

Bioproducts for Economic Expansion



What's the Situation?

Agriculture is one of Michigan's top industries. The state's agricultural/food system -- crops and livestock, leather, food processing, floriculture/ornamentals/turfgrass and biomass energy industries -- **accounts for \$60.1 billion in total economic activity (direct and indirect) and more than 1 million jobs.** Agriculture generates more than \$35 billion in direct economic activity. Michigan also has one of the most diverse agricultural industries in the nation. The state is second only to California in variety of crops grown. At the same time, Michigan has a strong manufacturing base and is a leading producer of automobiles, pharmaceuticals, chemicals, food products and furniture.

For Michigan and researchers at MSU, the possibilities to expand ties between industry and agriculture go far beyond alternative energy. **The state is uniquely positioned to build a new biobased economic sector upon the existing foundation of agriculture, forestry and natural resources, and industrial and manufacturing sectors.** The result would be the advancement of a new, sustainable biobased sector that will provide a competitive advantage in meeting the growing global demand for renewable sources of materials, chemicals and energy in products, processes and packaging. The Michigan Agricultural Experiment Station (MAES) and Michigan State University Extension (MSUE) have the research, education and outreach capabilities to partner with other MSU units and with other Michigan universities to drive Michigan forward to achieve this goal.

During her State of the State address, Gov. Jennifer Granholm announced **plans to invest in alternative energy research through the 21st Century Jobs Fund** and singled out MSU President Lou Anna K. Simon as a university president who would lead the way in such efforts.

President Bush announced a **commitment to invest in alternative energy sources** during his State of the Union address. The government is investing in alternative energy research, and Michigan is being recognized as a major area of opportunity. Funds from a recent grant to Michigan will be used for education, job training and alternative energy research, including fuel cell development.

Sampler of Success

MSUE and the MAES are working to make Michigan a leader in the new economy by developing, improving and educating about bioproducts for economic expansion. A few MAES and MSUE successes that affirm our capacity include:

- MAES chemical engineering researchers developed a patented pretreatment process that **makes the breakdown of cellulose 75 percent more efficient.** Breaking down cellulose into fermentable sugars is the first step in creating bioproducts such as ethanol, biodegradable plastics and other industrial chemicals.
- MAES researchers are developing a continuous production process for biodiesel. The current batch process is expensive and labor-intensive. The **new continuous process will be more efficient and cost-effective, and it will have environmental benefits,** fewer waste byproducts and higher purity byproducts that can be used to make other chemicals.
- MSUE educators helped the board of the farmer cooperative for Michigan Bio-Diesel, L.L.C., ensure that the bio-diesel plant will be **based in Bangor, Mich., rather than Fremont, Ind.** The plant, scheduled to open in June, will start producing 10 million gallons of soybean-based diesel fuel annually. It has the potential to produce upwards of 40 million gallons per year.
- MSUE educators worked closely with the MSU Product Center for Agriculture and Natural Resources to create the business plan for Michigan Bio-Diesel, L.L.C. The plan calls for **22 employees** – half will be degreed professionals; the other half will be experienced plant operators. The resumes the farmer-owned board has received to date indicate that **people from the local area will fill all of these new jobs.** In addition, numerous other affiliated jobs will spring up, bringing **the total economic impact of this plant to nearly \$95 million.**

A Few More Successes

- MAES researchers helped start Diversified Natural Products (DNP), a company in northwestern Michigan that is using MSU biotechnology research to make new biobased products. The company has two divisions – biobased fuels and chemicals, and gourmet and nutritionally enhanced foods. The unifying theme is agriculture-based biotechnology that harnesses readily available natural resources. One of the company's first products is exotic specialty mushrooms, including the elusive morel. This is the first time morels have been mass-produced indoors. The company is selling 2 tons of mushrooms per week and expects to sell 800,000 pounds of fresh mushrooms per year. **DNP so far has brought 56 jobs to an area hard hit by business closings and layoffs.**

DNP's biobased fuels and chemicals division produces succinic acid from "green" sources. Global demand for succinic acid is enormous — its used in everything from industrial solvents and biodegradable polymers to airport runway deicers. DNP makes succinic acid from natural sugars derived from sources such as Michigan corn.

Fifteen of DNP's patents have sprung from MAES researcher Kris Berglund's research.

- MSUE helped establish an ethanol plant in southeastern Michigan. The **plant employs 35 high-wage workers, indirectly employs an additional 135 people** and produces 45 million gallons of ethanol per year. The overall **economic impact is \$75 million per year.**
- MSUE helped sponsor Biodiesel Day in September 2005. Farmers were able to obtain the B99.9 fuel that they use to create B20 diesel for non-road vehicles. The **B20 soy diesel**, which is 20 percent biofuel and 80 percent petroleum, **allows farmers to comply with the 2006 Environmental Protection Agency (EPA) mandate that established low sulfur requirements in diesel fuel for off-road use.** The 2002 Farm Bill and the 2005 Energy Bill provided government incentives to produce renewable, biobased fuels to reduce dependence on foreign oil. These incentives allow biodiesel to compete economically with petroleum diesel. Capital Area Productions, a central Michigan farmer-owned

cooperative, received a \$24,500 grant from the U.S. Department of Energy and the Michigan Department of Labor and Economic Growth to purchase tanks and equipment to handle biodiesel.

- MSUE and the Michigan Department of Environmental Quality hosted the "Harvesting Clean Agri-Energy Conference" in Saginaw. This conference linked agricultural communities with energy opportunities. Agenda topics included biogas digesters, saving and generating dollars through renewable energies, and utilization of biofuels and bioproducts. The goal of the conference was to **form a cohesive Michigan agri-energy strategy that will lead the agricultural industry to adopt energy efficient technologies and management practices** that reduce production costs, minimize negative environmental impacts and improve economic sustainability.

Selected Goals to Build Michigan's Future

- Working with researchers across the MSU campus, the **MAES will create a biorefinery for testing concepts, developing applications, creating prototypes for the bioproducts industry**, training the growing work force, and spurring innovation and engineering of next-generation bioproducts equipment and technologies.
- **MSUE and the MAES will connect Michigan industries with the research, education and entrepreneurial activity** needed in the basic sciences, engineering, plant science and agriculture to provide the state with a foundation for vigorous development of a new biobased economic sector. For this sector to be successful, the bioeconomy must stretch far beyond the well-known potential for ethanol production. A **bioeconomy for Michigan centers on the broad diversity of crops that can be processed into industrial materials, fuels and chemicals. This new economy will yield new businesses, jobs and intellectual property in Michigan.**

For more information:

Thomas G. Coon, director, MSU Extension (517-355-2308 or msuedir@msu.edu)

Steven G. Pueppke, director, Michigan Agricultural Experiment Station (517-355-0123 or maesdir@msu.edu).