2013 Ohio State University Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Throughout 2013, Ohio Agricultural Research and Development Center (OARDC) and The Ohio State University Extension's (OSU Extension or OSUE) have continued to emphasize fulfilling The Ohio State University's (OSU) and College of Food, Agricultural and Environmental Sciences' (CFAES) land-grant mission and helping to meet the needs of the citizens of Ohio, and beyond. Collectively these research and Extension efforts are all part of CFAES' contribution to OSU's move from 'Excellence to Eminence' and to an Ohio higher education collaborative focus entitled 'One University'. To help reach these state, university, and college goals, CFAES has continued to add emphasis to our 'One College' approach.

OSU Extension and OARDC, administered through the Office of The Ohio State University (OSU) Vice President, Agriculture, and Dean, College of Food, Agricultural, and Environmental Sciences (CFAES), are charged to advance mission-oriented research and extension programming. Vice President and Dean, Dr. Bruce A. McPheron guides that office.

The charge to OSU Extension and OARDC is to be engaged, deliver impacts, and make a difference. That charge is implicit in the land grant mission, and is reinforced by the OSU leadership, by our elected officials, and by those we serve. Whether supporting Ohio farmers with releases of new cultivars or cultivating relations with our urban gardening constituents, OSU Extension and OARDC are engaged. Engagement and impact - oriented programs continue to be our hallmark.

A quote used in last year's report clearly articulates the importance of the impact of the land grant program nationwide:
"There is no other arena of economic activity, or field of science and innovation, that so directly addresses human survival and quality of life, global economic development, and prospects for an environmentally sustainable future as agriculture and agbioscience. Land-grant universities, through their experiment stations and extension services, are on the frontline of sustaining and securing America's leadership and competitiveness in what is and will be the key macroeconomic sector of our time." (Power and Promise: Agbioscience in the Northeastern United States. 2011. Battelle Technology Partnership Practice and BioDimensions, Columbus, Ohio).

OARDC and OSU Extension have continued to manage within the current fiscal realities, with ever increasing demand for services, and in face of Ohio's need for advancing job growth and economic development. While economic turnaround is evident throughout Ohio, OARDC and OSU Extension have continued to lead from a position that advocates that we leverage the investments made in research and extension to expand the economy while ensuring the wise use of our social, environmental, and human capital.

As referenced in previous reports, OSU is Ohio's designated academic Center of Excellence in Agriculture, Food Production, and Bioproducts, so designated by the Ohio Board of Regents and the University System of Ohio. This important designation places an additional mandate and added expectation on our college. OSU is highly dependent on OARDC and OSU Extension programs in fulfilling the research and extension/outreach mission of this Center.

Over a decade ago, CFAES conceptualized our mission under the moniker, AGBIOSCIENCE.The working definition for Agbioscience is: the physical, biological, environmental, chemical, engineering, social, and economic sciences utilized, independently or in combination, in food, agricultural, and environmental research and extension programming. We define agbioscience in our external communications as: The integration of scientific disciplines to address critical needs of food security, safety, and health; environmental sustainability; and bio-based energy, fuel, and products (ex: turning waste into fuel, analyzing federal policy for profitable farming; creating foods for better health; adjusting phosphorus recommendations for cleaner water; making plastics from renewable sources; discovering local sources for rubber).

Research and Extension programs throughout 2013 have been highly focused on generating and extending new knowledge and leveraging that knowledge into economic development and job growth. Economic development and job growth within agbioscience are dependent on the wise use of the social, environmental, and human capital found throughout Ohio and the nation. OSU's agbioscience program underpins Ohio's $100 plus billion agricultural industry.

OSUE and OARDC have continued to focus on three signature areas in agbioscience that were adopted by the College of Food, Agricultural and Environmental Sciences (CFAES) in 2008. These are (1) Food Security, Production and Human Health; (2) Advanced Bioenergy and Biobased Products; and (3) Environmental Quality and Sustainability. OSU established three university - wide Discovery Themes in 2012 -- (1) Health and Wellness; (2) Energy and Environment; and (3) Food Production and Security. Given that CFAES' signature areas programs align well with the Discovery Themes, CFAES' contribution to these themes is being expedited. CFAES is providing leadership at the University - level for Discovery Theme 3: Food Production and Security and is an active participant in the other two themes. These Discovery Themes guide collaboration across the university, direct allocation of new university resources, and add program emphasis university-wide.

Embedded within these signatures areas and discovery themes is support for the highest priorities of the state of Ohio, for NIFA's priority areas, and for program goals within the APLU/ESCOP Science Roadmap for Food and Agriculture and within The National Bioeconomy Blueprint.

In support of CFAES's three signature areas and our focus on the OSU Discovery Themes, multiple collaborative have been established with both internal and external stakeholders. CFAES faculty were, and will continue to be, active participants in the first initiative under Discovery Themes entitled Big Data. Multiple facets of agboscience are central to analysis of expansive data sets. Such analysis is important to CFAES focus on advancing research from discovery to application to commercialization, truly operationalizing the concepts of FARM TO FORK and CELL TO SELL.

OSU Extension and OARDC maintain core programs and serve our traditional clients, while at the same time, advancing new programs such as our initiative to reduce agricultural phosphorous in Ohio watersheds and our sustainable waste to energy foci. OSU Extension and OARDC continue to assist growers and producers in being more efficient, effective, economically viable, and environmentally sustainable on the production side. This support is most evident at our field days held throughout the state and in our various publications and websites that provide timely extension of research results.

Throughout the year we have continued to expand the traditional food and fiber markets by leveraging our research - extension - development - marketing nexus to add new value-added products and services. CFAES' business team and CFAES' Industrial Liaison Officer (ILO) support this expansion; both are charged with finding new markets for our outputs with the aim of creating new value-added products and services. Over the past decade CFAES research and extension personnel have developed joint initiatives and programs with over 400 businesses and industrial partners.

CFAES' Industrial Liaison Officer (ILO) continues to successfully collaborate with other OSU ILOs to enhance university - business/industry research collaborations. While still in its early stages, the CFAES collaboration with OSU's Industry Liaison Office has formed several new public-partnerships and facilitated sponsored research agreements. Notable efforts include forming the following: interdisciplinary teams exploring new food products, a Technology Review Board to perform due diligence on university discoveries, and an analytical approach to link company needs with OSU faculty capabilities.

CFAES continues to partner with law, engineering, business, and the health sciences, together with OSU's Technology Commercialization Office and the Industry Liaison Office, to move discovery to market and assist agbioscience-based companies with new product research and development. A federation of academic and industry-oriented departments has the ability to attract external capital, increase the formation of start-up companies, and attract partners and collaborators.

As the nation, the state of Ohio, and the food, agricultural, and environmental industries continue to make great advances, OSU Extension and OARDC facilities and programs remain critical in supporting continued recover from the severe economic downturn. As a nation, we collectively face pressures to become more energy independent, ensure safe and stable food supplies, have more sustainable systems, and are ever in need of approaches to lessen our impact on our environment. To those ends, land grant research and Extension programs will only grow in importance. OARDC and OSU Extension have worked diligently throughout 2013 to strategically position our college so we can better leverage our resources to be highly responsive to helping to meet theses needs.

The issues referenced in our 2012 report: the need for job growth, obesity, worldwide climate change, world hunger, and threats to a safe and secure food supply have only grown more critical in 2013 and demand even greater leadership and productivity from land-grant research and Extension programs. We have continued to address these issues, and have strengthened our land-grant role relative to these issues. To do this, OARDC and OSU Extension have helped position CFAES as a transformational leader. By focusing on areas of research, extension, and development excellence that are of strategic importance to the state of Ohio and the nation, OARDC and OSU Extension have targeted resources to new transformational strategies to generate technology-based economic development, supported by strong human capital enhancement programs. We have made advances in agbioscience through discovery of new knowledge, inventions, and in improved quality of existing technology. The discoveries we have made with our partners have seen successful commercialized use by producers, processors, and consumers. Key to this translation is OSU Extension's wide variety of information it communicates, technical knowledge at its disposal, and educational services for individuals, families, and companies to support translation and transfer of technology.

Throughout the year, OARDC and OSU Extension have used every opportunity, such as CFAES's Farm Science Review (FSR), to engage and garner stakeholder participation, feedback, and support. FSR, Ohio's premiere agricultural event, and one of the largest in the nation, is dedicated to demonstrating the best agricultural research and best management practices with ready - access for our stakeholders. In September 2013, CFAES - FSR hosted approximately 130,000 visitors over a three - day period.

OARDC and OSU Extension, collectively employ approximately 1200 fulltime employees, and work jointly with all CFAES agbioscience programs. Seventy plus faculty members hold joint appointments in OARDC and OSUE and most have advising and varying levels of teaching duties in CFAES academic programs. Likewise, OSU Extension and OARDC work closely with CFAES' Agricultural and Technical Institute (ATI), the nation's largest program of its kind. ATI is ranked as one of the top five programs in the nation among two-year institutions in the awarding of degrees in agriculture. This close collaboration, part

of the previously mentioned 'One College Approach', results in seamless programs such as our agronomic field days, annually held at one of our research stations across the state. Often you find the scientist that has conducted the research related to a agronomic practices standing in the middle of a row crop, surrounded by growers hearing the findings of the research, and exploring recommendations for adopting or adapting this latest science. That same research/extension faculty member may lecture about this research in CFAES academic courses, as well as help advise graduate students studying related issues. Teaching, research, and extension are highly integrated, often with the same faculty member participating at various levels in this tripartite role. Throughout the year we have used every opportunity to focus on our signature and high priority areas, as well as the OSU Discovery Themes...both in and out of the formal classroom.

OARDC, while serving as the research arm of CFAES, is intimately involved in instruction. OARDC research supports approximately 200 graduate level and postdoctoral students each year who spend their time in a lab - learning setting. OARDC is also involved in youth outreach helping young people build research skills and a better understanding of the supporting science and opportunities within agbioscience. Each year 50-plus high-school age and undergraduate students participate in the OARDC Research Internship Program (ORIP). STEM concepts are taught in laboratory and field settings and are included in student seminars, project reports, and symposia. OARDC and CFAES academic program leaders expanded the 2013 Summer Research Opportunity Program (SROP) that serves as a gateway to graduate education for underrepresented students nationwide. Twelve CFAES - SROP students conducted research on the Wooster campus and three were on the Columbus campus. OARDC's instructional program, whether providing tours for local school students, or funding post docs, is geared to building the scientific workforce for tomorrow. Such efforts are critical to our state and nation's ability to regrow the economy and compete in the international marketplace.

Our efforts to extend knowledge are not limited by traditional topics and audiences. Instead, we address emerging needs as they arise, such as a new land use issue in Ohio. As reported last year, reserves of oil and natural gas in Marcellus and Utica shales in Ohio have left landowners, communities, and government officials in need of information. The development of these reserves is resulting in a significant number of new Ohio jobs and significant economic returns. But landowners also need to fully understand the potential financial, legal, and environmental ramifications of the highly complex leases that could last for generations; and public officials often need guidance on community implications as well. That demand has rapidly expanded in 2013 as the leasing and drilling programs have intensified. OSU Extension is providing much needed information and guidance. Its Shale Energy Education Work Group is examining the financial, economic, development, family, environmental, and safety issues regarding shale energy. Additionally, a CFAES faculty member serves as Associate Director of OSU's Subsurface Energy Resource Center that focuses on oil shale in Ohio.

Collaborative ventures provide leadership and outputs/impacts that are relevant to multiple audiences and contribute to food, economic, environmental, and national security. Programs such as biobased product research, spearheaded by the Ohio Bioproducts Innovation Center (OBIC), a State of Ohio designated Wright Center for Innovation, are key to this impact-oriented portfolio. OARDC has $14.5 million of Third Frontier grants in biobased product research. Third Frontier is Ohio's economic development initiative to build a world - class research capacity. Included are research into solid state anaerobic digesters, plant derived natural fibers, natural rubber from the Ohio Gold dandelion, biomass to energy, and granular technology to deliver fertilizers, biopesticides, and the creation of other biologically active ingredients that are more economical and environmentally friendly than existing products. Most of these projects are matched and leveraged by industry collaborators.

In fiscal year 2013, OARDC had a portfolio of 592 active grants valued at $170 million. In 2013 OARDC leveraged state and federal base funding to attract projects such as:

- from the National Institute of Food and Agriculture:

• $6.5 million to study bioenergy and biofuels production
• $2.2 million for developing a universal flu vaccine by a norovirus P particle platform
• $.75 million to study long-term organic and transitioning farming systems
- from the National Science Foundation:
• $3.7 million for discovery of genes and networks regulating tomato fruit morphology
• $.9 million to study biodiversity and ecosystems within the urban landscape
- from the U.S. Agency for International Development:
• $24 million for collaborative research and capacity-building of Sokoine University of Agriculture and the Tanzania National Agricultural Research System
- from the Natural Resources Conservation Service:
• $1 million for evaluating and updating the Ohio phosphorus risk index
- from the Ohio Division of Wildlife:
• $1.9 million for a terrestrial wildlife ecology lab

While each of these programs is funded to conduct both basic and translational science, OSU Extension is a major partner in many of these studies. Without the expertise of extension faculty and staff, translating the science to the point of adoption by stakeholders, be it practices or production of new products, is not usually possible.

OARDC and OSU Extension programs are far ranging, often highly unique in content and methods of delivery, and highly responsive to stakeholder needs, while building on the latest science. Our programs range from projects such as developing biogas generators suitable for small farmers in developing countries, to green technologies such as enhancing national rubber supply from the Ohio Gold dandelions, to breeding an ash tree that is resistant to the emerald ash borer, to studying chemicals that could result in an entirely new way of killing mosquitoes that spread malaria, a disease that claims the lives of one million children around the world each year.

Our programs impact Ohioans daily. For example, excess phosphorous is a critical concern to multiple sectors in Ohio, including the agricultural community. Grand Lake St. Marys has lost an estimated $60-80 million in tourism due to harmful algal blooms. In 2011, algal blooms covered 990 square miles of Lake Erie's surface area, the largest in the lake's history. Those blooms are traced, in part, to phosphorus. In 2013, OARDC and OSU Extension launched a major initiative to evaluate and, where necessary, revise Ohio's current Phosphorus (P) Risk Index to better predict the risk of phosphorus moving off land in order to protect Ohio surface water quality. CFAES soil scientist Elizabeth Dayton has garnered a $1 million U.S. Department of Agriculture Conservation Innovation Grant and $1 million in matching donations from Ohio agribusinesses to complete the work. Local farmers are making their fields available as research sites. The goals are to make the P Index more accurate, add best management practice options for farmers, create an interactive web-based tool so farmers can calculate their P Index scores, and evaluate options and make informed decisions to better manage phosphorus. The initiative aligns with a U.S. Department of Agriculture's effort calling for states to help producers better manage the application of nutrients on agricultural land.

OARDC and OSU Extension are engaged in the full value/supply chain from idea inception to product development, delivery, and impact. To support this engagement BioHio Research Park was established to support commercializing ideas and products from food, agricultural, and environmental research laboratories and moving them to the marketplace. In 2013 the BioHio Research Park moved to the next phase by forming the BioHio Board of Directors; formally incorporating BioHio as a non-profit company and OSU affiliate; and working with the Economic Development Administration to develop a master plan for the 90-acre BioHio site. Tenants continue to move into a newly remodeled building, and are partnering with our faculty and staff to advance new products and services. The Park is a model for federal, state, and local collaboration... demonstrating how to move science into society to advance economic, environmental, and social well-being, in partnership with the government and business and

industry. OARDC and OSUE are using the Park as a catalyst for local and regional development in agbioscience.

Both internal and external assessments, and continued support by federal, state, local governments, by stakeholders, and by private business and industry, attest to the value placed on the work of OSU Extension and OARDC. According to a Battelle Technology Partnership Practice assessment report, the foremost in-state driver of agbioscience research and development is OARDC, with OSU Extension leading in-state extension education and human capital development. Their assessment found OARDC to be a substantial economic engine for the State of Ohio. Battelle's most recent calculation is that OARDC's spending impacts in FY 2008 generated 1,609 jobs; $156.3 million in economic output; $59.2 million in personal income for Ohio residents, and $5.5 million in state and local taxes. The Battelle report further noted that the dynamic work of OARDC in targeting agbioscience growth is paying significant dividends, both for the institution and for the State of Ohio.

According to the Battelle study, OARDC scientific research, innovation, and technology development is providing large-scale and widespread functional economic impacts across Ohio, both in terms of the generation of positive impacts (through the development, for example, of high-value crops, biobased materials and technologies) and significantly reducing negative impacts (such as crop losses or disease impacts). The study points out that OARDC is a generator of significant economic impacts for the state in the form of: technology commercialization; new and improved crops, breeds, and products for Ohio producers; new and improved technologies for Ohio industry; and an enhanced and protected environment and quality-of-life for Ohioans. OARDC and OSU Extension's partnership with the private sector is key to creating these meaningful impacts.

CFAES has long had a historical emphasis on working with the private sector in Ohio. For example, almost 400 companies have had grants, contracts, and agreements with OARDC in its role as CFAES' research arm in the past decade. OARDC designed our SEEDS program to recognize and create matching grant opportunities, which both expanded and enhanced the number of relationships with the private sector. Funds from SEEDS are to be used to explore creative ideas and to initiate novel research programs that are attractive to external sponsors and are consistent with the mission of CFAES. By providing seed money to develop the necessary preliminary data for a strong extramural grant application or by matching funds to leverage additional external funding, SEEDS has proved to be a valuable program for our scientists.

Battelle (2005) reported that OSUE generated annually a robust impact: $159 million in total Ohio economic output (sales); 1,918 jobs in Ohio; $64 million in personal income for Ohio residents; and $4.8 million in annual tax revenue within Ohio. Institutional spending, capital projects, workforce development, creation of new products and businesses, and the creation of new business incubator sites on both the Wooster and South Centers campuses by OARDC and OSU Extension support job creation and growth of the agbioscience sector. All of the noted actions are intended to improve the human condition by advancing strong business/economic growth in a socially responsible manner that is oriented to protecting a sustainable environment.

OARDC and OSU Extension have submitted an array of impacts for this 2013 reporting period that are helping to advance both society and science. The institution has moved beyond just creating food to creating energy and manufacturing materials such as domestic, non-food sources of natural rubber, biogas, and ethanol. Plant and animal genetics research, in combination food technologies, engineering, and plant and animal health research are supporting a safer, healthier food supply that is more sustainable, with less environmental impact. It is these programs that will substantially contribute to reducing global hunger. For the most part, all of these are collaborative efforts involving OARDC and OSU Extension, as well as multiple business and industry partners, and multiple federal, state, local agencies and non-government organizations. CFAES continues to support research, extension services/outreach,

and development across five other OSU colleges, entering into multi- and interdisciplinary partnerships to address complex problems and issues that require broad thinking.

Advancing research, growing human capital, and extending knowledge as a means of economic recovery, job growth, and advancing societal and environmental well-being remain key drivers within CFAES. It is at this nexus that OSU Extension connects with people in all stages of life, from young children to older adults, working with families and children, farmers and business owners, community leaders, and elected officials to build better lives, better businesses, and better communities. The organization delivers targeted, relevant, research-based information and programs to meet the needs of Ohioans. OSU Extension helps to enhance agriculture and the environment by working with farmers to strengthen their businesses, adopt new technologies, and improve efficiency while protecting the environment.

OSU Extension assists with technology, marketing and educational programming, protecting Ohio's position in the global marketplace. Their educators and specialists help to strengthen families and communities by teaching Ohioans how to apply science in their daily lives in order to make informed choices about everything from finances to healthy living and food safety. OSU Extension works to help build strong families and by offering programs and information to all Ohioans on childcare, parenting, family life, adult development and aging, and balancing life, jobs, and families. The Ohio 4-H Youth Development Program is part of a community of 300,000 Ohio youth, aged 5 to 19, experiencing hands-on learning in this extension effort through clubs, camps, and after-school programs in urban, suburban, and rural communities statewide. OSU Extension's 4-H Youth Development Program deliver skills in communication, math, science, and research and help Ohio's young people prepare for college, the workforce, leadership and life.

OSU Extension helps to advance employment and income opportunities for Ohioans delivering economic, small business, and job development programs that are tailored to local community needs in every county, whether metropolitan, rural, or a combination. OSU Extension's work and model education programs have implications beyond Ohio. For example, we know obesity has more than doubled in every region of the world in the past two decades, afflicting one half billion people. Conversely one billion people are now chronically hungry due to food insecurity. Outreach and extension education models developed at OSU can inform this dilemma.

Growing business sectors such as Ohio's green industry by improving workforce skills, and enriching the knowledge of professionals in turfgrass management, landscaping, and nursery is part of OSU Extension's efforts. Job readiness training to improve the skill level of potential employees is important in attracting new businesses and encourages retention and expansion among current employers. OSU Extension enhances communities and neighborhoods by partnering with businesses, current and emerging community leaders, and elected and appointed officials. Their programs inform residents, leaders, and entrepreneurs regarding local development issues and inform individual and community decision-making. Additionally, Extension programming protects Ohio's natural environment by working with landowners in managing woodlands and preserving streams and other water resources, such as Lake Erie. Collectively, these Extension efforts were all focused on building a stronger Ohio that is competitive in rebuilding its economy and improving the quality of life for all its residents.

OSU Extension's focus on local foods is one approach to building stronger communities. A 2010 study found that if northeast Ohio met 25% of its food demand with local food production, it would create 27,000 new jobs, increase annual regional output by $4.2 billion, and boost the tax base by $126 million. OSU Extension is helping make this shift happen by: (1) connecting more than 1,250 Ohio producers and buyers via MarketMaker; (2) assisting 225 producers to reach wholesale buyers since 2010 through this program; (3) providing technical assistance to 22 food co-ops across the state; and (4) by helping Ohio's 278 farmers' markets reach more consumers by setting up systems to accept food stamps: increasing

from seven markets in 2008 to 55 in 2012.

OSU Extension and OARDC manage numerous independent and joint projects and programs. There is a commitment to a broad array of research and Extension programming ranging from introducing new cultivars, to obesity and diabetes education programs, to on-farm field days, to soil fertility research and outreach in Africa and India, as well as in the U.S. CFAES maintains a robust international research and outreach program.

Ohio Agricultural Research and Development Center and Ohio State University Extension have worked throughout 2013 to accomplish the land-grant mission of OSU - CFAES and to meet stakeholder demands while supporting federal, state, and local agendas. OARDC and OSU Extension leverage federal base funding provided through NIFA to conduct both basic and translational (applied) research, and to manage comprehensive statewide Extension efforts in program development, delivery, and evaluation. While OARDC and OSU Extension focus heavily on our translational sciences and applied impacts, OARDC conducts and reports a substantial amount of basic research impacts that other researchers, government agencies, and business and industry worldwide depend on for our scientific breakthroughs. Likewise, OSU Extension has long been a leader in producing methodologies and techniques that inform fellow outreach and extension programs worldwide. Federal, state, and local resources are combined with extramural funds, gifts, in-kind contributions, and volunteer support to make the Ohio program truly stakeholder-based. Stakeholders are not limited to Ohio. Both OSU Extension and OARDC lead national and international efforts within their mission. To that end, we are dedicated to maintaining our land grant mission and vision, locally, throughout our nation, and the world.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	200.0	0.0	84.5	0.0
Actual	529.5	0.0	422.0	0.0

II. Merit Review Process

1. The Merit Review Process that was Employed for this year

- Internal University Panel
- External Non-University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Within OARDC, OSU Extension, and the College of Food Agricultural, and Environmental Sciences (CFAES), as a whole, merit review processes are critical to mission accomplishment and are mandated at all levels. Over the years the review process has been streamlined and, with introduction of digital media and social networking, we have seen dramatic changes in quality, quantity, and timeliness of reviews. Advisory committees and multiple internal and external stakeholder groups have provided feedback that aids in all facets of CFAES. Throughout 2013, these groups have been used for input on multiple matters including new facilities such as the food, agricultural, biological engineering building to be built on the

Wooster campus, new dimensions for agbioscience initiatives, annual reports, and new hires. With the introduction of the University's new Discovery Themes in 2012, our advisory groups are being called on for input on this new dimension. Documents, such as annual reports and one-page information sheets, are typically produced in draft form and targeted for review by individuals and groups who are both knowledgeable of, and vested in, the subject matter. They were asked to provide feedback on both content and how the story is told. This input has come from multiple levels such as partner business groups, advisory committees, elected officials, and commodity groups.

All of OARDC and OSU Extension's published matter, ranging from traditional print to social media outlets, have been compiled and reviewed by teams with both technical expertise and communication expertise. Most of these also had administrative review. Thus when stakeholders / partners were asked to review a draft document, they are provided with the best science available.

Each of the OSU Extension program areas continue to conduct long range strategic planning annually to prioritize programming. OARDC utilized its advisory committee this year, as well as various other committees, to focus on facilities, programs, operations, and long range planning. We have an extensive amount of one on one researcher-to-stakeholder interaction to identify needs, establish priorities, and engage in research and development programs. For the most part, a partnership with a stakeholder group exits for each program.

Given that all of OARDC and OSU Extension efforts are planned to benefit some targeted group or groups, we engage these groups at the beginning of the process thus providing formative reviews. This holds true even in highly theoretical research in that multi- and interdisciplinary partners have been engaged to advance these lines of inquiry. In this case the stakeholders may be internal to the organization, or found in other colleges and universities. Specialists from academic disciplines have provided insight from research trends and literature while county Extension personnel provide insight from local communities. Program area personnel have worked together to identify key issues that cut across disciplines. Special task forces, such as the aforementioned Shale Energy Education Work Group, collaborate to identify priority program efforts to address these issues. Funding is then allocated to support program priorities.

There has been a continual review of all plans to include the ability to be responsive to unanticipated issues. The system provides flexibility for educators to address these issues. In situations where grant monies were obtained, staff with specific, short -term employment contracts were hired to assist in meeting priority needs. Educator specialization is a way for the system to provide subject matter expertise close to local communities. Educators determine a subject matter specialization that relates to needs in their geographical area of the state. They receive additional training to remain on the cutting edge of their field and work with other educators to address local needs in a timely manner. In addition, educators remain linked to state specialists in the same discipline to enable the rapid dissemination of new information or the development of appropriate programming to address critical needs. As OSU Extension specialists continue to work in the context of ever increasing societal needs and tight budgets at all levels, the need for assessment and input from idea initiation to formative assessment to summative assessment is more important than ever to ensure limited resources are targeted to garner the greatest impacts where they are most needed. Throughout 2013 we have sought that input, usually in an informal process, often one-on-one, or in working group meetings.

OARDC centers and programs, and their stakeholders, have participated in multiple sessions ranging from planning and setting research agendas, to formative and summative evaluation of research projects. Our Ohio Bioproducts Innovation Center that brings together two of the largest industries in Ohio, agriculture and polymers, is one of the most engaged programs. Also both our CFAES business innovation team and our industrial liaison office are charged to be continually engaged, providing both feedback to and expanding partnerships for CFAES.

The OARDC internal competitive grants program (SEEDS) is peer reviewed by an internal panel of faculty and administrators representing all academic departments within the College. Some of the larger competitive grants are reviewed by panels of faculty and administrators and leading stakeholders who have expertise in the area of the award, e.g. agbioscience grants. Occasionally, faculty from outside the College are used a reviewers. Combined panels of academics and non - academics were used to help define research programs so they can more readily move into the marketplace. Many of the CFAES larger projects that compete for internal monies are required to have an interdisciplinary science and extension team as well as external members who are part of the business community. Such teams can more effectively move research through the full value chain and deliver needed goods and services to society. The goal is to advance the gate to plate or cell to sell approach in a timely manner.

All OARDC and OSU Extension publications are either blind peer reviewed or peer reviewed/juried before publications either go to print or are distributed via electronic media. Peer review, both formal and informal, and assessments from needs to formative to summative have long have been part of the business culture of OSU Extension and OARDC. Faculty members are encouraged to publish in the highest journal tier possible but are also encouraged to translate their more technical publications into trade journal articles, fact sheets, and, where appropriate, deliver their relevant ideas via social media. By placing more relevant information before stakeholders, the greater the chances that the feedback loops from those stakeholders will be complete.

As OSU Extension and OARDC strive to be more relevant, make wiser use of limited resources, and to maximize impact, stakeholder review, as well as internal and external peer review, are more important than ever. To that end the organization is committed to and had made use of both informal and formal reviews at all levels of the organization throughout 2013.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public
- Other (focus groups, public information booths at local gatherings,)

Brief explanation.

Stakeholder input is central to our organization's well-being and has long been part of our corporate culture. OARDC and OSU Extension, as well as our College of Food, Agricultural and Environmental Sciences (CFAES) as a whole, have continued to have wide support and active

participation from among our stakeholders. Each year, including 2013, our networks continue to grow. New stakeholders and partners are constantly being sought out and are seeking us out, especially as we enter new areas such as oil shale, and renewable energy from waste streams. As individuals and groups see meaningful engagement opportunities where they can influence outcomes, they are becoming more and more engaged. Our faculty and staff understand that each contact with a stakeholder is an opportunity for garnering their input and an opportunity for us to better understand needs. The key is meaningful engagement.

Over time, both formally and informally, we use all of the methods noted above. OSU Extension and OARDC are constantly engaged at some level with stakeholders. One technique we use is to ask some of the newly appointed government employees, some who were not overly familiar with our organization, to make a site visit and make input on our priorities, how we are communicating our story, and even to review and comment on draft fact sheets.

As an institution, new emphasis is continually being placed on business and industry participation and creating collaborative efforts that yield impacts such as new commercialized products and jobs. This level of stakeholder engagement is critical as the organization seeks to help Ohio grow its economy and put people back to work. Stakeholders understand that their collaborative participation is necessary to make this happen. To make the public - private collaboratives more valued, we communicate that there are joint expectations for:

- determining research agendas based on industrial need, with industry driving the process;
- evaluating research coming out of the technology platforms to determine; market opportunities through both technology and market assessments;
- evaluating commercial potential of patented technologies;
- forging partnerships with businesses interested in commercializing the agbioscience; and
- encouraging researchers to commercialize their research through licensing and spin-off opportunities and ongoing collaborations.

OARDC, OSU Extension, and most academic departments / schools within the College of Food, Agricultural and Environmental Sciences each effectively use their external advisory committees and stakeholder groups as a forum to discuss current programs and gather input for future direction, e.g. strategic planning. Electronic messaging, social media, webinars, tweeting, and blogging, as well as interactive group meeting / messaging systems have continued to expand rapidly. More of these stakeholders can now participate at lower time and travel costs using electronic messaging. All county Extension offices have an overall advisory committee, as well as focused committees, providing input for program planning, implementation, and evaluation. Electronic media is critical to fostering this input in that time and money are not always available for the traditional face-to-face meetings. It is this reduction in travel time commitment that may be one of our best tools for encouraging participation.

OARDC gathers input in many one-on-one settings in addition to group level engagement with a private business or industry on a project-by-project bases, or with commodity or civic groups. Stakeholders report that they appreciate this opportunity to make input. In addition to the series of OARDC and OSU Extension Battelle studies from 2004 through 2009 that drew extensively on stakeholders, each program area within OSU Extension conducted stakeholder based strategic plans to identify statewide priority programs. The process involved educators meeting with local advisory committees, reviewing demographic data, as well as economic and social trends in Ohio, and participating in a prioritization processes. As a result, each program area has focused teams composed of campus and center specialists, as well as county educators who develop curriculum and evaluation strategies for statewide programs. In many cases, these teams have specific target audiences whom they regularly involve in evaluating programs and educational materials and

engage in planning. Some of the program teams include members from external organizations (statewide agencies, organizations, commodity groups) who are appropriate partners to enhance program outreach and delivery. County Extension Advisory Committees, as well as the State Extension Advisory Committee, have been engaged in reviewing and prioritizing new multi and interdisciplinary programs as they relate to local communities. Multiple levels of stakeholders, due to their long history of engagement with OSU Extension and OARDC, maintain a strong commitment to making input into our programs, i.e. identifying needs, and participating in both formative and summative assessments. Throughout 2013, OSU Extension and OARDC have worked to continue to make 'meaningful engagement' the mantra of our stakeholder relations.

2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys
- Other (one on one interactions with existing and new stakeholders)

Brief explanation.

Each year, including 2013, our stakeholder base grows, not only in numbers, but also in type of groups ranging from traditional agricultural production, to environmental, to food networks, to mothers of infants. One of the largest groups was those looking information on leasing and environmental impact from oil and gas extraction from oil shale. Each group we work with is special, often having unique needs. While many seek us out, OARDC and OSU Extension make targeted efforts to find and link with representatives of all stakeholder groups. OARDC and OSU Extension utilized faculty and staff, associates from support organizations, traditional stakeholders, and political leaders to help identify other individuals and groups with whom we should be interacting. As new contacts are made, they are asked as to others who need to be included. This rolling process continues to serve the organization well.

This year informal needs assessments and targeted surveys have provided meaningful feedback. One on one sessions at our Farm Science Review, the state fair, local fairs, special events, and active participation by faculty and staff in community group processes and business/professional meetings have provided an opportunity to better link with constituents. Also this process is a means to expand this institution's clientele list, knowledge of needs, and feedback on outputs and impacts. These contacts are logged and maintained.

County Extension committee members are most useful in linking with our traditional stakeholders and expanding the list of those within the county that should be contacted. They are expected to have a constitution and bylaws that identify the makeup of the committee. The membership of committees is reviewed during annual onsite and self study diversity reviews to ensure that involvement is sought from the broadest array of constituents as is feasible. Extension educators are encouraged to, and have, reached out to new and underserved target audiences. Each team, or faculty and staff group, working on a project proposal or existing project will have a client partner list that is ever expanding. Likewise all administrative units in CFAES have advisory committees that continually seek to be more representative, thus they constantly opening up new

channels to new stakeholder individuals and groups.

Our future success in meeting needs and fulfilling our land grant mission lies in our ability to maintain links with a representative cross-section of our stakeholders. These linkages aid in assessing research and extension-related needs, extending information, growing human capital, opening opportunities for Ohio based products and services that we have helped to develop, and to ensuring we have a feedback mechanism from our stakeholders.

2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public
- Other (focus group interviews, unobtrusive observation, qualitative dat)

Brief explanation.

The methods noted above in III 2(B)1 have all been utilized to a greater or lesser extent this reporting year at various levels of the organization to gather data from stakeholders. While there are some formal processes used to gather input, most of our efforts are informal. Our survey of various groups is often done in open forum interview / discussion settings that generate more qualitative data than quantitative. OSU Extension and OARDC, as well as many faculty and staff members, departments and schools, and various research and extension groups within the institution have stakeholder lists that serve as their foundational contact points. In turn there are business and industrial partners, fellow research and extension institutions, and support organizations that are on our contact list. Federal, state, regional, and local governments, and agencies, as well as advisory committees and friends groups, commodity groups, as well as special interest groups also add to the list of stakeholders from whom we seek input in the initial planning and execution phases of our programs, and who provide both formative and summative assessment of outputs and impacts.

In a 2009 published study of OARDC's Accomplishments and Growth Strategies for Economic Development, Battelle reported using extensive field interviews with stakeholders to identify how core competencies can be translated into sources of innovative technologies and products for development. CFAES used similar techniques in preparing our 2008 CFAES Strategic Plan, as did OSU Extension when they prepared their strategic plan in 2008-09. Now all of these stakeholders are continually being re-engaged as we move forward. The ultimate aim is to have 'meaningful engagement' so once engaged our stakeholders find reasons to stay engaged. We work on the

premise that 'meaningful engagement' will yield meaningful data, both quantitative and qualitative, and that interpretation and internalizing that data will help lead the organization to meaningful partnerships, and that in turn will help foster real impacts.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities
- Other (Business management practices, culture of organization)

Brief explanation.

OSU Extension and OARDC, collectively and independently, advance both basic and applied research and build and test advance models for extension/outreach programming that meets client needs. To accomplish this requires close client/stakeholder/customer interaction. Throughout this reporting year (2013), both OARDC and OSU Extension, through the College of Food, Agricultural and Environmental Sciences, have continued stakeholder engagement activities that reinforce that our organizational culture is customer - centered, customer - focused. At each juncture of our decision-making, our organization has sought to weight stakeholder input against demand for our science and programs and our capacity to deliver. While there are often competing and conflicting demands, for the most part, input from our stakeholders is strongly reflected in what we do. Client needs and their input are critical in the state level budget process. Likewise their input continues to inform the Plan of Work for federal base funding in that meeting client needs is key to fulfilling the land grant mission and demonstrating that stakeholder support exists for programs that fulfill their needs and contributes to national well-being.

Stakeholder input is reflected, for example, in the new APLU/ESCOP Science Roadmap for Food and Agriculture that CFAES personnel were active in the development of, as reported in 2010. That input is still relevant and useful today. We recognize that state, federal, and extramural supporters must see constituency benefits in order to justify funding decisions. As we join with our stakeholders in meeting with elected officials at all levels of government, it is clear that stakeholder needs are being met and that the stakeholders and our organization are communicating common interest and need, albeit that need often is greater than our capacity to respond.

It is the field level interactions among stakeholders, researchers, and extension specialists where we jointly identify the majority of emerging issues. While strong theoretical academic insight is critical, food, agricultural, and environmental issues most often manifest themselves in field settings and in our clients' daily work and social lives. Clients remain our true partners joining with faculty members and staff to identifying emerging issues. Issues and needs originating from producers, processors, manufacturers, distributors, consumers and special interest groups have and will continue to inform both Extension and research programs. It is this input, when filtered through our academic knowledge bases, which provide our scientists with the study questions. Once answered, the response is framed for the clients, and in cooperation with these clients, as well as with other interested parties. The response includes intervention to effect change, deliver new goods, services, and ultimately to real impacts. These have and will continue to influence faculty

and staff hiring, shifts in priorities and resource allocation, and strategic/ action planning.

Likewise stakeholder input continues to influence how our College positions itself in the marketplace and conducts business. Stakeholder input has transformed the corporate culture in that as a public institution, it is imperative for society to see our organization reflecting their aspirations.

Input is considered at many levels of the organization. The Administrative Cabinet of OSU Extension reviews input from surveys and strategic planning processes to determine funding and staffing needs. The State Extension Advisory Committee and the OARDC Advisory Committee have met multiple times this year to provide input on programmatic needs and proposed priorities. Cooperative Extension administrators and others with statewide program leadership responsibility have initiated a departmental accountability process with all campus units receiving Extension funding. This process involves meetings to discuss shared priorities, surveys of internal and external stakeholders about their satisfaction with the content and expertise delivered from that unit, and review of documented impacts. This process is directly linked to annual funding for the campus departments. Locally, Extension Advisory Committees and other programmatic committees assist educators in prioritizing programs annually. They review information about local needs and the capacity of Extension to deliver programs, and guide the overall local programmatic vision.

Across all levels of administration, as well as at all program levels, stakeholder input has and continues to prove most valuable. Both OSU Extension and OARDC are extensively engaged with federal, state, and local officials, as well as business, industry, and special interest groups. The stakeholders' voices and needs are central to setting our institution's agendas and fulfilling our collective land grant mission.

Brief Explanation of what you learned from your Stakeholders

The individuals, groups, organizations, and businesses that are vested in CFAES' research and Extension activities provide a level of input that is central to our success. In essence they are part of the value chain. Those value chains have economic, ecological, ethical, aesthetic, and ethical outcomes and benefits.

The primary information learned in these interactions is that:

- the stakeholder perspective is not always as we might assume, thus it is imperative that we listen intently, communicate broadly, and stay engaged; staying engaged has been a strong recommendation from a number of stakeholders who have pointed out that periodic mailings and webpages do not equate to staying engaged;
- our science and services are highly valued; we are making real impacts that have positive social, economic, ecological, and ethical impacts, both quantitatively and qualitatively, for individuals, families, groups, communities, and business and industry;
- clients / stakeholders, both new and old, are willing to stay engaged if their role is meaningful and beneficial, thus CFAES' emphasis on 'meaningful engagement';
- OARDC and OSU Extension do not have the resources and personnel to meet all the demand, or take advantage of all the windows of opportunity, that present themselves; and
- the breath of demand is so wide and the quantity so great, and the shift so dramatic, that the organization must be engaged in constant planning to garner and optimize of resources, invest them in very targeted programs, and generate impacts in a timely manner, all the while clearly articulating to the full array of stakeholders what we have capacity and resources to do and not do.

This institution - stakeholder interaction is providing OARDC and OSU Extension with better insights into stakeholder needs, willingness to participate and at what levels, and a willingness to pay. Stakeholders better understand our institutional capacity to respond to needs, our funding models, institutional support (political, monetary, and client participation) needed, and the mission of

the institution in the 21st century. Because of our college's culture of 'meaningful stakeholder engagement', OARDC and OSU Extension better understand how to match existing resources and expertise with high priority needs of stakeholders. Out of these interactions emerge an improved understanding among all parties as to realistic expectations.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
9958590	0	6863049	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	10852592	0	6987262	0
Actual Matching	10852592	0	11817318	0
Actual All Other	0	0	0	0
Total Actual Expended	21705184	0	18804580	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	4018747	0	125387	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Climate Change

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
132	Weather and Climate	70%		25%	
133	Pollution Prevention and Mitigation	20%		65%	
605	Natural Resource and Environmental Economics	10%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	1.0	0.0
Actual Paid Professional	1.5	0.0	0.8	0.0
Actual Volunteer	0.0	0.0	0.0	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
90944	0	116433	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
90944	0	141143	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

On -going research activities related to climate change include both basic and applied research. This research takes place in all academic departments / schools within the College of Food, Agricultural, and Environmental Sciences. Laboratories for experiments, pilot plants, a feedstock processing plant, greenhouses, and research plots and stations support this program. All functional laboratories and sites are improved over time as program need warrants. OSU Extension provides parallel programs in this Planned Program to advance knowledge, promote adoption and change, and develop human capital. Climate change-related programs involving agriculture and natural resource professionals will help communities and individuals to plan for and make decisions to adapt to changing environments and sustain economic vitality. OARDC and OSU Extension faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal and external stakeholders.

2. Brief description of the target audience

In the Climate Change Planned Program, targeted audiences include, but are not limited to:

- Business and industry;
- Fellow academic units that partner with program scientists to create systems and processes needed to support research and the adoption of research findings by industrial partners;
- Ag producers and farmers;
- Fellow agencies or support organizations;
- General public;
- Other scientists and scientific groups;
- Political entities;
- Other education, outreach, and extension personnel;
- Students from elementary school to post doctorate studies; and
- News organizations.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	98522	17857	1225	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	28	7	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students Completed
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of participants attending educational programs of one teaching hour or more.

Year	Actual
2013	2284

Output #3

Output Measure

- number of webinars / online educational and research sessions

Year	Actual
2013	9

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Advance the understanding of soil carbon sequestration research to the point that Ohio farmers can enter the carbon trading market.
2	number of producers using no-till techniques
3	number of workshops and training issues on toxic algae blooms
4	create strategies / technology within our program mission to reduce atmospheric pollution that can contribute to global climate change
5	number of webinar participants who indicated that they learned something new

Outcome #1

1. **Outcome Measures**

   Advance the understanding of soil carbon sequestration research to the point that Ohio farmers can enter the carbon trading market.

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   number of producers using no-till techniques

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   number of workshops and training issues on toxic algae blooms

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   create strategies / technology within our program mission to reduce atmospheric pollution that can contribute to global climate change

2. **Associated Institution Types**

   - 1862 Research

3a. **Outcome Type:**

   Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2013	0

3c. **Qualitative Outcome or Impact Statement**

Issue (Who cares and Why)

The production of food animals often demand substantial amounts of energy. Specifically programs that require heated animal rearing facilities add an additional economic cost to meat production and an environmental cost in terms of CO2 production. Both costs need to be reduced to ensure sustainability. Pork production is one such industry.

What has been done
OARDC researchers, working with multiple ag experiment stations, are evaluating management strategies for reducing energy demands without reducing product output. The research team reduced nocturnal temperature at four research stations, demonstrating that decreasing temperature by 15 °F from 1900 hours to 0700 hours each day beginning four days after arrival in the nursery can save fossil fuel costs without an adverse impact on pig performance.

Results
Implementation of these findings can lead to a 29% reduction in use of heating fuel and electricity, saving $1.71 per pig. Assuming 20 million pigs are managed in this manner, annually projected savings of ~ $34,000,000 and a reduction of 140,720,000 kg CO2. Such economic and environmental savings are key to sustainable food animal systems such as swine production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

number of webinar participants who indicated that they learned something new

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	2320

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Participants of the webinars represent 200 organizations from around the country. Webinars are

targeted at a variety of groups of individuals -- general public, scientists, and educators are some of the key groups who benefit from the webinar content.

What has been done

Monthly webinars are offered by Extension personnel. In total, 2550 people attended Extension webinars on climate change in 2013. Some examples of webinar topics: impacts on fisheries in Lakes Michigan and Huron, harmful algal blooms in Lake Erie, climate education, strategies for flood mitigation, communication related to climate change, and climate change & public health.

Results

91% of the 2013 Climate Change webinar participants indicated that they learned new information and would share it with others. In addition to the learning outcomes, other agencies and schools have begun using the webinars as teaching tools. The National Park Service and USEPA, as well as 8 secondary schools and college courses have begun using the webinars as teaching tools. The webinars are archived online as a regional resource for more than 34,000 natural resource professionals. Archives can be viewed at: http://changingclimate.osu.edu/webinars/archives/

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation
605	Natural Resource and Environmental Economics

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
- Other (Social Acceptance of the issue)

Brief Explanation

Climate change is a multi-dimensional, political, and socially debated topic, thus the shift in any or all of these affect outcomes. Climatic extremes, coupled with pest and diseases that are often climate related, have helped to expand the array of research opportunities and challenges for which there are not adequate personnel and grants to address. As the food, fiber, and environmental economy adjust to the global climate change, flooding and weather patterns that are highly inconsistent with the norm, there will be other confounding changes in public policy, environmental regulations, demand for action/inaction, new predictive models, and a lack of worldwide consensus on how to respond / react / lead. This inconsistency has negatively impacted research and extension grants available for food, agricultural, and natural resource programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($170 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

For 2013, more than 2550 participants representing 200 organizations from around the country have attended the 9 monthly OSU Extension webinars, with 91% acknowledging they learned new information and would share it. The National Park Service and USEPA, as well as 8 secondary schools and college courses are using the webinars as teaching tools and the webinar archives is used as a regional resource for more than 34,000 natural resources professionals.

Key Items of Evaluation

For 2013, more than 2550 participants representing 200 organizations from around the country have attended the 9 monthly OSU Extension webinars, with 91% acknowledging they learned new information and would share it. The National Park Service and USEPA, as well as 8 secondary schools and college courses are using the webinars as teaching tools and the webinar archives is used as a regional resource for more than 34,000 natural resources professionals.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

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%		90%	
608	Community Resource Planning and Development	100%		10%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	2.0	0.0	5.0	0.0
Actual Paid Professional	2.0	0.0	2.5	0.0
Actual Volunteer	5.0	0.0	0.0	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**
121258	0	285778	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
121258	0	723344	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

Research and Extension activities will inform CFAES' sustainable energy and advanced materials programs, through both basic and applied research, and with the full range of Extension activities. The research takes place in all academic departments / schools within the College of Food, Agricultural, and Environmental Sciences. Laboratories for experiments, pilot plants, a feedstock processing plant, greenhouses, and research plots and stations throughout the state support this program. All functional laboratories and sites are improved over time as program need warrants.

OSU Extension provides parallel programs in this Planned Program to advance knowledge, promote adoption and change, develop human capital, and support economic development activities. Energize Ohio, an Ohio State University Extension signature program, provides non-biased, research-based information to address critical energy issues impacting Ohioans. The programming is designed to enhance community leaders' and local residents' knowledge of energy drivers and development in order to promote best practices and informed decision-making on the implementation of sustainable energy strategies in Ohio's communities, businesses, and farms.

OARDC and OSU Extension faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal and external stakeholders, to ensure the research has the greatest chance of effecting change within society.

2. Brief description of the target audience

Targeted audiences include, but are not limited to: business, industry, and residents that have expressed a need for sustainable energy and advanced materials information that is 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. community leaders, general public; other scientists and scientific groups; political entities; other education, outreach, and Extension personnel; students from elementary school to post doctorate studies; and news organizations.

3. How was eXtension used?

eXtension was used by OSUE as a resource for research based information and educational tools and as a platform to disseminate extension programming and webinars.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1820	4240	0	0

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

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	9	8	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed.
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Educational workshops and seminars

Year	Actual
2013	53

Output #3

Output Measure

- Research based assessments of energy project sites

Year	Actual
2013	3

Output #4

Output Measure

- Community energy project assistance & planning

Year	Actual
2013	4

Output #5

Output Measure

- Total number of participants in this OSUE event / project that are defined as under-served

individuals (i.e. individuals whose needs have not been addressed in past events)

Year	Actual
2013	533

Output #6

Output Measure

- Total number of participants in this OSUE event / project that are defined as under-represented individuals (i.e., individuals who may not have participated fully--e.g., women, minorities, persons with disabilities, small farm owners, etc.)

Year	Actual
2013	489

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 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 2017, the program will contribute at least two alternatives to a petroleum-based product or process that meets client needs with an acceptable point of purchase price.
6	Support, though research, the building of biobased development that annually, beginning in 2013, utilizes Ohio and the region's plentiful supply of biomass, including waste steam materials in such manner as to improve the economy.
7	Support the building of biobased development that, beginning in 2013, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.
8	Increased understanding of energy alternatives, resources and project support
9	Implement change in energy usage by workshop participants
10	Complete installation of alternative energy activity
11	Complete plan for community or business energy activity
12	number of individuals who indicated an increase in understanding of energy alternatives, resources, or project support as a result of OSUE programming efforts

Outcome #1

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

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.

Not Reporting on this Outcome Measure

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 2017, the program will contribute at least two alternatives 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, though research, the building of biobased development that annually, beginning in 2013, 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 Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many U.S. colleges and universities are turning to renewable energy to meet some or all of their power needs. It is part of a growing trend that also involves the implementation of sustainability initiatives such as the construction of "green" buildings and comprehensive campus recycling. OARDC set an ideal goal for its Wooster campus to become carbon-neutral. To do that, we need an energy source that goes through the carbon cycle, which anaerobic digestion does."OARDC Associate Director Dave Benfield.

What has been done
OARDC's Wooster campus is employing anaerobic digestion technology, which turns a variety of organic wastes into biogas that powers a generator that makes electricity. Quasar energy group, a Cleveland-based company that in 2010 built its flagship anaerobic digester in OARDC's BioHio Research Park, produces the biogas and electricity. The company's 550,000-gallon digester can process 30,000 wet tons of biomass annually, keeping a range of waste out of landfills and incinerators.

Results
The OARDC Wooster campus, that includes an OSU Extension complex, is using agricultural and food-processing wastes to meet a portion of its energy needs; quasar energy group has the capacity to supply up to one third of the Wooster, OH campus' 12-megawatt-hour annual electricity needs. That is 3.6 MWh of green energy, or enough to power 313 average U.S. homes, according to the U.S. Energy Information Administration. About 74 percent of the electricity generated by the Wooster digester is sold to OARDC.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #7

1. Outcome Measures

Support the building of biobased development that, beginning in 2013, effectively utilizes agriculture's production capacity to produce plants that have the desired attributes for manufacturing.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Increased understanding of energy alternatives, resources and project support

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Multiple biobased plastics are on the market and often-conventional wisdom, as well as advertising, labels them a green technology. The ability to reuse or compost any waster product is important to sustainability. Many biobased plastics are recycled, but can non-recycled biobased be composted?

What has been done
OARDC researchers studied a wide range of materials to compare their biodegradability: bio-based plastics made from crops such as corn, natural fiber composites (such as coconut fiber), and conventional (petroleum-based) plastics amended with additives that are intended to help them biodegrade. As controls, the scientists used conventional polypropylene plastic (which is known to not biodegrade) and cellulose paper, which fully biodegrades. These materials were tested in three different environments: compost (115 days), anaerobic digestion (50 days), and

soil (660 days).

Results
These researchers found that most bio-plastics or "green" plastics currently available in the market do not biodegrade within the time period used in standard solid-waste management processes and do not meet industry standards for compostability. Results indicate that only one of the bio-plastics included in the study, a PHA plastic made via sugar fermentation, biodegraded to significant extents in all three environments. Additionally, the conventional plastics treated with commercial additives showed almost no degradation, despite claims to the contrary often made by the manufacturers of such products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes
608	Community Resource Planning and Development

Outcome #9

1. Outcome Measures

Implement change in energy usage by workshop participants

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Complete installation of alternative energy activity

Not Reporting on this Outcome Measure

Outcome #11

1. Outcome Measures

Complete plan for community or business energy activity

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	49

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Existing businesses create a majority of the jobs and a local government's tax base and are the real economic engines of the local economy. Business Retention & Expansion (BR&E) programs are commonly used by economic developers to identify and address the barriers to the growth or retention of existing businesses. In Ohio, BR&E data has found businesses frequently cite the cost of doing business, including energy costs, as a barrier to growth.

What has been done
To disseminate details about Ohio's energy policy and share sustainable energy strategies implemented by local companies, our Extension team organized a series of workshops. The program provided participants with details on energy policy and development strategies implemented by businesses in northwest Ohio. The goal was to provide participants tools and knowledge to make informed decisions on energy investments, allowing them to grow and provide stabilized employment opportunities for Ohioans.

Results
A 2013 workshop with Ohio businesses asks participants to respond to the question: 'As a result of this program I am more likely to consider a renewable energy proposal at my place of employment?' Results showed the likelihood of participants acting on a renewable energy project increased by 3 points on a 6-point scale. JobsOhio Northwest Region Director, Gary Thompson, said, 'This program presented critical information on energy efficiency, energy cost savings and utilizing existing green sources of energy. The lower energy costs make Ohio a more competitive state, which helps retain and attract jobs, especially in the manufacturing sector.'

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

Outcome #12

1. Outcome Measures

number of individuals who indicated an increase in understanding of energy alternatives, resources, or project support as a result of OSUE programming efforts

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	91

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The abundance of natural resources and extensive open space positions rural communities across Ohio to play a central role in the development of future energy projects. However, energy development presents new social, economic, and environmental opportunities and challenges to impacted communities.

What has been done
In 2013, OSU Extension educators and specialists conducted over 23 programs that reached more than 503 people on renewable energy-related topics. In addition, the team has developed a number of tools to support educational efforts including 3 new fact sheets, one research project and technical report, and 3 multimedia programs, created from recorded Extension workshops.

Results
Program evaluation indicated there was an increase in knowledge and behavior related to the understanding of renewable energy drivers, the different types of policy that impact renewable energy development, and the pros and cons of renewable projects. Furthermore, as a result of programming, participants indicated they are more likely to consider a renewable energy project as a rural economic development strategy in their community.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development

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)

Brief Explanation

Supply, costs, transportation costs / impacts, 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. New sources of oil and gas from Ohio's oil shale is an external factor. Availability of biobased raw products in Ohio, and regionally, and at what costs, economic, social and environmental costs, are external factors. As the US has dramatically increased its output of carbon-based energy, interest in alternative energy has lessened. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands far exceed resources and capacity. While all factors noted above still effect the outputs and impacts in this area, the greatest external factor which may impact this planned program may be the rapid development of shale gas in Ohio. The plentiful supply of natural gas will more than likely directly compete with adoption of renewable energy.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other

interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

OSU Extension's signature program, "Energize Ohio," is still in its infancy. For the upcoming year, Energize Ohio will be implementing the following evaluation studies and data collection methods:

- After only (post-program)
- Retrospective (post-program)
- Before-after programming evaluation
- During programming evaluation
- Case studies

Key Items of Evaluation

Feedback from our research partners provides a critical indicator of success. Quasar, a long time on-site, renewable energy research partner on the OARDC-Wooster campus offered the following in reference to their work with an OARDC scientist:

"This new grant builds on Quasar's continuing collaboration with Dr. Yebo Li and The Ohio State University-OARDC. This project demonstrates the role academia can play in envisioning the future of the renewable energy industry." -- Clemens Halene, Vice President for Engineering, Quasar Energy group.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food Components	10%		90%	
703	Nutrition Education and Behavior	60%		5%	
724	Healthy Lifestyle	30%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	20.0	0.0	1.0	0.0
Actual Paid Professional	8.0	0.0	0.3	0.0
Actual Volunteer	1.0	0.0	0.0	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
485032	0	41058	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
485032	0	95057	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

Obesity research includes food science, plant sciences, and consumer research related to human health and obesity. Parallel Extension programs that address health and wellness, life styles, and consumer choice are included in this Planned Program as well. Given the complex nature of obesity as a subject, the areas is broadly supported in scientific areas ranging from genetics for breeding plants and animals that can be processed into healthier food products, to education of school children about eating healthy. Thus not all impacts relating to obesity are found in this Planned Program. OARDC and OSU Extension offer a variety of programs that would fall under the planned program of Childhood Obesity. Examples of program content include: ensuring nutritious foods are affordable and available, and providing guidance so that individuals and families are able to make informed, science-based decisions about their health and well-being.

2. Brief description of the target audience

Within the Childhood Obesity Planned Program targeted audiences include, but not limited to: specific individuals, families, and groups who have an expressed a need, or where there are latent needs, for related research and extension information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that partner with OARDC and OSU Extension to support not only the research, but also the adoption of the research findings by stakeholders; 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. obese children; other scientists and scientific groups; political entities; school administrators; students from pre-school to post doctorate studies; news organizations; and business and industrial groups concerned about obesity in their workforce or who are producers of foods and food additives that can help reduce obesity and its side effects.

3. How was eXtension used?

OSU Extension used eXtension as a source of additional information and support for program participants, emphasizing the Families, Food and Fitness area.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3678	44117	919	29293

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	3	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students competed
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- number of educational sessions held

Year	Actual
2013	83

Output #3

Output Measure

- Total number of participants in this event/project that are defined as under-represented individuals (i.e., individuals who may not have participated fully--e.g., women, minorities, persons with disabilities, small farm owners, etc.).

Year	Actual
2013	2299

Output #4

Output Measure

- Total number of participants in this event/project that are defined as under-served individuals (i.e. individuals whose needs have not been addressed in past events).

Year	Actual
2013	2034

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	To better understand human decision making; specifically with reference to how individuals make food consumption decisions.
2	Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.
3	To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.
4	Advance extension activities ranging from how to provide policymakers better insight about how to help individuals overcome their inability to adhere to weight-loss plans to impacts on individual and groups' lives, both in terms of weight loss and in overall improvements in health.
5	Number of participants who learned new information from this program. (OSUE)
6	Number of participants who plan to increase their level of daily physical activity. (OSUE)
7	Number of participants who plan to increase their consumption of fruits and vegetables. (OSUE)
8	Number of participants in this event / project who actually adopted one or more recommended nutritional practices that reduce the risk of chronic disease (OSUE)

Outcome #1

1. **Outcome Measures**

   To better understand human decision making; specifically with reference to how individuals make food consumption decisions.

   Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

   Apply new knowledge to programs at the field level with a goal of significant long term weight loss and overall improvement of health in those who participate.

   Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

   To identify research activities such as new data sources, improved techniques for data analysis, and improved hypotheses for obesity research questions.

   Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

   Advance extension activities ranging from how to provide policymakers better insight about how to help individuals overcome their inability to adhere to weight-loss plans to impacts on individual and groups' lives, both in terms of weight loss and in overall improvements in health.

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   Number of participants who learned new information from this program. (OSUE)

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3122

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The rate of childhood obesity has tripled in the last 30 years. Obesity in childhood often can result in future heart problems, bone and joint issues, social problems, sleep apnea, and many other adult health issues. Many schools have reduced the number of hours of gym and recess offered to students, which negatively contributes to the obesity issue. OSU Extension programs seek to educate children and their families. We believe that knowledge and understanding of obesity causes, and the subsequent impacts to health are the first step in affecting future quality of life.

What has been done
A wide variety of OSU Extension educational programs offered are designed to help participants acquire the knowledge, skills, attitudes and behaviors necessary for nutritionally sound diets. We present new and alternative approaches for a healthier lifestyle via demonstration, hand-on participation, and lecture. The long term goal of this program is for individuals to change their eating habits and become more physically active. Through self-assessment surveys, participants were asked if they learned new information regarding obesity topics presented.

Results
Participants increased their awareness, knowledge, skills, improved their attitudes, and indicated an intent to change behaviors regarding the importance of making healthful food purchases, healthy food preparation methods, adequate vs. too large portion sizes, and the role exercise and daily physical activity play in promoting and maintaining good health.

85% of participants reported learning new information as a result of OSU Extension programming related to Childhood Obesity.

Affecting knowledge gains is the first step towards individuals making true lifestyle changes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #6

1. Outcome Measures

Number of participants who plan to increase their level of daily physical activity. (OSUE)

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Number of participants who plan to increase their consumption of fruits and vegetables. (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	335

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The rate of childhood obesity has tripled in the last 30 years. Obesity in childhood often can result in future heart problems, bone and joint issues, social problems, sleep apnea, and many other adult health issues. Many schools have reduced the number of hours of gym and recess offered to students, which negatively contributes to the obesity issue. OSU Extension programs seek to educate children and their families. We believe that knowledge and understanding of obesity causes, and the subsequent impacts to health are the first step in affecting future quality of life.

What has been done
Extension presents new / alternative approaches for a healthier lifestyle via demonstration, hand-on participation, and lecture. The long term goal of this program is for individuals to change their eating habits and become more physically active. Through self-assessment surveys collected post-program, participants were asked to declare their intent to change behaviors related to obesity and living a healthier lifestyle.

Results
Participants increased their awareness, knowledge, skills, improved their attitudes, and indicated an intent to change behaviors regarding the importance of making healthful food choices,

specifically with regards to an increase in their consumption of fruits and vegetables. Ultimate program outcomes would detail the number of individuals who actually were able to adopt behaviors learned from Extension programming. At this time, resources are unavailable to document long-term impacts (changes in condition) of Extension programming. If budget and staffing will allow for it in the future, longitudinal studies of program impact may be implemented.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #8

1. Outcome Measures

Number of participants in this event / project who actually adopted one or more recommended nutritional practices that reduce the risk of chronic disease (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1246

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The rate of childhood obesity has tripled in the last 30 years. Obesity in childhood often can result in future heart problems, bone and joint issues, social problems, sleep apnea, and many other adult health issues. Many schools have reduced the number of hours of gym and recess offered to students, which negatively contributes to the obesity issue. OSU Extension programs seek to educate children and their families. The ultimate goal of Extension programming is to deliver information that the public can use to make lasting changes in their lives which impact their quality of health.

What has been done
A wide variety of Extension educational programs offered are designed to help participants acquire the knowledge, skills, attitudes and behaviors necessary for nutritionally sound diets. We present new/alternative approaches for a healthier lifestyle via demonstration, hand-on participation, and lecture. The long term goal of this program is for individuals to change their eating habits and become more physically active.

Results

Participants used the awareness, knowledge, skill, attitude increase changes from OSU Extension programming regarding childhood obesity and made lifestyle changes based upon those gains. After-program self-evaluation documented 1,246 individuals made changes to their recommended nutritional practices which have been shown to reduce the risk of chronic disease. As a result of OSU Extension programming, 34% of participants have put their gained knowledge into practice and are living healthier lifestyles.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

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 (Support in schools for programs)

Brief Explanation

Obesity is a complex topic to address, in that it encompasses a range of variables, including food quality, socio-emotional elements, access to healthy foods, economics, and the decisions of individuals in food choice. Shifts in these variables are impact all aspects of people's lives -- psychologically, socially, and physically. New 2013 research shows that obesity outcomes for individuals are somewhat determined by the time children reach kindergarten. Reaching individuals with education and prevention measures on such a compressed timeline presents challenges to researchers and Extension personnel as they consider new curriculum and delivery methods.

Within this program area, public monies and the fluctuations in appropriations have had a dramatic (both positive and negative) affect on human well-being, as do levels of government support for obesity education. The varying level of importance placed on social science research impacts our ability to compete for limited dollars, and thus impacts the extent to which research can be carried out. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and excessive programmatic demands are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

OSU Extension (OSUE) has had a long-standing program addressing obesity. OSUE has seen positive results from the evaluations issued to participants of programming related to Childhood Obesity. The following is an example of the information yielded from assessments done by OSUE. Participants gained knowledge of the following topics: different foods and their benefits, the need for balance of all the food groups, appropriate portion sizes, and the amount of physical activity needed daily. These skills will assist participants in obtaining a balanced diet and engaging in daily physical activity to achieve and maintain a healthy weight.

OSUE is building great capacity to both assess and respond to Childhood Obesity. To make significant progress, key programs include Simple Suppers, SNAP-Ed (Supplemental Nutrition Assistance Education Program), EFNEP (Expanded Food and Nutrition Education Program),the 'Choose It! Use It!' program, and the Ohio Farm to School program.

Simple Suppers is an interactive, hands-on nutrition education and cooking program for preschool children and their parents. The 10 lesson program includes: nutrition education/activities and discussion; skill building in food preparation/cooking; family meal preparation; group family meal; take-home educational materials; and session evaluation. Preliminary data indicate that Simple Suppers participants enjoy more family meals together at home, with parents indicating greater confidence in providing healthy options and encouraging healthy food choices for their children.

SNAP-Ed targets individuals and families eligible for the Supplemental Nutrition Assistance Program (formerly food stamp program). The goal of SNAP-Ed is to improve the likelihood that persons eligible for SNAP will make healthy food choices within a limited budget and choose physically active lifestyles consistent with the current Dietary Guidelines for Americans and MyPlate. In 2013, 86% of participants reported sometimes or almost always practicing behaviors associated with healthy food consumption.

EFNEP uses similar approaches to reach limited-resource families and youth. More than 80 percent of EFNEP families report living at or below 100 percent of poverty, and nearly 70 percent indicate being of minority status. This is important because poor health disproportionally affects minority and limited-resource audiences. In 2013, 70% of children and youth participating in EFNEP reported eating more healthy foods as a result of the program.

The 'Choose It, Use It' curriculum teaches children about making healthy choices when selecting food to eat, and choosing to get exercise on a regular basis. An assessment given following the program revealed that 90% of youth participating indicate that they plan to eat more fruits and vegetables daily. Additionally, 95% indicate that they plant to be more physically active daily.

The Farm to School program was transferred from the Ohio Department of Education to OSU Extension in 2012. The goal of the program is to bring healthy food to school cafeterias, while simultaneously supporting local farmers. Students who are touched by the program gain healthy eating habits that will set the foundation for a healthy lifestyle. In 2013, 33% of the 616 Ohio public school districts who participated in the USDA Farm to School Census reported participating in Farm to School activities.

The programming associated with the planned program, "Childhood Obesity," is offerred through the OSUE program area, Family and Consumer Sciences (FCS). FCS is currently in the process of working with the Program Development and Evaluation Unit of OSUE to review, revise and update their assessment tools for all FCS programming. Once assessment / evaluation tool changes are final, key indicators from those assessment tools will be incorporated into Reasearch in View (RiV), the online reporting tool used by The Ohio State University and OSUE. Data mined from the RiV database in turn provides some of the quantitative and qualitative data used to write the federal report each year. We anticipate seeing benefits from these updates in the next one to two years, as demonstrated by an increase in the number of outputs and outcomes for FCS-related reports (Childhood Obesity, Strengthening Families and Communities, Food Safety).

Key Items of Evaluation

As a result of OSUE evaluations, it was determined that 68% of participants of programming related to Childhood Obesity learned "some" or "a lot" of new information.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Food Safety

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	90%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	10%		95%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	1.5	0.0
Actual Paid Professional	4.5	0.0	0.5	0.0
Actual Volunteer	88.0	0.0	0.0	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
272831	0	74152	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
272831	0	230463	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

OARDC's food safety research to advance broad food safety goals include both basic and applied research. Research ranges from microbial studies to packaging. Laboratories, pilot plants, farms, and multiple business sites are available throughout state to permit data gathering and to continue long - term experiments. All functional laboratories and sites are improved over time as program need warrants. Parallel OSU Extension food safety programs are developed based on client demand and food safety standards set by both the industry and regulators. Food safety programs to reduce the incidence of foodborne illness and provide a safer food supply by addressing and eliminating causes is a primary program goal of OSU Extension and OARDC. Specific activities for the food safety education for consumers include: (1) Conduct food safety education classes with participants in the FNP and EFNEP program; (2) Conduct ServSafe classes with food establishment managers and employees; (3) Conduct Safe Food Handling for Occasional Quantity Cooks classes with volunteer food preparers; and (4) Provide research-based information to consumers through various forms of media, phone calls, fact sheets, and web pages.

2. Brief description of the target audience

Targeted audiences within our food safety programs (2013 - 2019) include, but are not limited to: specific individuals or groups who have expressed a need for food safety research and extension information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that partner with food scientists to create systems and processes needed to support not only the research, but also the adoption of the research findings by stakeholders; 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. persons who engage in home canning of food; other scientists and scientific groups; political entities; students from pre-school to post doctorate studies; news organizations; business and industrial groups; food stamp or food stamp eligible families (FNP); Low income families with young children (EFNEP); food establishment managers (ServSafe manager training; food service employees (ServSafe employee training); volunteer food preparers (general population) (OQC); and general consumers (via both formal or informal education).

3. How was eXtension used?

OSU Extension referred program participants to eXtension for additional information and answered food safety related questions which were submitted to educators and researchers through the 'Ask an Expert' site.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	13589	33594	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	5	31	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of Graduate Students Completed
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of educational sessions held

Year	Actual
2013	153

Output #3

Output Measure

- Individual instruction through email, phone, or office visits

Year	Actual
2013	1935

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.
2	Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.
3	Reduce food borne pathogens in the food supply chain.
4	Number of participants who learned new information from this program. (OSUE)
5	Number of participants who plan to adopt one or more recommended practices. (OSUE)

Outcome #1

1. Outcome Measures

Contribute to the advancement of knowledge about food packaging technologies, e.g. ultrasonic sealing, controlled environment packaging, to the extent that, annually, the risk of contamination due to packaging is reduced measurably.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Contaminated food causes an estimated 48 million cases annually in the U.S., with 1.3 million hospitalizations from foodborne illness each year, and 3,000 deaths. In Ohio, the estimated annual economic burden from contaminated food ranges from $1 billion to 7 billion. CFAES' Vegetable Safety Research and Extension Program studies how produce gets contaminated and then uses that knowledge to develop new science-based controls that are, affordable, socially acceptable and environmentally sustainable.

What has been done
The program's team members are from plant pathology, horticulture and crop science, natural resources, economics and nutrition. They work from the molecular level to a global scale conducting practical research on the survival and dissemination of pathogens, as well as knowledge synthesis and need for extension programming. This team is one of the most comprehensive teams at a single institution studying the integration of vegetable production and safety.

Results
The team has published 30 peer-reviewed food safety-related articles in scientific journals and seven fact sheets for CFAES- OSUE, has developed and delivered a statewide series of outreach meetings on Good Agricultural Practices for produce growers; trained eight new food-safety-related interdisciplinary scientists; organized meetings between Ohio produce growers and representatives of the Food and Drug Administration regarding FDA's proposed new food safety rules, and has received nearly $10 million in current and pending research contracts and grants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Expand the knowledge base for contamination detection within packaged foods by developing or refining technologies such as magnetic resonance or infrared spectroscopy that will, within ten years, eliminate the problem.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduce food borne pathogens in the food supply chain.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Number of participants who learned new information from this program. (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	7381

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Adult consumers in Ohio handle food that has the potential of making them ill. Foodborne illnesses cause $1-7.2 billion in health care, affect quality of life, and work productivity costs, which emphasizes the need for food safety education.

What has been done
OSU Extension offers several curricula that focus on food safety education. ServSafe® is a nationally recognized food safety training and certification program established by the National Restaurant Association. The ServSafe® food safety training and certification program is recognized by more jurisdictions than any other food safety program. Home food preservation sessions are offered, teaching the basics of home canning and preservation through demonstrations and workshops. The science behind preservation is emphasized, so that all participants understand why certain procedures must be followed precisely to ensure a high-quality, safe product. EFNEP and SNAP-ed programming are also offered. All OSU Extension staff and volunteers complete a Safe Food Handling class.

Results
7,381 participants reported on end-of-program evaluations that they learned recommended safe food handling skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #5

1. Outcome Measures

Number of participants who plan to adopt one or more recommended practices. (OSUE)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6453

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Adult consumers in Ohio handle food that has the potential of making them ill. Foodborne illnesses cause $1-7.2 billion in health care, affect quality of life, and work productivity costs, which emphasizes the need for food safety education.

What has been done

OSU Extension offers several curricula that focus on food safety education. ServSafe® is a nationally recognized food safety training and certification program established by the National Restaurant Association. The ServSafe® food safety training and certification program is recognized by more jurisdictions than any other food safety program. Home food preservation sessions are offered, teaching the basics of home canning and preservation through demonstrations and workshops. The science behind preservation is emphasized, so that all participants understand why certain procedures must be followed precisely to ensure a high-quality, safe product. EFNEP and SNAP-ed programming are also offered. All OSU Extension staff and volunteers complete a Safe Food Handling class.

Results

6,453 participants reported on end-of-program evaluations that they intended to adopt one or more of the recommended safe food handling practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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 (National Security Threats)

Brief Explanation

Food safety is impacted by all sectors of agbioscience: physical, chemical, biological, social, economic, and environmental. Climatic extremes, for example, impact food safety to the extent they impact supply or foster growth and dispersion of pest and pathogens. Climatic extremes that are now occurring throughout the world impact the quantity and quality of food supplied as well as the timely distribution of food before contamination is an issue. Economic shifts such as to cost of processing equipment or production costs, public policy shifts, regulations, and shifts in demand will be impact outcomes. Food trends / fads, food advertising agendas, new biological and chemical threats, and public nutritional health - related issues are also external factors that effect outcomes.

All of these place greater demand on the land grant system. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that far exceed resources, are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Studies have shown that food service outlets are responsible for 7 in 10 outbreaks of foodborne illness. This results in an estimated 48 million illnesses, 128 hospitalizations, and 3,000 deaths, all costing the nation $77.7 billion a year. OSU Extension offers food safety training to food service workers at restaurants, schools, hospitals, child care centers, nursing homes, and anyone else who might serve food to the public.

Based on a retrospective pre- / post-test administered by OSU Extension professionals, given at the end of home food preservation workshops, participants reported planning to do the following Extension-recommended behaviors more frequently when preserving food at home:

- 64% will acidify tomatoes with lemon juice or citric acid
- 30.7% will use a boiling water bath canner to process high acid foods
- 47.7% will use a pressure canner to process low acid foods
- 56% will use the correct headspace after filling the jars
- 51% will prepare bands, lids and jars according to guidelines
- 60.8% will use current OSU Extension and USDA canning and freezing recommendations
- 40.8% will blanch vegetables before freezing
- 48.1% will wash their hands with soap and warm running water for at least 20 seconds before working with foods

Results of pre- / post-test given to EFNEP clients at the end of 8-week class sessions:

- 53% indicated they would not thaw food at room temperature
- 30% decreased the frequency of leaving food on the counter for more than 2 hours

- 59% increased their use of a food thermometer when cooking meats
- 23% washed utensils before using them to cook other foods

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	0%		20%	
502	New and Improved Food Products	5%		15%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		10%	
607	Consumer Economics	10%		0%	
701	Nutrient Composition of Food	10%		10%	
702	Requirements and Function of Nutrients and Other Food Components	10%		15%	
703	Nutrition Education and Behavior	10%		5%	
704	Nutrition and Hunger in the Population	5%		0%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	20%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	20%		15%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	0.0	9.5	0.0
Actual Paid Professional	10.5	0.0	4.8	0.0
Actual Volunteer	10.0	0.0	0.0	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**
636604	0	665163	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
636604	0	1258985	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

This Planned Program advances broad global food security goals and includes both basic and applied research, and associated outreach and Extension programs. Research includes microbial studies, packaging, food taste tests, consumer preferences, and behavior. Laboratories, pilot plants, farms, and multiple business sites are available throughout the state to permit data gathering and to continue long - term experiments. All functional laboratories and sites are improved over time as program need warrants. Extension has the capacity to advance knowledge acquisition, promote adoption strategies, and help build human capital to promote global food security and reduce hunger both locally and worldwide. OARDC and OSU Extension faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal and external stakeholders.

Extension's Local Foods Signature Program is designed to strategically address the critical need for outreach education around the broad topic of local food systems, breaking these needs by building food literacy and skills around four themes: Food Production, Food and Family, Food and Business, and Food and Community.

2. Brief description of the target audience

Targeted audiences include, but are not limited to:

- Specific individuals or groups who have expressed a need for food-related information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature
- Fellow academic units that partner with food scientists to create systems and processes needed to support not only the research, but also the adoption of the research findings by stakeholders
- 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. persons who engage in home canning of food
- Other scientists and scientific groups
- Political entities
- Other Extension personnel
- Students from pre-school to post doctorate studies
- News organizations
- Business and industrial groups
- Philanthropic, social and or religious outreach groups wishing to create community gardens, local food pantries, community supported agriculture-type systems for lower socio-economic groups in their

communities

3. How was eXtension used?

OSU Extension's Ask a Master Gardener Volunteer (AaMGV) Program has continued to grow and evolve. MGV skill level and abilities continue to increase in order to respond to consumer horticulture questions with research-based answers in a timely, professional, and compassionate manner. From May through August 2013, there were 93 MGVs in 34 counties answering gardening questions via the AaMGV widget on the state website and all OSUE County websites. During that time period, out of 1,396 questions answered by OSUE professionals, MGVs were responsible for 911 of the responses. A large number of those questions were from community gardens experiencing problems.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	238823	28658	13056	29700

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

Patent Applications Submitted

Year: 2013
Actual: 1

Patents listed
Patent 8,435,580: Method and Apparatus for Peeling Produce in Batch or Continuous Flow (C1)

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	2	23	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate student completed
  Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Number of participants attending educational programs of one teaching hour or more.

Year	Actual
2013	230000

Output #3

Output Measure

- Total number of workshops offered to producers and agri-business leaders
  Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Total number attendees / participants of educational programs offered under the 'Local Foods' signature program themes: Food Production, Food & Family, Food & Business, Food & Community

Year	Actual
2013	10562

Output #5

Output Measure

- Total number of pounds of food distributed through local / community / urban gardens, or local food animal systems that were assisted or educated by the 'Local Foods' OSUE signature program

Year	Actual
2013	5000

Output #6

Output Measure

- The number of participants in educational sessions (presentations, workshops, webinars, etc.) offered by members of the Ohio Direct Marketing Team

Year	Actual
2013	1732

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Advance processing techniques, e.g. electrostatic coating, to achieve the desired traits requested by industrial partners, that are manifested in consumer demand studies, or that are novel technologies that may meet latent needs.
2	Participate in the creation of a standardized model and protocols for studying functional foods for the purpose of providing consumers with more informed functional choices that are currently available
3	Advance the study of stacking functional foods that have a lower than expected societal demand (e.g. soy) with more desirable foods such as tomato products as a means of providing consumers with more access than is currently present.
4	Expand utilization of products with known functionality or nutraceutical value and give consumers greater informed consumer choice, including the bioavailability of the desire substance in the food, than they presently have.
5	Reduce health risk by releasing at least one major study each five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes.
6	Reduce health risk by releasing at lest one major study each five years demonstrating negative nutritional side effects, fatty acids and obesity or obesity-related hepatic stealosis or prostate cancer.
7	Advance the understanding of the potential role of trace minerals such as the role of selenium in protection against breast cancer or copper's protecting against cardiovascular diseases to that extent society can make science-based choices.
8	Processing technology research such as pulse electronic field, high pressure, ohmic heating, and microwave will provide processors with a set of alternatives leading to efficiency and quality gains within economic realities.
9	Processing technology research will improve and optimize equipment and processing of food in such manner as meet consumer demand as or before that demand emerges.
10	Reduce through research and development the negative processing impacts on physio-chemical or molecular properties of food within varying parameters to make foods more acceptable and higher quality commensurate with demand.
11	Advance and document improvements in quality and quantity of food stocks to meet global food security and hunger goals.
12	Ohio Market Maker results will indicate food preferences and number of farmers/retailers networks established (measured in number of networks established).
13	Establishment of a number of local/regional food systems.
14	The primary long term outcome measure for OSUE programming on this issue is the growth of direct farm sales in Ohio as reported through the Census of Agriculture and other Direct Marketing team activities that provide insight into improved economic and social conditions. (measured in dollars)
15	number of schools purchasing Ohio produced food as part of the Ohio Farm to School program.
16	Number of farmers and other food businesses receiving training, guidance, and / or resources from the OSU Extension 'Maps and Apps' program

17	Total number of new community gardens, urban gardens, local food animal systems, or local food systems that were the direct or indirect result of an educational program offered by the 'Local Foods' signature program

Outcome #1

1. Outcome Measures

Advance processing techniques, e.g. electrostatic coating, to achieve the desired traits requested by industrial partners, that are manifested in consumer demand studies, or that are novel technologies that may meet latent needs.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Processing efficiency for the foods we eat impacts the cost that the consumer pays for processed foods. The more efficient processing technologies have potential to lower prices.

What has been done
Food processing applications typically remove the outer skin of produce. Peeling of produce is performed for appearance, quality, or other purposes such as to ensure uniform heating during additional processing operations. Where appearance and/or yield of a product is important, efficient peeling is fundamental to retain as much of the flesh of the produce as possible. OARDC scientists working with industry partners have patented a new device to peel produce. This is one in a long line of food processing innovations developed at Ohio State University.

Results
The apparatus and method for removing skins or peels from produce results in a whole peeled product. The apparatus and method are useful in the peeling of a variety of produce, including but not limited to tomatoes. The apparatus is comprised of a tub having a treatment zone and a variable power supply connected to the treatment zone by electrodes. When the power is energized, an electrical current is produced in the fluid and the produce. The current, after a sufficient time, ruptures the peel from the outer layer leaving the flesh of the produce. The discovery is being evaluated by multiple companies for future commercialization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products

Outcome #2

1. **Outcome Measures**

Participate in the creation of a standardized model and protocols for studying functional foods for the purpose of providing consumers with more informed functional choices that are currently available

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Advance the study of stacking functional foods that have a lower than expected societal demand (e.g. soy) with more desirable foods such as tomato products as a means of providing consumers with more access than is currently present.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Expand utilization of products with known functionality or nutraceutical value and give consumers greater informed consumer choice, including the bioavailability of the desire substance in the food, than they presently have.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Reduce health risk by releasing at least one major study each five years demonstrating nutritional health benefits, e.g. carotenoids and cataracts, anthocyanins and colon cancer or as a substitute for artificial dyes.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Reduce health risk by releasing at lest one major study each five years demonstrating negative nutritional side effects, fatty acids and obesity or obesity-related hepatic stealosis or prostate cancer.

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Advance the understanding of the potential role of trace minerals such as the role of selenium in protection against breast cancer or copper's protecting against cardiovascular diseases to that extent society can make science-based choices.

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Processing technology research such as pulse electronic field, high pressure, ohmic heating, and microwave will provide processors with a set of alternatives leading to efficiency and quality gains within economic realities.

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Processing technology research will improve and optimize equipment and processing of food in such manner as meet consumer demand as or before that demand emerges.

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Reduce through research and development the negative processing impacts on physio-chemical or molecular properties of food within varying parameters to make foods more acceptable and higher quality commensurate with demand.

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Advance and document improvements in quality and quantity of food stocks to meet global food security and hunger goals.

Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

Ohio Market Maker results will indicate food preferences and number of farmers/retailers networks established (measured in number of networks established).

Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

Establishment of a number of local/regional food systems.

Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

The primary long term outcome measure for OSUE programming on this issue is the growth of direct farm sales in Ohio as reported through the Census of Agriculture and other Direct Marketing team activities that provide insight into improved economic and social conditions. (measured in dollars)

Not Reporting on this Outcome Measure

Outcome #15

1. **Outcome Measures**

number of schools purchasing Ohio produced food as part of the Ohio Farm to School program.

2. **Associated Institution Types**

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	833

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The basic mission of 'Farm to School' is to increase the supply of fresh, local, nutritious foods in schools around the state. With that mission comes much broader goals that involve developing more informed food decision-making among students, supporting and connecting with local farmers, developing community ties, and reinvesting in local economies. 'Farm to School' initiatives are gaining momentum in light of two recent phenomena - rising obesity, in particular among youth, and the declining family farm.

What has been done
OSUE's 'Farm to School' Program provides youth, pre-K through college, with access to nutritious meals, while supporting local farmers and communities. This program provides children with fresh, local foods, and helps them understand where their food comes from and how food choices affect their health, environment and community. The Ohio Farm to School program is part of a national network and involves many local, state and regional partners, advisors and projects. OSUE and their partners provide guidance and help make connections that result in healthy young people, healthy economies, and healthy communities.

Results
OSUE's 'Farm to School' Program includes 137 school districts, representing 833 schools.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
607	Consumer Economics
703	Nutrition Education and Behavior
704	Nutrition and Hunger in the Population

Outcome #16

1. Outcome Measures

Number of farmers and other food businesses receiving training, guidance, and / or resources from the OSU Extension 'Maps and Apps' program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	932

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Emerging trends in social, mobile and location-based marketing present unique opportunities and risks for farmers and other food businesses. They need to connect to the consumer and guide them to their businesses. The OSUE 'Maps and Apps' program does just that.

What has been done
The 'Maps and Apps' program guides entrepreneurs by helping them see how consumers find their business online; how their business is viewed on mobile devices; how to use social media to access their content and special offers; plus how to post comments, photos, videos, reviews, and location-based check-ins; how to utilize apps and GPS devices to find / navigate to their business; and access the latest apps and gadgets. The 'Maps and Apps' program is presented at conferences, via webinars, hands-on workshops, and through an online multimedia website.

Results
In 2013 under the 'Maps and Apps' program, OSUE professionals made 9 conference presentations with 410 attendees, conducted 2 webinars with 100 participants, hosted 1 hands-on workshop with 22 attendees, had 400+ visitors or "hits" to online multimedia resources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
503	Quality Maintenance in Storing and Marketing Food Products
607	Consumer Economics
703	Nutrition Education and Behavior

Outcome #17

1. Outcome Measures

Total number of new community gardens, urban gardens, local food animal systems, or local food systems that were the direct or indirect result of an educational program offered by the 'Local Foods' signature program

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	19

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Can agriculture boost the use of abandoned urban lands? Can utilization of abandoned urban lands help people who live in urban food deserts - areas having little or no access to affordable, nutritious foods? Consumers continue to demand fresh, locally grown food products. The importance of educating, developing and connecting producers, markets, distributors, institutions, communities and consumers is needed.

What has been done
The OSU Extension 'Local Foods' Signature Program addresses the critical need for outreach education around the broad topic of local food systems. The subject affects every Ohioan: public interest is high; research needs are great. The Local Foods Signature Program is designed to strategically address these needs by building food literacy & skills around four themes: Food Production, Food & Family, Food & Business, and Food & Community.

Results
Significant audiences were reached in 2013. According to programs identified under the Local Foods signature program, 3,592 direct contacts and approximately 6,000 indirect contacts were made. Continued work with groups such as Cleveland Crops, an urban farming program managed by Cuyahoga County Ohio Board of Developmental Disabilities (CCBDD), was able to expand the growing season and keep people whom CCBDD serves employed year-round with high and low tunnel greenhouses, to grow as many vegetables as possible for as long as possible. This model is being examined to perhaps recreate in other cities across Ohio.

4. Associated Knowledge Areas

KA Code	Knowledge Area

607	Consumer Economics
704	Nutrition and Hunger in the Population
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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 (World conflict and terrorism)

Brief Explanation

Research and extension programs are dramatically improving strategies for feeding the world. However, there are major limitations that affect outcomes: global conflicts; the cost of supply and distribution, and storage of foodstuffs, both raw and processed. Climatic extremes to the extent they impact growth and supply, economic shifts such as the cost of processing equipment or production costs, public policy shifts, regulations, and shifts in demand are also affecting outcomes.

In developing countries, technologies, availability of basics such as seeds or livestock, soil and water for farming, labor, and a secure farming environment are limiting factors. While each of the limiting factors also presents an opportunity for research and outreach / extension programming, the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed resources are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new

knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Evaluation results of note for OSU Extension follow.

There were 2,818 participants in 2013 OSUE Food Security educational events, and 13,056 participants in OSU Extension events related to Assuring Quality Care for Animals.

Following the completion of an OSUE educational event on Plant / Animal Systems Management:

- 1,569 producers reported that they became aware of sustainable farming / gardening / agricultural practices
- 413 producers said they would be adopting one or more recommended sustainable agricultural practices
- 35,954 acres were managed under improved sustainable stewardship practices
- 23,016 acres of farm or forest land reported that will be kept in current use

Key Items of Evaluation

Aquaculture, a growing option for helping to feed the world, is a critical research and extension program at Ohio State University. The following feedback provides one level of assurance that our program is important: "Aquaculture, relatively, is still in its infancy. There's quite a market that Ohio can tap into. But we need research support from OARDC to do it. Without it, we could be wandering for years." -- Tom Machamer, president, Fish Farmers of Ohio Association

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Soil, Air and Water (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%		10%	
102	Soil, Plant, Water, Nutrient Relationships	0%		25%	
103	Management of Saline and Sodic Soils and Salinity	0%		5%	
111	Conservation and Efficient Use of Water	0%		15%	
112	Watershed Protection and Management	0%		10%	
131	Alternative Uses of Land	0%		10%	
132	Weather and Climate	0%		5%	
133	Pollution Prevention and Mitigation	0%		10%	
141	Air Resource Protection and Management	0%		10%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	5.5	0.0
Actual Paid Professional	0.0	0.0	4.3	0.0
Actual Volunteer	0.0	0.0	0.0	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	604648	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	445865	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

On -going OARDC research activities for soil air and water include both basic and applied agbioscience. Both laboratory and multiple field sites/research stations are available throughout state to permit data gathering and to continue long - term experiments, such as no-till plots. On-farm research takes place, as do national and international studies, as is evidenced by programs such as OARDC's carbon sequestration program. All functional laboratories and sites will continue to be improved over time as program need and resources available warrants. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel and with external stakeholders.

2. Brief description of the target audience

OARDC's targeted audiences for this Planned Program include, but not limited to: 1) Specific individuals or groups who have expressed a need for certain information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at Ohio Dept. of Natural Resources or a county extension agent; 2) Fellow agencies or support organizations that will not only use the information but will also be brokers of that information, including embedding it into groups to encourage change; 3) Populations who have not requested the information but will likely benefit from that information, e.g. immigrant populations; 4) Other scientists and scientific groups; 5) Political entities; 6) Extension personnel; 7) Students from pre-school to post doctorate studies; 8) News organizations; and 9) Business groups such as chambers of commerce and community coalitions.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	45	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
  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	Continue to advance soil, water, nutrient, and plant research to, among other outcomes, ensure Ohio continues to be one of the top five states in corn and soybean production and has knowledge to support growing niche market agriculture, organic farming, and biobased products.
2	Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.
3	Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.
4	Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.
5	Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated extension programming.
6	Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.

Outcome #1

1. **Outcome Measures**

Continue to advance soil, water, nutrient, and plant research to, among other outcomes, ensure Ohio continues to be one of the top five states in corn and soybean production and has knowledge to support growing niche market agriculture, organic farming, and biobased products.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Provide the necessary research finding (scientific knowledge and techniques) to support stakeholder compliance with Ohio and federal EPA regulations, and future regulations, regarding odors and other air quality issues in ag production and processing.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Expand watershed and ecosystem level modeling to the extent that scientific data and watershed management protocols can bring all streams effected by agriculture and natural resource runoff into compliance with Ohio EPA standards.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Through the provisioning of watershed specific data, support the creation of and conservation action of community-based watershed networks in each major watershed in Ohio.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Advance the basic knowledge contribution so that Ohio continues to be viewed as a center of excellence in terms of soils and water sciences, and associated extension programming.

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Provide the necessary soil, air, weather/climate, and water research, in conjunction with actions in other planned programs KA (e.g. IPM), to permit continued adoption of conservation tillage practices in the face of problems such as climatic changes, pest, etc.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Extreme weather events, such as the 2012 'Century Drought', are likely to increase in intensity and frequency with the projected climate change. Thus, there is a strong need to develop climate-strategic and resilient agroecosystems.

What has been done
The OARDC soil scientists working on the NC-1178 regional project involving ten universities assessed the effects of residue retention on no-till corn on sloping lands at Coshocton, Ohio, and observed increase by 3-4 metric ton /ha (1.3-1.8 ton/acre) in grain and 2.4-3.4metric ton/ha (1.1-1.5 ton/acre) of straw yields compared with un-mulched land.

Results
Crop residue mulch in no-till corn can mitigate the adverse effects of drought, and produces 37-65% more grains and 43- 80% more straw than un-mulched plots on sloping lands.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water

112	Watershed Protection and Management
131	Alternative Uses of Land
132	Weather and Climate

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 (extramural funding)

Brief Explanation

Climatic extremes, coupled with pest and diseases that are often climate related, can impact soil - related outcomes. As the soil - dependent food, fiber, and environmental economies adjust to the global marketplace, in conjunction with public policy shifts, regulations, and shifts in demand, outcomes are being impacted. Worldwide the availability of productive soils is a limiting factor. Also, the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available personnel and resources are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the

adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

Phosphorous runoff from farms is both an economic loss to farmers and a negative impact to the environment in terms of deteriorating water quality/cost of cleanup. Thus this program is a most important research and extension element in CFAES. The following feedback is from a partner farmer who is making his farm available for monitoring:

"If you might be part of the problem, you should want to be part of the solution. While we don't know what's causing the issue, agriculture needs to understand what we can do to change it. If we are losing nutrients from our fields, we need to make changes so our farms benefit."

-- Terry McClure, owner of McClure Farms, Paulding County

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Natural Resources and Environmental Systems (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
121	Management of Range Resources	0%		5%	
122	Management and Control of Forest and Range Fires	0%		5%	
123	Management and Sustainability of Forest Resources	0%		15%	
124	Urban Forestry	0%		10%	
125	Agroforestry	0%		10%	
134	Outdoor Recreation	0%		10%	
135	Aquatic and Terrestrial Wildlife	0%		35%	
136	Conservation of Biological Diversity	0%		10%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.5	0.0
Actual Paid Professional	0.0	0.0	2.1	0.0
Actual Volunteer	0.0	0.0	0.0	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	220574	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	292408	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

Natural resource and environmental systems program includes both basic and applied research across a broad array of activities. Both laboratories and multiple field sites are available throughout state to permit data gathering and to continue long - term experiments, such as human-wildlife interaction studies. Extensive in-state research takes place as do national and international studies, as is evidenced by programs such as OARDC's avian ecology studies. Close working relationships with the organizations such as the Ohio Department of Natural Resources will continue to greatly enhance program capacity and outputs/impacts. All functional laboratories and sites are improved over time as program need and resources available warrant. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation with both internal stakeholders, such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

OARDC's targeted audiences include, but are not limited to: specific individuals or groups who have expressed a need for natural resources and environmental research knowledge that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at USDA, ODNR, or a county extension agent; related 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, e.g. fish and wildlife clubs; populations who have not requested the information but will likely benefit from that information, e.g. people who fish for recreation; other scientists and scientific groups; political entities; extension personnel; students from pre-school to post doctorate studies; news organizations; business groups such as Ohio Farm Bureau; and community collations such as watershed coalitions.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	76	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
  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	In conjunction with companion agencies and organizations, advance research in forest biology and ecology to promote advances in best management practices on private forest land in Ohio.
2	Improve the flow of forest raw materials to the extent it meets the needs of Ohio industries within ten years.
3	Increase the production of oak and reduce maple to eventually achieve a balance equivalent to forest with natural fire regimes.
4	Meet federal and state needs for research data related to Ohio ecosystems as the demand arises
5	Increase the scientific understanding necessary to maintain flow of environmental goods and services through conservation actions commensurate with regional demand, i.e. Buffer zones in forest riparian zones, reforestation, CREP, carbon sequestration in forests and grassland biomass, outdoor recreation opportunities, urban forest zones.
6	Advance research knowledge, both basic and applied, in the areas of silviculture and horticulture to existing and emerging industry and consumer demand regarding forest genetics, forest biology, seed production, nutrition, and related topics.
7	Meet ODNR, USDA, USDI, local, commodity groups, community, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in aquatic and terrestrial wildlife including human wildlife use/conflicts, and human to human conflicts related to wildlife and use.
8	To contribute to the theoretical knowledge base within this planned program to ensure that where possible all applied research can be grounded in the best science and evaluation available in all knowledge areas selected.

Outcome #1

1. **Outcome Measures**

In conjunction with companion agencies and organizations, advance research in forest biology and ecology to promote advances in best management practices on private forest land in Ohio.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Improve the flow of forest raw materials to the extent it meets the needs of Ohio industries within ten years.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Increase the production of oak and reduce maple to eventually achieve a balance equivalent to forest with natural fire regimes.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Meet federal and state needs for research data related to Ohio ecosystems as the demand arises

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Increase the scientific understanding necessary to maintain flow of environmental goods and services through conservation actions commensurate with regional demand, i.e. Buffer zones in forest riparian zones, reforestation, CREP, carbon sequestration in forests and grassland biomass, outdoor recreation opportunities, urban forest zones.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

   Advance research knowledge, both basic and applied, in the areas of silviculture and horticulture to existing and emerging industry and consumer demand regarding forest genetics, forest biology, seed production, nutrition, and related topics.

   Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

   Meet ODNR, USDA, USDI, local, commodity groups, community, and other stakeholder demands for scientific knowledge to inform existing and emerging issues/practices in aquatic and terrestrial wildlife including human wildlife use/conflicts, and human to human conflicts related to wildlife and use.

   Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

   To contribute to the theoretical knowledge base within this planned program to ensure that where possible all applied research can be grounded in the best science and evaluation available in all knowledge areas selected.

2. **Associated Institution Types**

   - 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Streams, rivers, and wells can be polluted with chemicals and bacteria from a variety of sources including industrial, agricultural and residential wastes. Farm residents, and those individuals living in rural communities, are more likely to experience bouts of gastrointestinal upset than those living in the city. Identifying contaminated waters, and tracking the routes by which

contamination occurs, is critical to developing contamination control strategies to safeguard human and animal health.

What has been done

OARDC and OSUE scientists have developed and validated a toolbox of assays that permit the rapid detection, quantification, and characterization of bacteria in water. Using these molecular tests, 'hotspots' of bacterial contamination were identified. Despite the intense dairy farm density in the study region, markers for contamination from human waste predominated. There was little correlation between traditional indicators fecal contamination of water and the presence of important waterborne pathogens (Salmonella, E. coli, Campylobacter) in surface and ground water.

Results

The presence of human-specific markers of contamination indicates the need for increased environmental protection from human-related activities such as leaky septic tanks in the region. The detection of pathogens in water, including E. coli O157 in drinking water in the absence of indicator organisms, is worrisome and highlights the current pitfalls of water quality testing to ensure safety. Being mindful of the risk of water contamination, and steps that can be taken by rural residents to upkeep their wells and septic systems can have a significant impact on preventing intestinal infections and enhancing public health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

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.)

Brief Explanation

Public policy shifts, regulations, laws, and shifts in demand continue to impact outcomes. Also climatic extremes, coupled with pest and diseases that are often climate related, are also impacting outcomes. Exotic species such as the Emerald Ash Borer is a significant external factor, especially in terms of forest ecosystems. Factors such as the availability of state and federal base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that are exceeding resources, individually and collectively, are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

Environmental management, and in particular water, is a most important research and extension theme within CFAES. Thus the importance of the following feedback regarding one of our facilities/program:

"Ecosystem restoration will play a large role as we try to reverse the declines being seen in the nation's water quality. Research at the Olentangy River Wetland Research Park will play a crucial role in the development of predictable, repeatable habitat restoration models that can be implemented across the landscape."

-- Vince Messerly, professional engineer and president, Ohio Wetlands Foundation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Plants Systems (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	0%		15%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		5%	
204	Plant Product Quality and Utility (Preharvest)	0%		20%	
205	Plant Management Systems	0%		10%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		5%	
212	Pathogens and Nematodes Affecting Plants	0%		5%	
213	Weeds Affecting Plants	0%		5%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	0%		5%	
216	Integrated Pest Management Systems	0%		15%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	29.5	0.0
Actual Paid Professional	0.0	0.0	22.6	0.0
Actual Volunteer	0.0	0.0	0.0	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	2747618	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	3879336	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

OARDC's on-going research activities to advance plant systems goals include both basic and applied research. Both laboratory and multiple field sites/research stations are available throughout state to permit data gathering and to continue long - term experiments, such as commodity yields. On-farm research takes place, as do national and international studies. All functional laboratories and sites are improved over time as program need and resources available warrant. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders, such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

Audiences targeted by OARDC include, but are not limited to: specific individuals or groups who have expressed a need for plant systems information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at a USDA office, NRCS, or a county extension agent; 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. home gardeners; other scientists and scientific groups; political entities; extension personnel; students from pre-school to post doctorate studies; and news organizations.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	4

Patents listed

Patent 8,575,334: High-Purity Fractionation of Anthocyanins from Fruits and Vegetables;

Patent 8,404,475: ISOLATION OF NOVEL BACTERIA CONTRIBUTING TO SOILBORNE DISEASE SUPPRESSION;

Patent 8,395,021: Highly Active Soybean Promoters and Uses Thereof;

Patent Publication EP 2459700 A4: Prothioconazole Tolerant Cryptococcus Flavescens Strains for Biological Control of Fusarium Head Blight

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	146	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
  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	Meet or exceed the demand of fellow scientists and stakeholders within the next ten years for materials relating to plant genetics and plant breeding technologies, including identification of molecular markers for elite germplasms.
2	Provide new contributions to the body of literature that will positively advance plant genetics, e.g. molecular techniques and materials to aid in low temperature plant tolerance research.
3	Advance germplasm science over the next ten years to the extent that the genetic resources targeted for acquisition are preserved and can be considered secure in terms of systems preservation, e.g. short season crops or for studying rice pathogens.
4	Enrich the gene pool, and knowledge thereof, to meet identified stakeholder turf needs for nutrient uptake efficient materials, turf with greater traction, etc.
5	Enrich the gene pool and knowledge thereof in disease/pest resistance, and gene recombination and interaction studies.
6	Enrich the gene pool and knowledge thereof in disease resistance of rootstocks such as for apple trees and green industry, and for resistance to plant stresses, e.g. discoloration in products such as tomatoes reducing a $60 million loss annually in tomato industry.
7	Enrich the gene pool and knowledge thereof in the areas of molecular studies to better understand how immune systems in plants in inhibit diseases and how bacteria perturb the immune system.
8	Annually provide adequate preharvest research findings, including field trial data, to support Ohio's status as a top soybean and corn producer
9	Release or support release by others of special cultivars to enhance Ohio agriculture, e.g. grapes to replace tobacco in southeastern Ohio, low maintenance turf grass, nitrogen uptake efficient crops including foliar based fertilization, field crop cultivars.
10	Continually participate in and promote the development and timely release of modeling/forecasting programs that are cost effective and cost efficient for producers, e.g. WEEDCAST.
11	Annually contribute to and report a basic or applied understanding of IPM, including all physical, biological, and chemical components of the plant system, to reduce environmental stresses, improve production, and lower costs when employed.
12	New knowledge of fruit size and shape is important to meeting consumer demand and sustaining the industry.

Outcome #1

1. Outcome Measures

Meet or exceed the demand of fellow scientists and stakeholders within the next ten years for materials relating to plant genetics and plant breeding technologies, including identification of molecular markers for elite germplasms.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Microbial community profiling of samples differing in a specific ecological function, i.e., soil borne plant disease suppression, can be used to mark, recover, and ultimately identify the bacteria responsible for that specific function. Biocontrols for harmful diseases are critical to the sustainability of food plant systems.

What has been done
Previously, several terminal restriction fragments (TRF) of 16S rRNA genes were shown to be statistically associated with damping-off disease suppression. OARDC scientists? research presents the development of sequence-based TRF length polymorphism (T-RFLP)-derived molecular markers to direct the identification and isolation of novel bacteria involved in damping-off pathogen suppression. Multiple sequences matching TRF M139 and M141 were cloned and displayed identity to multiple database entries in the genera incertae sedis of the Burkholderiales. Sequences matching TRF M148, in contrast, displayed greater sequence diversity. A sequence-directed culturing strategy was developed using M139- and M141-derived markers and media reported to be selective for the genera identified within this group.

Results
OARDC scientists have patented novel Mitsuaria and Burkholderia species with high levels of sequence similarity to the targeted M139 and M141 TRF, respectively. As predicted, these Mitsuaria and Burkholderia isolates displayed the targeted function by reducing fungal and oomycete plant pathogen growth in vitro and reducing disease severity in infected tomato and soybean seedlings. This work represents the first successful example of the use of T-RFLP-derived markers to direct the isolation of microbes with pathogen-suppressing activities, and it establishes the power of low-cost molecular screening to identify and direct the recovery of functionally important microbes, such as these novel biocontrol strains.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Provide new contributions to the body of literature that will positively advance plant genetics, e.g. molecular techniques and materials to aid in low temperature plant tolerance research.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Advance germplasm science over the next ten years to the extent that the genetic resources targeted for acquisition are preserved and can be considered secure in terms of systems preservation, e.g. short season crops or for studying rice pathogens.

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Enrich the gene pool, and knowledge thereof, to meet identified stakeholder turf needs for nutrient uptake efficient materials, turf with greater traction, etc.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Enrich the gene pool and knowledge thereof in disease/pest resistance, and gene recombination and interaction studies.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soybean aphids are the most important insect pest of soybean in Ohio. Researchers have identified some soybean varieties with natural aphid resistance. However, the presence of soybean aphid populations that can survive on all known resistant varieties necessitates the discovery of new sources of soybean aphid resistance varieties.

What has been done
With support from the Ohio Soybean Council, OARDC and USDA-ARS, researchers screened over 1,000 soybean varieties for soybean aphid resistance. Two varieties exhibited resistance to all known soybean aphid resistant populations. These varieties will serve as breeding lines to create novel soybean varieties with multi-genic and broad-scale aphid resistance.

Results
The identification of these novel resistant soybean varieties will extend the durability of host-plant resistance for soybean aphid management, thereby limiting potentially environmentally hazardous insecticide applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Enrich the gene pool and knowledge thereof in disease resistance of rootstocks such as for apple trees and green industry, and for resistance to plant stresses, e.g. discoloration in products such as tomatoes reducing a $60 million loss annually in tomato industry.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Soybean is a valuable agronomic crop worldwide; the crop has the highest transgenic acreage of any crop. As efforts move forward to produce new and improved transgenic soybean, the need for different types of native soybean promoters will continue to increase.

What has been done
OARDC scientists, working on promoters from soybean, have identified and characterized promoters that regulate or control expression of an introduced marker gene in soybean. Based on microarray expression data, different genes have been recovered to yield different promoters. Additionally, the promoters have been modified by truncation and fusion with other promoter/regulatory regions to generate an array of promoters with different intensities and specificities of expression. These soybean promoters show much higher constitutive expression than the CaMV35S promoter, which is a promoter standard.

Results
This line of research has resulted in an OSU patent for Highly active soybean promoter from the SUBI-3 polyubiquitin gene and uses thereof.
Different forms of different soybean promoters were isolated, fused to the GFP coding region and analyzed using both transient and stable expression. These promoters are useful for regulating transgene expression. They are native soybean promoters or 'hybrid' promoters. Some of the promoters yield high expression levels which is desired for some transgenes while others appear to drive expression in the roots, which are useful for expression of a gene for pathogen resistance where root tissue is targeted by the pathogen.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

206	Basic Plant Biology
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #7

1. **Outcome Measures**

Enrich the gene pool and knowledge thereof in the areas of molecular studies to better understand how immune systems in plants in inhibit diseases and how bacteria perturb the immune system.

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Annually provide adequate preharvest research findings, including field trial data, to support Ohio's status as a top soybean and corn producer

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Release or support release by others of special cultivars to enhance Ohio agriculture, e.g. grapes to replace tobacco in southeastern Ohio, low maintenance turf grass, nitrogen uptake efficient crops including foliar based fertilization, field crop cultivars.

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Continually participate in and promote the development and timely release of modeling/forecasting programs that are cost effective and cost efficient for producers, e.g. WEEDCAST.

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Annually contribute to and report a basic or applied understanding of IPM, including all physical, biological, and chemical components of the plant system, to reduce environmental stresses, improve production, and lower costs when employed.

Not Reporting on this Outcome Measure

Outcome #12

1. Outcome Measures

New knowledge of fruit size and shape is important to meeting consumer demand and sustaining the industry.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Consumers often prefer big, plump tomatoes. So do growers. Processors often need fruits of a certain size for processing efficiency and quality control. Fruit size and marketability are market driven.

What has been done
The gene that directs tomato size arose thousands of years ago as farmers in South America began domesticating this popular fruit. An international research team led by a team of OARDC scientists has discovered and cloned a gene that regulates fruit size in the tomato.

Results
This work represents an important improvement in the understanding of the regulation of fruit size and how domestication played a role in the selection of this gene. The cloned gene, known as SlKLUH, impacts fruit size by increasing cell layers and delaying ripening. This gene promotes extra cell divisions during the process of fruit development, immediately after fertilization. These extra cell divisions lead to enlarged fruit, while the delay in ripening is likely the result of an extension of the cell division stage. This basic research also has important implications for vegetable and fruit production in that it helps breeders to manipulate genes to create new varieties with desired size and shape characteristics. This is only the second domestication gene involved in fruit size ever cloned in any vegetable or fruit crop.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources

204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology

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.)

Brief Explanation

Pests, pathogens, diseases, weeds, and climate change, among other factors can impact outcomes within plant systems. As the food, fiber, and environmental economy adjust to the global marketplace, in conjunction with public policy shifts, regulations, and shifts in demand, outcomes will be impacted. Production agriculture is most sensitive to these shifts. Research that is conducted well before its outcomes are needed and formative evaluation to identify opportunities and problems can have returns throughout the life of the program. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands exceed resources are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the

adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

Meeting the needs of growers, both in terms of research and extension, is a long-established program at "We've been doing this for five years now, and it's become a way of life. Most growers don't even realize how much they've changed their operations as a result of these trainings."

-- Fred Finney, owner, Moreland Fruit Farm, co-founder, Mount Hope Produce Auction

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Animals Systems (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	0%		15%	
302	Nutrient Utilization in Animals	0%		15%	
303	Genetic Improvement of Animals	0%		10%	
304	Animal Genome	0%		5%	
305	Animal Physiological Processes	0%		15%	
306	Environmental Stress in Animals	0%		5%	
307	Animal Management Systems	0%		10%	
308	Improved Animal Products (Before Harvest)	0%		15%	
311	Animal Diseases	0%		10%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	14.5	0.0
Actual Paid Professional	0.0	0.0	9.0	0.0
Actual Volunteer	0.0	0.0	0.0	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	1139868	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	3608366	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

OARDC research activities in this planned program include both basic and applied agbioscience research. Laboratory, animal enclosures, farms, and multiple field sites/research stations are available throughout state to permit data gathering and to continue long-term experiments. Ohio on-farm research is conducted as part of this program as is national and international studies. Effective research requires a mixture of laboratory, animal enclosures, and on-farm research to maximize knowledge. Emerging threats now require more advanced facilities such as OARDC's biosecurity lab, particularly needed in the study infectious animal diseases. OARDC will soon have its biosecurity lab fully functional. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders, such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

OARDC's targeted audiences include, but are not limited to: specific individuals or groups who have expressed a need for food animal systems information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at a USDA office, NRCS, Ohio Department of Agriculture, or a county extension agent; 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. small or recreational farmers; other scientists and scientific groups; political entities; extension personnel; students for pre-school to post doctorate studies; news organizations; and business groups such as Farm Bureau or commodity groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	100	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed.
  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	Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation
2	Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand, as well as nutrition utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feedstocks
3	Show incremental gains annually in dietary research to increase utilization of food stocks (e.g. via better understanding of protozoal ecology), increase bioavailability of nutrients including trace minerals, and protect animal and human health
4	Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products
5	Provide new contributions to the body of literature that will positively food animal genetics, e.g. molecular techniques and materials to aid in identifying genetic codes of bacteria in that breaks down cellulose
6	Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer
7	Advance preharvest research over five years to the extent that new technologies are being adopted and showing profitability in area such as improved muscle growth, quality of meat, tenderness, lower fat in dairy products, etc.
8	Animal disease researchers will continue to serve on first responder teams when stakeholders have an immediate disease problem
9	Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis
10	Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence

Outcome #1

1. Outcome Measures

Improve reproduction efficiency and enhanced application of new technologies over the next five years to fully meet the competitive demands faced by OARDC's stakeholders in areas such as early maturation, estrus, fertility, and ovulation

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The areas of swine management, animal welfare, caretaker education, and efficiency in all segments of swine production are critical to future of the swine industry. Pork production systems in the United States, and globally, have changed considerably over the course of the past five years, with change driven primarily by a combination of economic and societal factors, and an increase in consumer interest in topics such as antibiotics in food animals.

What has been done
OARDC and OSUE personnel, working with multiple ag experiment stations, are evaluating management strategies for the use of non-traditional feed ingredients in swine production. In particular, they were investigating alternatives to sub-therapeutic feed-grade antibiotic use in swine diets. Their results suggest that feeding the sub-therapeutic level of an antibiotic may have resulted in a reduction in the concentration of favorable bacteria in the pig's gut and intestines, allowing potentially harmful bacteria to proliferate, thus reducing pig performance.

Results
The multistate science team found that grower finisher pigs fed an antimicrobial alternative achieved faster rates of growth, resulting in fewer days to reach market weight, and therefore production costs were reduced when compared with pigs fed a common sub therapeutic level of an antibiotic. The study clearly defines that pigs can be reared in a multitude of production settings and that antibiotics can be eliminated from the finishing stage of production without detrimental effects on performance so long as the pig health is good prior to and throughout the finishing stage.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases

Outcome #2

1. Outcome Measures

Increase nutrition utilization for the purpose of increased growth and quality of products commensurate with consumer demand, as well as nutrition utilization, performance, and efficiency to the point that savings will off-set increases in costs of animal feedstocks

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Beef cattle production in the US is facing many challenges in maintaining viability during times of low profitability and demands for high quality product. Increased production of ethanol has reduced availability of corn for livestock feed, potentially creating an environment where increased production costs may negate profitable beef production. The beef cattle industry is very complex with a variety of producers and marketing channels before the beef end product reaches the consumer. Alternative feeding systems and strategies that decrease input costs without sacrificing carcass quality are needed.

What has been done

The central hypothesis was that metabolic modifiers that increase rumen pH will be highly effective in growing cattle (250 to 450 kg of body weight) whose requirements are better aligned with the nutrient profile of dried distillers' grains (DDGS) and that efficiencies of compensatory gain will be realized when corn-based diets are fed in a shortened finishing phase. Also the results of strategies that alleviate the metabolic consequences of feeding too much dietary DDGS for too long were investigated.

Results
OARDC researchers discovered that increased dietary forage and supplemental monensin could attenuate negative effects of high dietary use of distillers' grains. Project scientists also developed several strategies to neutralize this acid load by treatment with alkalis. With these discoveries and the ready availability of distillers' grains from the growing ethanol industry in Ohio, profitability potential for livestock, grain, and biofuels industries are enhanced. It was also found that distillers' grains are a more effective protein supplement in a corn silage based diet than soybean meal or urea based on cattle performance and economic metrics.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)

Outcome #3

1. Outcome Measures

Show incremental gains annually in dietary research to increase utilization of food stocks (e.g. via better understanding of protozoal ecology), increase bioavailability of nutrients including trace minerals, and protect animal and human health

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Meet the demand of fellow scientists and stakeholders within ten years for materials relating to genetics and breeding, including id of molecular markers for improved animal health and reproductively, and increased quality and quantity of products

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Alternates to the use of antibiotics that prevent and treat infections of livestock and poultry are needed. Antibiotics are losing their power to treat common infections. The use of traditional antibiotics in human and veterinary medicine has contributed to the selection of pathogens that are resistant to these drugs. It is estimated that antibiotic resistance among bacteria burdens the US public health system at a rate exceeding $4 billion annually. Also some consumers are now seeking antibiotic free products.

What has been done
Without effective medicines, the treatment of bacterial diseases of animals and humans is problematic. OARDC scientists are using a multifaceted approach to tackle the problem of antibiotic resistance. Using a high throughput method, tens of thousands of naturally occurring small molecules are being screened for their effectiveness to control important foodborne pathogens such Salmonella and Campylobacter. Several new compounds have been identified.

Results
Bacteria, including antibiotic resistant strains of pathogens, are transmitted to humans through the food chain and the environment. Several new compounds have been identified by using new, alternative strategies identified in this research to keep animals healthy without the use of traditional antibiotics. This work can increase agricultural productivity, ensuring a safe and affordable food supply, without contributing to the further emergence of antibiotic resistant bacteria. Thus, OARDC scientists' discovery of unique and novel strategies to control bacterial infections in agricultural animals is critically important to maintain and improve animal health and productivity while at the same time preserving the power of current antibiotics for the use in public health.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
304	Animal Genome
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases

Outcome #5

1. Outcome Measures

Provide new contributions to the body of literature that will positively food animal genetics, e.g. molecular techniques and materials to aid in identifying genetic codes of bacteria in that breaks down cellulose

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Improve management for multiple animal farm types, including organics, that will produce higher yields for and lower costs to the producer and consumer

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Aquaculture is an important food system for addressing the world's growing demand for protein and overall food security. To be sustainable increased efficiency and productivity are needed.

What has been done
CFAES' South Centers Aquaculture Genetics and Breeding Laboratory has completed a study on improving lines of yellow perch, concluding with a three year on-station and on-farm set of experiments. Both separate and communal rearing methods were used under a variety of conditions. This is the first step to expand commercialization of yellow perch.

Results
An OARDC and OSUE faculty and staff team, working with local growers, found that the CFAES genetically improved yellow perch had, on average across all study sites, a 27 - 42% higher production rate than the control population (non-genetically improved strains), and had 25% - 37% higher growth rates while having a 12% - 28 % higher survival rate. Over one million genetically improved yellow perch have been distributed to fish farms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals

307 Animal Management Systems
308 Improved Animal Products (Before Harvest)

Outcome #7

1. Outcome Measures

Advance preharvest research over five years to the extent that new technologies are being adopted and showing profitability in area such as improved muscle growth, quality of meat, tenderness, lower fat in dairy products, etc.

Not Reporting on this Outcome Measure

Outcome #8

1. Outcome Measures

Animal disease researchers will continue to serve on first responder teams when stakeholders have an immediate disease problem

Not Reporting on this Outcome Measure

Outcome #9

1. Outcome Measures

Animal disease researchers will provide the necessary research to inform producers in a timely manner how to protect against known and present diseases, e.g. bovine mastitis

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Porcine reproductive and respiratory syndrome (PRRS), a viral disease, causes direct losses to U.S. swine producers. PRRS is one of the most economically significant diseases impacting swine production worldwide. Now, PRRS is estimated to be present in 60 percent of U.S. herds. Even among vaccinated sow herds, the virus can cause 10-20 percent mortality, a significant

economic loss for an industry worth $681.5 million in production value alone and that supports 10,000 jobs.

What has been done
OARDC scientists have developed a patented technology for nanoparticle-based PRRS virus vaccine made from a biodegradable polymer of lactic acid and glycolic acid, known as PLGA. PLGA is an agent approved by the U.S. Food and Drug Administration for use in human vaccines and cancer drug-delivery systems. This is the first time the PLGA-based nanotechnology is being used with food animals.

Results
The new vaccine is enclosed in biodegradable nanoparticles, which improves its efficacy and its absorption by a pig's immune system. Tests show that two doses of this vaccine achieve 100 percent protection in pigs against genetically variant PRRS virus. The vaccine is commercially feasible. Once it is produced in large quantities, its cost should be similar to current PRRS vaccines. Annual swine vaccine sales are approximately $100 million. In addition to the U.S., the new vaccine could be targeted to swine operations in Europe, China and other swine-producing countries. The vaccine has potential to become a model for the development of similar nanoparticle-encapsulated vaccines for other diseases affecting food animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases

Outcome #10

1. Outcome Measures

Animal disease researchers will advance the research frontiers in emerging disease investigations to the extent that OARDC continues to serve as a center for excellence

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The development of vaccine platform that can be adapted to a changing virus that attacks the immune system of chickens will enhance global food security by increasing the production of poultry and eggs, providing more food for tables around the world. Effective control of infectious bursal disease (IBVD) is critical to the United States' $20 plus billion poultry industry. In Ohio, IBDV threatens an industry worth close to $700 million a year and supports more than 15,000 jobs.

What has been done

If a chicken is infected with the infectious bursal disease virus (IBDV), the bird becomes unable to combat other diseases. Poor growth and reduced egg production, as well as high flock mortality rates, occur. A major challenge to controlling IBDV is that the virus is constantly mutating, enabling it to avoid the immunity produced by current vaccines. Tailoring vaccines specific for the strains of viruses causing disease, not the ones causing disease in previous years, is required to stay ahead of this emerging disease.

Results

OARDC scientists have produced proteins that self-assemble into empty shells that look like viruses to the immune system and trigger an immune response, but that are completely non-infectious. These patented virus-like particles are developed using molecular biology methods creating virus-like-particle (VLP) technology for new vaccines and diagnostics that will benefit the food-animal industry and safeguard our food-production system. The unique VLPs provide a universal vaccine that will protect against multiple strains of IBDV. Currently,
there are no commercially available VLP vaccines for IBDV or any other poultry disease, and there are no universal vaccines of any kind available in the market for prevention of IBDV.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
311	Animal Diseases

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.)

Brief Explanation

Animal diseases coupled with abnormal weather patterns are impacting outcomes. Public policy shifts, regulations, and shifts in demand for product continue to impact outcomes. Human values and environmental sensitivities of the populace to animal production and processing are also external factors that affect outcomes. Formative evaluation relating to animal care norms and protocols can be effective in informing the process. Uncertainty, though, is a constant factor in the animal industry. Factors such as the availability of base funding to ensure a core research faculty and staff, availability of extramural research funds, and programmatic demands that are exceeding resources, all, affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

Developing new vaccines is a crucial part of our research program within OARDC. LARAD is a major partner, their feedback follows:

"The current process for developing vaccines against infectious bursal disease virus is slow and very expensive. There is a real desire among vaccine manufacturers to be able to find an alternative for this procedure. The VLP technology developed by LARAD has the opportunity to provide a much-needed answer."

-- Ken Rudd, CEO, LARAD Inc.

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Food, Agricultural, and Biological Engineering Systems (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
401	Structures, Facilities, and General Purpose Farm Supplies	0%		20%	
402	Engineering Systems and Equipment	0%		25%	
403	Waste Disposal, Recycling, and Reuse	0%		25%	
404	Instrumentation and Control Systems	0%		10%	
405	Drainage and Irrigation Systems and Facilities	0%		15%	
723	Hazards to Human Health and Safety	0%		5%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.0	0.0
Actual Paid Professional	0.0	0.0	1.5	0.0
Actual Volunteer	0.0	0.0	0.0	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	190626	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	270699	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

Engineering research activities to advance OARDC goals will continue to include both basic and applied research as discussed in the afore mentioned sections. Laboratories, construction sites, farms, a research park, and multiple field sites/research stations are available throughout state to permit data gathering and to continue long - term activities. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

OARDC's targeted audiences include, but not limited to: specific individuals or groups who have expressed a need for engineering information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature. Often those requests are communicated to OARDC by an intermediary such as a staffer at a USDA office, NRCS, Ohio Department of Agriculture, Soil and Water Conservation Districts or a county extension agent; fellow academic units that rely on engineers to create systems and processes needed to support not only the research, but also the adoption of the research findings by stakeholders 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. recreational animal owners; other scientists and scientific groups; political entities; extension personnel; students for pre-school to post doctorate studies; news organizations; and business groups such as small town administrators, county commissioners, or commodity groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	50	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- number of graduate students completed
  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	Provide appropriate facilities design and engineering processes commensurate with stakeholders demand, including fellow research units demands, to the extent that they have all the information necessary for making adoption decisions
2	Develop enhanced systems to support integrated plant growth systems that will annually result in increased productivity at reduced costs for the industry
3	Improve systems to that will permit small farmers to take advantage of alternatives to traditional commodity crops at a rate commensurate with demand
4	Improve mechanical devices and instrumentation needed by stakeholders
5	Develop improved systems to aid in meeting new or yet to emerge or novel needs
6	Advance development of state of the art integrated waste management systems to the extent that OARDC and Ohio are viewed as one of the top ten programs/states in this area nationally
7	Advance the knowledge of ecological based engineered systems for waste management to the extent that, where cost effective and appropriate, they will be adopted over mechanical systems
8	Aid rural stakeholders with onsite waste disposal systems to the extent that all rural Ohio onsite waste management systems could meet state standards
9	Reduce through research, development, and outreach the negative impact of farm-, recreation-, or industry-related accidents within agriculture and natural resources.

Outcome #1

1. Outcome Measures

Provide appropriate facilities design and engineering processes commensurate with stakeholders demand, including fellow research units demands, to the extent that they have all the information necessary for making adoption decisions

Not Reporting on this Outcome Measure

Outcome #2

1. Outcome Measures

Develop enhanced systems to support integrated plant growth systems that will annually result in increased productivity at reduced costs for the industry

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Improve systems to that will permit small farmers to take advantage of alternatives to traditional commodity crops at a rate commensurate with demand

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

Improve mechanical devices and instrumentation needed by stakeholders

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
For maximum efficiency, and to reduce cost and environmental impact, pesticide sprayers need to be target specific, rather than issuing a continuous flow. Until now such intelligent sprayers did not exist that would spray on target only.

What has been done
A new prototype for an intelligent sprayer can reduce pesticide use by growers up to 73 percent while reducing off-target contamination. Designed and developed by engineers from the College of Food, Agricultural and Environmental Sciences / OARDC and the U.S. Department of Agriculture's Agricultural Research Service, the air-, laser-, and computer-assisted device accurately targets spray applications.

Results
This is the only sprayer of its kind in the world. It discharges sprays only when there is a targeted plant in sight and matches the pesticide spray rate to the plant's characteristics, significantly reducing the amount and cost of pesticides for growers as well as the environmental risk of pesticide pollution. With a $1.8 million grant from the USDA, the sprayer was further refined and tested. The technology is now ready to be commercialized by sprayer companies.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
404	Instrumentation and Control Systems
723	Hazards to Human Health and Safety

Outcome #5

1. Outcome Measures

Develop improved systems to aid in meeting new or yet to emerge or novel needs

Not Reporting on this Outcome Measure

Outcome #6

1. Outcome Measures

Advance development of state of the art integrated waste management systems to the extent that OARDC and Ohio are viewed as one of the top ten programs/states in this area nationally

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Advance the knowledge of ecological based engineered systems for waste management to the extent that, where cost effective and appropriate, they will be adopted over mechanical systems

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Aid rural stakeholders with onsite waste disposal systems to the extent that all rural Ohio onsite waste management systems could meet state standards

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Reduce through research, development, and outreach the negative impact of farm-, recreation-, or industry-related accidents within agriculture and natural resources.

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.)

Brief Explanation

Economic shifts such as interest rates to borrow money for facilities, housing foreclosures, public policy shifts, regulations, shifts in demand, and issues such as climate change are impacting outcomes. Human values and conflicts, e.g. urban - rural issues, and environmental sensitivities to agriculture processes and location concerns related to facilities by the populace are also external factors that affect outcomes, e.g. engineering of large farms. Climate change may dictate new and different types of structures, equipment, and processes. Factors such as the availability of base funding to ensure a core research and extension faculty and staff, availability of extramural funds, and programmatic

demands that often exceed resources, all, affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

OARDC and OSU Extension have long been concerned about engineering for environmental mitigation improvement, including improving agricultural ditches. One of our conservation partners provided the following feedback on our two-stage ditch technology: "Research is paramount to provide the worth, function and relevance of a conservation practice in the ever-changing environment we are in today. The work that Andy Ward and other partners have done on two-stage ditches is the backbone and foundation of the effort."

-- Kent Wamsley, project manager, Wabash River Initiative, The Nature Conservancy

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Agricultural, Environmental, and Development Economics (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	0%		15%	
602	Business Management, Finance, and Taxation	0%		15%	
603	Market Economics	0%		15%	
604	Marketing and Distribution Practices	0%		5%	
605	Natural Resource and Environmental Economics	0%		10%	
606	International Trade and Development	0%		5%	
607	Consumer Economics	0%		10%	
608	Community Resource Planning and Development	0%		5%	
609	Economic Theory and Methods	0%		10%	
610	Domestic Policy Analysis	0%		5%	
611	Foreign Policy and Programs	0%		5%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	5.5	0.0
Actual Paid Professional	0.0	0.0	4.4	0.0
Actual Volunteer	0.0	0.0	0.0	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	595912	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	543931	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

To fulfill the goals of the Food, Agricultural and Economics Development Planned Program, OARDC will support both basic and applied research initiatives. Both laboratories and multiple field sites are available throughout state to permit data gathering and to continue long - term experiments. Extensive in-state research will take place, as will national and international studies. Close working relationships with multiple industries and organizations will continue to provide real-world settings and data, greatly enhancing the program's capacity and its outputs / impacts. All functional laboratories and sites are improved over time as program need and resource availability warrants. OARDC faculty and staff will engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

OARDC's targeted audiences for this 2013 -2017 planned program include, but are not limited to: specific individuals or groups who have expressed a need for economic findings related to some aspect of human capital that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that depend on scientists in this program for support information and for the approaches/measures they generate; fellow agencies or support organizations who will not only use the economic information but will also extend that information; populations who have not requested the information but will likely benefit from that information; other scientists and scientific groups; political entities; extension personnel; students from junior high school to post doctorate studies; news organizations; and business and industry groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	41	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Report number of graduate students completed
  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	New knowledge of production variations in markets that help producers, processors, and distributors have requisite information for enhanced decision making leading to decreased costs of inputs and an increase in profits/outputs.
2	Advanced knowledge of how to market and manage quality attributes of commodities leading to demonstrated value added/ profits for producers, processors, and distributors, and reported satisfaction/needs attainment among consumers.
3	Business management knowledge in targeted areas, e.g. risk management, weather insurance, impacts of land use shifts, grant management that are necessary for and result in increased profitability for stakeholders.
4	Research findings on novel programs such as pollution trading, carbon trading, conservation programs, cooperatives, etc. that results in enhanced profits, new sources of income, and/or prevention of loss of profits or loss of other resources, e.g. soil.
5	Relational contracting theory and practice information that will contribute to reduction of risks, improving profits, and adding stability to the system that meet stated stakeholder needs.
6	Stakeholders will have the necessary models that will improve on the forecasting of risk, demand, and prices in various commodity sectors leading to enhanced decision making, increased profits, and reductions in uncertainty.
7	Resultant management models that explain potential impacts of new/emerging trends e.g. trade agreements, bio-terrorism threats, and renewable fuels requirements, on specific agriculture sectors to the extent that negative impacts can be mitigated in a timely manner.
8	Market economies and efficiencies studies relating to factors such as pricing, finance, supply and demand, etc. ensuring that stakeholders are informed and their identified needs, e.g. lower operating costs, become more attainable.
9	Research finding on valuing environmental resources, e.g. wetlands, river restoration, and how it applies to stakeholder needs for demonstrated gains in profits, resources sustained, and/or actions mitigated.
10	Biocomplexity analysis to understand human-nature interactions at the landscape level that informs human enterprises, leading to demonstrated profitability, environmental protection, and/or improvements in quality of stakeholders' lives.
11	Increase profitability, reduce environmental impact, and/or improve quality of stakeholders' lives through bio-resource utilization efficiency and effectiveness research such as biomass to energy, nitrogen utilization, biocides, etc.
12	Market and non-market valuation of environmental resources, e.g. steelhead trout fishing, open space, that have often lacked economic justification that meets client needs, and informs individual, group, and government decision making.
13	Advance knowledge of vertical markets in developing counties that when applied leads to documented increased trade with the US.
14	Exchange rate, trade policy, and similar uncertainties research findings that lead to documented mitigation for stakeholders of certain negative effects of international trade.
15	New policy analysis research that informs policy development and fosters demonstrated gains for stakeholders in areas such as conservation programs, farmland protection, Farm Credit System resources, etc.

Outcome #1

1. **Outcome Measures**

New knowledge of production variations in markets that help producers, processors, and distributors have requisite information for enhanced decision making leading to decreased costs of inputs and an increase in profits/outputs.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Advanced knowledge of how to market and manage quality attributes of commodities leading to demonstrated value added/ profits for producers, processors, and distributors, and reported satisfaction/needs attainment among consumers.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Business management knowledge in targeted areas, e.g. risk management, weather insurance, impacts of land use shifts, grant management that are necessary for and result in increased profitability for stakeholders.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Research findings on novel programs such as pollution trading, carbon trading, conservation programs, cooperatives, etc. that results in enhanced profits, new sources of income, and/or prevention of loss of profits or loss of other resources, e.g. soil.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Relational contracting theory and practice information that will contribute to reduction of risks, improving profits, and adding stability to the system that meet stated stakeholder needs.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Stakeholders will have the necessary models that will improve on the forecasting of risk, demand, and prices in various commodity sectors leading to enhanced decision making, increased profits, and reductions in uncertainty.

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Resultant management models that explain potential impacts of new/emerging trends e.g. trade agreements, bio-terrorism threats, and renewable fuels requirements, on specific agriculture sectors to the extent that negative impacts can be mitigated in a timely manner.

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Market economies and efficiencies studies relating to factors such as pricing, finance, supply and demand, etc. ensuring that stakeholders are informed and their identified needs, e.g. lower operating costs, become more attainable.

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Research finding on valuing environmental resources, e.g. wetlands, river restoration, and how it applies to stakeholder needs for demonstrated gains in profits, resources sustained, and/or actions mitigated.

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Biocomplexity analysis to understand human-nature interactions at the landscape level that informs human enterprises, leading to demonstrated profitability, environmental protection, and/or improvements in quality of stakeholders' lives.

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Increase profitability, reduce environmental impact, and/or improve quality of stakeholders' lives through bio-resource utilization efficiency and effectiveness research such as biomass to energy, nitrogen utilization, biocides, etc.

Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

Market and non-market valuation of environmental resources, e.g. steelhead trout fishing, open space, that have often lacked economic justification that meets client needs, and informs individual, group, and government decision making.

Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

Advance knowledge of vertical markets in developing counties that when applied leads to documented increased trade with the US.

Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

Exchange rate, trade policy, and similar uncertainties research findings that lead to documented mitigation for stakeholders of certain negative effects of international trade.

Not Reporting on this Outcome Measure

Outcome #15

1. **Outcome Measures**

New policy analysis research that informs policy development and fosters demonstrated gains for stakeholders in areas such as conservation programs, farmland protection, Farm Credit System resources, etc.

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.)

Brief Explanation

Shifts in economic dimensions impact all aspects of people's lives..... psychologically, socially, business - wise, and physically. Within this program area, public monies, and the fluctuations in appropriations of such, can have dramatic (both positive and negative) affect on human well-being, as do levels of government regulations. Likewise public policy, priorities, and perceptions, in addition to popular culture and trends/fads, education, family, work, play, etc. are major external factors impacting this program its research and extension efforts. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available resources are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 12

1. Name of the Planned Program

Human Health (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	0%		5%	
721	Insects and Other Pests Affecting Humans	0%		20%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		50%	
723	Hazards to Human Health and Safety	0%		10%	
724	Healthy Lifestyle	0%		15%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	0.7	0.0
Actual Volunteer	0.0	0.0	0.0	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	68873	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	136540	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

On -going research activities to advance human health goals for societal well-being include both basic and applied research, as discussed in previous sections for this Planned Program. Effective research requires a mixture of laboratory and gathering places for subjects to maximize research knowledge. Emerging threats now require more advanced facilities such as a biosecurity lab, particularly needed in the study infectious animal diseases that may directly impact humans. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff will engage in appropriate levels of outreach, engagement, and consultation with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

Targeted audiences include, but are not limited to: specific individuals or groups who have expressed a need for health, obesity, and safety information that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that depend on scientists in this program for support information and for new health and safety technologies and approaches/measures fellow agencies or support organizations who will not only use the information but will also extend that information; populations who have not requested the information but will likely benefit from that information; other scientists and scientific groups; health workers/organizations; political entities; extension personnel; students from pre-school to post doctorate studies; news organizations; and business and industrial groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	18	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of graduate students completed
  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	Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.
2	Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.
3	Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.
4	Reduce health risk by releasing at least one major study each five years demonstrating techniques, procedures, or products that lessen the chance of contacting, or the impact if contacted, zoonotic diseases.
5	Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle

Outcome #1

1. Outcome Measures

Release studies on insects, ticks, and mites to protect human health that will provide a set of alternatives leading to health gains with lowered risks, and within economic realities, for the affected populations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
New methods for mosquito control are urgently needed. Mosquitoes worldwide are becoming resistant to the insecticides currently used to combat the spread of diseases such as malaria, which kills close to 1 million people every year, and dengue, which infects hundreds of millions of people annually.

What has been done
An OARDC scientist and his collaborators have discovered a chemical that causes "kidney" failure in mosquitoes, which may pave the way to the development of new insecticides to fight potentially deadly mosquito-transmitted diseases such as malaria and dengue fever. The team has found a chemical that interferes with the function of a class of mosquito proteins, called potassium channels, and which compromises the ability of mosquitoes to excrete urine. In addition to blocking their kidney function, the chemical leaves mosquitoes unable to fly and in some cases severely bloated, all of which would lead to a shorter lifespan for the mosquitoes.

Results
Female mosquitoes rely on their "kidneys" when consuming a human blood meal. They may ingest the equivalent of their body mass in blood, so they need to immediately get rid of the excess water and salt. They do this by urinating on their host while feeding. Mosquitoes with impaired "kidney" function would be less likely to survive the ingestion of blood. With this important proof-of-concept study completed, the team is now in search of similar chemicals that will show a high potency for perturbing potassium channels in mosquitoes, but not those in humans and other animals. If this can accomplished, then they may uncover a new generation of insecticides for controlling 'resistant' mosquitoes and mosquito-borne diseases.

4. Associated Knowledge Areas

KA Code	Knowledge Area
721	Insects and Other Pests Affecting Humans
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Advance the understanding of means and methods related to transmission of zoonotic diseases to humans, including prevention, that meets consumer demand/health threat, as or before such emerges.

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

Reduce through research, development, and outreach the exposure to biohazards, pathogens, and similar to the extent that annually such are reduced per capita with an overall time and economic savings to those who may be affected.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The lack of suitable cell lines for the growth of large amounts of virus is often a real bottleneck in the production of vaccines. As a result, vaccines to protect people against viral infections such as influenza can sometimes be in short supply.

What has been done
Viruses require living cells to replicate. This poses a challenge for laboratories that want to detect or study viruses. Some cells can be propagated in flasks indefinitely, but not every virus can grow in every cell. Thus, in order to grow viruses the cells that can support the replication of each specific virus of interest must be identified. OARDC scientists have isolated and characterized new cell lines that support the growth of several viruses, including the influenza virus.

Results
The commercialization and use in vaccine development of these cell lines will provide a much needed solution to this problem and provide a way to economically produce larger amounts of vaccines that can be used to protect animals and people from viral infections.

4. Associated Knowledge Areas

KA Code	Knowledge Area
722	Zoonotic Diseases and Parasites Affecting Humans
723	Hazards to Human Health and Safety

Outcome #4

1. Outcome Measures

Reduce health risk by releasing at least one major study each five years demonstrating techniques, procedures, or products that lessen the chance of contacting, or the impact if contacted, zoonotic diseases.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Create a growing base of knowledge that supports improving human health as it relates to food, environment, and lifestyle

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
It's not a new idea to use pigments from fruits and vegetables as natural alternatives to synthetic food dyes. But the work being done in an OARDC lab, focused on compounds called anthocyanins, is making it much more economical to use those natural colorants, and is elucidating the health benefits of doing so. Anthocyanins are the compounds that give color to most red, orange, purple, and blue fruits and vegetables, as well as cereal grains and flowers.

What has been done
Anthocyanins are powerful antioxidants, believed to play an important role in the prevention of cancer and other diseases. But until recently, anthocyanins have been difficult and expensive to isolate into pure forms. OARDC scientists have developed a new technique to extract the pigments, achieving highly purified anthocyanin blends.

Results
The patented technique is cost-effective and creates a new market opportunity for expanded research of anthocyanins. OSU is partnering with a new business venture created to commercialize the product. Kraft Foods announced it would be replacing artificial dyes with natural ones in its macaroni-and-cheese products marketed to children. A previous study shows that artificial food coloring may cause hyperactivity in children. The scientific evidence has not demonstrated convincingly that synthetic dyes actually do cause hyperactivity or other negative effects, but regardless, OARDC scientific view is that the use of natural colorants may actually be beneficial. Thus they are trying to provide alternatives for the food industry and for consumers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

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.)

Brief Explanation

Multiple factors, including factors such as climate change and weather conditions, play a major role in encouraging the growth and spread of pests and diseases that can be transmitted to humans. Shifts in economy can impact government or society in general abilities to attend to human health matters. Access to health care, both real and due to political positions, and education regarding healthy lifestyles also affects outcomes. Within this program area public monies, and the fluctuations in appropriations of such, have dramatic affect on human health, as do levels of regulations. Likewise public policy and the public's priorities and perceptions, especially regarding risks, are major external factors impacting this program.

Priority of this research for limited dollars and the resulting competition impact the extent of research that can be carried out. Items such as potential levels of public exposure to certain zoonotic diseases are major external factors. Likewise public willingness to learn

safety procedures in terms of pests or zoonotic disease threats are factors impacting research outcomes. Willingness to pay by consumers for additional food safety is also an external factor. Factors such as the availability of base funding to ensure a core faculty and staff, availability of extramural funds, and programmatic demands that exceed available resources are affecting outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 13

1. Name of the Planned Program

Human and Community Resource Development (OARDC Led)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	0%		10%	
802	Human Development and Family Well-Being	0%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	0%		25%	
804	Human Environmental Issues Concerning Apparel, Textiles, and Residential and Commercial Structures	0%		10%	
805	Community Institutions, Health, and Social Services	0%		10%	
901	Program and Project Design, and Statistics	0%		10%	
903	Communication, Education, and Information Delivery	0%		25%	
	Total	0%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	3.0	0.0
Actual Paid Professional	0.0	0.0	1.8	0.0
Actual Volunteer	0.0	0.0	0.0	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	236559	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	191181	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

The activities carried out in this Human and Community Resource Development Planned Program is primarily applied research and is supported by several CFAES academic departments. The preceding sections help to characterize actives within this Planned Program. Both laboratories and multiple field sites/community settings are available throughout state to permit data gathering and to continue projects requiring data over time. All functional laboratories and sites are improved over time as program need warrants. OARDC faculty and staff engage in appropriate levels of outreach, engagement, and consultation, with both internal stakeholders such as fellow extension personnel, and with external stakeholders.

2. Brief description of the target audience

Targeted audiences include, but not limited to: specific individuals or groups who have expressed a need for information related to some aspect of human capital that is to be derived through new research, extracted from on-going research, or is derived from scientific literature; fellow academic units that depend on scientists in this program for support information and for approaches/measures; fellow agencies or support organizations who will not only use the social information but will also extend that information; populations who have not requested the information but will likely benefit from that information; other scientists and scientific groups; political entities; extension personnel; students from pre-school to post doctorate studies; news organizations; and business and industrial groups.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	9	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of gradaute students completed.
  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	Advance human capital and sociological studies that will inform strategies for expanding and strengthening the agricultural workforce leading to improved quality and quantity of jobs in rural areas yielding demonstrated economic growth.
2	Advance human capital and sociological studies that will inform strategies for strengthening individual and family well-being, and community stability, e.g. grandmother daycare in single head households.
3	Develop a more complete understanding of the relationship between learning style and cognitive abilities of Ohio agricultural students to inform teaching ?learning leading to gain score increases within and a better-educated workforce.
4	Conduct statewide survey research to better understand public attitudes, perceptions, opinions, and behaviors related to select topics in agriculture, annually documenting how those data impact decision-making, e.g. public policy, industrial decisions.
5	Investigate shifts in rural-urban interface, land use, immigration, and similar changes to determine if community policies and/or levels of social capital in the community can shape the future of agriculture in face of urbanization pressures.
6	Improve through research the understanding of and skill development for decision-making by local farmers that will result in improved farm viability and competitiveness at the rural-urban interface.
7	Develop a conceptual framework within five years that will inform programming for developing statewide leadership characteristics, skills, and attitudes in a core of present and future leaders in order to advance a more socially responsible industry.
8	Study rural educational systems relative to educational resources, curriculum, instructional delivery, and student learning to the extent necessary to inform decision-makers how to improve rural education systems as requested.
9	Investigate the social implications of structural changes in agriculture and their economic implications, documenting challenges and opportunities for rural individuals, families, groups and communities, including business and government.
10	Investigate project formulation and administration to the extent that the findings help the institution to document gains in creativity, productivity, partnerships, collaboration, and proficiency within five years.
11	Advance understanding of communication, education and information services to show gain scores in the teaching and learning process within related agriculture and natural resources programs.

Outcome #1

1. **Outcome Measures**

Advance human capital and sociological studies that will inform strategies for expanding and strengthening the agricultural workforce leading to improved quality and quantity of jobs in rural areas yielding demonstrated economic growth.

Not Reporting on this Outcome Measure

Outcome #2

1. **Outcome Measures**

Advance human capital and sociological studies that will inform strategies for strengthening individual and family well-being, and community stability, e.g. grandmother daycare in single head households.

Not Reporting on this Outcome Measure

Outcome #3

1. **Outcome Measures**

Develop a more complete understanding of the relationship between learning style and cognitive abilities of Ohio agricultural students to inform teaching ?learning leading to gain score increases within and a better-educated workforce.

Not Reporting on this Outcome Measure

Outcome #4

1. **Outcome Measures**

Conduct statewide survey research to better understand public attitudes, perceptions, opinions, and behaviors related to select topics in agriculture, annually documenting how those data impact decision-making, e.g. public policy, industrial decisions.

Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

Investigate shifts in rural-urban interface, land use, immigration, and similar changes to determine if community policies and/or levels of social capital in the community can shape the future of agriculture in face of urbanization pressures.

Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

Improve through research the understanding of and skill development for decision-making by local farmers that will result in improved farm viability and competitiveness at the rural-urban interface.

Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

Develop a conceptual framework within five years that will inform programming for developing statewide leadership characteristics, skills, and attitudes in a core of present and future leaders in order to advance a more socially responsible industry.

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

Study rural educational systems relative to educational resources, curriculum, instructional delivery, and student learning to the extent necessary to inform decision-makers how to improve rural education systems as requested.

Not Reporting on this Outcome Measure

Outcome #9

1. **Outcome Measures**

Investigate the social implications of structural changes in agriculture and their economic implications, documenting challenges and opportunities for rural individuals, families, groups and communities, including business and government.

Not Reporting on this Outcome Measure

Outcome #10

1. **Outcome Measures**

Investigate project formulation and administration to the extent that the findings help the institution to document gains in creativity, productivity, partnerships, collaboration, and proficiency within five years.

Not Reporting on this Outcome Measure

Outcome #11

1. **Outcome Measures**

Advance understanding of communication, education and information services to show gain scores in the teaching and learning process within related agriculture and natural resources programs.

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 (Trends and fads)

Brief Explanation

How society is organized, make decisions, is educated, move from locale to locale, etc. all impact the food, agricultural, and environmental human - resources matrix. 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, will affect outcomes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

For 2013, CFAES - OARDC has conducted no formal studies regarding summative evaluation of our research program. Surrogate evaluation metrics, inclusive of but not limited to, that are considered indicators of research success are: research contracts and awards received/ongoing/completed ($120 plus million of active projects in 2013), number of referred publications reported elsewhere in this report, number of business, industries and groups engaged in CFAES' research programs (over 200 for 2013), number of patents received (five in 2013), economic impact of this college's research program as reported elsewhere in this report, the level of base funding from USDA - NIFA and the State of Ohio in 2013, impacts submitted in this report, and the continued robustness of CFAES' research program throughout 2013, both in terms of breadth of programs and depth of new knowledge generated and applied. OARDC has over 650 scientists and support staff providing services and science to Ohio's $100 plus billion agricultural research program, as well as providing support for related national and international programs.

The research reported herein is also supported by an informal yet effective formative

evaluation. Very little research is conducted at OARDC without early engagement of business, industry, commodity groups, special interest or community groups, or other interested parties given these are the individuals who have the need for and will be the adopters of our research output/impacts. Even in the case of very theoretical research, fellow researchers in industry, government, and academic institutions are consulted (formative evaluation/needs assessment) in the formulation of studies.

Key Items of Evaluation

None

V(A). Planned Program (Summary)

Program # 14

1. Name of the Planned Program

Advancing Employment and Income Opportunities (Extension)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
602	Business Management, Finance, and Taxation	15%		0%	
608	Community Resource Planning and Development	60%		0%	
801	Individual and Family Resource Management	25%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	22.0	0.0	0.0	0.0
Actual Paid Professional	7.5	0.0	0.0	0.0
Actual Volunteer	21.0	0.0	0.0	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**
454718	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
454718	0	0	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

- On-site workshops
- Meetings
- Curriculum development and maintenance
- Leadership development training
- Development and maintenance of online resources
- Establishment of collaborative partnerships
- One-on-one client consultations
- Volunteer organizational efforts

2. Brief description of the target audience

- Community leaders
- Economic development professionals
- Community residents (families and individuals)
- Business owners/operators

3. How was eXtension used?

Questions were answered through eXtension related to Business Retention & Expansion programming and content. Clients were referred to eXtension as an additional source of information, especially the 'Financial Security for All' community of practice portion of the website.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	109531	71435	0	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	8	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- formal training workshops (BR&E)

Year	Actual
2013	8

Output #2

Output Measure

- number of one-on-one consultations

Year	Actual
2013	46

Output #3

Output Measure

- number of formal presentation of findings to communities

Year	Actual
2013	4

Output #4

Output Measure

- number of web-based questionnaires distributed (BR&E)
  Not reporting on this Output for this Annual Report

Output #5

Output Measure

- number of hard-copy questionnaires distributed (BR&E)
  Not reporting on this Output for this Annual Report

Output #6

Output Measure

- number of individuals participating in Business Retention and Expansion (BR&E) programming

Year	Actual
2013	8255

Output #7

Output Measure

- number of multi-state partnerships associated with Business Retention and Expansion (BR&E) programming efforts

Year	Actual
2013	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of participants who increased their financial literacy
2	# of participants who have developed an integrated plan for achieving financial security
3	# of participants who understand their roles in the development of a community economy
4	# of participants using information to make community decisions
5	# of community plans developed and adopted
6	# of jobs created and retained
7	# of dollars of additional business financing leveraged
8	number of local leaders or community residents that are using evaluation skills and data to make important community decisions (BR&E)

Outcome #1

1. Outcome Measures

of participants who increased their financial literacy

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1860

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ohioans face a wide range of challenges in their daily lives. As determined through the use of statewide clientele surveys and focus groups, two key issues for residents of Ohio and the nation are economic stability and educational success. The nature of these complex key issues requires programming that is holistic and increasingly multidisciplinary. Improved knowledge is a key factor in bringing about behavior change, which leads to more secure households and more stable communities.

What has been done
Ohio's Extension professionals delivered high quality, research-based educational programs focused on building Healthy Finances throughout the state. Using the full range of program delivery modalities (e.g., face-to-face, one-on-one, webinar, social media campaigns, websites, media, demonstrations, workshops, etc.), we taught people the knowledge and skills they need to use their money wisely, purchase or maintain their home, and save for future goals.

Results
Overall, 65% of participants in financial literacy programs indicated that they learned new information and 34% plan to make positive changes in their finances based on their learning. Individual programs had notable impact. For example, 98% of participants in the 'Live Well on Less' program plan to use the information gained to help purchase a home. Agency partners shared that 43% of families closed on homes and 24% are waiting on outside funding to proceed with their purchase. The remainder of participants were working on rebuilding credit and paying off debt to proceed with the process.

4. Associated Knowledge Areas

KA Code	Knowledge Area

602 Business Management, Finance, and Taxation
801 Individual and Family Resource Management

Outcome #2

1. Outcome Measures

# of participants who have developed an integrated plan for achieving financial security

Not Reporting on this Outcome Measure

Outcome #3

1. Outcome Measures

# of participants who understand their roles in the development of a community economy

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	286

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Increased economic growth is of critical importance, yet local communities lack an understanding of issues related to their economy. Interested community leaders, residents, and representatives of business and institutions can affect economic conditions when they are meaningfully engaged in local and/or regional economic development efforts.

What has been done
Workshops have been conducted to explain how community residents can play a role in understanding and developing their local and regional economy.

Results
More than 90% of program participants have actively engaged in conducting local applied research to better understand their economy and to inform strategies for its improvement.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #4

1. Outcome Measures

# of participants using information to make community decisions

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	117

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local decisions affecting a community or regional economy are often ill-informed. As a result, limited resources are often not fully leveraged.

What has been done
Local community economic data have been collected via stakeholder engagement in applied research. The outputs of this applied research have been used to better inform local decision making.

Results
Local elected and appointed officials have used local community data to inform decisions regarding infrastructure expansion, use of tax incentives, and job-training programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development
801	Individual and Family Resource Management

Outcome #5

1. Outcome Measures

of community plans developed and adopted

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Community leaders are often faced with decision making, with little or no local research to inform direction.

What has been done
Through a community engagement process, local community socio-economic data and resident input have been collected and compiled in community plan/report formats that can be referenced to better inform local decision making.

Results
Local elected and appointed officials have used locally informed community planning documents to inform decisions regarding infrastructure expansion, zoning, subdivision review, and development patterns for the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #6

1. Outcome Measures

# of jobs created and retained

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	509

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Local and regional economies are powered by local and regional employment. Household finances are dependent upon gainful employment. Local and regional service providers rely on healthy economies as a funding mechanism necessary to fund services.

What has been done
Local community leaders have been engaged in community outreach efforts involving local employers to identify specific needs.

Results
Local community leaders have become better informed of local employer needs. Needs have been addressed enabling local employers to create and/or retain local jobs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development
801	Individual and Family Resource Management

Outcome #7

1. **Outcome Measures**

# of dollars of additional business financing leveraged

Not Reporting on this Outcome Measure

Outcome #8

1. **Outcome Measures**

number of local leaders or community residents that are using evaluation skills and data to make important community decisions (BR&E)

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The following methods of evaluation studies / data collection were employed within 2013 for the 'Advancing Employment and Income Opportunities' planned program:

- After-only (post program) assessment
- Retrospective (post program) assessment
- During (during program) assessment

As a result of program efforts, OSU Extension work has either directly or indirectly helped Ohio businesses leverage $227,400 and local community governments and/or organizations leverage $987,174 in 2013. These leveraged dollars represent the sum of a variety of funding streams, including grants, cost shares, loans and/or loan guarantees. These results have been documented via post program assessments.

Key Items of Evaluation

As a result of program efforts, OSU Extension work has either directly or indirectly helped Ohio businesses leverage $227,400 and local community governments and/or organizations leverage $987,174 in 2013. These leveraged dollars represent the sum of a variety of funding streams, including grants, cost shares, loans and/or loan guarantees. These results have been documented via post program assessments.

V(A). Planned Program (Summary)

Program # 15

1. Name of the Planned Program

Enhancing Agriculture and the Environment (Extension)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	8%		0%	
112	Watershed Protection and Management	10%		0%	
123	Management and Sustainability of Forest Resources	4%		0%	
133	Pollution Prevention and Mitigation	5%		0%	
204	Plant Product Quality and Utility (Preharvest)	1%		0%	
205	Plant Management Systems	4%		0%	
213	Weeds Affecting Plants	5%		0%	
216	Integrated Pest Management Systems	5%		0%	
307	Animal Management Systems	9%		0%	
308	Improved Animal Products (Before Harvest)	10%		0%	
315	Animal Welfare/Well-Being and Protection	6%		0%	
402	Engineering Systems and Equipment	8%		0%	
403	Waste Disposal, Recycling, and Reuse	5%		0%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
602	Business Management, Finance, and Taxation	5%		0%	
603	Market Economics	5%		0%	
721	Insects and Other Pests Affecting Humans	5%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	28.0	0.0	0.0	0.0

Actual Paid Professional	42.0	0.0	0.0	0.0
Actual Volunteer	91.0	0.0	0.0	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**
2546418	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
2546418	0	0	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

• Develop and deliver curriculum about 'The Ohio New and Small Farm College', an eight-week introductory course covering topics including production practices and requirements, marketing alternatives, the economics of land-use choices, the assessment of personal and natural resources, the identification of sources and assistance, and individual potential productivity/profitability.
• Develop and conduct 'Small Farm Conference(s)' and trade show(s) each year in at least one location in Ohio to potentially include 30-40 different seminars taught by Extension professionals and industry leaders focusing in the areas of: aquaculture, farm management, forages and pasture, livestock (exotic and traditional), natural resources, horticulture (fruits/vegetables), and organic production.
• Develop curriculum and teach tax education workshops for tax practitioners in partnership with the IRS and the Ohio Department of Taxation; completion of the tax education can result in Continuing Education credits for students.
• Enhance the adaptation of production techniques through utilization of on-farm research to work directly with producers to evaluate practices to enhance productivity and profitability.
• Conduct workshop training sessions for livestock haulers, food animal veterinarians, livestock producers, consultants and integrators.
• Prepare and distribute research-based educational materials in the areas of animal welfare and biosecurity through worksheets, factsheets, web-based sites, podcasts, and other emerging technologies.
• Offer 'Pesticide Applicator Training' (PAT), both private and commercial
• Offer 'Transitioning Your Farm Business to the Next Generation' workshops and 'Women in Agriculture' seminars.
• Offer beginner and advanced trainings and workshops for Ohio Volunteer Master Gardneners (MGVs) and Ohio Volunteer Certified Naturalists (OCVNs).
• Conduct workshops, provide publications, and serve as a resource on bed bugs to business owners, community leaders and citizens of Ohio.

Under the 'Increasing Profitable Crop Yields' OSU Extension signature program:

• Increasing field crop yields through technology adoption;
• Producing high-value crops on small tracts of land;
• Growing alternative crops for bioenergy;

- Publication of the Crop Observation and Recommendation Network (CORN) newsletter;
- Crop production conference;
- Multiple regional / local agronomy meetings and workshops;
- Website development and maintenance;
- Local and on-farm research;
- Field days;
- Precision ag data management analysis and decision workshops;
- Develop educational programs and tools to improve the efficiency of nitrogen utilization to improve farm economics and reduce environmental impact.
- Develop a user friendly manure nutrient credit spreadsheet

2. Brief description of the target audience

The target audience for efforts under the 'Enhancing Agriculture and the Environment' programs include:

- Ohio farm families
- Commercial green-industry companies
- Consumer horticulture advocates
- Commodity/farm advocacy groups
- Federal / state agricultural & environmental agencies
- State-wide consumer groups
- Volunteer groups
- Community leaders
- Business leaders
- Elected and appointed officials
- Non-government organizations
- New and small farmers
- Tax practitioners
- Certified Public Accountants
- Banks/Financial & Lending Institutions, especially those in rural communities
- Treasurer of State of Ohio

Included in the reporting of the NIFA planned program, 'Enhancing Agriculture and the Environment', OSU Extension has a number of programs that have more specific audiences, which are detailed separately below.

The target audience for "Increasing Profitable Crop Yields":

- Grain producers
- Fertilizer chemical retailers
- Input company representatives
- Crop advisory, agency soil and water conservation districts
- Natural Resources Conservation Service
- Ohio Department of Agriculture
- Environmental Protection Agency

The OSU Extension "Ohio Volunteer Master Gardener Program" targets the following audiences:

- Ohio citizens
- Community leaders and officials

- Master gardeners

eXtension "Ask a Master Gardener" - Ohio targets the following audiences:

- New and beginning gardeners
- Gardeners with distressed gardens, plants, new/unusual problems with plants and/or diseases

The "Ohio Certified Volunteer Naturalist" program targets the following individuals:

- Ohio citizens
- Community leaders and officials
- Certified naturalists.

OSU Extension programming on the topic of bed bugs targets the following audiences:

- Local and State Departments of Health
- Business owners
- Community leaders
- Government Officials
- Citizens of Ohio

3. How was eXtension used?

Through eXtension, OSUE launched 'Ask a Master Gardener (AaMGV) - Ohio', with a link on each county webpage and the main OSUE homempage. An icon was developed to increase visibility and reconginition of the service to users. The functioning of the process was streamlined, sending clientele questions straight to the master gardener volunteers (MGVs) instead of being routed through question wranglers. During the months of May through August 2013, AaMGV responded to 65% of all Ohio "Ask an Expert" questions. Out of 1,396 total questions answered by OSUE professionals for those four months, Master Gardener Volunteers (MGVs) were responsible for 911 of the responses. All of this was accomplished with one Program Manager coordinating and training 93 MGVs in 34 counties. This program has been very successful, and is another example of how the education offered through Extension "gives back" in the form of volunteer hours from the MGVs. These volunteer hours allow Extension professionals to accomplish more and feel confident that clientele's questions are being expertly answered by MGVs as the majority of AaMGVs spend between 30 - 60 minutes of prep time per response.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2390977	737680	730	525

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	26	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- number of volunteers involved in delivery and implementation of program

Year	Actual
2013	3800

Output #2

Output Measure

- number of multi-state partnerships

Year	Actual
2013	200

Output #3

Output Measure

- number of people completing the 'Transitioning Your Farm/Agricultural Business to the Next Generation' workshops

Year	Actual
2013	100

Output #4

Output Measure

- number of Crop Observation and Recommendation Network Newsletters distributed

Year	Actual
2013	44000

Output #5

Output Measure

- number of participants reached with agronomic information provided in regional / local Agronomy meetings

Year	Actual
2013	3700

Output #6

Output Measure

- number of hits to website

Year	Actual
2013	380000

Output #7

Output Measure

- number of local / on-farm research project sites

Year	Actual
2013	30

Output #8

Output Measure

- number of participants in local Field Days

Year	Actual
2013	1300

Output #9

Output Measure

- number of 'Weed Control Guide for Ohio and Indiana' distributed

Year	Actual
2013	3300

Output #10

Output Measure

- number of 'Corn, Soybean, Wheat and Alfalfa Field Guides' distributed

Year	Actual

2013	700

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of agronomic crop, fruit and vegetable producers that demonstrate an increase in biosecurity knowledge and skills.
2	Number of food animal producers that increase their knowledge of how to mitigate animal biosecurity hazards and risks on their farm operations and agribusinesses due to livestock mortality.
3	Increased knowledge of current practices and emerging technology.
4	Number of youth shows / county fairs that implement animal ID or quality assurance programs.
5	Increase profitability for the food animal sector of the Ohio agricultural industry.
6	Number of Schedule "F" tax forms filed by tax practitioners that participated in OSU Income Tax Schools.
7	Number of farms using transitioning planning.
8	number of Increasing Profitable Crop Yields participants that indicate they will implement new management practices based on information received at meetings
9	number of crop production acres that will implement best management practices for nutrient management
10	number of crop production acres that implement weed resistance management strategies
11	number of Ohio crop acres where appropriate utilization of integrated pest management (IPM) practices occur
12	number of individuals taught about disease identification, control and scouting or key weed control concepts

Outcome #1

1. Outcome Measures

Number of agronomic crop, fruit and vegetable producers that demonstrate an increase in biosecurity knowledge and skills.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3910

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Fruit and vegetable safety is a growing concern to both growers/producers and consumers. The safety of our waterways with nutrient runoff from fertilizer and manure application is of major concern to citizens, tourists, business owners, and government officials.

What has been done
Good Agricultural Practice (GAP) programs have been developed and delivered to fruit and vegetable growers, educating participants on on-farm food safety practices that can help reduce the risk of produce contamination from biological components that exist on the farm. Presentations were given to different groups on 4R Nutrient Management & Ohio's Waterway, where participants gained a better understanding of soil-plant interactions in relationship to crop productivity & the risk edge-of-field for nutrient loss & subsequent consequences downstream.

Results
A total of 3,910 participants attended a total of 361 4R Nutrient Management meetings and presentations; 204 conversations on nutrient management and water quality-related issues took place in 2013, and soils and soil health were discussed in 119 conversations. Mass media including 47 newspaper articles, 17 radio programs, and 128 electronic postings reached an estimated 482,680 people on nutrient management and water quality information. Additionally, a webcast on 4R Nutrient Stewardship was produced in connection with the Livestock & Poultry Learning Center (archived at http://www.extension.org/pages/66384/the-4rs-of-nutrient-stewardship).

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
216	Integrated Pest Management Systems
308	Improved Animal Products (Before Harvest)
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. Outcome Measures

Number of food animal producers that increase their knowledge of how to mitigate animal biosecurity hazards and risks on their farm operations and agribusinesses due to livestock mortality.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	170

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Swine diseases cause economic losses to pork producers. Pork producers face daily challenges to maintain and improve the health of their herds. In the face of these challenges, pork producers are eager for information that can reduce their risk of disease.

What has been done
A meeting of the Ohio Swine Health Committee, made up of the State Veterinarian, Ohio swine veterinarians, OSU Extension employees, and pork producers recommended that a Swine Health Symposium be held to educate pork producers. The fifth annual symposium was held March 20, 2013 at the Der Dutchman Restaurant in Plain City.

Results
*Total attendance of 170 producers and industry affiliates.
*Sponsorships and in-kind donations from industry affiliates totaled $10,500.
*102 post-meeting evaluations were collected. Producers reported a minimum yearly economic benefit of $230,000 as a result of knowledge gained from attending.
*Educational resource materials and proceedings of the presentations were made available to attendees

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection
402	Engineering Systems and Equipment

Outcome #3

1. Outcome Measures

Increased knowledge of current practices and emerging technology.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	939

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Ohio's agriculture industry is valued at more the $200 million dollars, but increasing input costs can have a negative effect on agriculture. Learning about new and emerging technologies and practices in agriculture allow Ohio farmers and agricultural business owners the opportunity to implement them into their business and ultimately save money.

What has been done
The Conservation Tillage Conference is an annual event that attracts 900 or more farmers, certified crop advisors, agribusiness representatives, and agribusiness owners who attend to learn about the latest technology and trends. Traditionally, Certified Crop Advisors can obtain continuing education units for certain sessions.

Results
Most participants at the Conservation Tillage Conference report that they gained useful knowledge that they plan to implement in this year's growing season and that they expect to see an increase in either their crop yield, see a cost savings, or both.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
205	Plant Management Systems
216	Integrated Pest Management Systems
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Number of youth shows / county fairs that implement animal ID or quality assurance programs.

Not Reporting on this Outcome Measure

Outcome #5

1. Outcome Measures

Increase profitability for the food animal sector of the Ohio agricultural industry.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Detailed financial and production data is essential for dairy farmers to understand their cost of production, profitability, and competitive advantage.

What has been done
Detailed, on-farm financial analysis and dairy/crop enterprise evaluations were completed on 40 Ohio farms.

Results
Farmers were able to compare average on-farm data with the top 20% of their peers in the cohort group. For example, the average cost per cwt was $21.87; but those in the top 20% for profitability had a lower cost of $18.93 cwt. Net farm income per cow was $321 on average, however, the top 20% of farms averaged $1294 per cow.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #6

1. Outcome Measures

Number of Schedule "F" tax forms filed by tax practitioners that participated in OSU Income Tax Schools.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	88272

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The OSU Income Tax School program has been providing education for Income Tax Preparers since 1964. Focusing on new tax rules and regulations for the coming tax season, the OSU Income Tax School "prepares the preparers" for tax season. The tax school is designed for tax preparers with some experience preparing and filing federal tax returns for individuals and small businesses. Additionally, the OSU Tax School offers an Agricultural Tax Issues and Form Preparation Workshop concerning the special issues with farm tax returns.

What has been done
The OSU Tax Schools curriculum is offered 8 convenient locations throughout Ohio. Instruction focuses on tax law changes and on the problems faced in preparing tax returns. Highly qualified instructors explain and interpret tax regulations and recent changes in tax laws. New in 2013, the Agricultural Tax Issues and Form Preparation Workshop was offered as a webinar.

Results
*1,166 attorneys, Certified Public Accountants, Tax Preparers, bankers and lenders attended the 2013 OSU Tax Schools.
*212 attorneys, Certified Public Accountants, Tax Preparers, bankers and lenders attended the 2013 Ag Issues Workshops via webinar
These tax preparers helped to file 88,272 Schedule "F" tax forms in 2013.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

Outcome #7

1. Outcome Measures

Number of farms using transitioning planning.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	215

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
As farm and agricultural enterprise / businesses owners age, they need to develop a farm transfer plan and increase family communication regarding the process of transitioning the farm to the next generation.

What has been done
Four "Transferring the Farm to the Next Generation" workshops were held throughout 2013 with a total of 212 participants. A six month follow-up survey was conducted to discover whether or not the tools they learned during the workshop had been implemented.

Results
Families are beginning the process of transferring the farm to the next generation. 205 of the 212 participants in the "Transferring the Farm to the Next Generation" workshops indicated that they gained skills to develop a farm transfer plan and to increase family communication. In the 6-month follow-up survey, past participants indicated they made great strides in putting some of the tools into action that they learned during the workshop. Some participants were farther along than others in their plan, and 7 participants had decided to postpone their plan for various reasons.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
603	Market Economics

Outcome #8

1. Outcome Measures

number of Increasing Profitable Crop Yields participants that indicate they will implement new management practices based on information received at meetings

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	18350

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The target audience for the 'Increasing Profitable Crop Yields' programming is farmers. The ultimate outcome of the program is adaption of management techniques that will increase farm profitability.

What has been done
Topics at agronomy programs focus on maximizing production, integrated pest management, reducing pesticide resistance, understanding social impacts of agricultural practices, and best management adoption.

Results
Program surveys using paper instruments and audience response technology (clickers) show 87% of producers and professional agronomists learned at least one new idea that will potentially increase farm profitability.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
133	Pollution Prevention and Mitigation
205	Plant Management Systems
213	Weeds Affecting Plants
402	Engineering Systems and Equipment
601	Economics of Agricultural Production and Farm Management

Outcome #9

1. Outcome Measures

number of crop production acres that will implement best management practices for nutrient management

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	825000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Excess or lost soil-applied plant nutrients can cause water quality impairment when they enter Ohio's streams, rivers, and lakes. Municipal and recreational users of Ohio's water can be affected by declining water quality.

What has been done
OSU Extension teaches landowners and farmers production practices to mitigate the potential losses of plant nutrients to Ohio's waters. Education occurs at workshops, summer field days, conferences, and one-on-one consultations.

Results

43% of workshop participants report they will continue their current farming practices because they match university recommendations, 41% will change 1 or more current farming practices, 22% will adopt a new idea/practice learned at the workshop, 16% will recommend changes of 1 or more farm practices to clientele/customers, 19% will recommend adopting a new idea/practice to clientele/customers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #10

1. Outcome Measures

number of crop production acres that implement weed resistance management strategies

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3750000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Weed resistance causes crop yield loss and loss of applied herbicide products (due to ineffectiveness), which require a shift in weed control systems. Implementation of multiple modes of herbicide action, tillage, seed bank reduction and other integrated weed management practices can reduce weed impacts and the cost of controlling weed to farmers; this cost savings is consequently passed on to consumers.

What has been done
Through research and educational programs, a discussion of re-introducing primarily glyphosate-based pre-emergent herbicides into soybean production systems has encouraged different modes of actions. Discussion about weed size has focused on application timing to target smaller weeds with adequate rates to achieve control.

Results

Greater than 80% of Ohio's licensed private pesticide applicators have increased the efficiency of their applications by better timing, pest identification and correct product choice to manage resistant weed populations. Additionally, 5499 farmers attended pesticide applicator recertification sessions and received training on crop weed control strategies, an update on new herbicide products, and information of the efficacy of various herbicides. 712 employees of commercial ag businesses received training on weed control. 3200 weed control guides were sold, 2000 Marestail fact sheets were distributed. 10 Weed Control videos were produced and posted to http://agcrops.osu.edu

4. Associated Knowledge Areas

KA Code	Knowledge Area
213	Weeds Affecting Plants

Outcome #11

1. Outcome Measures

number of Ohio crop acres where appropriate utilization of integrated pest management (IPM) practices occur

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	500000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Utilizing integrated pest management (IPM) practices protect cropland yields from insects, diseases, and weeds. This has environmental and economic benefits.

What has been done
The Crop Observation and Recommendation Network (CORN) newsletter is distributed to over 3700 subscribers weekly via e-mail. 67% of the articles in 2013 delivered IPM information and strategies to protect crop yields from damage and economic loss.

Results
In 2013, there was a 23% increase in the CORN newsletter subscription over 2012 subscription rates.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #12

1. Outcome Measures

number of individuals taught about disease identification, control and scouting or key weed control concepts

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	7111

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Practical agronomic skills of pest identification, risk assessment knowledge, and control of strategies are essential for servicing Ohio's cropland needs. This knowledge is of immediate benefit to farmers and Certified Crop Advisors (CCA), and of secondary benefit to farm product consumers (i.e. general public).

What has been done
*900 individuals attended the 2013 Conservation Tillage Conference, a 2-day educational conference attended by Certified Crop Advisors (for renewal credits), farmers, ag business professional, etc.
*6211 farmers & ag business employees attended pesticide applicator recertification sessions, receiving training on crop weed control strategies, an update on new herbicide products, & info of efficacy of various herbicides
*Weed surveys conducted by OSUE Educators & Field Specialists

Results
Marestail is a difficult weed to control in soybeans. To control this weed, it is essential to follow OSUE research-based recommendations. Field weed surveys conducted by OSUE personnel annually indicate a 16% improvement in 2013 in the control of this weed from 2012. The potential value to Ohio farmers can be calculated at $6.8 million for OSUE soybean weed control research and education.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

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

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

After only (post program) assessments were used as the evaluation study and data collection method in 2013 for assessing the 'Enhancing Agriculture and the Environment' planned program. Evaluation is commonly done following workshops and formal teaching events. Here, we would like to share results regarding one of the highlight conferences hosted by OSU Extension yearly.

The Conservation Tillage Conference (CTC) is an annual event that attracts 900 or more farmers, certified crop advisors, agribusiness representatives, and agribusiness owners who attend to learn about the latest technology and trends. In 2013, the event was evaluated using over 800 audience response clickers.

After attending the CTC, the following expectations about **soybean** yields per acre per year were shared:

- 71% of participants indicated they expected to increase their soybean yields by 1 - 2 bushels
- 16% expected a 3 - 5 bushel increase
- 11% expected a 5+ bushel increase
- 8% indicated no expected increase in soybean yields/acre/year

After attending the CTC, the following expectations about **corn** yields per acre per year were shared:

- 36% expected a 3 bushel increase

- 31% expected a 1 - 2 bushel increase
- 18% expected a 4 bushel increase
- 10% expected a bushel increase
- 7% expected no increase

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 16

1. Name of the Planned Program

Preparing Youth for Success (Extension)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	25%		0%	
806	Youth Development	75%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	52.0	0.0	0.0	0.0
Actual Paid Professional	79.0	0.0	0.0	0.0
Actual Volunteer	575.0	0.0	0.0	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
4789691	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
4789691	0	0	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

- Conduct workshops
- Face-to-face and virtual meetings
- Develop curriculum
- Provide training to professionals, volunteers and youth
- Media and web site creations
- Partnering with businesses and other organizations

2. Brief description of the target audience

- Youth - infant through 18 years of age (with a special focus on new and underserved audiences)
- Parents of youth
- Volunteers working with youth audiences
- Teachers/Educators working with youth audiences
- Families
- Volunteers
- Youth Development Professional Staff
- Community Leaders involved in subject specific areas
- Youth (8 - 18 years), parents of youth, and volunteers working with youth: all associated with animal projects
- General public who have an interest in animals

3. How was eXtension used?

eXtension is used as an occasional resource site, but use is limited. There is a Moodle course on the topic of Volunteer Education added by a small group of Ohio 4-H Educators, with some use by others. The major content of eXtension content matter is content-related, not organizational-related, which results in limited use by 4-H Professionals.

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	295000	472543	175473	0

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

Patent Applications Submitted

Year:	2013
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total

Actual	17	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of youth enrolled/engaged in organized community 4-H clubs

Year	Actual
2013	82853

Output #2

Output Measure

- Number of youth enrolled/engaged in after school 4-H programs

Year	Actual
2013	498

Output #3

Output Measure

- Number of youth enrolled/ engaged in military 4-H clubs

Year	Actual
2013	20

Output #4

Output Measure

- Number of youth participating in Special Interest and short term programs

Year	Actual
2013	58322

Output #5

Output Measure

- Number of youth participating in School Enrichment programs

Year	Actual
2013	58300

Output #6

Output Measure

- Number of youth participating in 4-H overnight camping programs

Year	Actual
2013	13247

Output #7

Output Measure

- Number of youth participating in 4-H day camping programs

Year	Actual
2013	3741

Output #8

Output Measure

- Number of adult volunteers

Year	Actual
2013	20047

Output #9

Output Measure

- Number of teen volunteers

Year	Actual
2013	4867

Output #10

Output Measure

- number of sessions (RMRW)

Year	Actual
2013	107

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Increase understanding of decision making processes
2	Increase knowledge in educational topic being presented
3	Demonstrate decision making and problem solving skills
4	Practice improved basic life skills
5	Youth who have participated in 4-H programs possess transferrable workforce skills
6	number of participants who increased awareness about what it costs to maintain a household (RMRW)
7	number of participants who increased awareness about how every spending decision affects other spending opportunities (RMRW)
8	number of participants who increased awareness about how the type of job they have affects how much money they will make (RMRW)
9	number of participants who increased feeling of importance about getting more education or training after high school (RMRW)
10	number of participants who increased feeling of importance about waiting to have children until financially ready (RMRW)
11	number of participants who increased feeling of importance about having a plan for spending that includes both needs and wants (RMRW)
12	number of participants who indicated their likeliness to make changes relative to getting more education or training after high school (RMRW)
13	number of participants who indicated their likeliness to make changes relative to learning how to make wise financial decisions (RMRW)

Outcome #1

1. Outcome Measures

Increase understanding of decision making processes

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	53400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to increase their understanding of decision making processes to become more productive citizens as adults.

What has been done
The typical club member attends an average of 11 club meetings per year. In 2013, there were a reported 4100 clubs and 350 4-H affiliates, with a combined membership of 82,853 individuals. Educational delivery methods employed by clubs included: Work night meetings (31%); workshops / clinics (59%); Skill-a-thon kits (54%); required demonstrations by members (81%);outside speakers (59)%; subject matter volunteers (45%); field trips / tours (56%); and community service (91%).

Results
In a previous ROR study (n = 48,100) of 4-H members who answered "YES" when asked if they learned any decision making skills through their 4-H club experience indicates a high level of knowledge, attitude, and intended behavior changes. 90% indicated they would think about what might happen because of the decision; 90% generated ideas for possible solutions before making a decision; 89% indicated they would determine the best alternative and actually make the decision; 88% indicated they would implement that decision; 86% indicated they would gather background information that will help to make a decision; 85% said they would evaluate the outcome of the decision.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

Increase knowledge in educational topic being presented

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	66900

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to increase their knowledge of presented educational topics to become more productive citizens as adults.

What has been done
Youth participating in a variety of activities (including clubs, after-school programs, military clubs, special interest and short term programs, school enrichment programs, overnight camping, and day camping programs) were surveyed on their knowledge gains regarding the educational topic presented at the event they attended.

Results
4-H members were asked to rate on a four point scale (where 1=NONE and 4=A LOT) the amount of project knowledge / skills gained through 4- H events; the items with the highest ratings were "Exhibiting the product(s) of a 4-H project" and "Working on a 4-H project". The next highest rated items were: "4-H project books and written 4-H materials" and then "One-on-one visits with an adult 4-H volunteer". The lowest rated item was "Attending 4-H workshops/ clinics". However, all but the last were rated 3 or higher on a 4 point scale.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

Demonstrate decision making and problem solving skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	53400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to demonstrate their decision making and problem solving skills to become more productive citizens as adults.

What has been done
In a recent study, local 4-H volunteers were asked to assess their club members' decision making / problem solving skills and transferable workforce preparation skills. Youth were asked to assess basic life skills learned, decision-making / problem solving skills learned, and project skills / knowledge gained in 4-H. One hundred ninety-one (191) volunteers and 336 youth collected and returned usable questionnaires.

Results
Over 90% of the respondents stated that half or more of their members demonstrated decision making skills. 4-H Club advisors were asked to indicate how many of their club's members could demonstrate decision making skills on each of the seven decision making skills taught. The highest rated skill was "Generate ideas for possible solutions before making a decision" (96%) and the lowest was, "Implement the decision (91%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

Practice improved basic life skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	35600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to improve basic life skills to become more productive citizens as adults.

What has been done
To assess the impact of Ohio 4-H community clubs, a survey was completed in the fall of 2010.

We assume similar impacts for 2013. 18 counties were randomly selected, and from each county, five 4-H clubs were randomly selected. 4-H volunteers and members in these clubs received either a printed or web-based questionnaire. 4-H volunteers assessed their club members' decision making / problem solving skills and transferable workforce preparation skills. Youth were asked to assess basic life skills.

Results
4-H members were asked if they learned any Basic Life Skills through their 4-H club experience. The percentage who responded "YES" is indicated for each life skill below: 96% indicated they understand it is important to follow through on commitments they have made; 96% indicated that they feel they have control over their own personal goals/future; 95% indicated they intended to or believe they can work / play with people who are different from them; 94% said they would use their time wisely; 94% indicated they would take care of their personal belongings; 94% said they will listen carefully to what others say; 93% said they will treat people who are different from them with respect.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

Youth who have participated in 4-H programs possess transferrable workforce skills

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	35600

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Youth need to possess transferable workforce skills to become more productive citizens as adults.

What has been done
4-H volunteers were asked to assess their club members' decision making / problem solving skills and transferable workforce preparation skills. Youth were asked to assess basic life skills learned, decision-making / problem solving skills learned, and project skills / knowledge gained in 4-H. One hundred ninety-one (191) volunteers and 336 youth returned usable questionnaires. These results were extrapolated to the 2013 Ohio 4-H community club members.

Results
When asked in a survey, 92-99% of 4-H Club advisors reported that half or more of their members demonstrated transferable workforce skills. The highest ranked skill was, "Display positive attitudes" (99%); the lowest ranked skill was, "Demonstrate self motivation" (92%). Other skills members achieved and demonstrated were: "Use time wisely" (94%); "Meet scheduled deadlines" (95%); "Demonstrate responsibility" (96%); "Are team players" (97%); "Acquire and apply new knowledge" (97%); "Are able to share information they have learned with others" (98%); and "Are respectful" (98%)

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

number of participants who increased awareness about what it costs to maintain a household (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6741

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This program will be of use to parents and their children. Parents will benefit as their children will become more likely to understand the money issues parents face in real life.

What has been done
Students participated in a 'Real Money Real World' simulation and made decisions on what to purchase based on a salary received, thus simulating the real world.

Results
6741 school-age participants have a better understanding of the costs involved in running a household with children including taxes, retirement savings and medical insurance. In addition, they are more prepared to make better decisions regarding important purchases when getting out on their own.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #7

1. Outcome Measures

number of participants who increased awareness about how every spending decision affects other spending opportunities (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6766

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This outcome matters to parents, family members, and friends of youth. Learning to make choices when spending money affects all areas of life. If money is foolishly spent on impulse purchases, parents can reinforce the ideas that when you spend your money quickly, there isn't anything left for the necessary expenditures.

What has been done
Students participated in Real Money Real World simulation and made decisions on what to purchase based on a salary received, thus simulating the real world. In the simulation, if / when they ran out of money, they had to rethink choices or get another income.

Results
Students determined they needed to make a plan and spend towards the most important things first such as housing, utilities and transportation and leave the extras until the end. This helps them better understand needs vs wants.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #8

1. Outcome Measures

number of participants who increased awareness about how the type of job they have affects how much money they will make (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6522

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Teachers, employers, parents - if students are interested in making a good salary they will be more likely to stay in school, do well academically and get a better education thus leading to a better job in the future.

What has been done
Students participated in a 'Real Money Real World' simulation and made decisions on what to purchase based on a salary received, thus simulating the real world. Those who 'received' a less than desirable job, had to make many concessions to stay on track and not overspend.

Results
Students commented that there is a direct correlation between education and job thus resulting in better career and salary choices. Many comments included concepts like "stay in school", or getting good grades so one can go to college for a better job in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #9

1. Outcome Measures

number of participants who increased feeling of importance about getting more education or training after high school (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6529

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Teachers, parents, employers -- if students stay in school and continue training after high school, the chances of better employment increase.

What has been done
Students participated in a 'Real Money Real World' simulation and made decisions on what to purchase based on a salary received, simulating the real world. If students did not have adequate training or education after high school, they were able to see first hand how this affected how much they could purchase on a limited salary.

Results
Students commented on the importance of getting good grades in school so they could get into a good college to study for a more lucrative career.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #10

1. Outcome Measures

number of participants who increased feeling of importance about waiting to have children until financially ready (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6643

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents - this program also tends to discourage teenage pregnancy after students realize how much child care and other child related expenses are.

What has been done
Students were forced to purchase child care if they had children because the other parent was either going back to school or looking for employment. They couldn't depend on assistance from relatives.

Results
Students were most surprised by child care. They had no concept of costs involved or the extras it takes in raising a child. Students comments included concepts such as, "wait to have children until you have a job and can afford them."

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #11

1. Outcome Measures

number of participants who increased feeling of importance about having a plan for spending that includes both needs and wants (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6676

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents and teachers care about this outcome measure. Students are still egotistically minded at this age and this program helps them to think more of others and begin to develop some adult habits of selflessness.

What has been done
Students participated in a 'Real Money Real World' simulation and made decisions on what to purchase based on a salary received, simulating the real world. If students overspent on non-essentials, they were made to go back and re-do their plan to take care of needs before wants. In addition, sometimes their salaries didn't even cover all basic needs, so they had to have another job to get by.

Results
Students become less selfish and begin thinking of others especially taking care of a family and what their parents must go through when they buy things for family. Students say they will be less likely to ask their parents for so much "stuff" in the future.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #12

1. Outcome Measures

number of participants who indicated their likeliness to make changes relative to getting more education or training after high school (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6529

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents do not want to have to support their children forever and the 'Real Money Real World' experience helps students to see the value of education. Teachers benefit as students strive to do better in all classes for a better overall GPA.

What has been done
Students chose occupations out of a hat, some with post-secondary education requirements and some not. Those with more training and schooling had better salaries.

Results
Students were able to compare their salaries with those of their friends and could see the direct correlation on what kind of a job made better money.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

Outcome #13

1. Outcome Measures

number of participants who indicated their likeliness to make changes relative to learning how to make wise financial decisions (RMRW)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	6443

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Parents can talk and talk about making wise financial decisions but when their children are able to see for themselves the impact that decision making has, it is more likely these habits will continue and develop into adulthood.

What has been done
With the variety of choices students have in this simulation, they must make wise financial choices to come out with a checkbook in the black. Students were given a variety of spending choices, some positive and some negative, during the course of the 'Real Money Real World' simulation. The simulation helped students to see the impacts of their financial decisions, thus informing future behavior.

Results
As a result of the 'Real Money Real World' activities, students are more likely to think before making purchases and are less likely to ask parents for unnecessary expenditures.

4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities
- Other (Personnel and management issues)

Brief Explanation

The two personnel and management situations which affected the reporting of 2012 Ohio 4-H statistics continued for 2013 data. Implementing ACCESS 4-H as the Ohio 4-H enrollment computer program for 2012, a series of management and technical issues continued to be encountered, such that the decision was made to abandon that program after 2013 and implement the 4HOnline system.

We feel the data reported for all categories continues to be conservative, but as were data collected for 2013. Also, the "new personnel" situation continues: there were fifteen new 4-H Educators hired in Ohio during 2012, and eight more during 2013; many are inexperienced with the data collection and reporting processes, which were changed at the end of 2013. At the same time, there continue to be less Extension Educators in other program areas, which demands more 4-H Educator resources in efforts other than reporting and data manipulation.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A survey was completed in the fall of 2010 to assess the impact of Ohio 4-H community clubs. The 2010 survey results were extrapolated to 2013 programming efforts and assessments. Because of the continuing issues with the ACCESS 4-H enrollment program, the planned survey for the fall of 2013 was not conducted.

In the 2010 study, eighteen counties were randomly selected, and from each county, five 4-H clubs were randomly selected. All 4-H volunteers and members in these clubs received either a printed or web-based questionnaire. 4-H volunteers were asked to assess their club members' decision making/ problem solving skills and transferable workforce preparation skills. Youth were asked to assess basic life skills learned, decision-making/ problem solving skills learned, and project skills/ knowledge gained in 4-H. Usable questionnaires were returned from 191 volunteers and 336 youth. These results are reported for the respondents and extrapolated to Ohio 4-H community club members. Of the volunteers who responded:

• 19% were male and 81% were female;
• The average tenure as a 4-H Advisor is 11 years;
• A given 4-H club member averaged 11 club meetings per year.
• 90% or more of clubs met monthly March through July, 70%-89% met in February and August, 40%-50% met January, September and October, while less than 30% met November and December.
• Educational delivery methods employed by clubs included: work nights (31%), workshops / clinics (59%), Skillathon kits (54%), required demonstrations by members

(81%), outside speakers (59)%, subject matter volunteer presenters (45%), field trips / tours (56%); and community service (91%).

Of the 4-H Members who responded:

- The average age of youth respondent =13.5 years old;
- The average years in a 4-H club = 4.9 years;
- 62% of the youth respondents held one of the seven possible 4-H club offices;
- 34% of respondents were male and 66% female.
- Almost 47% of the projects taken by respondents were in the Animal Sciences. A little over 30% of the projects taken were in Clothing and Textiles, Creative and Leisure Arts or Food and Nutrition. Almost 7% were in STEM and over 5% Natural Resources.

A new OSUE signature program, "Assuring Quality Care for Animals" was introduced in 2012, with the first full year of program delivery being 2013. This program expands on the curriculum of the current "Youth Food Animal Quality Assurance" program to address food safety, animal handling, and animal welfare. Animals are involved in 35% of Ohio 4-H projects, so teaching quality care is very important for the 4-H program. The new signature program has demonstrated changes in participant behavior. For 2013 the data reported in OSUE online reporting system for this signature program:

- 55 Extension professionals reported
- 145 events with a total of 13,056 participants
- 2,330 participants were reported as under-represented individuals
- 2,112 participants learned new information
- 1,727 participants plan to adopt one or more recommended practices
- 1,622 actually adopted one or more recommended practices

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 17

1. Name of the Planned Program

Strengthening Families & Communities (Extension)

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	50%		0%	
724	Healthy Lifestyle	20%		0%	
801	Individual and Family Resource Management	20%		0%	
802	Human Development and Family Well-Being	10%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	36.0	0.0	0.0	0.0
Actual Paid Professional	24.0	0.0	0.0	0.0
Actual Volunteer	15.0	0.0	0.0	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**
1455096	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
1455096	0	0	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

- Conduct formal and informal needs assessments
- Develop programming materials and curricula
- Conduct meetings, workshops and educational sessions
- Conduct program evaluation and applied research
- Form and sustain community partnerships
- Train volunteers, paraprofessionals, and other community agency/organization professionals
- Maintain online presence, through a variety of methods: social media (Facebook, Twitter, blogs), and websites

2. Brief description of the target audience

Strengthening Families and Communities programming is tailored to meet the needs of the intended audience. For example, school programming is age appropriate, whereas programs at Senior Centers are targeted to individuals living alone or with one other person in terms of food preparation. The end result is a program that has the potential to encompass all residents of the state. Below is a listing of the specific groups we intend to reach with targeted awareness, educational and skills-development programming:

- Parents of children ages birth to 18, including, but not limited to: teen, step, adoptive, foster, single, divorcing, incarcerated, fathers who may not have yet established paternity, and grandparents
- Adults in, or thinking about entering, intimate relationships
- Young adults
- Older adults and those who care for them
- Baby boomers, especially women
- Limited resource families, including mothers with young children and SNAP recipients
- New employees
- Bankruptcy filers
- Debt burdened individuals and couples
- First time homebuyers
- Individuals with diabetes and their caregivers/family support members
- Food establishment managers and food service employees
- Volunteer food preparers
- Child care providers
- Teachers
- Social service professionals
- General consumers

3. How was eXtension used?

eXtension was used as a resource for research-based information to provide an answer to consumer questions. It was also used as a resource for direct consumer use (both the general information and the "Ask an Expert" features).

V(E). Planned Program (Outputs)

1. Standard output measures

2013	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	105270	141029	20345	0

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

Patent Applications Submitted

Year: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	1	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Educational sessions held with two or more participants

Year	Actual
2013	1869

Output #2

Output Measure

- number of visits to the blog for the OSUE Signature Program, "Live Healthy Live Well"

Year	Actual
2013	26962

Output #3

Output Measure

- number of "Likes" on posts to the 'Live Healthy Live Well' OSUE Signature Program Facebook page

Year	Actual
2013	929

Output #4

Output Measure

- number of individuals (adults and youth) who participated in Supplemental Nutrition Assistance Program (SNAP) education programming, offered by OSUE.

Year	Actual
2013	82239

Output #5

Output Measure

- number of individuals who participated in an OSUE event/project that are defined as under-represented individuals (i.e., individuals who may not have participated fully--e.g., women, minorities, persons with disabilities, small farm owners, etc.).

Year	Actual
2013	17460

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	# of participants who increased knowledge on topic presented as a result of the education program/session(s)
2	# of participants who plan to adopt one or more recommended practices as a result of the education program/session(s)
3	number of participants whose knowledge of diabetes management has increased (DWD)
4	number of participants who are able to count carbohydrates (DWD)
5	number of participants who are eating smaller portion sizes (DWD)
6	number of participants who have lowered blood sugar levels (DWD)
7	number of individuals who indicated that they actually began practicing a behavior or skill that was learned from OSUE education events

Outcome #1

1. Outcome Measures

of participants who increased knowledge on topic presented as a result of the education program/session(s)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	22871

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Individuals and families face a wide range of challenges in their daily lives. As determined through the use of statewide clientele surveys and focus groups, three key issues for residents of Ohio and the nation are economic stability, healthy lifestyles, and educational success The nature of these complex key issues requires programming that is holistic and increasingly multidisciplinary Improved knowledge is a key factor in bringing about behavior change.

What has been done
Under the planned program "Strengthening Families and Communities," OSUE professionals deliver the highest quality, research-based educational programs focused on building Healthy People, Healthy Finances, and Healthy Relationships. We help people keep throughout the state healthy by providing education on good nutrition and food safety, how to use their money wisely, and balance the demands of life and work. OSUE uses a full range of program delivery modalities (e.g., face-to-face, one-on-one, webinars, social media campaigns, websites, media, demonstrations, workshops, etc.).

Results
Nearly 23,000 Ohioans who were reached with educational outreach provided by OSUE indicated via post-program assessments that they learned new knowledge and / or skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management

802 Human Development and Family Well-Being

Outcome #2

1. Outcome Measures

# of participants who plan to adopt one or more recommended practices as a result of the education program/session(s)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	8518

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Individuals and families face a wide range of challenges in their daily lives. As determined through the use of statewide clientele surveys and focus groups, three key issues for residents of Ohio and the nation are economic stability, healthy lifestyles, and educational success The nature of these complex key issues requires programming that is holistic and increasingly multidisciplinary Improved knowledge is a key factor in bringing about behavior change.

What has been done
Under the planned program "Strengthening Families and Communities," OSUE professionals deliver the highest quality, research-based educational programs focused on building Healthy People, Healthy Finances, and Healthy Relationships. We help people keep throughout the state healthy by providing education on good nutrition and food safety, how to use their money wisely, and balance the demands of life and work. OSUE uses a full range of program delivery modalities (e.g., face-to-face, one-on-one, webinars, social media campaigns, websites, media, demonstrations, workshops, etc.).

Results
Approximately 8,500 Ohioans who were reached with educational outreach provided by OSUE indicated via post-program assessments that they planned to use their new knowledge and/or skills and adopt one or more practices / behaviors recommended by OSUE professionals during educational delivery.

4. Associated Knowledge Areas

KA Code	Knowledge Area

703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

number of participants whose knowledge of diabetes management has increased (DWD)

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	300

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Nearly 1 in 10 Ohioans has been diagnosed with diabetes which, if not managed properly, can increase the risk for serious health problems, from heart disease to eye and foot complications. Diabetes costs Ohio $5.9 billion annually in medical expenses, lost work, and early death.

What has been done
OSU Extension Family & Consumer Sciences county Educators deliver via a three part workshop series the 'Dining with Diabetes' signature program to teach clientele ways to manage diabetes through menu-planning, carbohydrate-counting, portion control, label-reading, and healthy recipe taste-testing.

Results
28% of 'Dining with Diabetes' participants indicated their knowledge of diabetes management increased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior

Outcome #4

1. **Outcome Measures**

   number of participants who are able to count carbohydrates (DWD)

   Not Reporting on this Outcome Measure

Outcome #5

1. **Outcome Measures**

   number of participants who are eating smaller portion sizes (DWD)

   Not Reporting on this Outcome Measure

Outcome #6

1. **Outcome Measures**

   number of participants who have lowered blood sugar levels (DWD)

   Not Reporting on this Outcome Measure

Outcome #7

1. **Outcome Measures**

   number of individuals who indicated that they actually began practicing a behavior or skill that was learned from OSUE education events

2. **Associated Institution Types**

   - 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	3055

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Individuals and families face a wide range of challenges in their daily lives. As determined through the use of statewide clientele surveys and focus groups, three key issues for residents of Ohio and the nation are economic stability, healthy lifestyles, and educational success The nature of these complex key issues requires programming that is holistic and increasingly multidisciplinary. Behavior change, which will positively benefit our clients' lives, is an ultimate goal of OSUE programming. Documented behavior change demonstrates that OSUE educational efforts are successful -- our clients are taking knowledge learned from OSUE and putting it into practice, thus creating positive changes in their health, finances, and relationships.

What has been done

The team of OSUE Family and Consumer Science professionals, under the planned program "Strengthening Families and Communities," delivers the highest quality, research-based educational programs focused on building Healthy People, Healthy Finances, and Healthy Relationships. We help people keep throughout the state healthy by providing education on good nutrition and food safety, how to use their money wisely, and balance the demands of life and work. Using the full range of program delivery modalities (e.g., face-to-face, one-on-one, webinars, social media campaigns, websites, media, demonstrations, workshops, etc.), OSUE taught people the knowledge and skills they need to become and stay healthy.

Results

Approximately 3,000 Ohioans who participated in educational outreach provided by OSUE indicated via post-program assessments that they did use their new knowledge and/or skills and adopt one or more practices / behaviors recommended by OSUE professionals. Actual behavior change (medium or long term change) is more difficult to assess than short term changes, such as increases in knowledge, skills, attitudes or aspirations. Not all programs offered under the planned program of "Strengthening Families and Communities" assess medium and long term benefits of programming. This may be due to time, budget, or simply the logistics of a follow-up assessment with past program participants. Therefore, while 3,055 is the documented number of individuals who actually adopted new behaviors or practices learned from OSUE programming, we would like to believe the actual number would be higher.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
801	Individual and Family Resource Management
802	Human Development and Family Well-Being

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Of those attending OSU Extension educational sessions aimed at strengthening families and communities, 22,781 individuals reported an increase in knowledge as a result of OSUE sessions / programming. Post-program assessments revealed that in sum, 8,518 individuals reported that they intended to make behavior changes based on skills or knowledge gained during OSU Extension programming. Of those individuals who reported that they intended to make behavior changes, 3,055 were documented as reporting that they did make one or more behavior / practice changes as a result of OSUE programming. This reveals that 36% of assessed individuals made the move from intention to actual practice.

Assessment results from Extension programs that fall under the larger planned program of "Strengthening Families and Communities" have evaluation results of note; highlights of those results follow.

'Live Healthy Live Well' is a new signature program for Ohio State University Extension. This program aims to educate consumers on nutrition, fitness and other wellness issues, increase awareness and adoption of healthy lifestyle behaviors, and ultimately reduce health care costs. In response to 3 email-based health challenges, 92% of participants learned new information, 93% reported using the new information they learned, and 80% reported adopting one or more of the recommended practices that might help reduce their risk of developing chronic disease. Additionally, 56% reported maintaining their weight, while 35% reported losing weight.

'Real Money, Real World' is another signature program offered by OSU Extension. It teaches financial literacy to youth in grades 6 through 12. Retrospective (pre-post) self-evaluations were used with participants of the program. Data showed that the program made a dramatic difference in raising youths' awareness about the costs to maintain a household (53% of participants indicated a positive change in knowledge from before participating in the program to after participating). The awareness of the interrelationships of education, job, and money was also impacted - 32% of participants indicated they

experienced positive educational gains from the Real Money Real World program. Many youth were surprised to learn how much money was deducted from a paycheck for taxes, insurance and other deductions; 56% of students indicated they experienced learning increases related to that indicator.

Results also showed the curriculum was successful in providing motivation for intent to change behaviors. 67% of participants indicated that they planned to save their money regularly. 75% of participants stated that they intended to create a plan for spending that included budgeting for both needs and wants. Most dramatically, 92% of all participants in 2013 Real Money Real World programming indicated that participating in the program gave them a better idea of what was involved in earning, spending and managing money; the same proportion of students also believed that having participated in the program would help them in the future.

Another program offered by OSUE is 'Successful Co-Parenting' - a course designed to equip parents with knowledge, skills, tools, awareness, and strategies to help their children adjust to their parents' divorce now and in the future. Retrospective (pre-post) self-assessments collected from program participants revealed the vast majority reported the following outcomes: learning new information (90.2%), plan to use the information (91.9%), feel more prepared to co-parent their children with their former spouse (86.7%), and found the program to be helpful (88.7%).

Key Items of Evaluation

Basic Financial Management programming continues to have a substantial impact in the lives of Ohioans. For example, in Wayne County, surveys indicate that 98% of the financial management participants plan to use the information gained to help purchase a home. Agency partners shared that 9 families closed on homes and 5 were waiting on outside funding to proceed with their purchase at the end of 2013. An additional 15 participants were working on rebuilding credit and paying off debt to proceed with the process. 93% of participants indicated gaining new information and 96% indicated planning to use the information learned.

Holistic health programming also demonstrates sustained impact in Ohio. Results from the OSU Extension program, 'Live Healthy Live Well' indicate an increase in participant knowledge of wellness, nutrition, and fitness topics in addition to an increased adoption of health behaviors to reduce chronic diseases. In response to 3 email health challenges, 92% of participants learned new information, 93% reported using the new information they learned, and 80% reported adopting one or more of the recommended practices that might help reduce their risk of developing chronic disease. Additionally, 56% reported maintaining their weight, while 35% reported losing weight.