTA



105

Craft breweries in 2015

631,955

Barrels of craft beer brewed in 2015

\$1.324 billion

Annual economic impact on state in 2014

IN THE REGION



WISCONSIN

106 Craft breweries

MONTANA

47 Craft breweries

NORTH DAKOTA

11 Craft breweries

SOUTH DAKOTA

9 Craft breweries

Sources: Brewers Association, www.brewersassociation.org and AURI



Representatives from Aexcel, Minnesota Soybean Research & Promotion Council, AURI, Bargaen and BioSpan came together to discuss biobased road sealants.

BY BRITTANY GILBERTSON

In Hutchinson, soybeans spent a long time on the road before arriving at the April Road Sealant Forum, which presented several years' worth of data on the sealant's efficacy in preventing road deterioration.

Research findings by the United Soybean Board, suggest that biobased road sealants have a positive impact on road quality, the environment and city budgets. However, AURI's main reason for championing the project was to evaluate another potential market for Minnesota-grown soybeans. To judge the potential market share of these products that could be allocated to these products, researchers needed to determine a city's likelihood of use. In turn, local governments required further evidence of cost savings.

More than 50 attendees from construction, engineering and local governments convened April 20 to learn more about the sealants, their applications and impacts. The study conducted by the City of Hutchinson concluded that if applied to new pavement, the soybean-based sealant may delay the first chip and seal repair by six to eight years and can be applied a second time to further delay road work for 12 to 16 years. As a result, the soybean-based road sealants could save an estimated 30 percent of a typical city's road repair budget, freeing these funds for other projects.

To encourage the adoption of the sealants, AURI in cooperation with partners disseminated the information directly to key decision-makers who could bring this technology to cities, municipalities, parks and commercial properties throughout Minnesota.

"We brought industry leaders to Hutchinson to share results and strategize how to bring these methods to the state," said Harold Stanislawski, AURI project development director. "AURI hopes to see more trials and more evidence for the role of soybean-based road sealants in the state's roadway projects."

The Road Sealant Forum opened with remarks from AURI and Minnesota Soybean Promotion & Research Council on the status of soy-based road sealants. A panel of sealant applicators – with representatives from B&D Striping, Bargaen, Inc., Minnesota Asphalt and Aexcel for Bio-Stripe – discussed best practices for the sealant application and non-petroleum based striping and Cargill shared information on road rejuvenates. Another presentation on the *Latest Research and Experience on Soy-Based Dust Control* from North Dakota State University and EDC Dust Control, Inc. explained how soy products can be used in tandem with sealants for road protection. The biobased products result in both road life and environmental benefits.

"Communities like ours are looking for ways to become more sustainable. Using ag-based products

BIOBASED

SEALANT

PAVES

WAY

TO THE

FUTURE

for maintenance and preservation activities will help to reach our goal, while at the same time being friendlier to our environment and supporting local agriculture," said John Olson, public works manager for City of Hutchinson. "We learned about products that are already available and some that are in development. The information gathered at the forum will be used by City staff to review our operations to see if we can introduce even more ag-products into our operations."

The main portion of the program focused on the specific RePLAY™ soy-based road sealant and its performance on Hutchinson city streets. Research conducted by the Local Operational Research Assistance Program found the sealant permeated the pavement surface and performed well on both trails with significant damage and relatively new asphalt. According to the research report summary, after the application water ran off the paved surfaces at a higher rate of speed without wicking into the surface. Thus, the product serves to protect roadways from deterioration and maintain skid resistance for vehicles. According to its manufacturer BioSpan Technologies, Inc., RePLAY™ reverses the oxidation process and protects asphalt from potholing, edge rutting and cracking.

The City of Hutchinson reported other benefits such as a short drying time, non-tacky residue and no stickiness in hot weather as observed with petroleum-based sealants. There may be specific benefits to applying soybean-based road sealants to park systems and other areas concerned with the land pollution impact.

"Utilizing a Minnesota commodity like soybeans in road application has benefits to the rural communities in which they are grown, but also to the public and the roadways that benefit from extended life," said Mike Youngerberg, Minnesota Soybean senior director of field services in an attribution on the Minnesota Soybean Research & Promotion Council website.

As asphalt prices increase so do the cost of petroleum-based sealants. Overall results indicate that RePLAY™ would be cost-effective.

"We're excited that an agricultural product can help solve significant budgetary and road life issues in Minnesota," said Stanislawski. "AURI is committed to advancing such projects in the state. The forum is just the beginning of the journey for the economic case study analysis in Hutchinson and forecasting for other local governments. We need to understand where this product can be applied and work to educate city and state officials on how to advance the use of agricultural-based road sealants." AURI

Continued on page 12



PHOTO BY ROLF HAGBERG

When It Comes To Minnesota's Agricultural Future Don't Forget The



BY AL DOERING, SENIOR ASSOCIATE SCIENTIST – COPRODUCTS

Aquaculture – Feeding Shrimp in Minnesota

Can landlocked states enjoy fresh, sustainable seafood like the coasts? Minnesota has been exploring options for aquaculture shrimp farms, located within the state, to meet this growing demand. Thanks to improvements in the efficiency of raising shrimp, landlocked production could become a commercial reality. We may soon be giving fishing enthusiasts the option to catch their dinner in a heated tank versus braving the ice house.

Farm-raised shrimp are traditionally fed fishmeal which is no longer a low cost product. The demand for fish has necessitated governments to enforce wild fishing quotas, which drives up the price of fishmeal and fish oil. Minnesota-grown commodities can make commercial

fish production more affordable by replacing a portion of the fishmeal in a shrimp diet. Using dried distillers grains with solubles, corn gluten meal or specialty soybean meal, shrimp becomes less expensive to feed.

Shrimp producers no longer have to import expensive fish feed either. New technologies enable local manufacturers to produce very small pellets of plant-based proteins, allowing Minnesota to become a prime marketing for aquaculture shrimp production.

The Minnesota farming community acknowledges that many components of shrimp production benefit the state. Shrimp tanks use less land than other livestock and even take up less room than other

aquaculture tanks. The largest expenses of raising shrimp have been feed. This is where AURI is working to develop Minnesota grown commodities as fishmeal replacements as well as to provide alternative options to heat the aquaculture tanks. The adoption of biomass heating technologies could be another use for Minnesota grown crops for this second need.

When it comes to Minnesota's agricultural future, don't forget the shrimp!

NEW AURI STAFF



PHOTO BY ROLF HAGBERG

Erik Evans
Director of Communications

Erik is a Twin Cities native with a B.S. from St Cloud State University in Mass Communications and a Masters of Business Communication from the University of St Thomas. As the Director of Communications, he is responsible for developing and overseeing AURI's communications strategy as well as creating compelling messages for the organization's internal and external communication channels.



PHOTO BY ROLF HAGBERG

Holly Harguth
Administrative Assistant

Holly Harguth of Waseca joined AURI in April 2016 as Administrative Assistant. Holly also arranges many aspects of AURI's Board of Directors activities.



PHOTO BY ROLF HAGBERG

Ben Swanson
Associate Scientist of Food & Nutrition

Ben is from Sauk Rapids, Minnesota and received his undergraduate degree in Chemistry from the University of North Dakota. He then obtained a M.S. in Food Science and Engineering, with an emphasis in Food Safety and Quality Control, from the University of Minnesota. Ben works with clients to determine what AURI can do to advance their business or products, like conducting nutritional analysis and helping find suppliers and copackers.



Goutham Vemuri
Biomass & Renewable Products Technologies Scientist

Goutham is a chemical engineer by training with a focus on microbial biotechnology. He received his Masters and PhD from the University of Georgia, Athens and has a proven track record of taking projects from concept to commercialization. He has a broad and deep technical competence in process optimization and techno-economic analysis



PHOTO BY ROLF HAGBERG

Providing A Valuable Service

BY SHANNON SCHLECHT
AURI EXECUTIVE DIRECTOR

AURI takes a long-term view of Minnesota's agriculture industry and its entrepreneurs in each activity. We strive every day to achieve the economic impact intended by the state's leaders over 25 years ago when they created this unique institute.

I never cease to be amazed by the caliber of ideas existing throughout the state. You read about a handful of these ideas here, in Ag Innovation News, but there is so much more happening at AURI and at our partner organizations. For example, the annual MN Cup effort is underway again, and its food, agriculture and beverage division has been this innovation competition's fastest growing segment the past few years. The Midwest also continues to attract a consistent number

of companies into its accelerator program, including food and agriculture innovations. Additionally, AURI's project numbers for clients and initiatives have been up the past few years and the institute is on track to have roughly 125 new projects enter its doors in 2016.

The market value of Minnesota's crop and livestock production has averaged around \$20 billion in recent years and AURI is continually working with its clients and partners to add value to that already impressive number. A 2015 University of Minnesota Extension report sponsored by Minnesota's various Initiative Foundations estimated the overall direct and indirect economic impact from the agbioscience

industry to be \$23.4 billion across greater Minnesota with an additional \$12.5 billion in the metro area. Needless to say, a lot of value-added agribusiness activity is already underway here to create jobs and economic opportunities, but a sizeable potential exists to do more.

The innovators across the state provide a valuable economic service and AURI is proud to provide them with the essential tools and services needed to overcome constraints and technical hurdles along the road to commercialization.

Helping turn ideas into reality is what AURI does and we are proud of it.

★
Helping turn ideas into reality is what AURI does and we are proud of it.

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.



Fueling up with bananas

Researchers from the Agro-Energy Group at Universidad Politécnica de Madrid (UPM) have assessed the potential use of the residual biomass of bananas produced in the province of El Oro (Ecuador) for bioenergy applications. Results show that the use of this waste could satisfy 55 percent of the electrical demand of the region and 10 percent of bioethanol demand nationwide.

Bananas are one of the most important fruit crops in the world. A total of 106 million tons of bananas were produced in 2013 mainly in Asia and America, although this fruit is consumed worldwide because of its availability throughout the year. Banana production is a tropical, herbaceous and perennial crop and belongs to the Musaceae family, which produces one huge flower cluster and then dies. The plant is cut to bring the crop down, thus the stem and leaves turn into lignocellulosic biomass. The ratio of banana waste and product is 2:1.

In addition to lignocellulosic biomass there is another residue, which is the rejected fruit that has failed to meet the quality standards for its commercialization. The rejection rate may vary between 8 and 20%. This residue is used for animal feed, but the majority of the producers prefer to leave these residues to decompose outdoors for economic reasons.

May 2016 Sciencedaily.com



Fermented functional dairy products

Anti-hypertensive fermented functional dairy products using novel lactic acid bacteria have a big future, a review has found. Fermented milk contains anti-hypertensive peptides along with minerals such as potassium and calcium which have demonstrated a positive effect on blood pressure.

The review, by the Center for Food Research and Development in Mexico, said there weren't many heart health fermented milk products on the market and those that were tended to use the strain *Lactobacillus helveticus*. They encouraged research to find and evaluate new lactic acid bacteria that possess the ability to generate this bioactivity. In one study, authors concluded that daily consumption of the fermented milk with *Lb. helveticus* and *Sac. Cerevisiae* product for at least eight weeks was required to statistically significantly reduce blood pressure. The peptide data will require more testing to win heart and other health claims from the European Union nutrition and health claims regulation.

May 2016 Nutraingredients.com



Soy shows promise as natural antimicrobial agent

Soybean byproducts can already be found in food products; such as oils, cheese and baked goods. The use of these isoflavones and peptides may inhibit the growth of microbial pathogens that cause food-borne illness, according to a new study. Researchers at University of Guelph found soy can be more effective antimicrobial agent than current synthetic options. The team found soy peptides and isoflavones limited growth of some bacteria, including *Listeria* and *Pseudomonas* pathogens and are biodegradable, environmentally friendly and non-toxic.

Peptides are part of proteins, and can act as hormones, hormone producers or neurotransmitters. Isoflavones act as hormones and control much of the biological activity on the cellular level. The next step is for researchers to conduct large-scale tests.

April 2016 Sciencedaily.com



High-Tech Vending Machines Will Dispense 3D-Printed Snacks In The Future

VTT Technical Research Centre of Finland Ltd aims to develop advanced food manufacturing technologies by combining expertise in food, material science and 3D printing technology. Healthy snacks with great textures are in increasing demand among consumers. Researchers have the long-term vision of developing high-tech vending machines that provide customized purchases.

Today's consumer expects healthy, nutritious food with added elements such as design, pleasure and even playfulness. Self-production would enable customization in addition to these. 3D printing technology offers new opportunities to realize such expectations. VTT is testing its 3D food prototypes that include starch and cellulose-based materials. The nonprofit is also seeking to develop plant protein (from oats and faba beans) and dairy protein (from whey) concentrates that could be printed.

May 2016 techtimes.com

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

How much sweet corn does each person consumer per year (on average)?

- a. 6 pounds
- b. 11 pounds
- c. 24 pounds

Answer: c

Renewable Energy

The biofuels industry provides how many jobs in the U.S.?

- a. 76,000
- b. 383,000
- c. 4 million

Answer: b

Coproducts

How many metric tonnes of DDGS are produced in the U.S.?

- a. 35 million
- b. 87 million
- c. 2 billion

Answer: a

Biobased Products

The USDA estimates that biobased products nationwide contributes how much to the economy?

- a. \$989,000
- b. \$4.5 million
- c. \$369 billion

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.
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Agribusiness

Biobased Sealant Paves Way To The Future

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is working with partners now to advance the technology in Minnesota by formulating more demonstrations and validating performance.

The Road Sealant Forum was part of AURI's Innovation Network Program, which brings together thought leaders to identify industry needs and implement innovative ideas. The event concluded with a site visit to the treated roadways in Hutchinson.

"I have seen first-hand some very interesting soybean food applications, but the most innovative uses may not be food products," said AURI board member John Schafer. "AURI plays an important role in studying other uses for agricultural products; it's so meaningful for the organization to be able to bring together stakeholders who can grow new market segments."



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