



# Ag Innovation News

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PHOTO BY ROLF HAGBERG

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PHOTO BY ROLF HAGBERG

# INSIDE GREEN PLASTICS



This Baltix ([baltix.com](http://baltix.com)) sustainable table is made from Greenguard™ certified laminate over a 100% recycled wood fiber top. It has a BioEdge edgeband derived from natural corn polymer. The BioEdge product is made by AURI client Bio-Plastic Solutions (Blooming Prairie, Minnesota).

# AURI report details tech advances, opportunities in fast-growing bioplastics industry



BY LIZ MORRISON

Plastics made from plants are growing fast.

A new AURI report takes an in-depth look at the rapidly expanding “bioplastics” industry. The study, sponsored by the Minnesota Corn and Soybean Research & Promotion Councils, explores emerging technologies and markets for plant-derived polymers.

“Marketplace opportunities for integration of biobased and conventional plastics” is aimed at technical and industrial audiences, says AURI Senior Scientist Doug Root. It offers a detailed review of developing technology and identifies leading players in the bioplastics sector. This information will help Minnesota companies take advantage of coming opportunities in a new global industry, Root says.

Biobased plastics are made either partly or entirely from renewable plants instead of fossil fuels. Sources include corn, soybeans, potatoes, sugar cane, vegetable oils and non-food biomass such as corn stalks.

Bioplastics have the potential to conserve fossil fuels, reduce greenhouse gas emissions and cut the amount of waste going into landfills, says John Luepke, a corn and soybean grower from Courtland, Minnesota, and vice team leader of the Minnesota Corn Growers’ Expanded Uses Action Team. In addition, he says, bioplastics represent a huge new market for farm products.

“Plastics touch every aspect of daily life,” says AURI Microbiologist Jimmy Gosse. “There’s tremendous opportunity for agriculture to contribute to plastics.”

Today, bioplastics are a tiny segment of the worldwide plastics industry, representing about 1 percent of a 360-million-ton annual market, says bioplastics industry consultant Jim Lunt, author of the new report. Lunt is a retired NatureWorks executive who helped develop Ingeo™, a biopolymer made from corn. But the sector is growing at nearly 20 percent a year, Lunt estimates, driven mainly by consumer demand for sustainable products.

However, cheap oil and natural gas “make the economics of renewable biobased products more challenging,” says AURI Project Manager Randy Hilliard. “Price has to be competitive, and performance must be comparable to—or better than—traditional plastics.”

## First generation disposable bioplastics

The first generation of bioplastics—made from plant sugars and starches—is already widely used in disposable consumer products such as cups, bottles, cutlery, fast food containers and packing peanuts. These bioplastics are compostable, although a viable composting infrastructure for these plastics has not yet been developed in the United States.

NatureWorks, founded by Minnesota-based Cargill, is a leading manufacturer of the first generation biopolymer PLA, made from fermented corn sugar.

The industry is working to improve the performance characteristics of these materials so they function on par with traditional plastics, Lunt says. That’s expected to extend applications to many new products and markets.

## Plastic ‘building blocks’

Another important area of development is the conversion of plant-derived sugars to monomers and their derived bioplastics, Lunt says. These plant-based molecules are identical to their petroleum counterparts and form the chemical “building blocks” for many widely-used polymers, such as polyethylene. The Brazilian company Braskem is making commercial quantities of bio-polyethylenes from ethylene produced from sugar cane ethanol.

The technology for making plant-derived monomers is well-established, Lunt says, but economics in many cases still favor conventional fossil fuel feedstocks. These same technologies hold promise for Minnesota’s corn ethanol plants, which could one day produce high-value renewable chemicals along with fuel, Luepke says.

## Partially renewable bioplastics

The technology to create partially biobased plastics composed of both traditional and biobased materials is advancing rapidly, Gosse says. Coca Cola’s PlantBottle is one example. It’s the first fully recyclable plastic beverage bottle made partially from plants. It contains up to 30 percent renewable mono-ethylene glycol produced from sugarcane ethanol.

Rather than entirely displacing petroleum plastics, partially biobased polymers incorporate some renewable ingredients, Gosse says, offering the same functionality as traditional materials, but with a lighter environmental footprint. Often, Lunt adds, these bioplastic products can be made in existing manufacturing plants, making them more cost competitive with traditional plastics.

## Non-food based bioplastics

Currently, bioplastics are being made from food crops such as corn, soybeans and sugar cane. But the next generation of sustainable plastics will be made from non-food sources, Lunt says. New technologies are on the way for converting crop residues and waste wood into renewable polymers. Today, cellulosic biofuel production—the first step in the development of a cellulosic materials industry—is reaching the commercialization stage, Root says.

## Minnesota’s biomass supply chain

AURI is working to develop the biomass supply chain that will be needed to commercialize cellulosic ethanol, plastics and other renewable chemicals, Hilliard says. Minnesota has abundant biomass resources, but there are still many issues, including efficient harvesting, transportation, storage and pre-processing.

“Alternative feedstocks are an area we’ve worked in extensively,” Hilliard says. “We have a good handle on agricultural coproducts and are in a good position to help develop feedstocks for bio-plants.”

Read the report, “Marketplace opportunities for integration of biobased and conventional plastics,” at [auri.org](http://auri.org).

## Minnesota’s bio-advantage

Minnesota has many of the resources needed to become a thriving center for bioplastics, says AURI Senior Scientist of Biomass & Renewable Products Technologies Doug Root.

### Natural resources

The state’s biggest advantage is abundant feedstocks for making biomaterials, including corn stover and other crop residues, woody biomass and vegetable oils.

### Research power

Minnesota has very robust research capabilities, Root says. The Center for Sustainable Polymers at the University of Minnesota, for example, is doing basic research aimed at transforming how plastics are made. The Center is also “training the scientists who are going to go out and carry this work forward, make discoveries, and commercialize them.”

### Innovators

Minnesota boasts a surprising number of large and small companies that manufacture renewable materials. These include a strong ethanol sector and a growing number of manufacturing companies that make or use biopolymers. Bio-Plastic Solutions of Blooming Prairie, for example, makes extruded furniture parts and building materials from corn-based biopolymers.

“There is a lot of opportunity in Minnesota to develop a biobased materials industry,” Root says.



## AURi and Bioplastics

### Idea to reality:

The global bioplastics industry is developing rapidly. Minnesota industries needed an in-depth survey of technology and market opportunities in this field.

### AURi’s role:

AURi led a detailed study of the bioplastics industry. The report, which is aimed at a technical audience, will help Minnesota companies and entrepreneurs understand emerging opportunities in the bioplastics sector.

### Outcomes:

AURi and project partners will use the report to find opportunities in the plastics industry for greater utilization of biobased materials derived from agricultural commodities and coproducts.

### Partners:

Minnesota Corn Research & Promotion Council, Minnesota Soybean Research & Promotion Council

# A new

# WHEY

# to boost health

BY DAN LEMKE

Most Americans don't get enough fiber in their diets. If research into an innovative new technology bears out, an underutilized dairy ingredient could soon provide a hidden, healthy fiber boost.

An emerging research project at the Midwest Dairy Foods Research Center at the University of Minnesota (U of M), and funded in part by AURI and the Midwest Dairy Association, successfully polymerized lactose, a component of dairy whey, into an oligosaccharide, a prebiotic dietary fiber that feeds the beneficial bacteria in the digestive system.

Oligosaccharides have been shown in food to enhance digestive health, benefit the immune system, help with blood sugar control and aid in mineral absorption. These dietary fibers are ideal for food formulations because they easily dissolve and typically have little impact on flavor or texture. Fiber can also partially replace sugar, fat and calories, which makes it compatible with functional foods that deliver on health benefits.

The novel, continuous-flow process tested at the U of M yielded polymerized lactose, called poly lactose. It's an ingredient that has immense potential as a fiber source for the food and beverage industry because many food products ranging from breakfast cereals to yogurt are enhanced to boost their fiber content.

"The fiber market is growing in the U.S." says Tonya Schoenfuss, assistant professor in the Department of Food Science and Nutrition at the University of Minnesota in St. Paul. "People are looking for ingredients to improve their health. Soluble fibers in particular are estimated to have a compound annual growth rate of 10 percent, and they're actually quite expensive." The prebiotics market in 2014 is \$195 million and is estimated to grow to \$219 million by 2020.

## FOCUS ON LACTOSE

The technology is particularly exciting because it produces an indigestible fiber from a disaccharide milk sugar and creates a potential value-added ingredient from a relatively low-value milk processing coproduct, lactose.

Whey is the liquid leftover from making cheese and some types of yogurt. Once used largely for animal feed, whey protein is now sought after as a high-value, nutritional ingredient for human consumption. Concentrated whey proteins are often consumed by athletes to help build or repair muscle, used in infant formulas and by aging adults to help ensure proper nutrition.

Whey is concentrated by filtering it with water through a series of columns or membranes. As the whey protein is concentrated, other components such as fat, minerals and lactose permeate through the membrane. Schoenfuss's research could open new doors that would change the value of that lactose.

"We've been looking at whey ingredients, trying to improve the value of the components we get out of milk," Schoenfuss says. "We've been doing a lot with protein, so lactose seems like a good area to investigate for adding value."

"Lactose from whey or permeate is an underutilized product due to its abundant supply in the dairy industry," adds Donna O'Connor, AURI food and nutrition scientist.

O'Connor says the dairy industry produces several million tons of lactose each year. Lactose makes up about 4 to 5 percent of milk by weight. "There is a tremendous opportunity to use lactose in food applications and transform it from a commodity ingredient to a value-added product."

## AN INNOVATIVE APPROACH

Schoenfuss's research involved blending lactose with glucose and citric acid, then running the mixture through a twin screw extruder in a process called "reactive extrusion." What went in as a white powder comes out of the hot extruder a stringy, caramel-like product. Once it cools, it hardens to resemble glass. It contains 40 to 60 percent fiber that can be easily ground and added as an ingredient to enhance the dietary fiber content of food or beverages.

"This work is aimed at bringing value and benefit to humans by developing a new functional ingredient for food use from an underutilized coproduct stream," adds Mary Wilcox, vice president of business development for the Midwest Dairy Association, which oversees investments made by 10 Midwestern state dairy checkoffs. "Whey and its components increase the overall value of each pound of milk for both farmers and processors."

Minnesota is the seventh largest dairy producing state in the country, with about 465,000 head of milk cows. Annual milk production is over 9 billion pounds. Processors in the state produce more than 600 million pounds of cheese each year, so adding value to whey components could have substantial impact.

"Dairy is unique in that it's perishable and must be processed quickly," Wilcox says. "Anytime you separate or concentrate milk, cheese or whey, another coproduct is created that must be dealt with. Since demand remains strong, both domestically and globally, for higher protein foods containing whey protein ingredients, the manufacturing and supply of permeate coproducts will continue to grow."

"What Dr. Schoenfuss's research has done is identify a straightforward, less expensive process for creating a functional dietary fiber that is in high demand," says Rod Larkins, senior director of science and technology for AURI. "This is a classic example of using science to add value to a coproduct that could add profitability to the dairy industry."

## PREBIOTIC POTENTIAL

Prebiotic fibers are a rapidly growing ingredient category for formulating food and beverages. Total fiber market revenue in the United States alone is projected to grow from \$285 million in 2012 to over \$512 million by 2017. Most oligosaccharides are extracted from natural sources, like inulin from chicory root. Capturing some of that fiber market by further processing lactose is an encouraging opportunity.

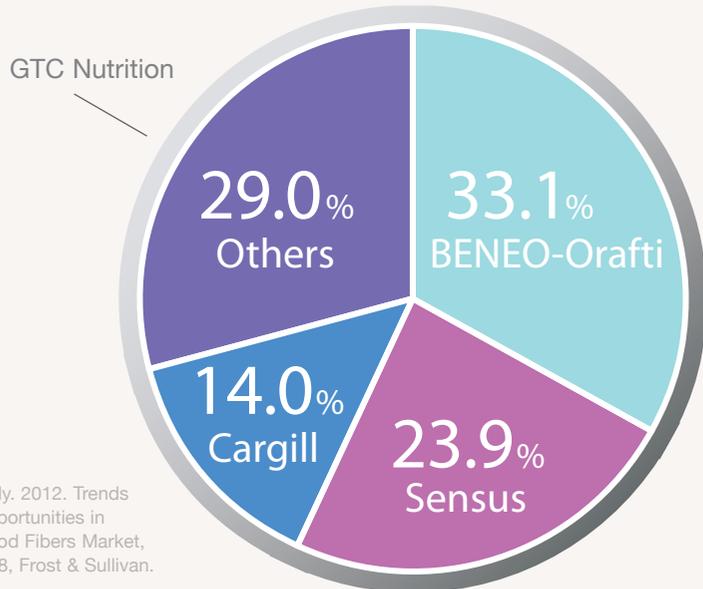
"It has a very high potential," Schoenfuss adds. "It just needs to go through the basic food safety and regulatory requirements that all new food ingredients go through. We also need to test that it does provide a benefit to our digestive health when consumed. That is the next step—to determine if it is a prebiotic fiber."

While the initial results of the university research are promising, more work is necessary to determine if poly lactose really does constitute a prebiotic fiber. Poly lactose would need to go through the FDA regulatory approval process to be accepted as either a food additive or as a self-affirmed Generally Recognized As Safe (GRAS) fiber ingredient such as inulin before it can be added to the food supply.

"Once poly lactose has been successfully proven to be a prebiotic oligosaccharide fiber in human studies, this work would help transform a dairy coproduct into a value-added ingredient," O'Connor says. "It could be well on its way for expanded use as a fiber source in food formulations once regulatory status is achieved."

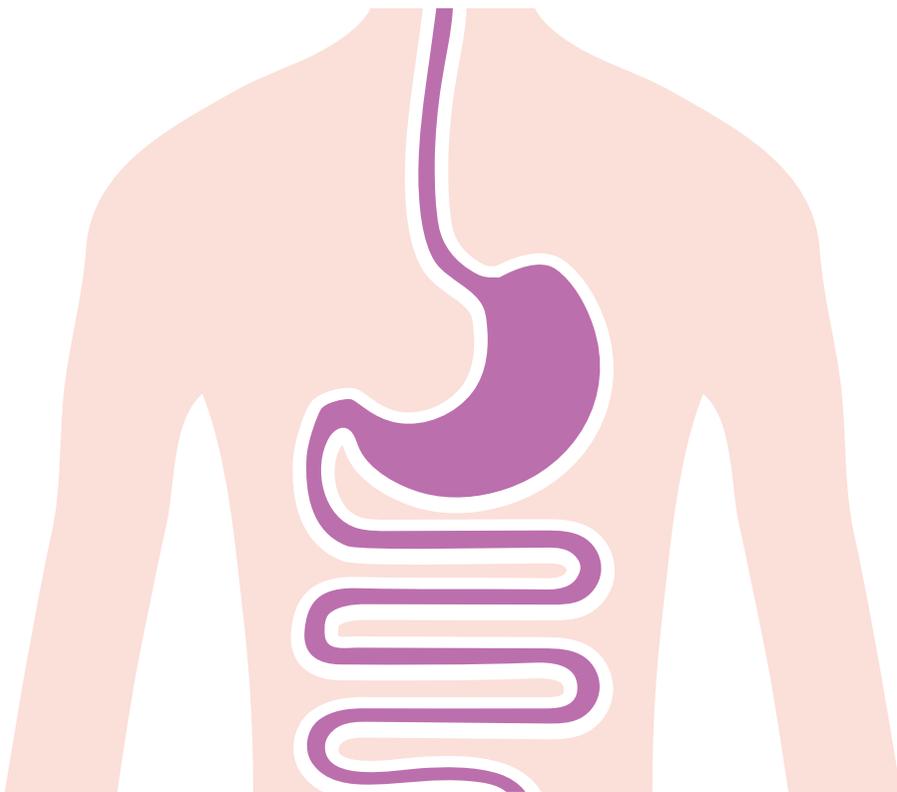
## Percent of Sales

Soluble Fibers Market: U.S., 2010



A. Reddy. 2012. Trends and Opportunities in U.S. Food Fibers Market, N9FE-88, Frost & Sullivan.

Whey and its components increase the overall value of each pound of milk for both farmers and processors.



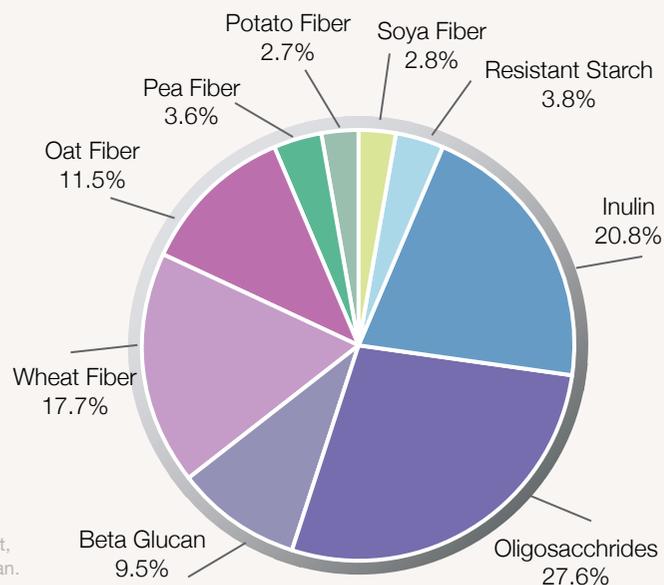
Mary Wilcox  
Vice President of Business Development for  
the Midwest Dairy Association



## Percent Sales Breakdown

Total Food Fibers Market: U.S., 2010

Soluble fibers are 57.9% and forecasted to increase to 62.7% by 2017



A. Reddy. 2012. Trends and Opportunities in U.S. Food Fibers Market, N9FE-88, Frost & Sullivan.



Nurseries, landscape business  
**\$3.5 billion** in “g  
to Minnesota economy

PHOTOS BY ROLF HAGBERG

## Economic impact study sheds light on challenges and opportunities

BY JONATHAN EISENTHAL

It's a vivid snapshot of the garden and yard industry in Minnesota, and what it adds to the Minnesota economy:

- \$3.5 billion dollars
- 42,000 full-and part-time employees
- \$1.9 billion in direct sales

Having come out the other side of the Great Recession, the Minnesota Nursery and Landscape Association (MNLA) wanted to know how their industry—which includes small- and medium-sized nurseries and landscape businesses, but not big box stores—was faring. So, they chose to revisit an economic impact analysis of member businesses first done in 2002. The study was conducted by St. Cloud State University's School of Public Affairs Research Institute, which performed the first economic impact study, and was funded by MNLA, AURI and the Minnesota Department of Agriculture's Minnesota Grown program.

“This economic impact study benefits us in many ways,” explains Cassie Larson, executive director of the Minnesota Nursery and Landscape Association. “Most importantly it helps us quantify the economic impact our industry and

member businesses have on Minnesota's economy for a variety of audiences including our own members, legislators, educators, and the general public.”

Member landscape and nursery businesses might also look at the study to see what regions are having greater activity, or where there may be a region that is underserved. “It also helps businesses to benchmark themselves against each other and the industry as a whole,” Larson says.

### Adjusting to the new economy

Looking at the numbers, researchers concluded that the recession that hit the housing sector also had a significant impact on nurseries and landscapers. More people began to use big box retailers and fewer purchased goods and services from smaller businesses. During these changes, more of the MNLA members began providing landscaping services, which may hint at a future trend.

“I think as the baby boomer generation moves into their retirement years, they don't want to do all the yard work themselves,” Larson observes. “They want to hire someone to do it for them. The study doesn't really provide proof of the reason behind this trend, but that's my inkling.”

According to the study, “the total number of Minnesota Landscape and Nursery companies decreased from over 3,000 in 2002 to 2,136 in 2013, but the average business is substantially larger in 2013 than 2002.” The MNLA board was not surprised to see this drop in nursery and landscape businesses as well as the volume of sales.

“While direct sales are down from the same study conducted in 2002, the fact that the number didn't decline further is a testament to the family run businesses in our industry,” says Heidi Heiland, president of the Minnesota Nursery and Landscape Association and owner of Heidi's Lifestyle Gardens in Plymouth, Minnesota.

“Small, family-owned and operated businesses can succeed even through an economic downturn. Most of our industry's companies have fewer than 10 full-time employees, yet collectively we provide more than 42,000 jobs. We're a strong, diverse and stable part of the Minnesota economy.”

During the holiday season, Mother Earth Gardens features locally grown Christmas trees from Osseo and Balsam Lake, Wisconsin.

Businesses add  
"green"  
to my

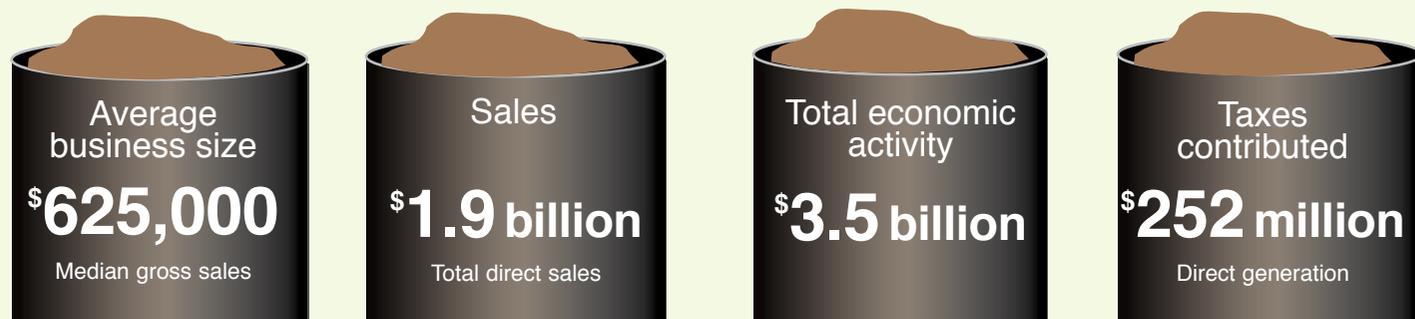
for the industry

## Adding value to horticulture products

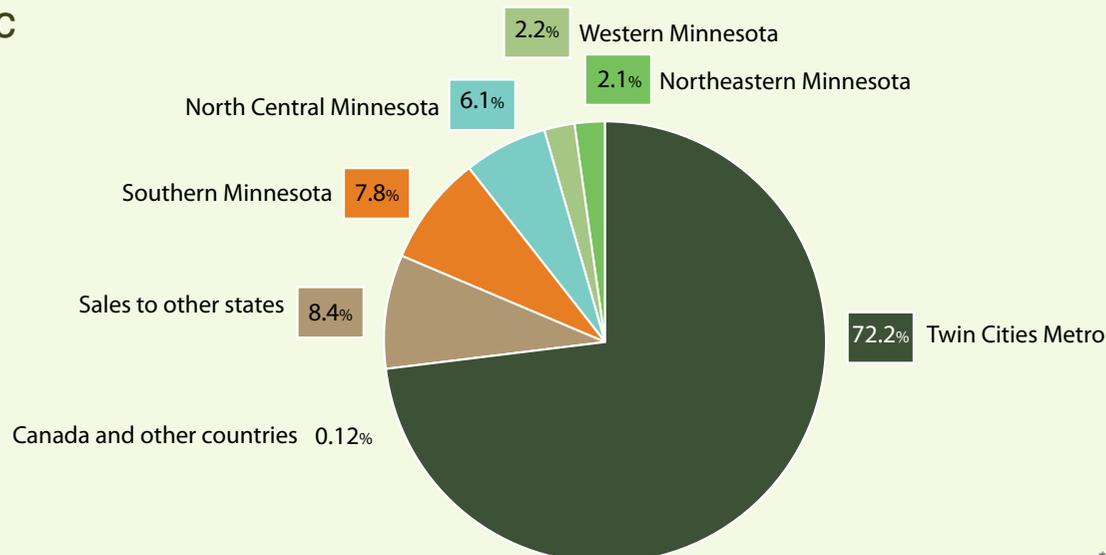
"One of the main reasons for doing the study was to identify areas where the value of horticultural products could be increased," says Randy Hilliard, who served as the AURI project manager for the economic impact study. "At the lab in Waseca, our scientists have worked on developing soil amendments that increase water holding capacity,

water efficiency, microbial activity and more. We also work on fertilizers, developing natural bio-based fertilizers and slow-release nitrogen fertilizers, as just a few examples. Studies like the MNLA economic impact analysis are key to understanding how to get a new product like the ones AURI helps develop into the market."

## Key facts\* in the portrait of Minnesota's nursery and landscape industry



### Geographic distribution of sales:



\*2013 figures

All economic activity related to the industry: **\$455,382,575**

# CALDO Foods

## wants to make HARISSA your next staple

BY JONATHAN EISENTHAL

Mona Radouani remembers like it was yesterday: her mother and her aunts making Harissa as part of their daylong work in the kitchen off the Mediterranean coast of North Africa. She always loved the incredible, mouthwatering savor of Harissa—a hot chili pepper paste.

After 15 years in the United States, Radouani founded Caldo Foods with the vision of bottling Harissa so that that everyone in America might reach for it to heat up a variety of dishes. “Caldo Foods’ products are part of the healthy Mediterranean diet, the healthiest diet known,” says Radouani.

“Caldo means ‘spicy hot!’ in Italian,” Radouani explains.

Harissa combines hot peppers with garlic, tomato and other fresh ingredients. It can be added to salads, sandwiches and meat dishes. Caldo Foods makes it in three varieties: Traditional, Smoky and Fierce.

In addition to the Harissa, Caldo Foods offers other products:

Chopped carrot dip—a unique product in the marketplace, Radouani says;

Chimichuri—used mainly as a meat sauce and based out of basil and other fresh ingredients;

Grilled vegetable salad that can also be used as a dip; and

Dried spice rubs for fish, meat and chicken.

“My husband and I love Harissa, and we wanted to share it with people here,” explains Radouani. “We use our family recipe, but we updated it so that it is more versatile and could be used with almost any dish to add flavor.”

The Radouanis’ Harissa was a hit with friends, and they started making it for parties, holiday celebrations and giving it as gifts.

One of the first challenges they faced in translating their home recipe into a manufactured product was finding an economical source for the volume of peppers and other ingredients they needed. That’s where AURI Senior Scientist of Food & Nutrition Charan Wadhawan came in. Wadhawan helped Radouani find the right supplier.

“For clients looking to source fresh food ingredients, there are two types of sources—manufacturers and food brokers,” said Wadhawan, who works in AURI’s Crookston-based food lab. “When we are dealing with small-to-medium size clients, they often need to connect with the food brokers.”

Wadhawan also helped connect Caldo Foods to co-packers that could manufacture the product to their standards. AURI identifies possible co-packers through its network of resources, including past clients. In addition, Wadhawan conducted the nutritional analysis necessary for labeling, provided shelf-life guidance and offered regulation assistance.

“There are already some Harissas on the market. The main difference is that the ones you can find in the stores are either too watered down, or they use vinegar and have a strong aftertaste,” explains Radouani. “We don’t use vinegar. We don’t use preservatives—only fresh food ingredients.”

AURI also connected the Radouanis to the Minnesota Department of Agriculture’s marketing division to help with distribution ideas. Watch for Caldo Foods’ items in retailers’ cases soon, as the Radouanis begin to get their product into the market.

Adding Caldo Foods’ products can turn a simple dish into a fancy plate. Add Harissa to mac and cheese to make a savory dish that even adults enjoy. Caldo Foods’ products can be ordered online at [caldofoods.com](http://caldofoods.com) and by phone at 612.284.2110.



### AURI and Caldo Foods

#### Idea to reality:

Commercialize a spicy pepper medley from the Mediterranean shores of North Africa, known as Harissa, and make it something that the average consumer uses to add savor to a variety of everyday foods.

#### AURI’s role:

Connect the entrepreneurs with food brokers to source their ingredients and co-packers to manufacture the product to the owners’ standards. Conduct nutritional analysis, pH and water activity testing; provide shelf-life guidance; offer regulation assistance; and develop the required information for labeling.

#### Outcome:

Caldo Foods has products to take to retailers and trade shows in order to begin distributing their product.



Mona Radouani aims to bring the mouthwatering and healthy Harissa to your home.



This grilled vegetable salad can also be used as a dip.



The spicy Mediterranean pepper blend Harissa.

PHOTOS BY ROLF HAGBERG



# Expanding the value of manure

BY ALAN DOERING  
SENIOR ASSOCIATE SCIENTIST - COPRODUCTS

Minnesota has a very strong livestock industry that includes poultry, swine, dairy and beef. Livestock production is accompanied with the challenging task of handling the manure, or what my father would refer to as “sunshine.”

Years ago this task consisted of manually collecting the manure and applying it to fields with a manure spreader. Manure was typically applied close to the farm yards so that there was less travel with the tractor and manure spreader; this always resulted in the most productive and fertile soils being located near the farm building site, and producers realized early on manure’s nutrient value improves crop production.

While the livestock industry has evolved, so have the methods for handling and storing livestock manure. Some of the handling methods include deep pit or lagoon storage for expanded storage capacity and less frequent emptying; they both require handling manure in a liquid phase. Other storage methods are designed to aid in separating the solids—the nutrient-rich part of manure—from the liquid portion; thus allowing for more diverse methods of land application.

There are several universities that have developed nutrient calculators that producers can use to determine the value of their manure based on nitrogen, phosphorus, potassium and sulfur content. Producers can compare these benefits to the costs associated with commercial fertilizer. While manure often has valuable nutrient content, the transportation costs can often hinder these advantages.

As AURI has worked across agriculture industries, it has become clear there is potential to capture greater nutrient value from livestock manure in a way that reduces the transportation challenges. Over the next two years, AURI will be focusing on identifying and evaluating new technologies that can assist with separating valuable nutrients from manure streams in order to allow for more efficient nutrient distribution. Having more concentrated forms of nitrogen, phosphorus, potassium and sulfur will make crop nutrient plans more accurate and expand the customer base for manure through reduced transportation costs and increased nutrient concentrations. These technologies could also aid with livestock expansion and manure management plans.

The focus of these new manure handling technologies include new chemical and mechanical designs, such as:

- Potential technologies to increase the speed at which the nutrient-rich solids settle out from manure and can be more readily removed.
- Manure handling tools that remove heavy solids from swine pit facilities while producing a concentrated solid that is high in phosphorus and potassium.
- Dairy and beef manure handling technologies that separate the solids from the liquid fraction with limited input costs or transportation costs.

The livestock industry continues to be a vibrant part of Minnesota’s agricultural economy, and these opportunities could help producers use nutrient-rich manure with lower input and transportation costs. AURI will help identify and evaluate these technologies to expand the value of their greatest coproduct—manure—and apply it to real-world applications, sharing information with producers as to the best options available.

## Minnesota company semi-finalist in national competition



PHOTO BY ROLF HAGBERG

Fergus Foods, LLC, the Minnesota maker of Nots! Snacks, is one of 10 national semi-finalists in the first-ever Rural Entrepreneurship Challenge. The challenge provides an opportunity for individuals to showcase ideas and business innovations being developed in rural regions of the United States.

Nots! Snacks are a crunchy, non-nut snack for those with nut allergies. They are made in a new allergen-free commercial kitchen, created by Fergus Foods and located in Fergus Falls, Minnesota.

After a series of virtual team interviews, judges will choose four finalists to continue in the challenge. The four challenge finalists will each win \$15,000. They will pitch their business ideas to a team of judges at the American Farm Bureau Federation 96th Annual Convention in January in hopes of winning the Rural Entrepreneur of the Year Award for an additional \$15,000, and the Peoples’ Choice Award for \$10,000 more, totaling prize money of up to \$40,000 to implement their ideas.

## Supporting innovation in rural economies



PHOTO BY ROLF HAGBERG

AURI Executive Director Teresa Spaeth presented on “Supporting Innovation in Rural Economies” at the national SSTI conference. SSTI is dedicated to technology-based economic development. Spaeth’s topic was on strengthening our rural roots, which focused on AURI’s role in enhancing the rural economy. Specifically Spaeth spoke about the help AURI provides to agriculture businesses regarding collaboration, project experimentation and research.

## Farm Fresh Road Trip series wins Emmy®



*Farm Fresh Road Trip*, a Twin Cities Public Television show sponsored in part by AURI and Minnesota Farmers Union (MFU), was recently recognized for its excellence. MFU President Doug Peterson and Membership Director Bruce Miller each won an Upper Midwest Emmy® Award for their work as producing partners for show.

The *Farm Fresh Road Trip* travels to restaurants across the state to film chefs using farm fresh local foods in their meals, as well as inform consumers about the importance of using Minnesota local foods.

“*The Farm Fresh Road Trip* demonstrates to a television audience the connection between the farmer, the chef and the consumer while showcasing the underlying importance of local foods in Minnesota’s economy,” says Doug Peterson, Minnesota Farmers Union President. “Twin Cities Public Television has done a great job in helping bring forward the importance of local foods and its benefits, and we are proud to be in a partnership with them. This Emmy® award is an honor.”

“Minnesota Farmers Union thanks AURI for the farm-to-table support, which allowed for the development and earning of this singular achievement and honor,” says Miller.



# Creating opportunity: Innovation networking and open innovation

BY TERESA SPAETH  
AURI EXECUTIVE DIRECTOR



Innovation isn't an accident. There must be a culture and environment that fosters innovation and that next great idea. And once there is a great idea, there needs to be a system in place to see that idea through to reality—from making a business plan to product testing and marketing to getting the product on shelves in the marketplace. It's an age-old adage: "it's not what you know, it's who you know," and the same is true when it comes to innovation. That's part of the reason that innovation networking is a key program at AURI.

Networking is instrumental in several steps of the innovation process. Here are a few ways that networking helps see ideas through to reality for the entrepreneurs that work with AURI:

- **Generating ideas:**

Each year, AURI organizes more than 50 meetings with Minnesota agriculture organizations and the agriculture industry to identify needs and opportunities in four core areas: food, renewable energy, coproducts and biobased products. This helps ensure that we are doing research that addresses real needs and current issues.

- **Selecting the best ideas:**

Research that just sits on a shelf doesn't help anyone. AURI's active dissemination efforts put the applied research results into the hands of start-ups and businesses that can determine if and how an idea would be successful.

- **Implementing ideas in the marketplace:**

AURI provides contacts with industry experts—such as co-packers that can help package a new product—plus hands-on technical assistance. Product testing, processing and plant design, materials sourcing and pilot lab access are just a few examples. And if AURI can't do it, we have the network to find who can.

This process of generate-select-implement aligns closely with open innovation, which is also known as external or networked innovation. Open innovation enables a company to connect with someone who has critical technology or equipment to allow a business to advance their product concept. This helps uncover new ideas, reduce risk, decrease time to market and leverage scarce resources.

These partnerships can be a great opportunity for small- and medium-sized businesses to connect with larger companies. Several large Minnesota agriculture companies have already embraced this concept and have asked AURI to work with them to identify clients that have technologies and/or products that would be valuable additions to their product lines. This is just one more role of the innovation network.

As the saying goes, "You can't make an omelet without breaking a few eggs." The same is true for innovation—you can't innovate without taking risks. Networking helps offset these risks by ensuring that new ideas meet real needs, that ideas have a real chance of success and that entrepreneurs have the resources and team in place they need to be successful. There will always be eggs broken in the process, but with innovation networking, you get a better omelet more quickly.

## 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.



### Road hog

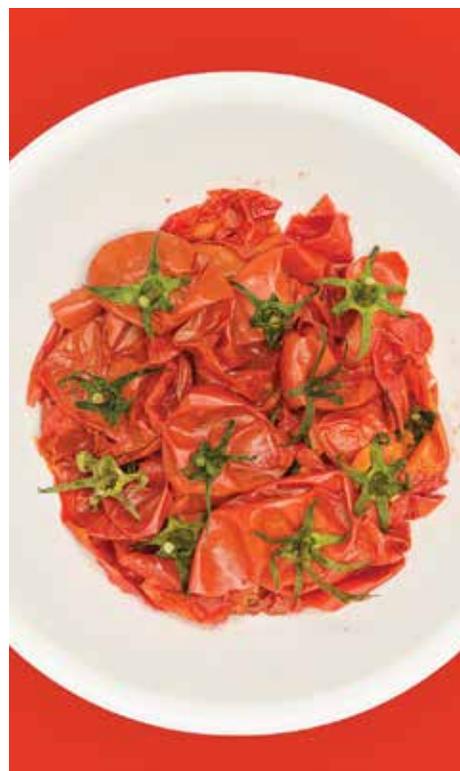
There is a motorcycle in Minnesota being powered by bacon grease. The grease comes from Hormel Foods and is known as 100 percent black label. The grease is treated by a biofuels company to be used in the motorcycle engine for about \$3.50 per gallon. The fuel gets about 75 to 100 miles per gallon. The exhaust even smells like bacon.

Bringmethenews.com, August 2014

### New bean on the block

The North Dakota State University soybean breeding program has a new variety of soybean. The variety, which is non-GMO, is intended for high-protein, tofu and soymilk markets. Compared to a conventional NDSU soybean, the new variety has 3 percent higher protein content.

AgWeek, October 2014



### Tomato-mobile

Ford Motor Company is working with Heinz to create sustainable materials for vehicles from tomato fibers. They are looking closely at dried tomato skins that could be utilized for wiring brackets or storage in vehicles (those that hold change and other small items). The idea is currently being tested. Heinz currently uses more than two million tons of tomatoes each year.

Farms.com, June 2014

### Plan for keeping crops cool lands prize

Several MIT Sloan students earned a \$100,000 grand prize at the first Agricultural Innovation Prize competition at the University of Wisconsin-Madison. Coolify, a startup founded by several MIT Sloan students took top honors for its plan for a micro-cold storage unit that would reduce food waste in rural India.

Mitsloan.mit.edu, May 2014



## 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

Which is the most widely eaten meat in the world?

- a. Beef
- b. Pork
- c. Chicken

Answer: b

### Renewable Energy

How many registered flex-fuel vehicles (those that can use regular gasoline and the ethanol blend E-85) are on the road today?

- a. 14,562
- b. 82,600
- c. 14 million

Answer: c

### Coproducts

What is torrefaction?

- a. A way to recycle cow manure
- b. A form of pyrolysis to change the properties of biomass for a higher quality
- c. A process to make pellets

Answer: b

### Biobased Products

One acre (43,560 square feet) of soybeans can produce how many crayons?

- a. 82,368
- b. 6,040
- c. 2 million

Answer: a

## ABOUT AURI

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

### Service Areas: What We Provide

#### Applied Research and Development

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.

#### 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.

#### 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

Labs are available to clients for hands-on testing and development.

#### Learn More

- Contact one of the AURI Offices to speak with a project development director about your business.
- Visit [auri.org](http://auri.org) to see the latest research and learn about upcoming events.
- Sign up to receive the *Ag Innovations News* or the AURI electronic newsletter to stay informed about AURI projects and clients.
- Follow AURI on Facebook and Twitter to get notices about new research, upcoming events, where to find AURI at tradeshows and much more.

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PHOTO BY ROLF HAGBERG

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PHOTOS BY ROLF HAGBERG

BY LIZ MORRISON

Coffee is a good pick-me-up for you—and your garden, too.

A Minnesota entrepreneur is turning the papery husk from green coffee beans into an all-natural soil amendment. JavaCycle's Soil Builder is made from recycled coffee bean chaff, a byproduct of coffee roasting that's usually discarded. The new gardening product, manufactured by Faribault-based JavaCycle, hit retail shelves this fall at Mother Earth Gardens stores in Minneapolis.

Soil Builder was developed by James Curren of Lonsdale, Minnesota, with help from AURI. Curren is a former agricultural commodities trading and finance executive at Louis Dreyfus Commodities. In 2004, he quit the corporate world and founded Providence Coffee, a fair trade and organic coffee roasting company that serves charitable groups around the country.

A few years later, he launched JavaCycle, which creates tote bags and other merchandise out of colorful bulk coffee bags. Curren's newest venture, recycling coffee chaff, "is the next step for JavaCycle," he says.

Ever since Curren started roasting coffee beans commercially, "I started thinking about what else could be done with the chaff." That question led him to AURI coproducts scientist Al Doering, who analyzed the material's physical characteristics, and helped Curren investigate potential uses in livestock feed, fuel and fertilizer.

Coffee chaff is a good source of nitrogen, phosphorus and potassium, Doering says, and it's also very absorbent. "That led us to the idea of a soil amendment to help hold moisture, relieve compaction and promote microbial activity and soil health," Doering says.

He and Curren tested various blends of light, fluffy coffee chaff and other ag processing coproducts. They settled on mixing the chaff with grain byproducts. Doering devised a manufacturing process that yields an easy-to-handle, granular product. AURI also helped develop recommendations for using JavaCycle's Soil Builder.

Additionally, JavaCycle and AURI are in the process of developing other fertilizers using coffee chaff as the base. "We have several other products in the pipeline," states Curren.

"None of this would have happened without AURI," Curren says. "Al quickly pieced things together."

JavaCycle's Soil Builder is sold in 1.5-, 3.5-, and 25-pound clear plastic bags. Curren got valuable pricing and marketing advice from Mother Earth Gardens, where JavaCycle's Soil Builder was rolled out this fall. Over the coming months, JavaCycle will begin reaching out to regional and national garden centers.

Curren is positioning the indoor-outdoor product as a potting soil ingredient, and as a soil enhancement or top-dress for garden beds. JavaCycle's Soil Builder is also approved for use in growing organic crops. In addition, Curren adds, "It's a made-in-Minnesota, non-GMO product, using locally-sourced materials."

Entrepreneur James Curren founded JavaCycle and is the creator of Soil Builder, which improves soil by using coffee chaff—a good source of nitrogen, phosphorus and potassium.



**AURI and  
JavaCycle**

**Idea to reality:**

JavaCycle, a Faribault, Minnesota company, was looking for a value-added use for coffee chaff, a byproduct of coffee roasting.

**AURI's role:**

AURI helped formulate a soil amendment that incorporates coffee chaff and Minnesota agriculture coproducts. AURI also devised a manufacturing process to make the product, and is working with JavaCycle to develop several other products.

**Outcomes:**

Soil Builder is now being test-marketed at Mother Earth Gardens stores in Minneapolis.

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