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Agricultural Utilization Research Institute

# *Agricultural innovation from idea to reality*



**Legislative Report for State Fiscal Year 2012**

*Reported as required by state statute*

### *Agriculture: Launching a stronger economic future in Minnesota*

It's no secret that Minnesota is at a critical juncture in our economic story. The effects of the recession that began in 2008 are starting to wane, and there are positive signs of growth. At the Agricultural Utilization Research Institute (AURI) we have the opportunity every day to work with entrepreneurs and businessmen and women at the forefront of agricultural innovation. Their bright minds, enthusiasm, and hard work ethic confirm our belief that there's a bright future ahead for Minnesota.

As the second largest employer in the state, with a total annual economic impact of $42 billion, agriculture has been, and will continue to be, integral to our economy. The agricultural industry is much broader than just our farmers; it includes food processing, biobased production, renewable energy, and much more. Success in agriculture benefits not just rural Minnesota, but the urban areas, too. With a large number of our agriculture innovation clients based in the Twin Cities metro area, we see more than ever the need to connect the success of our rural areas with the success of our urban areas.

The need for innovation is endless—it is the key to addressing the opportunities and challenges we face in keeping our food safe, producing renewable biobased products, bolstering an affordable energy supply, ensuring a sustainable environment, reducing waste and much more. We hope this report will give you a picture of the contributions AURI has made to Minnesota, and also inspire a vision for a future in which agriculture's strength and natural innovation spur Minnesota to even greater things.

AURI is proud to have contributed to the success story of Minnesota's agriculture economy thus far, one innovation at a time, and we believe agriculture innovation can launch Minnesota to even greater success.

Sincerely,

Teresa A. Spaeth

Teresa Spaeth
AURI Executive Director

## AURI
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## AURI's Mission

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

- Research and development of innovative 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; and
- The development of renewable energy and biobased opportunities from Minnesota agricultural commodities and coproducts.

# AURI by the numbers

## Getting long-term results...

**281,320**
**tons** of commodities used in new products or processes*

over **$218 million**
in non-AURI dollars towards new projects*

**217**
jobs retained*

More than **275**
new jobs created*

**$414,055,000**
of capital investment in new plants or equipment*

## Through a wise investment of time and resources...

**$5,680,046**
of non-state funds leveraged over two years**

**178**
new or improved products**

**90**
new or improved processes**

*From an eight-year survey of clients with a 16% response rate of AURI's client base. It is likely these results would have been improved with higher response rates.
**For fiscal year 2011-12.



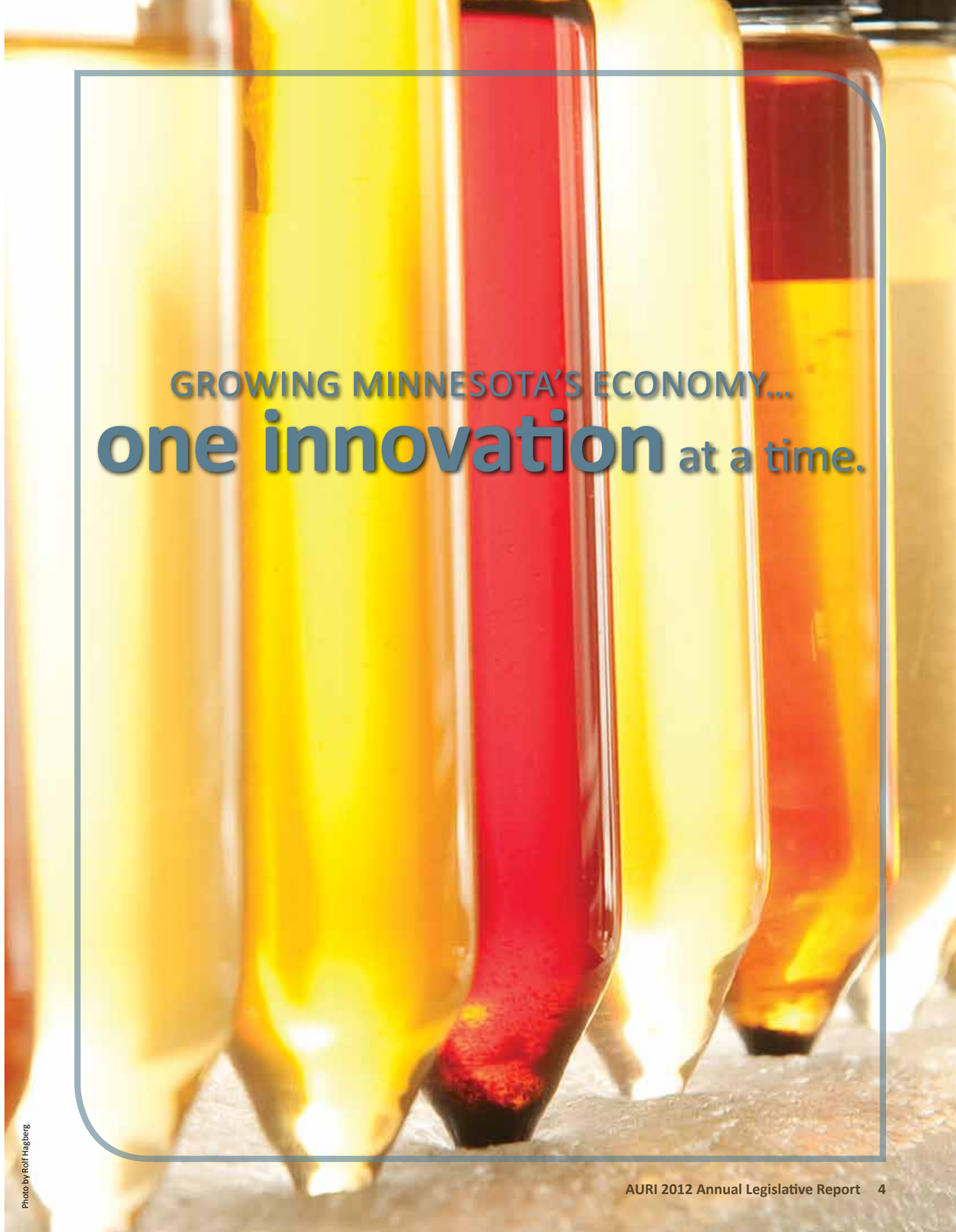



Photo by Rolf Hagberg

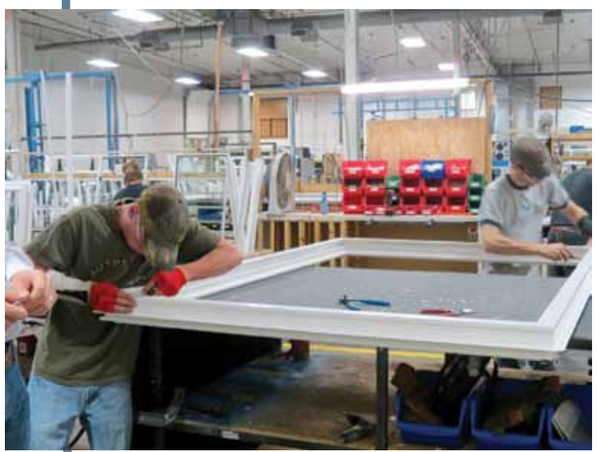
# Vector Windows

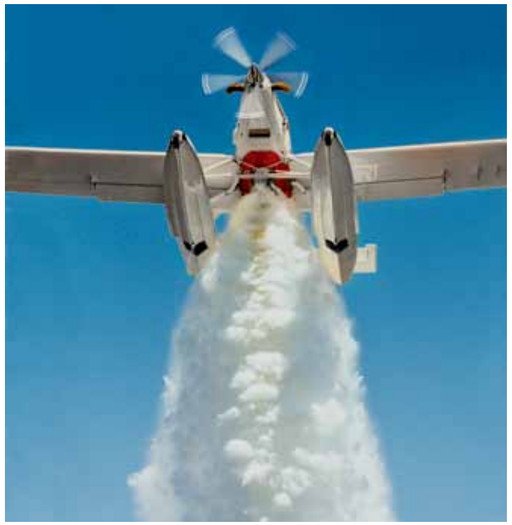
***Idea to reality:*** Vector Windows wanted to improve the overall energy efficiency as well as the "green aspects" of their windows. They were interested in developing windows that have renewable or biobased products in their construction.

***AURI's role:*** AURI staff introduced them to the concept of soy-based polyoil insulation, connected them to the manufacturer and equipment provider, and provided cost-share assistance for testing to ensure LEED (Leadership in Energy and Environmental Design) compliance for windows using PLA (polylactic acid) in their structure.

***Outcomes:*** Vector can now claim its windows meet the new R-5 quality grade, allowing the company to market its product as meeting the newest energy efficiency standards. Vector staff are also looking to create a label that promotes their use of Minnesota farmers' products.

***Partners:*** The Fergus Falls Economic Improvement Commission connected Vector Windows with AURI.





# EarthClean

***Idea to reality:*** EarthClean wanted to further develop TetraKO, a corn- and soy-based fire retardant. They also needed help to gain certification from the U.S. Forest Service as well as develop a mix-on-the-go product and a product that fights oil and gas fires.

***AURI's role:*** AURI staff are providing product development and testing assistance.

***Outcomes:*** EarthClean received EPA's Friend of the Earth award, and commercial quantities of TetraKO will be available for the 2013 wildfire season.

***Partners:*** Minnesota Corn Research & Promotion Council, Minnesota Soybean Research & Promotion Council





# Nots!

***Idea to reality:*** Entrepreneur Rob Fuglie, who has a son with peanut allergies, wanted to create a non-nut snack that would appeal to those with nut allergies and their families.

***AURI's role:*** AURI scientist Charan Wadhawan helped with product development and created a nutritional label with minimum ingredients, and AURI offered cost-share assistance to help procure a UPC label; evaluate market research and product placement strategies; and guide product scale-up.


***Outcomes:*** "Nots!" owner Rob Fuglie produces approximately 100 cases a month and is also building an allergen-free commercial kitchen that can also be used by other entrepreneurs creating products for those with allergies.

***Partners:*** The Fergus Falls Economic Improvement Commission was critical in connecting Fuglie with AURI as well as many other resources.

# Omega Maiden

***Idea to reality:*** Minnesota farmer Phil Batalden heard about the oilseed crop camelina at an organic growers conference. He said to his daughter, "If I grow it, can you sell it?" That was the birth of Omega Maiden Camelina Oil.


***AURI's role:*** AURI scientists helped analyze nutritional information and created supplement facts for the product label.

***Outcomes:*** Omega Maiden oil is now on shelves; the specialty oil is aimed at health-conscious consumers who want local, sustainably-grown farm products. "We're working to revive chemical-free, sustainable agriculture that strengthens rural economies and piques people's interest in traditional foods," says Kathleen Batalden-Smith.

***Partners:*** A small grant from the USDA's Sustainable Agriculture Research and Education program paid for start-up costs.

# Biomass heating


Photo by Rolf Hagberg

***Idea to reality:*** As consumers look for alternative, renewable energy, AURI is examining the feasibility of biomass as a heating source, especially for greenhouse operators and turkey growers that rely on propane for their energy. Biomass refers to any product from agriculture or forestry that can be fed into a combustor and burned to generate heat.

***AURI's role:*** AURI worked with DLF Consulting to create the Biomass Heating Feasibility Guide and disseminated the information to turkey growers and greenhouse operators through industry forums and the Minnesota Renewable Energy Roundtable. In addition, AURI is continuing to look at ways to make biomass use more feasible, including affordable ways to remove water from biomass to make it more usable.

***Outcomes:*** Helping the turkey and greenhouse industries reduce their heating costs will improve their competitiveness and profitability, hopefully leading to further growth and economic activity.

***Partners:*** Minnesota Power, Southwest Clean Energy Resource Team, Southern Minnesota Initiative Foundation, Southwest Minnesota Initiative Foundation, Heating the Midwest

# Biodiesel as a preservative


Photo by Rolf Hagberg

***Idea to reality:*** A national utility pole manufacturer is using biodiesel as the base ingredient for wood preservation in order to address odor problems caused by the traditional, petroleum base. Because the biodiesel-based treatment hadn't been thoroughly tested, they faced questions in the industry about the quality of the product.

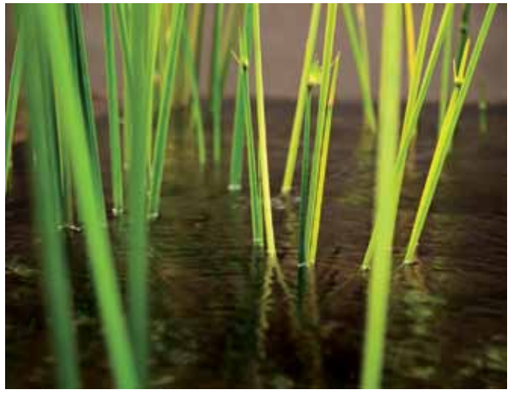
***AURI's role:*** AURI worked with the fuel consulting company MEG Corp and Michigan Technological University to test the wood treated with the biodiesel-based product and also investigate claims that biodiesel would cause chemicals to leach into the environment, affecting water quality.

***Outcomes:*** The performance of the bio substitute was comparable to the petroleum-based preservative system; there was no apparent disadvantage in substituting biodiesel. AURI and Minnesota Soybean plan to evaluate replacing the whole spectrum of petroleum-based products with plant-based products like biodiesel, which are environmentally friendly, renewable and come from our own farm economy.

***Partners:*** Minnesota Soybean Research & Promotion Council







# Protecting our waters with ag filters

***Idea to reality:*** Bioreactors, also known as biofilters, help reduce fertilizer run-off and soil erosion. These filters have historically been made from wood chips or straw, which have high costs, so AURI is exploring the effectiveness of using agricultural residues such as stover, straw and cobs.

***AURI's role:*** AURI is conducting a 15-month study in partnership with the USDA-ARS lab in St. Paul, testing the ability of crop residues to clean up water drained from agricultural lands.

***Outcomes:*** If agricultural fibers can be used in place of wood chips, it will save money for producers, encourage participation in this conservation practice, and make use of products such as stover, straw and cobs, which are often unused waste.

***Partners:*** Minnesota Corn Research & Promotion Council, USDA-ARS Lab

# Feeding trials

***Idea to reality:*** Farmers need more information about new livestock feed alternatives to make the most economical and nutritional choices available.

***AURI's role:*** AURI does many feed trials, working with the University of Minnesota and state grower groups and then disseminates the information to producers through commodity groups, industry forums, its website and more.

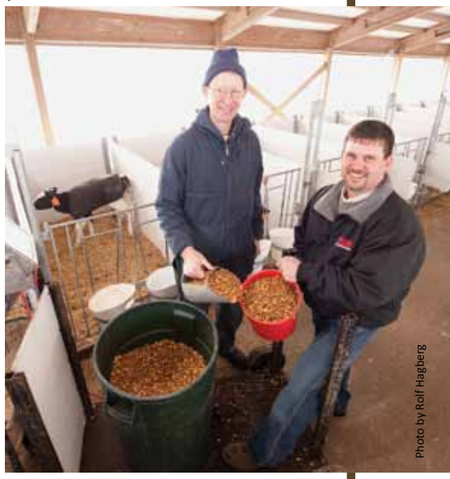


Photo by Rolf Hagberg

***Outcomes:*** Improving livestock feed with the coproducts left over during agricultural processing is a win-win for Minnesota's agricultural industry. Livestock farmers find new nutritional, lower cost feed options. The agricultural processing industry finds ways to add value to the products left over during processing.

***Partners:*** University of Minnesota, Minnesota Soybean Research & Promotion Council, Minnesota Corn Research & Promotion Council, Minnesota Turkey Growers, Minnesota Pork Producers, and others

## THE MINNESOTA RENEWABLE ENERGY ROUNDTABLE:

# Spurring Innovation in Minnesota

Since its inception in 2006, the Minnesota Renewable Energy Roundtable has been bringing together people from across the renewable energy industry—all with the goal of spurring innovation to make Minnesota a national and global renewable energy leader. Partnerships are essential to the roundtable, which is led by a planning team of representatives from the Minnesota Department of Agriculture, Minnesota Department of Commerce, University of Minnesota, the Minnesota State Colleges and Universities System, and AURI.

Minnesota's Renewable Energy Roundtable
Action Initiative

After its initial success, the state legislature adopted the idea into state statute in 2007. Today, the roundtable continues to foster new renewable energy innovation by bringing people and ideas together to create outstanding outcomes that impact the lives of Minnesotans. From education to economic development, the following are several impacts that have been generated by organizations across the state as a result of roundtable participation.

- **Implementation of gasification energy production in Minnesota:** Today, there are two large-scale gasification facilities that use biomass as a feedstock, and five small-scale gasification projects are in various stages of development.
- **Identification of renewable energy workforce needs:** From new courses developed by the Minnesota State Colleges and Universities System to a workforce gap analysis and asset inventory, roundtable participants are helping to address this industry's workforce needs.
- **Increased biomass use:** Multiple organizations have worked together to increase the understanding of factors that may lead to increased use of biomass in the state, educate those who stand to benefit from biomass heat, and share information that is leading to commercialization.
- **Minnesota GreenStep Cities:** Initial discussions of sustainability at the roundtable were the impetus for this assistance and recognition program administered by the Minnesota Pollution Control Agency.
- **Increased utilization of coproducts:** Research and development in the use of coproducts have led to expanded use of DDGS, glycerin, and other byproducts of agricultural processing.
- **Biofuels in gas turbines:** As the result of work by several Minnesota organizations, Xcel Energy is in the process of implementing the use of bio-oils as a replacement for petroleum fuels in gas turbines for electrical generation.
- **Increased biodiesel use:** Many roundtable participants have had a hand in getting biodiesel into the transportation infrastructure and supply chain. Efforts to bring Renewable Identification Numbers (RIN) to Minnesota's biodiesel industry have increased the value of biodiesel to Minnesota producers by an additional $1 per gallon.



Photo by Rolf Hagberg

## STATE FY2012: PROJECT DISBURSEMENTS

| Project Name | Disbursement Amount |
|---|---|
| Roseau Gasification | $369,151.69 |
| Biological Activity of Antibiotics in Distillers Grains | $109,051.61 |
| Digestion/Fermentation of Defatted SBM | $80,000.00 |
| Alternative Feed Ingredients and Dietary Electrolyte Balance | $61,733.40 |
| Metabolism Effects of Low Soluble DDG on Cattle Diets | $46,730.22 |
| Assessment of DDGS in Beef Cattle Rations | $45,446.17 |
| Development of Bioplastic Products | $41,976.16 |
| Increased Utilization of Distillers Grains in Cattle Feedlots | $39,817.25 |
| Energy Prediction Equations of DDGS | $39,513.62 |
| Assessment of the Effects of Low Oil DDGS on Beef Cattle | $36,630.07 |
| Potential Human Health Benefits from DDGS | $33,247.87 |
| DDGS Diets and Relationship to MHD | $33,032.49 |
| Biobased Study Roll-Out | $28,702.49 |
| Distillers Grains Sulfur Concentration and Dietary Roughage | $28,353.17 |
| Development of Corn Starch Fire Retardant | $28,125.28 |
| Pellet Formulation Development | $23,850.00 |
| Value-added Ingredients from Milk | $23,371.09 |
| Manganese Oxide | $21,704.33 |
| Biomass Heating Feasibility Guide | $19,188.07 |
| Assessment of the Effects of Glycerin on Beef Carcass Quality | $18,194.26 |
| Old-fashioned Peanut Brittle | $18,000.00 |
| Alternative Uses for Wheat and Barley | $17,550.00 |
| Food From Farm to Plate | $15,000.00 |
| Peak Power Cost Containment Utilizing Biodiesel Study | $14,513.50 |
| Membrane Biofilms | $13,142.70 |
| Muncipal Wastewater in Value-added Agricultural Processing | $12,639.41 |
| Development of Local Foods Cooperative | $12,371.01 |
| Evaluation of Food Centers Similar to AURI | $12,150.00 |
| Compost Bedding with Woody Blends | $12,065.00 |
| North Central Biomass Market Assessment | $11,259.47 |
| Spontaneous Oxidation of Milk | $10,759.72 |
| Manure Solids as a Soil Amendment | $10,000.00 |
| Local Foods Marketing Development | $10,000.00 |
| Local Foods Marketing Development | $10,000.00 |
| Food Cooperative Development | $8,859.92 |
| Implications of Producer Participation Rates | $8,458.59 |
| Assessment of the Benefits of Low Oligosaccharides in Swine Phase 2 | $8,447.52 |
| Low Sodium Cheese | $8,178.75 |
| Ag Residue Performance Evaluation in Denitrifying Bioreactors | $7,587.49 |



## STATE FY2012: PROJECT DISBURSEMENTS (CONT.)

| Project Name | Disbursement Amount |
|---|---|
| Nutraceuticals in Wild Rice Phase 1 | $7,500.00 |
| Soybean Processing Feasibility | $7,500.00 |
| Sodium Reduction in Blue Cheese | $7,250.00 |
| Midwest Biomass Resource Inventory | $5,500.00 |
| Improvement of Biodiesel Emissions and Performance | $5,107.33 |
| Fluid Milk | $4,963.61 |
| Utilization of Biodiesel as a Carrier Agent for Preservation Applications | $4,000.00 |
| Densification of Prairie Grasses | $4,000.00 |
| Increasing Biomass Yield and Economic Efficiency | $3,970.56 |
| Peak Power Cost Containment Utilizing Biodiesel Study | $3,725.50 |
| Positioning the Green Jobs Report for Action | $3,511.12 |
| Optimization of Co-Digested Cheese Whey Waste | $2,953.09 |
| Identifying Granulation Processes | $2,752.00 |
| Minnesota Renewable Energy Roundtable 2011 | $2,359.97 |
| Lactose Analytical Quality Testing Methods | $2,000.00 |
| Fungal Processing of Thin Stillage | $1,550.37 |
| Biobased Materials Community of Innovation Development | $1,442.60 |
| Biomass Pellet Binder Proof of Concept | $1,321.28 |
| Mechanical Dewatering Technologies for Wet Biomass Feedstocks | $1,084.30 |
| Livestock Industry Technology Forums | $1,000.00 |
| Relationship of Various DDGS Characteristics in Poultry Diets | $129.74 |
| **Total:** | **$1,053,272.10** |

# STATE FY2012: PROJECTS RECEIVING ASSISTANCE*

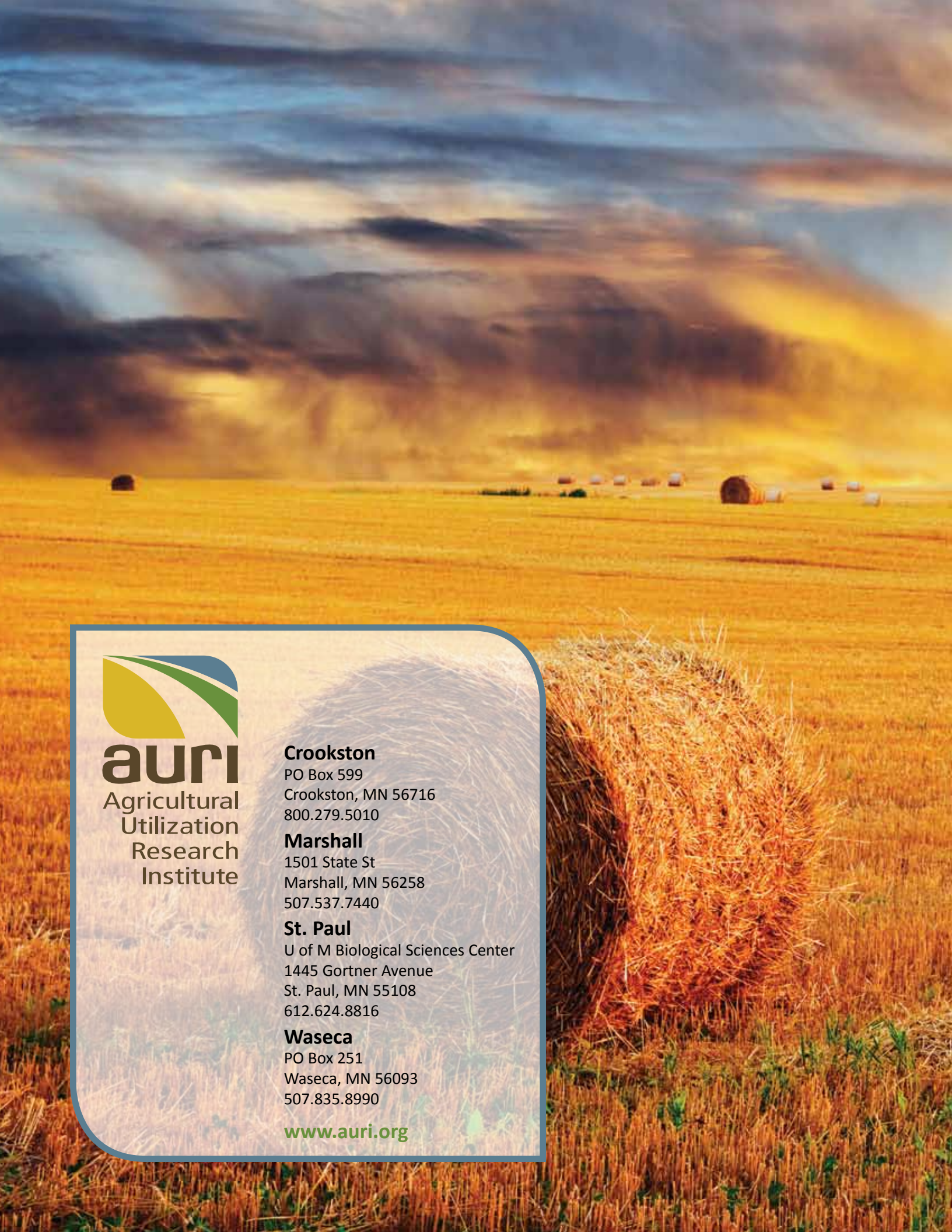
| Project Name | Hours Served |
|---|---|
| Project Management 2012 | 8,177.25 |
| Project Management 2011 | 2,424.00 |
| Discovery 2012 | 678.5 |
| Biobased Study Roll-Out | 550.75 |
| RCDG Discovery Time | 465.75 |
| Biodiesel Troubleshooting | 348.25 |
| Biomass Heating Feasibility Guide | 347.25 |
| Roseau Gasification | 291 |
| Minnesota Renewable Energy Roundtable 2011 | 282.5 |
| Meat Chip Product Development | 260.25 |
| Discovery 2011 | 244.75 |
| Increasing Biomass Yield and Economic Efficiency | 243.5 |
| Bio Covering | 221 |
| Biomass Research and Development | 219.5 |
| Heating /Renewable Biomass | 187.5 |
| Development of Corn Starch Fire Retardant | 172 |
| HACCP Workshops | 157 |
| Ag Residue Performance Evaluation in Denitrifying Bioreactors | 150.5 |
| Continued Development of Rural Innovation Network | 148 |
| Midwest Biomass Resource Inventory | 146.25 |
| Residue Assessment | 136 |
| Small-Medium Enterprises Food Safety Forums | 130.75 |
| Densification of Prairie Grasses | 122 |
| Soybean Coop Development | 116.25 |
| Swine Manure Digestion | 115 |
| Alternative Uses for Wheat and Barley | 114.25 |
| Litter Reformulation and Evaluation | 111.5 |
| Meat Lab HACCP | 108.25 |
| Rural Coop Development Training | 105 |
| Biobased Certification | 102.5 |
| Ag Biomass Pellet Fuel Blends | 92.5 |
| Digestion/Fermentation of Defatted SBM | 91.5 |
| Pellet Die Evaluation | 85 |
| Value-added Syn-Gas | 85 |
| Due Diligence Testing | 83.5 |
| Fungal Processing of Thin Stillage | 83 |
| Baking Recipe Development | 80 |
| Application of Green Chemistry | 74.5 |
| Fertilizer/Sugar Coproducts | 72.25 |
| ID/Priority Activities for Low Oligosaccharide Soybeans | 68 |
| Development of Biobased Materials Profile | 62 |
| Meat Science Presentation | 61.75 |
| Lab Scale Analysis/Biofilter | 59 |
| Black Carbon Analysis | 58 |
| Assessment of DDGS in Beef Cattle Rations | 56.5 |
| Coproducts and E Coli | 56.5 |
| Frozen Appetizer Dough Shell | 56.4 |
| Low Oligosaccharide/Swine II | 55.5 |
| Coproduct/Solid Fuel | 54 |
| Dairy Product Development | 54 |
| Commercialization Pathways for Food Entrepreneurs | 52 |
| Fertilizer/Feed Opportunity/Coproducts | 51.5 |
| Northwest Biomass Steering Committee | 50.25 |
| Biomass Gasification | 50.25 |
| Municipal Wastewater in Value-added Agricultural Processing | 50 |
| Phase Feeding of DDGS | 50 |
| Food Process Coproduct Assessment | 49 |
| Micro Carriers Fiber | 49 |
| Goat Feta | 48.5 |
| Healthy Turkey Sandwich | 48.5 |
| Food Safety Interventions | 48 |
| Development of Bioplastic Products | 47 |
| Biorefinery Technology Assessment | 45 |
| Salt Reduction/Processed Meat | 44.5 |
| Biomass Pellet Binder Proof of Concept | 43.5 |
| ASTM Biodiesel Check Sample | 43 |
| Minnesota Renewable Energy Roundtable 2011 | 41 |
| Densification/Wheat Straw | 39 |
| Specialty Vinegar Development | 39 |
| Proc Specialty Grains | 38.5 |
| Biogas Research Survey | 38.5 |
| Alternative Uses for Corn Stover | 38 |
| Improvement of Colorant Output of Purple Corn | 37 |
| Soy Board | 36.5 |
| Pork Fat Quality | 35.5 |
| Soap Product Development | 35 |
| SLS Technology in Downstream Ethanol Process | 34.5 |
| Nut Substitutes | 34 |
| Mech. Dewatering Technologies for Wet Biomass Feedstocks | 34 |
| Nutrition Labeling | 33.75 |
| Cellulose Dens/Bedding | 33.5 |
| Troubleshooting and Taskforce | 33 |
| Stone Ground Whole Wheat Flour | 32.5 |
| Commercial Kitchen Development | 32 |
| Eval Digester Feedstock | 32 |
| Biorefinery/DDGS in Biofuels | 32 |
| Anaerobic Digester Feedstocks | 31 |
| Livestock Industry Technology Forums | 31 |
| Manure Solids as a Soil Amendment | 30.5 |
| PLA Window Testing | 30.5 |
| Development of Bioplastics | 30 |
| Development of Biobased Fire Retardant | 30 |
| Product Development | 29.5 |
| Biomass and Waste Utilization | 29 |
| Flavor Presentation | 28.75 |
| Seasoning Blends | 27.5 |
| Natural/Organic Meat Processing | 27.25 |
| Summary Document: National Center for Agricultural Utilization Research | 27 |
| Nutritional Facts of Fruit and Vegetable Prodcuts | 27 |
| Jerky Validation/Shelf Life | 26.5 |
| Gelatinizing/White Peas | 26.5 |
| Energy Determination/Hazelnut | 25 |
| Characterize Corn Kernels | 24 |
| Utilization of Corn Solubles in Cow Gestation Rations | 24 |

*Projects receiving fewer than five hours of assistance are not included in this list.



# STATE FY2012: PROJECTS RECEIVING ASSISTANCE (CONT.)

| Project Name | Hours Served |
|---|---|
| Feasibility Assessment/Glycerin | 24 |
| State Specialty Meat Map | 23.5 |
| Litter Development and Evaluation | 23.5 |
| Biobased Research Gap Analysis | 23 |
| Barley Straw Initiative | 22.5 |
| Shelf Stability/Nutritonal Analysis | 21.75 |
| Assessment of the Effects of Low Oil DDGS on Beef Cattle | 19.75 |
| Beef Metabolism Study | 19.5 |
| Industry Value Chains | 19 |
| Calf Milk Replacer | 19 |
| Value-added Apple Development | 18.85 |
| Dessert Cake Development | 18.5 |
| Gourmet Snack Mixes | 18.3 |
| Fudge and Banana Bread | 18 |
| Nutraceuticals/Wild Rice | 18 |
| Ethnic Meat Market Development | 17.75 |
| City of Minneapolis Partnership | 17.5 |
| Identifying Granulation Processes | 17.5 |
| Community Commercial Kitchen Assessment | 17.25 |
| Candy Bar Development | 17 |
| Barley Straw-Water Clarity | 17 |
| Gluten-Free Frozen Meals | 16.5 |
| Food Safety Urban Outreach | 16.25 |
| Biobased Root Baskets | 16 |
| Development/Stable Milk Replacement | 16 |
| Warroad Cogeneration | 15.25 |
| Cellulose to Liquid Fuels | 15 |
| Implications of Producer Participation Rates | 15 |
| Development/Neighborhood Farm | 15 |
| Particulate Evaluation/Biomass | 14.5 |
| Gluten-Free Nutritional Analysis | 14 |
| Biochar/Swine Diet | 14 |
| Meat Lab HACCP activities | 13.5 |
| Chocolate Macaroons | 13.5 |
| Meat Product Development | 13.5 |
| Pre-cooked Meat Product | 13.5 |
| Milk Replacer/Coproducts | 13 |
| Granulation/Pellet Fuel | 13 |
| Energy/Navy Bean Culls | 12.5 |
| Nutritional Analysis: Turkey | 12.5 |
| Local Energy for Outdoor Boilers | 12.5 |
| Battelle Core Capacity Analysis | 12.5 |
| Making/Pie and Vegan Products | 12 |
| Peak Power Cost/Biodiesel | 12 |
| Sweet Hot Mustard Development | 12 |
| Utilization/Oil Extract DDGS in Poultry Diets | 12 |
| KDS (Grinder) Technology Evaluation | 11.5 |
| Process Development | 11.25 |
| Energy Bar Development | 11 |
| Reduced Sugar/Calories Jam | 11 |
| Ag Fiber/Mushroom Product | 11 |
| Food Coop Development | 11 |
| Baked Goods | 10.75 |
| Anaerobic Codigestion and Genset Upgrade | 10.5 |
| Pellet Fuel Development | 10 |
| Utilization of Camelina-Food App | 10 |
| Minnestalgia Quick Wild Rice | 10 |
| Sodium Reduction in Blue Cheese | 10 |
| Hydrous Ethanol Use/Engine | 10 |
| Ethanol Higher Value Production | 10 |
| Biomass Emissions Guide | 9.5 |
| Beef Product Development/Shelf life | 9.25 |
| Salad Recipe Scale-up Development | 9.05 |
| Healthy Granola Bars | 9 |
| Value-added Development of Hazelnuts | 9 |
| Food from Farm to Plate | 8.5 |
| Raw Foods | 8.5 |
| Nutritional Analysis/Cookies | 8.5 |
| Pellet Facility Sustain | 8.25 |
| High-Pressure Processing Development/Implementation | 8.25 |
| Ethnic Soups | 8 |
| Thin Toffee | 8 |
| Project Management System | 8 |
| Manganese Oxide | 8 |
| Development of Local Foods Cooperative | 8 |
| Models for Supporting Main Street Innovation | 7.5 |
| Ginger Drink | 7.5 |
| Wild Rice Pasta Products | 7.5 |
| Local Foods Marketing | 7.5 |
| Local Foods Market Development | 7.5 |
| Product Improvement | 7.25 |
| Utilizing Grass Screenings | 7.25 |
| Microdistillery | 7 |
| Popcorn Dressing | 7 |
| Jerky Shelf Stability | 6.5 |
| Optimization of Co-Digested Cheese Whey Waste | 6.5 |
| Muesli Cereal Products | 6.35 |
| Assessment/Corn Cobs/Feedstocks | 6 |
| Making Better Use of Agricultural Seconds | 6 |
| Nutritional Analysis of Sprouted Wheat Cracker | 6 |
| Healthy Bakery Products | 6 |
| Grass Screenings Gasifier Phase 2 | 6 |
| Distillers Grains Sulfur Concentration and Dietary Roughage | 6 |
| Soybased Polyol Feasibility | 6 |
| Central Food Coop Assessment | 6 |
| Marshall HACCP Workshop | 5.75 |
| Meat Processing Industry | 5.5 |
| Compost Bed/Blend Media | 5.5 |
| Canola Processing Technology | 5 |
| Jams, Jellies, and Pickles | 5 |
| Gluten Free Mixes | 5 |
| Soybean Processing Feasibility | 5 |
| Elderberry Coop Development | 5 |



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