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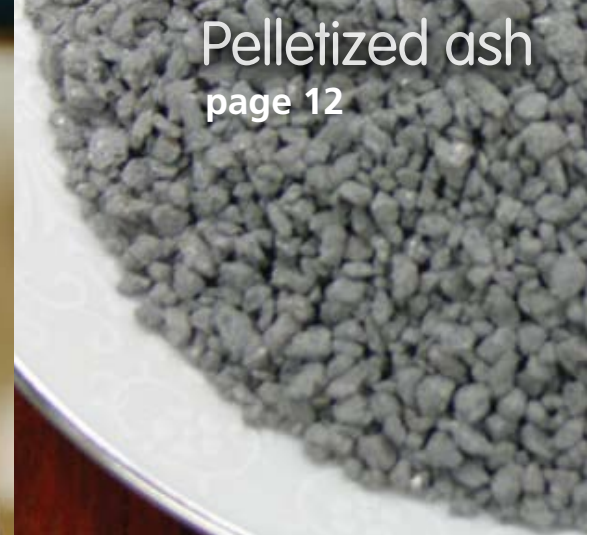
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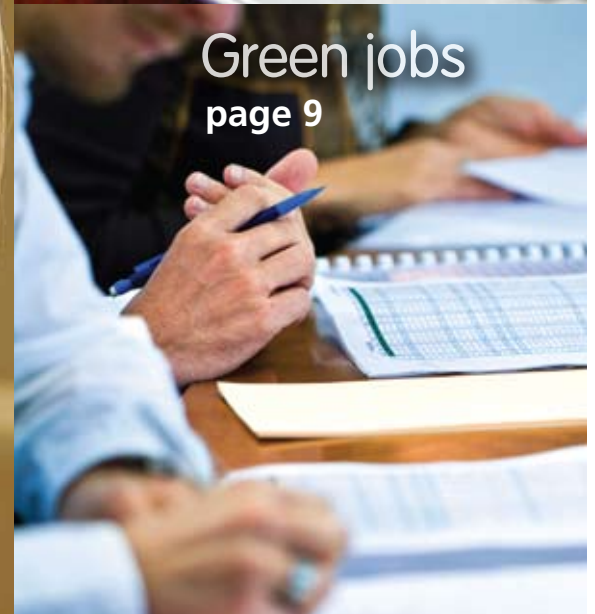
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from red corn**

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PHOTO BY ROLF HAGBERG



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Bio-greening the home turf

BY CINDY GREEN

Eco-friendly, bio-based products made from agricultural and natural resources, are gaining popularity among U.S. consumers. And the largest U.S. consumer — the federal government — is now mandated to purchase bioproducts over their petroleum-based counterparts if they are available and equal in quality and price.

AURI's Randy Hilliard wants to find ways to bring those advantages home.

Hilliard, AURI project director in Crookston, supports a local version of the federal BioPreferred program that gives federal agencies access to a catalog of bioproducts such as packaging material, lubricants, adhesives and other products. The program was mandated by the 2002 federal Farm Security and Rural Investment Act.

The federal program is gradually adding more products to its "preferred" list of bio-based products, which are defined as commercial or

industrial goods (non-food or feed) made with a significant amount of biological, forestry or agricultural products. They are usually biodegradable or recyclable.

BioPreferred collects voluntary manufacturing and product information, including lab results of bio-content and other key information to aid agencies in selecting products. The program's Web site lists hundreds of products, such as lubricants, industrial oils, starch-plastic cutlery, food containers, soaps, cleaners, fuel additives, coolants, fertilizers, inks, building material and paint strippers.

Federal agencies purchase about \$400 billion annually in goods and services. Many agencies using bioproducts "have found them to have comparable or superior performance to their petroleum counterparts," states the BioPreferred Web site.

"We started looking at what we could do in Minnesota," says Hilliard, who was hired by AURI in December 2005. "I was the new kid on

the block so they gave the project to me."

"The first thing I wanted to do was get a better handle on the industry — on companies manufacturing biomaterial."

AURI contracted with the Southwest Marketing Assistance Center in Marshall to survey manufacturers and consumers on what drives the bioproducts market. "We wanted to find out what they are doing with them. If they aren't making or using bioproducts, why not? What kinds of issues and problems are they running into?" Survey results were released this spring. (see story below)

"What we learned from consumers is there are many who don't have the information they need," Hilliard says. "From the manufacturers, it came down to marketing more than anything else. They said, 'show me there is a market and we'll make the products.'"

"When I first started looking at this, I thought we would do more with manufacturing, figure out how to make more products and use our

labs. A lot of them would make more products and could do it on their own if they can be shown there is a market."

"That's changed our thinking; how can we drive demand for these products?"

Hilliard has met with grower groups and state and local officials interested in getting a procurement program in Minnesota, similar to the federal BioPreferred. "We were going to do something on a state level but decided we should get a local model first to show some success and what works."

AURI is working with the Rural Minnesota Energy Board that represents 17 counties in southwest Minnesota — a joint-powers board that initially dealt with wind-related projects. "We approached them to see if they would have an interest promoting bioproducts," Hilliard says. "They recently passed a resolution encouraging all 17 counties to go this direction. So the direction now is to get a model going at a county level."

Who wants bioproducts?

Marketing center's survey of manufacturers and consumers shows price, quality and availability are major factors in bioproduct industry growth



Soy-based inks.

manufacturers produce bioproducts, those who do have experienced increased demand and plan to produce more. Consumers said they need to know more about the advantages and what's available. If they are available and equal in price and quality, consumers are likely to buy more eco-friendly products, the survey showed. Most agreed that besides environmental benefits, supporting agriculture is a purchasing incentive.

Results also showed that marketing will be key and advertising the bio-advantage could support industry growth.

BY CINDY GREEN

Marshall, Minn. — AURI recently commissioned the Southwest Marketing Advisory Center to assess manufacturer and consumer attitudes about using and buying bioproducts to determine current and future demand.

"We wanted to get a better understanding of why people would or would not use bio-based products," says Mike Rich, SMAC executive director.

While only a minority of surveyed



Bio-based lubricants

Manufacturers' response

Surveys were mailed to 1,000 Minnesota manufacturers that could be potential bioproduct users — either in the manufacturing process or end product — with a 10 percent response. Only one-fourth said they currently produce bioproducts. But of those that do, 55 percent said they'll keep up bio-production and 41 percent plan to produce more bioproducts. Almost 40 percent said they started making bioproducts because of consumer demand and 47 percent said bio-based products have increased their sales. A majority of biomanufacturers said the industry needs more technological development.

Of all manufacturers surveyed, 71 percent said consumer demand would impact future bioproduct industry growth; 52 percent said legislation and 43 percent said new-market development would impact growth. Only 24 percent said they needed assistance with product development; 43 percent said market assessments would be beneficial.

Biomanufacturers' response

A smaller group of 60 manufacturers, known to produce bioproducts, were also surveyed — with the highest response rate of 18 percent. About 55 percent of respondents' customers are distributors, serving businesses, households and retailers.

Most said they had seen sales increase over the past two years and 64 percent said their bio-production would increase in the next year — the rest planned to continue at current levels. Consumer demand and desire for more environmentally-friendly products will grow the industry, 91 percent said. Also, 64 percent said a desire for the competitive edge will drive the industry.

Bioproducts increased the business of 82 percent of biomanufacturers; 73 percent said superior-quality fueled sales as well as eco-benefits.

Most biomanufacturers said they could use assistance — primarily with marketing and secondarily with product development, technology and government assistance.

AURI seeks to bring benefits of federal BioPreferred program to Minnesota counties

Nobles, Redwood, Renville and Rock counties have passed resolutions saying they will promote bioproduct purchases over petroleum counterparts “if economically feasible and consistent with contracting law,” says Annette Bair, Energy Board coordinator.

“They’re using taxpayer money and understand the importance of supporting ag-based products.” Counties “may start looking at a department or two where bioproducts have made an inroad,” such as lubricants and janitorial products, she says.

Rural counties “background of support” for biofuels leads easily to bioproducts, Bair says. “Redwood County Highway Department is using 50 percent biofuels in the summertime. ... The Minnesota Prairie Line train was the first in the country to use biofuels.”

“Education is key,” Bair says. She provided information to county boards and engineers that biodiesel will not cancel engine warranties. And AURI tests showed that

clogged fuel filters blamed on biodiesel in 2005 may have had more to do with moisture in tanks. “Myths or misunderstandings happen with any new product.”

“They’re using taxpayer money to buy something and they want to make sure it’s a good product, good price and supporting the local economy.”

Blue Earth County Commissioner Colleen Landkamer, also a National Association of Counties director and former president “was instrumental in getting a ‘green initiative’ started where counties nationwide would purchase bioproducts,” Hilliard says.

Only four percent of ag commodities are used in industrial products but “the products have a higher value from small quantities,” Hilliard says.

“For example, in Minnesota we have medical-device manufacturers. If biobased-materials go into plastic medical devices, a

lot more potential value would go back to the producer ... and it could benefit the state economically.”

“That’s our approach to try to build demand and awareness, starting with government agencies, and developing a good working model for them to develop a biopreferred procurement program.”

Hilliard says counties need help keeping an inventory of their purchases matched with bioproducts that could be replacements, “with an emphasis on what’s being made here,” he says. “Most are either soy-oil or corn-starch based — cleaners, packaging materials, plastics, films, lubricants. Others are agricultural fibers — like mats made of straw or wood fiber.”

“The United Soybean Board is really interested in what we’re doing — they want to use it as a national model.” ■



Randy Hilliard.



Bio-based building materials.

About 57 percent said they were knowledgeable or very knowledgeable about bioproducts, but only 41 percent said they use bioproducts. Of those, 63 percent said it was because they were environmentally friendly and 58 percent because they use less fossil fuels.

A solid majority (63 percent) correlated bio-based products with fuels; 71 percent said they perceived bioproducts as being environmentally friendly. Respondents were neutral about using bioproducts if the price



Starch packing peanuts.

was the same but quality was lower than petroleum-based counterparts. More were agreeable to using equal-quality bioproducts priced slightly higher. However the majority, increasing with the respondents’ age, would purchase bioproducts only if the price and quality were the same.

About 95 percent said they would purchase quality, competitively-priced bioproducts

if available — most out of concern for the environment but support for agriculture was also a major benefit. ■



Straw mats.

PHOTOS BY ROLF HAGBERG

Consumer response

Surveys were randomly mailed to consumers in five counties — Ramsey, St. Louis, Olmsted, Blue Earth and Polk — with a 9 percent response. Respondents were primarily male (77 percent), older (68 percent age 56 or older), and about split between urban/suburban and rural/small town upbringings. About 93 percent were Caucasian, 77 percent married and 65 percent college or post-secondary graduates with an average income of \$66,700.

AURI's first oils scientist retires

Max Norris led fats and oils research for 18 years



PHOTOS BY ROLF HAGBERG

Max Norris, right, working in AURI's oils lab in the summer 2002 with chemist Jerry Crawford, who retired in 2005.

BY LIZ MORRISON

Marshall, Minn. — AURI's "oilman" retires July 1.

Max Norris joined AURI in 1990, soon after it was founded. He organized the Institute's laboratories and led fats and oils research and technical services for nearly two decades. Norris headed up AURI's early biodiesel initiatives, the first such efforts in the state. And he guided successful oilseed product development, including NuSun cooking oil, SoySoft lotion, and Preference and Destiny crop-protection adjuvants.

Former Durkee Foods director of research and development, Norris helped establish AURI as a respected research institution, says Teresa Spaeth, AURI executive director. "Max brought professionalism and solid science to AURI he has been a mentor to everyone in the organization."

Two-part career

Norris, 68, says he had a two-part career. "I spent the first half of my career at Durkee Foods and the second half at AURI."

He grew up in Beaumont, Texas, the youngest of three brothers and son of a house painter. His interest in agriculture started in high school, and a Future Farmers of America teacher pointed him to a career in the industry. "I guess I have a little bit of dirt in my blood," he says. Norris earned a B.S. in agriculture from Sam Houston State College in Huntsville, Texas. That's where he met his wife of 48 years, Virginia Norris, a South Dakota State University psychology professor

who retired in June. "We met the first day of college," Max recalls. "My roommates and I went dancing with some girls from the sorority across campus. We paired up by height — I was the tallest boy, and she was the tallest girl."

Norris went on to graduate studies in organic chemistry at the University of Missouri. His research focused on egg products. In 1965, he joined Durkee Foods' bakery products division as a fats and oils chemist. The Cleveland-based company made vegetable oils, spices, snack foods, condiments, frozen bakery doughs, confectionery items and many soybean oil-based products for the food-processing industry.

Norris spent 25 years with the company, rising to director of research for Durkee's consumer products, food service and industrial products divisions. "When a customer had a need, we developed the product they needed."

Norris left Durkee Foods in 1989, after it was acquired by British conglomerate Unilever. He spent a year as a food industry consultant but found the work unsatisfying. "I never got to see how the project turned out," he says. But more important, "I'm a people person, and consulting is a lonely life."

In 1990, AURI's first executive director, Virgil Smail, recruited Norris to the newly-formed nonprofit. AURI was quite a change from Durkee Foods, where Norris had managed 250 employees and a \$15 million annual research budget. At the time, AURI had just a handful of staff and no lab facilities. But AURI offered the chance to build an organization dedicated to value-added agriculture, working with

farmers and rural entrepreneurs on innovative ideas. "That's what intrigued me," he says. "It was exciting as all get out!"

Early biodiesel initiatives

Taking a walk with Norris into AURI's fats and oils laboratory at Southwest Minnesota University in Marshall, several bench-top trials are visible on spotless, stainless-steel lab tables. One involves a vegetable-oil foam spray for protecting outdoor grain piles. Norris has worked on dozens of new oil crop uses — many are petroleum substitutes. "We want to grow the total market pie," he says.

Biodiesel is one of the most important new soybean oil uses, Spaeth says. "Max did a significant amount of work on biodiesel back in the day when people thought it was a pie-in-the-sky dream." In 1992, Norris began working on biodiesel fuel specifications for underground mining equipment. Over the next 15 years, his team helped three groups of Minnesota farmers build biodiesel production plants.

Today, the state has more than 65 million gallons of biodiesel manufacturing capacity, and all diesel fuel sold in Minnesota is a 2-percent biodiesel blend. "Max was the strongest advocate for bringing biodiesel on line and getting it to the marketplace," says Edgar Olson of Crookston, retired AURI executive director.

Norris also headed up AURI's Center for Producer-Owned Energy, which helps Minnesota growers start renewable-energy ventures. The Center's innovative work on

wind-biodiesel electrical cogeneration is now being tested on Minnesota's Buffalo Ridge, Norris says. When the wind stops or drops, the biodiesel generator takes over, producing continuous renewable electricity.

Soybean growers' 'own expert'

Norris is especially proud of AURI's close relationships with Minnesota's grower groups.

Soon after joining AURI, Norris convened an oils task force to get some ideas rolling, recalls Mike Youngerberg, Minnesota Soybean Growers Association field services director. "Soybean oil prices were really, really low back then," Youngerberg says, and state growers were keenly interested in developing new markets.

"We felt a serious need for an organization like AURI," says Youngerberg, who has been with the Soybean Growers since 1986. "AURI helped extend the dollars we had to invest in new uses," he says. But more important was "AURI's technical support, identifying projects, reviewing projects, providing technical expertise — all the things we couldn't do ourselves. ... My farmers look at Max as their own expert."

Collaboration with AURI resulted in successes like crop adjuvants made from methylated soybean oil, Youngerberg says. Technical support has been as important as financial, he adds. A few years ago, for example, "Max helped us through some tough times when out-of-spec biodiesel fuel hit the marketplace."

Norris, who lives in Lynd Township near Marshall, will continue to do some consulting. He and Virginia, who have two daughters and five grandchildren, are looking forward to more travel and family time. First up: a trip to Colorado with the grandkids.

"I've thoroughly enjoyed working at AURI," Norris says. "I've had a ball!" ■



Norris.

Where are they now? Updates on past features.

SoySoftening the world

Lotion manufacturer finds business fine online

BY DAN LEMKE

Edina, Minn. — The world is a softer place thanks to an accidental discovery. A lotion made from central Minnesota soy oil was developed 12 years ago. Since then, thousands of hands — from the Midwest to the Middle East — have felt the healing benefit of SoySoft.

“It amazes me how people find us,” says Lucy Larson, who operates the SoySoft company with her husband Cliff at their Edina home.

SoySoft produces deep-treatment and daily-moisturizing body lotion as well as five scented lotions and matching body washes. Products are available in hundreds of stores in more than 30 states. But it’s the online business that has seen the biggest boost.

“Internet sales used to be about five percent of our business. It was minimal,” Larson says. “Now it’s up to almost 30 percent of our business. That surprised us.”

SoySoft has been a surprise since its unexpected discovery.



PHOTO BY DAN LEMKE

Lucy Larson, who operates the SoySoft lotion company with her husband Cliff, says they discovered soy’s soothing properties when plant workers at Cliff’s soybean-processing plant noticed their dry, cracked hands softened and healed after direct contact with soy oil.

In the mid 1990s, plant workers and electricians at Midwest Protein in Grove City, a soybean-processing facility owned by Cliff Larson, noticed their dry, chapped and cracked hands softened and healed after direct contact with soybean oil. The plant uses a mechanical rather than chemical process to separate soy oil from meal, leaving vitamins and essential fatty acids intact. Those active ingredients improved workers’ hands.

The Larsons recognized the possibilities and began working with a cosmetic chemist to formulate a soy-oil-based lotion. In August 1996, they had a prototype. Shortly after, they began working with a Minneapolis manufacturer to produce and bottle SoySoft. They were entering a market dominated by industry heavyweights, so they focused marketing efforts on gift shops and small retailers.

The soy lotion was a natural promotional fit for organizations like the Minnesota Soybean Growers Association and the United Soybean Board, Larson says. Soybean groups in Minnesota, Kentucky and Maryland have actively promoted SoySoft and found retail markets across the country. In 2007 they marketed an average 1,550 bottles of lotion per month, Larson says.

SoySoft isn’t just a hit in the United States. The lotion has been shipped to soldiers in Iraq by the Minnesota Soybean Growers and there is a loyal customer base in England. Larson says they even have a sales representative for Morocco and Dubai because those markets have nothing like SoySoft.

Like most small businesses, SoySoft has made changes. The lotion is now manufactured in Henderson, Minn and SoySoft is doing private labeling for other companies. Larson says she would like to develop an organic product to reach other market segments.

Over the past 12 years, SoySoft sales in small towns have been hurt by retail outlets closing due to struggling rural economies. But that has been partially offset by online sales, which helps SoySoft function like a much larger company.

“I’ve had a good experience and learned a lot,” Larson says. “I still get testimonials from people who say they’ve tried everything, but our products are the only ones that work for them. That keeps me going.” ■



STOCK PHOTO



CONTRIBUTED PHOTO

Color-full Corn



BY LIZ MORRISON

What makes raspberry yogurt pink, cherry-pie filling red and grape soda purple? Would you believe refined petroleum?

That's right. FD&C Red No. 40, the most common food color, is derived from fossil fuel. Nearly 7 million pounds of synthetic red dyes, worth over \$2 billion, are added to foods, beverages, cosmetics and medicines every year.

Now a Minnesota food-ingredients company has come up with a natural alternative to Red Dye No. 40. With help from AURI, Suntava will introduce Sayela™ Colorant, a patent-pending color additive made from corn, this year. "Sayela" means "reddish" in the Lakota Native American language.

The natural plant dye is derived from Suntava™ Red Maize, a non-GMO corn variety bred by Red Rock Genetics of Lamberton, Minn. The striking, magenta-colored hybrid is full of valuable red pigments known as anthocyanins.

Demand for plant-based color additives is surging, as more consumers want foods with no artificial ingredients, says Suntava CEO Bill Petrich, a former Schwan Food Company executive. Natural-red colorant sales are rising 10 percent a year — more than three times the rate for synthetic red food dyes, he says. Today natural pigments account for about \$500 million of the \$2.8 billion market for red food color. "This is a great time to enter the market," Petrich says.

There are many natural red-dye sources — purple cabbage, tomatoes, black carrots, elderberries, grape skins. However, plant-based dyes are susceptible to light and heat, unlike synthetic colorants, Petrich says. "The colors can change during processing and storage. That's the down side of natural colorants." Also, fruit and vegetable colorants may impart an odor or taste. And most botanical dyes are imported, so supplies "are more uncertain."

Suntava's advantages

Compared to other plant-based dyes, Suntava Red Maize pigments have many advantages, Petrich says. The dye stability is "slightly better than elderberry but not as good as black carrot." But among natural dyes, its hue is one of the closest to Red Dye No. 40, the industry standard.

Suntava Red Maize has agronomic advantages, too. It is grown, harvested and stored just like conventional yellow corn, a plus for assuring reliable domestic and global supplies. "Corn is the king of crops," Petrich says, adding that many natural dyes are imported "and have experienced cost increases due to the strength of the dollar."

Red corn's starch and gluten are unaffected by Suntava's proprietary anthocyanin-extraction

PHOTOS BY ROLF HAGBERG

Bill Petrich, Suntava CEO, holds vials of a natural alternative to Red Dye No. 40 derived from red corn. Entomologists Lee and Joann French bred the red maize hybrid and their daughter Michele (at right and pictured on the cover) works in the Suntava lab where the colorant is made. Regina Bertoldo is pictured on the left and on page 7.

Minnesota company introduces natural food-color additive made from red corn



process, Petrich says. So in addition to pigments, “we still have a commodity to sell, which has an established market.”

There are “many, many applications” for red food color, Petrich says, including soft drinks, confections, snacks, dairy foods, condiments, cereal and cosmetics. Vitamin waters may be one of the best markets, says Petrich who is negotiating with potential customers in the United States, Europe, Australia and New Zealand.

Antioxidants in development

Besides colorants, Suntava plans to produce nutraceuticals — food additives that promote health.

Suntava Red Maize contains high levels of three powerful antioxidants: cyanidin-3-glucoside, pelargonidin and peonidin, Petrich says. Antioxidants are widely used in dietary supplements, power bars and drinks, breakfast cereal and other fortified foods. And they are frequently used in cosmetics and anti-aging products. “The wholesale market for these is even bigger than the colorant market,” topping \$5.7 billion a year, Petrich says.

Suntava has developed a process to extract the antioxidants from red corn and is working towards FDA approval for Sayela extract.

A new crop for Minnesota

Red maize is a brand new commercial crop for Minnesota, says Dennis Timmerman, AURI project director, who has assisted the red-corn venture since 2002. Meadowland Cooperative, based in Lamberton, is handling grower contracts, agronomics and identity-preserved storage.

“Agronomically, it’s similar to yellow corn, although the yields are less than conventional corn,” says John Valentin, Meadowland general manager. “So we’re paying growers on a per-acre basis, rather than per bushel. This year, we had more farmers who wanted to grow it than we had acres available,” he says. “It’s new and exciting, so people are interested in it.”

The 3,000-member co-op has also invested in Suntava. If the business takes off, red maize could be a good specialty crop for Meadowland growers, Valentin says, “and the return could be better than yellow corn.” Within a few years, Petrich says Suntava might easily need 10,000 to 15,000 acres. Meadowland, a full-service cooperative with 14 locations across a 75-mile swath of southwestern Minnesota, “is large enough to handle any size volume this might grow into,” Valentin says. ■



Discovery by bugs

Entomologists researching insect-resistant corn find a maize with red-dye potential



Western Corn Rootworm Beetle

BY LIZ MORRISON

Lamberton, Minn. — When Lee and Joann French first started breeding red corn, they were looking for hybrids that would be bad for pests. In a serendipitous twist, they found a hybrid that's good for people.

They've turned that discovery into a new business, Suntava, which will produce natural-food colors and antioxidants from the Frenches' red corn.

For nearly 30 years, the Frenches have supplied research insects to universities and chemical and seed companies to test pesticides and new plant genetics. Internationally-known French Agricultural Research Inc. rears corn borers, corn rootworms, black cutworms and half a dozen other major corn pests.

The Frenches' climate-controlled labs in Lamberton produce about 350 million insect eggs a year, says Lee, an entomologist and professor at Southwest Minnesota State University in Marshall. His wife, Joann, a biologist and chemist, spends summers collecting fresh "livestock" from farm fields all over the Upper Midwest. That's necessary, she says, because corn pests are continually adapting.

Bugs to plants

About a dozen years ago, the Frenches started searching for genes to improve insect, drought and disease resistance. Using traditional breeding methods, they drew on ancient maize strains, looking at "many different populations from all over the world," Lee says.

The Frenches and their team of plant breeders were especially interested in the properties of red maize, which gets its intense color from plant pigments called anthocyanins, which are also flavonoids that contribute to good health.

Help from AURI

In 2002, the Frenches turned to AURI's Dennis Timmerman for help researching the commercial potential of their new red maize hybrid.

AURI helped secure a \$100,000 USDA Rural Development grant for the project. The Minnesota Corn Research and Promotion Council and AURI also provided research money. The grants enabled the Frenches to identify the pigments and antioxidants in their new hybrid and test their properties. Later, AURI supported development of Suntava's proprietary extraction and refining methods. "AURI did a good job of helping us avoid the common pitfalls of start-ups," Joann says. "That was one thing we needed."

In 2007, the Frenches hired Bill Petrich to get the business up and running. Petrich spent 10 years with Schwan Food Company developing new businesses and product launches for the Marshall-based food company.

The Frenches had envisioned putting up a manufacturing



Entomologists Joann and Lee French bred a pest-resistant corn from ancient red maize strains that turned out to be a good source for natural red dye and antioxidants.

plant in Lamberton. But that was putting the cart before the horse, Petrich told them. The first step in launching a successful new product, he says, is to ask: "What's the market? Who are your customers? How will you get it to market? How will it be financed?"

Petrich charted a course of slow, deliberate growth for Suntava: "Start small, identify customers, farm out the manufacturing, and prove there's a market for the product. Then decide if it makes sense to build a plant. Our focus now is on research and development, and sales and marketing."

Petrich's first task was to raise start-up money. He worked with Twin Cities-based Northland Securities to put together a half-million dollars in bridge financing, giving Suntava immediate access to cash. Northland Securities also helped raise private investment capital. Suntava completed its initial capitalization in February, exceeding its equity goal, Petrich says.

Earlier this year, Suntava received FDA approval for its red dye, Sayela™ Colorant, which will be manufactured by a local co-processor. Suntava is now seeking patent protections for its pigments and extraction process.

The Frenches also started a non-GMO corn-breeding company, Red Rock Genetics, which has applied for a patent on Suntava Red Maize and is continuing to develop new red corn hybrids, Lee French says.

Bringing the Frenches' concept to market has been "up and down," common with start-ups, Petrich says. He recalls the day an investor check arrived the very afternoon that a loan payment was due. It's been a rewarding experience, too, he says, especially "working with people in rural Minnesota." ■

Minnesota's Renewable Energy Roundtable



Training talent

Renewable-energy industry presents job opportunities as well as ag markets

BY DAN LEMKE

Jackson, Minn. — The emerging biofuels industry is offering up more than new ag markets. Developing talent for new rural jobs is another opportunity the Minnesota Renewable Energy Roundtable is paying attention to.

Dennis Hampel, dean of career and technical programs at Minnesota West Community and Technical Colleges, Joann Frederickson of Bemidji State University and Claudia Neuhauser of the University of Minnesota lead the Roundtable's talent development team. It is addressing workforce issues such as training needs and educational curriculum development.

"We need to make sure the right training is being done and in the right numbers," Hampel says. The Roundtable, coordinated by AURI, is a coalition of public and private organizations interested in promoting a Minnesota renewable-energy industry.

In late 2007, AURI, Minnesota corn and soybean grower associations and the Southwest Initiative Foundation commissioned Midwest biofuels industry study to determine future employee and training needs. The report found there could be as many as 7,000 to 10,000 job openings in the ethanol industry and 7,300 to 9,800 in biodiesel.

But Hampel says that's only a fraction of what's possible.

"An ethanol or biodiesel plant only needs a few operators," Hampel says. Beyond that, "there is need for purchasers, people with training in contractual issues, electricians and plumbers.

"When you take a look at wind-energy development, for example, there has been tremendous growth in Minnesota. We are taking a look at the whole spectrum to get an understanding of how many technicians it will take to service the industry, how many maintenance people. But we're also looking at how

other areas such as construction jobs will be affected."

The talent development team is primarily focused on two areas: K-16 education and customized training.

K-16 possibilities range from curriculum development for elementary students to baccalaureate degrees for post-secondary students. Younger students could participate in project-based activities including science-fair projects in renewable energy.

Customized-training options could include plant operator and technician training and "green construction" training for contractors.

"We're not going to produce our way out" of energy demands, Hampel says. "We also need to be concerned with conservation and be able to bring contractors up to speed on green techniques."

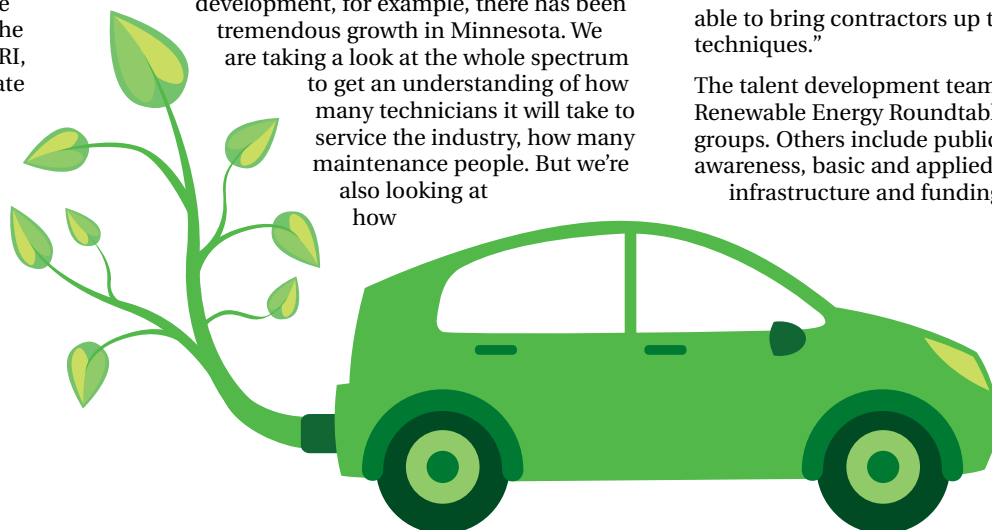
The talent development team is one of five Renewable Energy Roundtable working groups. Others include public policy and awareness, basic and applied research, infrastructure and funding.



The Roundtable represents more than 60 organizations including higher education, research, agriculture, state government and industry.

"Renewable energy is the mechanism, but what we're really talking about is rural wealth creation and retention," says Teresa Spaeth, AURI executive director. "Developing an industry that creates value-added uses for agricultural products, generates economic activity in rural areas and has the potential for good jobs in those communities is great for Minnesota and the region."

Hampel says funding for curriculum development is a challenge. However, several grant possibilities could help finance educational efforts in Minnesota and beyond. ■



Elsewhere in ag utilization

BY DAN LEMKE
CARTOONS © UNCLE HYGGLY

Editors note: Elsewhere provides news from around the globe on new uses for agricultural products. Please note that ARS is the research arm of USDA.

Sweetened plastic

Sugar-beet pulp may cut the cost of biodegradable plastic, according to ARS researchers. About 40 million tons of pulp, a fibrous sugar-beet processing coproduct, is generated in the United States each year and primarily used in livestock and pet foods. Researchers are converting sugar-beet pulp into a polylactic-acid plastic filler. PLA is a natural alternative to petroleum-based plastics like polypropylene because it has similar technical properties but is biodegradable. Because producing PLA from fermented corn sugars is complex and costly, using cheaper pulp-derived fillers could reduce PLA's cost.

From: USDA-ARS
March 12, 2008

Colorful cabbage

Plant pigments called anthocyanins provide fruits and vegetables with distinctive blue, red and purple coloring. ARS research into anthocyanins' affect on the human body suggests the pigments may protect against cancer, improve brain function and promote heart health. Previous studies have shown that some anthocyanins yield twice the antioxidant power of vitamin C.

From: USDA-ARS
February 28, 2008

Oceans of opportunity

Tons of American soybeans are destined for a watery end—food for the world's aquaculture

industry. Soybean leaders say fishmeal is becoming scarce, creating opportunities to use soy meal in fish, shrimp and shellfish feed. Aquaculture is the fastest growing animal-feed producing sector, consuming meal from more than 250 million bushels of soybeans annually. Raising fish in huge floating cages in the ocean is on the increase, and Americans now consume about 16 pounds of fish and shellfish each year. One aquaculture company official says about \$7.5 billion worth of soybeans could go to aquaculture.

From: United Soybean Board
April 28, 2008

Peanuts pasture

Forget alfalfa. For southern U.S. farmers, perennial peanuts may be the best forage option. After more than 50 years of research, the rhizoma perennial peanut is now considered by many growers to be the best perennial warm-weather legume for southern states. The peanut is well adapted to the lower South, where its nutritional-quality, persistence and broad use are making it a staple pasture and hay crop—at a fraction of alfalfa's cost.

From: USDA-ARS
March 3, 2008

Biodiesel card

The National Biodiesel Foundation unveiled the first-ever biodiesel fuel card at the Mid-America Trucking Show. The BioTrucker Fuel Card highlights 151 truck stops that carry biodiesel and is accepted at 5,000 truck-accessible retail locations across the United States. The card can be used for fuel, cash advances, repairs and other road expenses.

Truckers and fleets pay cash price on all fuel and no transaction fee for biodiesel at

in-network truck stops. Also, three stops are offering a two-cent discount at the pump for BioTrucker Fuel Card holders.

From: Biodiesel Bulletin
April 2008

Firefighting wool

An ARS scientist has discovered and patented a heat-resistant material that can be added to wool and other fabrics to match the flame resistance of commercial firefighter uniforms. Wool, less susceptible to burning than synthetic fibers, is ideal for firefighting and

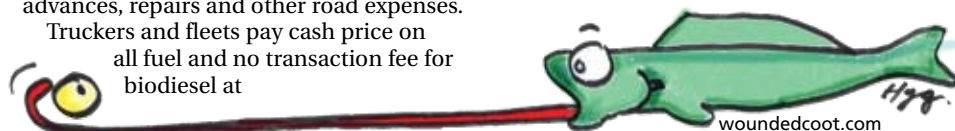
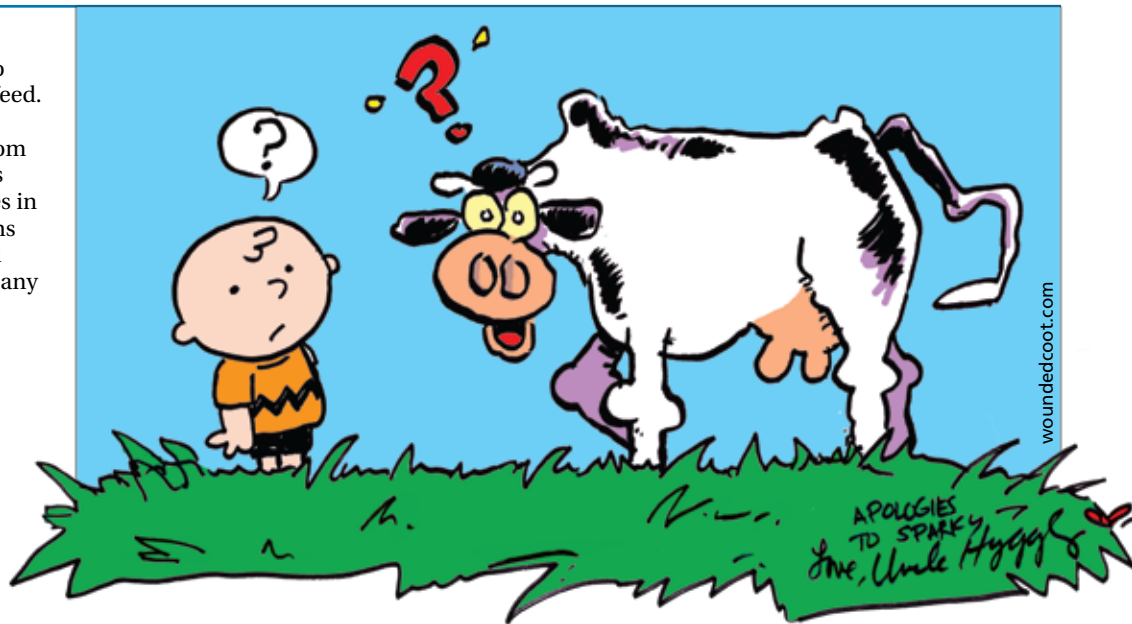
military uniforms. Unlike synthetic fibers that can bead and drip on the skin when burned, wool produces a soft ash.

From: USDA-ARS
May 1, 2008

Soy transformers

This year, all new electrical transformers in Xcel Energy's eight-state service territory are being filled with 100-percent soybean oil, replacing petroleum-based mineral oil, the industry standard. Food-grade soy-oil liquid is being used in new single-phase transformers for residential and light-commercial use.

From: Xcel Energy
October 16, 2007



AURI news briefs

Ag Innovator of the Year

Grass-seed company honored for plans to produce its own power

Williams, Minn. — Northern Excellence Seed, LLC, one of Minnesota's first companies preparing to generate power on-site from biomass, was presented the 2008 AURI Ag Innovator of the Year award at a June 18 ceremony in Bemidji.

The 29-member cooperative, formed in 2002, contracts for 18,000 acres of Kentucky bluegrass, ryegrass, timothy and other specialty grass seeds. The Northern Excellence processing plant in Williams cleans and bags about 8 million pounds of seed annually.

The cleaning and processing also generates about 2 million pounds of grass-seed chaff and screenings. Instead of paying \$10,000 to \$15,000 for disposal, Northern Excellence is installing equipment to gasify chaff and straw and make electricity. The Lake of the Woods County business may be the only factory in the country to gasify grass-seed waste.

Converting waste into watts will furnish energy to run the seed-cleaning plant and save the company at least

\$60,000 a year in electricity and waste disposal costs, says Brent Benike, Northern Excellence Seed general manager.

"When you farm in Northern Minnesota your whole life, you have no choice but to be innovative," Benike says. "You have to be able to adapt either through processing or how you use your crops."

The Ag Innovator award is given each year to a client selected by AURI's board of directors that has shown innovation in their product or process, uses significant amounts of agricultural products and has made a positive impact on Minnesota.

"They were innovative in identifying new grasses to produce by looking at varieties such as perennial ryegrass," says Michael Sparby, AURI project director. "Then they had the willingness as a young cooperative to take a look at waste streams to reduce their energy loads."

Northern Excellence Seed is the seventh Minnesota company to receive the award. Previous winners include Pet Care Systems, Mississippi Topsoils, FUMPA Biofuels and USA Solutions. ■



Benike.

Creating the future

BY TERESA SPAETH

None of us can see the future. We may be able to predict certain events based on past experience, but the future still eludes us.

That doesn't mean we can't have a hand in creating the future.

AURI strives to be innovative in all we do. Whether streamlining processes, offering unique services or identifying value-added opportunities for Minnesota agriculture, innovation is paramount. That means continually evaluating our efforts to identify new and creative ways of doing business.

One of AURI's tactics to foster innovation involves looking at issues in a backward way — looking at desired end results first, then determining how to get there. This 'history of the

future' technique fosters innovation because it forces us to think differently.

For example, if we want 20 percent of Minnesota's energy consumption to come from renewable sources by 2012, assume that already happened. Then determine what policies were written, renewable-energy power plants constructed and electrical distribution lines put in place to make that happen. That's how plans of action emerge.

AURI has used this technique with many of our partners to chart their future. It's different than our usual approach to life. But by assuming that we will reach the desired results, we can identify the steps to get there.

So while we can't see the future, we can have a hand in shaping it. ■



Spaeth.



A nonprofit corporation created to strengthen rural Minnesota's economy, AURI helps businesses respond to market opportunities with new and value-added uses for agricultural goods. The Institute builds working partnerships with business innovators, agricultural groups and researchers, and provides technical support to clients conducting new product research and development.

AURI programs are available to legally-organized businesses or cooperatives with projects that have the potential to create new uses or new markets for Minnesota agricultural commodities. AURI assistance is designed for the early stages of a product's life cycle, while an element of feasibility is yet to be determined.

Project proposals are evaluated on the following criteria:

- Innovation/uniqueness
- Market viability
- Use of Minnesota commodities
- Number of farmer-producers impacted
- Amount of value added from further processing
- Economic impact
- Cost savings

Programs are designed to assist with:

- Identifying emerging value-added opportunities
- Developing innovative commodity-based products
- Developing production processes for feasible products
- Promoting products developed with AURI technical assistance
- Providing resources to bring new products and processes to the marketplace

Assistance may include:

- Access to AURI's scientific and business staff
- Access to laboratory and pilot plant facilities
- Product development and feasibility testing
- Process evaluation and improvement
- Technology transfer and applied research
- Business needs evaluation
- Links to available resources
- Potential for grant funds to qualifying applicants

AURI provides resources proportionate to the project's impact. Smaller-impact projects may be eligible for technical assistance only, while projects with industry-wide impact may be eligible for financial assistance.

AURI Facilities

- AURI operates several laboratories:
- Coproducts Utilization Laboratory and Pilot Plant, Waseca
 - Fats and Oils Laboratory, Marshall
 - Meat Laboratory, Marshall

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AURI ag innovation quiz

1. **What percent of ag commodities are currently used in industrial products?**
 - a. 4 percent
 - b. 40 percent
 - c. 11 percent
2. **How many bottles of soy-based lotion did SoySoft market per month in 2007?**
 - a. Over 150
 - b. About 15,000
 - c. Over 1,500
3. **About how many pounds of synthetic red dye is added to food, cosmetics and beverages every year?**
 - a. 63,000 pounds
 - b. 7 million pound
 - c. 356,000 pounds
4. **"Sayela" means "reddish" in what language?**
 - a. Swahili
 - b. Pig Latin
 - c. Lakota
5. **The red corn bred near Lamberton was originally grown for what purpose?**
 - a. To test drought, insect and disease resistance
 - b. For the craft market
 - c. Because it was pretty
6. **What feedstock will Northern Excellence Seed be using to produce energy for their operation?**
 - a. Geothermal
 - b. Grass-seed cleaning waste
 - c. Algae
7. **What is one of the challenges limiting use of ash for fertilizer?**
 - a. Difficult to apply
 - b. None produced in Minnesota
 - c. It has no nutrient value
8. **Which of the following is an opportunity offered by renewable energy development in Minnesota?**
 - a. Cheap gas
 - b. Curriculum development and educational opportunities
 - c. Drilling for canola oil in northwest Minnesota



Answers: 1.a, 2.c, 3.b, 4.c, 5.a, 6.b, 7.a, 8.b

ABOUT AG INNOVATION NEWS

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PHOTOS BY AL DOERING

Minnesota biomass-energy plants are producing more than 100,000 tons of ash per year that could have fertilizer value, but the ash has to be granulated before it can be applied to fields. AURI is helping test an ash-densification system, pictured above, where ash enters a processor as a fine powder then exits as granules, which are being tested for the nutrient value in corn test plots.

ASH TO DIRT

Densifying fine ash powder could make it a viable commercial fertilizer

BY DAN LEMKE

Minneapolis, Minn. — Alan Doering and several curious onlookers watch in anticipation as thousands of BB-sized granules drop down a sleeve into holding barrels. Ash entering as a fine powder exits as irregular-shaped grains about an eighth of an inch across — the potential makings of commercial fertilizer.

“Ash has value as fertilizer, but without finding a way to granulate or pellet it, the ash is so light and powdery that it’s difficult to land apply or blend with commercial fertilizer,” says Doering, who heads AURI’s coproduct utilization program in Waseca. “We are producing more than 100 thousand tons of ash per year in Minnesota from facilities that produce energy from biomass. The supply is there, but we need to identify ways to more effectively handle it.”

That may have just happened.

Ash from three combustion technologies: gasification, direct combustion and a fluid-bed reactor were collected and tested in a granulation process developed by Bepex International in Minneapolis. The process, used to densify and blend powdered materials, successfully bound two of the three ash types, forming granules with a 50 to 70 pound-per-cubic-foot density, similar to commercial fertilizer. Char ash from gasification didn’t respond as well.

The densification tests were part of a multi-phase project to evaluate the nutrient value of biomass-derived ash and ways to improve handling. Using a relatively low-cost coproduct like ash could also temper the sharp commercial-fertilizer cost increases of the past several years.

Ash nutrients vary with feedstock and combustion method. In general, agricultural ash contains about 200 to 300 pounds of phosphorus (P) and potassium (K) per ton, says Jeff Vetsch University of Minnesota soil scientist. Ash also contains important micronutrients such as sulfur and zinc, but little nitrogen.

Vetsch is leading research at the Southern Research and Outreach Center in Waseca where the three ash types have been applied to several corn test plots. Two application rates are being evaluated, equivalent to 50 and 100 pounds-per-acre of phosphate. Corn’s ash response will be compared to conventional fertilizers. Besides comparing plant growth and grain yields, corn-tissue samples will be analyzed for P and K concentration and uptake. Soil samples will be taken before, during and after the growing season.

“We are trying to help these biomass plants identify real-world applications for utilizing their ash in crop production,” Doering adds. “Once this information is available, it will be up to the plants to pursue whatever makes the most sense for them.”

Field trial results are expected in the spring 2009. ■

