TESTIMONY OF DENNIS HALL, ASSISTANT DIRECTOR,
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BEFORE THE U.S. SENATE
COMMITTEE ON AGRICULTURE, NUTRITION & FORESTRY
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Chairwoman Stabenow, Ranking Member Roberts, and Members of the Committee, thank you for the opportunity to speak with you today. It is a privilege to come before you to discuss the exciting potential of bioproducts and biobased manufacturing.

For the past 6 years, I have served The Ohio State University as the Assistant Director of the Ohio Bioproducts Innovation Center (OBIC). OBIC was established in 2005 as an economic development organization with the mission to accelerate commercialization of polymers, specialty chemicals, and advanced materials made from renewable biobased feedstocks. OBIC connects technology development in Ohio's agriculture industry to specialty chemical, polymer, and advanced materials industries. Farmers, rural communities, and agricultural businesses, and ultimately all consumers, benefit from new markets for commodities. In addition, the polymer, specialty chemicals, and advanced materials industries gain from development of innovative new feedstocks and materials. And that means jobs.

OBIC has a history of successfully providing technical and commercial assistance to economic development projects in Ohio by connecting its network of academic, industrial, and farm, chemical, and polymer organizations. The Center has developed nearly a dozen bioproduct clusters involving supply chain members, researchers, and policy-makers to produce bio-based products such as soy-based thermoset resins, natural fibers and fillers for composites, and anaerobic digestion of biomass wastes. Awarded $9.6M in capital funds and $1.9M in operating funds from Ohio Department of Development (ODOD) in 2005, OBIC has since leveraged that investment by assisting 60+ collaborators in obtaining over $100 million of supplemental funding to drive program activities. For example, the NFCC/OBIC partnership has so far created or retained 10 jobs in the Ohio supply chain while 12 new jobs and $3 million in revenue are expected by the end of 2012.

**More OBIC Success Stories**

I want to tell you about some of the really cool products that you will begin to see or have already used, but did not realize they first came from someone's farm or ranch.

- Ohio is very proud of a recent start-up company known as Nutek that has developed a complete line of cleaning and lubricant products from soybeans

grown in northwest Ohio.

- If you have seen a late-model John Deere combine or tractor, the green hood and panels are made from a soy/corn composite material manufactured by Ashland Specialty Chemical with headquarters in Dublin, Ohio.
- A new plastic material that is infused with natural fibers is being marketed in construction products and been prototyped for several auto parts.
- And we have another start up company that is processing swine manure into an asphalt substitute that will be used in the manufacture of shingles and other roofing materials.

The key point in all of these examples is that we do not have to bury biomass deep in the Earth and let it cook for a couple thousand years in order for it to be useful to us. We are able to harvest these valuable chemicals today from plants grown on American farms.

Ohio has made bioproducts development an area of strategic importance. We did this because Ohio's number one industry is agriculture and the State is ranked first in the nation for employment in the polymer industry. The nexus of these two industries—where agriculture and the polymer industries meet—is the area where there is untapped potential and an opportunity for innovation and significant economic growth. The economic benefits of biobased products go beyond creating good manufacturing jobs throughout the country. Manufacturing value-added products that utilize biobased adhesives, cleaners, composites, paints, plastics, and rubber also creates new market opportunities for farmers who grow commodities and are interested in diversifying into new types of feedstocks while simultaneously making better use of existing and abundant biomass resources that go to waste today.

**Why Bioproducts?**

Research and development efforts to create new supply chains to replace high value petrochemicals have been launched across the country to satisfy future material demand. Reasons for these initiatives include a new source of income to the agricultural sector, innovations emerging in ag-biosciences, consumer demand for environmentally friendly products, and perhaps most significantly, risk management of price volatility and supply availability of oil-derived feedstocks. In 2008, interest in biobased materials was especially keen as oil hit $146/ barrel.

From a public policy perspective, Ohio identified bioproducts as a strategic area of emphasis because of a) market pull from Ohio's more innovative polymer and advanced materials companies, b) existence of critical mass and portions of the entire supply chain within the state's borders, and c) value-added opportunities associated with specialty chemicals and advanced materials. Consider the current use of oil in the U.S. and the relative value of specialty chemicals compared to transportation fuels. According to the U.S Department of Energy, Americans use 70% of our oil for transportation fuel at a total value of $385 billion. In contrast, we

only use 3.4% of our oil consumption for specialty petrochemicals, but at a value nearly equal to that of transportation fuel, $375 billion, or 22 times higher on a per share basis. Production of value-added materials is a source for significant increases in jobs across the supply chain, but especially in the production and pre-processing of biomass resources in rural America.

Individuals are often surprised by some of the innovative biobased materials that corporate and university researchers have identified. For example, a start-up company in Ohio with assistance from OBIC is commercializing a new process to convert swine manure to an asphalt supplement for road and roofing applications. Another OBIC start-up is commercializing a proprietary process to compound natural fibers for composites as an alternative to fiberglass with the benefits of lower cost, lighter weight, and comparable performance. OSU researchers are domesticating a new plant, Taraxacum kok-saghz, or commonly known as Russian Dandelion, as a novel source of high-quality natural rubber.

**The Challenge of Commercialization**

As exciting and promising as these ideas are, progression through the stages of technology commercialization from concept to established market can have multiple barriers with some of the largest occurring at the pre-commercialization phase.

Large investment of resources for infrastructure, supply chain development, prototype demonstration, scale-up, or market analysis is often necessary.. Obtaining capital at this stage in the process is difficult and an area where government resources can make a profound difference.

Corporate leaders have identified that obtaining pre-commercial quantities of biobased materials for product testing and development is their top priority (Hall 2007),. What is difficult is determining who should pay for these materials. The start-up company often lacks financial resources necessary to provide these materials to interested customers. Potential customers of these novel materials typically consider the risk of paying the full cost of producing pre-commercial quantities greater than the potential gain of finding a material that it will out-perform products from existing suppliers. This barrier is generally referred to as the "Valley of Death" as technologies often struggle to survive this challenge.

New biobased technologies can be extremely beneficial to our country's economic growth and long-term stability. Traditional venture funding for biobased chemicals and polymers may require demonstration of commercial scale production before agreements are made to invest. Crossing that "valley" can require more than one bridge (Scharfenberger 2011). To span this gap financially, multiple support systems are needed including public and private (venture capital) funding as well as operational support that can be provided by economic development centers. These support systems provide the information that potential investors require to help take that product to market.

The creation of corporate networks and geographic clusters can also catalyze biobased technology commercialization because they increase productivity making companies more competitive (Porter 1998). Establishing these new biobased ecosystems can be a slow process and require entities to reach out to new partners. This can be hindered by geography, policy, or lack of resources. A neutral third-party such as an economic development center whether linked to a university or other entity, can lower these barriers by creating information-sharing networks. OBIC has served this function in Ohio since 2005.

**Model Programs to Address These Challenges-**

USDA has several programs that can make a difference in the area of bioproducts, but in most cases they are either substantially underfunded or need to be modified. Small and medium sized companies need assistance in validating their business case and lessening the risk to future investors.

A great program that has helped several products make it to market is the Biomass Research and Development Initiative (BRDI) jointly administered by USDA and DOE. In 2009, 800 pre-proposals were submitted for 22 grant awards. The following years, many worthy programs did not bother to apply because of the low chance of winning and applications have fallen to 320 pre-proposals with 8 awards in 2010 and 240 pre-proposals in 2011 (awards have not yet been made for this year's applicants). OBIC has collaborated on one of the successful awards and we see this as an excellent program, but have been hesitant to encourage applications due to lack of awards commensurate with the program demand.

The Biorefinery Assistance Program (Section 9003) and the Rural Energy for America Program (Section 9007) are model programs with two problems that limit their utility for bioproducts. The first is that their focus is solely on advanced bio-fuels (9003) and energy (9007) and they miss the opportunity to target high value bioproducts. Second is the paradigm of rural economic development, not agricultural economic development. Many great alliances can be created between rural communities where biomass feedstock development and preprocessing can occur in collaboration with chemical compounders and manufacturers who are located in an urban setting.

We are very excited about involvement in the Northeast Bioenergy and Bioproducts Professional Development for Educators project headed by Cornell University and funded through a USDA grant in sustainable bioenergy. This program will provide training for sixty-six educators annually through six sites giving teaching tools necessary to inspire students in science, technology, engineering, agriculture and math career paths and help lead future generations in the emerging bioeconomy.

**Closing-**

In the Feature Commentary of the Winter 2009 issue of Industrial Biotechnology, Kevin Jarrell of Modular Genetics (Jarrell 2009) articulates a new era in sustainable chemistry. Building off the revolution in chemical production that occurred between 1930 and 1960 by adding the new tools of biotechnology, Jarrell suggests that as many as 50,000 new products collectively worth roughly $1 trillion is achievable.

As society wrestles with the ongoing challenge to lessen our dependence on petroleum, the question becomes what percent of that $1 trillion industry will be manufactured in the United States? And how many jobs can we create and retain? The current trend of chemical manufacturing moving to other countries is attributed to the lower cost of producing commodity chemicals in these countries, but it does not have to be that way. The U.S., a land that is home to great scientists and industry, prime farmland, beneficial climate, and abundant water resources, has the opportunity to stake its claim on a sustainable system of novel products and accelerate efforts to make that challenge another great American success story.

Thank you again Chairwoman Stabenow, Ranking Member Roberts and Members of the Committee for allowing me to speak with you today. I applaud your leadership as you continue your work to support the nation's rural communities. I look forward to answering any questions.

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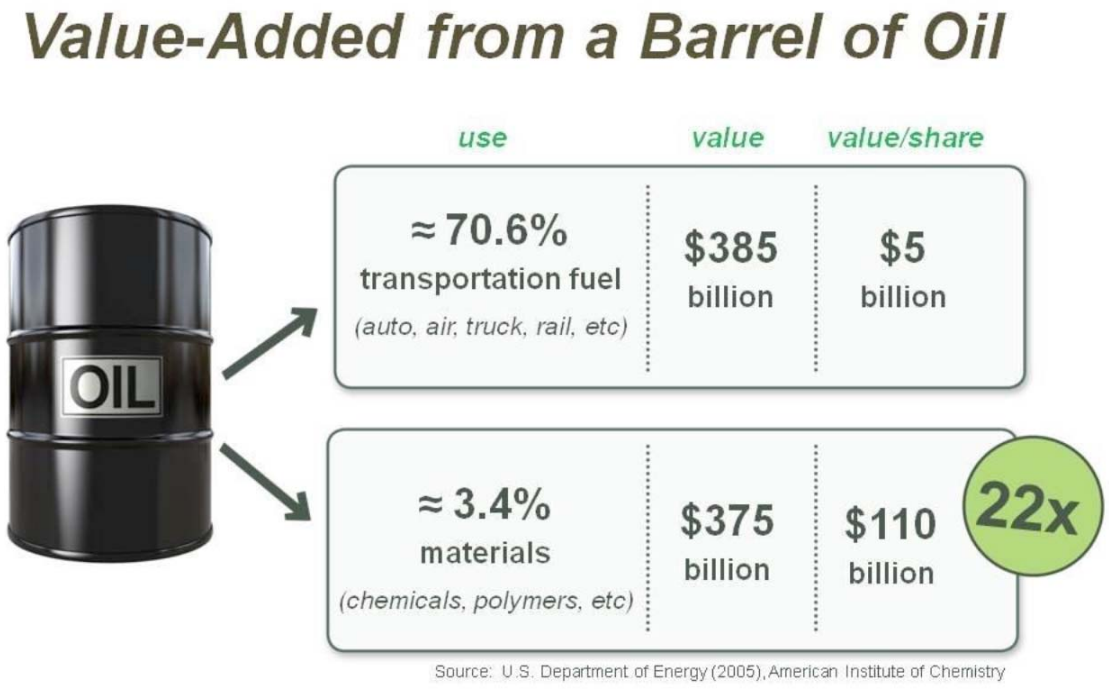
Appendix


Value-Added from a Barrel of Oil
use
value
value/share
≈ 70.6%
transportation fuel
(auto, air, truck, rail, etc)
$385
billion
$5
billion
OIL
≈ 3.4%
materials
(chemicals, polymers, etc)
$375
billion
$110
billion
22x
Source: U.S. Department of Energy (2005), American Institute of Chemistry