Green Energy – Montana's New Cash Cow

Commissioner's Office, Montana Department of Labor and Industry

By Michelle Robinson

Montana is blessed with many natural resources that provide the opportunity to produce clean, green energy and products. However, as the fourth largest U.S. state, with a small, dispersed population, the state historically has focused its economy on producing agriculture and forestry products for export.

In January of 2006, Montana received one of the U.S. Department of Labor's three-year, $15 million Workforce Innovation in Regional Economic Development (WIRED) grants. In an initiative branded as Montana's Agro-Energy Plan, or MAP, the funding will be used to nurture an innovative, value-added bioproducts industry that will create globally competitive enterprises and high-paying jobs across 32 rural counties and six Indian reservations in eastern Montana.

Today, much of the production of farmers and ranchers in central and eastern Montana is commodity-based. Montana is a leader in producing goods such as wheat, barley, alfalfa and cattle, and has always been a large exporter of these products to other states and countries. Value typically is added and captured outside of the state.

Government and industry leaders realize that in order to become globally competitive, Montana must embark on an aggressive effort to manufacture more value-added products derived from its rich agricultural resources. MAP is the spark needed to ignite the fires of prosperity and partnerships in the biofuels industry.

"We have the nation's largest reserves of coal, some of its best wind resources and the capacity for a strong biofuels industry," says Montana Governor Brian Schweitzer. "Proper development of Montana's resources can play a vital role in helping the nation meet the target of 25 percent renewable energy by the year 2025," he said, referring to a vision set by the 25x'25 Alliance and endorsed by Montana and many other states.

Planting the seeds of economic prosperity

The state, with assistance from consultants New Economy Strategies and Goodfellow Agricola, is currently focusing its efforts on bioproducts and biofuels as components of a new "carbohydrate-based, bio-agriculture" economy. In this strategy, plants are used as the primary materials in the production of chemicals, construction materials and energy.

From seed to shelf: Montana produces a variety of crops that are being converted to fuels, lubricants, animal feed and many other uses.

Sometimes touted as a modern phenomenon, bioproducts actually have a long history. The carbohydrate basis for production of materials proliferated well into the 20th century, but declining access to raw materials (e.g., Japanese control of Asian rubber plantations in World War II) and inexpensive oil prices in the mid 1900s led to a shift from carbohydrates to hydrocarbons (such as petroleum-based plastics) as the primary raw material of manufactured goods. Modern technology certainly has impacted the economic viability and technological possibilities of carbohydrate-based manufacturing. However, many modern and familiar materials, such as diesel fuel and even plastic, now can be produced economically from plant sources.

One of the greatest benefits of Montana's geography is its ability to produce feedstock for the biofuel and bioproduct industry. Bioproduct and biofuel development requires a special understanding of individual feedstocks, technologies and other practical considerations. Unique characteristics of each crop dictate applications for which it is best suited. Those applications impact technical and economic aspects of

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bioproduct and biofuel production and sales. In addition, the byproducts emerging from waste streams in the process are important to the economic viability of bioproduct and biofuel production.

To bridge the gap between typical workforce development training and economic development, the Montana Department of Labor and Industry has allocated MAP funds to the Department of Commerce, the Office of the Commissioner of Higher Education and the Department of Agriculture for re-granting. Grants are used to fund bioproduct business training assistance, job training programs and curriculum development.

Miles City Community College (MCC) has developed a first-of-its-kind community college bioproduct curriculum in partnership with Native American tribal colleges, including Stone Child College (Chippewa Cree), Fort Belknap College (Gros Ventre and Assiniboine), Fort Peck Community College (Sioux and Assiniboine), and Chief Dull Knife College (Northern Cheyenne).

"Our collective goal is to provide skilled laborers for the fields of bioproducts," says Kristin Gustad, MAP grant project director at MCC.

Another grant recipient is Sustainable Systems, LLC of Montana, which currently produces oil for sale in food-based markets. "We are networked with approximately 400 agricultural producers who rely on us as a market for their oilseed crops," says company president Paul Miller. Sustainable Systems is currently expanding its oilseed crushing plant capabilities to 600 tons per day and doubling its workforce over the next 12 months just to keep up with the growing demand. "We are working with educational institutions and our farming communities to identify workers that wish to pursue a sustainable economic model of agricultural processing," said Miller.

Fuel of possibility

Montana also has abundant forest resources that can be converted into bioproducts and biofuels, and coal and gas resources that can be mixed with biofuels or other bioproducts. Montana is particularly well positioned to participate in the growing market for biodiesel, which can be readily substituted for common diesel in trains, trucks, farm equipment, generators and cars with diesel engines.

Montana State University-Northern is a leader in the biodiesel industry. MSU Northern has the only four-year diesel program in the nation with an extensive diesel engine testing suite capable of monitoring performance changes in real time. In addition, the program boasts that each of its forty students gets ten job offers on average upon graduation. Future efforts aim to strengthen linkages with industry, expand the biodiesel program, and explore new partnerships with national leaders such as the National Renewable Energy Laboratory in Denver.

Montana is focused on biodiesel because of the many advantages it holds over ethanol. Biodiesel has a less complicated manufacturing process, does not require engine retrofitting, and can be transported in existing petroleum tank trucks and pipelines. (In contrast, ethanol has special handling requirements and cannot be transported in pipelines.) The market for biodiesel is growing and even making inroads for fleet-wide adoptions by the federal government. Yellowstone National Park is adopting 100 percent biodiesel in all its vehicles and generators, and other national parks are following the trend.

Farmers Brett Earl and Logan Fisher envisioned a business to manufacture biodiesel from oilseeds grown near their hometown of Chester, Montana. Earl earned a degree in chemical engineering, while Fisher holds a degree in business administration. Their combination of lifelong farm experience and advanced education fueled the vision.

For technical assistance, they approached Bear Paw Development Corporation in Havre, the site of one of four newly created Bio-Product Innovation Centers. Bioproduct Innovation Centers are co-located within four regional economic and community development organizations – Bear Paw Development Corporation, Great Northern Development Corporation, Beartooth RC&D and Snowy Mountain Development Corporation – to provide customized training and technical assistance to owners of existing businesses, entrepreneurs evaluating new business opportunities and cooperatives pursuing bioproduct and related value-added agriculture business opportunities.

Bear Paw's Brandi Beecher helped develop the Earl-Fisher Bio-Fuels business plan and funding proposal for the Montana Department of Agriculture's Growth Through Agriculture funding program. Earl-Fisher Bio-Fuels started up in April 2007 with production capacity of 100,000 gallons per year and expansion plans for 1 million gallons of capacity and 10 full-time employees.

"We feel that growing oilseed crops locally, producing biofuel locally and consuming biofuels locally will be a key component to enhance Montana's rural economy and create sustainable jobs," says Earl.

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Despite the promising outlook, hurdles remain before biodiesel production becomes a major component of the Montana economy. Studies have shown that biodiesel has different cold flow performance depending on the feedstock used. To address this, researchers at MSU-Northern are currently testing the cold flow properties of fuels from different feedstocks and the effects of various additives.

Gearing up Montana's economic engine

Beyond biodiesel, biolubricants may prove an even greater opportunity for Montana, as they are higher-value products that are less sensitive to the higher distribution costs associated with remote areas. Bio-based lubricants and hydraulic fluids have superior performance relative to petroleum-based alternatives in many applications and are favored for their biodegradability, making them the product of choice in sensitive environments.

Several research efforts are under way to develop bio-based hydraulic fluids and lubricants (such as crank case oil and a spray lubricant similar to WD-40), and a number of companies are selling these products. Apart from these, the following bioproducts or techniques currently are in research and development or being sold by companies:

- Development of TKS (Russian dandelion) for bio-based rubber and products
- Glycerin as a compost accelerator
- Camelina as a source for biodiesel and oil production, food for both animals and humans, and limitless byproduct opportunities
- Gluten-free crops
- Plant-based pharmaceuticals
- Development of bacillus-based biological agents for controlling plant disease
- Research on new equine products and feeds
- Bio-based products for highway anti-icing operations
- Omega-3 products from goats and dairy cows
- Bio-based coating systems to protect metals from corrosion
- Evaluation of multiple oilseed genetic lines for value-added oil yield and quality characteristics
- Parameters critical to ethanol production from Montana small grains

A range of support

Montana has numerous additional programs and assets that support bio-based businesses:

- The Montana Biotechnology Center at the University of Montana fosters biotech-related research and development within the university, and technology transfer to public and private institutions across the state.
- Montana Manufacturing Extension Center (MMEC) provides technical, business management and engineering assistance and training to the value-added agricultural business community. MMEC plans to launch BQ-9000 certification training, a quality assurance program for biodiesel producers and distributors. "Not only will this be extremely valuable to biodiesel producers, it will fill the void of quality systems training in this field," says MMEC field engineer Jim Haider.
- Montana State University's Biobased Institute conducts research to improve the profitability of Montana agriculture through enhancement of current production and development of new value-added applications and products.
- The Montana Extension agriculture and natural resources programs apply university research and resources to help Montana growers and landowners increase profits, reduce loss, protect our food supply and sustain future resources.
- The TechRanch in Bozeman is an incubator for high-technology companies at Montana State University.
- The Montana Bioscience Alliance in Billings focuses on promoting research, building and supporting professional networks, extending education and training in bioscience disciplines, and creating pathways for biotechnology commercialization.

"Montana has multiple advantages aside from being the last best place. We have a multitude of available natural resources," says Montana Labor Commissioner Keith Kelly. "By developing our energy resources, we are well positioned to become a national player in sustainable energy production and a model for rural energy development."

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For more information, visit http://dli.mt.gov/wired/wired.asp, or contact Adam de Yong, WIRED MAP Project Director, Montana Department of Labor and Industry, at (406) 444-3662 or adeyong2@mt.gov.