AURI
AG INNOVATIONS

Agricultural Utilization Research Institute




2011 Legislative Report

www.auri.org

Message from the Executive Director

The Agricultural Utilization Research Institute (AURI) has had an exciting and landmark year. From great client success stories to critical collaborations, our partners and clients have helped AURI positively impact the agricultural processing sector.

At AURI, we are committed to nurturing discovery and innovation in biobased products, coproducts, renewable energy and food. As other sectors of our economy have lagged, agriculture has continued to be a bright spot. We see significant opportunity to realize economic benefit for Minnesota businesses, especially in these four areas. Over the years, AURI has been honing its expertise and resources to target its "Core Four" (Renewable Energy, Biobased Products, Coproducts and Food). We believe that given Minnesota's assets, market opportunities and technological advancements, these areas are likely to be the most promising for agricultural processors and entrepreneurs in our state.

In the last year alone, AURI has had more than 100 projects that helped to move forward the agricultural processing sector. AURI clients have developed or refined 78 new products or processes. At a time when capital investments were hard to come by, AURI related projects have stimulated over $14.9 million in capital investment in Minnesota.

While all of these numbers are important, the best way to tell the AURI story is to highlight a few of the successes from the past year. While these few highlights are by no means all encompassing, they are strong examples of how AURI is impacting the future of agriculture.

Thank you for your continued support and interest in AURI. We look forward to working with our partners in the year to come.

Sincerely,

Teresa Spaeth
AURI Executive Director

AURI Mission

AURI was created and funded by the Minnesota legislature to foster long-term economic benefit through increased business and employment opportunities to rural Minnesota through:

- Research and development of innovative new uses or value improvements for Minnesota agricultural commodities and products, including the identification and expansion of new and existing markets
- Implementation of basic and applied research to support innovation, technology and growth of the agricultural industry
- Development of renewable energy and biobased opportunities from Minnesota agricultural commodities and coproducts

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Over the years, AURI has served hundreds of clients. No two projects are alike. This is the nature of helping innovative businesses develop and implement new products or processes. AURI works with each client to help them achieve their unique goals. AURI's clients have access to idea-generating research, scientific technical assistance and extensive resource networks.

Ag Innovator of the Year: North American Fertilizer

In 2011, North American Fertilizer (NAF) was recognized as AURI's Ag Innovator of the Year. Acknowledged for building a new business around a renewable ash fertilizer product, NAF is an example of innovations in agricultural coproducts leading to economic development and job creation.

North American Fertilizer LLC sells 110,000 tons a year of ash fertilizer derived from incinerated poultry manure. The ashes come from Fibrominn in Benson, Minn., a 55-megawatt electricity plant fired by a half-million tons of turkey and chicken litter. The leftover ash is a good source of essential crop nutrients. The nitrogen in the poultry manure is consumed during combustion, but the minerals in the manure remain. In addition to phosphorus and potassium — primary crop nutrients — the ashes contain other important nutrients, including sulfur, zinc, copper, magnesium and boron.

The $5 million NAF facility was built in 2007 by a group of Minnesota farmers and entrepreneurs. NAF employs five full-time workers and three seasonal workers. NAF also contracts trucking services to ship fertilizer between its warehouses in Benson and Olivia. Upon finishing up a $1.8 million expansion, the company will increase its fertilizer storage capacity to 100,000 tons. At a time when U.S. fertilizer imports are on the rise, NAFmicro represents more than $10 million in retail sales of locally-grown, renewable fertilizer.

This past fall, more than 75,000 tons of NAFmicro fertilizer was spread on central Minnesota farm fields to feed next season's corn, soybeans, alfalfa, wheat and sugar beets. Another 30,000 to 40,000 tons will be applied in the spring. In total, roughly 150,000 acres of central Minnesota cropland will benefit from NAF's renewable fertilizer.

AURI, in partnership with the University of Minnesota, helped NAF test ash fertilizer in field trials. This information was critical to demonstrating the effectiveness of this fertilizer in production. AURI was also involved in early planning and feasibility studies for Fibrominn.

Minnesota's biomass energy industry is just getting started. As this new energy sector develops, large quantities of biomass ashes will become available, opening the door for new uses and enterprises.

Project Snapshot

AURI scientists helped identify needed information for marketing their product to producers. AURI also provided cost share support for field trial testing at the U of M Extension facilities.

Idea to opportunity: Use leftover ash as a source of essential crop nutrients, creating an ash fertilizer.

Outcome: NAF is just finishing a $1.8 million expansion, which will increase its fertilizer storage capacity to 100,000 tons.

Client Successes

Riverview Dairy

Riverview LLP, which milks 30,000 cows in Stevens and Swift counties, was one of the first Midwest dairies to install manure digesters, generating renewable methane — a natural gas substitute that can be burned for heat or electric power. Riverview's three anaerobic digesters produce enough green electricity to supply 3,200 homes.

After leaving the digesters, dairy manure is mechanically separated. The liquid portion is injected into cropland as fertilizer. The solid portion is returned to the barns as cow bedding. Riverview recycles about half its manure solids to its own barns and sells some to other dairy barns for bedding, earning about $12 per ton. The remainder is applied to cropland, fetching about half the value of bedding.

After hearing from local gardeners that using digested manure had positive results, Riverview began looking at the garden and nursery markets as a potential higher-value market for its unused digested solids. However, before entering that market, more must be known about the product, its application rates and its results.

AURI is helping Riverview characterize the physical and chemical attributes of the digester solids and conduct horticulture research trials. Trials will compare seed germination, rooting and plant growth in traditional peat-based potting mixtures and digested manure solids. A key partner in this project is the University of Minnesota's West Central Research and Outreach Center (WCROC) in Morris.

Project Snapshot

AURI scientists are testing physical and chemical characteristics of various plant medias.

Additionally, AURI provided cost share support for greenhouse testing at the West Central Research and Outreach Center.

Idea to opportunity: Identify a higher value use for unused dairy digester solids.

Outcome: Although testing is still in progress, this project has the potential to add value to a renewable energy coproduct while bringing down costs for nursery and greenhouse growers by providing a beneficial growth media alternative – making both more economically competitive.

E-Z Tarp

Doug Kavanagh, operations manager at Glacial Plains Cooperative in Murdock, Minn., handles more than 20 million bushels of corn a year and as a common practice, must cover these grain piles every fall.

However, covering a two-million-bushel corn pile with a plastic tarp is an expensive, back-breaking job. It takes eight to10 strong men an entire day, as they must slog over a slippery hill of grain, lug a four-ton, $40,000 tarp into place, and tape the seams and secure the edges.

Once the tarp is in place, aeration fans must run continually to keep the cover from blowing off. Tarps often tear, letting in moisture. When it's time to move the grain in the spring, the single-use tarps have to be cut up and hauled to a landfill, the entire process resulting in excessive labor, expense and hassle.

A few years ago, after a day of tarp wrangling, Kavanagh thought, "There has to be a better way." And thus, the idea of a spray-on cover was conceived. Agreeing that this idea was a great opportunity, Glacial Plains General Manager Tom Traen immediately called AURI to set this brainstorm into motion. Kavanagh and Traen sat down with Michael Sparby, AURI project director, and AURI chemists Doug Root and Ranae Jorgenson to hash out the concept. That was the genesis of an ag-based, sprayable "bio-tarp," designed to shed water and protect grain and silage piles all winter.

"We recognized an exciting idea," Root says. Although spray-on organic coverings are used in other settings, such as waste lagoons and sugar beet piles, "there doesn't seem to be anything like this on the market."

The product, called "E-Z Tarp," was formulated and bench-tested at AURI's fats and oils lab in Marshall, Minn., followed by small-scale trials at the Murdock co-op. Now it's ready for commercial scale-up and final testing. Kavanagh and Traen, both grain-industry veterans, are seeking investors.

It took about two years to develop the E-Z Tarp formula, according to AURI Analytic Chemist Ranae Jorgenson. The product had to be made of 100 percent food-grade materials. It had to form a waterproof barrier durable enough to last through the winter without cracking, yet crumble enough to mix easily into the grain or silage pile after storage. Finally, it had to be sprayable in cold weather using existing mixing and application equipment.

The first two bio-tarp formulations failed in outdoor tests. The third formula was tested on small corn and haylage piles during the fall and winter of 2009-2010. "It held together all winter," Kavanagh says. The corn piles remained dry, and periodic aeration didn't disturb the covering, he says. The haylage piles "continued to ferment under the bio-tarp, just as they were supposed to do."

"We think we're pretty close to the final formula," Jorgenson says. The next steps will be testing the bio-tarp on commercial-size grain piles and identifying the most efficient mixing, pumping and spraying equipment. The material, a water-based emulsion like latex paint, has a syrupy consistency. The bio-tarp ingredients are mixed and heated to 140 degrees, then pumped while still warm. As the emulsion cools, it hardens into a solid waxy sheet, creating a waterproof cover in about four hours.

(continued on page 6)

Client Successes

E-Z Tarp (continued from page 5)

Project Snapshot

AURI scientists worked with two grain marketing veterans to develop a new covering for grain stored outdoors.

Idea to opportunity: Develop a spray-on biodegradable, food-grade covering for grain and silage piles, replacing plastic tarps.

Outcome: Prototype successfully developed and tested at AURI's Marshall laboratory, and will be tested this summer on large scale.

Vinylite

Vinylite was interested in finding a substitute for the metal contained in their windows. Metal is strong but a good conductor for both heat and cold. Finding a substitute would potentially improve their energy efficiency rates. However, windows still need to be able to hold up to structural tests.

Initially, Vinylite's efforts to find an appropriate substitute for metal failed. Substitutes, including polylactic acid (PLA), were simply not strong enough and could not hold up to industry specifications. After several discussions with AURI staff, Vinylite agreed to look at a soy-based foam as an insulator for their windows.

AURI project staff partnered with an insulation specialist to identify a process to inject soy-based polyols into Vinylite's windows. A regional distributor (EnDySis) based in Rogers, Minn., provided the test equipment for the project demonstration.

It worked. The soy-based foam has allowed Vinylite to increase the insulating value of the window from R3 to R5. The company was so happy with the results that they have dedicated a new line of windows that incorporates the soy-based foam and has plans to include this foam in all of its productions lines in the near future.

Project Snapshot

AURI project management staff suggested an ag-based bioplastic as a material that met Vinylite's specifications for their new products.

Idea to opportunity: Identify an ag-based bioplastic solution for local window manufacturer.

Outcome: Vinylite was able to substantially improve its windows R-values from R3 to R5. Vinylite has dedicated a new line of windows that incorporates the soy-based foam and has plans to include soy-based foam in all of its production lines in the near future.

Ferndale Markets

Ferndale Market, located in Cannon Falls, Minn., has been a family farm for three generations. This operation handles about 200,000 turkeys annually. Recently, Ferndale owner John Peterson came to AURI with a desire to diversify their operation. Although the demand for turkey is always high around Thanksgiving, Peterson understood that there was more market potential to be had throughout the year.

To take advantage of this emerging market, Peterson was interested in developing new turkey products, including specialty turkey sausage. Working with AURI Meat Scientist Carissa Nath in the USDA Certified Meats lab in Marshall, Minn., Ferndale was able to do the necessary development work to get these new products to market. AURI developed recipe formulations, nutritional panels and labeling for the products. Additionally, AURI assisted Ferndale in identifying appropriate processors and finalizing product specifications for each product.

"AURI's involvement was invaluable… we couldn't have undertaken this on our own," says Peterson.

Ferndale sells their locally grown and processed fresh turkey products at its on-farm store and at numerous natural food stores in Minnesota. During Farm Fest, Nath handed out samples of several of these new products. Although many traditional sausage lovers were reluctant to try a turkey sausage, they were quickly won over by the flavorful new products. For a complete listing of locations to buy Ferndale Products, check out the company's website at ferndalemarketonline.com.

Project Snapshot

AURI worked with Ferndale Market to expand their line of turkey products. AURI provided recipe formulations, nutritional paneling and labeling. AURI also helped identify appropriate processors and worked with the processors to develop specifications for each new product.

Idea to opportunity: Develop gourmet, fresh turkey sausages to expand the client's line of turkey products.

Outcome: Three different turkey sausage formulations were successfully developed and are currently marketed to numerous retail stores across the state as well as at Ferndale's on-farm retail store.

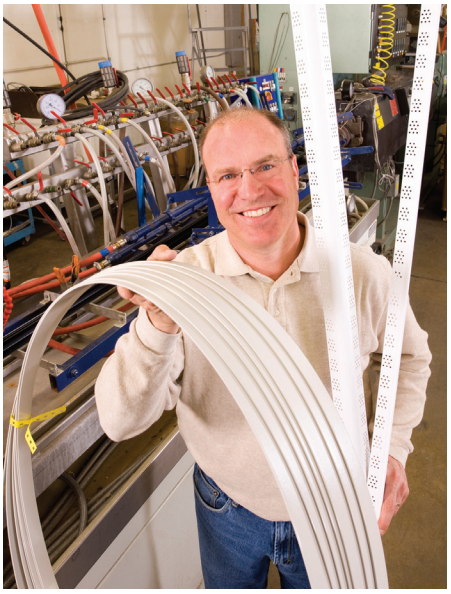
Client Successes

Additional Client Successes!

Pet Care Systems, one of the original biobased product companies in Minnesota, announced in August of 2011 that it was going to pursue another multimillion dollar facility expansion. AURI has continued to support Pet Care Systems' focus on adding value to multiple agricultural products and coproducts through their animal care products. Swheat Scoop is the most notable product from Pet Care Systems and can readily be found in Target® and numerous pet supply retailers.

American Bio Labs' patented Slip-Stick™ process as a pelleting enhancer is now ready for the market after AURI provided pilot lab assistance during development to the Minnesota company. American Bio Labs' Slip-Stick™ process improves pellet durability of many livestock and poultry feeds containing high levels of oil. This improvement in pellet durability results in a significant increase in feed efficiency contributing to producers' profitability. American Bio Labs' formulation has also been shown to aid in the production efficiency, saving livestock and poultry producers considerable money.

Bio-Plastics Solutions is a biobased company developing green building materials utilizing ag fibers to improve their products' physical characteristics that aid with incorporating these materials into more structural applications. Bio-Plastics Solutions is moving forward in the advancement of biopolymers and natural fibers to meet specifications of a rapidly increasing number of durable material applications that are being sought by the industry. Research is focused on producing a high-purity biobased structural material.



At AURI we strive to provide support from idea to commercialization. While AURI's experts and laboratories are vital to delivering solutions to Minnesota businesses, we could not generate such a large impact without the support of our partners. In addition to partnering on client projects, AURI has vital collaborations that help move forward large industry initiatives and maximize valuable research dollars.

The areas of food, renewable energy, biobased products and coproduct utilization are rapidly evolving. If our 20-plus years have taught us anything, it is that working together we can accomplish more.

For decades, checkoff dollars raised through the sale of commodities have funded projects that have escalated new uses and markets for ag products. Farmer-controlled organizations, such as research & promotion councils, manage the funds.

Several commodity groups have partnered with AURI to identify new use opportunities, define research needs, manage projects and conduct tests and analyses at AURI laboratories. Commodity organizations' research funds go further, matched with AURI technical assistance and often state and federal funds.

This past year, AURI has partnered with several commodity organizations, including the Minnesota Corn Growers Research & Promotion Council, Minnesota Soybean Research & Promotion Council and Midwest Dairy Association.

Commodity Group Collaborations: Commodity organizations' research funds go further when matched with AURI technical assistance.

AURI has managed dozens of projects funded fully or in part by commodity checkoff dollars. Some of the projects recently initiated include:

Tapping Central Minnesota Markets

AURI is assisting the Ottertail County Soybean Processors Co-op with identifying niche markets in central Minnesota, such as livestock producers and pet food processors interested in purchasing soybean meal from the co-op.

Developing Low-Sodium Cheeses

AURI assisted the Midwest Dairy Association and the Midwest Dairy Foods Research Center with developing and improving low-sodium processed and natural cheeses.

Critical Collaborations

Testing Copper in Milk

Some dairy co-ops are having problems with spontaneous milk oxidation before and after pasteurization, which may be related to high copper rates in dairy feed, common in the spring. A University of Minnesota flavor chemist is determining if a specific flavor compound could identify milk that is prone to oxidation. Project partners include the Midwest Dairy Association and Midwest Dairy Foods Research Center.

Building with Bioplastics

Bio-Plastic Solutions, a plastic components manufacturer in Blooming Prairie, Minn., is developing moldings, trims and cabinet accessories made with biobased material. AURI's coproducts lab in Waseca has helped identify biomass that can be combined with PLA and other materials to make bioproducts with structural integrity. Minnesota Soybean and Minnesota Corn Growers are project partners.

New Wheat and Barley Uses

AURI is expanding a 2002 report on value-added and alternative uses for wheat to include barley. The updated report will look at opportunities and barriers for potential new or improved wheat and barley uses. The second phase will disseminate information and explore viable options in northwest Minnesota. The Minnesota Wheat Research & Promotion Council is a project partner.

The Future of Bioplastics

AURI led a two-year bioplastic market study and a survey of Minnesota manufacturers on using biomaterials. The project culminated with a bioplastics forum in August, which brought together more than 80 industry, economic development, academia and government representatives to discuss opportunities for building a bioplastics industry in Minnesota. Sponsors included Minnesota's Soybean Research & Promotion Council, Corn Research & Promotion Council and the Southern Minnesota Initiative Foundation.

Defatted Soymeal

AURI assisted Midwest Ag Enterprises with developing a process to refine the protein in soybean meal to make a high-value feed ingredient for cattle, hogs and poultry, similar to soy protein concentrates used in the food industry. A process was developed to remove anti-nutritional oligosaccharides, which potentially could be used to make ethanol.

Whey Clean

This project follows a successful 2010 AURI initiative that demonstrated bacterial biofilms forming on the filtration process in whey-processing facilities. The study will test a sanitation protocol and provide recommendations to the dairy industry. The Midwest Dairy Association is a project partner.

Cleaning Drainage Water with Ag Residue

Crop residues, such as straw and corn stover, are being tested in bioreactors that consume nitrates in water flowing from farm drainage tiles. The Minnesota Corn Growers Association is a project partner.

High-Tech Livestock

In August, AURI held livestock technology forums at Farmfest to share results of AURI initiatives on new processes and products that can improve performance and reduce production costs for Minnesota's livestock industry. Forum sponsors included Minnesota's Soybean Research & Promotion Council and Corn Research & Promotion Council.

Corner Stover Estimates

This study will analyze potential corn stover biomass availability at various distances from electrical or biofuels plants. Stover (the leaves, stalks and cobs left in a field after harvest) is a feedstock for fuel production. Researchers will also look at how producers decide whether or not to harvest stover. The Minnesota Corn Growers Association is a project partner.

Distillers Dried Grains

The following research projects focus on the use of distillers dried grains, a nutrient-dense byproduct of ethanol production. Because of the increasing supply of distillers grains, or DDGS, it is cost competitive with other feed sources and its use is increasing.

Controlling Contamination

This project is evaluating the potential for antibiotic residues in distillers grains. In ethanol plants, small amounts of antibiotics are used to control bacterial contamination during fermentation. Bacteria compete with yeast for sugars and micronutrients during fermentation and can reduce ethanol yields by up to five percent. Controlling bacteria also improves distillers grain quality. The Minnesota Corn Research & Promotion Council is a project partner.

Improving Distillers Grains in Cattle Feed

Despite the known advantages of distillers grains low starch and high energy and moisture content for feed rations, some producers are concerned about DDGS sulfur content. If too high, sulfur could cause hydrogen sulfide toxicity and reduce cattle's performance. AURI is funding feed trials using distillers grains with low sulfur concentrations. The Minnesota Corn Growers and University of Minnesota are project partners.

Soluble-Sensible Cow Diet

Corn solubles are a proven, effective dietary supplement for gestating cows. While their price is low, solubles in liquid form are costly to transport. Buying large quantities, such as a semi-load, could reduce costs, but corn solubles can only be stored for a week. This project looks at alternative methods of storing, handling and feeding corn solubles to reduce costs. The Minnesota Corn Research & Promotion Council is a project partner.

Critical Collaborations

Feeding Distillers Grains to Poultry

Distillers dried grains are becoming more common in poultry diets. However, some producers are concerned that DDGS nutritional content isn't consistent, and energy derived from the feed can be influenced by the amount in feed and nutrient digestibility. This study will look at the relationship of various DDGS characteristics in poultry diets. The Minnesota Corn Growers Association is a project partner.

Lowering Unsaturated Fat in Cattle Diets

AURI is studying cattle feed made with 35 percent distillers dried grains that have reduced soluble content, which lowers the unsaturated fatty acid in the feed. Increasingly, ethanol plants are removing distillers grains solubles, which have other uses. Researchers expect feeding low-soluble grains will improve the nutritional benefits for cattle. The Minnesota Corn Growers and University of Minnesota are project partners.

Balancing Electrolytes

This study is identifying the optimum dietary electrolyte balance (DEB) in turkey diets that contain distillers dried grains and canola meal. DEB reflects the balance of sodium, potassium and chloride and, when optimized, improves the health of turkeys. DEB can be affected by alternative feed ingredients that contribute sulfur to diets, such as distillers grains and canola meal, but other diet additives can improve the balance. Minnesota Corn Research & Promotion Council is a project partner.

Better with E

Mulberry Heart Disease in domestic swine is increasing. Distillers dried grains in swine diets have been blamed for increasing MHD, as DDGS contains high levels of polyunsaturated fatty acids that impair Vitamin E. However, Vitamin E can be added to DDGS, and this study will assess the effects of supplements in sow and nursery pig diets. Project partners include the Minnesota Corn Growers, Minnesota Corn Research & Promotion Council and University of Minnesota.

Additional Partnerships

Initiative Foundation Partnerships

During the past year, AURI has strengthened its partnerships with many of the Initiative Foundations throughout the state. Given AURI's focus on bringing economic development to rural communities, the Initiative Foundations have been natural partners. Although there are numerous success stories where AURI has worked together with these foundations to support local businesses, we have highlighted some of our more groundbreaking partnerships below.

In 2011, AURI and the Southern Minnesota Initiative Foundation (SMIF) partnered to bring the Biobased Products: A Focus on Bioplastics event to southern Minnesota. Keynoted by Congressman Walz, the event focused on recent research highlighting market and technological advancements in biobased plastics. Thanks to funding from SMIF, AURI will be conducting additional events that expose southern Minnesota businesses to emerging technologies.

The Northwest Minnesota Foundation (NWMF) has also formalized its partnership with AURI this year. The NWMF has targeted funds to support AURI clients and AURI research that will lead to economic development in their region. Headquartered in Crookston, Minn., AURI and NWMF are natural partners!

Cooperative Development

With help from a $225,000 U.S. Department of Agriculture Rural Cooperative Development Grant, AURI is increasing its capacity to help Minnesota cooperatives evaluate cooperative business structures, marketing and business plans, finances and equity development. All cooperatives served by the center will benefit rural areas and be located in communities under 50,000 in population.

For more than two decades, AURI has helped cooperatives with developing products, improving processing, finding raw materials and converting byproducts to income streams. However, it has not had a formal program focused on rural cooperative enterprise development.

AURI is partnering with Cooperative Development Services to develop internal capacity and serve clients who are ready to undertake cooperative development. Specifically, AURI has been working with Win Curtiss of the Wisconsin Cooperative Development Services in Madison, Wis., who is knowledgeable in board governance and strategic planning and St. Paul attorney Lois Josefson, who is contributing expertise in cooperative business planning and development and conducting market and feasibility assessments.

AURI is a member of CooperationWorks!, a network of 24 centers across the country that intend to revitalize communities through cooperative enterprise development. Through this association, AURI is working to build capacity to better serve clients organized as cooperatives. Often new and existing cooperatives require specialized guidance from advisors trained in cooperative development. CooperationWorks! offers intensive training in cooperative business development, finance, law, governance and management. AURI Project Directors Denny Timmerman, Randy Hilliard and Bruce Stockman are training to become cooperative development practitioners.

Heating the Midwest

Heating the Midwest (HTM) is a group of volunteers with a serious interest in growing awareness and usage of biomass thermal fuel for heat in the Midwest. The organization's mission is: "To advance biomass thermal heating in the Midwest for a more sustainable future, while improving the economic, environmental and social well-being of the region."

AURI has played a vital role as technical support for this initiative. As both members of the Steering Committee and Team Leaders for the Biomass Resources Action Team, AURI staff have been working with partners from industry, government, other non-profit organizations, universities and local tribes to get this initiative moving.

Look for a biomass resources inventory from AURI in 2012!

Major Research Initiatives

Throughout the course of the year, AURI conducts several Industry Focused Research Initiatives. These initiatives are designed to support stakeholders and clients seeking additional information on market opportunities and new technologies. These initiatives are often based on a pressing industry need and lead to individual client projects that look to implement the technology in their business. The initiatives are responsible for generating ideas for AURI clients, stakeholders and staff alike. Unlike client-specific work conducted by AURI, these research initiatives are available to the public and can be found at www.auri.org.

Biobased Products – An Emerging Opportunity

In the summer of 2011, AURI, in partnership with the Minnesota Soybean Research & Promotion Council, released a comprehensive report entitled *Biobased Products: Minnesota's Opportunity & Challenge*. The report explores the challenges and opportunities facing this emerging industry.

Biobased products are made from biological, renewable raw materials such as corn, soybeans or other agricultural materials. They are often considered a substitute for petroleum-based products and are thought to leave a smaller ecological footprint than fossil fuel sources. The report took a detailed look at the potential for creating new market opportunities for Minnesota agriculture and Minnesota manufacturers.

The report also included findings from a survey of some Minnesota manufacturers regarding their current use of biobased materials (primarily bioplastics), the market drivers and challenges surrounding the adoption and use of these materials, and the intent of manufacturers to increase such use. Nearly two-thirds of Minnesota manufacturers surveyed anticipate increasing their use of biobased material. Most are using these as alternatives to petroleum-based materials in molded products, architectural/shelving structures, packaging and point-of-purchase materials.

A group of premier industry thought leaders served as advisors on this project. Collectively, they vetted the report's findings and recommendations. Following the release of the report, AURI partnered with Minnesota Soybean Research & Promotion Council, Minnesota Corn Growers and the Southern Minnesota Initiative Foundation to bring together nearly 100 players in Minnesota's emerging biobased industry for a one-day event. Since the event, AURI has been working with a team of interested individuals to further the work in this area.

A special acknowledgement is due to Russell Herder, a Minnesota-based marketing firm with significant experience in market research, and the Student Marketing Advisory Center at Southwest Minnesota State University, both of which contributed significantly to this project.

Reusing Water and Saving Money!

Water is essential for life and important for many types of agricultural processing. In some cases, the most available source of water could be water that's already been used.

A joint effort by AURI and Metropolitan Council Environmental Services has resulted in reports examining the potential for using treated wastewater in nonpotable ag processing applications. Instead of using fresh water, some applications such as heating or cooling can be accomplished using reclaimed wastewater, saving aquatic and financial resources.

While there are examples from other states where reclaimed wastewater is being utilized, water treatment facilities and ag processors have made no such connection in Minnesota, *yet*.

AURI brought together members of the state's ag processing industry to consider the possibility of treated wastewater utilization, identify technical needs, and make connections between major water users and those discharging treated water. Reusing water could save ag processors money, provided the end user has relative proximity to the supply.

Minnesota's approximately 600 municipal water treatment plants yield about 425 million gallons of treated wastewater a day, which nearly matches the daily water use of Minnesota industries.

Anaerobic Digester Casebook for Food Processors

Dairy producers have been using anaerobic digestion systems for years to turn manure into power. Now food manufacturers are seeing financial opportunity in turning food waste into energy.

Most food processors send their waste to municipal facilities but, as companies grow, they can overload the municipal systems and processors must pre-treat the waste or handle it in-house. Both are costly. A recent AURI research initiative took a closer look at how food processors could use anaerobic digestion to save money and alleviate concerns about waste water treatment. According to the report, food processors can decrease the amount of waste solids and pollutants as well as create energy by utilizing anaerobic digestion in their facilities.

AURI partnered with the Energy Center of Wisconsin to develop this Anaerobic Digester Casebook for food processors. The casebook looks at six types of anaerobic digester systems and various feedstocks used by food companies in the Great Lakes region — Minnesota, Indiana, New York, Wisconsin and Illinois. The 12 processors profiled make cheese, meat, vegetable, oat, sugar, beverage, refrigerated-dough and corn-based products. This casebook provides companies with examples and insights from others in the industry who are already using this technology.

Other Research Initiatives and AURI Client Tools Released in 2011 include:

Investigation of Drying Technologies for Post Digester Solids

The purpose of this initiative is to identify drying technologies that might make the drying process more economical and make the use of post-digester manure solids for a fuel or fertilizer viable.

Major Research Initiatives

Barley Straw for Odor Control

There is a demand for barley straw as an odor control mechanism, however, transportation issues limit the use of it as a marketable product. The purpose of the project is to explore whether barley straw can be pelleted, and if so, develop the pelleted product in a way that preserves the natural odor control enzymes and properties of the barley straw and allows for an effective, marketable odor control product that floats and can be easily transported/stored.

NW Minnesota Methane Digester Feedstock Inventory

The agriculture industry is abundant and the potential for biogas production is significant in northwest Minnesota. Biogas, or methane, is produced through a process of anaerobic digestion of biodegradable materials known as feedstocks. Common feedstocks for anaerobic digestion include agricultural waste, industrial wastes and wastewater, municipal biowaste, and energy crops. If farmers, ranchers and businesses combined their resources, a successful digester could be better justified. This report looks at the inventory of feedstocks available in the region.

Crop Residue Valuation Template

The Crop Residue Valuation Template tool allows individuals to calculate the fertilizer replacement value of crop residue removal along with projected residue yields for corn stover and wheat straw. AURI does not recommend utilizing soybean straw for biomass needs due to sustainability questions associated with soybean straw removal.

Media and Media Mix Evaluation for Dairy Compost Barns

This study evaluated alternate media as well as media mixes that could be used as bedding for compost barns. The goal is to help dairy farmers expand the number of alternative media and media combinations that could potentially be used more economically in dairy compost bedded pack systems. The study includes literature review, laboratory analysis of the media and media mixes, demonstration study at four production farms, and the development of a computer model that is designed to help farmers decide what media(s) works best for their purpose.

A Food Entrepreneur's Guide to Omega-3 Claims

AURI has received several requests for technical assistance related to omega-3 and omega-6 fatty acids and the allowed health claims for products containing these important nutrients. The information in this brochure is meant to guide clients as they investigate the omega-3 and omega-6 content of their products.

Natural and Organic Meat Processing Guide

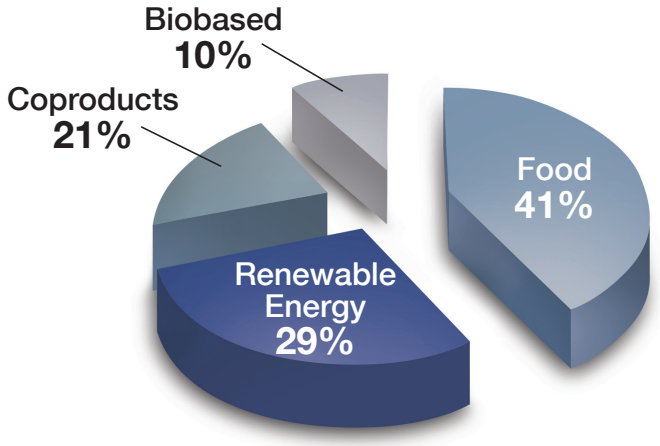
Over the past 10–15 years the food industry has seen a push from consumers for products that are more "label friendly" or minimally processed. Often times this means developing products with as few added ingredients as possible. However, one of the biggest challenges to meat processors is the fact that the consumer still desires the same taste and appearance in these minimally processed products that conventional products possess. This guide is intended to help processors meet consumer demands and create minimally processed products without sacrificing the taste and appearance of the product.

During the State's Fiscal Year 2011, AURI received $2.78 million in funding from the State of Minnesota. The organization maximized this investment by leveraging $2.30 for every state dollar invested in AURI projects. Working with commodity organizations, farm organizations, foundations and federal agencies, AURI made the most of the dollars invested by the state.

Projects supported by AURI resulted in over $14.9 million of new capital investment by Minnesota businesses. For every dollar AURI invested in projects, a return of five dollars was seen in new capital investment. This was done at a time when finding capital to invest was a challenge for many businesses across the country. This success proves that investments in research, development and due diligence do help alleviate the challenge of access to capital.

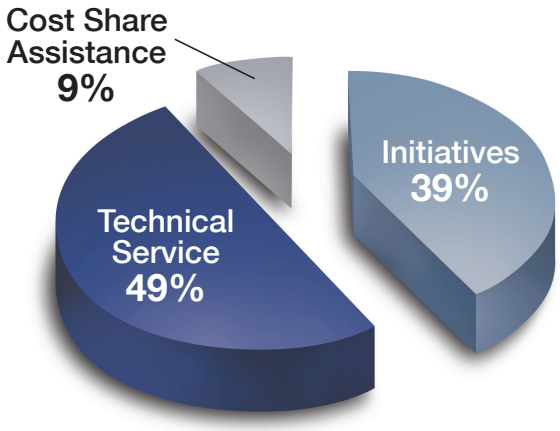
During the last fiscal year alone, AURI helped more than 100 businesses make more informed decisions about moving forward on expansions, launching a new product, or developing a new ag processing venture. During this timeframe, AURI helped develop or refine 78 products or processes. While new products have found their way to the marketplace, new processes are harder to see. However, they are resolving inefficiencies for our clients and making their businesses more profitable.

AURI's Core Four Focus Areas:
Food, Renewable Energy, Biobased Products and Coproduct Utilization



This chart represents the breakdown of AURI's work in its four core areas.

Project Assistance



This chart represents the breakdown of type of services provided to AURI clients.

Celebrating AURI Milestones

AURI Becomes Minnesota's First Venture Development Organization

AURI has been designated as Minnesota's first Venture Development Organization (VDO) by the Regional Innovation Acceleration Network (RIAN).

Organizations selected as Venture Development Organizations are business-driven and work to promote and support regional growth through innovation-based entrepreneurship. VDOs support this growth by providing a variety of services including business assistance and speeding the commercialization of technology.

This network provides AURI with an opportunity to connect with similar organizations across the nation and learn about best practices in technology-based economic development.

The RIAN network is a project of the State Science and Technology Institute funded by the U.S. Economic Development Administration.

AURI Participates in Prestigious National Conference

AURI Executive Director Teresa Spaeth was selected to attend an exclusive invitation-only conference on Rural Wealth Creation. The conference was put on by the United States Department of Agricultural Economic Research Service, the Ford Foundation, and the Aspen Institute. The conference provided AURI an opportunity to obtain and share ideas about bringing wealth to rural communities. AURI used this opportunity to showcase its work on the Rural Innovation Network Model. One very exciting aspect of this conference was the focus on agriculture's ability to help communities prosper – something AURI has always believed in!

AURI Asked to Participate in Governor Dayton's Trade Mission to South Korea

AURI Project Development Director Denny Timmerman was asked to participate in Gov. Mark Dayton's trade mission to South Korea. The delegation included representatives of the state's commodity groups and farm organizations. The purpose of the trade mission was to build relationships and expand export markets for Minnesota's agricultural goods, including value-added agricultural products. AURI was brought along to focus on South Korea's interest in low oligosaccharide soybeans, Berkshire pork and biobased products.

A special thank you to the Minnesota Farmers Union and the Soybean Research & Promotion Council who co-funded AURI's participation in the trade mission.

AURI Serves on the National Corn Utilization Technology Conference Planning Committee

AURI was asked to serve on the Planning Committee for the National Corn Utilization Technology Conference. AURI Senior Director of Innovation Jen Wagner-Lahr will be chairing the session on water usage. This chairmanship correlates to the work AURI has done in partnership with the Metropolitan Council on wastewater reclamation in agricultural processing facilities. AURI is excited for the opportunity to share its knowledge and resources with ag processors from across the country and support Minnesota Corn Growers' involvement in this effort.

AURI Scientist to Chair Industrial Oil Group

AURI scientist Doug Root was selected to chair the American Oil Chemists Society's (AOCS) Industrial Oil Products Division. Root is senior scientist of biomass and renewable products technologies and is located at the AURI office in Marshall, Minn.

The AOCS Industrial Products Division provides a forum for professionals involved in research, development, engineering, marketing and testing of industrial products and coproducts from fats and oils, including glycerin and its derivatives.

The efforts of oil chemists and, in particular, chemists working on development of industrial oil products, are an important avenue toward expanded uses for renewable fats and oils. The products developed in the oil products industry are often direct replacements for petroleum-based materials.

AURI's National Television Debut

In February, AURI scientist Alan Doering and the organization's coproduct utilization program were featured on Animal Planet's "Must Love Cats" series. Animal Planet's trip to AURI was focused on the organization's role in testing and development of biobased animal litters, including Swheat Scoop wheat-based cat litter made in Detroit Lakes, Minn.

Long-Time AURI Chairman Retires

Long-time AURI Chairman Al Christopherson retired at the end of 2011. Christopherson leaves a strong legacy and commitment to Minnesota agriculture. His representation of the Minnesota Farm Bureau on AURI's board has been a strong foundation for the organization. We would all like to send a sincere thank you to Christopherson for his years of dedication, service and hard work on behalf of AURI and value-added agriculture.

What you need to know to work with AURI

AURI generates economic impact in Minnesota communities by helping businesses take advantage of innovative opportunities in biobased products, renewable energy, coproduct utilization and food. With unique facilities and professional staff, AURI is a one-of-a-kind resource that provides scientific and technical assistance to Minnesota businesses looking to create more value for the state's agricultural products.

AURI takes a deliberate approach to developing agriculturally-based innovations. These advancements don't just happen; they are the result of focused research, strategic collaborations and an emphasis on implementation.

How to Get Involved with AURI

- Contact one of the AURI Offices to speak with a project development director about your business
- Visit www.auri.org to see the latest research and learn about upcoming events
- Sign up to receive the Ag Innovations Newspaper or the AURI Electronic Newsletter to stay informed about AURI projects and clients
- Follow AURI on Facebook and Twitter to get notices about new research, upcoming events, where to find AURI at tradeshows and much more

What to Expect When Working with AURI

- Seamless service from idea to implementation
- Unbiased information grounded in science, technical knowledge and experience
- Assistance from scientists and technicians in unique laboratory facilities
- Dedicated project staff who help assess market opportunity, develop an implementation plan, explore available resources and facilitate coordinated services from AURI
- Access to leading research in agricultural processing in the areas of food, renewable energy, biobased products and coproduct or waste product utilization
- Connections to a variety of resources that help businesses achieve goals

How AURI can Help Your Business:

In addition to project management expertise, innovation management experience, targeted network development, and in-depth industry knowledge offered by AURI's professional staff, our organization provides businesses access and assistance through the following specialized laboratories:

Food
Shelf-Life, Sensory Evaluation, Nutritional Assessment, Regulatory Assistance, Packaging Assistance and Recipe Formulation

Meats
Smoking, Packing, Processing and More

Analytics
Microbial, Gas Analysis and Chemical Analyses

Fats and Oils
Fat / Oil Analysis, Biomass Analysis, Food, Feed and Meat Analysis

Coproduct Utilization
Fertilizers, Sorbents, Renewable Fuels, Energy, Animal Feeds, Soil Amendments, Biodegradables Pilot Performance Grinding, Milling, Size Reduction, Blending, Pelleting and Drying

Project Name	Hours Served
C5 Molasses	323.00
Digested, Fermented, and Defatted Soybean Meal	288.50
Anaerobic Digester Feedstocks	266.50
Development of Bioplastic Products	243.25
2011 Meat Lab HACCP	214.75
Identify Opportunities to Utilize Biobased Products	205.75
Assessment of DDGS on Beef Cattle Rations	194.00
Drying Technologies, Post Digester	191.50
Roseau Gasification	183.00
Micro Carriers Fiber	171.00
Heating with Renewable Biomass	161.00
Biobased Materials	155.00
Pelleting Evaluation	153.50
Rural Cooperative Development Training	153.00
Pizza Recipe Development	145.25
Milk Replacer from Coproducts	137.50
Processing Specialty Grains and Distillers	137.50
Food Safety Urban Outreach	137.00
Biomass Pellet Binder Proof of Concept	135.00
Nutritional Analysis	131.50
Biomass Emissions Guide	130.00
Lab Scale Analysis of Biofilter	126.75
Barley Straw Initiative	122.50
MN Renewable Energy Roundtable Portal	122.00
Fertilizer and Feed Opportunities for Coproducts	120.00
Sustain Switchgrass and Cordgrass	119.00
Utilizing Grass Screenings	116.00
Biobased Medical Devices	103.00
RCDG Discovery Time	101.50
Particulate Evaluation of Biomass	101.00
Production and Process Development	98.50
Gasification as a Value-Added Technology	98.50
ASTM Biodiesel Check Samples	92.25
Effects of Glycerin on Beef Rations	90.25
Convene Agricultural Issues Roundtable	90.00
Green Chemistry Technology	88.50

Project Name	Hours Served
Beef Jerky Shelf Stability	81.75
Identify Granulation Processes	78.50
Drying Peptone from Swine	75.50
Summary of Research Results from National Center for Ag Utilization Research	73.00
Co-Digestion Enhancement	70.50
Manure Solids as Soil Amendment	70.00
Evaluation of Digester Feedstock	69.00
Mechanical Oil Extraction	69.00
ASTM Biodiesel Check Samples	68.75
CERTS Planning Committee	68.50
Positioning the Green Jobs Report for Action	65.00
Energy Administration Work	64.00
Particulate Evaluation of Biomass	62.50
Fuel Pellets	61.00
Litter Re-Formulation and Evaluation	60.50
Biobased Material Development	60.00
Product and Process Evaluation	60.00
Municipal Wastewater	59.00
Value Add Developments for Hazelnuts	58.00
CLA/Omega 3 Guide	58.00
Sustainable Switchgrass	53.00
C-5 Sugar Extraction	52.50
Biofuel Assessment	51.50
Densification of Prairie Grasses	51.50
Assessment and Effects of Low Oil DDGS	50.50
Identifying Emerging Technologies	50.00
Gluten-Free Labeling	46.90
Biomass Heating	46.00
Cellulose to Liquid Fuels	45.00
Biobased Study Roll-Out	44.50
Biodiesel Taskforce	44.00
Consumer Education of Irradiation	43.00
Increase Biomass Yield	43.00
Quick Wild Rice	42.75
Dessert Toppings and Sauce	42.50
Biodiesel from Biomass	42.50
Pasta Filata Cheese Development	41.75

(continued on page 22)

State FY2011 Projects Receiving Assistance

(continued from page 21)

Project Name	Hours Served
Corn Grain Dust Particulates	40.00
Salt Reduction of Processed Meat	39.00
Waste Collection and Anaerobic Digester Feasibility Study	39.00
Goat Feta	38.00
Assessment of Corn Cobs as a Feedstock	38.00
Nutritional Analysis of Raw Vegan Food	38.00
Biogas Industry Forum	38.00
Bio Tarp	37.00
Explore Ethanol Meetings	37.00
MN Renewable Energy Roundtable Facilitation	36.50
Assessment of the Value of Using Corn Solubles	36.00
Continued Development of RIN Model	34.00
Warroad Co-Generation	33.50
Pellet Fuel Assessment	33.00
Donuts	33.00
Communities of Innovation in Food Production	32.00
Wheat Straw Pulp	32.00
IDEA Competition	31.75
HACCP Assistance	31.50
Value-Added Ingredients	31.50
HACCP Workshop	30.75
Swine Manure Digestion	30.50
Vinegar Development	30.50
Innovation Launching Pads	30.50
Nutrition Labeling	30.00
Biobased Lubricants	29.00
Whole Grain Baked Products	27.50
Low Sodium Cheeses	27.00
Biodiesel Troubleshooting and Taskforce	27.00
Gourmet Snack Mixes	26.50
Add Lab Capabilities for Cellulose and Fiber	26.00
Utilizing Camelina in Food Applications	25.75
Combustion Ash Opportunities	25.50
Spontaneous Oxidization of Milk	25.00
Alternative Cutting	24.25
Enhancing Protein Qualities of Soybeans	24.00
Fatty Acid Composition of Algae Oil	24.00
Biomass Crop Establishment	23.50

Project Name	Hours Served
Impact 20/20 Workforce	23.00
Grass Screenings Gasification Phase 2	23.00
Gas Turbine Generator	23.00
Reclaim Wastewater from Manure storage	22.00
Food from Farm to Plate	22.00
Low Carbon Fuel Study	22.00
Alternate Feed Ingredients	22.00
Biomass Crop Establlishment	22.00
Natural and Organic Meat Labeling	21.50
Crop Residue Value Template	21.50
Nut Substitutes	21.00
Sunflower Oil Extraction	21.00
Project Managem System Exploration	20.50
Optimization of Co-Digested Cheese	20.50
HACCP-2010 Meat Lab Activities	20.25
Food Business Incubator	20.00
Development of Digester GenSet Technology	20.00
Pellet Technologies	20.00
Mechanical Dewatering Technology	19.50
Compost-A-Mat Sorbency	19.50
Feasibility of Meat Dairy Goats	19.25
Lignin Content Effect	19.00
Improve Biodiesel Emissions	18.50
Soy Board	18.00
Value Add Poultry Litter	18.00
Trans Fat-Free Icing	17.50
Small Scale Pellet Production	17.50
Local Foods Market Development	17.00
Hot BBQ	16.75
Product Development	16.75
Reduced Sugar and Calories Jam	16.75
Drinkable Antifreeze Additive	16.50
Chocolate Macaroons	16.00
Chili Sauce	16.00
Benefits of Biochar on Livestock	16.00
DDGS in Swine Diets	15.50
Peak Power Cost of Utilizing Biodiesel	15.00
Char Ash Densification	14.50

Project Name	Hours Served
Organic Fertilizer Formulation	14.50
Process Development	14.00
Agricultural Biomass Pellet Fuel	14.00
Latino Meat Cutting	14.00
Product Development	13.75
Biomass and Waste Utilization	13.50
Energy and Handling Evaluation	13.50
Popcorn Dressing	13.30
Membrane Biofilms Phase 2	13.00
Frozen Appetizers and Dough	13.00
2011 Drucker Award	13.00
Heat and Energy Delivery Evaluation	12.50
Coproduct Drying and Pelleting	12.50
Healthy Bakery Products	12.00
Food Processing Coproduct Assessment	12.00
Local Food Cooperative	12.00
Energy from Navy Bean Culls	11.00
Seasoning Blends	11.00
PLA Window Testing	11.00
New Dairy Product	11.00
Red River Coatings	11.00
Ash Densification	11.00
Food Process Casebook	11.00
Development of Local Foods Cooperative	11.00
Healthy Granola Bars	10.50
Flavored Sunflower Oil	10.50
Sausages and Gyro Kits	10.00
Gelatin and Jellies	10.00
Fertilizer and Feed Opportunities for Coproducts	10.00
Northwest Biomass Steering Committee	10.00
Wild Rice as a Nutraceutical	9.80
Pellet Facility Sustainability	9.75
Impact 20/20 Education	9.25
Northwest MN Renewable Energy Roundtable	9.25
Glycerol Replacing Corn in Diets	9.00
Sausage Process Development	8.00
Nutraceuticals in Milk	7.80
Organic Granolas	7.50
Sweet Hot Mustard Development	7.50

Project Name	Hours Served
Special T's Gourmet Foods	7.00
Soy Lubicants and Specialty Product Development	7.00
Utilizing Ag Residuesfor Fuel	7.00
Fish Cheese Spreads	6.90
Meal Replacement Bar	6.90
Culinology Students	6.75
Muesli Cereal Products	6.50
Compost Bedding from Blended Media	6.00
Ligin Content and Densification	6.00
Meat Balls Production	5.60
Candy Bars	5.50
Barley Straw for Water Clarification	5.50
Molasses Fertilizer	5.50
Flat Die Pellet Mill Evaluation	5.50
Dill Aparagus/Fruit Salsa	5.50
Biomass Boiler Design	5.00
Livestock Industry Technology Forums	5.00
Buckwheat Growers	5.00
Project Management 2011	7,938.75
Project Management 2010	2,854.25
Discovery 2011	694.50
Minnesota Renewable Energy Roundtable 2011	615.75
Discovery 2010	536.50
TOTAL	**22,680.70**

*This report reflects only projects receiving more than 5 hours of assistance. Numerous businesses and entrepreneurs received assistance of less than 5 hours. Also, initial client meetings that don't lead to formal projects are captured in discovery.

State FY2011 Project Disbursements

Low Sodium Cheeses	$8,178.75
Spontaneous Oxidation of Milk	$10,759.72
Convene Agricultural Issues Roundtable	$16,000.00
FY2010 Annual Client Survey	$1,527.15
Positioning the Green Jobs Report for Action	$2,677.50
BioBased Materials Community of Innovation Development	$13,348.63
Peak Power Cost Containment Utilizing BioDiesel Study	$9,008.00
Value Added Impact Study	$25,000.00
Peak Power Cost Containment Utilizing BioDiesel Study	$11,053.50
Compost Bedding with Woody Blends	$77,935.17
Assessment of the Benefits of Low Oligosacchrides in Swine-Phase 2	$63,104.95
Enhanced Utilization of Milk Coproducts	$35,541.66
Opportunities for biobased products in West Central MN	$52,700.00
Lactose Analytical Quality Testing Methods	$2,000.00
Membrane Biofilms	$13,333.33
Nutrient Availability in Ash-derived Fertilizer	$5,175.00
Poultry Production and Process Development	$527.26
Local Foods Marketing Development	$25,000.00
New Dairy Product Development	$2,322.50
Community of Innovation in Food Production	$12,419.82
Alternative Cutting Methods (meat)	$133.05
Value-Added Ingredients from Milk	$23,371.08
American Ag Energy Pellet fuel Assessment	$9,843.33
Grass Screenings Gasification Phase 2	$295.74
Glycerol in Calf Diets	$9,677.00
Assessment of DDGS in beef cattle rations	$138,460.13
Municipal Wastewater Utilization in Ag Processing	$5,950.00
Assessment of the Effects of Low Oil DDGS on Beef Cattle	$70,008.16
Distillers Grains Sulfur Concentraion and Dietary Roughage	$24,628.35
Improvement of Biodiesel Emissions and Peformance	$30,068.65
Investigating Drying Technologies for Post-Digester Solids	$1,021.34
Utilization of Biodiesel as a Carrier Agent for Preservative Applications	$17,768.50
Biomass Crop Establishment	$4,900.00
Sustainable Switchgrass and Cordgrass	$1,066.30
Potential Human Health Benefits from DDGS	$14,296.06
Assesment of the Value of Using Corn Solubles in Swine Feeding	$30,000.00
Industrial Food Processing Anaerobic Digester Casebook	$10,000.00
Energy Prediction Equations of DDGS	$1,287.19
Biological Activity of Antibiotics in Distillers Grains	$34,096.54
Increased Utilization of Distillers Grains in cattle feedlots	$177.90
Metabolism Effects of Low Soluble DDG on cattle diets	$11,511.12
Anaerobic Digester Feedstocks and Co-Digestion	$2,499.54
Alternative Feed Ingredients and Dietary Electrolyte balance	$10,659.18
Sustainable Switchgrass and Cordgrass	$573.20
Biomass Crop Establishment	$573.20
Biomass Binder Proof of Concept	$3,268.06
Development of Bioplastic Products	$13,020.82
TOTAL	**$856,767.38**

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