



AG INNOVATION NEWS[®]

The newspaper of the Agricultural Utilization Research Institute

IN THIS
ISSUE:



Manure to biogas
page 2



Top opps for
corn & soybeans
page 6



Red dye from corn?
page 12

HOME-GROWN ON THE RANGE

Kadejan's cage-free poultry operation opens retail store and new markets
page 4-5

Digester technology could boost mid-sized dairies

SCALED DOWN



COW



POWER



PHOTOS BY ROLF HAGBERG

BY DAN LEMKE

Brooten, Minn. — Jerry and Linda Jennissen and their cows are out to prove that large dairies aren't the only ones with power.

A building attached to their dairy barn is filled with tanks, pipes and the constant hum of an engine burning biogas produced by an anaerobic digester.

Digesters are usually installed in large dairies, with 700 cows or more. Jennissen's Jer-Lindy Farm, with 150 dairy cows, is being studied to see if average-size herds can be energy producers.

"The Minnesota Project received a Legislative Citizens Commission on Minnesota Resources grant to put a digester on a mid-sized farm," says Jerry Jennissen. "After a lengthy process, it ended up here."

"We wanted to see if the technology could work," says Amanda Bilek, a former Minnesota Project employee who is now an energy policy specialist with the Great Plains Institute. "The goal was to test cutting-edge technology that could prove to be profitable for an average-size Minnesota dairy farm. We are learning a lot."

Manure to biogas

In the fall 2007, building began on the digester that started producing electricity in May 2008.

Cow manure is scraped into a mixing pit twice a day where it is diluted with recycled water until the slurry is 6 to 8 percent solids. The manure is intermittently pumped into a 33,000 gallon tank where it remains for about five days. The sealed environment is maintained at a 100-degree temperature.

Bacteria in the digester converts manure organic matter to methane gas that is collected and pumped to a modified automotive engine built to run on natural gas or propane. The generator produces 40 kilowatts of electricity from the biogas. Electricity not used by the digester plant is sold to Stearns Cooperative Electric Association. The leftover digester solids are reused for cattle bedding.

Jennissen says the manure alone doesn't generate enough biogas in the digester, so whey from an area milk processor is added to boost biogas output. "We tripled our gas production by adding whey," Jennissen says.

Steep learning curve

Because most digester technology is designed for large-scale operations, Jennissen's digester has had challenges. It was difficult to find an engine sturdy enough to handle the rigors of round-the-clock operations. The Jer-Lindy digester is on its third engine.

"One of the biggest assets for big digesters is that you can find large generator sets to operate on biogas," says Joe Borgerding, a local electrician and mechanic who is designing an efficient gen set for smaller digesters. "Most engines built to run on the smaller amount of biogas aren't designed to run long-term. They aren't robust enough."

Despite the challenges, identifying technologies and processes that will make smaller-scale digesters feasible could boost rural economies as well as dairy producers.

"The average-size dairy herd in Minnesota is 104 cows," says Bob Lefebvre, Minnesota Milk Producers executive director. "The idea of having a sustainable system that works economically in an operation of this size would be attractive to many dairies. We would have more energy producers."



Small-scale technology

AURI and the Center for Producer-Owned Energy became involved this year to help pinpoint how raw biogas impacts engines and to assist with developing technologies for smaller-scale generators.

"So much digester technology is large scale, but developing what is needed for it to be feasible in smaller operations would spur new development and build a new economy," says Jen Wagner-Lahr, AURI project director. "There will also be options in how the energy is delivered," whether as biogas or electricity, she adds.

Unlike other renewable-energy sources, such as solar and wind power, anaerobic digesters can maintain power 24 hours a day. They also could use waste streams from dairy operations and local processors.

"There is a real environmental benefit," Jennissen says. "We are creating power plus treating waste."

A report on the economic feasibility of small scale digesters is available at www.mnproject.org/e-Jer-LindyFarm.html ■

Jerry Jennissen (above) and his wife Linda installed an anaerobic digester that turns manure into methane (at right) on their 150-cow dairy farm. Typically, digesters are installed in large dairies with 700 cows or more.





WHERE BIRDS ROAM FREE

Central Minnesota processor feeds consumer interest in poultry raised without confinement or additives

BY CINDY GREEN

Glenwood, Minn. — For two decades, Pete Thorfinnson has served customers who want chicken and turkey raised the old-fashioned way — free to roam and grow naturally, without antibiotics or stimulants.

His free-range poultry company, Kadejan, has grown from a small processing operation he started in 1989 to a larger plant that processes 5,000 birds a week. This summer, he opened Kadejan's first retail store in Glenwood that offers locally-grown food products and gift items.

“He was doing free-range chicken before it was cool,” says Michael Sparby, AURI project director. “He was so far ahead of his time.”

PHOTOS BY ROLF HAGBERG

Pheasants first

AURI first worked with Kadejan in 1994 when Thorfinnson needed to expand his operation. Five years earlier, he had started selling pheasants from his shooting preserve to white-tablecloth restaurants. Soon, customers were asking for free-range poultry, too, so he established Kadejan, a small processing operation. But because of state regulations, his annual capacity was limited to 20,000 birds.

With AURI's help, Thorfinnson built a plant that upped his production tenfold and never stopped growing. "We have kept our heads above water," Thorfinnson says.

His customer base expanded to food cooperatives, then upscale grocers. Kadejan poultry is now available at 37 groceries, including all Kowalski's stores, several Cub Foods stores and natural food grocers and cooperatives throughout the Twin Cities and into central and southern Minnesota, Iowa and Wisconsin. Fine diners are still a strong market. About 15 Twin Cities restaurants serve Kadejan's free-range poultry including Capital Grille, Cafe Brenda, Brasa Rotisserie and Cafe Levain.

Kadejan facilities have also expanded. In August 2007, "we converted our old processing plant to a hatchery and we moved into a new processing plant," Thorfinnson says. "We're processing roughly 260,000 birds annually."

Kadejan raises some of its own poultry and provides chicks to area producers who raise chickens for the processor. Thorfinnson says his products used to carry the Minnesota Grown label, "but the USDA made us take it off because our chicks were coming from out of state," even though the poultry was raised and processed in Minnesota. Now that Kadejan is hatching its own chicks, "we're going to try (Minnesota Grown labeling) again."

Michael Sparby, AURI project director, is helping Kadejan connect to a local food-marketing cooperative, Pride of the Prairie, that promotes Upper Minnesota River Valley products. One of its founding members, the University of Minnesota Morris, is interested in purchasing food from local vendors, Sparby says. "Students want to know what they're eating."

"In the popular media, there is a push for local foods and to know where your food comes from," Sparby says. "Kadejan has been there for well over 10 years — way before the mystique. He was getting into the market through quality and achieving that through free range."

Free to roam

Kadejan chickens and turkeys are never caged. They live "free range" during the summer and are "free roaming," with plenty of room indoors during winter months when it's too cold to survive outdoors. The poultry are fed whole grains with no fish or animal byproducts. "We're not organic, but we aren't adding anything," Thorfinnson says.

The term "all natural" on a label "doesn't mean anything anymore," Thorfinnson says. "It's a watered-down claim — means minimally processed and no ingredients added. It has nothing to do with how they're raised." All-natural chicken can contain up to 8 percent added moisture. Labeling "no hormones" is also meaningless because the USDA hasn't allowed hormones to be fed to poultry "since I've been in business," he says.

More importantly, Kadejan's label states "grown without antibiotics or growth stimulants." Besides treating illness, antibiotics in feed can stimulate growth; so can lighting changes. "Genetics in our chickens aren't any different from any other in the nation," he says. But while others take 32 to 36 days to grow, "our chickens take longer. ... We're up around 50 to 56 days on average."

Kadejan's customers are willing to pay a premium price for longer production. The birds are "better tasting, better textured," he says.



Cleaned without chlorine

Why would free-roaming taste better? "It's hard to put a finger on that all of the years we've been doing this," Thorfinnson says. The biggest difference, he says, may be the hand-cleaning and natural air-chilling processing Kadejan uses, rather than the common industry practice of chilling in chlorinated water.

"We don't want to chlorinate our product. ... I have eight children; I don't want to do that with the chicken I put on our table." Proper cleaning requires "management and training of employees," so waste or fecal matter doesn't contaminate meat.

The USDA is putting pressure on small processors to chlorinate to prevent salmonella and other pathogens. "They want a silver bullet. It's a battle that's not going to get easier," Thorfinnson says. "We've never had a consumer complaint, in all these years, about an illness. Our consumer base is educated; they know what they want to eat. ... Whatever happened to education? You don't eat raw chicken."

Carissa Nath, AURI meat lab technologist, says she is investigating "antimicrobial intervention that doesn't use chlorine. There are large processors using air chilling without chlorine," she says.



Hand-cleaning and air cooling takes time. "Our processing line moves slower than the larger companies. Kadejan's USDA inspector examines about 14 chickens per minute; the industry average is 32. "This reduces the risk of contamination," he says.

Birds with added value

Kadejan, which has marketed whole birds and poultry cuts, is venturing into value-added products including sausages, deli meats and snack sticks. Recently, Kadejan installed a smokehouse and is purchasing pork from area producers to make bacon as well as smoked turkey and chicken breasts.

Norm Nytroe, Kadejan's product development specialist, owned and operated a meat market in Starbuck, Minn. for 18 years. "I'm an old nitrate person," he says. "I've done most curing with beef and pork." Now he's developing all-natural poultry products using curing agents like celery powder, "and getting surprisingly good results." he said.

While Kadejan's value-added products may look like others on the market, "we're unique because we're home-grown, all-natural," Nytroe says. "When you taste these locally-grown, locally-processed products, they're amazing." ■

Pete Thorfinnson (above) inspects eggs that will be hatched at his Kadejan poultry facility. The birds will be raised cage-free on area farms and fed whole-grain diets that don't include animal byproducts or additives. Below: Kadejan recently opened a retail store in Glenwood to market Kadejan poultry as well as locally-grown food products and gift items. Pete is pictured with his daughter Jayme Gienger and her husband Weston.





AURI identifies promising value-added opportunities for Minnesota corn and soybeans

BY LIZ MORRISON

What technologies and products will propel Minnesota value-added agriculture in the next decade?

AURI recently released two reports that outline eight top prospects for corn and soybeans, drawn from more than 200 possibilities. Prepared by Memphis-based Informa Economics, the reports will help farmers and ag processors grasp the economic potential of advancing technology, says Dennis Timmerman, AURI project director.

There are enormous opportunities for adding worth to Minnesota corn and soybeans, Timmerman says. Processing innovations could boost ethanol and biodiesel profitability. Green chemical technology could turn biofuel plants into diversified biorefineries. New seed traits may help farmers capture specialty markets. Down the road, second-generation biofuels and chemicals could open up new markets for corn residue and non-food crops.

Plant-based plastics have the potential to add even more value to crops than transportation fuels, Timmerman says. "Plastic production consumes only a fraction of our petroleum supply but is nearly equal in value to gasoline."

Minnesota corn growers are especially interested in ways to improve corn ethanol efficiency, says Riley Maanum, Minnesota Corn Growers Association research and project manager. The industry has struggled to be profitable as corn prices rose and fuel demand fell.

Maanum sees promise in corn stillage digestion, which "could cut energy costs and conserve water. There's solid research on this, so it's not too far off." Corn fractionation — splitting the kernel into its components before fermentation — is another top opportunity "to get more value out of every corn kernel," Maanum says.

On the soybean side, new value-added varieties hold great promise for Minnesota growers, says Mike Youngerberg, Minnesota

Soybean Growers field services director. For instance, high-stability-oil soybeans, now in the breeding pipeline, would have many industrial applications. "Even the biodiesel industry is waiting for high-stability oils to diversify their product mix."

Specialty livestock feed is another top soybean opportunity, Youngerberg says. One emerging sector is aquaculture, which is poised to expand rapidly "as the world looks at feeding more people." Minnesota soybean growers are funding both research and marketing efforts aimed at supplying specialty soybean to poultry, baby pig and fish growers, he says.

Challenges ahead

AURI is already working on many of the top opportunities identified in the reports, Timmerman says. But the development challenges are daunting, and success is not assured.

Some ideas, such as cellulosic ethanol, will require scientific or engineering breakthroughs, says Informa economist Scott Richman, lead author of the reports. "For others, it's a question of cost or performance relative to alternatives, such as petroleum," he says. "Often, they are related; the technology has to advance to the point where it is cost competitive."

There are other hurdles, too, he notes. Uncertain government policies, gyrating crop and oil prices, tight credit and the global economic downturn discourage investments in value-added corn and soybean ventures. Beyond that, he adds, many bio-based products could be made from a number of different plants, so corn and soybeans will have to compete with alternative feedstocks.

Yet, those challenges make it imperative to "continue to assess our future opportunities," Youngerberg says. "The world is changing and looking forward is what we're all about."

The search for petroleum alternatives is being driven by climate change fears, the desire for energy independence and consumer demand for renewable products, says Informa economist Scott Richman, lead author of the AURI reports.

Major U.S. markets for petroleum and bio-based feedstocks

Sector	2006 Market Value (billion \$)
Gasoline	298
Plastics	203
Pharmaceuticals	163
Resins, synthetic rubber manufacturing	93
Diesel (on highway)	88
Textiles	38
Cleaning products	34
Paints, inks, coatings	22
Fertilizers	13
Lubricants	11
Adhesives, binders	9
Cosmetics, personal care products	6
Solvents	6
Sorbents	3
Wood substitutes, composite panels	3

Source: Informa Economics from U.S. Department of Commerce: 2006 Census of Manufacturing, Freedonia Group, DOE: EIA

SPECIAL SECTION: TOP OPPS FOR

C O R N A N D S O Y B E A N S

VALUE-ADDED VARIETIES

PHOTO BY ROLF HAGBERG



Packing in more oil

New varieties will supply growing industrial demand for vegetable oils

New high-oil soybean varieties will help farmers and soybean processors meet rising demand for both food and biofuels.

Most of the new industrial applications for soybeans use the oil portion of the seed, rather than the protein. Breeding work is underway to increase soybean oil content from about 19 percent to 25 percent, without sacrificing yield. The first high-oil varieties will be available soon and could offer farmers the chance to earn an oil premium. One big advantage of high oil beans: Identity-preserved handling won't be needed, although grain elevators would have to start measuring oil content.

Fresher for longer

High-stability-oil soybeans would fill major market niche

With the phase-out of trans fats, oil from new bean varieties being developed stays fresh without hydrogenation and holds up under high-heat deep frying.

Trans fats, which now must be listed on nutritional labels, form when oils are partially hydrogenated for shelf stability. Plant breeders are developing soybeans rich in monosaturated fatty acids, or oleic oil, and low in polyunsaturated fatty acids, or linolenic oil. Mid- and high-oleic soybean oils have no trans fats, a longer shelf life, and many food and industrial applications.

Growers could earn significant premiums from these bean varieties. Like other specialty crops, high-stability-oil soybeans will require identity-preserved handling.

SPECIALTY FEED

Fish food

Aquaculture emerges as an outlet for soy protein concentrate

Fish rations may soon contain a specially-processed soybean meal, offering feed producers a new aquaculture market.

The global aquaculture industry has been growing about 6 percent a year since the late 1990s, outpacing fishmeal production. Commercial fish farmers are looking for alternative protein sources.

Traditional soybean meal doesn't perform well in all fish diets, particularly carnivorous species' rations. But removing some of the meal's carbohydrates raises its protein content and improves its nutritional value. Soy protein concentrate is about 65 percent protein, compared to about 48 percent for conventional soymeal.

The cost of making soy protein concentrate is still too high to compete with fishmeal, but cheaper methods are being developed as fishmeal supplies are tight. Aquaculture demand for cost-competitive soy protein could top 1 million tons a year, three times current production.

GREEN CHEMICALS

Eco-friendly plastic

Soy polyol replacing petroleum polymers

Soybean oil can make plastic "greener."

As demand grows for environmentally-friendly products, manufacturers are turning to soy-based polyols for furniture, bedding, flooring and many other consumer goods. Polyol, a

component of polyurethane plastic, represent a 3.4 billion-pound market in North America alone. In addition to being renewable, soy polyols generate fewer harmful greenhouse gases and volatile organic compounds than oil-based polyols.



IMPROVED CORN ETHANOL

Methane from stillage

Anaerobic digestion could make ethanol greener, cheaper

Corn-ethanol plants could use methane digestion to generate fuel from corn stillage, an ethanol byproduct.

Renewable methane, a natural-gas substitute, could be burned to power the plant, cutting fossil fuel use by up to two-thirds. Thin-stillage digestion would also conserve water and curb greenhouse gas emissions, making corn ethanol "greener;" and would generate renewable fertilizer.

Anaerobic digestion is widely used in ag processing, but not in ethanol production because of high-capital costs. The technology is now being demonstrated at several ethanol facilities, including POET's cellulosic ethanol pilot plant in Scotland, S.D.

PHOTO BY ROLF HAGBERG



Better separation

New distillation methods cut energy use

New technology could cut ethanol distillation's energy needs by almost half, lowering costs and greenhouse gas emissions.

Most ethanol plants use steam distillation and molecular sieves to separate ethanol and water vapor after fermentation. It's an expensive, energy-intensive process. Several alternatives are being developed including vacuum stripping, gas stripping and membrane separation. Some are expected to be commercialized within five years.

More from every kernel

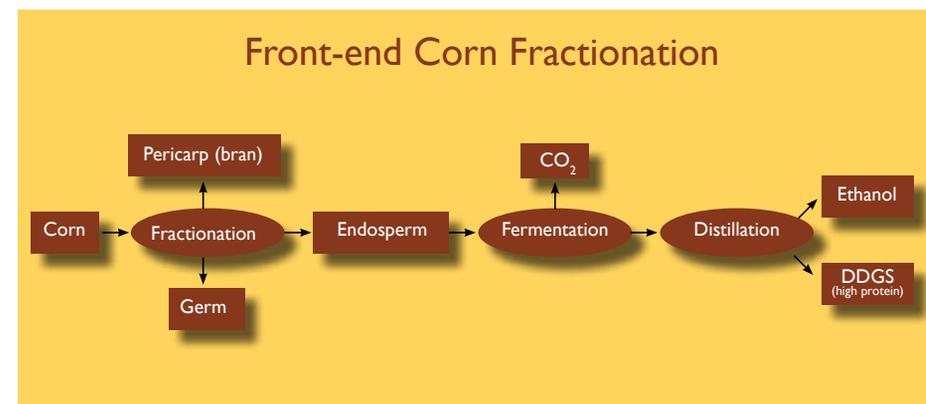
Corn fractionation could lift ethanol profits and cut risk

Separating a corn kernel into its components — hull, germ and starch — before fermentation could boost ethanol yields, cut costs and create additional coproducts.

Ethanol dry mills grind up the entire kernel, sending non-fermentable corn oil, protein and fiber to the distillery along with starch. These components remain after starch is converted to alcohol and are usually dried and sold as distillers grains, a livestock feed.

In front-end corn fractionation, only starch is sent to the fermenter. The hull and germ are processed for crude corn oil, corn-germ meal and other products that, together, have more value than dried distillers grains. Fractionation, which is nearing commercialization, could potentially raise net ethanol revenues by 9 to 28 cents per gallon.

Fractionation splits the corn kernel into its component parts, which can then be processed separately, as illustrated below.





Renewable resin

Making epichlorohydrin epoxy from glycerin shrinks environmental footprint

Glycerin, a biodiesel coproduct, could slash the environmental costs of manufacturing a widely-used epoxy resin.

Epichlorohydrin, used in electronics, auto, aerospace and wind-turbine manufacturing, is derived from propylene, a petroleum product. New glycerin-to-epichlorohydrin technology uses 30 percent less energy than the oil-based process, and generates a fraction of the wastewater, salts and unwanted chlorinated organic compounds. Demand for epichlorohydrin outpaces current production, offering significant growth potential, plus a new use for glycerin.

PHOTO BY ROLF HAGBERG



Green glue

Soy-based wood adhesives less toxic

The use of soy-based wood adhesives, first developed in the 1920s, is poised to grow 15-fold.

Today, formaldehyde-based wood adhesives dominate the 3.75 billion pound U.S. market. But rising environmental and health fears over using these glues in wood composites is stimulating strong interest in less-toxic glues made from soybean flour. Development is also spurred by LEED building standards and California regulations limiting formaldehyde emissions from interior wood panels.

The United Soybean Board estimates that soy wood adhesive's annual use could rise from the current 50 million pounds to more than 700 million within a few years.

RENEWABLE FUELS

Better biofuel function

Renewable diesel performs more like petroleum diesel

A soy-diesel production alternative could cut biofuel distribution costs and improve performance in cold temperatures.

Today's biodiesel is made by transesterification, a chemical process. By contrast, "renewable" diesel is made by hydroprocessing, a refining method that yields fuel nearly identical to petroleum diesel. Renewable diesel could be refined into low-temperature transportation fuels such as jet fuel, handled through the existing diesel pipeline and storage systems, and used in unmodified diesel engines.

One drawback: renewable biodiesel co-processed with petroleum is not eligible for the full biodiesel federal subsidy.

PHOTO BY ROLF HAGBERG



Leaner processing

Energy-efficient enzymatic transesterification on the horizon

Making biodiesel through an enzyme process, instead of a chemical process, could improve manufacturing efficiency and make use of low-quality fats and oils.

Enzymatic transesterification consumes less water and energy and can take advantage of cheaper feedstocks. That could cut biodiesel manufacturing costs. The enzymes are still too expensive for commercial use, but the process could become competitive within a few years.

Source: "A Study Assessing the Opportunities and Potential of Soybean Based Products and Technologies," Informa Economics for AURI, August 2009. Find the full report, with more than 100 potential value-added ideas for soybeans, at www.auri.org.



Specialty corn protein

Zein extraction is cost-prohibitive, but cheaper methods are in the works

A valuable corn protein could improve corn-ethanol economics.

Zein, a food-grade protein, is used in many consumer, medical and industrial products including grease- and water-proof coatings for pharmaceutical tablets, candies, nuts, paper products and textiles.

Usually zein is extracted from corn-gluten meal, a wet-milling coproduct. But high processing costs limit its use. Several technology companies are developing cheaper ways to extract zein from fractionated corn or ethanol coproducts, such as distillers grains.

SECOND-GENERATION BIOFUELS

PHOTO BY ROLF HAGBERG



Another corny fuel

Biobutanol could be produced at retrofitted ethanol plants

Biobutanol could become a versatile corn-based transportation fuel or a raw material for green plastics.

Butanol, an industrial alcohol, is now derived from petroleum and used primarily as a chemical solvent. Cost-competitive technologies are being developed to brew "biobutanol" through corn-sugar fermentation, much like ethanol. In fact, conventional corn ethanol plants could be refitted to produce butanol.

Biobutanol blends better with gasoline than ethanol, generates fewer harmful emissions, and is a more valuable feedstock for green chemicals and bio-based plastics. It also has a higher energy content than ethanol and could be moved through pipelines.

Several U.S. companies, including Denver-based Gevo, are planning to convert existing ethanol plants to biobutanol production.

PHOTO BY ROLF HAGBERG



Efficient cellulosic ethanol

Biochemical conversion may be the best small-scale option

The race is on to find efficient ways to turn crop residues, such as corn cobs and other cellulosic biomass, into competitively-priced ethanol.

Significant research is being invested in two main cellulosic technologies — biochemical and thermochemical. Neither is commercially viable yet, but biochemical conversion has advantages over thermal. It offers several value-added coproducts besides ethanol and is likely to be economical on a smaller scale, reducing feedstock transportation costs.

Research is focusing on three main production problems: pretreating biomass, which is expensive, separating sugars from cellulose, and fermenting sugar efficiently.

VALUE-ADDED CHEMICALS

Better chemistry through corn

Bio-based succinic acid and 3-HPA could tap a huge chemical market

Two corn-based chemicals could replace many commonly-used chemicals now made from oil and natural gas.

Succinic acid and 3-hydroxypropionic acid, or 3-HPA, are used to produce solvents, plastics, adhesives, coatings, resins, fibers, lubricants and other products. Fermentation techniques are being developed to convert renewable plant sugars to the chemicals, which are listed by the U.S. Department of Energy as plant-based chemicals with the greatest market potential.

Succinic acid is used in plastics and elastic fibers. At the right price, bio-based succinic acid markets could top \$1 billion a year — and up to \$7 billion according to some estimates. Also, because corn-based succinic acid production consumes carbon dioxide, a global-warming gas, the manufacturing process could be carbon negative.

Likewise, the market potential for a cost-competitive, bio-based 3-HPA is huge. One of its most promising uses is in manufacturing acrylic acid, which is used to make absorbents for diapers, personal care products and "soaker pads" in packaged meats and poultry.

Making 3-HPA from corn sugars is still in the early research phase. Bio-based succinic acid development is more advanced, with commercialization expected in five years or less.

Succinic Acid Biorefinery Concept Ethanol plants could one day become "biorefineries," producing transportation fuels and an array of high-value chemicals, such as succinic acid.

Source: "A Study Assessing the Opportunities and Potential of Corn Based Products and Technologies," Informa Economics for AURI, August 2009. Find the full report, with more than 100 value-added ideas for corn, at www.auri.org.





PHOTOS BY PAM AAKRE

An old bakery with new ingredients

Reopened Barnesville bakery offers organic doughnuts and cookies

BY MARY STEIDLER

Barnesville, Minn. — James Nelson kept a family tradition alive when he reopened the bakery his Dad established in 1937. But it's the nontraditional goods that make Son-Rise Bakery unique.

Son-Rise offers "diabetic-friendly" doughnuts and cookies made with healthy ingredients and Minnesota-grown organic flours.

Nelson's enduring love for baking began in third grade when he helped out at his father's bakery. "I grew up frying doughnuts in 400 degree oil, standing on a box," he remembers. His career in teaching and coaching took him away from Minnesota — most recently to Boise, Idaho.

In 1998, after suffering a heart attack, Nelson's interest in healthy foods escalated and he started developing organic baked goods.

In 2006, Nelson learned that his father's Barnesville bakery was vacant and he decided to move back to his childhood home and reopen the bakery under a new name. He brought in his son, Myron, as co-owner.

The father-son team has sourced ingredients, developed their organic product line, trained new staff and upgraded the facility. After more than a year searching for a suitable organic flour, Nelson discovered Natural Way Mills in Middle River, Minn. "Ray Juhl at Natural Way is the miller who made it possible for us to get the flour produced just the way we needed it," he says.

Nelson also researched and found a supplier of organic stevia (STEE-vee-uh), a natural plant-based sweetener that "tastes great in doughnuts and cookies and gives an energy burst" without the blood sugar "crash" after eating high-sugar foods, Nelson says.

The bakery's organic goodies also contain inulin, a dietary fiber that "promotes healthy bacteria in the gut," Nelson says. "We chose inulin to replace the fats and sugars that are common in traditional bakery products."

To develop their product line, the Nelsons conducted scores of tests on baking methods and ingredients with the help of Charan Wadhawan, AURI food scientist in Crookston. Wadhawan sourced ingredients, analyzed nutritional and

sensory values, and advised on regulatory issues. "Without Charan, I wouldn't have made it," Nelson says.

Son-Rise used AURI food laboratory equipment, including a sheeter, proofer and mixer, to help develop their processes. "Sometimes things go very wrong and you have to start all over," Nelson says. "The best way to learn is to experiment."

"That's what AURI is here for," Wadhawan says. "More and more consumers are demanding low-calorie, healthy foods, but they don't want to sacrifice great taste, Son-Rise recognized this trend and developed baked goods that are both healthy and appetizing."

The result is bakery goods that are "98.7 percent organic," Nelson says. "I think they're the finest in the world."

Healthy food doesn't have to be bland, Nelson says. At a recent tradeshow, "I convinced a very reluctant gentleman to try an organic doughnut," he says. "He didn't speak English, but once he tasted the doughnut, he ran away to get his grandson who came back and translated how much his grandfather loved the food."

Son-Rise is also marketing organic product mixes to consumers and industrial markets such as schools. "We sold 3,500 pounds of mix this week," Nelson says. "I know my organic products can help people live more healthily, and that's my lifelong dream."

For more information on Son-Rise Bakery products or to purchase mixes, contact James Nelson at (208) 908-2301. ■

AURI STAFF COLUMN: SEEING AROUND CORNERS

Advances make food safer, sustainable and tailored to tastes

BY CARISSA NATH

Every person on earth who eats is involved in agriculture. Despite our relationship with food, we don't usually equate innovation with food production. However, advances are ensuring that the food we eat is safe and meets consumers' demands.

Food safety

The food industry is continuing to investigate antimicrobial interventions that reduce food-borne illnesses, such as meat irradiation. The American Meat Institute recently requested that the USDA consider approving electron-beam irradiation for whole carcasses. No determination has been made, but it's quite likely we will be hearing much more about irradiation intervention.

High Hydrostatic Pressure Processing is another possible intervention. This non-thermal process uses ultra-high pressure (87,000 psi), which has proven effective in reducing food-borne pathogens. I expect we will see more large processors using HHP.

Ethnic processing

As ethnic populations rapidly increase, processors will use cutting and processing techniques that better serve these groups and offer new market opportunities.

Many ethnic populations are accustomed to meat cut differently than what we currently offer. New cuts as well as marinades and spice blends for ethnic foods could open the door to new markets. It's a matter of listening to consumers.

Sustainability

The American Meat Institute recently launched a website, www.sustainablemeatindustry.org, to help meat companies implement sustainable practices. Topics include water reuse, environmentally-friendly packaging, energy-efficient lighting, employee care, animal handling, ensuring a safe and wholesome product and community care.

Pork industry recovery

The global economic recession, overproduction and H1N1 have all hit the pork industry hard this year and many people are closely watching to see when and how the industry will bounce back. Opening and enhancing export markets and educating consumers worldwide on pork's safety will certainly help. Also, many industry analysts say the U.S. hog herd needs to decrease by about 10 percent to bring supply and demand in check. Given the importance of the pork industry, whatever happens will have a profound effect on the rest of agriculture. ■

STAFF PROFILE: CARISSA NATH



AURI Meats Lab Technologist

Carissa Nath is AURI's go-to person on meat projects. The Texas native has been with AURI for more than a year, helping processors and entrepreneurs develop meat products out of the Marshall office and meat lab.

Where did you get your education?

I earned my undergraduate degree from Texas Tech University in Lubbock and my master's degree from South Dakota State University in Brookings.

What are your primary responsibilities at AURI?

I operate and coordinate activities of AURI's USDA-inspected meat lab facility. I also develop and manage client projects in meat product development.

What interested you in working in the meat industry?

I first became interested in the meat industry through my involvement in intercollegiate meat judging. I also worked in the meat safety lab during my undergraduate career and assisted with meat science research projects. I think working in the meat industry is exciting and very rewarding.

What is the most rewarding part of your work?

Assisting clients with product development is both challenging and rewarding. It is also great that everyday is something different — it doesn't get boring. ■

Elsewhere in ag innovations

BY DAN LEMKE/CARTOONS BY UNCLE HYGGLY

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. Please note that ARS is the USDA's research division.



Take two asparagus

To treat a hangover, researchers suggest you drink lots of water, get plenty of rest and eat your asparagus.

A new study shows that the amino acids and minerals in asparagus extract may ease hangovers and protect liver cells from alcohol toxins. Researchers at the Institute of Medical Science and Jeju National University in South Korea analyzed effects of asparagus shoot-and-leaf extracts on human and rat liver cells. Asparagus is also noted for its anti-cancer, anti-fungal, anti-inflammatory and diuretic effects.

From: Institute of Food Technologists
August 13, 2009

Sticky opportunity

USDA-ARS researchers have determined that corn germ can be used as a protein extender for plywood glues, potentially opening a new market for the agricultural byproduct. Glue extenders reduce the amount of main binder, or resin, in plywood glues and improve adhesion. Extender is typically made from industrial-grade wheat flour. Researchers are working on more ag-based extenders in the event glue manufacturers need an alternative.

From: USDA-ARS
September 1, 2009



Potted chickens

Chicken feathers, usually an unwanted poultry-processing byproduct, may have a valuable future in biodegradable flower pots, say ARS scientists.

In the United States, every year about 4 billion pounds of chicken feathers are left over after processing. Working with the Horticultural Research Institute in Washington D.C., ARS researchers used feathers to formulate planting pots that degrade over variable time periods, from one to five years. The pots

look and feel like any other plastic planters but will disintegrate naturally, without harm to the environment. Manufactured without petroleum components, the feathered pots would slowly release beneficial nitrogen to the soil.

From USDA-ARS
September 8, 2009

Freshwater fighter

A freshwater algae variety could be bad news for cancer cells. USDA researchers identified a type of algae responsible for some isolated fish kills. The same toxin may be useful in cancer treatments.

Laboratory tests show that even low concentrations of euglenophycin significantly decreases cancer cell growth and can kill cancer cells. Future tests will attempt to verify whether the toxin can slow or prevent tumor formation.

From: USDA-ARS
September 8, 2009

Drink your medicine

Instead of the dreaded needle injection, a vaccination may someday be a pleasant drink of yogurt smoothie.

Northwestern University Feinberg School of Medicine researchers have developed an oral vaccine using probiotics, the healthy bacteria found in yogurt, cheese and other dairy products. Benefits go beyond eliminating the "ouch!" factor. Delivering vaccine to the gut, rather than injecting it into a muscle, harnesses the full power of the body's primary immune force, located in the small intestine.

From: Medicalnewstoday.com
March 13, 2009

Camelina feed

Camelina meal in cattle feed has been approved by the U.S. Food and Drug Administration. The oilseed, rich in Omega-3 fatty acids, could enhance beef products. The FDA approved inclusions of up to 10 percent camelina meal in cattle diets.

From: Newsday.com
November 11, 2009

Power to the veggies

Scientists have discovered that an antioxidant in vegetables such as broccoli and cauliflower could protect cells from damage caused by the body's inflammatory response to infection and injury. The University of Pennsylvania School of Medicine finding has implications for inflammation-based disorders such as cystic fibrosis, diabetes and heart disease.

From: Medicalnewstoday.com
November 18, 2009



Clayton McNeff, cofounder of Ever Cat Fuels, speaks at the grand opening of a biodiesel plant in Isanti.

Ever Cat opens revolutionary biodiesel plant



Host Don Shelby.

Isanti, Minn. — Ever Cat Fuels opened a biodiesel processing facility this fall that could eventually turn algae into fuel. Featured in the April 2009 issue of Ag Innovation News, Ever Cat's patent-pending Mcgyan® process turns low-cost feedstocks, such as waste oils, into biodiesel.

Feedstock is run through 6-foot long, 6-inch diameter reactors and catalyzed to

fuel in seconds. The process doesn't use water or chemicals and doesn't produce waste.

The Isanti facility employs 20 people and has a 3-million-gallon annual capacity. The plant's grand opening was held September 28, hosted by WCCO news anchor Don Shelby. ■

Dynamic capabilities

BY TERESA SPAETH

Change is swift. What was cutting edge a few years ago, even months ago, may already be outdated. Just look at mobile phones, computers, video games, even renewable-energy technologies. Last year's advancements alone can make your head spin.

At AURI, we strive not only to adapt to change, but to create long-lasting value from change. "Dynamic capability" is a term organizational developers use to define a firm's ability to integrate, build and reconfigure internal and external competencies

to address change. A rapidly-changing environment forces organizations to respond quickly and to be innovative.

With our dynamic capability, AURI brings people and opportunities together to foster innovation. Over our 20-year history, we have witnessed a great deal of change and adapted to innumerable opportunities. This didn't happen by staying apart; it happened by bringing people together.

As a research institute, we can bring seemingly disparate resources together to create and

implement innovation. The Renewable Energy Roundtable, for example, has brought more than 500 individuals from at least 130 organizations together to advance Minnesota's alternative-energy industry.

In this and upcoming issues of Ag Innovation News, check out "Seeing Around Corners," a column by our scientists on advancements in value-added agriculture. Change is rapid, but it creates opportunities to develop and implement innovations that will have long-lasting value for Minnesota. ■



AURI GUIDE TO SERVICES

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
 - Product Development Lab, Crookston
 - Fermentation and Chemistry Lab, Crookston

AURI Offices

Headquarters
P.O. Box 599
Crookston, MN 56716
1-800-279-5010

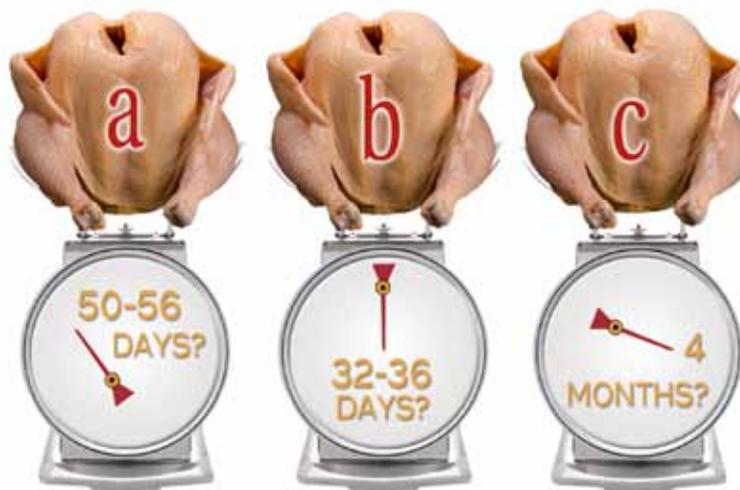
Southeast Office
P.O. Box 251
Waseca, MN 56093
(507) 835-8990

Southwest Office
1501 State Street
Marshall, MN 56258
(507) 537-7440

For staff e-mail addresses, visit AURI on the Web: www.auri.org

AURI ag quiz

WHICH CHICKEN WENT TO MARKET?



1. Most anaerobic digesters and generators are designed for large dairy herds. How many head of dairy cows power the Jer-Lindy digester?

- a. 1,000
- b. 150
- c. 62

2. What new markets have shown promise for Suntava red corn?

- a. Hair coloring
- b. Cosmetics and snack foods
- c. Automotive paint

3. What is the name of the innovative process that can convert low-cost feedstocks into biodiesel?

- a. McMuffin process
- b. Macarena process
- c. McGyan process

4. In what year did James Nelson's father establish the family bakery in Barnesville?

- a. 1937
- b. 1991
- c. 1977

5. About how many free range birds does Kadejan of Glenwood process annually?

- a. 1 million
- b. 25,000
- c. 260,00

6. On how many value-added opportunities for corn and soybeans did the Informa reports focus?

- a. 3 for corn, 2 for soybeans
- b. 8 each
- c. 200 total

7. How many days does it typically take for Kadejan's free range chickens to reach market weight?

- a. 50 to 56 days
- b. 32 to 36 days
- c. 4 months

8. What veggie is reportedly good for battling hangovers?

- a. Cauliflower
- b. Asparagus
- c. Kumquats

9. What is the size of the average dairy herd in Minnesota?

- a. 12 cows
- b. 650 cows
- c. 104 cows

10. What ethanol coproduct could be digested anaerobically to produce biogas and fertilizer?

- a. Stillage
- b. Spillage
- c. Zein

Answers: (1) b (2) b (3) c (4) a (5) c (6) b (7) a (8) b (9) c (10) a

ABOUT AG INNOVATION NEWS

Dan Lemke, communications director
Cindy Green, managing editor
Rolf Hagberg, photography
Design by pounce.com

Published by the Agricultural Utilization Research Institute to inform the food, agriculture and business communities and the general public about developments in ag-based products.

For information on AURI, call 1-800-279-5010 or visit our Web site: www.auri.org

Out-of-state subscriptions are \$10 per year; Minnesota subscriptions are free. To save AURI mailing and printing costs, order an electronic version at www.auri.org/news/subscribe.htm

Address correspondence or subscription requests to:

Dan Lemke
Ag Innovation News
P.O. Box 251
Waseca, MN 56093
Telephone: (507) 835-8990
dlemke@auri.org





markets

Purple corn grown in southwest Minnesota colors food and beverages

BY DAN LEMKE

Afton, Minn. — Bill Petrich is seeing red. It's a good thing.

Petrich is CEO of Suntava, a new company producing red dye from purple corn grown in southwest Minnesota. Suntava is finding commercial success with food and beverage companies looking to replace petroleum-derived red dye #40 with a natural colorant.

"With any start up, you have some bumps in the road," Petrich says. "And we've been through our fair share, but there are some bright lights at the end of the tunnel."

Suntava extracts natural color, trademarked Sayela™, from Suntava™ Purple Corn, bred by Red Rock Genetics of Lamberton, Minn. The corn variety is not genetically modified. Petrich says Suntava is working on delivering its first significant color order and he's tapping into markets he didn't foresee.

"We've tested the colorant in a number of unique applications and are making inroads into cosmetics and even seed coatings," Petrich says. "There are a lot of opportunities we never imagined."

Suntava "has identified a new use for a unique agricultural commodity," says Dennis Timmerman, AURI project

director. AURI has provided technical and extraction-process assistance. "Not only has this led to the development of a new business, it benefits growers in southwest Minnesota who grow the purple corn for Suntava," Timmerman says.

The whole grain from Suntava's purple corn can also be used in tortilla and corn chips. "We started going after the food market about six months ago," Petrich says. "It's a nice augmentation to our business."

Nutraceuticals also offer market potential. Suntava Purple Corn contains high levels of antioxidants used in dietary supplements, energy drinks, breakfast cereal and other fortified foods.

Sayela colorant is close to the hue of red dye #40, which is the most prevalent synthetic dye used in U.S. foods and beverages. Since the purple corn handles similar to field corn, it can be dried and stored for extended periods — a competitive advantage over natural dye sources such as black carrots or elderberries that are more challenging to store.

Petrich says food and beverage companies are also interested in a domestic source because dyes that come from international locations require refrigeration during shipment.

"Color is everywhere," Petrich says. "It's a big, big market." ■



PHOTO S BY ROLF HAGBERG