FOOD SECURITY, PRODUCTION, AND HUMAN HEALTH

Bringing Knowledge to Life

Research Leads to Safer Food

Foodborne illness kills about 3,000 Americans and costs the United States $152 billion annually. Although raw leafy greens are among the riskiest foods, that could change thanks to Ohio Agricultural Research and Development Center research.

“Leafy greens are porous. That porosity makes it easy for pathogens to enter the leaf,” said microbiologist Ahmed Yousef.

Currently, processors use liquid sanitizers on greens before packaging. “But research shows liquid sanitizers are not always effective, and sometimes make the problem worse,” said food engineer Gonul Kaletunc. Air pockets can prevent the liquid from ever reaching portions of the leaf surface; when it does, it may not penetrate the leaf deep enough to reach microbes.

Yousef, Kaletunc, and fellow food engineer Sudhir Sastry are testing more effective gaseous sanitizers — ozone and chlorine dioxide — and determining when it would be best to use them: perhaps during vacuum cooling or possibly during transport.

“If we apply the right techniques in the right place at the right time, we really can improve the safety of produce,” Sastry said.

More: http://go.osu.edu/leafy

The Essentials

If the food industry uses better techniques to make food safer, will consumers pay for it? An OARDC scientist suggests they might.

Using a new approach for willingness to pay estimates, agricultural economist Brian Roe determined Americans would be willing to pay about one dollar per person each year, or an estimated $305 million in the aggregate, for safer food.

There is a limit: If a treated product cost only 10 cents more than an untreated package, about 60 percent of respondents said they would buy the improved product. But when the higher price reached $1.60 more per package, less than a third would opt for the treated product.

More: http://go.osu.edu/Esk
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Going Viral: OARDC Scientists Gain Recognition in Fighting Virus-Related Diseases

Rotavirus is the leading cause of severe diarrhea in infants and young children worldwide. Globally, it causes more than a half-million deaths each year in children younger than five years of age. In the United States, direct medical costs from rotavirus are estimated to reach up to $385 million annually.

Norovirus causes more than 21 million cases of acute gastroenteritis each year in the United States alone. The Centers for Disease Control and Prevention estimates that more than half of all foodborne disease outbreaks are due to norovirus.

The Ohio Agricultural Research and Development Center is a global leader in combating these viruses, with researchers from Food Science and Technology and the Food Animal Health Research Program armed for attack. Leaders such as Linda Saif, elected a member of the National Academy of Sciences (NAS) for her achievements in viral research, join with other collaborators to track how viruses are transmitted through water, the environment, and the food chain in order to find new ways to inactivate viruses or prevent them from causing disease.

More: [http://go.osu.edu/GVB](http://go.osu.edu/GVB) and [http://go.osu.edu/virusgrant](http://go.osu.edu/virusgrant)
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Non-GMO Soybeans Add $32M Extra to Ohio’s Economy

Thanks to price premiums and new OARDC varieties, non-GMO soybeans add an extra $32–64 million a year to Ohio’s economy.

Why the price premiums? Because of strong demand for non-GMO soybeans in European and Asian markets.

On a farm of 1,000 acres, non-GMO soybeans can mean $48,000–96,000 more every year in the farmer’s pocket.

OARDC’s latest new variety, a non-GMO type called Summit, which is specially suited to northern Ohio, yields 2.4 bushels more per acre than a similar predecessor. To a farmer, say, in Lucas County, switching to Summit on 1,000 acres would be worth $31,200–33,600 more every year.

Program Serves a Growing Niche: Non-GMO Soybeans Add $32M Extra to Ohio’s Economy

The Ohio Agricultural Research and Development Center’s soybean breeding program fills a small but growing and valuable niche that industry tends to ignore — developing new non-GMO soybean varieties. (GMO stands for genetically modified organism.) Soybeans grown from non-GMO varieties are demanded by many of Ohio’s export markets, sell at a premium price, and can boost a farm’s profitability.

Thanks in big part to OARDC’s program, which continually improves soybean varieties and makes the seed available to farmers, Ohio grows more non-GMO soybeans than any other state. About 15 percent of Ohio’s 4.5 million acres of soybeans are non-GMO types — ones that come from traditional breeding.

Based on an example yield of 48 bushels an acre, a price of $12 a bushel, and a non-GMO premium of $1–2 a bushel, non-GMO soybeans bring an extra $32–64 million every year to Ohio farmers’ wallets and the state’s economy.

More: http://go.osu.edu/GQ3

Leah McHale leads OARDC’s Soybean Breeding Program, whose new non-GMO varieties, for example, can earn a 1,000-acre Ohio farm up to $96,000 more annually.
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Land Grant to the World: OARDC Involved in Vital Food Security Work in Tanzania

A world-class institution in a global age, the Ohio Agricultural Research and Development Center’s work and impact often transcend the borders of Ohio and the United States. Such leadership is evidenced by the U.S. Agency for International Development’s selection of OARDC in 2011 to lead the Innovative Agricultural Research Initiative (iAGRI). Headed by Mark Erbaugh, director of the university’s International Programs in Agriculture, the $24 million, 5-year project aims to improve agricultural productivity and food security in the East African nation of Tanzania — a country of 42 million largely dependent on agriculture and where half of the population lives in poverty.

Michigan State University, Tuskegee University, the University of Florida, Virginia Tech, and Iowa State University complete the consortium involved in iAGRI, which will endeavor to boost the training and research capabilities of Tanzania’s Ministry of Agriculture, Food Security and Cooperatives as well as Sokoine University of Agriculture, following the U.S. land-grant model.

OARDC has more than 10 years of experience in agricultural research in Tanzania and has managed international development projects in many other African nations.

More: http://go.osu.edu/GUz

iAGRI is helping our scholars acquire urgently needed skills and to produce the information and technology needed to respond to dramatic changes in our food system. We are happy that the Tanzanian graduate students who study in the U.S. under iAGRI will be exposed to the American land-grant university model, which attempts to close the gap between the laboratory and the real world. This project will help spring a ‘green revolution’ in agriculture in Tanzania.”

— Benjamin Tisekwa, dean, Faculty of Agriculture, Sokoine University of Agriculture
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The national bed bug epidemic is costing homeowners and businesses, especially in tourism, billions of dollars every year, and Ohio is no exception. Fortunately, thanks to the Ohio Agricultural Research and Development Center, the state is a leader in fighting the pest. OARDC scientist Susan Jones, who specializes in urban and household insect pests, studies how well bed bug insecticides, detectors, and other products work, serves on bed bug task forces in Columbus and Cincinnati, and has emerged as a national authority.

Also, Jones and another OARDC scientist, Omprakash Mittapalli, an expert on insect molecular biology, recently reported the first detailed study of bed bugs’ genetic makeup. The scientists’ work shows how the insects become resistant to common pesticides, a trait that makes killing the pests difficult and expensive. Knowing this, Mittapalli said, “could lead to novel methods of control that are more effective” — saving people and companies money, plus possibly spurring new products.

More: [http://go.osu.edu/GRK](http://go.osu.edu/GRK)
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Foreign Bugs Killing Ohio’s Trees: Research Team Is Our Frontline Defense

Invasive tree-killing insects, such as the emerald ash borer, are costing Ohio’s economy big. So scientists with the Ohio Agricultural Research and Development Center are working to fight them. Through ongoing research, entomologist Dan Herms and colleagues detect new invaders, track their spread, test ways to limit or eradicate them, and recommend steps to homeowners, businesses, and communities. Also a part of it: Developing improved varieties of trees that can stave off attack, leading to stronger replacements for what’s been destroyed and potential new products for Ohio’s $4 billion nursery and landscape industry.

Herms and team’s research “has helped our company grow and flourish in these challenging times,” said Mark Webber, owner of a Dayton landscaping company and the 21-year host of a 100,000-listener radio gardening talk show (WHIO, Dayton). The team’s findings, Webber said, “have helped us provide local Ohio employment and produce environmentally sound results for our clients.”

More: http://go.osu.edu/GQa and http://go.osu.edu/GQb
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Safer, Cleaner Soil and Water…and Saving Big Money in the Process

“The soil is the great connector of our lives,” author Wendell Berry once said. Scientists with the Ohio Agricultural Research and Development Center continue their work to do good for all three — the soil, our lives, the connection. Soil chemist Nick Basta, for example, has developed a low-cost way to treat the lead that contaminates soil in our cities. (Lead in soil can make children sick and makes the land unfit for gardens.) His method is just a quarter the cost of the next most economical option — a big help for cash-strapped communities, especially ones ramping up urban farming.

Soil scientist Warren Dick is pioneering the use of flue-gas desulfurization (FGD) gypsum, a byproduct from Ohio’s coal-fired power plants, to keep phosphorus in the soil, where we need it, and out of Lake Erie, where we don’t. His work has the triple benefit of putting a waste to good use, improving the soil for crops, and cleaning up the lake, especially toxic algae blooms.

More: http://go.osu.edu/GQg and http://go.osu.edu/GQh

THE ESSENTIALS

• Children under 6 in greater Cleveland have the highest lead poisoning rate in the United States — nearly 1 out of 10, more than six times the national rate.

• Basta’s method for treating lead in soil, using composts and similar materials, costs at least 75 percent less than the next most affordable remedy — about $7,500 an acre instead of $30,000.

• Cleveland alone has 3,000 acres of vacant lots, of which about 900 acres have lead levels requiring treatment to grow food. If the city were to treat them with Basta’s method instead of the more expensive option, the savings would total at least $20 million.

• Why tackle Lake Erie phosphorus? It feeds harmful algae blooms. Safe drinking water for 11 million people and the lake’s more than $1 billion tourism industry are at risk and will benefit.
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Ohio’s honey bee population has crashed, and scientists with the Ohio Agricultural Research and Development Center want to know why. Entomologists Mary Gardiner, Larry Phelan, and Scott Prajzner are investigating whether pesticide exposure is a culprit and, if so, where it’s coming from.

At stake is every third bite of food we eat, which is how much of our food supply needs bees for pollination. In the United States total, it’s a service worth $9–15 billion.

“We’re comparing urban landscapes within the city of Cleveland, landscapes in Cleveland’s suburbs, and a diversity of agricultural landscapes in Wayne County,” Gardiner said. Their goal is to determine the risk within a honey bee’s “pasture”—the area in which the bee forages for pollen. It’s sometimes several square miles or more. Are bees getting toxins from farms, cities, suburbs, or some combination?

It’s a key first step to understanding the problem, developing science-based recommendations to cut the risk, and helping bees to recover.

More: http://go.osu.edu/GQn and http://beehealthy.osu.edu/
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THE ESSENTIALS

- If Russian dandelion rubber were to reach an 8.4% share of the North American natural rubber market, it would generate at least 3,600 new jobs, with the first 250 expected by the end of 2014.

- The dandelion project’s potential has attracted support from major players in the rubber and transportation sectors, including Bridgestone, Cooper Tire, Veyance Technologies, and Ford Motor Co. Ford plans to use dandelion rubber for interior car components.

- The Natural Fiber Composites Corporation (NFCC) established a 6-million-pound composite material plant in Wooster, with 12 jobs and $3 million in revenue expected by the end of 2012.

- The two projects have received a combined $6 million in funding from the Third Frontier program.

In Your House, In Your Car: OARDC Boosts Development of New Bioproducts

In collaboration with the Third Frontier-funded Ohio BioProducts Innovation Center (OBIC), the Ohio Agricultural Research and Development Center is partnering with industry to develop the next generation of biobased industrial materials that will go into the manufacturing of homes and vehicles — not to mention new Ohio businesses and jobs.

One example is natural rubber. Under the leadership of Katrina Cornish, endowed chair and Ohio Research Scholar in bioemergent materials, OARDC researchers are perfecting growing and extracting techniques for a rubber-producing plant that can be commercially produced in Ohio: Russian dandelion. OARDC will establish a pilot-scale processing plant in 2012 for solid rubber, latex, and film products. Also, Russian dandelion plantings have been significantly expanded to supply the processing plants.

OARDC and OBIC have also partnered with Columbus-based Natural Fiber Composites Corporation (NFCC), which manufactures biobased composite materials for construction, vehicles, and packaging reinforced with plant fibers instead of fiberglass. OARDC engineers helped the company perfect its feedstock and processing technology so it could reach production levels.

More: http://go.osu.edu/GRZ and http://go.osu.edu/composites

Katrina Cornish leads a public-private partnership seeking to develop domestic sources of natural rubber from plants such as Russian dandelion and guayule.

Growing demand for natural rubber could create supply issues in the mid- to long-term. Having a domestic source of natural rubber, such as TKS, potentially provides significant strategic and cost savings opportunities to Bridgestone. While we are in the very early stages of the evaluation of TKS-sourced natural rubber, early testing results have been encouraging.”

— Robert Handlos, Vice President for Research, Bridgestone Americas Center for Research & Technology

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The future of the U.S. ethanol industry depends on its ability to increase yields and be competitive with fossil fuels. The Ohio Agricultural Research and Development Center is collaborating with a Cleveland-based company to make that possible.

Thanks to a $1 million Third Frontier grant awarded in 2008, Arisdyne Systems Inc. has developed a technology called controlled-flow cavitation, which allows ethanol plants to get more fuel from the same amount of corn. It accomplishes this by breaking open the cell structure of corn particles and releasing trapped starch molecules in the kernel — more starch means more sugar and, ultimately, more ethanol.

OARDC biosystems engineer Fred Michel has conducted testing to prove that Arisdyne’s cavitation system can increase ethanol yield by roughly 2–3% — data critical to convince ethanol plants to test and adopt this new technology. Michel is also investigating new applications for cavitation, including cellulosic ethanol made from the non-edible parts of corn and other crops, such as wheat middlings.

More: http://go.osu.edu/GQ7
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

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Metal and glass food packaging is increasingly being replaced by plastic materials, but use is limited because plastic is porous to some types of gases. In a NASA-funded project, Melvin Pascall, a scientist at the Ohio Agricultural Research and Development Center, is examining the use of nanoparticles to develop new plastic food packaging materials that could be even lighter, cheaper to produce, and provide a better gas barrier.

“Nanoparticles can be fibers, sheets, or spheres that are no more than 100 nanometers in at least one dimension,” Pascall said. A nanometer is one-billionth of a meter; the particles can be seen only through an electron microscope. Though small in measurement, nanoparticles can provide strong reinforcement for plastic packaging, providing much sharper changes in color when a signal is warranted.

More: [http://go.osu.edu/GVC](http://go.osu.edu/GVC)
As the research arm of The Ohio State University’s College of Food, Agricultural, and Environmental Sciences (CFAES), the Ohio Agricultural Research and Development Center (OARDC) employs nearly 650 scientists and staff members throughout the state, conducting research that benefits all Ohioans. OARDC’s Wooster campus is the largest agbioscience research facility in the United States, and OARDC scientists work closely with researchers in Ohio State’s Colleges of Education and Human Ecology, Medicine and Public Health, Veterinary Medicine, Biological Sciences, and Engineering. Research support is provided in three signature areas:

- **Advanced Bioenergy and Biobased Products**
- **Environmental Quality and Sustainability**
- **Food Security, Production, and Human Health**

For more information, see the CFAES Strategic Plan at [http://go.osu.edu/GQ5](http://go.osu.edu/GQ5).

At any given time, OARDC scientists are engaged in more than 400 research projects in the areas of agricultural, environmental, and development economics; food, agricultural, and biological engineering; animal sciences; entomology; food animal health; food science and technology; horticulture and crop science; human and community resource development; human ecology; natural resources; and plant pathology. OARDC also trains graduate students in each of these areas.

The Ohio General Assembly established OARDC as the Ohio Agricultural Experiment Station in 1882. Since its founding, OARDC has been a leader in research that makes a difference for Ohioans and for the world.

OARDC is supported by a line-item appropriation from the Ohio General Assembly, competitive grants, gifts, contracts, federal grants, and other sources. OARDC uses these funds to provide direct research support and economic development for Ohio’s annual $90+ billion agbioscience industry. OARDC is not funded by student tuition or any other general funds of The Ohio State University.