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1680 Madison Avenue
Wooster, OH 44691-4096

March 31, 2006

Mr. Barton Hewitt
CSREES/Partnerships
US Department of Agriculture
Stop 2214
Washington, DC 20250

Dear Mr. Hewitt:

We are enclosing the FY 2005 AREERA Report of Accomplishments and Results for the College of Food, Agricultural, and Environmental Sciences, including the Ohio Agricultural Research and Development Center and Ohio State University Extension.

If you have any questions, please contact for research: Steve Slack (330-263-3987), Gary Mullins (614-292-3897) or for extension: Keith Smith (614-292-4880), Deborah Lewis (614-292-5089).

Sincerely,

Steven A. Slack
Director, OARDC

Keith L. Smith
Director, OSU Extension

Attached: FY 2005 AREERA Report of Accomplishments and Results

hard copies: Bob Moser
Deborah Lewis
Tom Archer

Federal Report of Accomplishments and Results (FY 2005)

The Ohio State University
College of Food, Agricultural, and Environmental Sciences
including
The Ohio Agricultural Research and Development Center
and
Ohio State University Extension

Goal 1. An Agricultural System that is Highly Competitive in the Global Economy

Executive Summary

During the seventy-five years between the end of the Civil War and the beginning of America's entry into World War II, agricultural production, in terms of units per acre, remained essentially unchanged. In the subsequent sixty five years, productivity dramatically increased. It is often tacitly assumed that this increase in production efficiency can be attributed primarily to agricultural research. After all, it occurred simultaneously with genetic improvements of plants and animals as well as advances in plant and animal nutrition, soil science and management methods as developed by State Agricultural Experiment Stations, often in partnership with industry. Still attempts to specifically relate agricultural research to economic advantage have been rare. Under current budgetary restraints, political leaders are increasingly concerned that discretionary investment of tax dollars is used to support increased economic growth.

Regions across the nation are facing a dramatic transformation as the United States moves to an economy driven by knowledge and technology—through both the creation of new industries, as well as the application of technology to traditional industries. OARDC continues to focus on traditional areas where need exists while moving the research program into this new economy. Both are accomplished by leveraging federal and state base funding through competitive processes and the utilization of stakeholder input in the initial planning phase for programs, as well as scientific peer review and stakeholder review of outputs and impacts.

This 'Knowledge Economy', as this new paradigm is being called, is increasingly less dependent on making and growing things and more dependent on ideas and innovation. Knowledge has replaced raw materials and physical labor as the source of value, wealth, and economic prosperity. OARDC is positioning its agricultural bioscience (AgBioscience)/biotechnology foci within knowledge-based industry clusters. Advances in AgBiosciences have shifted agriculture's foci beyond food and fiber production, alone, toward goals of also improving public health, social well-being, and the environment. OARDC is playing a new and different role in delivering nutritional, pharmaceutical, and bio-based value-added products; in providing sound stewardship of resources; and in supporting rural communities. A more comprehensive view of the value chain is now driving OARDC's research agenda.

In addition, globalization, trade liberalization, consumer preferences, public concern about food safety and the environment, and changes in the relationship between agriculture and rural communities have altered the context in which OARDC's AgBioscience research, in collaboration with OSU Extension, is being conducted. Emerging areas such as biotechnology, genomics, and ecosystem science have also transformed the practices and products of agriculture. New institutional arrangements known as the AgBioscience Innovation Grants (ABIG), a component of OARDC's Research Enhancement Competitive Grants Program (SEEDS), and Ohio BioProducts Innovation Center (OBIC) are presented in Key Themes 1G, to illustrate transformational approaches in which OARDC and OSU Extension are leaders.

OARDC, OSU Extension, and the College of Food, Agricultural, and Environmental Sciences have joined with agricultural partners in a statewide futuring effort that resulted in the publication of *Ohio's Agricultural Roadmap* (2005) under the sponsorship of the Ohio Farm Bureau Federation. In this document, OARDC's role is defined as providing the science for the state's 'AgBioResouces'.

The emphasis is on reducing risk, adding value to products, and strengthening Ohio's competitiveness, while enhancing the quality of and quantity for citizens' lives, as environmental and natural resources are protected. While focusing on this new economy, OARDC recognizes that all its future gains are based in great part on its existing strengths and past achievements.

OARDC and its stakeholders, for example, lead an excellent and long-standing corn and soybean breeding and crop improvement program. For the 19 varieties of soybeans released by OARDC between 1985 and 2002, the estimated income to Ohio producers from OARDC varieties is about $3.38 billion or just under $200 million per year. Thus, threats such as soybean rust must be addressed through aggressive research and extension education programs. As the corn and soybean sectors continue to expand to include biobased products, the economic benefit to Ohio's economy and improvements to individuals' lives will only grow.

OARDC research is also having a positive impact on tomato production in Ohio, especially in the area of whole peeled and diced products. A major limitation to cost efficiency in production and processing of tomatoes intended for whole-peel and diced products are physiological disorders that affect both the appearance and nutritional quality of fruit. OARDC scientists are partnering with the Ohio industry to enhance appearance and add value through nutritional research, upwards of a $60 million impact statewide for producers and processors.

Animal production efficiency studies have yielded poultry breast muscle growth findings with the potential to contribute to the industry and add value for the consumer. An additional line of inquiry into turkey breast meat quality has yielded a provisional patent and a draft license agreement with a company that produces approximately 40% of the breeding stock in the United States.

Plant and animal health research are addressing critical areas such as soybean rust and new viruses in turkey populations. OARDC scientists have identified and mapped a new resistance soybean rust gene for Ohio, for the soybean disease pathogen, *Phytophthora sojae*. These findings are critical; uncontrolled soybean rust in Ohio has the potential to costs millions of dollars annually.

Out of a request by a stakeholder for rapid intervention, OARDC's animal health research program found that a swine vaccine thought to protect the turkeys did not work. That prompted an examination of different H3N2 viruses infecting turkeys and swine. Molecular genetic studies indicated the turkey viruses to be very similar and the swine virus was minimally similar to the turkey viruses. Appearance of the H3N2 triple assortant virus in turkeys was the first report on

this subject. A vaccine was made from the new turkey isolates to protect breeder candidate hens. This vaccine is currently being used for that purpose.

For Ohio to continue to add value to existing and new crops, OARDC will continue to explore new options and issues. Farming carbon is one such option. OARDC is seeking ways to minimize carbon (C) loss and maximize retaining C in the soil, thus reducing the effects of C on global climate change.

Ohio's Commercial agriculture and horticulture industries depend upon Ohio State University Extension to provide timely and innovative, science-based, objective information that can be implemented within their management systems to remain competitive in our global economy. An innovative approach to problem solving, research and extension outreach is the use of empowered teams. A high priority for The Ohio State University Extension is the development and coordination of commodity/issue focused teams consisting of State/Regional Extension specialists, County Agriculture and Natural Resource Educators and research faculty from multiple disciplines to deliver high impact, research-based information and educational programming that is timely and easily accessed by Ohio's diverse commercial agriculture and horticulture industries.

Ohio State University Extension and the Ohio Agricultural Research and Development Center have currently engaged 26 multi-disciplinary self-directed teams ranging from our Agronomic Crops Team to our Watershed Management Network. These faculty-led teams interact closely with their respective state/national commodity organizations, state/federal agencies and environmental organizations to identify and develop OSU Extension statewide and multi-state/regional educational programming and future electronic and print communications and publications structure.

Team electronic communications are the keys for Ohio farmers and green industry professionals to access strategic information for global competitiveness. Many of our teams continue to develop weekly/monthly electronic newsletters and research updates that are continually evaluated for their economic and behavioral impact. Our team members develop management newsletters following weekly tele-conferences such as: *Amazin' Graze, Buckeye Yard and Garden Line (BYGL), Crop Observation and Recommendation Network (CORN), Grain Marketing Research and Innovative Strategies (GRAINS), Pesticide Update (Pep-Talk), Pork Pointers, Veg-Net, Vineyard Vantage*, etc. Many newsletters are listed on our OSU Extension *Ohioline* web site, as well as many of our team's individual web sites for easier access by our stakeholders.

Ohio State University Extension engaged the Battelle Memorial Institute's Technology Partnership Practice to conduct an analysis of OSU Extension's economic impact on Ohio's key stakeholder industries. OSU Extension clearly provides a diverse range of product development, technology transfer, training, educational and advisory services for Ohio's agriculture sector. Using the "IMPLAN" Input-output data, Batelle calculated that OSU Extension had a minimum of a one percent increase in agricultural output representing $149 million in direct and indirect output, $29 million in personal income for Ohioans and 2,712 new jobs created. It should also

be noted that expansion of the agricultural sector has benefits that can be felt in every county in the state.

Smith-Lever Fund expenditure for Goal 1: $1,317,316 EXTENSION FTE's: 18.8
Hatch expenditures for Goal 1: $3,823,068 OARDC FTE: 37.2

Goal 1 Key Themes

1. Key Theme: Agricultural Communications/Information Technologies

(Reference OSU Plan of Work Extension Program 1A: Summary of Extension Programs)

a. **Description of Activity** - Team electronic newsletters and fact sheets/bulletins through appropriate e-mail list serves and Web sites have been identified by Ohio clientele as preferred option to more traditional extension educational meetings. Many of OSU Extension's commodity-focused teams provided weekly/monthly electronic newsletters and research updates which have been evaluated for their economic impact. OSU Extension team members developed educational newsletter summaries following weekly tele-conferences titled: *Amazin' Graze, Buckeye Yard and Garden Line (BYGL), Crop Observation and Recommendation Network (CORN), Ohio Ag Manager (OAM), Pesticide Update (PEP TALK), Pork Pointers, Veg-Net, Vineyard Vantage* and the Watershed Network's *Buckeye Basins*. We have listed all newsletters on our OSU Extension *Ohioline* Web site, as well as many of our team's individual Web sites for easier access by our stakeholders/producer clientele and continually update newsletter list-serves.

b. **Impact** - Newsletter surveys have indicated that agronomic crop producers saved over $67.5 million dollars in chemicals used from implementing management practices presented in the *CORN* newsletter and over $9.2 million from utilizing marketing/management tips found in our *OAM* newsletter. The OSU Extension beef team Web site, released in May 1997, had more than 12,400 hits during 2005. The *Buckeye Yard and Garden Line (BYGL)*, started in 1990, continues to be a key electronic educational tool developed by the OSU Extension Nursery Landscape and Turf Team for county Extension offices, the commercial green industry, and the gardening public. Estimates from the Ohio Nursery and Landscape Association place the economic benefit of the green industry state wide at over 4.3 billion dollars. In the 2005 *BYGL* Evaluation Survey, over 2,000 respondents indicated that *BYGL* saved their businesses over $4.1 million. Over 75% of the respondents indicated that the *BYGL* changed their pest management practices. Through newsletters, media and other sources, respondents indicated that *BYGL* reached over 2.4 million people in 2005. This version of *BYGL* web site is linked to thousands of plant and plant pest images and over 26,000 fact sheets from throughout the U.S. via links to the OSU Horticulture and Crop

Science in *Virtual Perspective* Web site. In addition, *BYGL* is used throughout Ohio at universities as part of the curriculum for undergraduate horticultural courses.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

2. Key Theme: Value Added Products

(Reference OSU Plan of Work Research Program 1B: Value Added Products)

a. **Description of Activity** - Corn and soybeans continue to be the two most important agronomic crops in Ohio, each contributing approximately $1 billion per year to the Ohio economy. The nation saw the second largest crop ever of these two commodities in 2005. OARDC continues with traditional corn research. Results of the corn testing program aid producers in understanding performance. OARDC continues work on new corn varieties and plant health studies. As corn demand continues to grow for traditional and new uses, breeding for specific traits to meet demand, including for biobased product markets, will continue to be a critical component of OARDC's research portfolio.

Illustrative of this biobased industry is a new $80 plus million ethanol plant in northwest Ohio, providing additional outlets for grain. The grain processing plant produces ethanol, high protein animal feed, and carbon dioxide. The plant can convert upwards of 20 million bushels of corn annually into over 50 million gallons of ethanol.

Soybeans, due to their regional sensitivity to length of day, temperature characteristics, soil types, pests, and pathogens, require an intense research program within OARDC. The soybean-breeding program, including field trails, serves a critical role in developing specific high-yield, disease-resistant, high-quality strains of soybeans that thrive in Ohio and maintain the viability of the industry. Within the last two plus decades, OARDC released over 40 varieties adapted to this region's growing conditions.

Newer varieties developed at OARDC have emphasized resistance to phytophthora root rot because this disease is, at present, the single biggest threat to Ohio's soybean industry. The disease has been constantly expanding geographically in Ohio over the past 20 years. OARDC scientists have discovered an effective gene for resistance to phytophthora root rot and are incorporating it into some glyphosate-resistant (Roundup Ready) varieties. Reduction in yield from phytophthora root rot ranges anywhere from five to 30 bushels per acre. The potential loss on a million acres of soybeans infected by this pathogen could be as high as $120 million.

An additional threat is soybean cyst nematodes (SCN). As with the phytophthora root rot, the best defense against SCN is genetic resistance. New OARDC varieties have been developed that exhibit such resistance. SCN resistance is only effective with proper management, including control of weeds

that can harbor the pests over winter. OARDC continues to support an active weed science program to compliment soybean, corn, and other agronomic programs.

The protein content of soybeans is determined by a combination of the plant's genetics, soil, and environmental conditions. To capitalize on niche markets, OARDC research scientists have had a long-term research focus on developing food grade, high protein soybean cultivars adapted to Ohio growing conditions. Approximately one-third of Ohio soybean growers continue to grow non-GMO food grade soybeans varieties. High-protein, food-grade soybeans now constitute a significant proportion of Ohio soybean production (these are always non-GMO varieties), all of which are particularly popular in East Asia.

b. **Impact -** Servicing the corn producers, processors, and consumers is an established OARDC and OSU Extension program. A surrogate measure of impact is the utilization of corn field trial data by stakeholders. Over 30,000 copies of the 2005 performance trial reports were distributed and data were made available at <http://www.oardc.ohio-state.edu/corn2005/>. Growers seek to choose hybrids that generate stable, high yields across a range of locations and/or years, and seek scientific data on which to make these decisions. Field trial data demonstrate that corn varieties can vary by as much as 50 bushels per acre in any given year, thus the importance of and demand for these annual field trial data.

The productivity of Ohio corn growers has attracted an ethanol plant, strategically located in northwest Ohio, that provides additional outlet for grain. The new plant will create 35 to 40 skilled jobs and will add over $85 million per year direct revenue to the local economy. OARDC and OSU Extension's long-term commitment to corn research and timely communication of research findings are credited in part with creating such opportunity.

Ohio soybeans grown from varieties developed by OARDC, and based on the production of certified seed over the 17-year period (1985 -2002), generated $3.38 billion, providing over 4000 jobs annually. Newly developed varieties, of which OARDC is a contributor, gives Ohio soybean producers the option of Roundup Ready soybeans with resistance to phytophthora and soybean cyst nematodes. With the introduction of glyphosate-resistance genes into soybean varieties adapted to Ohio conditions, it is anticipated that these varieties will once again become 35 to 40% of the market. New economic outputs are now being analyzed.

Newer food grade (non-GMO) soybean varieties released by OARDC are having a greater yield and higher protein content than older varieties, thus there is a potential to begin to make greater gains than in previous years in off setting the low yield issue in food grade soybeans. Food grade soybeans have lower yields but higher market value per bushel than non – food grade soybeans. Current total Ohio soybean exports amount to over $600 million per year.

The development of high-protein varieties resulted in Cargill opening a new soybean protein processing facility in Sidney, Ohio. The plant adds $10 plus million dollars to the regional economy annually. This new plant, and its continued successful operation in 2005, is a major addition to the food industry

and has potential to contribute to biobased product development. OARDC, in partnership with OSU Extension and producer stakeholders, have helped to create the business climate that makes such plant location possible.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** - State Specific

3. Key Theme: Innovative Farming Techniques

(Reference OSU Plan of Work Research Program 1C: Innovative Farming Techniques)

a. **Description of Activity** - There is a growing concern about the increase in atmospheric concentration of carbon dioxide (CO2) and other greenhouse gases and projected climate change. OARDC's Carbon Management and Sequestration Center (C-MASC) is identifying ways to minimize carbon (C) loss and maximize retaining C in land, reducing the effects of C on global climate change. Ohioans are farming carbon and now have the option of trading carbon on the commodity market.

The research program is focusing on soil carbon sequestration.

Key findings show that carbon can be sequestrated at varying rates based on agronomic practices employed:

Principal practices of soil C sequestration	kg/ha/yr)
(i) Conservation tillage	300 to 600
(ii) Use of compost/manure (10-20 ton/ha/yr)	500 to 1000
(iii) CRP/CREP	500 to 1000
(iv) Improved pasture management	50 to 500
(v) Forest soil management	50 to 200
(vi) Restoration of mined/degraded soils	500 to 1000
(vii) Elimination of summer fallow	50 to 400
(viii) Growing cover crops	200 to 400

Nationally, in 1990 conservation tillage accounted for 73 million acres of U.S. cropland; in 2004 it had grown to 112 million. No-till accounted for 17 million acres in 1990, and has now grown to 62 million acres. Out of a total of 277 million acres in cropland, 62 million acres are in no-till and 50 million acres in mulch-till and ridge-till. Carbon sequestration potential is significant.

b. **Impact** - Data are being generated which clearly demonstrate that carbon can be sequestered at varying rates based on the agronomic practice utilized. Those data support the use of continued no-tillage and low tillage farming practices, the importance of the Conservation Reserve Enhancement Program to help achieve national goals of atmospheric carbon reduction, provide additional justification to invest in sustainable agricultural practices, and on-farm conservation planning, as well as set the stage for advancing carbon as a cash crop for farmers via carbon trading on commodity markets.

Additionally, a major impact of this program and its importance is the

institutional arrangements and partnerships including Ohio State University Extension and various colleges throughout Ohio State University, Ohio University, Case Western Reserve University, Ohio Department of Agriculture, Ohio Department of Natural Resources, and the Ohio Farm Bureau. The program is developing the criteria for carbon sequestration at regional and national levels, and collaborates with adjacent states in the management process. Partners include Ohio Coal Development Office and federal government offices of USDA-NRCS and USDA-ARS, and American Electric Power (AEP), among others. The Center has support of industry and commodity partners including the Ohio Farm Bureau. Research is carried out in close collaboration with Battelle, Los Alamos National Lab (LANL), Pacific Northwest National Lab (PNNL), and Consortium for Agricultural Soils Mitigation of Greenhouse Gases (CASMGS), a consortium of nine universities and one National Laboratory assembled to investigate the potential of agricultural soils to mitigate greenhouse gases.

c. Source of Federal Funds – Hatch

d. Scope of Impact –Multi-state

4. Key Theme: Increased Animal Production Efficiency

(Reference OSU Plan of Work Research Program 1D: Increased Animal Production Efficiency)

a. Description of Activity - Per capita consumption of chicken and turkey has increased dramatically since the 1970s. Nationally, chicken consumption has increased from 40.3 pounds per person in 1970 to present day 82.5 pounds per person. Turkey consumption has risen from 8.1 pounds in 1970 to current consumption of 17.4 pounds person. Breeders are focused on maximizing growth with an emphasis on the breast muscle. Every percent improvement in breast muscle yield is worth $100 million to the U.S. turkey industry, and is worth over $300 million to the U.S. broiler industry. Results from current OARDC studies are supporting industry's needs for increasing breast muscle growth.

The trend though of increased growth rate and muscling has resulted in meat quality being negatively altered. The turkey-processing industry is experiencing a meat-quality problem similar to the pale, soft, exudative (PSE) condition in swine. Turkey PSE meat, after cooking, has a soft texture, poor juiciness due to reduced water-holding capacity, and increased yield losses. Approximately 40% of commercial turkey meat exhibits poor water-holding capacity and represents a significant financial loss to the poultry industry.

The specific objectives of one OARDC research project was to determine if the genetic selection of turkeys for increased growth rate and breast muscling has changed pectoral muscle fiber morphology and to determine the method of inheritance of pectoral muscle morphological characteristics. These objectives were successfully accomplished.

Aquaculture is a growing research program at OARDC, in partnership

with Ohio State University Extension and Ohio Aquaculture Association. Currently one-third of the world's fish supply is produced from aquaculture. Aquaculture is the most rapidly expanding facet of all animal husbandry. On a global scale, aquaculture accounts for more than 70 million tons of fish each year.

To contribute to the scientific understanding, supported by Ohio Aquaculture Association, OARDC opened the Bowling Green (Ohio) Aquaculture Satellite Center in 2005 to compliment its aquaculture facilities in Columbus, Ohio, and in Piketon, Ohio at OARDC and OSU Extension's South Centers. OARDC and OSU Extension are contributing to an in-state industry of 150 growers who are producing over five million dollars of Ohio products annually.

In one series of aquaculture studies underway, but not yet to the impact phase, the outcomes of the genetic improvement of yellow perch program are expected to increase the efficiency and profitability of yellow perch by 35-50%. Identification of proteins associated with muscle growth or quality parameters of muscle will help improve production and quality characteristics of selected broodstock. Bluegill is also a potentially important species. Genetically, male bluegill have the potential to grow 40-50% faster than a typical mixed population.

A major issue facing aquaculture farmers today is the increase in fish loss due to disease, specifically the infectious hematopoietic necrosis virus (IHNV). This particular virus causes devastating loss. The virus is transmitted by direct contact with infected survivors or through contaminated feed. OARDC scientists sought to produce a recombinant vaccine against the IHNV virus.

b. **Impact** - Poultry breast muscle growth research has the potential to make significant contribution the industry and in nutrition for the consumer. An additional line of inquiry into turkey breast meat quality has yielded a provisional patent and a draft license agreement for potential licensing with a company that produces approximately 40% of the breeding stocks in the United States. This patent covers the ability to determine features of muscle that lead to desirable meat products and to identify appropriate female parents from which muscle morphology is inherited. If the license is agreed upon, OARDC will test breeding material and provide information to guide genetic selection programs.

In the aquaculture study, scientists were able to obtain the amino acid sequence of the IHNV G protein during this project. The G protein is important, as it is the antigen responsible for inducing proactive immunity against the devastating IHNV virus. The developments in this project proved useful for mapping the epitopes for antibodies that are necessary to ward off the IHNV virus. This is an important step in creating a vaccine against this virus.

c. **Source of Federal Funds –** Hatch

d. **Scope of impact –** State Specific

5. Key Theme: Plant Production Efficiency

(Reference OSU Plan of Work Research Program 1E: Increased Plant Production Efficiency)

a. **Description of Activity** - Ohio is the birthplace of commercial tomatoes, as well as the Livingston Seed Company, originally called the Buckeye Garden Seed Company, that released the first variety of commercial tomato. OARDC has released 17 new tomato varieties since 1991.

In 2005, the economic return on investment for Ohio tomatoes, based on OARDC economic simulations, rarely exceeds 5% for tomato paste. In contrast, these simulations indicate that whole-peel and diced products yield an average return on investment of 22%. Lycopene and beta-carotene, key nutritional (and marketing) assets, are reduced by 18% and 22%, respectively, in fruits affected by yellow shoulder disorder (YSD). Beta-carotene is recognized as a nutrient due to pro-vitamin activity and lycopene consumption has been correlated with a reduction in certain cancers. The cause of color disorders such as YSD involves both plant genotype and environmental conditions.

OARDC research has associated low levels of available potassium (K) and phosphorous (P) in soils with a higher incidence of YSD. Another soil factor strongly implicated is organic matter, with high YSD risk associated with soils having less than 1.5% organic matter. The effect of K fertigation through sub-surface irrigation lines on crop quality and quantity is showing promise. Foliar K applications have been ineffective in increasing either fruit yield or quality. Varieties of tomato differ in their susceptibility to color disorders, thus variety use may offer growers a strategy to manage fields with low K, P, or organic matter. OARDC and OSU Extension are promoting management practices that reduce YSD and optimize return on investment, while increasing the potential for health benefits.

b. **Impact -** For Ohio tomato production, OARDC test plots and growers' fields research show that soil test data can help predict if a field may be at risk for producing tomatoes with yellow shoulder disorder (YSD). The most important indicators of risk are the ratio of potassium to the square root of magnesium (the "Hartz" ratio), potassium levels, organic matter, and soil pH.

The manufacturing of high value processed-tomato products is economically viable for small processors and growers and requires fewer acres relative to the production of tomato commodities such as paste. Color disorders affect as much as 65% of the processing tomato crop and the potential cost to farmers and processors is therefore in excess of $60 million annually.

Color disorders also reduce the nutritional value of tomato products, lowering the beta-carotene and lycopene levels by 18% and 20%, respectively. The research findings and associated extension activities are guiding management planning.

Decision tools directed towards industry stakeholders are found at <http://www.oardc.ohiostate.edu/tomato/managingcolor.htm>. Feedback indicates that these findings are benefiting growers, processors, and consumers.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – State Specific

6. Key Theme: Animal Health

(Reference OSU Plan of Work Research Program 1F: Enhancement of Animal Health)

a. Description of Activity - A major turkey breeder reported to OARDC's Food and Animal Health Research Program a drastic drop in egg production with minimal other clinical signs in the affected flock. The threat required immediate intervention. That flock went completely out of production and other flocks on the same farm also went out of production. Samples were taken from the flock. The intervention team was able to isolate an influenza virus from the affected flock.

The influenza virus that was isolated was unique because it did not replicate in embryonated chicken eggs, the common method of isolation of avian influenza viruses. Yet, the line of research pursued at the OARDC lab over the years lead the scientists to determine that there must be an influenza virus involved because a sensitive test (PCR) was giving positive results. The scientists were able to isolate the virus in tissue culture, a procedure not commonly used for avian influenza viruses. The virus was found to be an H3N2 triple assortant virus containing genetic elements from human, swine, and avian viruses. The H3N2 viruses are the most common influenza viruses in human and swine in the U.S. but they have never been isolated from turkeys. Appearance of the H3N2 triple assortant virus in turkeys was the first report on the subject.

Later, the scientists were contacted by the manager of another large turkey breeder operation in another Midwestern state who had the same problem. Again OARDC scientists were able to isolate an influenza virus using the same procedures used earlier. That virus was shown to be similar to the viruses isolated earlier. Interestingly, the turkey breeder hens involved in the second outbreak were vaccinated twice with a vaccine made from a swine H3N2 isolate. Obviously, the swine vaccine did not protect the turkeys and that prompted an examination of these different H3N2 viruses from turkeys and swine. Molecular genetic studies indicated that the turkey viruses were very similar; the swine virus was minimally similar to the turkey viruses. In addition, a very low antigenic relatedness between the turkey and swine viruses was detected.

b. Impact - A key finding was that the swine vaccine thought to protect the turkeys did not work and that prompted an examination of these different H3N2 viruses from turkeys and swine. Molecular genetic studies indicated the turkey viruses to be very similar and the swine virus was minimally similar to the turkey viruses. Appearance of the H3N2 triple assortant virus in turkeys yielded the first report on this subject. In addition, a very low antigenic relatedness between the turkey and swine viruses was detected. An autogenous vaccine was made from the new turkey isolates to protect breeder candidate hens. This vaccine is currently being used for that purpose.

A breeder hen is worth approximately $50 and that does not include the potential profit from the eggs to be produced. The potential economic loss from

an uncontrolled virus such as the H3N2 triple assortant virus has not been modeled. Were this to a virulent strain of virus, with fairly rapid means of geographical dispersal, and the intervention team of scientists had not created the appropriate vaccine, the economic loss could have been staggering and a major component of the food system compromised.

This report also illustrates the important role that agricultural experiment station scientists (and base funding to support those scientists) play on intervention teams when the immediacy of the problem and the potential impact require an immediate response. These scientists are frontline in battling threats to food security, whether it is from a naturally occurring mutant virus or a terrorist act.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – Multi-state

7. Key Theme: Plant Health

(Reference OSU Plan of Work Research Program 1G: Enhancement of Plant Health)

a. **Description of Activity** - Soybean rust has been detected in the United States but not in Ohio. Soybean rust is an aggressive fungus similar to wheat and corn leaf rusts. It is caused by either of two fungal species, *Phakopsora pachyrhizi*, also known as the Asian species, and *Phakopsora meibomiae*, the New World species. The Asian species, the one found in the United States, is the more aggressive of the two species, causing more damage to soybean plants. The presence of the disease in other countries, such as Brazil, has caused significant yield losses and high fungicide costs. There are concerns that the disease could present similar issues for Ohio growers.

Related OARDC research is occurring on two fronts. One involves understanding use of the appropriate fungicides and how to more effectively administer these products given the high costs of treatments. Researchers are also considering the impact of spraying concurrently for rust and soybean aphids, which if to occur at the same time, pose a potential threat to the plants due to combinations of required sprays to treat both.

The other research project sought to verify the genomic location of Rps8 in a larger population of soybean (138 F2: 3) families with SSR and RFLP markers. Based on linkage analysis with SSR and RFLP markers, Rps8 was located on molecular linkage group F in this population. This region of the soybean genome contains numerous other resistance gene loci as well as pathogen and pest resistance. Partial resistance and R-genes for *Phytophthora sojae* are critical avenues of management of this soil-borne pathogen. In 2005, progress was made in identifying defense pathways involved in partial resistance to *P. sojae* and mapping Rps8 in a large population.

b. **Impact** - With soybean rust now officially confirmed in the United States, the more educated Ohio growers are about the fungus, the better prepared they will be

to manage an infestation. Evaluations of seed treatments and practices to manage *P. sojae, R. solani*, and *F. solani f. sp. glycines* have been completed. Also, fungicides were evaluated for plant health benefits and for any effect on foliar diseases in Ohio. Soybean cultivars with resistance to *P. sojae, Sclerotinia* and *F. solani f.sp. glycines* were also evaluated in field studies. Using this new knowledge, OARDC and OSU Extension faculty and staff are providing information to help producers nationwide understand and be prepared for the rust, but to do so in a manner that is equivalent to the risk. These faculty and staff produced and distributed 150,000 soybean rust fungicide bulletins nationwide, as well as preserved killed soybean rust infected leaves to all states for winter and summer training sessions. Personnel are now working with local producers to monitor sentinel plots for early detection. Identifying rust early is critical. Given that rust looks almost identical to the common Septoria brown spot in its early stages, these joint monitoring efforts are imperative.

OARDC scientist have identified and mapped a new resistance soybean rust gene for Ohio, and applicable to many areas of the Midwest, for the soybean disease pathogen, *Phytophthora sojae*. Scientists verified that this new resistance gene would be effective against Ohio's *P. sojae* populations, as well as identifying defense pathways, time, and location of expression for partial resistance to this disease pathogen. These findings are critical to future work on mechanisms of this resistance. Uncontrolled soybean rust has the potential to costs millions of dollars annually if it arrives in Ohio and cannot be controlled.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – Multi-State

8. Key Theme: Economic Competitiveness

(Reference OSU Plan of Work Research Program 1H: Economic Competitiveness)

a. **Description of Activity** -OARDC Research Enhancement Competitive Grants Program (SEEDS) provides competitive grants to OARDC scientists in four colleges via a peer review process that includes both internal and external reviewers. OARDC annually provides 1-2 million dollars through this process.

To further advance and more quickly commercialize OARDC research, in partnership with private industry, OARDC and OSU Extension received 1.1 million dollars from the Governor of Ohio's office. Those funds are placed in a competitive pool in the AgBioscience Innovation Grant (ABIG) program and made available annually to three to four interdisciplinary teams who have sound science research proposals and discoveries that have commercial potential. The research and development teams include business/industry partners and have the capacity for business planning, extension/outreach, and commercialization, as well as the required research expertise.

b. **Impact -** For every OARDC dollar invested in projects completed and reported over the life of OARDC's SEEDS program, $5.52 has been returned as a result of

industry matches and extramural funding. Ohio partnerships have created and are focusing on generating information applicable to national as well as local problems. Eight U.S. patent applications have been filed as a result of the initial findings of SEEDS research projects. Two patents have been granted and three licensing agreements have been obtained. In addition, OARDC faculty have increased contract and grant awards by thirty percent per year over the last two years.

The College of Food, Agricultural, and Environmental Sciences, OARDC, and OSU Extension received an $11.6 million Third Frontier Project competitive state award to create the Ohio BioProducts Innovation Center (OBIC). Ohio's Third Frontier Project seeks to promote a culture of innovation building upon Ohio's research strengths and focus on the development of new products in order to strengthen the State's economy and create jobs. The Center will develop chemical conversion technologies to generate industrial products such as lubricants and adhesives from raw materials grown in the state, including corn and soybeans. Combining development of unique germplasms with novel chemical-synthesis technologies, oils, carbohydrates, and proteins will produce specialty chemicals targeted for use in a range of bioproduct applications. Ultimately, OBIC's 'cell-to-sell' management plan links Ohio's research and commercial partners to focus academic research on market-based problems identified by business partners, which in turn lead to the commercialization of high-value industrial bioproducts and manufacturing solutions.

The Ohio Bioproducts Innovation Center has a Board of Advisors with representatives from commodity groups, business and industry, universities, government, and research stakeholders. This Board provides OBIC leadership and scientists with vested stakeholders who can help set a needs-based agenda, and meaningfully participate in formative and summative evaluation in that they have been/will continue to be fully engaged throughout the program.

Given that the global petrochemical industry exceeds $1.8 trillion annually, and biobased products will continue to fill the gaps in this market, as well as create new markets, the impact potential for biobased product development and other biotechnology research is immense. To that end OARDC is investing in institution building that will further strengthen its position to lead.

Building institutional models that wholly embrace partnerships and commercialization of research is necessary for OARDC to achieve its early twenty first century aims. OARDC, in partnership with OSU Extension, is using the OBIC and ABIG models in long term program planning. The receipt of competitive grants for these programs, and the partners who are actively participating in ABIG and OBIC, are indicators of success. The Chair of the Ohio Soybean Council comments at the announcement of the OBIC award best summarized the partnership and the potential for success. She stated - 'Ohio soybean growers have invested in their futures to develop new uses and markets for soy products. The opportunity to work with Ohio State and Battelle is exciting for all farmers in Ohio, especially soy producers…….'

In 2005, Ohio Board of Regents (Ohio's governing board for all state

universities) and the Ohio Department of Development contracted with Battelle's Technology Partnership Practice to independently assess the economic competitiveness capacity within the state university system, and report on, Positioning Ohio and Its Research Institutions: Core Competency and Technology Platform Roadmap. The report states: "AgBioscience is tightly centralized in the work of OSU and the Ohio Agricultural Research and Development Center with specific strengths in multiple key growth areas of AgBioscience. Expertise in the AgBiosciences is being specifically applied to advancing the state's position in functional foods, phytochemicals, and nutraceuticals through plant pathways and is also cementing its R&D base in biobased materials (biopolymers), energy sources, and other biobased products". Such external review findings are useful in positioning OARDC as a research leader in AgBioscience and as a transformational leader in jointly advancing science and economic competitiveness.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact**- State Specific

9. Key Theme: Plant and Animal Biotechnology

(Reference OSU Plan of Work Research Program 1I: Plant and Animal Biotechnology)

a. **Description of Activity** -Plant and Animal Biotechnology, a new theme added to the 06 -07 Plan of Work and a major thrust area for OARDC, is central to OARDC, and our College, University, OSU Extension, and external partners' efforts to insure that agriculture is a key participant and a transformational leader in the new 'knowledge economy'.

Ohio's biomass, rich in agricultural and food- processing wastes, is capable of producing at least 65 percent of Ohio's residential electricity needs according to the Ohio Public Utilities Commission, the Ohio Department of Development, and the U.S. Department of Energy. These resources, however, have not been tapped for their full potential and most often represent an environmental liability and financial burden to agribusinesses and food manufacturers alike. In an effort to harness the power of the state's abundant biomass and provide alternatives to record-high energy prices, OARDC is establishing a pioneering bio-energy research facility on its Wooster campus.

Funded in part by a $1.5-million State of Ohio's Third Frontier Project award and $1.74 million in special federal funds, the facility's aim is to optimize different technologies—such as anaerobic digestion and fuel cells—for the biological conversion of biomass into scalable energy systems. The facility will also offer an industrial testing platform to verify the energy potential of various wastes from different industries.

The facility compliments ongoing biomass conversion research at OARDC by including a set of 1,600- gallon anaerobic digesters especially

designed to handle industrial food-processing wastes. Besides being capable of handling a variety of fuels that are not clean, which is expected from renewable fuels, another plus of this fuel-cell system is that it is manufactured in Ohio by Cleveland's Technology Management Inc. (TMI) - one of several industry partners in the project. One component of this research is the Wooster plant of national snack-food manufacturer Frito-Lay, that is working with OARDC and NewBio to turn unusable chips and wastewater into methane.

Current research is focused on the problem of inefficiencies within the system being studied. Anaerobic digestion, to produce sufficient methane for limited heating and electrical generation, is an established technology. Unfortunately, the cost of the system and the typical biogas composition of approximately 60% methane and 35% carbon dioxide compromise economic returns from power generation in comparison systems using fossil fuels. OARDC scientists have demonstrated substantial gains. Digestion of food processing wastes in stirred digesters with continuous control to pH 7.4 produces biogas with 20% - 75% methane within 48 hr. Digester sludge is the most effective starter culture. Addition of trace minerals and or associated altered start-up conditions in stirred and pH controlled digestions of food waste nearly doubled gas production.

A pilot-scale (8,000 gallons) anaerobic digester optimized for high-strength food processing wastes by NewBio gave sustained biogas production with 76.0 +/-0.7% methane and 19.7 +/- 0.4% carbon dioxide when continuously fed with mixed snack food wastes buffered with magnesium monohydroxylate (MgOH).

b. **Impact -** Bio-conversion processes to generate energy can be used to reduce energy costs for Ohio companies. Research on waste-to-energy conversion at OARDC utilizes bio-energy technologies for both reducing waste-management expenditures and generating those companies own source of power. An example is the Wooster Ohio plant of national snack-food manufacturer, Frito-Lay, that is working with OARDC and NewBio to turn unusable chips and wastewater into methane. Plant costs savings can be over $300,000 currently being spent in residual-waste disposal, and there is potential to generate 20 percent of the plants energy needs.

Critical to this and other biomass to energy systems is the research conducted by OARDC scientists that has now boosted the percent of methane output from 60% or less to over 75% and the lowering of carbon dioxide output. At this level, bio-conversion plants can be profitable.

NorTech, a northeast Ohio technology-based economic development organization, recognized the potential of this bio-energy initiative and presented OARDC with one of their 2005 Innovation Awards.

c. **Source of Federal Funds –** Hatch

d. **Scope of Impact-** State Specific

Goal 2. A Safe and Secure Food and Fiber System

Executive Summary

Food safety is a national priority because failure to protect our food supply from natural outbreaks of diseases and food poisoning threatens consumer health as well as export markets. Granted there is also the possibility of terrorist's threats to our food supply but in terms of risk analysis, this external threat would seem to be small. Still, one incident could cause such public fear that it could create an economic disaster for segments of the food/agricultural industry. It is often argued that food recalls are proof that the surveillance system for the protection of our food supply is working. However, the increase in communications and the 24/7 news outlets provides greater publicity to any event than it warrants which could be a major part of the public perception that our food supply is becoming increasingly dangerous.

Safe food handling is a targeted issue and includes: Promote food safety across the food chain; consumer education for safe food handling; certificate training for food handlers; and food safety education for growers, producers, distributors, retailers, and food service workers. At the same time that food safety is an issue, consumers demand and will pay for greater convenience. The challenge is to produce food which is nutritious and tasty but which can be processed and distributed without contamination, either accidentally or deliberately, and is handled safely as it is prepared by and for consumers.

At the same time that food safety is an issue, consumers demand and will pay for greater convenience. The challenge is to produce food which is nutritious and tasty but which can be processed and distributed without contamination, either accidentally or deliberately. Consumers' lifestyles, hence their eating habits, are constantly changing. These changes bring about increased demand for high quality, value added, and convenient foods. This requires that production of food ingredients, which are as nutritious as non-processed counterparts and are not subject to contamination with harmful microorganisms during production and shipment.

Food safety, both pre- and post- harvest, is of state, national, and international concern. Whether the threat is a terrorist-sponsored or from naturally occurring organisms, research to ensure the protection of all sources of our food and the delivery system itself is critical for the security of all citizens. Likewise research programs into the functionality of foods – flavor, quality, utility, novel foods, consumer acceptance, etc.- must also be incorporated into food systems research if we are to account for the multitude of variables within food systems modeling.

In pre-harvest food safety, OARDC studies are among the first to describe an association between farm management factors (type of bedding) and *E. coli* O157 prevalence in cattle. The choice of bedding material used to house mature dairy cows may impact the prevalence of *E. coli* O157:H7. *Escherichia coli* O157:H7 persisted at higher concentrations in used-sawdust bedding than in used-sand bedding. This method of management can be incorporated into pre-harvest food safety intervention practices. Post-harvest food safety research at OARDC resulted in a new way for processors to peel tomatoes using very little lye—an environmental waste problem—and preserve the nutrient-rich peel to use in sauces and purées using the Ohmic heating process.

In terms of functionality of foods and associated OARDC research, scientists have produced cost-effective in vitro models for screening the bioaccessibility of carotenoids and are investigating mechanisms associated with the absorption of bioactive compounds from foods. Companion OSU Extension education throughout Ohio compliments OARDC pre and post-

harvest food safety research and key issues relating to functionality of food.

Smith-Lever Fund expenditures for Goal 2: $1,178,112 EXTENSION FTE's: 17.6
Hatch expenditures for Goal 2: $146,847 OARDC FTE: 1.4

Goal 2 Key Themes

1. Key Theme: Food Safety

(Reference OSU Plan of Work Extension Program 2Ae: Pre-Harvest Food Safety)

a. **Description of Activity** - The Ohio Department of Agriculture mandates all youth who exhibit food producing animals to attend quality assurance training annually. This yearly event is the result of drug residues in junior fair animal carcasses and at the urging of meat processors in the state. To answer the Ohio Department of Agriculture mandate County Extension Professionals with the cooperation of Ag Educators and Ag Societies provide educational quality assurance programs developed with the guidance of State Extension Specialists that assure packers and consumers of a safe wholesome product.

b. **Impact** - More than 37,000 youth and adult junior fair food animal producers received quality assurance training to assist them in meeting compliance standards being implemented by respective food animal processing industries. With this in mind State Extension Specialists and Extension Educators developed and introduced the New "Youth Food Animal Quality Assurance Curriculum Guide" at the 2005 QA Extension Educators in-service. The end result were QA programs that will be more consistent providing educators the tools to develop a program that will cater to a number of learning styles including both lecture and hands on experiential learning. The full impact of this curriculum will be determined in the 2006 QA training year, as Extension Educators, Ag Educators and Ag Societies will have had the full 12 months to implement the new curriculum. Several counties reported having no livestock quality assurance issues associated with their junior fair livestock sales in 2005. With the New curriculum guide and increased rigor of the information youth are exposed to the number of counties with a clean record for violations should rise in 2006. Examples of QA programming impact across the state include:

- Ross County: 101 adults received QA training. In turn, the volunteers taught Quality Assurance to 1400 youth. These youth reviewed the components of the 10 Good Production Practices, practiced reading a feed tag, and completed an activity that included learning about medication withdrawal time and applying that information to decide which animals in the activity would be safe to cull for slaughter and which animals had not yet met their medication withdrawal requirements. In addition, curriculum materials this educator developed were shared in a state-wide QA notebook to county educators throughout Ohio.
- Perry County: 465 4-H youth participated in Livestock Quality Assurance programs at the club or county level. Of those, 208 attended a PQA Level III

training session. Thirty-six youth, ages 12-18, completed an optional Youth PQA test; 94% passed, gaining program exemption for the next two years. Fifteen youth participated in the optional Livestock Skill-a-thon program, with an average score across species area of 78%.

- Gallia County: 499 youth were trained in the 10 best practices during 7-one hour sessions, throughout the one day event. In addition 68 Gallia County youth were trained at the 1 hour make up session held a week later. An evaluation form was given to each participant and parent who went through the program. Results of our evaluation indicated that 99% of those participating approved of this method of learning. 98% indicated they learned something new during the program.
- Delaware County: Three hundred eighty-one 4-H and FFA youth learned livestock management practices relating to quality assurance, with 151 of those youth earning certification through the National Pork Producers Council youth Pork Quality Assurance program. Participants worked through a hands-on simulated situation with a sick animal and made medication decisions and administered treatment based upon what they had learned in the program. At the 2005 Delaware County Fair, problems with Scrapies ID compliance were dramatically reduced.

c. **Source of Federal Funds** – Smith-Lever 3b&c

d. **Scope of Impact** – State Specific

2. Key Theme: Food Safety

(Reference OSU Plan of Work Research Program 2Ar: Pre-Harvest Food Safety)

a. **Description of Activity** - Farm management practices that reduce the prevalence of food borne pathogens in live animals are key to pre-harvest food safety. Environmental and food contamination with Shiga toxin-producing *E. coli* (STEC) pose a threat to public health worldwide, with notable geographic differences in incidence of human disease caused by these organisms.

To ascertain the potential role of livestock bedding in the ecology and epidemiology of *E. coli* O157:H7 on farms, the survival of this pathogen was determined in used-sand and used-sawdust dairy cow bedding. Additionally, a longitudinal study was conducted to compare the prevalence of *E. coli* O157:H7 on 20 commercial dairy farms using either sand or sawdust bedding materials.

Escherichia coli O157:H7 persisted at higher concentrations in used-sawdust bedding than in used-sand bedding. The overall average herd-level prevalence (3.1% vs. 1.4%) and the number of sample days yielding any fecal-positive tests for *E. coli* O157:H7 (22/60 vs. 13/60 days) was higher in sawdust-bedded herds. The choice of bedding material used to house mature dairy cows impacts the prevalence of *E. coli* O157:H7 on dairy farms.

b. **Impact** - Diet and environment are considered important factors influencing the prevalence of *E. coli* O157 and other pathogens. These studies are among the first to describe an association between type of bedding and *E. coli* O157 prevalence in cattle. The choice of bedding material used to house mature dairy cows impacts

the prevalence of *E. coli* O157:H7 on dairy farms. *Escherichia coli* O157:H7 persisted at higher concentrations in used-sawdust bedding than in used-sand bedding. These findings can be incorporated into pre-harvest food safety intervention practices. Companion studies are occurring in Norway.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – Multi-State (Norway)

3. Key Theme: Food Processing Safety

(Reference OSU Plan of Work Extension Program 2Be: Post-Harvest Food Safety)

a. **Description of Activity** – Small food and meat processing businesses benefited from outreach educational activities provided by Ohio State University Extension and the College of Food, Agriculture and Environmental Sciences. The programs varied in content from basic thermal processing of foods, to setting up and monitoring the safety programs of the business using a HACCP plan. Fact sheets for food processors on various alternative processing technologies were completed this year, as well as a manual to assist USDA FSIS inspectors with technical information to evaluate the HACCP procedures that each plant is using, and if food safety hazards were properly addressed.

b. **Impact** – There were 707 participants who attended sessions in food processing safety and HACCP. Over 10,000 copies of the HACCP scientific documentation were printed and distributed by USDA, FSIS to more than 5,000 small and very small federally inspected meat processing establishments. This programming allows businesses to meet compliance requirements for local, state, or federal inspection, depending on the nature of the business.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – State specific

4. Key Theme: Food Safety Training for Food Establishments

(Reference OSU Plan of Work Extension Program 2Be: Post-Harvest Food Safety)

a. **Description of Activities** - Ohio Food Code requires that a "person-in-charge" who is knowledgeable of food safety to be present at all times in licensed food establishments. Successful completion of the ServSafe manager-training program and a passing score on the national certification examination qualifies an individual to meet this regulatory requirement for the respective business. Sixteen hours of instruction are required to meet certification. The course is certified by the National and Ohio Restaurant Associations and the Ohio Department of Health. Ohio State University Extension has 27 qualified instructors who are recognized by the Ohio Health Department as providers. Another version of the same training is aimed at employees who desire food safety knowledge, but who are not serving as "person-in-charge." This is a 6-hour training course and is provided by the same 27 qualified instructors.

b. **Impact -** This program allows food establishments to meet compliance requirements for local and state inspection. In 2005 alone, there were 271 participants in both employee and manager trainings. For the managers' training program, the national certification examination is required. The passing rate for all participants who attended extension-sponsored programs was 89%. This program allows food establishments to meet compliance requirements for local and state inspection. Managers who attend this course do so for the purpose of training their own employees, thus this program has a projected multiplier effect of 500% (i.e. for every one participant trained, five additional employees will receive training within the business).

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – State specific

5. Key Theme: Food Safety – Volunteer Quantity Cooks

(Reference OSU Plan of Work Extension Program 2Be: Post-Harvest Food Safety)

a. **Description of Activities -** Churches, civic organizations, 4-H clubs – all of these groups sponsor events where food is prepared and served to large numbers of people. The volunteers who prepare that food may only have household food safety information, but they are operating in a public situation where members of groups at high-risk for foodborne illnesses may be dining. Volunteer quantity cooks learn how to protect their clients through an extension sponsored and taught program to train them in safe food handling procedures.

b. **Impact -** The workshops held this year benefit each person who ate the food prepared; thus, this program represents a train-the-trainer program that will impact many more than those who actually attend the workshops. There were five Occasional Quantity Cook workshops held in 2005, with 93 participants; including 4-H advisors, churches, Head Start Volunteers, and Catholic Charities Soup Kitchen volunteers.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – State specific

6. Key Theme: The Ohio Specialty Crop Food Safety Initiative

(Reference OSU Plan of Work Extension Program 2Be: Post-Harvest Food Safety)

a. **Description of Activities** - The competitive global marketplace and educated consumers are increasing the pressure on fresh fruit and vegetable producers to implement Good Agricultural Practices (GAP) in their farming operations. The objectives of this program are to increase the safety and marketability of fresh produce through the adoption of GAP and help growers achieve successful third party audits. Two Fruit and Vegetable Food Safety Workshops were held this year. Other activities included a Spanish language food safety program for farm labor, the development of a greenhouse vegetable food safety program, and

creating a food safety fact sheet.

b. **Impact -** The Ohio Specialty Crop Food Safety Initiative assists Ohio fresh fruit and vegetable producers in adopting Good Agricultural Practices in their farming operations to increase the safety of the food they produce. This year, 546 people participated in the workshop in conjunction with the Ohio Fruit/Vegetable and Direct Agricultural Marketing Congress. All of the participants were from an under-served group, while 185 were from under-represented groups.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – State specific

7. Key Theme: Food Safety Programming

(Reference OSU Plan of Work Extension Program 2Be: Post-Harvest Food Safety)

a. **Description of Activities** - Ohio State University Extension serves the local clientele with a variety of activities aimed at improving the safety of food prepared and eaten in the home. County educators are a reservoir of information on topics like safe food storage and preservation. They provide information to Ohio residents about potentially tainted or spoiled foods, procedures on how to ensure safe food preparation, and food safety aimed at special groups like senior citizens or youth. Workshops, health fairs, in-store demonstrations, media, and face-to-face conversation are methods used to deliver food safety information to clientele in 2005.

Foodborne illnesses adversely affect the health of Ohio citizens and are costly to the State's economy. Health care costs associated with the care of foodborne illnesses are increasing. The Ohio Department of Health compiles data on cases for foodborne illness, making it possible to calculate the economic impact of foodborne illness in Ohio for selected pathogens. Reported cases are low indicators of actual disease, so estimates of actual cases more accurately reflect health care costs. The foodborne diseases with the greatest incidence in Ohio during 2003 were Campylobacteriosis (1265), and Salmonellosis (1326). Using per case cost factors available from the Economic Research Service (USDA), it is possible to calculate economic impact of foodborne illness in Ohio for selected pathogens. The estimated health care cost of Campylobacteriosis during 2003 was $29,370,770 and $90,144,132 for Salmonellosis. Food safety education is effective when messages are targeted toward changing behaviors that have the greatest impact on preventing foodborne illness.

b. **Impact -** The continued emphasis on food safety in all types of programs will ensure that Ohioans will continue to enjoy safe food. A total of 18,763 direct contacts for food safety were made during 2005. Nearly 50,214 copies of materials pertaining to food safety were distributed, and an estimated 355 volunteers contributed 1,592 hours towards food safety programs. Ohio offers three specific food safety programs: ServSafe Manager training, ServSafe employee trainings and Occasional Quantity Cooks.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – State Specific

8. Key Theme: Post-Harvest Food Safety

(Reference OSU Plan of Work Research Program 2Br: Post-Harvest Food Safety)

a. Description of Activities - Safety, quality, and innovation are the aims of OARDC food scientists and engineers whose stakeholders, those from whom they gain insights for problem formulation, range from on-farm producers and processors to grocery store shoppers to NASA scientists. OARDC research is making food safer, lengthening its shelf life, and providing expertise to medical researchers and food companies on how to improve foods.

Salmonellosis, for example, is a food-borne disease with 1.4 million cases nationwide at an approximate cost of $2.3 billion annually. Eggs are the primary source. OARDC scientists found that by treating whole shell eggs with a combination of ozone, mild heat, and slight pressure significantly reduced contamination in eggs without damaging their quality. Ohio is the second-largest egg producer in the country with production valued at well over $300 million annually. Salmonellosis can have tremendous negative economic impact in Ohio.

OARDC is working on a NASA-funded project to heat food and sterilize waste in space. Using ohmic heating, food packaging containing electrodes has been developed allowing astronauts to enjoy a hot meal. Ohmic heating is produced by projecting an electric current through the food, heating food directly rather than from the outside in. After dinner, the astronaut can use the same packaging to sterilize biological waste and other refuse. The techniques are needed on a possible mission to Mars.

A parallel study has resulted in a new way for processors to peel tomatoes using very little lye—an environmental waste problem—and preserve the nutrient-rich peel to use in sauces and purées. Currently, more than 12 million tons of tomatoes nationwide are processed into tomato sauce, puree, paste, and whole and diced products. Ohio produces over 177,000 tons of processing tomatoes, valued at nearly $14 million annually.

But tomato processors have long faced a dilemma: Peeling tomatoes for canning can be done effectively with a lye bath -- but the waste generated becomes an environmental issue. Lye is usually neutralized by making it into a salt, but then there is a salt disposal issue.

Processors use steam to peel tomatoes, but at the cost of product quality. Ohmic heating results is peeled tomatoes equal in quality to those processed using a highly concentrated lye solution, but without the environmental implications. Ohmic heating runs an electric current through food, heating it directly. The process heats foods much more quickly than conventional methods and leaves behind a fresher-tasting product.

Ohmic heating uses only one percent lye solution, as opposed to a 12 to 18 percent solution in traditional methods, caustic waste is dramatically reduced. The other benefit is that, in a traditional peeling system, lye will eat away the peel so that it is no longer usable. With the ohmic process, the peel is retained for use in paste or puree products. Skins contain many vitamins and phytochemicals, such

as lycopene, and improves the paste or puree products.

b. **Impact** - OARDC research has resulted in a new way for processors to peel tomatoes using very little lye—an environmental waste problem—and preserve the nutrient-rich peel to use in sauces and purées using the Ohmic heating process.

The process works well on a bench-scale model and is ready for pilot-scale testing that peels one tomato per second. Both processing and environmental benefits have been identified.

Ohio and California tomato processors have met the idea with enthusiasm. Currently, more than 12 million tons of tomatoes nationwide are processed into tomato sauce, puree, paste, and whole and diced products. Ohio produces over 177,000 tons of processing tomatoes annually, valued at nearly $14 million. As part of the research project, consumer focus groups have been surveyed regarding their attitudes towards products processed by alternative technologies. A patent on the process has been submitted.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

9. Key Theme: Functionality of Foods

(Reference OSU Plan of Work Research Program 2C: Functionality of Foods)

a. **Description of Activities** - OARDC scientists are exploring how the body's cells absorb certain nutrients; such work has global implications in reducing the incidence of blindness, cardiovascular disease, and some types of cancer. Nutrient absorption can vary from less than 1 percent to 100 percent. The human diet contains as many as 20,000 compounds yet only 50 or 60 of these are essential, but many others possess anti-inflammatory, anti-microbial, and anti-carcinogenic properties.

The more a compound is absorbed, the more effective it is. But absorption efficiency can vary for a number of reasons. Thus it is essential to study the absorption and metabolism of nutrients and bioactive components in the context of actual foods and meals to develop optimal functional foods.

In one new study, OARDC scientists are comparing results from two different systems -- a laboratory model and an animal model. A parallel study is taking place at the University of Wisconsin. The work focuses on what happens to nutrients during their transit through the body. The completed studies are expected to yield faster, more economical model to screen nutrient bioavailability from various foods and meals.

The long-term goal is to identify crop varieties with highly bioavailable nutrients such as provitamin A, iron, zinc and protein, for genetic crossing with currently used varieties of high-yielding crops that are not nutritionally dense. A parallel project has developed a cost-effective method for assessing the bioavailability of health-promoting compounds from traditional and functional foods. The novel test food was tomato juice enriched with soya isoflavonoids. Tomato juice is a widely consumed food that is an excellent source of lycopene

and polyphenols and has been selected as a delivery vehicle for soya isoflavonoids. Because the majority of individuals who ingest traditional western diets have an aversion to soy products, the tomato-soy product represents an attempt to increase consumption of bioactive components in soy. Both lycopene and isoflavonoids appear to decrease the risk of cardiovascular disease and some types of cancer.

"Stacking" such compounds through the development of novel functional foods represents a chemopreventative strategy, as well as a possible therapeutic avenue for coupling with pharmacologic agents in the treatment of cancer and cardiovascular disease. Likewise, economic benefits for both the tomato and soybean industries exist.

These findings support the use of cost-effective in vitro models for screening the bioaccessibility of carotenoids and investigating mechanisms associated with the absorption of bioactive compounds form foods and meals. They also show that the small intestine has an active role in the metabolism and absorption of isoflavonoids.

b. **Impact -** Diverse studies consistently show that many non-essential components of the diet modulate health status. To achieve beneficial effects, the compounds must be released from the food during digestion, and be converted to bioactive metabolites and absorbed before transport to target tissues. The development of foods that contain novel combinations of bioactive compounds represents an important strategy for increasing the intake of healthy compounds.

Using a novel tomato-soy product, OARDC scientists and their colleagues have demonstrated that a simulated digestion model and human intestinal cells represent cost-effective approaches to screen the bioavailability of carotenoids and plant estrogens from foods, and to explain the mechanisms associated with their absorption.

The lack of an antagonistic interaction between lycopene and isoflavonoids during digestion of a novel tomato-soy food support the use of tomato products as vehicles for increasing soy intake. These and other bioactive compounds in the novel 'stacked' beverage have the potential to collectively decrease the risk of certain diseases and some types of cancer, as well as serving as potential adjuvants coupled with therapeutic agents.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – Multi-state

Goal 3. A Healthy, Well-nourished Population

Executive Summary

Dietary Guidance can be defined as the use of principles found in the Dietary Guidelines for Americans to develop non-formal nutrition education series for youth and adults. Additionally, there are programs targeted to the elderly, and to individuals at risk for or having diabetes, focusing on their nutritional needs. These community-based nutrition education programs are offered at the local level by OSU Extension. The Dietary Guidelines for Americans provide a basis for healthy lifestyle choices. The Food Guide Pyramid is a pictorial and practical guide for

educating consumers to use the Dietary Guidelines. OSU Extension professionals inform consumers of health risk factors (e.g., obesity, hypertension, etc.) and nutrition practices and encourage appropriate nutrition and lifestyle changes and promote reading labels on processed foods.

U.S. citizens, like other highly developed countries in the world, have an abundant, inexpensive food supply available to them. Food provides both pleasure and the nutrients necessary for health and survival. The goal is for all to be food secure, that is, access by all people at all times to enough food for an active, healthy life and at a minimum, includes: (1) the ready availability of nutritionally adequate and safe foods, and (2) the assured ability to acquire personally acceptable foods in a socially acceptable way. It is important to recognize that nutrient needs vary over the life cycle and research must be conducted to determine how age and gender influence nutrient needs. It is also important to recognize that the human body uses nutrients in chemical reactions within the body. Nutrition science plays an important role in reducing obesity, diabetes, cancer and heart diseases. The Ohio State University is one of a few institutions with a college of agriculture, a department of human nutrition science, and a medical college. Scientists from the many disciplines are researching together such agricultural products as tomatoes, soybeans, and raspberries to discover the chemical content and chemical reactions in hope of discovering chemicals that are effective as antioxidants and as anti-carcinogens. They are also researching behaviors that lead to healthy food choices.

A healthy, well-nourished population is dependent on the ability of people to obtain foods that will improve the over-all quality of their diets, and the quality of the food they eat. A healthy population also engages in other positive health practices, including physical activity, individual health monitoring, and safety practices that will reduce the risk of accidents and disease. OSU Extension professionals have been actively educating the people of Ohio regarding the importance of good health and nutrition practices. The professionals met with individuals and groups, in formal and non-formal teaching sessions, in workshops, committee meetings, health fairs, and walk-by exhibits. The result has been a change in 1) the way some individuals purchase, prepare and store food; 2) the level of interest in monitoring and improving health through screenings and exams; and 3) the ability of individuals to improve their personal practices to decrease health risk.

Human nutrition and health continue to be major focal areas for OARDC. As baby boomers enter their retirement years, cancer and heart concerns grow, and obesity is listed as a national problem, each incremental gain in the improvement of health care will have a major impact on society. Ongoing research at OARDC will contribute to gains in the areas of improved nutrition and better understanding of the role of nutraceuticals. OSU Extension programs carry these science-based findings to the citizens of Ohio.

OARDC researchers are studying the role of fats in nutrient uptake. They addressed fat in avocado's effect on the human body's absorption of four carotenoids - alpha-carotene, beta-carotene, lutein and lycopene - as a means of better understanding that role. Findings indicate that fat helps the body absorb some key nutrients, increasing uptake by as much as 15 times. Certain fats are necessary in the diet for effective nutrient uptake.

In the area of nutraceuticals, OARDC scientists are working with medical researchers in a ‘crop

to clinic' program to examine how phytochemicals in foods fight certain human health problems. Current research is focusing on nutrients found in berries to determine if they can stop or slow some of the biological processes that contribute to the development of different types of cancer.

Smith-Lever fund expenditures for Goal 3: $1,841,177 EXTENSION FTE's: 27.1
Hatch expenditure for Goal 3: $31,728 OARDC FTE: 0.2

Goal 3 Key Themes

1. Key Theme: Ohio Food Stamp Nutrition Education (aka - Ohio Family Nutrition Program)

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. Description of Activity - The FY2005 Ohio Family Nutrition Program (FNP) received $2,211,066 from the United States Department of Agriculture through Ohio Department of Job and Family Services to conduct nutrition education in 67 county units across the state of Ohio. The goal of the Ohio Family Nutrition Program is to improve the likelihood that Food Stamp Program (FSP) participants and applicants will make healthy food choices within a limited budget and choose active lifestyles consistent with the current Dietary Guidelines for Americans and the MyPyramid Food Guidance System.

The educational methods included: face to face delivery through group meetings, demonstrations, hands on opportunities for skill development, displays at health fairs and other community events targeting the food stamp audience, and newsletters. FNP programs collaborate with other organizations that target the same audience. Programs are presented in locations that are near to participants' homes, at times convenient to participants, and in community sites that Food Stamp Program participants frequent.

The goal for the FNP Program Assistant is to teach three or more interventions (series) planned for a consistent group of 2 or more individuals, lasting a minimum of 20 minutes per intervention, offered on different days, and including an evaluation component. Preferably the subject content of each class in the series is related to the same objective. The teaching objective for a series may be Nutrition, Food Safety, Thrifty Food Shopping, or General (includes all three objectives). Each program includes a component related to Food Security. In some cases a series of classes may be impossible, thus a single lesson is the alternative. A single lesson is an intervention planned for 2 or more individuals, targeting one of the above FNP objectives, lasting at least 20 minutes and including an evaluation component.

b. Impact - In FY2005 the Ohio FNP program reached 69,192 direct contacts and 363,988 indirect contacts. Participants were a part of 5,126 nutrition interventions; 1,411 food safety interventions; and 1,850 thrifty food shopping interventions. A total of 56,908 participants indicated they learned new information and 53,327reported they planned to make changes in their food

related behaviors. Thirty seven percent (37%) of the participants completing an end of class survey indicating some degree of food insecurity. Individuals reported the types of food assistance they were receiving: 38.5% reported using food stamps, 24.5% reported using WIC, 17.5% had family members utilizing child nutrition programs, 4.8% reported using commodity foods, 14.6% utilized local food pantries, 4% utilized soup kitchens, and 22.4% utilized senior meal sites.

Individuals participating in a series of classes were asked to complete a 5 point Likert scale retrospective survey at the last class of the program. The Likert scale retrospective survey is an evaluation instrument designed to gather outcome data for each FNP objective. The mean scores for the pre/post test for each evaluation question for FY2005 follow (each question is listed with the mean score before the program followed by the mean score after the program). Each question was statistically significant.

General (n= 1190)

- I use the "Nutrition Facts" on the food label to make food choices. (2.63, 3.25)
- I shop using a grocery list. (3.04, 3.41)
- I eat 3 or more servings of vegetables each day. (2.68, 3.13)
- I eat 2 or more servings of fruits each day. (2.78, 3.18)
- I wash my hands with soap and water before preparing the food. (3.92, 4.07)
- I run out of food before the end of the month. (2.22, 2.11)
- I use the Food Guide Pyramid to select a variety of foods. (2.21, 2.87)
- I use a thermometer to check if foods were fully cooked. (1.88, 2.52)
- I am physically active (Walking, gardening, sweeping, etc.). (3.25, 3.5)

Nutrition (n=2877)

- I use the "Nutrition Facts" on the food label to make food choices. (2.69, 2.86)
- I use the Food Guide Pyramid to select a variety of foods. (2.41, 2.65)
- I eat 3 or more servings of vegetables each day. (2.69, 2.78)
- I eat 2 or more servings of fruits each day. (2.82, 2.85)
- I am physically active (Walking, gardening, sweeping, etc.). (3.05, 2.97)

Food Safety (n=787)

- I wash my hands with soap and water before preparing the food. (3.87, 3.74)
- I use a thermometer to check if foods were fully cooked. (1.91, 2.67)
- I wash knives and cutting surfaces with hot, soapy water after preparing meat. (3.79, 3.75)
- I leave meat or leftovers like a casserole at room temperature for more than two hours. (3.19, 3.12)

Thrifty Food Shopping (n=778)

- I plan meals ahead of time. (2.69, 2.70)
- I compare prices before buying food. (3.2, 3.0)

- I shop using a grocery list. (2.82, 2.75)
- I run out of food before the end of the month. (2.16, 1.78)

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

2. Key Theme: Summer Food Service Program and Ohio Food Stamp Nutrition Education (FSNE)

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. **Description of Activity** - The goal of food stamp nutrition education is to provide educational programs that increase, within a limited budget, the likelihood of food stamp program (FSP) participants making healthy food choices and choosing active lifestyles consistent with the most recent advice reflected in the Dietary Guidelines for Americans and the MyPyramid Food Guidance System. FNSE works with the FSP participants to ensure they are able to acquire the food they need in socially acceptable ways. An example of this effort is to increase participants' knowledge and use of other food assistance programs.

The Ohio FSNE program, known as the Ohio Family Nutrition Program (FNP) partnered with the Summer Food Service Program, a USDA Food and Nutrition Service food assistance program, to help families maintain their food security throughout the summer months. The Summer Food Service Program provides free, nutritious meals to school-aged children in low-income areas during school vacations. Locally, approved sponsors operate the program. The sponsors receive reimbursement for the meals served and for operating costs. Sponsors may be schools, units of local government, public or nonprofit private residential summer camps, and other nonprofit private organizations. An approved site is in a community in which 50 or more percent of the population is living in poverty. Any child may receive a free meal at an approved open site without the need to apply. FY05 eleven pilot counties participated: Ashtabula, Guernsey, Hancock, Huron, Logan, Lorain, Lucas, Marion, Ross, Van Wert and Washington.

b. **Impact** – During the 8-9 weeks of the school summer break 11,176 children from 1 year to 18 years of age in 11 different Ohio counties participated in nutrition education activities conducted by the FNP and its Program Assistant. The program included 356 interactive, hands-on educational interventions. The primary topic discussed was nutrition and the targeted messages for maintaining a healthy lifestyle: eat a variety of foods, eat whole grains, eat more fruits and vegetables, increase physical activity, eat breakfast everyday, eat healthful snacks, read nutrition labels to make food choices, and eat low fat dairy foods. Each lesson included a parent component to extend the messages taught in the class to the child's home.

This resulted in 6,486 indirect contacts with the child's parent or guardian primarily in the format of a newsletter. Curriculum for a variety of age groups was provided to each participating county. Depending on the location of the intervention site and the needs of the children, lessons, activities and food

demonstrations were provided. Site locations included schools, nonprofit agencies buildings, faith based agencies, city or community parks, and parking lots where the lunches would be dropped off by the sponsor. In some counties the FNP PA partnered with the 4-H program to bring additional activities to the children. In other counties older children volunteered to help the younger children with the activities. Sometimes parents volunteered to help complete the tasks. A total of 452 individuals were reported to have volunteered their time in some capacity to help the program be a success.

At the end of the program sponsors were contacted to provide feedback as to the success of the efforts of the FNP program. All indicated they felt the program was a great success and of benefit to the children. They reported that the children really looked forward to the days when there were additional activities. Teachers reported that the children were able to stay on task better and were better prepared to begin the school year. Other sponsors felt the FNP program was very successful in engaging the children in the nutrition activities. Other responses included: looking forward to the program next year; being very willing to continue writing letters of support; and hoping we can continue working with their after school programs.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

3. Key Theme: Nutrition Education – Food resource management

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. **Description of Activity –** Expanded Food and Nutrition Education Program's (EFNEP) program assistants used a variety of means to share information about food resource management. People were reached through media outlets, such as radio, newspapers, newsletters, and through direct contact in programs on a weekly or monthly basis. Objectives of the programs and media messages involved use of food resource management and shopping behaviors that improve personal and family food supply; how to save money while shopping for food; planning spending for food; make wise choices about how food is acquired, how often food is purchased, and types of food purchased; use comparative pricing of food; and use recommended meal planning and preparation practices.

b. **Impact** - Thirty seven program assistants (25.5 FTE) working with the adult phase of the Expanded Food and Nutrition Education Program reached 5,042 parents of young children between October 1, 2004 and September 30, 2005. As a result, 88.9% of 4,178 'graduates' (individuals participating in a series of face-to-face nutrition lessons) made positive changes in their food intake, as measured with a pre/post instrument for recalling food eaten in the previous 24 hours. Homemakers who graduated from the series of classes taught by the Expanded Food and Nutrition Education Program's Program Assistants showed marked change in the ability to manage food resources and practice food safety recommendations, and improved their nutrition knowledge and practices. Seventy six percent (76%) of graduated homemakers showed a positive behavior change in one or more food resource management practices taught to them(meal

planning, price comparisons, strategies for extending the food supply, or use of a grocery list to be a wise shopper). Fifty two percent (52%) improved in two areas. Eighty percent (80%) of the graduates showed a positive behavior change in their nutrition practices in at least one area (meal planning, healthy food choices, food preparation without salt, nutrition label reading, eating breakfast) and 63% improved in at least 2 categories.

Five Nutrition Educators (7.6 FTE) taught 17,691 young people nutrition information. Eighty one percent (81%) of 1393 selected youth surveyed report that as a result of the information learned in the program, they eat a greater variety of foods, and 95% of 6,297 selected youth reported an increased knowledge of nutrition.

Cooperating agencies, organizations and local OSU Extension offices contributed nearly $164,000 in support of education of low income parents of young children through EFNEP.

Thirty seven program assistants (25.5 FTE) working with the adult phase of the Expanded Food and Nutrition Education Program reached 5,042 parents of young children between October 1, 2004 and September 30, 2005. As a result of the food safety education taught to them, at graduation 60% of homemakers showed improvement in their food safety practices (thawing and storing foods properly).

Five Nutrition Educators (7.6 FTE) taught 17,691 young people food safety information. As a result of this teaching 74% of 1393 selected youth reported improved food safety and preparation practices.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

4. Key Theme: Human Nutrition Targeting Ohio Youth

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. **Description of Activity –** "Jump into Foods & Fitness" (JIFF) is an activity based curriculum developed by Michigan State University Extension and adopted by Ohio FNP in 2004 for the summer feeding youth program in 10 Ohio Counties. In 2005, OSU Extension adopted the curriculum for use within Ohio Youth EFNEP and Ohio 4-H out-of-school-time programs. The funding that Ohio 4-H received in 2005 from the Governor of Ohio provided an opportunity for OSU Extension Family and Consumer Sciences and 4-H Youth Development to collaborate utilizing the "Jump into Food & Fitness" curriculum in several different arenas:

Youth EFNEP and the OSU Master Nutrition Volunteer Program: State and Center Specialists trained OSU Extension professionals and volunteers in each of the eleven Ohio EFNEP counties. Training included recruitment of adult volunteers, OSU Extension Volunteer policies and procedures, out-of school-time programming, curriculum training using the 7 JIFF lessons and program evaluations.

4-H After-school Nutrition Programs and Science Program in 16 pilot

counties. The State Team for After-school programming (Theresa Ferrari, Graham Cochran, Cindy Torppa, Karen Jackson, Bob Horton & Forster) planned and implemented the training that occurred at Adventure Central in Spring 2005. The training included two sessions of 4 hours each in order for professionals and volunteers to implement the "Jump into Foods & Fitness" curriculum.

Service learning with two OSU Department of Human Nutrition Community Nutrition Classes. OSU Extension specialists provided 4 to 6 hours of classroom training for OSU students enrolled in each of the Community Nutrition Classes. The training included working with youth in after-school settings, OSU Extension volunteer policies, challenges student would encounter as they worked at sites in the University District, understanding the new MyPyramid food guidance system and the Dietary Guidelines for Americans and the seven "Jump into Foods & Fitness" lessons.

b. **Impact** - The service learning was funded by Ohio 4-H Youth Development to develop, implement, and evaluate a service learning collaboration aimed at expanding the service capacity of 4-H/Youth EFNEP in the Franklin County Area. Fifty four (54) undergraduate students from The Ohio State University, Department of Human Nutrition were trained to implement and evaluate an experientially based program (Jump Into Foods and Fitness - JIFF) to help at risk youth learn knowledge, skills and strategies for prevention of overweight and development of a healthy lifestyle in four after school settings.

Key results are: 1) OSU students demonstrated increased competency after training and evaluated the training program favorably. Of interest, *75% of students trained indicated an interest in becoming a Master Nutrition Volunteer in the community after their academic experience terminated. This group represents an untapped resource who could help to expand current 4-H/EFNEP-Youth programming capabilities.* 2) The seven session JIFF program was provided by OSU students to youth in an out-of-school setting during Winter (Phase I) and Spring Quarter (Phase II) 2005. *Six hundred and twenty seven (627) child contacts occurred in 5 different community sites in the University District demonstrating our capability to access and work with this at risk population.* This equates to an OSU student to child ratio of approximately 1 to 8. 3) *Child evaluations were obtained for sixty five (65) children*. Thirty four and thirty one children completed the evaluation during Phase I and Phase II of this project. While the child evaluation form was challenging to interpret, some trends were noted. For all groups, there was a *notable improvement in AFTER JIFF scores for item # 6 (eat fruit/drink real fruit juice every day).* There was also an *improvement in AFTER JIFF scores* (less notable than item # 6) for all groups in item *# 10 (do moderate physical activities)*. For 3 out of 4 groups, *modest improvements in AFTER JIFF scores were noted for items #9 (drink milk or cheese daily) and # 17 (use a jump rope for stretching and jumping).* 4) At one of the sites, a *taste testing presentation effectively induced parents to sample the foods their children made. At both sites, taste testing and gift cards effectively induced parents to complete a parent survey.* 5) Of those parents who completed the survey, *95% noted 'parent worksheets' to be 'very helpful' or 'helpful'*; *95% learned something new at the taste testing; 90 % found the parent newsletters to be 'very helpful' or 'helpful*.' Of particular interest, the *majority of the parents*

ranked the 'taste testing' as the most useful source of information. 6) *A delivery model, training program, and supplemental parent education materials are tangible outcomes of this grant*. These products can be used to provide JIFF in multiple 4-H venues including 4-H Summer Camps and 4H clubs and groups thereby expanding current 4-H/EFNEP-Youth programming capabilities.

Nutrition Education in the Central Ohio Latino population: A Human Nutrition professor and Extension Specialist and his colleague targeted a community on the west side of Columbus and utilized the JIFF curriculum with the children. One goal of the project was to translate the JIFF family newsletter and an Ohio 4-H beginning food & nutrition project and a gardening project from English to Spanish. The project was successfully completed.

c. Source of Federal Funds - Smith-Lever 3b&c

d. Scope of Impact - State Specific

5. Key Theme: Nutrition Education – Dining With Diabetes

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. Description of Activity - Diabetes is reaching epidemic proportions in the United States. Receiving education about how to manage/control one's diabetes is key to maintaining or improving health and preventing complications. Parts of Ohio lack enough health care providers to adequately educate and train individuals with diabetes to manage their food intake and other aspects of their disease. Extension Family and Consumer Science Educators have teamed with local registered dietitians and certified diabetes educators to provide a 3 lesson series oriented toward helping diabetics and their families manage their diabetes by improving their food consumption practices. They have adopted a curriculum, Dining with Diabetes, that was developed by University of West Virginia Extension.

b. **Impact** - Over 600 individuals participated in Dining with Diabetes classes that were conducted in twenty-two Ohio counties. Participants recorded increased knowledge in nutrition and food preparation skills, indicated that they were using the information learned in classes to plan meals, to monitor portion sizes more closely and to understood the importance of exercise in diabetes management.

OSU Extension sponsored a statewide training using videoconference to train fifty Family and Consumer Sciences Educators and Registered Dietitians on the Dining with Diabetes team. Presenters for the training included diabetes researchers from The Ohio State University, health care practitioners and Dining with Diabetes Team members. Each professional who attended the training received a notebooks containing evaluation instruments and programming materials. The training included twelve new county teams each with an FCS Educator and a Registered Dietitian.

A partnership with the Ohio Department of Health was formed in 2005. As a result six counties were selected to pilot the Dining with Diabetes program at Federally Qualified Health Centers. Each county in the pilot received funding to conduct the program free of charge to participants.

c. Source of Federal Funds - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

6. Key Theme: Food Security

(Reference OSU Plan of Work Extension Program 3Ae: Human Nutrition/Health)

a. **Description of Activity** - The rationale for *"Choice food pantry: Community feedback, improvement and dissemination"* was: Although in the United States there is plenty of food, some families – especially minority groups – don't always have access to good quality food, and some of them even go hungry. Food insecurity, defined as being uncertain if there are adequate resources to provide food for all family members, is a reality for millions in the US. In Ohio, on average 10.9% of all households experienced some food insecurity on a yearly basis from 2001-2003. Although the relationship is poorly understood, research has shown that low-income populations have a higher risk for being overweight. This might be due to lower food expenditures that leads to poor diet quality with high fat, high calorie diets, and low fruit and vegetable consumption.

Food pantries have the potential to address both food insecurity and poor diet quality by distributing healthy food at no cost to low-income families. However, some individuals will not access food pantries because they may feel ashamed. Others may access them, but will not use all the food they are receiving because it doesn't meet their food preferences, and therefore some food may be wasted.

Partnering Agencies in Butler County, Ohio, are using the "choice" food pantry model to address food insecurity and poor diet quality. These choice food pantries allow clients to choose food items using a point system allocated according to the client's family size and guided by the USDA Food Guide Pyramid. This way, the clients choose food based on need and preference. The *choice food pantry* might be more dignifying, with less waste, and provide an opportunity for nutrition and money management education.

The objectives of the project are: To explore the process of converting a traditional food pantry to a *choice food pantry* from a consumer and provider point of view; to identify food consumption and health issues related to the use of choice food pantries; and to identify barriers that might be relevant to choice food pantries, including their perceptions on the impact of changing the food pantry from a non-choice food pantry to a *choice food pantry*.

b. **Impact** - To achieve these objectives qualitative data were gathered in Fall 2005 using focus groups as follows: two focus groups from long-term customers (Hispanics-Spanish and non-Hispanics- English); one focus group with the food pantry administrators; and one focus group with food pantry volunteers from the community. Expected focus groups outcomes include: the information from the focus groups will identify barriers and incentives of choice food pantries; the information will help guide the next steps on the food pantry service, incorporating ideas to make modifications of choice food pantries so that they are more user-friendly (social marketing); the information will be also very useful to identify important steps to follow in improving the process of converting a

traditional food pantry to a *choice food pantry*.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

7. Key Theme: Human Health

(Reference OSU Plan of Work Research Program 3Ar: Human Nutrition/Health)

a. **Description of Activity** - Fat is often viewed in popular culture as having negative health benefits. OARDC researchers are showing that certain fats are not only good for you but are necessary for a healthy body. Fat helps the human body absorb some key nutrients. OARDC researchers have found that avocados, rich in monounsaturated and omega-3 fatty acids, can increase - by as much as 15 times absorption of nutrients that protect against heart disease, cancer, and blindness. In previous studies, OARDC researchers have found that a little fat added to salads increased absorption of the carotenoids, and that carotenoids in salads were not well absorbed when consumed with no-fat salad dressings.

The current research addressed fat in avocado's effect on the body's absorption of four carotenoids: alpha-carotene, beta-carotene, lutein and lycopene. The researchers found that participants who consumed a whole avocado with their salsa absorbed nearly 4.5 more times lycopene, which has been linked to protection against prostate cancer, and 2.5 times more beta-carotene, which, along with alpha-carotene, helps protect against cancer and heart disease.

Those who ate a whole avocado with their salad absorbed five times more lutein, which helps protect against macular degeneration, the leading cause of blindness in the elderly. They also absorbed seven times more alpha-carotene and 15 times more beta-carotene. The avocado oil produced results similar to those found with the whole avocado.

b. **Impact** - OARDC researchers addressed fat in avocado's effect on the body's absorption of four carotenoids. Findings indicate that fat helps your body absorb some key nutrients. Avocados, rich in monounsaturated and omega-3 fatty acids, were found to increase -- by as much as 15 times -- absorption of nutrients that protect against heart disease, cancer, and blindness.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – State Specific

8. Key Theme: Nutraceuticals

(Reference OSU Plan of Work Research Program 3B: Nutraceuticals)

a. **Description of Activity** - One in three Americans will contract cancer at some point during their lifespan. One-third of the country's cancer deaths could be prevented, as they are related to physical inactivity and nutrition. OARDC scientists are working with medical researchers in a 'crop to clinic' program to examine phytochemicals in foods.

Findings include how lycopene in tomatoes battles prostate cancer and how biochemicals in broccoli can fight bladder cancer. About 232,000 new cases of prostate cancer are diagnosed each year. Reducing the incidence just by 5 percent would trim $400 million from the estimated $8 billion spent annually on prostate cancer treatment. The American Cancer Society estimates that 63,210 cases of bladder cancer were diagnosed in 2005, with 13,180 deaths. Economic studies indicate that direct medical expenditures related to bladder cancer amounted to almost $3.7 billion in 2001.

OARDC food scientists have teamed up with cancer researchers to examine the link between foods and prostate cancer, in particular, the effects of isoflavones in soy and lycopene, a carotenoid found mainly in tomatoes. Concentrated cooked sources of tomatoes, such as tomato sauce, are associated with greater health benefits. The heating used in processing such products, and adding a small amount of fat, makes the lycopene more easily absorbed by the body.

Current research is also focusing on nutrients found in berries to determine if they can stop or slow some of the biological processes that contribute to the development or spread of different types of cancer. Black and red raspberries, blackberries, strawberries, and elderberries are some of the fruits who's disease-fighting power is being researched by OARDC scientists.

Berries contain a number of compounds that have been shown to have anti-carcinogenic properties, including vitamins A, C, and E; selenium; ellagic acid; and anthocyanins (which give berries their color). In laboratory studies, project scientists have found that freeze-dried berries can inhibit the development of oral, esophageal, and colon cancers in rodents. The berries prevented carcinogens from being converted into forms that cause DNA damage and also slowed down the growth of pre-malignant cells. Such promising results have led to the establishment of human clinical trials.

b. **Impact -** Phytochemicals in foods can help fight human health problems. Findings include how lycopene in tomatoes battles prostate cancer and how biochemicals in broccoli can fight bladder cancer. Berry research has yielded enough promising results as nutraceuticals for fighting cancer to warrant human trails. Given that cancer is responsible for one in every four deaths in the United States and an astounding $189.8 billion in overall costs every year, the human health and economic benefits from this line of research are substantial. Expansion into nutraceuticals research and partnering with medical researchers reflects OARDC continued emphasis on incorporating biotechnology into its research portfolio.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

Goal 4. Greater Harmony between Agriculture and the Environment

Executive Summary

Sound natural resource conservation and environmental management practices underpin a

sustainable food and fiber industry, for both traditional commodity production and for associated business and industry. OARDC has been vested in such programs since the inception of the experiment station when it created forestry, fisheries and wildlife program in the late 1880's. OARDC has a long history of land reclamation research and utilization of industrial byproducts as soil enhancers and fertilizers. For example, synthetic gypsum, a byproduct of coal fired electrical generators, is a good sulfur fertilizer. One line of OARDC research has demonstrated that this product and low levels of nitrogen yield productive agronomic crops and have positive environmental benefits by preventing nitrate contamination due to excess use.

A successful integrated pest management program is central to sustaining the food and fiber industry and minimizing environmental impacts. OARDC scientists have demonstrated that crops grown under long term organic management have resistance to certain insect pests, and that this finding is related to soil biological and chemical characteristics, referred to as biological buffering. Without continued efforts to understand and employ the advantages offered through integrated pest management, functioning ecosystems will be negatively impacted.

Organically grown products are in tremendous demand and the research related to the growing of those products is instructive in conservation methodologies for all growers. Technological understanding of spray heads for biopestcides, or living pesticides, is one example reported herein.

All life on earth is directly or indirectly dependent on water, and no industry is more dependent on water than the food and fiber industry. While lakes and ponds contain large volumes of water, it is the rivers and streams that distribute that water throughout the state. Drainage ditches are part of this system. OARDC researchers are demonstrating that a two-stage channel drainage ditch system will reduce maintenance costs, sediments, and pollutants. Restoration and management of river systems, especially riparian zones, are important to insuring Ohio's water supply. OARDC research is informing riparian zone management in the eastern United States by providing alternatives to a "one-size-fits-all" filter stripping approach to protecting ecosystem functions along small tributary systems.

As livestock production continues to expand in Ohio and with the odors, dust, insect pests, and water pollution associated with the increased numbers, there is a need to provide educational programs to producers on composting livestock mortality and composting animal waste. Due to the diverse distribution of the state's population, livestock producers, commodity groups and OSU Extension are taking a pro-active approach to improve neighbor relations by providing programs that ameliorate issues associated with agricultural waste.

Ohio contains nearly 7.9 million acres of forests and woodlands. OSU Extension regional specialists, county educators and Soil and Water Conservation District personnel provide newsletters and best management practice workshops across the State, addressing a wide variety of topics, including but not limited to House Bill 88 - Agriculture Pollution Abatement Law and issues related to silvicultural non-point source pollution.

OSU Extension, working in partnership with the Ohio Livestock Coalition and key state and federal agencies, has developed and implemented the Ohio Livestock Environmental Assurance Program (LEAP). LEAP helps livestock producers to profitably manage environmental

challenges that are critically important to the success of their business.

Smith-Lever Fund expenditures for Goal 4: $1,351,031 EXTENSION FTE's: 19.9
Hatch expenditures for Goal 4: $1,255,564 OARDC FTE: 11.6

Goal 4 Key Themes

1. Key Theme: Agricultural Waste Management

(Reference OSU Plan of Work Extension Program 4Ae: Agricultural Wastes and By-Products)

a. **Description of Activity** – In 2005, OSU Extension sponsored and conducted many programs in Agriculture and waste management including: Manure Science Review, Midwest Professional Nutrient Applicator's Association training, air quality programs for animal feeding operations, and the Manure Management Issues program. Specific activities and impacts follow.

b. **Impact** - The Manure Science Review program is a statewide manure management education program targeting animal operations. This multi-agency and organizational program focuses on environmental, economic and production issues critical to animal operations in this state with an emphasis on Best Available Technology for manure handling, treatment and storage. The MSR program provides continuing education credits for Ohio's Certified Crop Consultants individuals dealing directly with animal manure over three days at three locations across Ohio. This program specifically targets animal producers with important information about animal manure management. This program had over 300 growers, consultants, professionals and policy makers attend.

The Midwest Professional Nutrient Applicators Association (MPNAAA) was developed in conjunction with commercial manure applicators to provide educational opportunities for this group and their clients. Over 75% of the membership is certified under Ohio's Certified Livestock Managers program. Emergency Spill Response Training was conducted and attended by over 125 custom manure applicators, animal producers, consultants and industry professionals.

Increasing odor and air quality concerns have created a major challenge for the viability and growth of Ohio's animal producers. U.S. EPA has signed an air quality compliance agreement with animal feeding operations (AFOs) which explicitly states that all AFOs need to comply with federal air quality regulations. Management of air emissions from these operations is a major challenge that Ohio livestock and poultry producers face. Science based research and best available technologies and management practices associated with these air emissions will enable Ohio's animal producers to effectively manage these air quality issues. More than 100 individuals attended air quality educational programs in 2005. These programs included an air quality in-service targeting animal producers and associated professionals on new regulations and research efforts pertaining to animal agriculture, as well as a engineering workshop focused on designing and installing biofilters on mechanically ventilated facilities.

Over the past several years, manure application to farm fields has come under additional scrutiny, particularly the applications of manure to frozen and/or snow covered ground. Livestock producers and custom manure applicators should always exert extreme caution, follow best management practices (BMPs) and utilize best available technologies (BATs) when applying manure, particularly when field conditions are less than ideal, which would definitely include winter-time application. The top priority of any application of nutrients to the land should be to protect water quality. Manure Management Issues, Challenges & Solutions Program was developed in cooperation with Ohio's agricultural commodity organizations, regulatory and state agency partners to further educate producers on manure management when application conditions are less than ideal. To date more than 454 individuals have participated in these programs.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

2. Key Theme: Nutrient Management

(Reference OSU Plan of Work Extension Program 4Ae: Agricultural Wastes and By-Products)

a. **Description of Activity** - The Livestock Environmental Assurance Program (LEAP) continues to advance environmental stewardship educational programming in Ohio in 2005. LEAP programming continues to expand with the addition of LEAP-Pasture and the development of LEAP-Youth.

Since 1997, more than 5,000 individuals from all major animal commodity groups in Ohio, including horses, have participated in a LEAP training program. Beef producers had the highest number of individuals participating, while poultry and dairy had the largest percentage of total producers participating, followed by swine, beef, sheep and horses.

There is a growing need for environmental education within agricultural education curriculum. Forty-eight percent of respondents in a survey of Ohio livestock producers identified manure management as the greatest environmental challenge facing their operations. Odor, soil erosion, and water quality issues were identified as additional issues critical to the future success of animal operations in Ohio. A youth Livestock Environmental Assurance Program incorporates unique outreach opportunities for cooperative interaction among government environmental organizations, livestock commodity groups, and local producers or research facilities. The involvement of these organizations will enhance the educational experience and reach beyond the boundaries of traditional adult and youth education. Youth and Youth Educators will be exposed to a diverse group of scientists who will share a rich knowledge base focused on environmental protection and enhancement from the animal producer’s perspective. These individuals will be able to integrate their scientific, environmental, and ecological knowledge into the daily management, benefiting society as a whole, and linking agriculture, the food systems, and public health.

The primary objective of this program in youth livestock environmental

assurance (LEAP-Youth) is to develop the next generation of highly qualified livestock producers, university, government and industry leaders, with a global perspective, and the ability to interface with numerous disciplines as they address the public's need for a safe, healthy food production system and maintaining a safe environment.

LEAP, Level 2 continues to target animal producers with more advance environmental stewardship training. LEAP, Level 2 addresses issues related to manure and wastewater handling and storage, feed management, land application practices, nutrient management, record keeping and other utilization options. Implementation plans emphasize Best Available Technologies (BAT) and Best Management Practices (BMP) to efficiently address and minimize the impact and effect from dust, noise, odors and pests on the respective farm, farm neighbors and the community. LEAP, Level 2 is designed to help producers obtain and organize data and information, as well as identify appropriate technologies necessary to implement a Comprehensive Nutrient Management Plan (CNMP) for their operation.

b. **Impact** – Nearly 6000 individuals from all major commodity groups in Ohio have participated in a LEAP level 1 and LEAP Pasture training program. More than 150 individuals have attended a LEAP Level 2 training.

LEAP-Student was introduced to 50 new and seasoned vocation agriculture educators. The primary goal of the new student version of LEAP is to produce a new generation of highly qualified individuals who can work in fields that interface production agriculture with the environment, specifically, manure management, air, and water quality issues while linking environmental assurance with agriculture, food production systems and public health. This program's curriculum matches-up with agricultural education standards for plant science, animal science, business operations and environmental science. Twenty-nine benchmarks in the areas of care and management, contaminates, plant nutrition, water, air, land, waste management, emergency response and issue identification/discussion are identified in each of the program's 13 chapters.

c. **Source of Federal Funds** – Smith-Lever 3b&c

d. **Scope of Impact** – State Specific

3. Key Theme: Agricultural Wastes and By-Products

(Reference OSU Plan of Work Research Program 4Ar: Agricultural Wastes and By-Products)

a. **Description of Activity** - Coal is the No. 1 energy source in the United States and Ohio is a major coal producing and coal-burning state for electricity. Almost 90 percent of coal burned in the United States is used to generate electricity, and coal-fired power plants produce approximately 52 percent of the nation's total electrical output. Approximately 122 million tons of coal combustion byproducts are generated each year. Synthetic gypsum is created when coal-containing sulfur

is burned and the sulfur-bearing gases formed are removed by reaction with a chemical scrubber - process known as flue gas desulphurization (FGD).

Per the 1990 Clean Air Act, coal-burning industries, such as power utilities, continue to work toward reducing sulfur gas emissions, the leading cause of atmospheric acidic deposition. Environmental control equipment to remove sulfur gases is expensive. However, manufacturing and agricultural uses exist for FGD gypsum that can help offset some of the cost.

OARDC scientists are researching uses for synthetic FGD gypsum. The mineral, like its natural counterpart, has a wide range of agricultural and horticultural benefits and was commonly used as early as the time of Benjamin Franklin who conducted several experiments with gypsum.

Synthetic gypsum is a good source of sulfur for plants, especially for forages that require high amounts of sulfur. Sulfur, among other benefits, helps in chlorophyll formation, improves root growth, and improves plant production. Gypsum is moderately soluble in water and a good source of calcium and sulfur. It is these properties that make synthetic gypsum a good 'conditioner' for building soil structure and improving water and air movement within the soil.

b. **Impacts -** Synthetic gypsum, a byproduct of coal fired electrical generators, is a good sulfur fertilizer. Field results obtained during four years of testing indicate the experimental site was originally deficient in sulfur for corn. When sulfur was applied in the form of synthetic gypsum, the highest yields obtained were reached with a lower N application rate than when sulfur was not applied. This suggests that one way to improve the efficiency of nitrogen fertilizer use is to add sulfur via the synthetic gypsum with the nitrogen fertilizer when growing corn. This will improve the profit of farmers since less nitrogen fertilizer is needed to achieve good yields, and will also have positive environmental benefits by preventing nitrate contamination due to excess use.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

4. Key Theme: Integrated Pest Management

(Reference OSU Plan of Work Research Program 4B: Integrated Pest Management)

a. **Description of Activity -** An OARDC project linking soil management, pest management, and crop health is providing agroecosystem management strategies to optimize management of soil organic matter, nutrient cycling processes, pest management, and crop health. The research project is demonstrating that crops grown under long term organic management have resistance to certain insect pests, and that this finding was related to soil biological and chemical characteristics, described in terms of biological buffering. A sustained influx of organic matter into soils provides a resource base for soil biological communities that then regulate the balance of plant available nutrients in ways that optimize between plant growth and quality, and defense against pests.

The project is now exploring the relationships between soil organic matter quantity and quality, soil nutrient availability, insect pests, and weed ecology on a range of farms with varying soil management histories. In a related study,

OARDC scientists are investigating the impacts of soil management on crop growth and quality, and susceptibility to insect pests. These projects represent a comprehensive approach to understanding integrated pest management and the ecology of plant health.

Pest and the management thereof are not always tied to food production. A house dust mite study illustrates this. OARDC scientists are testing the impact of ultraviolet light on the American house dust mite, Dermatophagoides farinae. Data clearly show that only a one (1) second exposure to ultraviolet light is lethal to the egg stage. The scientists are currently testing different exposure times on all stages of mites with the hypothesis being that UV-C will have an impact on molting and reproduction since UV-C damages both DNA and RNA.

b. **Impact** - Integrated pest management is central to sound ecosystem management. OARDC scientists have demonstrated that crops grown under long-term organic management have resistance to certain insect pests. Information from this project should assist organic and transitional farmers with agroecosystem management strategies to optimize relationships among soil organic matter, soil fertility, and insect pests. Biological buffering predicts several benefits from the increase in biologically active soil organic matter, including better mineral balance in crops, lower susceptibility to insects and disease, and greater resilience to environmental stresses.

Some 10.3% of adults in Ohio have asthma, which is greater than any other chronic disease. The percentage of children suffering from asthma approaches 15% in some areas with minority and lower income families suffering the most. In 2001, 153 individuals died and in the US about 5,000 people die from asthma.

Annually, over $750 million is spent to treat asthma (hospitalizations) patients in Ohio and the costs continue to rise at an alarming rate. Because asthma is a chronic disease, it is one of the most expensive to manage. Thus, healthcare organizations are eager for novel developments in reducing or preventing asthma. This research offers a solution in integrated pest management of allergen producers as more than half of the asthma sufferers are sensitive to indoor allergens, especially dust mites

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

5. Key Theme: Organic Agriculture

(Reference OSU Plan of Work Research Program 4C: Organic Agriculture)

a. **Description of Activity** - Consumer demand for organic products in the United States has grown more than 20% annually over the last decade. USDA estimates that organic cropland has doubled in the last decade. Rapid growth in demand is expected to continue. Responding to the growing public interest and requests by organic producers and other stakeholders, the OARDC Organic Food and Farming Education and Research Program was established to permit scientists to carry out research investigations under the same rules and conditions as organic

farmers, increasing the relevancy of the resulting data to farmers and consumers.

Biopesticides is one area of inquiry. In contrast to chemical pesticides, biopesticides are living systems. This introduces additional challenges with respect to formulation and delivery because the biological agents must remain viable during the spray application process to be effective. OARDC scientists sought to determine if exposure to hydrodynamic stresses during flow through a hydraulic nozzle, i.e. spray application, could cause permanent damage to the biological pesticide, entomopathogenic nematodes (EPNs), that serve as the benchmark species. Aqueous suspensions of EPNs were passed through three different hydraulic nozzles - standard flat fan, hollow cone, and full cone - within an experimental, opposed-pistons flow device. Overall, common hydraulic nozzles were found to be acceptable for spray application of EPNs following the manufacturer's recommendations. However, it is recommended that an appropriately sized (i.e., larger than the organism) cone type nozzle is more suitable for spray application than a fan nozzle in order to avoid damage to the biopesticide.

b. **Impact -** Exposure to hydrodynamic stresses during flow through a hydraulic nozzle, i.e. spray application, will not cause permanent damage to the biological pesticide studied, if the proper spray nozzle is utilized. Flat fan type nozzles should be avoided. Findings will help applicators of biological pesticides identify the proper nozzle size and type, and the maximum spray pressures that will be best for their biological pesticides. Further studies may encourage greater use of these living pesticides by making their application better understood. OSU Extension promotes this understanding.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

6. Key Theme: Water Quality

(Reference OSU Plan of Work Research Program 4Dr: Water Quality)

a. **Description of Activity** - The production of agricultural and forestry products are dependent on a supply of clean water. Ohio has that supply, but Ohio is a highly populated state with a relatively high water table. The high water table means that contaminants from agriculture, communities, and industries can rapidly move into Ohio's ground and surface waters. Historically agriculture, forestry, and many other industries, as well as communities, have added contaminants to the soil and water.

Natural streams and rivers constantly seek their own stability. So do drainage ditches, a human-made addition to surface water systems. Within drainage ditches in Ohio, benches at the bottom of the ditches and small stable channels are created in predictable ways. This happens even though the ditches have been artificially constructed, are periodically cleaned out, and often receive large discharges from subsurface drainage systems. Farmers have reported that several decades ago, drainage ditches had substantially better ecological function than they do now.

OARDC scientists and other researchers from Ohio institutions are studying how knowledge of natural stream concepts can be applied to make drainage ditches more self-maintaining, improve water quality, and also enhance the ecology of these systems. Drainage ditches are important but costly. In many of Ohio's agricultural areas, most natural channels have been deepened and straightened to facilitate the flow of water from agricultural subsurface drainage outlets and to reduce flooding. The cost of maintaining these ditches is more than $400/mile/year, with total maintenance costs in highly ditched Northwest Ohio approaching $2 million annually. A two-stage ecologically sensitive ditch design has been developed to provide an improved approach to drainage.

b. **Impact** - The two-stage channel drainage ditch system will reduce maintenance costs and reduce sediments. A 3,000 ft long ditch with a two-stage design has potential to reduce nitrate discharges by at least 10 to 20 percent, a valuable improvement for Ohio agriculture. Findings are being presented to drainage network managers, agency personnel, policy makers, engineers, and the scientific community via fact sheets, a website, refereed journal articles, workshops, and at local, state and national meetings. Several two-stage ditches have been constructed in Ohio and others are being planned.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – State Specific

7. Key Theme: Ecosystem Based Management

(Reference OSU Plan of Work Research Program 4F: Ecosystem Based Management)

a. **Description of Activity** - Across the eastern United States, there is an increasing need to restore the structure and function of headwater riparian areas. However, the appropriate methods for restoring these sources of water that are critical for agriculture production, household use, recreation, and overall proper functioning of ecosystems is not clearly defined. As headwater riparian areas have been recognized as critical components of functioning ecosystems, they also are increasingly considered to be functional ecotones rather than narrow buffers or corridors along streams and rivers in the landscape. A more detailed characterization of riparian areas is needed, including more specific information on how environmental factors influence the composition and structure of these plant communities.

OARDC scientists have found distinct differences in vegetation composition between floodplains and lower slopes of headwater streams. These differences are likely in response to different hydrogeomorphic conditions that in turn promote unique environmental conditions and plant communities. Also, significant differences in the composition and structure of the ground-flora between the different landforms were identified. This suggests that the differences in ground-flora composition observed appear to be associated with differences in landforms and the flow regimes associated with the headwater stream valleys. These patterns show that the vegetation along these small stream valleys is ordered along a gradient of decreasing soil moisture and increasing moisture

stress from the streamside into the uplands in these headwater areas.

b. **Impact** - OARDC research is informing riparian zone management in the eastern United States by providing alternatives to a "one-size-fits-all" filter stripping approach to protecting ecosystem functions along small tributary systems. This is important because most research is being conducted along higher-order streams in large watersheds, not in the small headwater tributaries that OARDC scientists are studying. Understanding how to restore and maintain the ecosystem functions along small tributary systems is most important. The OARDC scientists are contributing to this knowledge gap. A clear impact of this and other research is that setting one width ("one-size-fits-all" approach) for stream buffer strips along headwater steams is not a workable solution in that landforms and the flow regimes unique to each headwater stream valley vary and must be considered. One size buffer strips are not sound in terms of maximizing ecosystem functions and protecting the source of clean water supplies.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** – Multi-state

8. Key Theme: Forest Resource Management

(Reference OSU Plan of Work Extension Program 4G: Forest Resource Management)

a. **Description of Activity** - 2005 saw the Forest Resource Management programming take a distinctive turn. The movement of Emerald Ash Borer (EAB) further into the northwest corner of the state coming into closer contact with woodland owners prompted other items to be put on the back burner in order to address the questions and concerns of Ohio's woodland owners. In order to help woodland owners assess and minimize their risk of infestation by EAB, a fact sheet was prepared that creates a decision tree for woodland owners to work through trying to decide what best fits with their goals and objectives while still minimizing the impact EAB will have on their woodland. Along with the fact sheet a bulletin was created to help decision makers decide what tree species to us in place of ash in a variety of planting scenarios (tree lawn, yard, woodland reforestation and riparian zones).

These publications became the supporting documentation for programming that was started in the later part of 2005. A program that addresses the bug, what it does, how to work through the woodland management fact sheet and then how to implement the chosen management strategy was offered to several county areas around the state.

In addition to the Ohio programming change for EAB there was also a Tri-State Emerald Ash Borer Workshop, lead by Ohio and held in Indiana, working with Michigan, Ohio and Indiana resources to try to answer questions for both woodland owners and urban landowners.

Since the focus of the program took a direct line to dealing with all the implications of EAB moving further into the state, other programs were offered in reduced numbers. The Ohio Woodland Stewards Program offered several classes along with its annual 3 editions of the newsletter Ohio Woodlands, Watersheds &

Wildlife. In addition to the Woodland Stewards programming, 6 pesticide recertification sessions were taught, including both agricultural producers dealing with woody brush control and the commercial applicators dealing with forestry herbicide applications. The Tri-State Woodland & Wildlife Workshop was held again in cooperation with Indiana and Michigan – with Indiana being the 2005 host.

b. **Impact** - There were approximately 300 individuals who attended a variety of Emerald Ash Borer workshops in and around the state.

- The participants in these programs indicated that the information would be put to use and shared with others, helping to create greater awareness about EAB and all of its implications.
- The participants in the Tri-State programming efforts indicate that they enjoy the diversity offered at these multi-state programming events.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** – Multi-state

9. Key Theme: Forest Crops

(Reference OSU Plan of Work Extension Program 4H: Forest Specialty Crops)

a. **Description of Activity** - Forest specialty crops, including maple products, Christmas tree, herbs, and tree fruits and nuts, offer income opportunities that often exceed typical commercial timber production. In Ohio both the Christmas tree and maple syrup industries are well organized and progressive. Both have commodity organizations, the Ohio Christmas Tree Association and the Ohio Maple Producers Association. A recent USDA-NASS report suggested that there were over 1000 commercial Christmas tree producers in Ohio. A recently completed survey estimates that there are over 600 commercial maple producers in Ohio, along with countless hobbyist, producing syrup and confections for personal use. In both of these industries most of the entrepreneurs are part-time, and their earnings represent an important component of their annual income. Both industries represent several million dollars in annual sales – around five million dollars for the maple industry and approaching thirty million for the Christmas tree industry. Entrepreneurs in both industries are interested in maximizing profitability by improving their abilities to produce a quality product at the least cost, in evaluating the application of new production technologies, and in developing and improving their marketing strategies. Less well-organized are the tree fruit and nut and the forest herb producers. Nonetheless, they are a clientele who are growing in numbers and in their desire to receive information and participate in OSU Extension programs.

b. **Impact** –

- 311 commercial maple producers in Ohio and 125 commercial maple producers in Massachusetts received in-depth training on various aspects of maple production.
- 240 potential and small scale maple producers in Ohio received training on the fundamentals of maple product production and marketing.

- Several OSU Extension and non-Extension faculty have completed an extensive survey of the Ohio maple industry to identify its demographics, production and marketing practices, and information needs. The results of this survey will be invaluable in developing future educational programming and publications to serve that industry. To date, the results have been presented in Ohio and several other maple producing states, and submitted and/or published in several peer and producer publications.
- Ohio State University Extension is providing the leadership for the writing and publication of the next edition of the North American Maple Syrup Producer's Manual, the primary reference for maple producers in the United States and much of Canada. Publication is anticipated during 2006.
- 116 Christmas tree growers in Ohio received in-depth training on various aspects of Christmas tree production.
- 156 Christmas tree growers from Minnesota and Indiana received in-depth training on the latest production techniques for Canaan fir, and growing high quality Christmas trees on relatively poorly drained soils.
- OSU Extension personnel continued to strengthen participation in programs that address needs of other forest specialty crops by participating in programming of other organizations , including the Ohio Walnut Council and Rural Action.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

Goal 5. Enhanced Economic Opportunity and Quality of Life

Executive Summary

During the decade of the 90's, most Ohioans prospered but many others were left behind. As economic difficulties continue in the 21st Century, lack of economic opportunities worsens, particularly in Southeastern Ohio which has been in decline since the coal industry moved out. Agriculture, mostly in the form of beef cow and calf operations and forage crops provide some opportunity but others are needed. One of the possibilities that have been explored is aquaculture, represented here by the newest entry in the field, fresh water shrimp. Production of these crustaceans for a niche market can provide some income to residents of this economically depressed area.

Economic development, directly or indirectly, is an outcome of all OARDC programs. Budgetary support from the state and federal governments has been relatively flat for the past few years except that additional funds have been appropriated to or competitively obtained by OARDC specifically for support of economic development programs.

OARDC continues exploration of a number of research themes to create opportunities for both quality and quantity of life. One program is facilitating niche market program development resulting in the Ohio Family Farm Beef Industry Network. The network adds value to members'

high quality beef products and positions those products in the marketplace. Additionally, OSU Extension and OARDC faculty are leading a Social Responsibility Initiative (SRI). The SRI focuses on some of the most pressing food, agricultural, and environmental issues facing Ohio and the world, from genetically modified foods and environmental quality to urban sprawl and the globalization of agriculture.

Ohio's green industry continues to be an important economic driver while enhancing the aesthetic quality of our cities, homes, and gardens. Ohio's sale of certified nursery stock is over $2.2 billion annually; landscape services alone account for another $1.2 billion. OARDC and OSU Extension have active programs supporting this industry.

Quality of life studies are also important components in OARDC's research portfolio. Results from one studying is providing guidance for social service professionals and community education providers who seek to understand and support the employment and child care needs of low-income women in rural areas, particularly when grandmothers are chosen as the providers of child care.

The Land Use Team has recently been active with workshops on the new state purchase of the development rights program that was funded by a $25 million state bonding initiative with a local match. In addition, the Ohio Department of Development had provided grants to nearly 60 Ohio counties to develop a farm preservation plan. Extension personnel were actively involved in recruiting and training members and assisting in the development of these plans. Additional assistance was given to the development and training of various planning commissions and in assisting in the comprehensive community planning process.

OSU Extension personnel provide the lead in about a nine counties for their community economic development programs. Extension works on a total community development paradigm. In the economic development strategies, the Business Retention and Expansion Program continues to be enhanced by the Department of Agricultural, Environmental and Development Economics. This flexible consulting program assists the local community in selecting their own survey tool and reporting mechanism. The community is provided the items and assistance they request. Retention and Expansion Programs are conducted for nearly all sectors of the economy including industrial, agricultural, retail and service. Additional assistance is provided in educational programs on enterprise zones, joint economic development districts, and tax abatement. Assistance is also provided in attraction and community capture of local discretionary income.

Programs are also available for local leaders and government officials on wastewater treatment alternatives and water supply systems. Extension educators in several counties work closely with local groups in the creation and operation of revolving loan funds and the establishment of industrial parks. Some of the Community Development Educators conduct downtown revitalization programs and state route corridor development projects.

Community Leadership Development is a wide-ranging area that includes operation or assistance of year-long leadership training programs. More ad hoc programs include training for members of non-profit boards of directors. Leaders are instructed in such programs as: appreciative inquiry, finding and mobilizing community assets, and Vision to Action. The Public Issues

Team provides instruction on Framing of Issues, National Issues Forum (as per Kettering Foundation), and dispute resolution.

Tourism Development Programs are focused in the rural areas on heritage tourism. The Ohio Chautauqua Program has brought a renewed sense of pride in several counties as they participate in enrichment activities and rekindle an interest in historical events.

The Ohio 4-H Youth Development program provides positive environments for culturally diverse youth and adults to reach their fullest potential as capable, competent, caring and contributing citizens thus enhancing their quality of life. As a result of the Ohio 4-H positive youth development experience: youth develop marketable skills for lifelong success; youth participate in and learn through citizenship opportunities to transform local communities; youth appreciate and build upon diversity to foster a harmonious global society; youth have a sustained relationship with a caring adult to enable them to be productive citizens; and volunteers build their skills and abilities in working with youth.

Smith-Lever Fund expenditures for Goal 5: $4,742,579 FTE's: 72.5
Hatch expenditure for Goal 5: $203,970 OARDC FTE: 2.2

Goal 5 Key Themes

1. Key Theme: Economic Development

(Reference OSU Plan of Work Research Program 5A: Economic Development)

a. Description of Activities - A question within the food and agricultural marketing sector and among consumers is how can one purchase the type of beef you buy from producers (i.e. freezer beef) at grocery stores? OARDC, OSU Extension, and a group of producer stakeholders, with a $1.26 million federal grant, established the Ohio Family Farm Beef Industry Network. As of 2005, the network has developed and now markets two unique branded-beef programs certified by the U.S. Department of Agriculture: Ohio Signature Beef, providing top-quality products such as steaks, and Ohio Heritage Beef, providing specialty snack foods.

To qualify for these programs, carcasses must meet six strict criteria and, during the finishing phase of production, the cattle are raised without any added hormones or antibiotics, and are fed a corn-based diet. The beef is also dry-aged to improve the flavor. Quality control points at every stage of production ensure farmers live up to the program's specifications.

The network brings together small-scale, family-owned processing facilities, located primarily in central and northwestern Ohio, and cow-calf producers from southern Ohio to provide a sustainable production and marketing system. The program also enhances the economic quality of life of Ohio's rural communities by adding value to their extensive feed resources—grass from the southern and eastern parts of the state and corn from central and northwestern Ohio.

Network producers are not allowed to use growth implants and antibiotics to raise their cows; OARDC animal scientists assist producers with finding management alternatives to address health and nutrition issues. In addition, agricultural economists work with the producers to derive formulas to establish prices for their products.

b. **Impact** - Smaller Ohio producers cannot compete with the large feedlots operations in terms of volume. Thus niche markets such as those developed through the Ohio Family Farm Beef Industry Network are providing network members a means to add value to their high quality products - Ohio Signature Beef and Ohio Heritage Beef and position those products in the marketplace. The Network now contributes over $11 million annually to Ohio's economy and links more than 80 producers and independent beef processors, as well as 20 retail grocers. Farmers contribute an average 50-60 head per year to the programs, with herd size ranging from 30-200 head. Participating producers earn $60-80 more per head than if they sold their product through the regular market. OARDC and OSU Extension are full partners with the Network.

c. **Source of Federal Funds** - Hatch

d. **Scope of Impact** - State Specific

2. Key Theme: Rural/Urban Interface

(Reference OSU Plan of Work Research Program 5Br: Rural/Urban Interface)

a. **Description of Activities** - From their roots in the 1800s, land-grant universities have focused their teaching, research, and outreach activities to help farmers produce low-cost, abundant, and readily available food supply. While a safe, plentiful food supply is still a priority, OARDC and OSU Extension recognize that today's consumers are calling for safe, wholesome, and nutritious foods produced ethically, humanely, and without adversely affecting the environment. Socially responsible food, fiber, and agricultural production must strike a delicate balance between people, profit, and environment.

OSU Extension and OARDC faculty are leading a Social Responsibility Initiative (SRI). The SRI focuses on some of the most pressing food, agricultural, and environmental issues facing Ohio and the world, from genetically modified foods and environmental quality to urban sprawl and the globalization of agriculture.

A biennial survey of rural and urban Ohioans, an OARDC supported research component of the SRI, assesses stakeholders' perceptions of food, agriculture, and the environment, and tracks changes in those views over time. A primary goal of the project is to measure Ohioans' attitudes toward some of the most pressing social issues related to food, agriculture, and the environment. One study shows Ohioans are concerned about large-scale livestock farms. More than 70 percent of Ohioans report that they are familiar with issues pertaining to large-scale poultry and livestock facilities and are concerned that the farms pose a threat to Ohio's water and stream quality. Of the 4,000 Ohioans surveyed, 71 percent agreed or strongly agreed with the statement, "Large-scale poultry and livestock

facilities pose a serious threat to water and stream quality in Ohio." In addition, 59 percent agreed or strongly agreed that the facilities "are a threat to rural quality of life". Respondents' views of the livestock issue and other agricultural issues are often colored by how closely linked they are to farming. For example, people with farming parents or grandparents tend to be more trusting of farmers and generally have more positive attitudes toward agriculture.

b. **Impact -** Information for the project provides stakeholders a database for decision-making. To date, these data have been utilized in Crawford County, Ohio to guide development efforts and community planning. Content related to local food system development is being used by agricultural development professionals to better understand opportunities for developing alternative agricultural enterprises at the rural-urban interface. Survey data are also informing producers and food system entrepreneurs of some of the opportunities for tapping consumer markets. Likewise information gathered to date illuminates the relationship between neighboring practices and conflict amelioration at the interface of farm and nonfarm land-uses and is being used by a variety of agricultural organizations, including Ohio Farm Bureau, dairy industry organizations, and the Ohio Livestock Coalition.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

3. Key Theme: Green Industry

(Reference OSU Plan of Work Research Program 5C: Green Industry)

a. **Description of Activities** - Ohio State University Extension has estimated that the overall sales of certified nursery stock in Ohio is over $2.2 billion annually; landscape services alone accounts for $1.2 billion. Pines are the fourth largest selling nursery crop in the United States with approximately 30 million plants produced annually with a value exceeding $100 million. Mature landscape pines, beginning at the ages of 15 to 18 years, are worth over $200 per tree. One of the major economic limitations of the ornamental industry, including pines, is the impact of pests.

Numerous fungal pathogens and insects often severely limit the ecological, environmental, and commercial value of pines. OARDC scientists are contributing to a better understanding of the interactions among trees, pathogens, and insects that will help the industry and meet stakeholder demands. Such information is being used to formulate biologically based integrated pest management programs for pines and other ornamental species for natural, and urban forests, as well as nurseries and Christmas tree farms. Austrian pine, an important ornamental species in Ohio and the Midwest, and the common fungal disease Sphaeropsis (Diplodia) shoot blight and canker are being used to model disease resistance mechanisms in conifers. Conifers respond to disease in a way that is similar to how people respond to the introduction of disease through vaccination —increased exposure increases the natural defenses used to fight the disease. This phenomenon in trees has been known for some time, but the

mechanisms by which this happens are not known. The goal is to try to prevent this disease in ornamentals with limited use of pesticides.

b. **Impact -** The long-term goal of this research is to exploit the inherent natural basis of disease resistance and use that resistance to develop novel and efficient disease management strategies. It is possible that once identified, these signaling molecules may be used, rather than the pathogen, to produce systemic resistance to a variety of diseases and insects. These findings provide significant advancements in understanding how trees defend themselves and provide new insights on how to best manage diseases and insect pests in the landscape. Additional studies are expected to help the industry utilize natural traits within pines to protect them form pathogens rather the wholly relying on insecticides. Such findings have economic, ecological, and human health benefits in that the use of pesticides can negatively impact each of these.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

4. Key Theme: Quality of Life

(Reference OSU Plan of Work Research Program 5D: Quality of Life)

a. **Description of Activities** -Participants in the Rural Families Speak program who use their own mothers as their regular childcare providers serve as subjects in an OARDC quality of life study. Unique characteristics, both positive and negative, of grandmother-provided child care for low-income women have been identified. Mothers reported that grandmothers provide childcare and flexibility at no or low cost to mothers, and provide benefits to familial relationships. Possible areas of weakness, however, are constraints on mothers to maintain the care-giving arrangement due to the nature of the adult daughter - older mother relationship, even if grandmothers' health is poor, the mother has experienced poor parenting from her mother in her own childhood, or there is tension regarding blurring of mother and grandmother role boundaries. Implications for educational programming focus on the need to understand the unique features of grandmother care when developing, marketing and evaluating support and educational programs for grandmother child care providers; typical child care provider programs aimed at professional, for-profit caregivers will not suffice.

This OARDC research provides policy implications for insuring that eligible grandmother caregivers receive federal childcare assistance. This financial resource can provide additional income for the grandmother and increase the financial resources of the entire family. A second area of focus is on the strength of mothers' commitments to working and providing care for their own children. Results suggest that the majority of low-income, rural women have a strong commitment to both, and use multiple strategies for satisfying those commitments.

Implications regarding this group of mothers include sharing this information with social work professionals who counsel and support mothers' employment and child care choices. A smaller group of women have a strong

commitment to providing the care for their children. In this study, these women either have a partner whose income could support the family while the mother stayed home to care for the children, have found a way to earn an income from home, or arrange their out-of-home work schedules so that they are away from their children for the fewest hours possible. Implications for this group focus on providing resources, both financial and educational, that will help these mothers to maximize their ability to earn income from home. A small number of women have multiple distressing circumstances that obscure their commitment to work or caring for their children. These circumstances include joblessness, marital problems, mental illness, and physical illness. Implications regarding this group include the need to provide immediate mental health and social services to these high-risk mothers before attempting to promote employment or child care decisions.

b. **Impact** - The results of this research provide guidance for social service professionals and community/extension education providers who seek to understand and support the employment and child care needs of low-income women in rural areas, particularly when grandmothers are chosen as the providers of child care. Reaching this audience of child care providers is challenging and has been fairly ineffective, if attempted at all. OARDC research provides valuable insights that can guide the development of more effective education and support to the grandmother caregivers, the mothers who use this arrangement, and ultimately the children in this type of care.

c. **Source of Federal Funds** – Hatch

d. **Scope of Impact** – State Specific

5. Key Theme - Jobs/Employment

(Reference OSU Plan of Work Extension Program 5E: Community Economic Well-Being)

a. **Description of Activities** - The Community Development Program Area's work in economic development issues centers on working in partnership with community elected and appointed officials, development officials, Chambers of Commerce, and other economic development organizations, committees, and boards to create economic opportunities and enhance economic conditions. Statewide, fifteen full-time Community Development Educators, five Program and Research Assistants and many dual-program Extension Professionals contribute to this effort focusing on the following programs: tourism and byway development, business and residential retention & expansion, retail market analysis, business incubation and attraction, downtown market analysis and downtown revitalization, economic impact analysis, small business planning and human resource management, financial planning, tax incentives and community business loan programs, community foundation development, and job preparation skills. Facilitation and assistance to local economic development-related boards and committees is also a program area focus.

b. **Impacts** - Educators reported assisting local communities in the direct creation or retention of over 300 jobs. Over $53,000,000 in new property investment was

facilitated via local economic development assistance, downtown revitalization efforts, and management of local tax incentives programs. One community was able to facilitate the expansion of a local business by making an $18,000 loan from their local RLF. Another leveraged over $22,000 for downtown revitalization studies, and a third was awarded an $11,000 grant to host the 2006 Chautauqua. As a result of local program efforts, a $325,000 Industrial Site Improvement Grant was received which will create approximately 40 new jobs. One community realized the creation of its first ever community foundation board and treasury, and made three local grants. Another foundation's holdings grew from $100,000 to over $3,000,000 in two years. Program personnel provided more than 3,500 consulting hours to businesses and conducted a total of 35 business education events for 827 individuals, resulting in more than $45.7 million in aggregate economic impacts. A county's country byway marketing plan was used by over 40 hospitality industry representatives to determine their own direct market strategies. Another impact of tourism programming resulted in Congressional funding in the amount of $248,000 to augment local byway development efforts.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

6. Key Theme: Community Leadership

(Reference OSU Plan of Work Extension Program 5F: Community Development)

a. **Description of Activities** - Some elected and appointed local government officials take office without the benefit of either formal leadership training or practical leadership experience commensurate with the responsibilities they assume once in office. Many community members who could serve in volunteer leadership positions do not see themselves as leaders and therefore don't volunteer. The result is a lack of trained, experienced, and enthusiastic elected and volunteer leaders.

Many elected officials ultimately learn their job by doing it in an almost swim or sink method. To support current office holders and prepare potential office holders Extension Educators and Specialists have developed a number of Local Government Leadership Academies. These Academies help participants gain leadership skills, an ability to understand and use a variety of community planning and change methods, and an awareness of issues important to the local community.

Extension Educators and Specialists have also created and/or support local Community Leadership Programs which train volunteer, non-profit, and sometimes elected and appointed officials. The programs include large system change processes such as Appreciative Inquiry, Vision to Action, Public Deliberation, Future Search, Asset Based Community Development, and Citizen Engagement through the 21st Century Town Meeting. Participants also learn small group processes that focus on Team Development.

b. **Impact** - 697 participants participated in the leadership programs provided by

Extension Educators in 2005. The participants report that the programs have helped them both hone their current leadership talents as well as add new capacity to their leadership skill set. The Local Government Leadership Academy participants indicated a greater awareness of their responsibilities and legal requirements for discharging their duties, and increased knowledge regarding technology issues for communities, and regional planning duties. The education in large system change processes has given some areas of the state the ability to initiate regional development programs.

The Appreciative Inquiry and Team Development training created new levels of confidence in Community Leadership Program participants. Bolstered by their new knowledge and in class group leadership experiences program participants have reported running for and winning elected office. Participants have also increased their level of volunteerism within their communities.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

7. Key Theme - Financial Management

(Reference OSU Plan of Work Extension Program 5G: Management of Economic Resources)

a. **Description of Activities** - Individuals and families who are facing challenges to present and future economic well-being and overall quality of life come in all ages, geographic regions, ethnic groups, and economic strata. Throughout Ohio in 2005 county educators were sensitive to these challenges for families in their communities. For some, the loss of good-paying jobs with benefits has greatly affected families and their respective communities. For others it is declining health concomitant with inadequate or non-existent health insurance that threatens their economic well-being and quality of life.

County Extension educators sought to help families assess their financial circumstances, increase their financial management skills, and develop their decision-making abilities to improve both present and future economic well-being. They did this through face-to face instruction with individuals and families, training of professionals such as teachers and social workers who work directly with individuals and families, and through distance education. The distance education took place via correspondence 'courses' (sometimes called letter studies), television, radio, and newspaper media, and county Extension web sites. Contact and related knowledge gained through social marketing campaigns is difficult to measure. The promise of eXtension will be explored in 2006. Financial Security in Later Life will be a key feature of the introduction of the new web presence.

There were two main emphases, overall, in the financial management programs offered in 2005. They were basic financial management skills and planning/working for financial security in retirement. The basic financial management skills involved determining/prioritizing goals, organizing financial records, tracking spending, establishing a spending plan and decreasing spending,

improving bill paying and reducing debt, and beginning or increasing savings.

b. **Impact** - Many Ohioans made progress in their financial management skills and behavior as a result of participating in Extension programs. Overall, 14,850 participants learned new information in financial management programs provided by Ohio Extension educators. In addition, many had made more explicit plans or had begun specific behaviors:

- 12,028 planned to utilize recommended financial practices
- 4266 utilized recommended financial practices
- 1502 planned to develop a strategy to reduce debt
- 500 reduced total debt
- 2128 planned to use specific goals to guide financial decisions
- 659 did use specific goals to guide financial decisions
- 736 organized or improved organization of the financial records
- 1322 planned to make better spending decisions
- 726 reported improved spending habits
- 1875 planned to set aside money for unplanned expenses
- 715 set aside money for unplanned expenses
- 623 set aside money for occasional expenses
- 717 improved bill paying
- 1985 planned to start saving toward a goal
- 722 increased savings

Planning for a future of economic well-being and enhanced quality of life was a focus of the financial management education that occurred in 2005. Most of the programs fell under the rubric of Financial Security in Later Life. Others involved long-term health care. Specific behaviors related to long-term financial security are listed below:

- 156 plan to determine retirement needs
- 109 have determined retirement needs
- 163 plan to establish retirement goals
- 115 have established retirement goals
- 82 plan to start or increase contributions to employer-provided retirement plans
- 38 have started or increased contributions to employer-provided retirement plans
- 35 plan to develop a plan for managing long-term health care
- 18 have developed a plan for managing long-term health care
- 455 plan to develop an integrated plan for achieving financial security
- 109 have developed an integrated plan for achieving financial security.

c. **Source of Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

8. Key Theme – Land Use Issues

(Reference OSU Plan of Work Extension Programs 5H: Land Use Issues)

a. **Description of Activities** - During calendar 2005 Extension Educators and

Specialist assisted public officials, community leaders and the general public with land use issues. Educational workshops were held on Comprehensive Land Use Planning, Subdivision Regulations and Zoning Basics. The OSU Extension Land Use Team members were asked to teach land use education sessions at the Ohio Auctioneer's Association Annual Conference and the Ohio Township Trustee's Association winter and summer meetings. The OSU Extension Land Use team also conducted an annual Land Use Conference targeted to elected and appointed officials throughout the State. Land Use Education programs were also provided at the Ohio County Commissioner's Association Annual Meetings.

b. **Impact** - Attendance at the various sessions mentioned above totaled over 3,000 people. The Existing Land Use Tools Subcommittee of the OSU Extension Land Use Team continues to provide training for residents and officials throughout Ohio at community preferred locations. Of particular interest is the program that is offered to Hamilton County Realtors which is provided at a location in the major urban area of Cincinnati. The program provides 109 hours of continuing education credits for real estate and development professionals. Another location of interest is at the Knox, Morrow and Richland, Tri-County Newly Elected and Appointed Public Officials Institute. Fifty newly elected and appointed public officials in this area of north central Ohio have received land use education programs as part of this annual program.

The on going development of comprehensive land use plans in Van Wert County, Coshocton County and Marion County continues. During 2005 Land Use Team Members began work on land use plans in Wyandot County, The City of Salem in Columbiana County, Huron County and Columbia Township in Lorain County. An update to The Morrow County Zoning Resolution was also started. A land use planning study has also begun in Washington County. The uniqueness of Extension Land Use Planning methods is the inclusionary participation of citizens. This priority has met the participation of nearly 1200 citizens in determining their community's future.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

9. Key Theme – Land Use Issues

(Reference OSU Plan of Work Extension Programs 5H: Land Use Issues)

a. **Description of Activities** - Ohio population growth is slow but we continue to develop large amounts of open land. In the 1990s, Ohio ranked 8th in the nation in the amount of land converted to urban uses, but only 22nd in total population growth When Ohioans move it tends to be to a home of greater value and one further from the center of the metro area. The Cincinnati metro area was typical of other Ohio urban areas with 80.3 percent of those who moved between 1960 and 1990 choosing a more expensive home and 80.6 percent choosing one further out

from the central city. There are tensions at the rural-urban interface as farmland disappears in the face of outward development. 92 percent of Ohioans think it is important to preserve farmland, but only 13 percent of Ohioans indicate a preference for living in the city. The result of the development patterns in Ohio is that many Ohioans are separated from their jobs by long commutes. Typical of many residents near Ohio's large urban areas, 54 percent of Delaware County workers travel into Franklin County to work with an average commute time of 27.5 minutes.

Citizens across Ohio view their communities in vastly different ways. Some experience s growing communities on the fringes of a larger city that faces the growing pains of providing services and infrastructure for a quickly growing population. Others live in rural communities with a growing population of citizens who are attracted by the open spaces but whose arrival is driving up property values and making it difficult for agriculture to be profitable. And still others live in central city or inner ring suburban neighborhoods with abandoned or deteriorating homes and commercial properties, left behind by businesses and individuals who have moved outward?

"Planning for Growth and Development:How Should Ohio and Its Communities Respond?" was a Public Issues Education Team (PIE) discussion project prepared for in 2004 and conducted in 2005. The economic and social health of communities across Ohio is the subject of this discussion effort.

Using a process developed by National Issues Forums (NIF), a focus group of twelve Ohio citizens with a variety of backgrounds came together in the spring of 2004 to identify land use issues related to public policy in Ohio. Members of this group brought backgrounds in farming, housing, planning, and education and came from diverse parts of the state. The group was augmented by five members of the OSU Extension Land Use Team including the project leaders for this program.

This "issue framing" group suggested focusing these forums on planning for growth and development in Ohio in a sustainable manner. Based on the input of this group it was decided that the forums should focus on the following three approaches: a) Redevelop cities and suburbs to make them more desirable places to live and to work; b) Preserve land in metropolitan areas for natural and agricultural uses; and c) Foster a regional approach to growth and development.

Based on the input of the framing group, materials were prepared for the forums: a) a ***discussion guide*** was written and tested through use in three pilot forums; b) pre-forum and post-forum participant surveys to capture participant opinions; and c) a ***video***, "Mosaic of the Land," that had been previously prepared by the OSU Extension Land Use Team was edited to twelve minutes for use as an introduction to the forums.

b. **Impact** - Through August 30, 2005, twelve forums were held in ten counties across all regions of Ohio with 231 participants. In conjunction with the forums, 208 pre-forum and post-forum participant surveys have been collected and compiled. In addition to the survey information reviewed above, the facilitators kept notes on the statements made during the forums. Generalization from hours of conversation in dozens of forums is difficult. Each forum was unique and local land-use issues (e.g., loss of farms, declining tax base, etc) had an influence on

the urgency with which certain communities viewed some of the approaches discussed during the local forum.

Nevertheless the facilitators feel confident that the following statements are fair representations of common threads across the forums: Ohioans, in general:

- favor redevelopment of urban areas, but at the same time they seemed to recognize that the challenge of quality public education in urban areas is a major complicating factor in getting people to return to cities.
- favor preservation of open space. At the same time, local issues influence their view on the importance and urgency of that effort. People at the urban fringe where development is great seemed more attuned to both the urgency and the difficulty of this task.
- have more questions about the regionalism issue than they do about the other areas discussed in these forums. They are unclear about the geographic extent of a region; i.e., "is it their county or larger and then, if larger, how far does it extend?" They are also unclear about the changes envisioned by regionalism; i.e., "is cooperation and collaboration the goal or are mergers and consolidation of governmental units the goal?"

These insights represent, along with the survey results above, a snapshot of public opinion from citizens in a dozen communities who took the time to confront land use, growth and development issues in Ohio.

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

10. Key Theme - Tourism

(Reference OSU Plan of Work Extension Program 5I: Business Efficiency)

a. **Description of Activities** - Tourism development is one major focus of the Ohio community economic development program. Tourism is important in Ohio with over ten billion dollars in primary economic activity. The Extension Tourism Team developed and delivered a series of events and programs with educational materials for increasing interest and effectiveness in applying tourism development strategies for economic vitality, emphasizing rural areas. Nearly 350 persons involved or contemplating tourism-related ventures were reached through the Tourism Team's programming in 2005. Presentations regarding various aspects of the Team's work were made at the CODA Conference (Berea, KY), Ohio County Commissioners Summer Meeting (Zanesville), and the Tri-State Diversity of Food Conference (Cincinnati). Several members of the Team serve in leadership roles with local Convention and Visitors Bureaus and regional tourism organizations (e. g. Ohio's Hill Country Heritage Area) and are directly involved with developing and implementing tourism events and activities. Several tourism organizations now have strategic action plans as a result of planning processes facilitated by Tourism Team members.

b. **Impact** - The Advancing Community Tourism (ACT) Conference continues to highlight agritourism as an agriculture diversification enterprise, especially in

tobacco-producing counties, and to demonstrate its being a complementary sector to heritage, culture and nature tourism development currently in place. Two team members (also Direct Marketing Team) operate agritourism businesses and are able to teach from their experiences. Agritourism and heritage tourism are related through programs and promotional efforts in several Appalachian counties that have undertaken the quilt-barn mural project (now multi-state) initiated in Adams County. The "Ohio Appalachia Activity Book" was developed as a heritage tourism souvenir for the gift market. The emerging sector, culinary tourism, was also introduced. Agritourism sites and events are becoming more prevalent in marketing literature in the region.

A hospitality training program was finalized and initially presented at two county CVB sessions with volunteers and staffs. One CVB has already adapted and utilized the materials for train-the trainer programs locally and is offering the training for other CVBs. Ambassador and hosting programs are being strengthened through this training. Extension tourism work is also focusing on community readiness for tourism and helping residents better understand tourism as an industry and their roles in helping visitors have great experiences. Through inventorying, residents gain a better appreciation of their own tourism assets which can be enjoyed also by the people who live there as well as provide opportunities for civic involvement.

Work with Scenic Byways continues to be the focus of several Extension Educators. The Amish Country Scenic Byway can trace increased revenue since its designation. Educational programs and a marketing plan have been instrumental in making this happen. The Lake Erie Coastal Ohio Trail received state and federal designations in 2005, thanks to significant work by Extension personnel. Still other Extension Educators are working with more localized scenic byway designations which provide opportunities for educational programs about tourism as well as technical assistance.

c. **Source of Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

11. Key Theme - Aging

(Reference OSU Plan of Work Extension Program 5J: Work/Life/Health Issues)

a. **Description of Activities** - Fourteen (14) county Extension units submitted reports on efforts to: 1) increase awareness of aging, health, and consumer issues; 2) improve the quality of life for older adults and those who care for them; 3) increase awareness of services and resources of older adults in their counties; 4) provide support for the widowed and grandparents raising grandchildren; and 5) encourage stronger interpersonal relationships. Four issues of the Senior Series Hotline Newsletter, a product of the collaboration between Ohio State University Extension and Ohio Department of Aging and Ohio's Aging Network, was created and distributed to senior citizens, their families, and other aging-related social service organizations throughout the state reaching 17,418 households.

b. **Impacts** - Four thousand, six hundred forty-two (4,642) individuals where reached with educational messages. Four thousand, two hundred ten (4,210)

attended educational sessions. Of those, 88% (3,723) indicated they had learned new information and 70% (2,965) planned to adopt one or more recommended practices. When follow-up contact with program participants was made and the question asked, 498 individuals indicated they had actually adopted one or more of the recommended practices they had learned. Two county-specific aging-related impact examples:

- Active participants in the monthly programs report that the emotional support provided by the group is essential for their mental and social well-being. (Hardin)
- Participants have a higher quality of life as they adapt to change and are experiencing much more positive outlooks as the face the challenges associated with aging. (Fulton)

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

12. Key Theme - Child Care Provider Training

(Reference OSU Plan of Work Extension Program 5J: Work/Life/Health Issues)

a. **Description of Activities** - Twenty-one (21) county Extension units submitted reports on efforts to: 1) assist new providers in becoming locally certified with the county Department of Job and Family Services; 2) improve existing child care providers' skills and maintain certification; and 3) increase knowledge, skills, and application of developmentally appropriate child care practices to provide safe and nurturing environments for children.

b. **Impacts** - Two thousand, four hundred fifty-four (2,454) child care providers where reached with educational messages. One thousand, seven hundred thirty-eight (1,738) attended educational sessions. Of those, 90% (1,569) indicated they had learned new information and 71% (1,240) planned to adopt one or more recommended practices. When follow-up contact with program participants was made and the question asked, 480 individuals indicated they had actually adopted one or more of the recommended practices they had learned. Two county-specific child care impact examples:

- 100% of the child care providers reported that they had learned new information in these sessions and listed at least one thing they planned to put into practice immediately. (Union)
- 46 people were licensed to become home child care providers in the county. (Washington)

c. **Source of Federal Funds** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

13. Key Theme: Leadership Training and Development

(Reference OSU Plan of Work Extension Program 5K: Positive Youth Development)

a. **Description of Activities** - The purpose of State 4-H Leadership Camp is to help

meet that challenge by enabling teen participants to become better leaders and to achieve the following objectives: develop collegial leadership knowledge, skills, and attitudes; contribute leadership in groups to identify & achieve goals and earn support; develop leadership skills such as envisioning, consensus-building, group building & recognition; realize the degree of control they have over their lives; are encouraged to take the initiative to try new things and not be afraid of failure or success; gain in physical, intellectual, emotional and social development; gain ideas & methods to improve their clubs, communities, country & world; develop new friendships; provide real leadership in committees, leadership groups, & cabin groups, and have fun.

State 4-H Leadership Camp is built on 10 research-based principles for effective youth leadership development. It: a) is built around specific leadership development purposes and goals, b) encourages high expectations and confidence in teens and demonstrates respect for teens, c) emphasizes experiential learning and involves teens in exercising genuine leadership, d) teaches teens history, values, and beliefs of U.S. society, e) promotes awareness, understanding, and tolerance of other people, cultures, and societies, f) involves teens in collaborative experiences, teamwork, and networking with peers, g) helps teens develop specific skills related to leadership, h) involves teens in significant relationships with mentors and positive role models, i) facilitates the development of individual strengths and personal characteristics, and j) involves teens in service to others, to their community, to their country, and to the world.

b. **Impact** - Camper ratings of how well the 2005 State 4-H Leadership Camp objectives were achieved ranged from 6.1 to 6.7 (Agree to Strongly Agree), as outlined on the table below (scale: 7=strongly agree/excellent to 1=strongly disagree/very poor) (n=75):

As a result of the 2005 State 4-H Leadership Camp, participants…

- Developed collegial leadership abilities – **6.1**
- Contributed leadership in helping groups shape & achieve goals and gain support – **6.3**
- Developed leadership skills such as envisioning, consensus-building, negotiation, perspective-taking, p.r., group building and recognition – **6.2**
- Realized the degree of control they have over their lives – **6.1**
- Were encouraged to take initiative to try new things and not be afraid of failure or success – **6.3**
- Gained in physical, intellectual, emotional and social development & became more competent, caring and contributing individuals – **6.1**
- Gained ideas to improve their clubs, communities, country & world – **6.2**
- Developed new friendships – **6.7**
- Provided real leadership in committees, leadership groups & cabins – **6.4**
- Had fun – **6.4**
- Evaluation data were analyzed using the *SPSS 13.0 Statistical Package*. Independent Samples T-Tests and ANOVA analysis documented that responses were similar for all groups of campers, regardless of gender, 4-H project experience or family structure. In addition, 91% of the 2005 campers responded to an open-ended item which asked if State 4-H Leadership Camp made a difference to them, and provided descriptions of

specific things they learned and planned to do as a result of their Leadership Camp participation.

c. **Source of Federal Funding** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

14. Key Theme: Youth Development/4-H

(Reference OSU Plan of Work Extension Program 5K: Positive Youth Development)

a. **Description of Activities -** In Ohio, 103,752 youth participated in organized community clubs, 97,519 youth participated in special interest and day camp programs, 19,722 youth participated in resident camps, and 60,229 youth participated in school enrichment opportunities.

b. **Impact -** 4-H youth participants enrolled in over 198,000 individual projects as a result of their involvement. Youth participated in a variety of educational clinics and in-services to increase their subject matter and life skill development. Ohio was also a part of the national 4- H Impact Assessment project. In general, youth are very positive about 4-H and specific aspects of the program. The vast majority (90 percent or more) agree or strongly agree with the statements such as the following: "4-H teaches me to be responsible for my actions" and 4-H teaches me to help other people. Other program impact highlights include youth reporting: "All kinds of kids are welcome in 4-H," 97 percent; "I feel like I belong in 4-H," 89 percent; "4-H helps me accept differences in others," 90 percent; "I feel safe when I do 4-H activities," 93 percent; "In 4-H I feel that it is safe to try new things," 94 percent; "Boys and girls have equal chances to do everything in 4-H," 94 percent and "Both boys and girls can be leaders in 4-H" 94 percent.

c. **Source of Federal Funding** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

15. Key Theme: Parenting

(Reference OSU Plan of Work Extension Program 5L: Parenting and Family Life)

a. **Description of Activities –** Forty-four (44) county Extension units submitted reports on efforts to: 1) provide court-mandated parenting classes for divorcing parents of minor children; 2) increase divorcing parents awareness of the ways their actions and behaviors influence the impact of the divorce on their children; 3) instruct divorcing parents on ways to reduce conflict in their post-divorce relationship and co-parent cooperatively; 4) provide knowledge and skills about basic child development, limit setting and appropriate methods of discipline to parents referred to Extension for parent education by agencies such as children's services, the juvenile courts, counseling centers, Department of Job and Family Services, early intervention programs, nursery school/child care facilities, or probation officers; 5) provide information and training to first time parents about basic infant care; 6) provide truancy diversion parent education; 7) provide basic

parenting skills education to incarcerated parents; and 8) provide knowledge, skills and aspirations to fathers so that they participate more fully as actively engaged parents.

b. **Impact -** Seven thousand, seventy-three (7,073) parents where reached with educational messages. Six thousand, four hundred thirty-one (6,431) attended educational sessions. Of those, 83% (5,369) indicated they had learned new information and 68% (4,387) planned to adopt one or more recommended practices. When follow-up contact with program participants was made and the question asked, 1,778 individuals indicated they had actually adopted one or more of the recommended practices they had learned. Two county-specific parenting impact examples:

- 100% of participants indicated they would use 1 or more of the ideas presented.(Van Wert)
- A retrospective post class questionnaire was designed to assess changes in participants' intention to practice the skills learned during the sessions. Findings from paired sample t-tests revealed statistically significant increases in intension to use 12 out of 12 skills measured. (Morrow)

c. **Source of Federal Funding** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

16. Key Theme: Communication Skills

(Reference OSU Plan of Work Extension Program 5L: Parenting and Family Life)

a. **Description of Activities –** Seven (7) county Extension units submitted reports on efforts to increase knowledge, skills and attitudes that will positively impact family, couple, marital, and general interpersonal communication.

b. **Impact -** One thousand thirty-four (1,134) individuals where reached with educational messages and attended educational sessions. Of those, 78% (879) indicated they had learned new information and 29% (331) planned to adopt one or more recommended practices. When follow-up contact with program participants was made and the question asked, 25 individuals indicated they had actually adopted one or more of the recommended practices they had learned.

c. **Source of Federal Funding** - Smith-Lever 3b&c

d. **Scope of Impact** - State Specific

Stakeholder Input Process

The College of Food, Agricultural, and Environmental Sciences of The Ohio State University was awarded a grant from the W. K. Kellogg Foundation to conduct a process that would create: 1) a new vision for food systems education, with implications for changes in land-grant universities and higher education across the country; 2) new structures for engaging citizens in vision building, decision making, and agenda setting; and 3) new models for educational responsiveness to constituent needs. The process entitled "Project Reinvent" brought together,

through 18 focus group sessions, more than 230 individuals from the College, the University, and citizens of the State of Ohio to gather their views on what the College of Food, Agricultural, and Environmental Sciences must become to most effectively serve the needs of the people of Ohio and meet the challenge of the 21st century. External stakeholder groups participating in the focus sessions included farmers and producers, consumer and food advocacy/health care, food processors and retailers, agribusiness suppliers, commodity groups, environmental and natural resources groups, sustainable agriculture groups, legislators, primary and secondary educators, entrepreneurs/new technology, rural economic development groups, and media.

Some key highlights resulting from the focus groups input includes:

- The College adopted a new vision statement that would drive future decisions and an implementation grant was secured. Four teams were formed to address system change issues in:
  - Organizational structure
  - Reward system
  - Programmatic focus
  - Communication and marketing
- A team was formed to create a strategic plan for the Ohio Agricultural Research and Development Center, encompassing the Columbus and Wooster campuses and the 10 branch stations. In May 1998 the team presented the first phase of a strategic planning process, which identified a number of strategic issues and a series of experimental efforts to address those issues.
- Integrated systems approach identified and adopted as the foundation of the efforts within the College. The College recognizes that to sustain agricultural practices in the future the efforts must address issues of 1) production efficiency, 2) economic viability, 3) environmental compatibility, and 4) social acceptability in an integrated manner.
- A group of college and community leaders were brought together to serve as an ongoing advisory council to the Vice President and Dean of the College on issues that have widespread impact and implications for the College, its many units, and the full spectrum of audiences.
- An OARDC Internal Competitive Grants Program that matches funds from industry and other stakeholders with OARDC funds.

And the stakeholder input process continues. The Ohio Agricultural Research and Development Center and most academic departments have external advisory boards that meet at least quarterly to discuss current programs and provide input for future direction. Within the past 2 years in excess of 100 meetings have been held throughout Ohio with state legislators, community lay leaders, and representatives of Ohio State University Extension and OARDC to dialog on current educational and research programs and converse on future programs.

The Extension Community Development Program utilized a variety of methods to obtain stakeholder input. Many of these processes are intricate to the Community Development process itself. For example, appreciative inquiry, community asset assessment, and traditional needs assessments were used in twenty counties where full-time Community Development Educators are employed. Other community input programs were conducted in the Price Hill project in Hamilton County, the Comprehensive Community Planning Project in Highland County and Community Economic Development. Each of these boards conducts a year round program for

community funds for the Community Economic Development Program Educators in other counties utilize Community Development Program Sub-committees that interact with the county Extension Advisory Committee.

The Ohio 4-H Youth Development program seeks stakeholder input in a variety of ways. Fundamental to the input are the local county 4-H advisory and subject matter committees located throughout the state. Furthermore, the many committees include the direct input from both adult and youth membership. Stakeholders are also involved on statewide committees to further ensure important input to the development and implementation of positive youth development programming in Ohio.

Stakeholder input through the Food and Nutrition Extension Advisory Committee indicates a desire of specific population groups to acquire the information and knowledge necessary to improve nutritional health. Teens active in sports want to understand how food can provide an "edge" in sports competitions. Teachers want resources for teaching the in-school pregnant teen best nutrition choices for herself and for her baby. Older adults want to manage their blood pressure and their blood cholesterol levels. Older adults often express needs in one of two ways: those who are so busy that they want to prepare quick, nutritious meals or want to select healthy food choices at a restaurant and those who have no desire to prepare food because of declining health.

Program Review Process

Merit Review

(Note: The merit review process has not changed in FY 2005.)

OSU Extension develops long range program plans through a process involving Extension personnel from throughout the system, input of lay leaders in communities, incorporating data about Ohio's population, and through collaboration with other agencies, institutions and organizations.

Each of the four program areas conducts long range strategic planning to prioritize programming. Specialists from academic disciplines provide insight from research trends while county Extension personnel provide insight from local communities. Systematic prioritization processes, such as Delphi, are used. Program area personnel work together to identify key issues that cut across disciplines. Special task forces or teams then collaborate to identify priority program efforts to address these issues. Funding is then allocated to support program priorities. Programmatic resources such as personnel or materials reflect the program priorities. In addition, these priorities direct from what sources grant funds are sought.

Once strategic plans are in place, there is continual review of 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 are obtained, staff with specific, short-term employment contracts are 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. They are encouraged to work with other educators in their region to address local needs in a timely manner. In addition, educators are 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.

Scientific Peer Review
(Note: The scientific peer review process has not changed in FY 2005.)

Base funds (Hatch, McIntire Stennis, Animal Health) allocated to OARDC undergo an extensive review process within the OARDC system. The following describes the review process:

- Project proposals are initiated by research faculty and research scientists in consultation with colleagues and Department or Program chair.
- Chairs review all proposals. Chairs are responsible for selecting at least two peer reviewers for each proposal. The reviewers are expected to have expertise in the subject matter area and can be from on campus or off-campus. The reviewers evaluate, recommend, and comment on each proposal.
- Reviews are returned to the proposing scientist who them responds to suggestions, makes changes, and resubmits the proposal to the Chair.
- Chairs indicate departmental approval by signing the AD-416.
- Following review and approval by Chairs, proposals are forwarded to the Experiment Station Director's Office where they are reviewed for accuracy in coding and format and concurrence with State Experiment Station and CSREES program directions. Revisions are requested if proposals are incomplete, are not sufficiently justified, or documented.
- Upon approval by the Director or his/her designee, projects are assigned a number and are electronically forwarded to CSREES for approval and inclusion into the Current Research Information System (CRIS). The Experiment Station Fiscal Office is notified of all approved projects wherein the Fiscal Office maintains records of expenditures to be used in the AD-419 and the Annual Report which are submitted to CSREES. The Experiment Station publishes the Annual Report to document and distribute scientific accomplishments and impacts.

Evaluation of the Success of Multi and Joint Activities

Agriculture and Natural Resource Extension Programs

Over the past several years, Ohio State Extension's Agriculture and Natural Resources (Ag/NR) program area has provided strong leadership to engage our 21 Commodity and Issue Teams to network with neighboring land grant universities. Within our annual report, we have profiled just a few of the very successful high profile programs, products and activities that are better leveraging our Federal, State, and County dollars to serve our very diverse industries and clientele.

Evaluations conducted by our multi-state committees and Teams have indicated that they feel

that Multi-state conferences create improved learning opportunities and also better complement the discipline strengths of each institution. Many of our conferences and educational products have developed a strong tradition of support from clientele throughout the entire region. It is our vision to continue to provide a supportive environment to our Extension Field and State Faculties that will build upon these successful multi-state ventures.

Research Activities from a Research Perspective

Multi-disciplinary research teams have been formed to address critical issues. The Agroecosystems Management Team brings together stakeholders and those involved in research, teaching and outreach from different disciplines and institutions to discuss and develop whole systems approaches to the challenges affecting agriculture and rural communities. Its activities include public seminars on system research, sustainable agriculture and agroecosystems, sponsorship of stakeholder initiated workshops on sustainable management practices, and support of local learning communities. A practical management guide that relates basic principles of ecosystems based management to specifics of crop and livestock production has been produced. Educational materials have been developed for grade K-12.

The Ohio Compost and Manure Management Team was formed to build focus on issues and system technologies leading to safe, economic utilization of livestock manure with minimum odors and nutrient losses to water supplies. A video linked seminar series addressing manure management issues followed by discussion increased communication among stakeholders and provided an opportunity for networking with researchers and policy-makers. Organized tours of livestock and composting facilities that demonstrated effective waste management were conducted. A field day highlighting construction of a composting pad and treatment wetlands was attended by approximately 100 individuals. A website that highlights OCAMM goals, activities, seminar summaries, and link to sites with relevant information was developed.

Multi-state Extension Activities

1. Key Theme: Agricultural Communication

a. **Description of Activity** - The *Agricultural Outlook* is a multi-state effort (Purdue-Illinois-Ohio) to provide a comprehensive and timely hard copy and electronic commodity outlook guide for the Eastern Corn Belt farmers and Agri-business professionals. Lead editors from each state choose the various commodity experts in each participating state to provide both a short and long term outlook for commodities of major economic importance to this region. Each year, as many as twelve authors from the three participating states will produce this very timely and high demand publication.

b. **Impact** - Agriculture Economists and farm management specialists in Indiana,

Illinois and Ohio prepared a 16-page annual Outlook publication which was inserted in the issue of the Prairie Farmer which is published/circulated in each state. The potential readership of farmer and allied industry personnel is over 240,000 subscribers.

c. **Source of Federal Funds** - Smith-Lever 3b&c

2. Key Theme: Agricultural Communications

a. **Description of Activity** - Purdue/DTN/Ag Answers Agreement (Electronic News Service) - This partnership is a joint effort to disseminate timely management/marketing information aimed at larger scale commercial farmers across the Eastern Corn Belt through the most widely subscribed farmer information network. Both Purdue and Ohio State University specialists and research faculty on a daily rotation provide articles on contemporary crop, livestock production, and pest management.

b. **Impact** - Both Indiana and Ohio cooperated in disseminating production oriented ag news, research results, contemporary advice from production extension specialists and AG/NR educators, and updated calendar event information to producers via electronic news systems. Potential readership is 150,000 farm families and agri-businesses across the eastern corn belt.

c. **Source of Federal Funds** - Smith-Lever 3b&c

3. Key Theme: Agricultural Profitability

a. **Description of Activities** - The Tri-State Dairy Nutrition and Management program effort provides an annual educational forum aimed at larger scale professional dairy producers and many professional industry consultants across the Eastern Corn Belt dairy region. Educational agendas range from the latest diet formulation software programs to recruiting and retaining new dairy farm employees and neighbor relations. Now in its 15th consecutive year, the symposium has garnered an international reputation among professional dairy nutritionists.

b. **Impact -** Dairy and Veterinary Extension Specialists from Indiana, Michigan and Ohio developed and conducted two educational dairy conferences focusing on contemporary nutrition and efficient management systems. Conferences focused educational agendas toward highly competitive dairy managers and professional allied industry (veterinarians, nutrition and reproductive specialists and herd consultants).

c. **Source of Federal Funds -** Smith-Lever 3b&c

4. Key Theme: Farm Science Review

a. **Description of Activities** - The Farm Science Review is recognized by the National Farm Show Council as one of the premier Farm and Home Shows in North America. Considered a flagship event sponsored by OSU's College of Food, Agriculture and Environmental Sciences and OSU Extension, the annual three day event averages 150, 000 people from throughout the eastern Corn Belt

and Canada. OSU Extension has extended and invitation to Purdue University Extension to participate in the many educational venues focusing on Agriculture Production systems, Natural Resource Conservation and Management and Family Health and Consumer Information. Thirty two Purdue Extension Specialists, County Educators and Extension/Research Associates engaged with their OSU Counterparts to present the latest research information on topics in Universal Design, Pesticide Containment, Direct Marketing, Entrepreneurship and Woodland and Pond Management.

b. **Impact -** One of the newest educational events was an all day effort for Certified Crop Consultants (CCAs) held during the Review and allowed 45 CCAs from Ohio and Indiana to receive 22 Continuing Education Credits. The 45 CCAs represented over 1 million acres of Cropland in the eastern Corn Belt that they managed for many absentee land owners.

c. **Source of Federal Funds -** Smith-Lever 3b&c

5. Key Theme: Emerald Ash Borer Education

a. **Description of Activities** - *Emerald Ash Borer Preparedness:* Over the past year, a Tri-State Team of Extension/Research Professionals from Ohio, Indiana and Michigan have conducted over 125 County, Regional and Multi-State Diagnostic and Eradication Programs for homeowners, woodland owners and commercial forestry professionals. The Multi-State, Multi-Disciplinary Team has members from OSU, Purdue and Michigan State Universities as well as respective state/federal agencies. Despite statewide quarantines and increased public awareness of timely "best management practices", this invasive pest continues to migrate toward new regions within all three states and a multi-state team focus will continue to be critical to addressing integrated pest management approaches. The Multi-State Team has 40 members representing Ohio, Michigan and Indiana.

b. **Impact -** The total economic impact of the Emerald Ash Borer on homeowners and private woodland owners over the tri-state region has been estimated to be $3Billion dollars since the pest was first discovered in 2002.

c. **Source of Federal Funds -** Smith-Lever 3b&c

6. Key Theme: Water Quality

a. **Description of Activity** - *Central Role in State Initiatives:* Watershed Team members play a central role in statewide watershed protection efforts. Through the Team, OSU Extension has developed a strong partnership with OEPA and ODNR in supporting the formation and development of multi-stakeholder collaborative watershed organizations, as called for in the Action Agenda for Ohio Watersheds. The strength of this partnership is reflected in the financial support (over $150,000 in three years) provided to OSU Extension by ODNR Division of Soil and Water and OEPA Division of Surface Water.
New Partnerships for Regional Water Quality Coordination in the Great Lakes Region: OSU Extension is one of six partners (with University of Illinois Extension, Purdue Extension, University of Minnesota Extension Service, University of Wisconsin Extension, and Michigan State University Extension) on

a USDA-CSREES Regional Water Quality Coordination Grant. The grant is spearheaded by the Great Lakes Regional Water Quality Leadership Team (WQLT). The WQLT seeks to ensure the integration of water quality efforts in the Great Lakes Region, specifically in the areas of Animal Waste Management, Nutrient and Pesticide Management, Watershed Management, and Drinking Water and Human Health. The goals of the regional project are:

- Increase coordination and collaboration across states in the region;
- Leverage University Extension and research resources across the region to address high priority water quality issues;
- Strengthen regional relationships with federal and state partners and offer an entry point to Extension and the Land Grant University resources.

As part of the regional grant agreement, Ohio State University Extension receives an annual allocation to support efforts to coordinate Extension and research activities and foster the professional development of faculty, Extension Agents, Specialists, and Associates working in the area of water quality. In FY2005 OSU personnel collaborated with colleagues from all six participating universities through Regional Theme Teams (Animal Waste Management, Nutrient and Pest Management, Drinking Water and Human Health, and Watershed Management). Theme teams propose and rank key areas for research and extension activities and develop administrative and operational support systems to encourage and support successful multi-state water quality programming.

OSU personnel were involved in several regional projects that were developed through the Great Lakes Regional Water Quality Coordination grant including:

- *Building the capacity of E. coli monitoring by volunteer networks*
- *Professional development for manure haulers*
- *Developing a social component for the USEPA Region 5 Nonpoint Source Evaluation Framework*

In addition to the work groups, funding from the Great Lakes Regional Water Quality Coordination Grant was used to support research and extension projects in Ohio with a high potential for multi-state collaboration. Federal funds supported the Ohio Watershed Academy, a four-month long professional development and distance education course for watershed coordinators, agency staff, and citizen volunteers.

b. **Impact –** OSU Extension Watershed Team members participated in the development of several Watershed Action Plans in watersheds throughout Ohio. Many of these plans have been endorsed by Ohio EPA, which enhances local collaboratives' ability to attract funding for water quality projects.

Regional grant funds supported the Ohio Watershed Leaders (OWLs) workshop. Over 50 agency professionals and watershed coordinators participated in this two-day workshop, which gave participants hands-on experience in geology, team building, and a variety of other water quality related topics. A survey of participants indicated that the workshop allowed them to build relationships, develop new knowledge on stream protection, and gave them a renewed sense of purpose in their work.

In Ohio, partial funding from the regional project led to the formation of a new Ohio nutrient applicator's association. About 100 nutrient applicators have

been trained in Best Management Practices (BMPs) for liquid manure application.

A group of dedicated volunteer monitors throughout southern and central Ohio have learned to monitor their local streams for bacteria. Some of these individuals will have the opportunity to apply for certification as data collectors through the Ohio Environmental Protection Agency.

Regional funds leveraged a $20,000 grant from Ohio EPA to develop indicators of social change resulting from non-point source management projects.

Twenty water quality professionals and volunteers completed the Ohio Watershed Academy. Evaluations indicated that participants in the course were more capable of participating in collaborative watershed planning efforts and had a better understanding of resources available to conduct watershed planning and implementation. Federal funds leveraged $60,000 in grants from Ohio EPA for this project.

c. **Source of Federal Funds** - Smith-Lever 3b&c

7. Key Theme: Positive Youth Development in Out-of-School Time

a. **Description of Activities -** Ohio is the home of one military installation—Wright Patterson Air Force Base (WPAFB). Building on a partnership that began in 2002, youth in base after-school and youth programs have participated in a variety of 4-H projects for the past three years. New programming efforts begun in 2004 and continued in 2005 have strengthened the 4-H Military partnership even further, and the program has evolved to become an integral part of both organizations. Local 4-H Educators have worked with the WPAFB staff to plan and conduct these programs. Military staff members serve in the role traditionally filled by volunteers in community clubs. We are very fortunate to have excellent working relationships with the staff.

The overall goal is to provide predictable, consistent youth programs to youth on military installations worldwide. In 2005, grant funding allowed continuation club and after-school programs. The grant funding supported participation of teens from the base 4-H club participated in the Ohio 4-H Teen Conference, as well as participation by military staff in the statewide Ohio Volunteer Conference and other professional development experiences.

Because of a high level of deployment of National Guard and Reserve Soldiers, Ohio submitted an application for *Operation Military Kids,* a nationwide initiative designed to provide support to the children and youth of families that are impacted by the Global War on Terrorism. The additional funding allowed expansion of efforts to youth in families of the National Guard and Reserve service members around the state.

b. **Impact** - Impacts are at the organizational system level. Thus, an important impact of this project is the successful collaboration built between 4-H and WPAFB. This positive working relationship is an important foundation that enables quality programs and outcomes for youth. This relationship is fostered through regular meetings and communication among the staff involved. Military staff have taken increased ownership for programming and the military youth are becoming integrated within the county and state 4-H program (e.g., professional

and volunteer conferences, county fair exhibits, camps). In 2005, over 300 youth participated in 4-H military programs. School-age youth participate primarily through the after-school during the school year and the 10-week summer program. A 4-H club established at the Youth Center allows older youth to take on leadership roles. For example, some of them served as camp counselors at Operation Purple Camp Wright-Patt targeted to youth with a deployed parent.

The work to expand to youth of Guard and Reserve families around the state is an outgrowth of the strong partnership relationships fostered over the past three years. Because Ohio 4-H has a strong camping program, initial efforts focused on this delivery method. Two camps were held in 2005 (one week-long Operation Purple camp in the summer and a weekend camp during the fall). 4-H camp counselors, camp counselor alumni, and Collegiate 4-H members served as camp counselors. Camp participants reported that the biggest benefit of the camps is meeting other youth who are in the same situation. In that sense, camp serves as a positive youth development experience where youth learn teamwork and responsibility while in a group living setting. Specifically, for the weekend camp they reported that they "definitely" made friends with someone at camp (89%), learned something new (87%), had fun (83%), and did something they had never done before (73%). The vast majority wanted to come to camp again. Plans are in the works to run camps in the summer of 2006. Other aspects of Operation: Military Kids include assembling Hero Packs to distribute to youth when their parents are deployed. Approximately 750 of these backpacks were assembled as community service-learning project by 4-H members. Overall, this project has served to sensitize youth and the public to the issues faced by youth when a parent is deployed in military service.

c. Source of Federal Funds - Smith-Lever 3b&c

8. Key Theme: Parenting and Family Life

a. Description of Activities - GRANDPARENTS RAISING GRANDCHILDREN targeted Extension and other professionals who intended to develop or wished to strengthen their programming on grandparents raising grandchildren. Using Web Course Technology (WebCT), the goal of this 2 week e-seminar is to provide professionals with (a) a better understanding of the research on grandparents raising grandchildren, with a particular emphasis on the nature and quality of the relationship between children/youth and their custodial grandparent(s)., and (b) ways this information can be applied to programs and services intended to meet the needs of custodial grandparents in our communities. A total of 173 professionals (63% Cooperative Extension) from across 36 states participated in one of two e-seminar sessions offered in January (n = 84) and February (n=89) of 2005.

Of the 173 registered participants, 31 (18%) did not log on during the week of the e-seminar and 142 (82%) logged on at least 1 day: 17.9% logged on all 5 days, 19.7% 4 days, 13.9% 3 days, 16.2% 2 days, and 14.5% only 1 out of the 5 days. On average, those who participated logged on 3 out of 5 days of the e-seminar.

During the e-seminar, a total of 781 messages were posted (January = 327

and February = 454) by participants, panelists, and the moderators. Among the 142 participants who logged on, 63.4% posted at least one message to the discussion board: 19.0% posted 1 message, 19.7% 2-3 messages, 15.5% 4-10 messages, and 9.2% 11 or more messages. 100 participants (68% Cooperative Extension) from across 32 states completed the on-line evaluation: 48 participants from the January session and 52 from the February session.

b. **Impact** - On a 5-point scale ranging from (1) strongly disagree to (5) strongly agree, nearly all of the participants reported that they agreed/strongly agreed that the e-seminar (a) helped them better understand the issues surrounding custodial grandparenting (87%; M = 4.3), (b) provided them with new ideas for working with custodial grandparents and with community partners to support grandparents raising grandchildren (89%; M = 4.3), and (c) stimulated them in wanting to learn more about grandparents raising grandchildren (87%; M = 4.3).

On a 5-point scale ranging from (1) strongly disagree to (5) strongly agree, nearly all of the participants indicated that they were satisfied with the overall quality of the presentation (92%; M = 4.3) and discussion (84%; M = 4.1), and that they enjoyed participating in this e-seminar (91%; M = 4.4).

Most (83%) of the participants indicated that they would like to see more training programs conducted in this format and 91% said that they would participate in this type of training again.

c. **Source of Federal Funds** - Smith-Lever 3b&c

Integrated Research and Extension Activities

1. Key Theme: Soybean Rust Education/Awareness

a. **Description of Activity** - OSU Extension's Agronomic Crops Team provided a coordinated research and extension initiative to prepare Ohio's Crop Producers and Crop Consultants for the threat of Soybean Rust, a potentially economically devastating fungal disease that has threatened Ohio's 1.4 Billion Dollar Annual Soybean Industry. Key OSU Extension County Educators identified 54 County Sentinel Plots within their respective counties which they routinely scouted themselves and with their respective host farmers and crop consultants. Led by OSU Extension Plant Pathologists and Extension Associates, this locally driven project fed weekly Soybean Rust articles embedded within the Team's Crop Observation and Recommendation Network (C.O.R.N.) Newsletter.

b. **Impact** - Due to timely scouting and diagnostic evaluations, no foliar fungicide applications were recommended or deemed necessary which saved Ohio's Soybean producers $15/acre. Overall savings on Ohio's 4.5 Million Soybean Acres was $67.5 Million which could be directly added to Ohio farmers' profitability.

c. **Source of Federal Funds** - Smith-Lever 3b&c

2. Key Theme: Conservation Tillage and Technology Conference

a. **Description of Activity** - OSU Extension has provided coordination and leadership for the development of the Conservation Tillage and Technology Conference since 1980 making it the longest running conservation tillage conference in the United States. The current two day format typically has 60-70 speakers, including OSU Extension and Research Specialists and County Educators as well as other USDA Agency Professionals, Crop Consultants and Farmers. Participants can choose from more than 30 hours of Certified Crop Advisor (CCA) credits on Soil and Water, Nutrient Management, Pest Management and Crop Management.

b. **Impact** - Attendance in 2005 reached 625, a new record. It is a regional conference drawing many participants from Indiana, Michigan and the rest of the Eastern Corn Belt. Approximately 322 participants received credits as Certified Crop Advisors and received 3,339 total CCA Credits. Farmer surveys demonstrated they valued the Tillage Conference Educational agenda at $12,500/Farm and that total direct impact for farmers attending was $2.5 Million. Approximately 125 Crop Consultants attended representing 5 Million Acres of Cropland and placed a value on their increased knowledge at $5/Acre. The total economic impact for managed or influenced by the Crop Consultants participating was $25 Million.

c. **Source of Federal Funds** - Smith-Lever 3b&c

3. **Key Theme: Community Development Research Projects**

a. **Description of Activity** - During 2005, OSU Extension Community Development partnered with faculty and staff at OARDC on three studies including: *"An Assessment of Agricultural Producers' Attitudes and Practices Concerning Pesticide Spray Drift", "Lawn Care Professionals' Perceptions on Practices and Issues Facing the Industry",* and *"Ohio Homeowners' Attitudes and Practices Related to Development of Residential Environments".* While each study is now complete and findings have been shared with target audiences, we are currently engaged in assessments of impact documentation for 2007. Activities and impacts are shared below.

b. **Impact** - *An Assessment of Agricultural Producers' Attitudes and Practices Concerning Pesticide Spray Drift*: This report summarizes the findings of a survey conducted among a sample of 89 agricultural producers in Ohio in the summer of 2005. The objectives of the study were to document current practices used for drift reduction as well as the concerns growers have about pesticide spray drift and drift abatement. This topic has become increasingly important in recent years as various government agencies have sought to regulate pesticide use in order to reduce drift. Presentations of the findings have been made to representatives of a number of agencies, including USDA and EPA, and also to agricultural producers. The researchers will discover how agencies use this information in design of regulations concerning pesticide spray drift and how producers have changed practices as a result of study information.

Lawn Care Professionals' Perceptions on Practices and Issues Facing the Industry: This report presents findings of a survey completed by lawn care professionals during the summer of 2004. The sample consists of a total of 122 members of the industry in a variety of positions ranging from technician to manager/supervisor, and company owner/president. The results show what lawn industry professionals think about the impacts that their industry is having on the quality of water in lakes, rivers and streams. The study was presented to an annual conference held for these professionals at OARDC in June 2005. The study will help educators understand areas in which they can improve outreach to lawn care professionals as the industry continues to face commercial, social, and environmental challenges in the future. The researchers will measure how lawn industry members have changed practices in response to their colleagues' concerns and practices as described and summarized in the study.

Ohio Homeowners' Attitudes and Practices Related to Development of Residential Environments: This study describes the results of a survey of 432 Ohio homeowners undertaken in the fall of 2004. The results provide a comprehensive view of residents' attitudes and practices on lawn care and provide a great deal of base line data concerning use of chemicals applied by lawn companies and by individual homeowners. The researchers will measure how lawn industry members have changed practices and marketing of services and products to meet the concerns and demands of homeowners.

c. Source of Federal Funds - Smith-Lever 3b&c

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Actual Expenditures of Federal Funding for Multistate Extension and Integrated Activities
(Attach Brief Summaries)
Fiscal Year: 2005

Select One: ☐ **Interim** **X Final**
Institution: The Ohio State University
State: Ohio

	Integrated Activities (Hatch)	Multistate Extension Activities (Smith-Lever)	Integrated Activities (Smith-Lever)
Established Target %	11.4% **%**	5% **%**	7% **%**
This FY Allocation (from 1088)	5,561,177	9,776,235	9,776,235
This FY Target Amount	$633,974	$488,812	$684,336
Title of Planned Program Activity			
An Agricultural Production System That is Highly Competitive in the Global Economy	$928,623	$125,783	$232,816
A Safe and Secure Food and Fiber System	16,293	20,722	12,639
Healthy, Well Nourished Population	25,139	8,913.00	5,909.00
Greater Harmony Between Agriculture and the Environment	392,044	232,732	321,673
Enhanced Economic Opportunity and Quality of Life for Americans	125,359	126,468	148,521
Total	$1,487,458	$514,618	$721,558
Carryover	0	0	0

Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays represented here accurately reflect allowable expenditures of Federal funds only in satisfying AREERA requirements.

Director, OSU Extension

Director, OARDC

March 31, 2006
Date

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities
(Brief Summaries)

Goal 1: An Agricultural System that is Highly Competitive in the Global Economy

Ohio's Commercial agriculture and horticulture industries depend upon Ohio State University Extension to provide timely and innovative, science-based, objective information that can be implemented within their management systems to remain competitive in our global economy. An innovative approach to problem solving, research and extension outreach is the use of empowered teams. A high priority for The Ohio State University Extension is the development and coordination of commodity/issue focused teams consisting of State/District Extension specialists, County Agriculture and Natural Resource agents and research faculty from multiple disciplines to deliver high impact, research-based information and educational programming that is timely and easily accessed by Ohio's diverse commercial agriculture and horticulture industries.

Ohio State University Extension and the Ohio Agricultural Research and Development Center have currently engaged 21 interdisciplinary self-directed teams ranging from our Swine Educators' Team to our Watershed Management Network. These faculty-led teams interact closely with respective state/national commodity organizations, state/federal agencies and environmental organizations to assist in developing our Extension led statewide programming and current communications structure.

Team electronic communications are the keys to access strategic information for global competitiveness. Many of our teams continue to develop weekly/monthly electronic newsletters and research updates that will be evaluated for their economic impact. Our team members develop newsletters following weekly tele-conferences such as: *Amazin' Graze, Buckeye Yard and Garden Line (BYGL), Crop Observation and Recommendation Network (CORN), Grain Marketing Research and Innovative Strategies (GRAINS), Pesticide Update (Pep-Talk), Pork Pointers, Veg-Net and Vineyard Vantage*, etc. Many newsletters are listed on our OSU Extension *Ohioline* web site, as well as many of our team's individual web sites for easier access by our stakeholders.

Goal 2: A Safe and Secure Food and Fiber System

Safe food handling is a targeted issue and includes: Promoting food safety across the food chain; consumer education for safe food handling; certificate training for food handlers; and food safety education for growers, producers, distributors, retailers, and food service workers. At the same time that food safety is an issue, consumers demand and will pay for greater convenience. The challenge is to produce food which is nutritious and tasty but which can be processed and distributed without contamination, either accidentally or deliberately, and is handled safely as it is prepared by and for consumers.

Consumers' lifestyles, hence their eating habits, are constantly changing. These changes bring about increased demand for high quality, value added, and convenient foods. This requires that production of food ingredients, which are as nutritious as non-processed counterparts and are not subject to contamination with harmful microorganisms during production and shipment.

Although research that leads to a safer food supply is actively in place, scientists acknowledge that the safest foods are still a hazard if mishandled during food preparation just before consumption either in a food establishment or at home. Consumer and food worker behavior is an important issue to address to complete the assurance of the safe food cycle. Education efforts, either in higher education or through outreach, have focused on this critical need so that the "human factor" can be reduced or eliminated as a cause of food-borne illness.

Goal 3: A Healthy, Well-nourished Population

Dietary Guidance can be defined as the use of principles found in the Dietary Guidelines for Americans to develop non-formal nutrition education series for youth and adults. Additionally, there are programs targeted to the elderly, and to individuals at risk for or having diabetes, focusing on their nutritional needs. These community-based nutrition education programs are offered at the local level by OSU Extension. The Dietary Guidelines for Americans provide a basis for healthy lifestyle choices. The Food Guide Pyramid is a pictorial and practical guide for educating consumers to use the Dietary Guidelines. OSU Extension professionals inform consumers of health risk factors (e.g., obesity, hypertension, etc.) and nutrition practices and encourage appropriate nutrition and lifestyle changes and promote reading labels on processed foods.

U.S. citizens, like other highly developed countries in the world, have an abundant, inexpensive food supply available to them. Food provides both pleasure and the nutrients necessary for health and survival. The goal is for all to be food secure, that is, access by all people at all times to enough food for an active, healthy life and at a minimum, includes: (1) the ready availability of nutritionally adequate and safe foods, and (2) the assured ability to acquire personally acceptable foods in a socially acceptable way. It is important to recognize that nutrient needs vary over the life cycle and research must be conducted to determine how age and gender influence nutrient needs. It is also important to recognize that the human body uses nutrients in chemical reactions within the body. Nutrition science plays an important role in reducing obesity, diabetes, cancer and heart diseases. The Ohio State University is one of a few institutions with a college of agriculture, a department of human nutrition science, and a medical college. Scientists from the many disciplines are researching together such agricultural products as tomatoes, soybeans, and raspberries to discover the chemical content and chemical reactions in hope of discovering chemicals that are effective as antioxidants and as anti-carcinogens. They are also researching behaviors that lead to healthy food choices.

A healthy, well-nourished population is dependent on the ability of people to obtain foods that will improve the over-all quality of their diets, and the quality of the food they eat. A healthy population also engages in other positive health practices, including physical activity, individual health monitoring, and safety practices that will reduce the risk of accidents and disease. OSU Extension professionals have been actively educating the people of Ohio regarding the importance of good health and nutrition practices. The professionals met with individuals

and groups, in formal and non-formal teaching sessions, in workshops, committee meetings, health fairs, and walk-by exhibits. The result has been a change in 1) the way some individuals purchase, prepare and store food; 2) the level of interest in monitoring and improving health through screenings and exams; and 3) the ability of individuals to improve their personal practices to decrease health risk.

Goal 4: Greater Harmony between Agriculture and the Environment

Ohio is different than most sister states in that it has a relatively high population density and yet agriculture [defined broadly to include plant and animal production, food and food processing and landscape/turf] leads all other industries in dollar value, amounting to about $75 billion annually. This commingling of agriculture and food processing with large urban and suburban population centers provides opportunities but also challenges. Most often the challenges are the disposal of wastes and by-products without offending the aesthetic sensibilities and quality of life of neighbors. Efforts to solve these problems have long occupied the time of OARDC scientists and OSU Extension programming and continue to do so with the development of new methods and technologies.

An area which causes some friction between urban populations and agriculture are the perceived dangers of chemicals used for pest control. Ironically, much of the use of pesticides is by home owners and companies treating lawns and golf courses within urban - suburban centers. One method to reduce pesticide use is called integrated pest management (IPM) in which management and natural enemies of pests are used to decrease the need for insecticides. The use of a species of round worms (nematodes) to control white grubs in turf grass is highlighted here as one example of IPM.

In addition to the usual methodology to minimize environmental damage, scientists at The Ohio State University have created a team, called ecosystems management, which seeks to use ecologically sound principles to not only increase profitability but also be environmental friendly. This systems management approach has been extended to the classroom in the education of undergraduate as well as graduate students.

As livestock production continues to expand in Ohio and with the odors, dust, insect pests, and water pollution associated with the increased numbers, there is a need to provide educational programs to producers on composting livestock mortality and composting animal waste. Due to the diverse distribution of the state's population, livestock producers, commodity groups and OSU Extension are taking a pro-active approach to improve neighbor relations by providing programs that ameliorate issues associated with agricultural waste.

Goal 5: Enhanced Economic Opportunity and Quality of Life

During the decade of the 90's, most Ohioans prospered but many others were left behind. As economic difficulties continue in the 21st Century, lack of economic opportunities worsens, particularly in Southeastern Ohio which has been in decline since the coal industry moved out. Agriculture, mostly in the form of beef cow and calf operations and forage crops provide some opportunity but others are needed. One of the possibilities

that have been explored is aquaculture, represented here by the newest entry in the field, fresh water shrimp. Production of these crustaceans for a niche market can provide some income to residents of this economically depressed area.

OSU Extension personnel provide the lead in about a nine counties for their community economic development programs. Extension works on a total community development paradigm. In the economic development strategies, the Business Retention and Expansion Program continues to be enhanced by the Department of Agricultural, Environmental and Development Economics. This flexible consulting program assists the local community in selecting their own survey tool and reporting mechanism. The community is provided the items and assistance they request. Retention and Expansion Programs are conducted for nearly all sectors of the economy including industrial, agricultural, retail and service. Additional assistance is provided in educational programs on enterprise zones, joint economic development districts, and tax abatement. Assistance is also provided in attraction and community capture of local discretionary income.

Programs are also available for local leaders and government officials on wastewater treatment alternatives and water supply systems. Extension educators in several counties work closely with local groups in the creation and operation of revolving loan funds and the establishment of industrial parks. Some of the Community Development Agents conduct downtown revitalization programs and state route corridor development projects.

Community Leadership Development is a wide-ranging area that includes operation or assistance of year-long leadership training programs. More ad hoc programs include training for members of non-profit boards of directors. Leaders are instructed in such programs as: appreciative inquiry, finding and mobilizing community assets, and Vision to Action. The Public Issues Team provides instruction on Framing of Issues and dispute resolution.

The Ohio 4-H Youth Development program provides positive environments for culturally diverse youth and adults to reach their fullest potential as capable, competent, caring and contributing citizens thus enhancing their quality of life. As a result of the Ohio 4-H positive youth development experience: youth develop marketable skills for lifelong success; youth participate in and learn through citizenship opportunities to transform local communities; youth appreciate and build upon diversity to foster a harmonious global society; youth have a sustained relationship with a caring adult to enable them to be productive citizens; and volunteers build their skills and abilities in working with youth.