

# **Agricultural Utilization Research Institute**

## **2009 Legislative Report**



## **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:

- The identification and expansion of existing markets for new or existing commodities, ingredients and products;
- The development of new uses or value improvements for Minnesota agricultural commodities; and
- The development of renewable energy opportunities from Minnesota agricultural commodities and co-products.

## **AURI Vision**

AURI is respected as the leading resource for catalyzing innovation in value-added agriculture that creates economic vitality for Minnesota

## **AURI Function**

AURI provides scientific technical expertise, feasibility and targeted network coordination to add value and long-term economic vitality to Minnesota agriculture and communities.

# Agricultural Utilization Research Institute

The Agricultural Utilization Research Institute (AURI) was created by the legislature to foster long-term economic benefit through increased business and employment opportunities to rural Minnesota through:

- the identification and expansion of existing markets for new or existing commodities, ingredients and products;
- the development of new uses or value improvements for Minnesota agricultural commodities; and
- the development of renewable energy opportunities from Minnesota agricultural commodities and co-products.

AURI's efforts are focused on catalyzing innovation in value-added agriculture that creates economic vitality and stability in Minnesota. This is accomplished by providing project development services, targeted network coordination and scientific technical assistance for the development of new products and expanded uses for Minnesota agricultural commodities.

AURI programs help producers, agri-processors and their communities capture a larger portion of the market value-chain during all economic cycles. Regardless of economic conditions, AURI programs have been in increasing demand. AURI clients tend to focus on improving their efficiency and effectiveness during periods of high commodity prices. During periods of lower commodity prices, clients tend to seek innovative new uses for their products.

The Agricultural Utilization Research Institute provides seamless service from feasibility to implementation to individuals and organizations that are developing value-added businesses across Minnesota. These services are provided to existing businesses, cooperatives and entrepreneurs. Core functions include:

- Providing scientific technical and feasibility assistance, laboratory and pilot plant services supporting value-added agricultural processing in Minnesota
- Acting as the applied research and development resource for small and medium-sized commodity processors
- Identifying, educating and informing agricultural stakeholders about emerging value-added agricultural opportunities
- Facilitating innovation and collaboration, including coordination of Minnesota's Renewable Energy Roundtable which works to eliminate barriers to development of new renewable energy sources in the state
- Working with agricultural processors on efficiencies and technologies vital to sustaining profitability in times of high raw commodity prices which drastically impact margins

AURI serves a variety of clients including producers, grower groups, cooperatives, small and medium-sized commodity processors and entrepreneurs. AURI provides assistance to clients at various stages of product development. Staff also dedicates time to "discovery." These initial consultations and evaluations determine if an idea fits AURI's criteria, is unique and innovative and has the potential to significantly impact commodity utilization or respond to a market opportunity. Ventures that do not fit AURI's mission are either ended or referred to other organizations; ventures that are deemed viable are formed into projects, which provides access to AURI programs and services.

AURI project staff assists with project development activities and feasibility analysis. Laboratory and pilot plant staff support the technical elements of project development. Pilot plant and laboratory activities assist clients with product development, troubleshooting, methods training, analysis and product scale-up activities. These value-added innovations lead to growth in the state's economy, employment and business development opportunities, especially in rural counties.

# Agricultural Utilization Research Institute

AURI also operates the Center for Producer-Owned Energy (CPOE), which was originally established as a USDA supported agricultural innovation center to develop farmer-owned, renewable energy enterprises. To date more than 60 projects have been initiated by the CPOE utilizing Minnesota-grown agricultural products and coproducts as energy sources.

AURI collaborates with other available resources in the state to effectively and efficiently leverage needed resources for Minnesota businesses. Collaborations have been established with USDA, MnSCU, University of Minnesota, SBDCs, MDA, DEED, the BioBusiness Alliance of Minnesota and all major commodity groups and farm organizations within the state.

AURI's facilities are strategically located throughout the state to enhance service delivery and client access:

- Crookston: State headquarters, food product development lab, and fermentation and microbiology lab
- Marshall: Center for Producer-Owned Energy; fats & oils lab; analytical and process labs; USDA inspected meats lab
- Waseca: Co-products utilization lab and pilot plant

Client services include project development assistance, feasibility assessments, hands-on access to laboratory facilities as well as limited cost-share assistance that expands scientific and technical capacity. These services provide reliable and unbiased information for clients to make informed decisions.

Industry initiatives focus on examining emerging opportunities with the potential for broad impact. They include agricultural energy development, side stream research, bio-industry development and other projects with the potential to impact a large number of producers.

AURI's key organizational strategic goals include:

- Stabilizing the rural economy by fostering and promoting agricultural innovation
- Advancement of the renewable energy industry in Minnesota
- Seamless service from feasibility to implementation of innovations and process improvements for Minnesota commodities and co-products.

AURI project involvement often happens early in a product development life cycle while a significant portion of feasibility has yet to be determined. This means it can take many months or even years for a concept to reach reality and be implemented or taken to market. Some never reach that stage because of market, economic or other reasons. Among the measures tracked by AURI to show the impact of organizational activities is the number of value-added products that have been developed and entered the marketplace, the amount of capital invested in innovative value-added ventures, dollars saved by avoiding investment in non-feasible projects and the amount of outside funds leveraged by AURI supported projects. These measures show that implementation is occurring and economic activity is happening as a result of AURI assistance. In the past two years:

- 281 unique projects and initiatives were developed and received AURI assistance in an effort to move Minnesota-grown agricultural products into new, value-added markets
- 69 new or improved ag-based products reached the market with AURI assistance
- Nearly \$71 million in new capital was invested in new AURI-supported, value-added ventures
- Over \$100 million in rural wealth retained by not investing in ventures deemed not currently viable
- Over \$1.4 million in outside funds were committed to new value-added projects

AURI has particular focus on projects in the following areas:

- Biofuels development
- Bio-based product development
- Consumer products
- Innovative technologies
- Coproduct and waste product utilization

The following pages highlight examples of where innovations are already occurring.

# Biofuels Development

## Northern Excellence Growers

AURI has worked for several years with Northern Excellence Growers of Williams, Minnesota on a gasification process to convert grass seed screenings to electricity to power their seed cleaning plant.

### Opportunity

- Large supplies of screenings which have little value and are costly to dispose
- Grower group wants to use the screenings as a biomass fuel source to offset electrical costs

### Idea

- Gasify screenings, produce syngas to replace natural gas

### Outcomes

- An estimated annual savings of \$60,000 in energy and disposal costs per year
- Installation and operation of 100 kilowatt gasifier, the nation's first powered by grass seed screenings



## Alternative Energy Solutions

AURI has assisted Alternative Energy Solutions in developing fuel for providing agriculturally-based energy for 65,000 square feet of greenhouse near Altura, Minnesota.

### Opportunity

- Utilize biomass from native prairie grasses to provide heat for greenhouses, offsetting fossil fuel usage

### Idea

- On-farm pelleting of locally-produced native prairie grasses for use as fuel in 2 hot water boilers

### Outcomes

- Two operational on-farm biomass pellet mills utilizing native biomass
- Fifty percent reduction in energy costs for greenhouse

## Sunrise Agra Fuels

AURI has provided technical assistance and product formulation for Sunrise Agra Fuels of Bird Island, helping them become the state's first commercial ag biomass-based pellet fuel manufacturer.

### Opportunity

- Utilize agricultural coproducts and residue as pellet fuel for home heating to compete with corn and wood as well as with fossil fuel burners

### Idea

- Operate a pellet facility using locally-generated biomass to produce fuel pellets

### Outcomes

- Job creation in Kensington
- Production began in October of 2008 at a facility in Kensington producing 3,000 to 4,000 tons of pellet fuels a year
- Use of an existing production facility that had been underutilized

## Biofuels Needs Assessment

A comprehensive review of training and educational needs and job market potential for the biofuels industry has yielded important data about requirements for industry survival.

### Opportunity

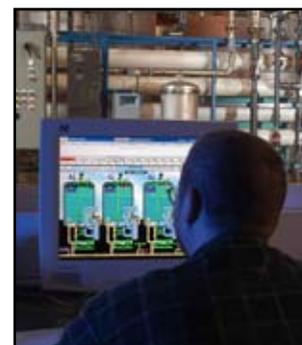
- Understand the current state of biofuels production in the Midwest, particularly as it relates to training needs and curriculum development

### Idea

- Converse with multiple biofuels experts and participants to determine current and likely future needs for success of industry

### Outcomes

- Two detailed reports showing industry needs for training
- Information utilized by Renewable Energy Roundtable Talent Development team to help identify curriculum development needs



# Bio-Based Products

## Limpert Environmental

AURI assisted this Litchfield company in their efforts to produce agriculturally-based erosion control products as well as a patented mix of products based from composted bison manure.

### Opportunity

- Need for affordable erosion control products

### Idea

- Utilize local biomass for erosion control items and a patented bison manure for growing media and mulch

### Outcomes

- Creation of 12 new jobs
- Retrofit a vacated factory in Litchfield to produce erosion control products
- New value-added products on the market



## Environmental Dust Control

Environmental Dust Control produces a dust suppression product utilizing liquid agri-processing leftovers. The biodegradable product is useful particularly in environmentally sensitive areas, work sites and roadways.

### Idea

- Utilize vegetable oil processing coproduct for dust control in work and construction areas

### Opportunity

- Add value to low-cost coproduct and further penetrate market

### Outcomes

- Creation of Dustlock, a value-added use for vegetable-based coproduct
- Creation of 3 jobs
- Over 500,000 pounds applied last year
- Value-added use for coproduct



## Pet Care Systems

AURI has provided technical assistance on several projects for Pet Care Systems of Detroit Lakes, including the development of wheat-based animal litters.

### Opportunity

- Capitalize on market for alternative animal litters

### Idea

- Utilize non-food grade wheat for small animal litters and horse bedding

### Outcomes

- Patented process for biodegradable pet litter, safe for sewer and septic systems
- Introduction of new ag-based horse litter
- Two additional production jobs created



## Suntava

AURI has worked with Suntava of Afton on their corn-based natural colorants and nutraceutical ingredients. Growing the red corn provides an opportunity for a 3,000 member cooperative in Southwestern Minnesota and is providing entry into the market for a natural colorant replacing petroleum-based products.

### Opportunity

- Compete with petroleum-based food colorants

### Idea

- Utilize compounds from red corn for natural colorants and nutraceutical ingredients

### Outcomes

- Entry into \$2 billion annual colorant market
- Opportunity for growers to raise value-added crop
- Ingredient developed for nutraceutical markets
- Creation of new business and 25 new jobs



# Consumer Products

## Mahnomen Baked Chips

AURI worked to develop product formulation for baked, formed potato chips, which was key to the development of a new business and building of a new production facility in Mahnomen.

### Opportunity

- Produce formed, baked potato chips to provide healthier alternative to fried potato chips

### Idea

- Build facility in economically disadvantaged area to make use of available workforce and regionally-produced potatoes

### Outcomes

- Construction of \$8.5 million production facility which will operate starting January 2009
- Creation of 30 production jobs
- Fully operational plant will employ as many as 100 people

## Gluten-Free Products

AURI assisted Bittersweet Bakery of Eagan in the development of gluten-free bakery products to provide options for people who cannot consume gluten.

### Idea

- Develop a line of freshly baked products that do not contain gluten

### Opportunity

- Reach market of consumers with inability to eat gluten

### Outcomes

- Creation of 6 new jobs
- Formulation of nearly 40 gluten-free fresh bakery products
- Formation of new business



## Noah's Ark Processors

AURI has provided assistance to Noah's Ark Processors of Dawson for their kosher meat product processing.

### Idea

- Develop and market case-ready kosher bison, elk, lamb and goat products

### Opportunity

- Expand production by reopening animal processing facility in Dawson

### Outcomes

- Creation of 55 jobs
- Reopened facility in Dawson in February 2008
- World's only kosher processor of bison and elk
- Additional market for local producers



## French Meadow Bakery

AURI has provided product development assistance to this Eagan company in formulating baked products with functional ingredients to meet specific dietary needs.

### Idea

- Produce baked products with nutritional ingredients designed to promote health

### Opportunity

- Develop Men's and Women's bread as well as a wide variety of other organic breads, wraps and baked products

### Outcomes

- Development of unique baked products that take advantage of emerging markets for nutritionally-designed food
- Expanded to new 60,000 square foot facility
- Nationwide distribution
- Additional jobs created at new facility



## Ash Densification

Gasification and combustion of agricultural products is becoming an accepted technology for energy production in Minnesota with several facilities operating at this time. Technologies being used include fluid bed burners, gasification systems and direct combustion burners.

### Idea

- Utilize ash from biomass energy production as a lower-cost fertilizer

### Opportunity

- Apply ash to farmland as a source for potassium, phosphorous and minerals

### Outcomes

- Tested and identified methods of densification to get ash into form that can be land applied
- Tested nutrient value of ash
- In-field trials completed evaluating nutrient availability to plants, results available spring 2009
- Alternative fertilizer source identified



## Green Grass Gas

Eagle Bluff Environmental Learning Center is evaluating the feasibility of digesting grasses for the production of methane gas that can be used for heating or cooling on the campus.

### Idea

- Reduce carbon footprint of Eagle Bluff

### Opportunity

- Utilize innovative technology to produce energy

### Desired outcomes

- Reduced carbon footprint
- Convert highly erodible lands to perennial crops
- Generate heating and cooling through digestion of available grasses



## Corn Soluble Fertilizer

AURI has tested the syrup or solubles left over from the ethanol production process as a possible liquid fertilizer. The syrup is a coproduct of the ethanol process and contains nutrients that are beneficial to the soil including nitrogen, potassium and phosphorous.

### Idea

- Utilize coproduct for fertilizer similar to the way liquid manure is handled

### Opportunity

- Tap into availability of ethanol coproduct for use as fertilizer to offset cost of commercial fertilizer

### Outcomes

- Tests showed nutrients were available to plants
- Field trials showed positive results on plant health and yields
- Value-added option for the state's dry mill ethanol plants



## Advanced Biofuels Production

AURI has teamed up with numerous Minnesota companies to assess and evaluate various emerging biofuels production technologies. These technologies include processes for producing ethanol, biodiesel and syngas in novel ways utilizing agricultural commodities and coproducts in new ways.

### Idea

- Utilize new or alternative processes to produce biofuels from agricultural resources economically

### Opportunity

- Utilize locally available resources to produce biofuels

### Outcomes

- Identified functional technologies
- Additional biofuels development
- Value-added uses for ag commodities and coproducts
- Rural economic stabilization by helping existing plants identify new opportunities
- Job creation

# Coproduct and Waste Product Utilization

## Compost-A-Mat

AURI provided assistance to USA Solutions of St. Joseph in developing a cornstalk-based swine mat as well as connecting the company with the only existing Minnesota manufacturer capable of producing their product.

### Opportunity

- Utilize cornstalks as an animal comfort mat

### Idea

• Replace bulky rubber farrowing and nursery mats that require disinfecting after each use with biodegradable mats



### Outcomes

- Compost-A-Mats are produced and marketed to swine producers around the country
- Biodegradable alternative mat made from renewable resources
- Created two jobs for the start-up company
- Created 4 additional jobs for manufacturing company in Floodwood, Minnesota

## Crude Glycerin

AURI assisted Farmers Union Industries to develop value-added uses for coproducts from their rendering and biodiesel operations. The project evaluated the potential for utilizing crude glycerin from biodiesel production with feather and bone meal from mortality rendering.

### Idea

- Blend low value products to increase feed value and transportation possibilities

### Opportunity

- Produce higher value densified feed ingredient

### Outcomes

- Development of Gro Mor Hi Torque brand feed
- New value-added uses for two coproducts
- Entrance into new market for Farmers Union Industries

## Reclaimed Wastewater

AURI has partnered with the Metropolitan Council Environmental Services to evaluate potential for using reclaimed wastewater for agricultural processing.

### Idea

- Use reclaimed municipal wastewater for ag processing

### Opportunity

- Reduce costs for processors and conserve clean water resources

### Desired outcomes

- Identify feasibility for using treated water in commercial applications
- Conserve high quality groundwater
- Reduce costs for agri-processors

## Corn Cob Collection

This past fall the Chippewa Valley Ethanol Company harvested cobs from several thousand acres of corn. Different technologies were utilized and demonstrated to show how cobs could be collected at the same time as the grain, eliminating the need for another pass through the fields. The cobs have little nutrient value to soil and will be used as fuel in CVEC's gasification system.



### Idea

- In-field cob harvesting utilizing single-pass harvesting technologies

### Opportunity

- Utilize corn cobs from area corn fields to produce energy without compromising soil health or incurring additional handling costs

### Desired Outcomes

- Demonstration and identification of appropriate technology
- Economical harvest of cobs
- Utilization of corn cobs to offset ethanol plant's thermal energy needs by 75 percent

# Minnesota's Renewable Energy Roundtable

## Organizational Overview

Few things have attracted the attention, generated as much debate or caused as much disruption in the past few decades as the rising cost of energy.

While this disruptive scenario is causing pain, finding new ways to power the world is presenting real opportunity for alternative energy development. Biofuels, biogas, wind power, biomass conversion and other emerging technologies are being examined as new ways to power the future.

Minnesota has established a leadership role in many aspects of renewable energy and boasts one of the largest and most sophisticated systems for renewable energy production and distribution in North America. A unique



collaborative effort engaging higher education, agriculture, industry, economic develop-

ment, community development, private business, policy-makers and state government has led to the formation of a working group designed to address impediments and chart the course for continued leadership in the renewable energy industry in Minnesota.

In September 2006, AURI facilitated a series of discussions attracting more than 100 people at each session to share ideas, brainstorm and gain a mutual understanding of the challenges and opportunities facing the development of renewable energy in Minnesota. Participants determined at that time there was a need for continued collaboration, giving rise to the Renewable Energy Roundtable.

The mission of the Roundtable is to take action on the immediate challenges and opportunities facing our state, region and nation using Minnesota's assets. The goal is twofold:

- Ensure that Minnesota is recognized as a leader in renewable energy knowledge, application and utilization
- Create an implementation platform for moving short and long-term strategic action forward

Because no one institution or organization is fully responsible for Minnesota's renewable energy success, the Renewable Energy Roundtable is working to bring all the stakeholders together. AURI dedicates staff time and expertise to Roundtable coordination, facilitation, planning and organization. Legislation passed in 2007 designates AURI as the coordinating body, but the mission is shared by many participants and leading organizations including the University of Minnesota, the Minnesota State Colleges and Universities System (MnSCU), the Minnesota Department of Agriculture, the Office of Energy Security and others.

From the issues identified and priorities set by Roundtable participants, five themes were identified. They include:

- Basic and Applied Research
- Public Policy and Awareness
- Talent Development
- Infrastructure Development
- Economics and Financing

These five overarching themes formed the basis for establishing Action Teams to address issues and opportunities in these areas. The focus of these teams is to implement ideas and take action that assures Minnesota's ongoing leadership.

More than just positioning Minnesota as a leader in renewable energy, the benefits to the state are much more far-reaching. These benefits include rural economic stabilization, energy independence, adding value to Minnesota grown commodities, talent attraction and retention in Minnesota and creating personal energy-conscientious attitudes.

## Outcomes

The Roundtable provides more than just a discussion forum. Action plans are developed and carried out. Some of the outcomes that have occurred as a result of Roundtable efforts include:

- Development of communications portal
- Creation of Office of Energy Security
- Green Star Community designation
- Renewable energy curriculum development and customized workforce training
- Microenergy loan program

# AURI Initiatives

In addition to working on proprietary projects with Minnesota businesses in an effort to develop new, value-added uses for agricultural products, AURI also is proactive in pursuing opportunities. Through cultivated relationships with dozens of stakeholders and a staff of seasoned professionals, AURI is able to identify emerging trends and opportunities that have the potential to utilize large amounts of commodities. These initiatives examine possible new uses or technology improvements that hold the potential for large-scale impact. Results from these initiatives are public information and are shared with all interested parties in an effort to prompt commercial development.

While these initiatives are not connected with a commercial partner, they are intended to highlight opportunities for creating additional revenue streams, identify areas of possible commercial development, foster job creation and stabilize the rural economy. The following initiatives have been put in place over the past biennium to spur value-added development:

- ***Extending shelf life of wet cake and wet sugar beet pulp***
- ***Collaborative opportunities in forestry***
- ***Biofilters for drainage water***
- ***Regional refining capacity***
- ***Ash as bedding***
- ***Feeding wet cake to swine***
- ***Minnesota alternative feed inventory***
- ***Cheese processing and coproduct***
- ***Update manure digestion system***
- ***Bio-oil fuel for turbines and sterling engines***
- ***Sustainable prairie cordgrass***
- ***Ethnic cutting and processing techniques for beef and pork***
- ***Small-volume ethanol plants***
- ***Use of thick stillage in dairy digesters***

- ***Advanced biomass burner identification***
- ***Energy and carbon footprint assessment of using swine wastes on cropland***
- ***Nutraceuticals in milk***
- ***Opportunities for functional foods in cereal and other Minnesota grains***
- ***Flat die-pellet mill evaluation for biomass***
- ***Anaerobic digestion incorporating novel bacteria for H2S reduction***
- ***Biomass fertilizer cost-sensitivity analysis***
- ***Phosphorus and potassium availability from ash***
- ***Economic impact of producer or local ownership***
- ***Utilization of waste water for agricultural value-added processing***
- ***Next generation technology and process identification***



**Appendix A****Agricultural Utilization Research Institute  
Projects Funded During State Fiscal Year 2008**

<b>Project Title</b>	<b>Funding</b>
Action Now Initiative for Renewable Fuels	\$ 3,813
Ag Fiber Carriers	\$ 2,977
American Ag Energy	\$ 3,625
Assessment of Opportunities in Soybean By-Pass Protein	\$ 3,333
Bepex International	\$ 21,002
Biobased Products in MN	\$ 7,100
Biofuels Industry Needs	\$ 25,542
Biomass Pellet Feasibility Study	\$ 5,000
Commercial Kitchens	\$ 2,000
Corn Utilization Research and Development-Phase II	\$ 60,000
Crude Glycerin Turkey Diets	\$ 12,370
Digest Struvite Testing	\$ 11,655
Enchanted Dairy Digester	\$ 10,000
Fuels Initiative II	\$ 6,061
Gas Free Beans	\$ 2,000
Gas Screening Gasification	\$ 1,030
Hydro Seeding Compost	\$ 19,652
Local Foods Marketing	\$ 39,000
Meat Processor Short Course	\$ 1,186
Organic Frozen Baby Food	\$ 19,807
Otter Tail Ag Phase II	\$ 47,136
Partial Fulfillment of Sub-Contract /U of M for RDF	\$ 3,223
Power Cost Containment Eagle Bluff	\$ 25,000
Renewable Energy	\$ 8,295
Soybean By-Pass Protein	\$ 3,971
Sustainable Switchgrass	\$ 1,500
Stevens County Gasification	\$ 21,184
Taste Panel - Turkey Valley Farms	\$ 2,200
The Nova Group	\$ 9,981
Utilizing Low Oil DDG	\$ 18,199
Utilization of Renewable Energy Co-Products	\$ 21,815
Value Added Forums	\$ 750
Xcel Grant	\$ 285,208
<b>Total Funded Projects - FY08</b>	<b>\$ 705,615</b>

**Appendix B****Agricultural Utilization Research Institute  
Project Technical Assistance  
State Fiscal Year 2008**

<b>Project Number</b>	<b>Project Title</b>	<b>Hours Expended</b>
2002108T	Identity preserved value-added beans	10.00
2003095T	Ag fiber carriers	72.75
2005003T	Biobased industrial products	381.50
2005013T	Biofuel development	6.00
2005040T	Sausage product development	9.50
2005047T	Ag-based horse bedding	14.00
2005068T	Ethnic dish development	19.00
2005080T	Peak power cost offset using biodiesel	48.00
2006004T	Local Foods Initiative	6.00
2006006T	Value added ag impact study	13.00
2006020T	Liquefaction of agricultural residue	35.00
2006026T	Steak evaluation	106.00
2006033T	Bird feed product development	18.25
2006034T	Swine bio-filter evaluation	8.50
2006037T	Value added milling of agricultural products	21.25
2006039T	Value added salad dressing development	6.00
2006045T	Shelf stable beef products	29.50
2006049T	Expanded DDGS utilization	16.00
2006054T	Biomass pellet development	9.00
2006060T	Value-added beef product development	6.50
2006076T	Corn utilization research and development phase II	26.00
2006085T	Hydro seeding compost development	49.50
2006089T	Sausage product development	24.00
2007002T	Shelf stable animal product development	46.50
2007003T	Meat processing short course	10.50
2007004T	Malic acid evaluation	12.00
2007006T	Fuels Initiative II	50.50
2007007T	Anti-gelling agent for biodiesel	56.50
2007010T	Identification of Minnesota business needs	39.50
2007011T	Canola seed oil and meal assessment	93.25
2007012T	Nutraceutical opportunities for wheat and barley	13.25
2007013T	Commerical kitchen availability in Minnesota	20.25
2007015T	Soybean bypass protein	44.00
2007016T	Value added organic development	5.00
2007017T	Near Infrared Spectroscopy	5.00
2007022T	Assessment of sterol glucosides in soybeans	14.00
2007023T	Application for soybean meal components	14.50
2007024T	Small scale ethanol	17.00
2007025T	AURI Meat Lab activity	66.00
2007026T	Biodiesel quality assessment	31.50
2007033T	Crude glycerin assessment in turkey diets	26.50
2007034T	ASTM biodiesel testing	12.00
2007038T	Blended bio-fuel development	20.00
2007039T	Biomass pelleting feasibility	67.50
2007042T	Renewable energy coop model	27.00
2007046T	Wild rice utilization	6.00
2007048T	Value-added process development	46.75
2007050T	Value-added process development	66.50

**continued**

<b>Project Number</b>	<b>Project Title</b>	<b>Hours Expended</b>
2007052T	Sustainable switchgrass evaluation	68.50
2007054T	Bio-based polymer coating	44.00
2007056T	Processing swine diets	45.50
2007062T	Hydroponic growing evaluation	10.00
2007065T	Salmon cheese spread development	10.00
2007067T	Sausage development	14.00
2007069T	Pellet binder performance evaluation	132.00
2007070T	Evaluation of coproduct-based fertilizer	55.25
2007072T	Subcontract with University of Minnesota	291.50
2007074T	Biomass fuel evaluation	99.25
2007075T	Oilseed feasibility	16.00
2007076T	Soybean expeller processing	23.00
2007078T	Fudge recipe development	60.30
2007079T	Advanced corn burner design	27.00
2007080T	Value added product development including maple syrup	8.90
2007082T	Warroad co-generation	25.00
2007084T	Oligosaccharide-free soybean meal	40.50
2007085T	Improving pelleting efficiency	7.50
2007086T	Ag residue application	9.00
2007087T	Dairy digester assessment	44.50
2007088T	Biodeisel Technical assistance	31.50
2007092T	Biomass fuel evaluation	225.50
2007093T	Sausage processing	158.25
2007094T	Shelf life testing	82.50
2007095T	Nutritional analysis of turkey product	7.00
2007096T	Pork product development	49.25
2007097T	Fresh processing of turkey	65.75
2007098T	Fruit smoothie development	48.30
2007099T	Identification of new and emerging technologies	59.00
2007100T	Organic smoothie development	11.50
2007101T	Aitkin county biomass assessment	6.00
2007102T	Wild rice to new markets	7.50
2007103T	Fermentation alternatives	38.50
2007104T	Fermentation alternatives	5.00
2007105T	Novel candy development	7.50
2007E	Energy Discovery 2007	456.00
2007T	Discovery 2007	1,158.50
2008001T	Biomass gasification for fertilizer	18.00
2008003T	Uses for potato culls	47.00
2008004T	Opportunities in forestry	52.00
2008005T	Oilseed cake evaluation	35.00
2008006T	Homegrown energy evaluation	24.00
2008007T	ASTM biodiesel participation	133.50
2008008T	HAACP	74.50
2008009T	Nutritional labeling assistance for bison products	123.75
2008012T	Nutritional labeling of unique food product	94.50
2008016T	Utilizing ash	39.50
2008019T	Poultry taste panel	140.00
2008020T	Finance options for renewable energy	10.50
2008021T	Jerky testing	36.00
2008022T	High oil corn	13.00
2008025T	Densification of prairie grasses	21.00
2008026T	Technology evaluation	28.50
2008026T	Animal product process development	32.25

**continued**

<b>Project Number</b>	<b>Project Title</b>	<b>Hours Expended</b>
2008029T	Screen densification of fuel	12.50
2008030T	Promo of value-added beef cuts	142.00
2008032T	Advanced corn burner design	11.00
2008033T	Development of baked potato chip	90.50
2008034T	Fats & Oils Lab service	40.00
2008035T	Local Foods Marketing-II	52.50
2008036T	Peak power cost containment	32.50
2008037T	Dairy market development	17.50
2008038T	Natural covering development	203.25
2008039T	Biomass product assessment	32.50
2008041T	Pelleted glycerin combination	22.00
2008042T	Flaxseed cracker development	113.00
2008044T	Wheat product development	25.00
2008046T	Beef product nutritional testing	34.75
2008047T	On-farm canola oil press & biodiesel development	102.00
2008048T	Wheat and barley malt	14.00
2008049T	Goat cheese Manufacturing	12.00
2008050T	Value-added process testing	39.75
2008051T	Energy product development assistance	96.50
2008052T	Evaluation of novel biodiesel process	18.00
2008059T	Edible bean process assistance	25.00
2008060T	Turkey product nutritional analysis	8.50
2008061T	Compost bed evaluation using blended media	8.00
2008063T	Flat die pellet mill evaluation	8.50
2008065T	Salsa product development	16.25
2008E	Energy Discovery 2008	1,263.00
2008STAKE	Stakeholder analysis	248.00
2008T	Discovery 2008	4,802.00
AIC026T	Utilizing low oil DDGs	14.00
AIC027T	Otter Tail Ag Phase II	19.00
AIC028T	NW MN gasification	50.75
AIC029T	Biofuels industry needs assessment	25.00
AIC031T	Densification assessment	41.50
AIC032T	Utilization of renewable energy co-products	7.00
AIC034T	Stevens County gasification	40.00
AIC036T	Digester struvite testing	51.00
AIC037T	Utilization of dairy processing coproducts	130.00
AIC038T	Grass screening gasification Phase II	47.00
AIC039T	Cellulosic ethanol process development	60.50
AIC040T	Biomass gasification for fertilizer	253.00
AIC041T	Biomass ash densification	57.50
AIC042T	Manganese oxide and DDGS in livestock diets	42.00
AIC043T	Corn cob collection	6.00
AIC044T	Glycerol as replacement ingredient in livestock diets	5.50
AIC045T	DDGS beef cattle assessment	36.00
AIC046T	Identification of emerging technologies	21.50
AIC047T	Value added ag feasibility	58.00
AIC049T	Microturbine durability test	11.00
AIC050T	By-pass protein & soyoil	30.00
AIC051T	Regional biomass usage assessment	93.00
AIC052T	Municipal wastewater in ag processing evaluation	10.50
AIC053	Renewable energy development template	49.50
ETIME	Energy industry facilitation	4,237.55
<b>Total Direct Project Hours:</b>		<b>19,009.50</b>

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