

fuel

fuel

Renewable Energy Developments in the Northern Plains

Fall 2011

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biofuel

Fuel produced from renewable resources, especially plant biomass, vegetable oils, and treated municipal and industrial wastes. Biofuels are considered neutral with respect to the emission of carbon dioxide because the carbon dioxide given off by burning them is balanced by the carbon dioxide absorbed by the plants that are grown to produce them. The use of biofuels as an additive to petroleum-based fuels can also result in cleaner burning with less emission of carbon monoxide and particulates.

—*American Heritage Dictionary*

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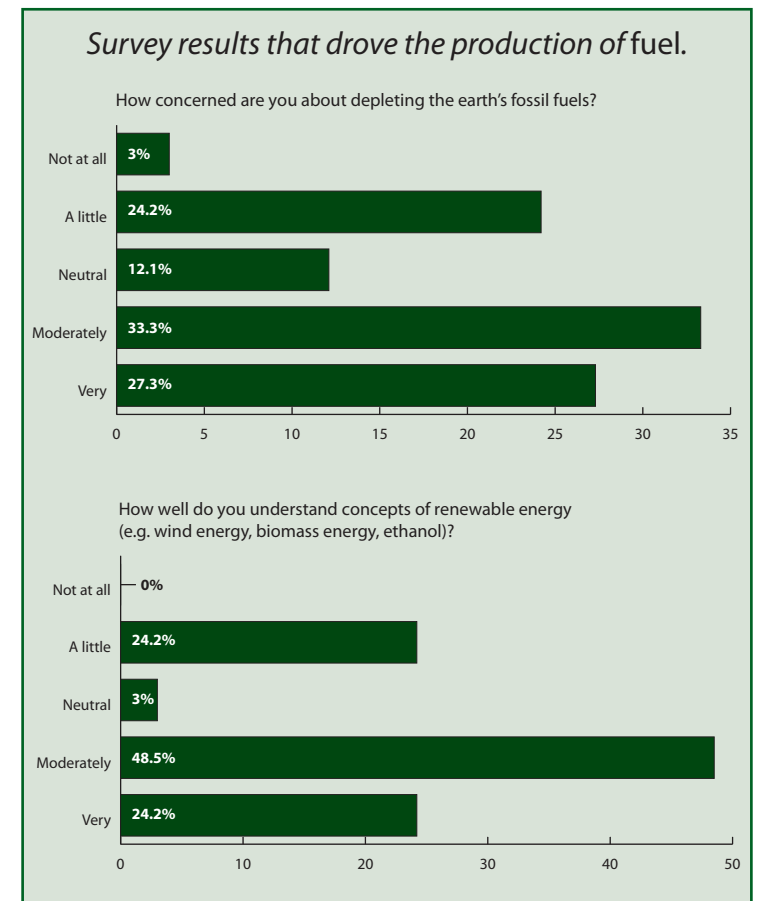
fuel: Behind the scenes

This fall North Dakota State University communication students came together to produce a magazine that examines a significant and growing industry in the upper Midwest: biofuel. Renewable energy is a fairly new concern, but NDSU has a history of leading the region in research on fueling the world with the crops. Agricultural students have looked to improve the ways we use crops to feed hungry mouths for years. But with recent advances in technology, they now have the responsibility of efficiently fueling the planet. As fossil fuels become a more limited resource, we need to adapt new methods of supporting the way we live.

This magazine covers topics on renewable energy relevant to the Northern Plains. Topics vary from wind energy to Fargo-Moorhead’s MATBUS to crambe plant production. Each story carries a different perspective on how renewable energy is changing the Northern Plains.

Course co-instructors Dr. Crawford and Dr. Collins taught us the essential elements that go into producing a magazine. We studied photojournalism, interviewing, writing, magazine history, design and organizational structure. Our ultimate goal was to create a professional publication worthy of your time.

We would like to thank Dr. Crawford and Dr. Collins for their dedication to this magazine’s success. Their knowledge and enthusiasm was invaluable to us.



We would also like to extend our gratitude to those who contributed information to our stories, and those who made donations to cover production costs: NDSU’s department of communication and extension office, and Country Hearth Bread of Fargo.

You may access a copy of *fuel* in pdf form online at <http://tinyurl.com/cgg5pgm>.

~fuel staff

Soybeans account for more than 73 million acres of farmland across the United States...



The Small Wonder in Our Backyard

By JENNA CURRIE-MUELLER

It's hard to believe the average human thumb is the same size as North Dakota's most profitable crop, the soybean. This small crop occupied 4,100 acres across the state in 2010, placing North Dakota in the top 10 states for soybean acreage in the United States. North Dakota contributes 138.3 million bushels annually to the United States total yield.

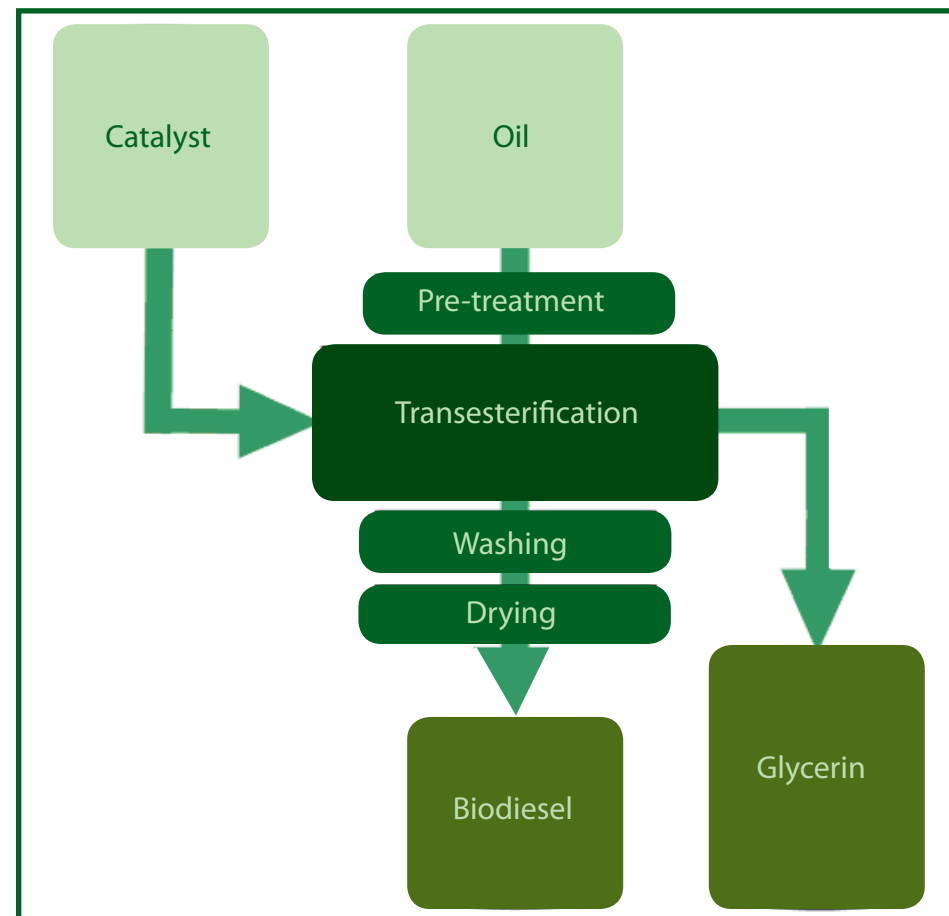
Soybeans are a highly versatile crop that boast multiple uses; they can be used for livestock feed, candles, food, and manufactured for biodiesel. Biodiesel is a renewable fuel,

derived from natural resources that can be used in diesel engines. Biodiesel derived from soybeans burns cleaner than traditional diesel, is non-toxic, environmentally friendly, and is made from renewable resources. Economically, biodiesel reduces the United States' dependence on foreign oil, permitting its fossil fuel reserves to last longer. Additionally, soybean biodiesel production stimulates the local and national economy by adding and creating new jobs for its citizens.

Soybeans become soy biodiesel through the transesterifica-

tion process. Before the transesterification process can begin, soybean oil must be extracted from a mature soybean. After harvest, soybeans are cleaned, cracked, taken from their shells and rolled into small flakes. During this process, the oil cells in the soybeans are broken and extracted.

After the soybean oil has been extracted, transesterification occurs. This process separates and removes the glycerin from the soybean oil to create soybean biodiesel. The biodiesel made from this process burns cleaner than traditional petro-



Transesterification process.

leum-based diesel as it produces a smaller drip.

In 2007, Congress passed the Energy Independence and Security Act. This act requires the United States to steadily increase its use of biodiesel each year. By 2012, the United States needs to use at least one billion gallons of biodiesel annually. This requirement seemed almost impossible to achieve in 2007; however, the use of soybean as biodiesel as fuel makes the requirement easier to reach. As North Dakota is amongst the top 10 states for soybean production, this means with North Dakota's aid in soybean production, this requirement can be met quickly and effectively.

North Dakota is essential in reaching this requirement. North Dakota's largest city, Fargo, fuels its buses on soy biodiesel. Pledging to be a leader and setting an example for other cities within North Dakota and the United States, Fargo actively advertises its use of soy biodiesel. This pushes North Dakota's soybean acreage to grow even further. To assure this growth doesn't come to a halt, the North Dakota Soybean Council (NDSC) actively releases



Soybean.

information regarding soybeans and biodiesel several times throughout the year.

The NDSC was established in 1992 by the North Dakota legislature, it is composed of a board of eight chairs representing different areas of the state. Scott Gauslow, NDSC vice chairman, recalled the organization was formed to promote the longevity of the soybean in North Dakota.

"Our council is a research and promotion council. We help develop the bean, manage it, test it and give it better variety. We deal in (domestic) marketing and international marketing in biodiesel and livestock," Gauslow said.

The NDSC funds several areas of soybean research, including crop growth, harvesting, use as feed, and biodiesel. The NDSC allocates 40 percent of its \$3 million annual revenue to soybean research. However, according to Gauslow, without promotion of the soybean, the research is a waste of time. Therefore, the council actively



Soybeans intact within their pods.

publishes fact sheets and other information to the public to teach about soybeans and biodiesel.

"The council doesn't promote biodiesel as much as we used to. The primary reason for that is 98 percent of soybeans are exported. This doesn't affect the North Dakota farmer

as much. But our dues to the United Soybean Board directly promote biodiesel through the USB." Gauslow said.

Although North Dakota boasts large soybean acreage and actively uses biodiesel, unfortunately most of its exported

soybean biodiesel more actively than the NDSC. Perhaps one day, North Dakota will utilize soybean biodiesel as its main

fuel, allowing the crop to complete a full circle. Until then, the NDSC's ongoing work in researching and promoting soybeans and soy biodiesel throughout North Dakota and the United States assures North Dakota as an emerg-

ing leader in biofuels.



*"Our dues to the United Soybean Board directly promote biodiesel."
—Scott Gauslow*

soybeans don't return as transformed biodiesel. To compensate for this, the NDSC relies on the USB to focus on promoting

MATBUS Goes Green

What it means to Fargo-Moorhead

"The 64 buses run on 20 percent biofuel to locations in Fargo and West Fargo, N.D. and Moorhead and Dilworth, Minn. One gallon contains 80 percent regular gasoline, and the remaining 20 percent consists of high-quality soybean and other vegetable oils."

By CARLY BISHOFF

Fargo-Moorhead is making great strides in improving its eco-footprint by utilizing biofuels in public transportation. F-M Metro Area Transit (MATBUS) Transit Administrator Julie Bommelman said MATBUS provided more than two million safe rides to passengers with its 25 routes in 2010 – all while helping the environment by utilizing biofuels in all vehicles.

According to Gene Fife, MATBUS shop supervisor, the 64 buses run on 20 percent biofuel to locations in Fargo and West Fargo, N.D., and Moorhead and Dilworth, Minn. One gallon contains 80 percent regular gasoline, and the remaining 20 percent consists of high-quality soybean and other vegetable oils. This mixture releases less carbon dioxide and particulate matter into the atmosphere than traditional diesel fuel. According to Bommelman, "If everyone in the F-M area left their cars in





Gene Fife driving a new hybrid MATBUS vehicle.

Brommelmán said. She said taking each passenger from his or her personal vehicle is making the greatest difference for our air, and that 487 participants pledged online to leave their cars at home.

As far as fuel economy compared with diesel buses, “there’s not a real increase with biodiesel,” Fife said. According to a study by Upper Great Plains Transportation Institute, “The Environmental Protection Agency estimated that the energy content of

their garages one day per week, each person would save about 20 pounds of carbon emissions that would have otherwise been released into the air.”

Think gas prices are high? There’s help. Because they share miles with other riders, “the regular MATBUS rider uses much less oil than the average person, only about half. Our studies show that people who use public transit are saving 34 supertankers of oil each year,” Fife said. Today’s supertankers can carry an average of 2 million barrels or 84 million gallons of oil.

Inspired by the projection, MATBUS created a new promotion last month to encourage citizens to find alternate trans-

portation one day per week. The “Commuter Challenge” asked residents to pledge using another form of transportation like bus, walking, bike, or carpool once per week from Sept. 6 to Nov.

*“People who use public transit are saving 34 supertankers of oil each year.”
— Gene Fife*

4. “It’s been very exciting for us. The billboards and radio ads with Y-94 and BOB 95 FM helped earn a 12 percent increase in passenger numbers,”

conventional diesel is 129,500 BTUs (British Thermal Units — a measurement of energy) per gallon, and that for 100 percent canola- or soybean-based biodiesel, it is about 119,200 BTUs per gallon.” Based on this information, Fife knows the biofuel MATBUS uses (with 20 percent biofuel oil) is expected to get 1.6 percent less fuel economy than regular diesel.

Bus maintenance is also crucial for good fuel economy in biofuel vehicles, Fife said. Most people think buses are like regular vehicles, but the ones that run on biofuel depend on many detailed computers. Fife explained that the bus, engine, transmission, fare boxes, and on-board real-time tracking software

are all run by computer. “All my mechanics use laptops daily,” Fife said. He explained that running diagnostics through the buses’ computers is an efficient way to solve most problems that come with using biofuels. In order for the biofuels to work properly in the vehicles, diagnostics run by the computers must check for specific problems.

MATBUS is on the move, and we don’t just mean around town. In the past five years it has doubled its ridership, most likely based on its partnership with North Dakota State University students and faculty. More routes are being opened as more advances in the biofuel program are taking effect. In 2010, MATBUS purchased four hybrid diesel electric

paratransit vehicles, and two 35-foot buses. In 2012, Fargo plans to purchase two 40-foot hybrids.

Public transportation run on biofuel is not just unique to the F-M area. The United States is quickly becoming a huge user of biodiesel. Currently, public transportation in the United

States saves 37 million metric tons of carbon emissions and 4.2 billion gallons of gasoline per year. Cities like Cincinnati, St. Louis, Oklahoma City and Seattle have switched to biodiesel. Bus fleets are fueling their vehicles for the government, military, national parks, and some universities with green biodiesel. For example, following the lead of Yellowstone National Park, more than 50 national parks, from Kentucky to Alaska, are now using biodiesel blends.

All of these actions help to cut costs for the nation: according to the Energy Information Association, the United States currently spends almost \$250 billion annually on foreign oil, which is equal to more than

\$475,000 every minute. The United States consumes approximately 20 million barrels of oil each day. By 2025, the demand is forecasted to reach 26 million barrels per day, and 60 percent of that will most likely be imported.

Looking toward 2012, MATBUS will be updating its five-year Transit Development Plan. Staff will evaluate the current system to establish improvement strategies to better serve the communities it covers. MATBUS supervisors hope this will spark even more growth and bring new ideas to make transportation in Fargo-Moorhead cleaner, safer, and less costly — thanks to biofuels.



North Dakota State University students board MATBUS. MATBUS uses 20 percent biofuel in its vehicles.

440,000 birds are killed annually from impacts with wind turbines...

IS WIND ENERGY FOR THE BIRDS?

By BRITTANY NEGAARD

Wind energy is quite popular in the world of alternative energy. It has a reputation of being a clean and safe fossil-fuel alternative, and the Northern Plains seems to have unlimited potential to tap into this new source. Wind energy is clean, renewable, and pollutes less than fossil fuels.

But clean wind energy still may kill. The American Bird Conservatory estimates that wind turbines kill 440,000 birds annually due to impact. Besides impact, wind energy poses numerous threats to natural habitats. The effects of these possible threats are largely unknown.

“Bird deaths from wind power are the new inconvenient truth. The total number of birds killed and the amount of bird habitats lost will dramatically increase as wind power build-out continues across the country in a rush to meet federal renewable energy targets,” said ABC Vice President Mike Parr.

Some argue that turbines pose no more threat to wildlife than other commonplace threats such as vehicles or buildings. It is difficult to figure exact numbers of bird mortalities, but it’s estimated that hundreds of millions are killed annually in

the United States from anthropogenic sources. This includes fatalities from birds flying into buildings, collisions with vehicles, poisoning from polluted water, and cat predation.

North Dakota Game and Fish Conservation Supervisor Steve Dyke believes this does not mean the issue of bird mortality from turbines should be ignored. “Just because it doesn’t kill more (than other anthropogenic sources) does not make it non-impactive,” said Dyke.

“I think there’s a perception among the general public that wind energy is 100 percent great, and by that they think there is zero impact to fish and wildlife resources,” said Dyke. “I think that is somewhat of a misnomer. Every wind tower that goes on the landscape has some level of impact, and depends to great deal on where it’s put. Turbines on native prairie and wooded draw will have a greater level of impact on the habitat.”

While the future impact of wind turbines on wildlife and natural habitats is difficult to gauge, several studies have measured current impact. A National Wind Coordinating Collaborative spring 2010 fact sheet claims that songbirds are

killed more than any other type of bird at wind turbine sites. These birds typically migrate at altitudes above rotor-swept areas, yet during poor weather conditions and during takeoff or landings, they fly at lower altitudes and are vulnerable to collisions with turbines.

Many are concerned about endangered raptor species including the bald eagle and the golden eagle. While raptors are not most affected by turbines, high numbers of hawk and eagle fatalities have been reported where populations of these species are high.

Prairie grouse are also at risk from turbine development. Northern Plains hunters may see a reduction in grouse, affecting not only the sport but also economic contributions to rural areas.

In addition to birds, the NWCC reports that several species of bats are vulnerable to collisions. Bats are attracted to the turbines because of the sounds produced or the concentration of insects around turbines. In addition to direct collision with turbines, bats may also experience fatality from rapid pressure changes in the air as they pass through turbine farms. The

pressure causes internal injuries, which have been shown to be fatal.

Many wind turbine companies are taking measures to reduce the risk to birds. Some strategies include painting turbines different colors, changing the speed of the turbines, tracking birds’ behavior in relation to the weather and the turbines, and shutting off turbines during peak migratory times. Currently, little is known about the effectiveness of these techniques.

Ducks Unlimited of North Dakota is working with wind energy companies to study the effects of turbines on local wildlife, specifically waterfowl. The company recently partnered with Acconia Energy, Next Era Energy and the U.S. Fish and Wildlife Service to study turbines in North Dakota and South Dakota. Johann Walker, Director of Conservation Planning for the Great Plains Region of Ducks Unlimited, said, “The objective of our study was to compare density of breeding ducks on wetlands in wind projects and wetlands not in wind projects.”

The results of Ducks Unlimited’s study should be released this spring, and additional research is planned. The study

hypothesized “the potential that wind energy can pose a problem for wildlife populations,” said Walker.

Studies like these may help energy companies decide where to build. The NWCC suggests a pre-construction evaluation be conducted at every potential wind site. It is believed that areas with a high density of small mammal prey and conditions favorable to high prey densities should be avoided for new wind turbine sites. Agricultural habitats appear to be the best location for turbines compared with forested areas.

The Northern Plains possesses huge potential for wind energy, especially in North Dakota. But the area is also home to many birds and other animals, some of which are endangered. It is also a destination for hunters. If wind energy disrupts these animals’ habitats, we could see a negative impact in that industry. It will be important for the growing industry in the Northern Plains to research and adapt to make turbines as little a threat as possible to these species.



Biofuels are becoming more prominent in the farming community...

Fueling the Modern North Dakota Farm

By JILL FALCK

On a North Dakota farm, it is time for harvest. Fall is here; farmers are excited to get the crop off and anticipate where this harvest produce will go and how it will be used. In past years, farmers may not have anticipated that their corn crop would go towards producing biofuels. But more and more farmers are seeing their crops become fuel, not food. And sometimes the harvest comes full circle, as the biofuel returns to help run the farms.

Biofuels are becoming more prominent in the farming community. From equipment used by farmers, to the use of biofuels by chemical and seed dealers, biofuels are popping up in and around the towns near the farming communities. According to Kaleb Little, the Communications and Member Specialist of National Biodiesel, “biodiesel could have a very real impact on the farming

industry in the United States. The largest input cost in our food system is petroleum fuel for growing, harvesting, processing and transporting food products.”

According to the U.S. Department of Energy, the use of biofuels can provide extra farm income and can improve the environment all at once. “American farmers have a great opportunity, now and in the coming years, to help make the nation more self-sufficient in energy,” reads a report released by the department.

Ethanol can be made from a variety of agricultural produce.

Farmers can have the possible assurance that their crops can help produce fuels that they could in turn use to assist in planting or harvesting the next crop. According to Little, biodiesel can be created from agricultural byproducts and co-products such as raw vegetable oil from produce, rendered animal fat from livestock production and recycled cooking oils from restaurants. These renewable products that farmers produce every year could be used to support the farmers and their markets for their own products.

Soybean oil is quickly becoming a major factor in the

biodiesel world. “In the United States, approximately 50 percent of biodiesel produced is made from soybean oil,” said Little. “The biodiesel industry has created a new market for soybean oil, which helps support U.S. soybean prices and reduces the pricing pressure on soybean meal.”

Farmers who use biofuels on their farms can be reassured that they are becoming less dependent on fossil

fuels and foreign oil, and that they are putting fewer harmful pollutants into the environment. According to Thomas Saidak writing in *Biofuels Digest*, “farmers could run their farm operations with biodiesel by using only 5-7 percent of their acreage produce.”

Farmers can also be assured that biofuels are environmentally friendly. According to the U.S. Department of Energy, reductions in emissions was evident with the use of biofuel, but the report did find an increase in nitrous oxide components. “If we could use a domestically produced, clean, renewable fuel like biodiesel in that system instead of an imported, dirty, fossil-carbon fuel it could have a very positive impact on climate change mitigation,” said Little.

Advances in technology have made farm equipment more environmentally friendly and more energy efficient. John Deere, a leading agricultural equipment manufacturing company, has made strides in becoming more environmentally friendly. Lisa Buchholz, an agricultural engineering major at North Dakota State University and an employee with John Deere, has noticed the push to “go green.”

“John Deere is an advanced leader in the farm equipment industry and they know what farmers need and what farmers want,” said Buchholz. “A lot of machinery can be converted for the use of biofuels. Some of the newer machinery could even be

built to use biofuels without any mechanical updates.” Although it would be difficult for farming operations to run completely on biofuels, many farmers can run a good majority of their equipment on biodiesel and use ethanol in their gasoline applications.

Farm implement industries have encouraged biofuel use. According to America’s Advanced Biofuel, “the industry has encouraged all farmers to ask their fuel distributors to carry biodiesel in at least a 2 percent blend.” This small push is just a start towards having more



“If we could use a domestically produced, clean, renewable fuel like biodiesel in that system instead of an imported, dirty, fossil-carbon fuel it could have a very positive impact on climate change mitigation.”

—Kaleb Little

farms use higher percentage blends of biofuel.

As biofuels become more prominent, North Dakota farmers can take advantage of opportunities and benefits biofuels have to offer, making a few minor changes to their farming op-

erations. As farmers learn more about the benefits of biofuels, their operations could become significantly more efficient, and even more profitable.



Cornfield at the end of harvest season.

North Dakota State University Department of Communication

Our mission statement is three-fold:

- Enhance critical thinking relative to creating and interpreting written, oral and visual communication through any medium.
- Provide students with the theory and skills necessary for them to enter and progress in professions requiring extensive communication skills.
- Provide a graduate program that includes theory, research and practical experiences that is suitable for individuals entering from an academic or professional orientation.

The department is also committed to creating opportunities that benefit its faculty and the state of North Dakota through quality research and service. Faculty development and retention is an ongoing and vital element in the process of maintaining a department of high quality. In turn, members of the department seek to share their knowledge and expertise concerning effective and innovative communication with the professionals and residents of North Dakota.

For more information contact Mark Meister, chair, mark.meister@ndsu.edu.

Or go to: www.ndsu.edu/commuication.

NDSU

COMMUNICATION

Manure VS. Money

The stinky price of energy

By DANIELLE BOLDENOW



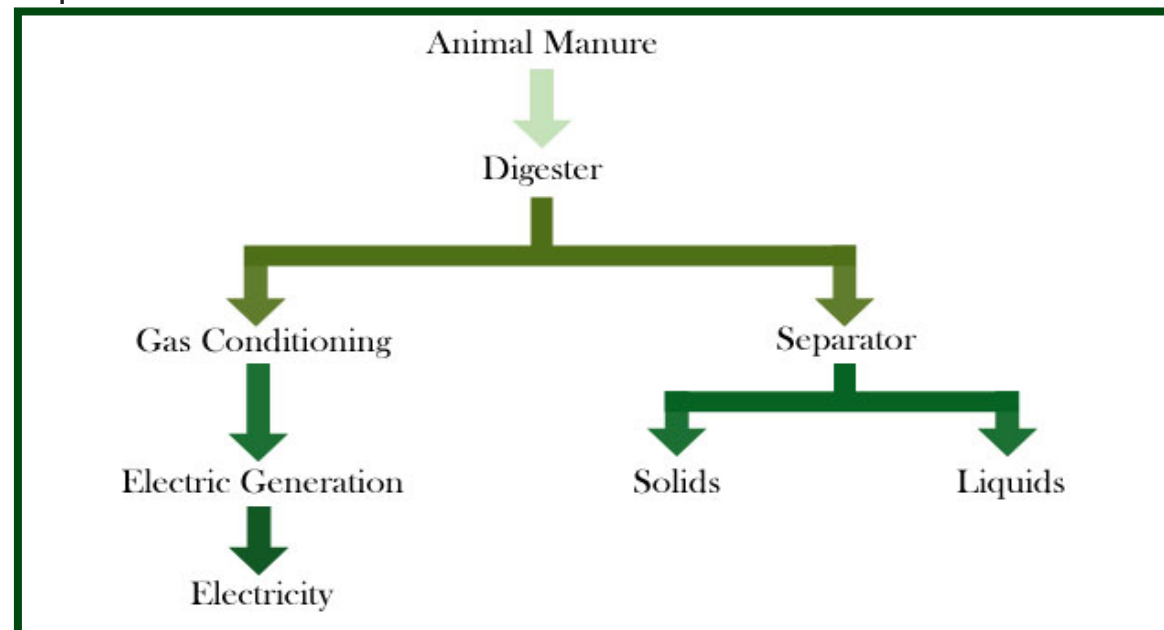
Is cow manure really a beneficial source of energy?

At first it seems like such a brilliant idea. Take the manure from your own cows and use it to create energy. It benefits the earth and saves money, right? Well, not necessarily. Scott Pryor, assistant professor of agriculture and biosystems engineering at North Dakota State University, said using manure as fuel may not be quite as good as it seems. “At first glance it seems great,” Pryor said. “People think ‘how could that possibly go wrong?’ But in the end, economically it’s not so great.”

Animal manure is a form of biomass that can be created into a biogas. When manure is put into

an anaerobic digester the bacteria decomposes the organic matter. Without oxygen it produces a biogas composed of 60 percent methane and 40 percent carbon dioxide. The biogas can then be combusted to power a generator and used as a heat source. “Heating is the best use. There are no losses” Pryor said. The biogas can even be put into a separator where it could be changed into non-digestible by-products such as liquids and solids, or could be converted back into electricity, fuel and other sources of energy.

The possibilities seem endless. Why don’t more farmers invest in an anaerobic digester?



Process of an anaerobic digester.

It seems currently the cons outweigh the pros. “The capital equipment could be expensive and there is a lot of work that goes into it, Pryor said. “It is more of a capital loss than a capital benefit.” It could be difficult for farmers to obtain financing for these systems. Though consistent power is available from a nearly endless supply of animal manure, it can be quite expensive to run the equipment and keep it maintained.

According to the 2010 *U.S. Anaerobic Digester Status Report*, produced by the U.S. Environmental Protection Agency, no manure digester systems operate in North Dakota, and only five operate in Minnesota. “The fact that there aren’t digesters suggests that the economics do not add up in North Dakota and much of Minnesota,” Pryor said. A reason for such a lack of digesters in North Dakota is that 79 percent of digester projects are on dairy farms. These are

more common in Minnesota and the Northeast.

Another issue associated with running digesters in North Dakota is the extreme weather the state sees, especially during the winter. A colder climate creates the need to constantly heat the digester in order for it to run efficiently. This creates more costs for farmers. “It’s better in the southern regions because you don’t need any heating,” said Shafiqur Rahman, NDSU assistant professor of waste management engineering.

The fact that there are cheaper ways to create energy also plays a part in biomass drawbacks. Rahman, who specializes in animal waste management and bio-solids management, is constantly researching new ways to save energy. “Wind and coal are cheaper forms of energy than maintaining a digester,” said Rahman. “That’s why people are not interested in producing energy from biomass.”

Although digesters are expensive and difficult to maintain, as a whole the nation has seen a great increase in energy production based on this system, according to the digester status report. Since 2000, energy production from anaerobic digester systems has increased

from fewer than 50 million kilowatt-hours (kWh) to over 350 million kWh.

But it seems that manure and money don’t mix economically for farmers of North Dakota. That doesn’t hinder the researchers at NDSU who are searching for new ways to create cheaper biofuels. For example, Rahman currently is looking for ways to enhance the economic viability of anaerobic digestion through the suitability of canola meal. Because researchers see so many benefits of animal biomass and digesters, they can’t look over them based on cost alone. Future research will continue to look for ways to reduce the cost of digesters and make animal manure a better-smelling way to energy.



Pros

Consistent Power

Since animal manure is in such abundance on farms, there is always a steady stream, creating a stable source of electricity generation.

Improved Water Quality

Waste streams remove phosphorous and metals that could contaminate water supplies.

Renewable

Animal waste does not use natural resources to create.

Odor Reduction

If the waste streams are in digesters they won’t be sitting outside, creating a stench.

Valuable Byproducts

Separated byproducts can be made into fertilizer to be used or sold.

Cons

Expensive

Installation costs on average \$500 per cow, with additional operating expenses. It could be difficult for farmers to obtain financing for these systems.

Large Farms Only

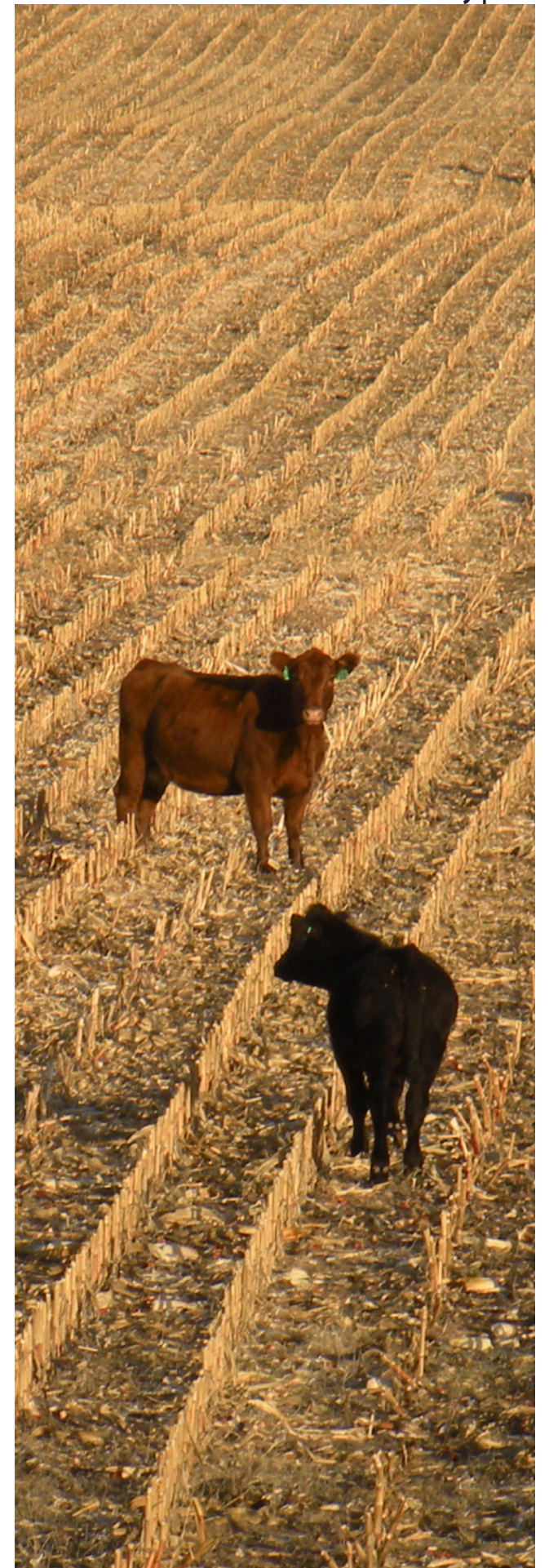
It is suggested that farms with at least 300 cows could install a system, making it difficult for smaller farmers to capture additional revenue.

Time-Consuming

It takes about 30 to 60 minutes per day to ensure efficient operation.

High Land Use

The operation requires a lot of space, causing problems for smaller farms.



Large demand for sunflowers in the food processing industry is causing sunflower oil prices to rise, making...

Sunflowers too Co\$tly for Biofuels

By TONI TOLLEFSON

If you happen to be among many spectators perched at a Fargo-Moorhead RedHawk's baseball game, you are sure to witness a common baseball cliché being consumed in large quantities: sunflower seeds. But, are those fancy black-and-white striped seeds that we see at sporting events oil seeds? Not necessarily. There are two different types of sunflower seeds; the first group includes oil seeds, small, black and high in oil content. The second is the large striped confectionary seed we see in ballparks.

Sunflowers are a popular Midwest crop. So much so, in fact, that North Dakota is the

leader in sunflower production, growing about half the nation's total, and South Dakota and Minnesota follow behind in a close second and third. The remaining sunflower producing states include Kansas, Colorado, Nebraska, Texas and California.

So, what encouraged Midwest farmers to start growing sunflowers? "Price and yield are keys for farmers selecting this crop for production" said Larry Kleingartner, executive director of the National Sunflower Association, based in Mandan, N.D. Can we expect to see more sunflowers in the Midwest? "This relates to the competitive nature with other crops," said Kleingartner. "At this point

corn is dominant because of the ethanol mandates." The ethanol mandates, or Renewable Fuel Standard (RFS), mandated that a minimum of 4 billion gallons of renewable fuels be used in 2006 and that Americans consume at least 7.5 billion gallons by 2012. Two years after these mandates, Congress passed the Energy Independence and Security Act of 2007 that expanded the RFS mandate. Americans now consume 36 billion gallons of biofuels annually.

What do sunflowers have to do with biofuels? These vibrant yellow flowers produce a high oil content seed — considerably higher than soybeans. An average yield can produce about

600 pounds of oil per acre. However, sunflower oil is more costly than canola and soybean oils because sunflowers are already in high demand in the food industry. The higher price of sunflower oil currently makes it unaffordable as biofuel. "Using sunflower oil as a feed stock for biodiesel is like taking the T-bone cut and making it into hamburger," said Kleingartner. "Sunflower oil is demanded by food companies and consumers as food and I expect that will continue well into the future,"

With world population increasing and per capita food consumption increasing, it may

be difficult to grow crops for fuel and expect to feed the world as well. Currently no research considers sunflower seeds for biofuel production. Kleingartner said cheaper oils, particularly soy and canola, are more appropriate for biofuels. The growing food vs. fuel debate likely will continue to escalate in the future.



Did you know?

The sunflower plant is native to North America. The wild sunflower is so common in Kansas that it is actually a serious weed problem. These are the multiple-headed plants.

Confirmed cases of individuals allergic to sunflower seeds/oil are very rare. However, individuals allergic to peanuts or tree nuts should carefully look at the label to ensure that the sunflower seed has been packed in a peanut- and tree-nut-free facility.



A sunflower field in eastern North Dakota.

According to a 2004 Guinness World Record...

A sunflower grown in Michigan had 837 heads on one plant.

A sunflower grown in the Netherlands holds the record for being the tallest sunflower in the world. It measured 25 feet, 5.4 inches.

Cellulosic Ethanol: Jamestown's Future Fuel

"The Buffalo City" plans to bring big boost to North Dakota agriculture with new facility by 2015.

By SHELBY SORENSON

Jamestown, N.D., will soon be home to a rare biofuel production facility. The plant will produce cellulosic ethanol, a biofuel made from nonfood plants, and it could potentially be a big boost for North Dakota agriculture. The biofuel is produced from lignocellulose, a structural material that comes from plants. It is composed of cellulose, hemicellulose and lignin. Not only is cellulosic ethanol renewable, but it generates far more energy than it takes to produce. The fuel is similar to corn ethanol and can be used to fill the tank of any flex-fuel vehicle that typically runs on E85.

Last February North Dakota Agriculture Commissioner Doug Goehring led a group of government, energy and farming representatives to the Kalundborg Cellulosic Demonstration Site in Denmark to examine the possibility of building a cellulosic biomass refinery in North Dakota. The group weighed pros and cons of such an operation, and how it could benefit North Dakota. They left Denmark pleased with the site's production capabilities, and decided

to set up a biofuel production operation in Jamestown.

The new plant is projected to create 38 to 50 jobs and, it is hoped, will help North Dakota farmers establish a steady source of income.

Cellulosic ethanol is more

*"Agriculture and energy are inextricably linked."
— Sandra Broekema*

abundant than any existing fuel. It essentially uses waste to create a resource. Farmers who can make use of this biomass may see income even during poor harvests.

The cellulosic biofuel facility is planned next to the Spiritwood Station power plant. According to Sandra Broekema, business development manager for Great River Energy, the company is considering the refinery as a way to optimize the operation of Spiritwood Station, a combined heat and power plant. The refinery will also benefit North Dakota agriculture. "Agriculture and

energy are inextricably linked," said Broekema. "New technologies to convert dedicated energy crops like switchgrass on marginal land, and crop residues, to biofuels are being developed all over the world." Broekema said using crop residues to produce energy provides another market and income stream from the same acre of farmland.

Phase I, the conventional dry mill ethanol plant, should be completed by the end of 2013. Phase II, the cellulosic addition, will be completed by the end of 2015. According to Broekema, Phase I is expected to cost a little more than \$100 million. Phase II is expected to cost slightly less. The plant, Dakota Spirit AgEnergy, will be owned by a group of key stakeholders including Great River Energy.

Future Americans could be looking at this renewable resource to fuel their vehicles. For now, cellulosic ethanol may be seen as a resource for farmers to make a steady income in North Dakota.



Money in Ammonia

Fertilizer's progress toward becoming domestic

By KATIE JOHNSON

Gas prices are burning a hole in everyone's pocket. In a world that still depends primarily on fossil fuels, production costs are rising and profits are shrinking. Ammonia fertilizer, a farmers' staple, relies for its production a fossil fuel, natural gas. How can they continue to afford it? North Dakota researchers have an answer: make it domestically without using natural gas.

This move away from fossil fuel-produced fertilizer seems inevitable. Over the past decade, America's dependence on imports has skyrocketed. Ammonia fertilizer is no exception. In 1999, the United States imported 35 percent of its fertilizer. By 2005, that number rose to 80 percent, and costs have gone up. American agriculture is struggling to pay the bill.

Ted Aulich, a senior research manager at the University of North Dakota Energy and Environmental Research Center (EERC) in Grand Forks, knew there had to be another way to produce fertilizer — something cheap, easy and domestic.

Traditional ammonia fertilizer production uses the Haber-Bosch process, a system perfected over 100 years. It requires high temperatures, high pressure and natural gas. Natural gas is

the primary source for hydrogen, which reacts with nitrogen to create the ammonia used in fertilizer. The primary suppliers of fertilizer use the Haber-Bosch process and charge barely-affordable rates to farmers.

"The cost of fertilizer almost exactly correlates to the price of natural gas," Aulich said, about 80 percent of production cost. To him, this doesn't seem fair or efficient for farmers. In 2009, Aulich's team began experiment-

"I just like the idea of being more efficient."
— Ted Aulich

ing with a combination of biomass gasification and electrolytic process to produce the ammonia for fertilizer.

Instead of using natural gas, Aulich's team developed a way to use biomass, a renewable resource considered a "leftover" or "waste," as the source of hydrogen. The electrolytic process uses electricity instead of high temperature and pressure to drive the chemical reactions.

Chris Zygarlicke, deputy associate director of research at EERC, said his favorite part of

the process is its versatility.

"The key is to make it adaptable. If hydrogen isn't [available] from one source, you can find it from another source like landfill gas," said Zygarlicke.

The electrolytic ammonia fertilizer production process is still relatively new, but most of the research is done and waiting for a large investor. "Everything has been proven on a laboratory scale. Now it needs to go to a pilot scale," said Zygarlicke. The perfected process is expected to spread around the world.

The idea of biomass-based fertilizer seems great, but what does this mean for North Dakota? The Northern Plains? Where exactly does this area come into play with this new process?

Wind.

The benefit of using electricity to drive production is the opportunity to use wind energy, especially in North Dakota. According to Aulich, North Dakota is an incredibly windy state, and he sees how much electricity its windmills could produce. "[We] looked at this and said, hey, we can utilize all this wind energy and plumb them into these electrolysis factories," said Aulich. "It's a great way to turn North Dakota wind energy into dollars."

So not only does the electrolytic ammonia production rely on biomass instead of natural gas, it can use wind for electricity instead of fossil fuels. The EERC has created a process that requires fewer resources and less money. Zygarlicke said the wind-powered, biomass-dependent process "will be good for North Dakota."

While Aulich's goal was to create a process that North Dakotans could cost-effectively run themselves, he said he doesn't

know if he truly believes in creating a world that runs solely on renewable energy. However, when people have an opportunity to waste less, Aulich said, they should investigate it.

"Even if you don't believe in the whole CO₂ emissions and greenhouse gases thing, just look at it from the point of conservation," Aulich said. "I just like the idea of being more efficient."

Electrolytic nitrogen fertilizer faces a few bumps in the road. The process is new and so hasn't

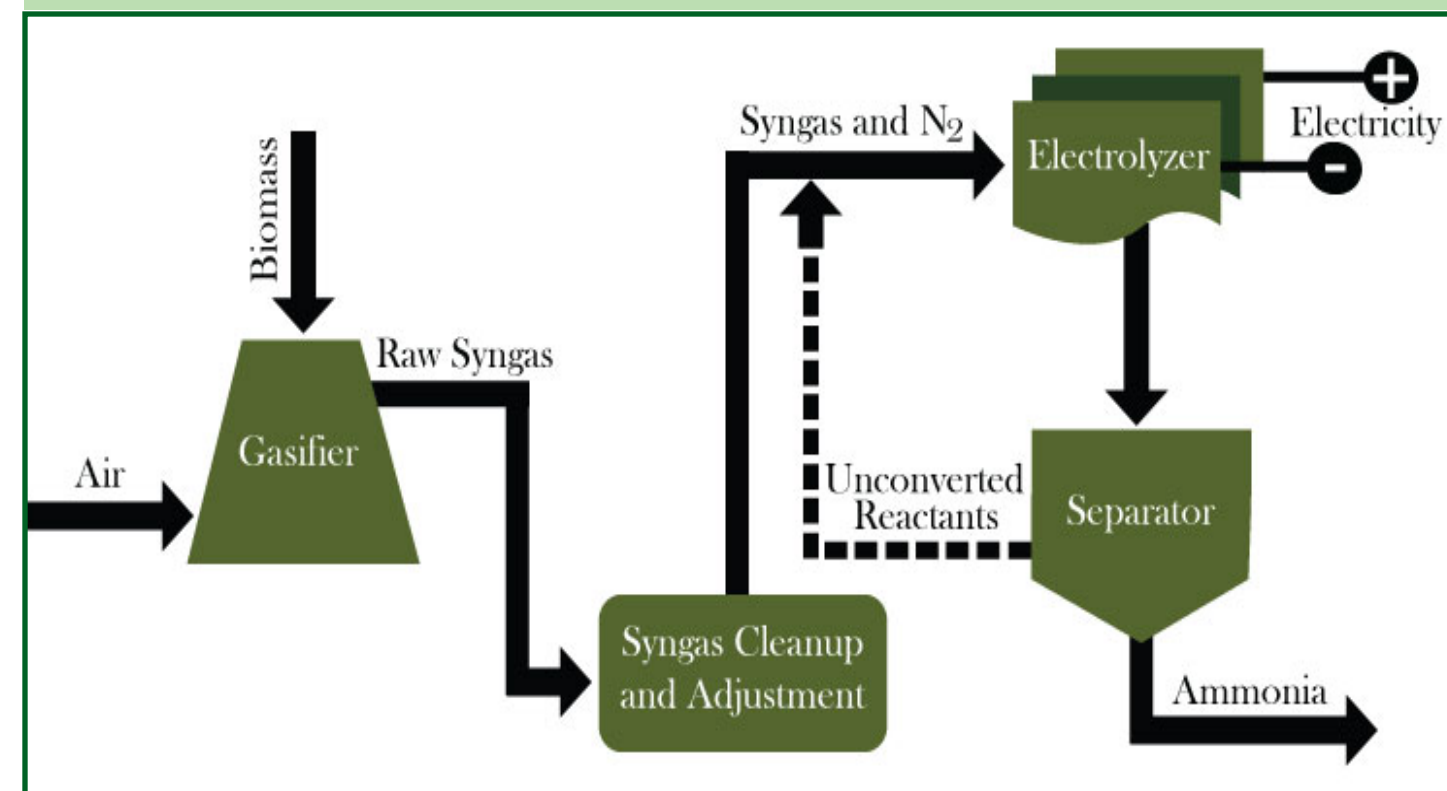
had 100 years to be perfected like Haber-Bosch. Technicians still need to find ways to lower temperature for the electrolytic membrane and grid wind energy into factories. "The rest is good to go," Aulich said.

While the process isn't perfect, it is still viable for mass production. It's just waiting for the right people with the right money. Once that's in play, farmers can expect access to more home-grown fertilizer.



HOW IT WORKS...

Instead of using natural gas as the source of hydrogen, the EERC's process uses biomass. The biomass is gasified, creating a mixture of hydrogen and carbon monoxide (syngas). Add nitrogen, and it yields the same results as the Haber-Bosch process, but requires a lot less energy and uses renewable resources.



Spiritwood Station(ary)

North Dakota's newest and most advanced power plant can't find a job to do for this economy.

By LEVI SATTERLEE

Great River Energy's Spiritwood Station, a heat and power plant one mile south of Spiritwood, N.D., was put on standby this fall.

Construction of the \$350 million project was finished this summer. Originally, the plant operation was set for 2010, but Lyndon Anderson, communications supervisor for Great River Energy, said the economy slowed the project down. Anderson said low prices led to decreased demand in the Midwest Independent Transmission System Operator (MISO) market, sending Spiritwood Station off line. MISO

is a nonprofit organization that provides power from Manitoba to southern Illinois and western Pennsylvania.

But technicians are ready. In September, Spiritwood Station began a 60-day trial run to test all the working parts of the plant. "It's going fine — just a lot of fine tuning right now," said Anderson.

Spiritwood Station will generate 99 megawatts of electricity at

full capacity, enough to power up to 63,000 homes. In comparison, Coal Creek Station, North Dakota's largest power plant, produces 1,200 megawatts of electricity per year, enough to power about 500,000 homes, farms and businesses, Anderson said.

The bread and butter of the

*“Coal Creek Station is about 35 percent efficient...Spiritwood Station will be about 66 percent efficient.”
— Lyndon Anderson*

Spiritwood Station, however, is its efficiency. Spiritwood Station is considerably more efficient than any other power plant in North Dakota.

“Coal Creek Station is about 35 percent efficient where Spiritwood Station will be about 66 percent efficient, which is significant,” said Anderson. A normal power plant operates at around 33 percent efficiency, meaning it's normal for power plants to

waste two-thirds of every unit of fuel they burn through smoke stacks and cooling towers.

Anderson said more efficiency in the Spiritwood Station will create a much better value for the consumer. To increase the efficiency, the new plant relies on process steam, which most plants release through

cooling towers. Instead of wasting steam's potential energy, Spiritwood Station is designed to produce steam that can be piped and sold. The neighboring Cargill malting plant will be the primary benefactor of the piped steam. Spiritwood staff are currently in the process of finding more users for the station's steam.

“More users will make Spiritwood Station even more efficient,” said Anderson.

In another technological advancement, the station relies on new type of coal produced by Great River Energy's Coal Creek Station, called DryFine. DryFine is an altered form of lignite dried to produce a higher energy rating. Once the coal is removed from the mine, it is dried to about 25 percent moisture



Spiritwood station.

content using waste heat from the plant, said Anderson. The drying process takes the energy capacity of the coal from 6,100 Btu (British Thermal Units) to 7,500 Btu. This process also removes pollutants from the lignite, said Anderson. DryFine is a higher quality version of the lignite coal found in North Dakota, Anderson said.

“We can get coal closer to the quality of subbituminous coal found in Montana and Wyoming,” Anderson said. Subbituminous coal has a sulfur

content of less than 1 percent which helps power plants reduce SO₂ emissions.

Spiritwood Station will burn about 610,000 tons of coal per year at full capacity. In comparison, Coal Creek Station burns around 8 million tons of coal per year, said Anderson.

The Spiritwood Station also has much better emission control.

“It's a newer power plant, so you have to build for newer standards. Spiritwood Station has the best available control

technologies,” said Anderson.

Spiritwood Station has emission control

for sulfur dioxide, nitrogen dioxide and mercury. Currently, mercury emissions are not regulated, but the Spiritwood Station is ahead of its time.

Despite all of its technological advances, Spiritwood Station cannot afford to operate under the current economical conditions. The decreased demand has caused energy prices to drop well below the possible operating range for

Spiritwood Station.

While the plant waits in standby, 15 employees will work full time to maintain the system. Anderson said employees run the pumps, belts and machinery to keep the system clean, safe and efficient. Once the plant comes back on line, Spiritwood Station will add eight or nine employees to the staff, said Anderson.

The uncertain economic climate has left Spiritwood staff unsure when the plant will go on line, however.

“We will look at it in 2013, but there is no plan to operate in 2012,” Anderson said.

Spiritwood Station will generate 99 megawatts of electricity at 100 percent capacity. North Dakota's largest power plant produces 1,200 megawatts annually.



Crambe: Untapped Resource May Shrink U.S. Dependence on Foreign Oil

By ISAAC BOLIN

A new plant is climbing the ranks in the race to become the best biofuel feedstock. Crambe (pronounced CRAM-bee) can serve as an alternative for erucic acid, an important part of oil refining. Traditionally, erucic acid is derived from rapeseed oil, which does not grow well in the United States. Utilizing crambe may decrease the United State's dependence on foreign oil products with a cleaner and less expensive fuel.

Crambe is native to the Mediterranean and Middle and Eastern Asia. But, said Blaine Schatz, director of the North Dakota State University Carrington, ND., Research Center, "Crambe is well suited for the climates of western and central North Dakota" as it can grow in colder, dryer climates. Crambe was introduced and commercially grown in the mid-1990s, but it hasn't hit its full potential in North Dakota and the surrounding region. Schatz said that this may be because it hasn't been researched enough, noting "there is significant opportunity for crambe in the biofuels industry."

Crambe's potential impact is also being examined at North Dakota's Energy and Environmental Research Center's (EERC). Researchers found crambe to be an industrial seed crop. This means it is used solely for biofuel production, and won't take resources from food products such as soybean oil. The EERC has tested the viability of crambe as a biofuel feedstock, and according to Chad Wocken, senior research manager, "it is the most similar to petroleum in its chemical make-up," because the carbon chain length of crambe oil is longer than that of soybean or canola oil.

This makes it act more like traditional petroleum fuel. According to the EERC, crambe oil is an industrial (non-food-grade) oil that costs less to plant, fertilize, and grow.

If crambe can solidify its position as a staple crop in North Dakota, the first step in utilizing it will be to construct a pilot renewable oil refinery. In 2006 the U.S. Air Force asked Wocken and a team of researchers to design a way to produce jet fuels from renewable oils. The U.S. Department of Defense gave the team a \$1 million grant to design a renewable fuel pilot plant.

To actually build the plant, however, the EERC needs \$4.7 million. Unfortunately the project hasn't met much support from commercial companies. According to Wocken, the cost of petroleum is still relatively low compared to biofuels.

Petroleum company Tesoro said it will offer a host site in North Dakota for the renewable fuel refinery, but funding is needed before construction can begin. This project would be a step in the right direction for the environment because if all went well, similar renewable oil refineries might be possible around the country and worldwide. But for North Dakota to become the first state with a renewable oil refinery, crambe, canola, and other feedstock prices will need to be more competitive with traditional petroleum.

Schatz said he can see that change is coming. "Who knows how the biofuel industry will look in a few years?" With government subsidies for some crops possibly disappearing in the future, crambe and other industrial crops could become a much more viable option for farmers.

**WILL NORTH DAKOTA BECOME THE FIRST
STATE WITH A RENEWABLE OIL REFINERY?**

CRAMBE
VARIETY TRIAL



Beets to Ethanol: Refueling Rural Communities

North Dakota group looks beyond soybeans for biofuel.

By JESSIE TOPP

When you think of advanced bio-fuels, you probably think corn or soybeans, not sugar beets. But with the help of North Dakota State University and others, Maynard Helgaas and the Green Vision Group (GVG) hope to change that.

In 2007, Helgaas, president of GVG of Fargo, considered the possibility of creating an advanced biofuel facility in North Dakota. His initial research focused on the use of sugar-based feedstock for biobutanol in Europe. By 2008, GVG formed and began researching sugar-based ethanol.

During initial research, GVG compared corn ethanol against ethanol derived from sugar beets. The results were astounding: growing sugar beets produces twice the amount of energy per acre versus corn. This means almost double the profits for the sugar beet enterprise.

GVG is developing an advanced biofuel from North Dakota beets, proposing 12 factories throughout the state to promote rural development. NDSU has played a vital research role in preparing for these factories. Areas of interest

include juice storage, economic feasibility, seed development, yield trials, tangible benefits, facility development and carbon footprint.

Juice Storage

Dennis Wiesenborn, professor of agricultural and bio-systems engineering at NDSU, researches ways to improve the storage life of beet juice by adjusting the pH level. The conventional method of effectively storing juice in the sugar beet industry is by adjusting it to a high pH (basic). Wiesenborn is more interested in storing the juice at a low pH (acidic). In the sugar beet industry, that is not an option. Beet sucrose at an acidic pH level hydrolyzes to produce undesirable glucose and fructose. For GVG however, hydrolyzing the sucrose is not a problem. "We are looking at fermenting the sugars to ethanol, where glucose and fructose are necessary in the first step of fermentation," Wiesenborn said.

In addition to improving the juice storage life, Wiesenborn is looking at the anaerobic storage of the whole beet. Converting beets to juice is a long process, meaning some of the beets will

be piled. Wisenborn hopes to avoid prolonged storage of beets in piles. "Storing beets in frozen piles causes the properties of the beet to change, which results in the loss of sugar," Wisenborn said.

Economic Feasibility

David Ripplinger joined NDSU's department of agribusiness and applied economics as a research assistant in early 2011. Ripplinger has focused on the business model, citing issues, and technology of getting the beet from the physical form to sugar.

GVG hopes plants will be operating by 2013. Ripplinger says the project is now entering Stage Two, and various concepts still need consideration, including getting farmers involved, marketing the ethanol, securing the EPA permits and producing the seed.

Ripplinger also considers life-cycle analysis, measuring the economic impact of producing ethanol from sugar beets. To conduct life-cycle analysis, Ripplinger said, "We have to consider what it takes for a farmer to produce it, how does it transport to the facility, and,



American Crystal Sugar Co. produces sugar from sugar beets. GVG plans to use sugar beets in a new way.

eventually, usage by the consumer." Ripplinger's research shows sugar beet ethanol has a smaller carbon footprint and produces fewer environmental emissions than corn ethanol. These are key components relating to federal policy and attracting government subsidies.

A challenge is that sugar beets have to compete on a cost basis and an agronomic basis with other North Dakota crops. Some critics say adding sugar beets to an operation's crop rotation will be costly to farmers; however, Ripplinger's financial analysis shows this is not the case. At the same time, many agronomic benefits exist: the

beet's deep tap root aids drought resistance, and sugar beets are a good fit into a rotation. Benefits of producing ethanol from sugar beets are "significant and widespread," Ripplinger said.

Seed Development

Creating sustainable seed varieties is imperative to the success of advanced biofuel. To ensure that seed is being produced, GVG recruited two prominent seed companies, Syngenta and Betaseed. They have established field trials across North Dakota to gather background and yield varieties. Data collected from the field trials are used for crop insurance purposes and to deter-

mine varieties most sustainable in North Dakota.

Seed companies need five to seven years to produce a new sugar beet variety. Since a large amount of testing and research goes into creating the seed, companies like Syngenta and Betaseed have to plan ahead for production. "Seed production has to meet demand," Betaseed technology manager Craig Talley said.

Yield Trials

A major objective of GVG's initiative is to determine the adaptation and potential of energy beet production in non-traditional production areas of North

Dakota. To help with this endeavor, GVG contacted Blaine Schatz, director of NDSU's Carrington, N.D., Research Extension Center, to conduct yield trials. The first formal effort to gather data began in 2010.

Results from seven yield trial environments across the state identify energy beets as an adapted crop. Schatz said the performance "exceeded what our initial anticipation was for energy beet performance." Now in the project's second year, various challenges have surfaced, including delayed planting. According to Schatz, regardless of the challenges, "the projection based off of observation is that we will have really respectful yields." He predicts the 2011 yields will be similar to long-term average dry land yields in the Red River Valley, which, in his opinion, would deem it a success.

Tangible Benefits

Ongoing yield trials show advantages to growing energy beets include positive economics, diverse crop rotation, and improved soil resource. Projections for potential yield levels and returns from the business plan "identify energy beets as a crop that would interject very positive economics into the farm enterprise," Schatz said. Energy beets would also add diversity to a producer's crop rotation, which typically benefits other crops in the rotation. As noted, one key difference energy beets bring to a rotation is a deep tap root. "A lot of the benefits we get excited about are tied to the deep tap root," Schatz said. According to Schatz, the deep tap root does a number of things to improve the soil resource. "It is going to use water deeper in the profile, which will reduce

saline seeps and elevated salt content in the soil. The resulting pore space also improves soil drainage."

Past research and soil samples have revealed pooled amounts of nitrogen and other nutrients deep in the soil. Traditional crops such as wheat, soybeans and corn cannot effectively use resources past three or four feet. However, energy beets are able to utilize these nutrients. "The rotational benefits tied to the root system are quite significant," Schatz said.

Carbon Footprint

An ultimate goal of biofuel development is to reduce carbon emissions linked to global warming. Cole Gustafson, NDSU professor and chair of agribusiness and applied economics, said energy beet production needs pesticides and nitrogen fertilizer.

Making these requires energy. As a result, a substantial amount of research focuses on reducing carbon emissions released growing energy beets for advanced biofuel. "We have to document all the carbon that goes into producing the energy beets, how much is released in the processing process, and how much carbon it takes to get the biofuel to urban consumers," Gustafson said.

The key to what GVG is doing to reduce the carbon footprint centers around the large number of rural facilities. "We are looking at trying to obtain our energy beets within a 20-mile radius of the plant," Gustafson said, which reduces the amount of trucking. According to Gustafson, "It all comes down to energy use and fuel."

Facility Development

GVG refers to itself as an architects for rural development. A goal of its project is to build 12 factories in rural communities across North Dakota. Each will need around 23 employees and is expected to produce 20 million gallons of ethanol per year. Helgaas expects construction of the first plant to begin fall 2012, with the first year of production in 2013.

The plants will be alike, which Helgaas says is a tremendous benefit. "The construction, training and operation of each plant will be identical. It's like having one big instruction manual."

The benefit for farmers joining with GVG is the investment opportunity. The hope is that the farmers would become part owners of the plant, similar to the original setup of Dakota

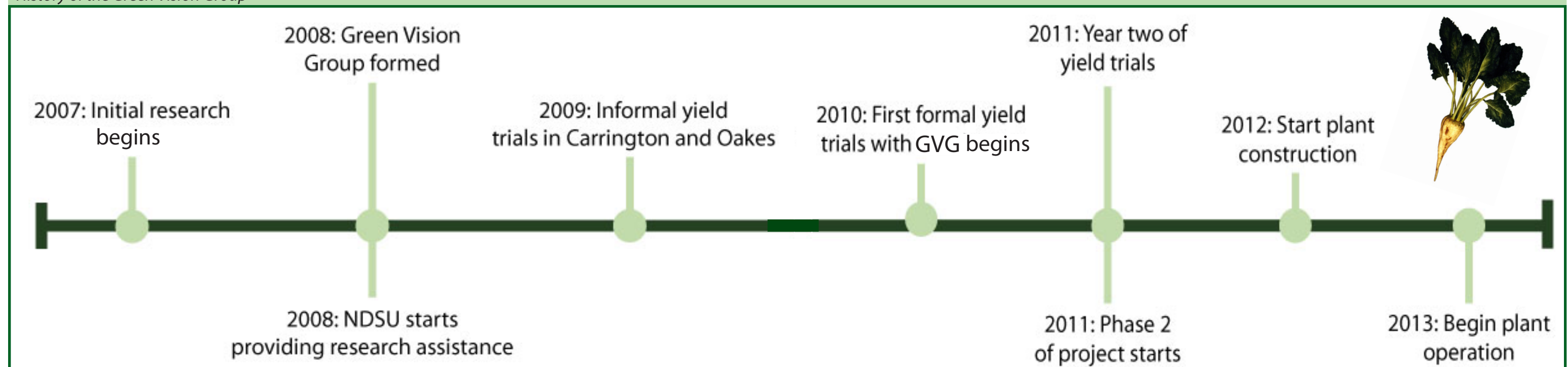
Grower's Pasta Company. "The return on investment is incredible," said Helgaas, estimating it to be between \$7-\$20 million.

Creating an advanced biofuel from energy beets in non-traditional areas of North Dakota is a large endeavor. Years of research and planning will be put to the test after the completion of the first factory next year. Rural communities will not be the only ones benefiting from the economic impact of the plants. Urban communities will also benefit from the advanced biofuel they will be able to use in their vehicles.

GVG is changing the way people think of advanced biofuels. Soon, GVG believes when the words "advanced biofuels" are mentioned, sugar beets will be as common of a response as corn or soybeans.



History of the Green Vision Group





WIND ENERGY AND EDUCATION MOVEMENT IN THE MIDWEST

By TYLER RESSLER

WIND ENERGY HAS MADE ITS WAY TO THE TOP OF THE UNITED STATES RENEWABLE ENERGY LIST. WILL FARGO-MOORHEAD JUMP ON BOARD?

Imagine your television, refrigerator, computer, lights, and everything you plug in being powered by fields of hundreds of wind turbines. For Fargo, N.D., and Moorhead, Minn., this could be reality in the near future, and an opportunity to create many jobs for North Dakota. Engineering professors in the region are now taking a closer look at wind turbine-generated energy in their classrooms to train their students in this new industry. Knowledge of wind technologies will boost output of non-fossil fuel energy not only locally in Fargo-Moorhead, but nationally.

Over the last decade, wind energy has made its way to the top of the list of ways the United States can “go green” with renewable energy. As production of wind turbines increase, so does demand for expert technicians. Higher education is responding with educational courses on wind energy development. In 2008, Lake Region State College, Devils Lake, N.D., started a wind power technician-training program. This program

responded to increased demand for turbine operation technicians as turbines expand throughout the country.

North Dakota State University is also building programs in wind energy education. Carl Pedersen, energy educator for NDSU's office of agriculture extension and biosystems engineering, said several different courses include education on renewable energy like wind turbines. For example, Biobased Energy addresses benefits, impact on communities, general costs compared to current resources, and conversion of the technology. Offering courses like this is one way NDSU is helping students to prepare for the possibility of wind energy technology growth in the Midwest.

"Going green is something that appeals to everyone, and wind energy is a good way to save," said Brent Warner, a senior studying engineering management. Offering courses on wind energy education is a great step toward the future.

The NDSU engineering department's increasing interest in green technology has sparked enthusiasm among students as well as professors.

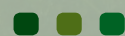
"[Wind energy technologies] are obtainable, but the biggest obstacle right now is the cost effectiveness of renewable energies," said Pedersen. He believes after surveying community needs and solving cost issues, Fargo-

Moorhead will be able to implement more wind technology. However, he does not see this happening immediately.

As NDSU considers advancing its education on wind energy, others are concerned with finding companies able to build this new technology locally and regionally. One popular builder of wind energy throughout the United States, currently working on a project near Rugby, N.D., is Iberdrola Renewables Inc. According to Iberdrola, construction of a wind turbine typically takes six months to one year. Iberdrola begins by testing the area to determine if it will generate enough wind to make the technology feasible. Technicians evaluate air density and land elevation, and calculate average wind speed and direction over a one-year period.

When a property deemed suitable for wind turbines, landowners are offered rent from the state as compensation. Wind turbine technology can be present on the land and yet not restrict landowners from daily field activities or grazing livestock.

The area around Fargo-Moorhead is mostly flat, so wind is an abundant resource. As the community considers partnerships with higher education and technical experts to tap their wind as an energy source, it could be taking one step closer to more sustainable living.



What Exactly is Corn Oil Extraction?

How does corn become fuel after harvest?

By AUSTIN RESSLER



Ethanol plant.

Countless fields of corn spread across the Midwestern plains. So why not reinvent and broaden the use of these crops in North Dakota? From paint and bar soap to cooking oils and biofuels, we use corn oil virtually every day.

Oil is found deep inside

kernels of corn. Each kernel has an outer layer called the husk, which acts as a shell. This husk is filled with a starch that contains what is known as the germ. Although small, the germ contains valuable oil, the key to creating biofuel.

Corn oil extraction is one of the most significant advance-

ments in alternative fuel development. Nearly half of all American ethanol plants are now producing corn oil, and on top of that, five of North Dakota's ethanol facilities are in the process of developing crops for biofuels. Tharaldson Ethanol, Casselton, N.D., is the nation's seventh largest ethanol plant.

Cole Gustafson, professor and chair of North Dakota State University agribusiness and applied economics, brings extensive knowledge of biofuels and biomass research to his

classes. Gustafson has won several teaching awards for his work. He said ethanol plants use two methods to extract oil from corn. The biggest difference between these two is the way kernels are initially treated. Wet milling softens the kernels for easier separation. To prepare, kernels are steeped in water. The second and most common process is dry milling. Workers grind kernels into flour and add water and enzymes. The next step for both methods is to cook the mixture and allow the corn oil to ferment and transform into ethanol.

The discovery of the benefits of using corn oil in biofuels continues to have a significant impact on the world. "North Dakota residents will benefit in more ways than one," Gustafson said. One of the greatest benefits of corn oil extraction is money saved. Biofuels create "a higher value product and give more value to consumers with

"North Dakota residents will benefit in more ways than one. [Biofuels create] higher value product and give more value to consumers with less cost."

—Cole Gustafson



less cost," Gustafson said. The future of biofuel in North Dakota looks promising, said Gustafson, because North Dakota has great potential to develop

new and improved crops for biofuels. North Dakotans will have greater opportunities and more access to biofuels as these technologies advance. ● ● ●

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A Public Relations Role in Ethanol Use

How local public relations firms are communicating agricultural changes

By LIZ SIENKANIEC

Alternative energy and agricultural companies are working to become more green, and want to promote their efforts locally and regionally. Public relations firms are faced with a mission of tailoring one message to multiple audiences. To generate greater attention to expanding agricultural programs, area PR firms “are learning to communicate to different audience segments with different messages that tie back to one common element,” said Colin Clarke, senior strategist for AdFarm, a Fargo, N.D.,-based regional public relations firm exclusively serving agricultural industries.

Energy efficient companies in the region are relying on the expertise of public relations and the news media to get the word out on going green. Public relations professionals such as those of AdFarm are being called on to educate and promote benefits of alternative fuels for both city

The North Dakota Ethanol Producers Association (NDEPA) focuses on ways to publicize new laws and companies’ response efforts

and rural people.

One regional company, the North Dakota Ethanol Producers Association (NDEPA), uses its own public relations staff to publicize new laws, and how companies are responding with efforts to develop biofuels. The association relies on public relations initiatives to share the most current information with area residents.

NDEPA’s formation six years ago was inspired by public relations needs. It was aimed at providing North Dakotans with information specifically designed to promote overall ethanol use and spread the benefits of alternative energy fuels. Partnering with the North Dakota Ethanol Council, the NDEPA discov-

ered in a state-wide study that a mere 21 percent of the auto industry had received formal training in the use of ethanol-based fuel. Based on this information, the NDEPA is implementing a comprehensive marketing plan to educate North Dakotans on the benefits of ethanol use.

State government has also lent support to biofuel publicity. For example, partnerships between North Dakota and alternative energy companies have publicized research and findings on ethanol fuel’s effect on air quality based on its use in 2001–2006 passenger vehicles.

Meanwhile, AdFarm combines public relations with agriculture as a subdivision of Fargo’s Flint Communications. AdFarm investigates effects of social media on perceptions regarding biofuels and other alternative sources of energy. “AdFarm brings an extremely high level of communications professionalism to a unique

industry like agriculture with insights, relevance and a deep understanding of the target audiences within agriculture,” Clarke said.

AdFarm also has a company-owned farm plot in North Dakota that grows a specific crop each year. This allows employees to have hands-on experience managing the field and learning the growing side of farming, choosing which crop to grow and market. “Some perceive that because of our strong focus on agriculture we don’t understand consumers,” Clarke explained.

But AdFarm staff believes its uncommon expertise in agriculture as consumers themselves gives them a clearer understand-



ing of both consumers and consumer marketing.

To some, the world of alternative fuels may generate an image of a secluded enterprise led by those in the fuel industries. Others envision a movement that is fast becoming the way of the future. Regardless, the partnership between agriculture

initiatives public relations campaigns helps fuel the movement among not only the industries and the farmers, but the regional public who will be the ultimate winners in a regional push to provide more alternatives to petroleum.

