

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Bio-based Non-Food Value Chains-OARDC Led

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
511	New and Improved Non-Food Products and Processes	0%		100%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2009	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	0.9	0.0
Actual	0.0	0.0	1.9	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	138500	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	93442	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Faculty working in this program are found in all academic programs within the College of FAES. Much of the extramural funding is coordinated through the College's Ohio Bioproducts Innovation Center that has received ten plus million dollars in state Third Frontier Grants. This Center provides a key linkage between the state's two largest industries..... agriculture and polymers. This Planned Program is model for public - private enterprises and is central to a new business incubator park on OARDC's Wooster Ohio campus. The first major installation in the park is a bioenergy business that will turn waste into energy to be used on that campus. Faculty in this Planned Program have conducted numerous basic and applied research projects, as noted in the CRIS reports, and published in peer-reviewed journals, and in all types of other media from social networks to on-line trade journals and extension publications. As a matter of routine practice OARDC faculty, staff, and administrators in this, and in all Planned Programs, work in partnership with business, industry, government, NGOs, commodity groups, and other stakeholders on a daily bases. They are as committed to development, as they are to the research element, insuring that research is moved into society to create new products and services, jobs, economic activity, and overall, improve social well - being. Where complementary extension activities occur they are reported with the appropriate sections.

2. Brief description of the target audience

Targeted audiences include: business and industry that have expressed a need for biobased product information that is to be

derived through new research, extracted from on-going research, or is derived from scientific literature; other stakeholders, with particular focus on consumers; fellow academic units that partner with program scientists to create systems and processes needed to support not only the research, but also the adoption of the research findings by industrial partners; fellow agencies or support organizations who will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change; populations who have not requested the information but will likely benefit from that information, e.g. general public; other scientists and scientific groups; political entities; extension personnel; students from middle school to post doctorate studies; and news organizations.

V(E). Planned Program (Outputs)

1. Standard output measures

2009	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2009

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2009	Extension	Research	Total
Plan	0	4	
Actual	0	6	6

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Commercialized products and processes will be tracked

Year	Target	Actual
2009	0	0

Output #2

Output Measure

- Number of patents will be tracked

Year	Target	Actual
2009	0	0

Output #3

Output Measure

- Number of peer-reviewed journal articles will be tracked

Year	Target	Actual
2009	4	7

Output #4

Output Measure

- Number of graduate students completed.

Year	Target	Actual
2009	0	0

Output #5

Output Measure

- Commercialized products and processes will be tracked

Year	Target	Actual
2009	0	0

Output #6

Output Measure

- Total number of OARDC sponsored communication products/efforts,excluding peer reviewed publications, will be reported
Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Programs in this area will develop strategies to engage and include producers, industrial partners, and consumers groups over a 5-year period resulting in effective leadership-oriented partnerships.
2	The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand.
3	Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.
4	Maintain an ongoing needs assessment program to identify yet to be determined needs of society for bio-based products as crude oil and natural gas supplies decline, as well as assessing impacts from other external factors.
5	By 2011, and one each five years thereafter, the program will contribute at least one alternative to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.
6	Support, through research, the building of biobased development that annually, beginning in 2011, utilizes Ohio and the region's plentiful supply of biomass, including waste steam materials in such manner as to improve the economy.
7	Support, through research, the building of biobased development that annually, beginning in 2011, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.

Outcome #1

1. Outcome Measures

Programs in this area will develop strategies to engage and include producers, industrial partners, and consumers groups over a 5-year period resulting in effective leadership-oriented partnerships.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

BIO-BASED INSTITUTION: Institutionalizing new long term initiatives requires a substantial investment in time, money, personnel, and organizational commitments. OARDC and the larger business and government community committed to research innovation in bio-based products in 2005.

What has been done

In 2005 the Ohio Bioproducts Innovation Center (OBIC), founded at OARDC, was created to bring together various parties to address creation of bioproducts, including bioenergy, as a replacement for petroleum based products. OBIC has brought together two of the largest industries in Ohio, respectively, agriculture and polymers, with substantial state support. OBIC's mission is to position Ohio as a leader in economic development based on the utilization of bio-derived materials and products.

Results

The five year impact of OBIC is the creation of an institution that is highly interdisciplinary, highly integrated linking business, industry, government, and academia throughout Ohio to advance bioproducts research and development. Within the first five years, OBIC has received \$11 million dollars in funding, with an additional 2X match from alliance members, with over \$71 million dollars leveraged. OBIC Board of Directors and partners truly represent all related business/industry sectors in Ohio; OARDC serves as OBIC's home institution and managerial center.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

The program will build scientist/stakeholder cores to guide/provide biological, chemical, physical, engineering, and social research necessary to create new and improved processes and products commensurate with demand.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

SUSTAINABLE ENERGY: As worldwide crude oil supplies are depleted, prices increase, and the US becomes less energy independent, new biobased sources are needed.

What has been done

In response OARDC scientists have developed an innovative (patent-pending) integrated technology known as iADs. The system is called "integrated" because it combines a liquid biodigester that processes wastes such as manure and sewer sludge and OARDC's "solid-state" digestion technology that allows for the production of methane from various sources of cellulosic biomass, e.g. yard trimmings and crop residue. A partner industry, with support from Ohio's Third Frontier fund will demonstrate iADs technology at its flagship biogas facility at OARDC's BiOhio Research Park in Wooster, Ohio. The integrated system will be able to process over 30,000 wet tons of biomass annually with 750 kW generation capacity. Energy will be supplied to the Wooster campus .

Results

OARDC scientists have developed an integrated anaerobic digestion system dubbed iADs, which can cost-effectively produce clean energy from both solid and liquid organic wastes through anaerobic digestion - a process in which microorganisms break down organic matter and yield biogas, in the absence of oxygen, inside a biodigester. Biogas can be used to generate electricity and thermal heat; it can also be cleaned, separated and dried to produce natural gas, or compressed to fuel automobiles (compressed natural gas, or CNG).

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Annually the program will report, in conjunction with industrial partners, non-proprietary research gains made to the consuming public to garner interest in adoption of new products and processes when released.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Maintain an ongoing needs assessment program to identify yet to be determined needs of society for bio-based products as crude oil and natural gas supplies decline, as well as assessing impacts from other external factors.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

By 2011, and one each five years thereafter, the program will contribute at least one alternative to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Support, through research, the building of biobased development that annually, beginning in 2011, utilizes Ohio and the region's plentiful supply of biomass, including waste steam materials in such manner as to improve the economy.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2009	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

NEW BIOBASED PRODUCT: Wastestreams from bioprocessing are problematic in terms of environmental impacts, and in terms of economic losses due to the cost of disposal and the loss of economic gain from the byproduct. Two byproducts of concern to the soybean industry are glycerin and soybean straw. Biodiesel processing yields a crude glycerin wastestream. Likewise soybean straw often ends up in the waste steam.

What has been done

An innovative liquefaction and foaming process was developed at OARDC for polyurethane production from crude glycerin (byproduct of biodiesel process) and soybean straw. The liquefaction and foaming conditions were optimized to obtain high quality foam with the required strength and R- value for insulation.

Results

OARDC scientists have worked with the Ohio Soybean Council and an Ohio-based biodiesel plant to turn soybean straw and various soybean-processing byproducts into polyurethane foam used to make products such as insulation and packing material. The polyurethane foam that is biodegradable, heat resistant, and performs as well as petroleum-based foam. The patent for this technology has been filed and a one year option agreement was assigned to an Ohio energy company.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #7

1. Outcome Measures

Support, through research, the building of biobased development that annually, beginning in 2011, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (Supply and cost of crude oil, extramural funding; federal/state base funding)

Brief Explanation

Supply, costs, and demand for petroleum products, and shifting projections of world reserves of crude oil and natural gas, as well as U.S. access to these, are critical external factors. Availability of biobased raw products in Ohio, and regionally, and at what costs are external factors. Economic shifts such as cost of processing equipment or production costs, public policy shifts, regulations, and shifts in demand impact outcomes. Product trends/fades, advertising agendas, and public perceptions to areas such as to petroleum reserves, are also external factors that affect outcomes. Internal factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that often exceed resources, are affecting outcomes.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

Evaluation Results

Key Items of Evaluation