

BRINGING KNOWLEDGE TO LIFE



OHIO AGRICULTURAL RESEARCH
AND DEVELOPMENT CENTER

2010 Annual Report



<http://www.oardc.osu.edu>

OARDC LEADS THIRD FRONTIER PROJECTS

Focus on advanced bioenergy and bioproducts provides solutions, creates jobs

The Third Frontier is Ohio's economic development initiative to build a world-class research capacity, to support the development of new products, and to finance advanced manufacturing technologies which help industries become more productive. Every Third Frontier grant is matched and leveraged with industry collaborators.



\$2 million
Third Frontier grant

Solid-state anaerobic digester: Partnering with **quasar energy group** and OBIC, this system produces and captures methane from cellulosic biomass such as yard trimmings and crop residue. A patent-pending technology developed by OARDC researchers could double the amount of biogas produced.



Funded by a
\$1.5 million
Third Frontier award and \$1.74 million in federal funds

Biomass to Energy: OARDC's Biomass to Energy facility seeks to optimize various technologies (such as anaerobic digestion and fuel cells) to turn wastestreams into scalable energy systems. The facility will also offer an industrial platform to verify the energy potential of various wastes from different industries.



\$3 million
Third Frontier grant

Natural fibers to green up the composite market: OARDC researchers and The Ohio Bioproducts Innovation Center (OBIC) have partnered with Natural Fiber Composites Corporation to create a new generation of composite materials utilizing plant-derived fibers — for use in transportation, construction, consumer, and industrial products. OBIC is a Wright Center of Innovation established by the Third Frontier Program to link university research with industry partners to accelerate commercialization.



\$3 million
Third Frontier Wright Projects Program grant

Natural rubber from a domestic source: *Taraxacum kok-saghyz* (TKS), a type of dandelion native to the former Soviet Union, produces high-quality natural rubber and can be grown right here in Ohio. OARDC, OBIC, and other partners are developing this renewable, domestic source of natural rubber that is expected to create new industries and jobs.



\$5 million
Third Frontier grant

Granular technology for better economy and environment: OARDC, OSU Extension, and OBIC are working with the Andersons, Inc. to develop granular material that more effectively contains, transports, and delivers fertilizer and pesticides, or other biologically active ingredients, to specific areas.

OARDC IS PAYING SIGNIFICANT DIVIDENDS FOR OHIO.

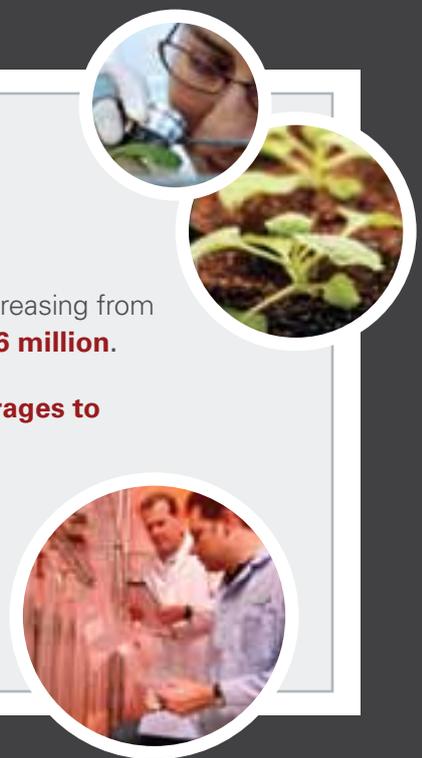
A 2009 independent study by Battelle's Technology Partnership Practice reports the following:

- A potential **\$22 million savings** in the Ohio horticulture industry has been generated by advancing biocontrol fungicides versus chemical fungicides.
- The development of media technology has led the \$2.8 billion Ohio nursery industry to **employ 96,000 personnel**.
- Poultry and egg production in Ohio has been safeguarded via multiple technologies, thus **securing an \$861 million industry and 8,700 jobs**.
- Ohio's exposure to \$65 million in negative impacts attributable to annual **livestock disease losses has been reduced**.
- Growth in Ohio's \$11.1 billion food processing sector has been sustained via the **development of new functional food products, advanced ingredients and packaging technologies**.
- Ohio has been **protected from \$46.6–\$93 million in foodborne illness health costs** associated with *Salmonella*.
- Feedstock and process development have **driven Ohio's emerging position** in the multi-billion dollar biofuels and biobased products industry segments.



OARDC: AN INTERNATIONAL LEADER IN AGBIOSCIENCE RESEARCH

- OARDC-sponsored research expenditures **grew 23.2% between 2004 and 2008**, increasing from \$19 million in 2004 to \$23.4 million in 2008 with a **current research portfolio of \$126 million**.
- With 108 research faculty, the current year's **\$23.4 million in research funding averages to \$217,000 per faculty member**.
- A **64% growth rate in funding** in the applied and commercially oriented "nonfederal research funding" category was achieved between 2004 and 2008.
- Innovations have generated **123 invention reports and 40 patent applications**.



A FLAGSHIP OF FRE

ADVANCED BIOENERGY AND BIOBASED PRODUCTS

\$8 million

Grants and funds supporting OARDC's BioHio business and technology park

OARDC's Wooster campus is home to a burgeoning business and technology park, moving ideas and products from the lab to the marketplace in the agbiosciences — Ohio's largest industry at more than \$100 billion.

BioHio provides space and support for companies and startups, and links university research and resources with the private sector to promote economic development and create jobs in areas such as food safety, renewable energy and materials, and environmental remediation.

"BioHio is a truly unique asset. It brings economy-shifting potential to our county and our region. We are truly fortunate to have OARDC here, as it is demonstrating how R&D activity can be leveraged to drive economic growth, job creation, and the generation of income," said Rod Crider, president, Wayne Economic Development Council.

In 2010, water, sewer, gas, electric, and road improvements were made on the park's main 95-acre site, thanks to a \$3.1 million grant from the Ohio Department of Development and \$3.4 million in matching funds from the city of Wooster. Pouden Hall was renovated via a U.S. Department of Commerce \$744,000 grant and \$1.2 million in local matches.

The first tenant: Cleveland-based **quasar energy group** will be housed in Pouden Hall. The company also built an accompanying flagship biogas facility in the BioHio Research Park. The modern anaerobic digester — which can process 550,000 gallons of agricultural and food-processing waste, keeping them from landfills and saving businesses disposal fees — is now producing 450 kW of electricity that is being used by OARDC.

More information: <http://go.osu.edu/6j>



70%

 | The percentage of medicines and health-promoting foods that originate from plant compounds

Natural plant compounds help crops protect themselves against diseases and insects. They are also the source of over 70% of human medicines and health-promoting foods. Unluckily for us, they are hard to find and usually scarce.

Not for long. An OARDC scientist is using a process called metabolite mining to identify new compounds never before seen in plants, specifically soybeans. Even better news is that these compounds may play a critical role in plant defense against pests — a big plus for agriculture — and may also provide novel chemicals for pharmaceutical research. OARDC discovered that plants make the majority of previously unknown natural products during periods of stress or when defending against attacking pests. When using a herbicide to attack soybean plants and stimulate their disease-resistance mechanisms, the plants produced 30 new natural products — five never before reported in soybeans and two never found in any other plant.

More information: <http://go.osu.edu/6z>



\$20 MILLION

The amount Ohio cattle producers can save in a year through a new nutrition strategy

Thirty percent of the 146 million bushels of Ohio corn used by the state's growing ethanol industry ends up in a byproduct called distiller's grains (DGS), which are a great feed for cattle and sheep and cheaper than corn and hay. A nutrition strategy developed by OARDC scientists is increasing the amount of DGS farmers can effectively feed their animals, reducing feed costs by 20–50%, decreasing manure output by 50%, and saving Ohio cattle producers \$100 annually per cow, for a potential savings of \$20 million.

More information: <http://go.osu.edu/6k>



ENVIRONMENTAL QUALITY AND SUSTAINABILITY

3 FEET

A better depth to store soil carbon



Researchers at the Ohio Agricultural Research and Development Center are finding that carbon stored on the soil surface (first 8 inches) degrades more rapidly than carbon at deeper depths (up to 3 feet). Some reasons: higher microbial biomass, more soil surface activity, and fewer soil minerals.

Ways to promote deep carbon storage include: manure application, which supports earthworm activity; practices that support a stable soil structure with conduits that move carbon deeper; and growing plants with deep, extended roots.

The research focuses on the impacts that changes in climate and carbon have on the environment, and how we can respond through scientific and policy-oriented solutions. The Intergovernmental Panel on Climate Change estimates that beneficial land management would offset 10–20% of the world’s projected carbon emissions from fossil fuels.

More information: <http://go.osu.edu/6u>

What is carbon sequestration? Storing or sequestering carbon in the soil is one way to mitigate climate change. No-till farming aids in carbon sequestration by minimizing soil disturbance and slowing the release of carbon dioxide into the atmosphere. Carbon dioxide has been linked to climate variability.

Shrinking Sprawl Good News for Urban Economic Development

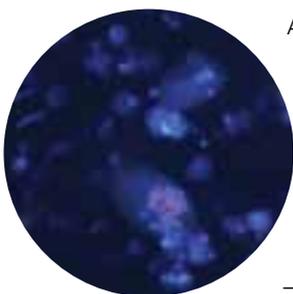


Ohio’s exurban sprawl — business and residential living between suburban and rural areas — is shrinking due to the recession. But OARDC research shows that could be good news for urban areas in terms of job growth and economic development. Community organizers and policymakers can use the research to plan for the future of exurban land use and sprawl.

More information: <http://exurban.osu.edu>

600,000 metric tons

The reduction in milk’s carbon footprint possible through new approaches to feed



As the state’s largest industry, agriculture does its part to protect the environment. Farmers have long been known as the stewards of the land, and OARDC research is helping them continue to minimize their impacts on the state’s natural resources.

One example is OARDC research that will reduce the impact of dairy cows on the environment by manipulating rumen protozoa. These microbes inside a cow’s stomach promote the emission of methane — which is 25 times more potent than carbon dioxide as a greenhouse gas — and ammonia, which can contaminate surface waters and soils. If just half of the nation’s dairy farmers adopt new approaches to feed as a result of this and other research, the carbon footprint of fluid milk would drop by 600,000 metric tons of CO₂. This research complements the U.S. dairy sustainability initiative, an effort between the U.S. Department of Agriculture and the U.S. dairy industry.

“The techniques developed by Ohio State have allowed us to better understand the role of protozoa in ruminal fermentation,” said Gale Bateman II, Ruminant Nutritionist, at Provimi North America, in Lewisburg, Ohio. “We believe that [OARDC’s] work can assist us in predicting when different interventions will impact practical nutrition of dairy cattle on farms.”

More information: <http://go.osu.edu/6s>



RENEURSHIP, AND

EMERGING MARKETS



52.1%

How much faster improved lines of yellow perch grow

As Americans — including Ohioans — reach for healthier food, demand for seafood is increasing. The number of Ohio fish farms has grown more than 24% each year for seven years according to recent census numbers, and the value of Ohio's aquaculture exploded from \$1.8 million in 1997 to \$6.6 million in 2007.

Now, OARDC research is helping provide fresher seafood — to Ohioans from Ohioans — and supporting this emerging market:

- An effort to improve the genetic traits of yellow perch has already generated five improved lines that grow 28.2%–52.1% faster than unimproved fish; some of these lines have been distributed to farmers.
- To increase the profitability of bluegill aquaculture, scientists are developing a technology to create all-male offspring, which grow twice as fast as females. To do so, they developed “YY-males,” which when crossed with regular females, produce all-male populations.
- A study to find an alternative to fishmeal, a fish feed protein source that is declining in production, also will benefit Ohio's important soybean crop. Researchers are developing superior strains of yellow perch with higher utilization rate of soy-based diet and also testing its use in spotfin shiners, a popular baitfish.
- To meet baitfish market demand in Ohio, researchers have established indoor out-of-season spawning techniques for spotfin shiner culture, which is benefiting Ohio's baitfish industry.
- To reduce algae growing in nutrient-rich ponds, researchers are reviewing the benefits of winter wheat, rye, and other nitrogen-reducing vegetation that also provides habitat for prawns.



Previously unranked, aquaculture now ranks 15th in value of agricultural products sold in Ohio. Nationally, Ohio ranks first in pounds of yellow perch sold and in bluegill production. Ohio also ranks fourth in sales of baitfish and sport fish.

SUSTAINABILITY

FOOD SECURITY, PRODUCTION, AND HUMAN HEALTH

11,000

The number of eggs that can be pasteurized at a time to eliminate *Salmonella* from inside whole shell eggs

A *Salmonella* outbreak like the one in 2010 could be avoided in the future, thanks to OARDC research that is using ozone to eliminate *Salmonella* serovar *enteritidis* from inside whole shell eggs. OARDC researchers have earned two patents, one of which combines ozone with mild heat to eliminate *Salmonella* that may lurk inside whole shell eggs. The process results in a much more acceptable product to consumers than heat-processed pasteurized eggs currently on the market. Egg Tech Ltd., a partnership of three major Ohio egg farmers, holds the exclusive commercial license for the technology. It is anticipated that by early 2011, commercial equipment based on Ahmed Yousef's research will be operating in Ohio and used to pasteurize nearly 11,000 eggs at a time — a boon to Ohio's \$585 million egg industry.



\$1 BILLION

The amount farmers, millers, and bakers may save in losses thanks to new fungicide

In 2009, when Ohio saw its first major head scab outbreak on wheat in more than 10 years, growers had a web-based tool to manage the risk of the disease developing on their crop. The Wheat Fusarium Head Blight Risk Assessment Tool (<http://www.wheatscab.psu.edu/>) uses weather and crop development to forecast the risk of head scab across 24 states. As an early-warning system, it can save yields and protect grain: For every \$1 lost due to head scab, it's estimated that another \$2 is lost elsewhere in the wheat industry due to yield impacts and grain contamination.

Growers may soon have another weapon in the fight against head scab: a "green" fungicide containing a naturally occurring yeast that OARDC researchers isolated from Ohio fields has been licensed by Sci Protek, Inc., in Visalia, California, and is slated for release in 2014, potentially saving farmers, millers, and bakers \$1 billion per year in crop losses.

More information:

<http://go.osu.edu/62>



Over \$100 million | OARDC's Research Portfolio

In 2004, OARDC launched a targeted effort to expand the economic impact of Ohio's agbioscience economy.

That successful venture contributed to the 2010 designation of The Ohio State University as the Ohio Center of Excellence in Agriculture, Food Production, and Bioproducts by the Ohio Board of Regents and the University System of Ohio. It is the only such center housed completely within a single university.

"Simply put, this is what we do — and we've been doing it for 100-plus years," says Bobby Moser, vice president and dean of the College of Food, Agricultural, and Environmental Sciences. "From a research perspective, we have a portfolio that comes close to over \$100 million in state and federal funds and private contracts and grants. The Center of Excellence designation allows us to leverage our position with funders who invest in areas that are already recognized as strong."



OARDC LOCATIONS IN OHIO

OARDC's Outlying Agricultural Research Stations are vital to the success of the state's ongoing agbioscience research. While the laboratory is fundamental to any research program, the true test of Ohio's agricultural research takes place in the field.

The Outlying Agricultural Research Stations provide facilities for scientists to conduct field experiments under the state's numerous climatic conditions. Soil type, terrain characteristics, climate, water supply, marketing opportunities, and human and natural resources are integrated to make this site-specific research responsive to the distinct needs of every part of our diverse state.

1. Northwest Agricultural Research Station, Wood County
2. North Central Agricultural Research Station, Sandusky County
3. Muck Crops Agricultural Research Station, Huron County
4. Wooster Campus, OARDC, Wayne County
5. Ashtabula Agricultural Research Station, Ashtabula County
6. North Appalachian Experimental Watershed, Coshocton County
7. Pomerene Forest Laboratory, Coshocton County
8. Western Agricultural Research Station, Clark County
9. Columbus Campus, OARDC and OSU, Franklin County
10. Eastern Agricultural Research Station, Noble County
11. Ohio State University South Centers, Pike County
12. Jackson Agricultural Research Station, Jackson County



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