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Ohio Agricultural Research and Development Center
1680 Madison Avenue
Wooster, OH 44691-4096

March 31, 2005

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

Dear Mr. Hewitt:

We are enclosing the FY 2004 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 2004 AREERA Report of Accomplishments and Results

hard copies: Bob Moser
Deborah Lewis
Tom Archer

Federal Report of Accomplishments and Results (FY 2004)

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.

Agriculture and related industries are a significant part of Ohio's economy, amounting to approximately $80 billion per year. According to an input / output model of the Ohio food industries published in 2003, food and agriculture contributed 10% of the gross state product, accounted for 15% of the total employment and contributed 10% of the total income. While agriculture has strong support within the state and is a significant line item in the state budget, with budgetary shortfalls a reality, both the executive and legislative branches of the Ohio government urged a comprehensive review of the economic impact of OARDC research. During the summer of 2003, The Technology Partnership Practice of Battelle Memorial Institute was engaged to do an analysis of OARDC's economic impact in past years (Phase I) and to make recommendations for future programmatic activity which will have the greatest impact on the state's economy (Phase II). The Battelle group has had extensive experience in economic analysis of business activities, including studies of economic development for the State of Ohio. In addition, OARDC arranged for a group of four scientists with expertise in administration of agricultural / University research to provide the Battelle group with their perspective on the future research opportunities.

The Phase I report was an input / output analysis using the IMPLAN software for determining the economic impact of projects and business related activities. In addition to the economic analysis, Battelle conducted in-depth interviews with OARDC personnel to develop a detailed understanding of specific research focus areas. The Phase I report will be used extensively for this report.

It was obviously a formidable task to select specific project areas to demonstrate the economic impact of OARDC research. One area which Battelle chose to emphasize was the extensive programs in soybean research, not because they were the most important of the literally hundreds of research projects but rather because soybean research was an area where definitive evidence of impact could be documented. For this, the Battelle group determined the acreage allotted to the production of seed from the 19 varieties of soybeans released by OARDC between 1985 and

2002, and from that, calculated the percentage of the Ohio soybean crop that was represented by the OARDC varieties.

The Battelle report estimated that the income to Ohio producers from OARDC varieties over the period of 1985 through 2002 was about $3.38 billion or just under $200 billion per year. The report also concluded that the direct income contribution of OARDC varieties to soybean income for 2002 was $72.5 million. Using their input / output model, Battelle calculated an additional, indirect income of $118.5 million for a total of $191 million added to the Ohio economy from OARDC soybean varieties in 2002. The year 2002 was used because that was the most recent year that data were available. Unfortunately, the soybean yield of 32 bushels per acre for that year was the lowest that it had been in years. If the same percentage of OARDC-derived soybeans were planted in 2003 as occurred in 2002, the direct income by proportion would have been over $100 million and the total contribution would have been over $250 million.

The apparent reason that the use of OARDC varieties declined between 1994 and 2002 was producers increasingly chose glyphosate-resistant (Round Up Ready) varieties. Varieties developed for Ohio which also have the glyphosate-resistant gene have recently been released. These include varieties with a newly discovered, very effective gene against the fungus causing phytophthora root rot, a major problem in the heavy clay soils of Ohio in a particularly wet year.

Food grade soybean production continues to increase in Ohio. Two new food grade varieties were recently released. These have higher protein content, are more resistant to phytophthora and have greater yields than previous varieties. In 2002, Battelle estimated that Ohio soybean exports accounted for $460 million over the 1991 to 2001 time period. Much of these exported soybeans were high-protein, food grade varieties. With the availability of the new releases, Ohio food grade soybean production would be expected to increase over the next few years. Cargill has recently opened a soybean processing plant in Western Ohio to produce an isolated soybean protein because of the availability of quantities of high protein soybeans in the region.

The Battelle report also made it clear that OARDC research has had a positive economic impact on tomato production in Ohio which has expanded dramatically in the past few years. While specific economic data are not available, it is clear that the tomato research program enjoys substantial industry support.

Research on prevention of diseases in the $1.9 billion dollar animal industry is a priority. The trend toward larger production facilities for poultry, swine and dairy cattle make these industries increasingly vulnerable to infectious diseases. Work has continued on the development of vaccines for infectious bursal disease virus (IBDV) which can cause high rates of mortality in poultry as well as suppress the birds immune system against other contagious diseases. Vaccine development also continues for protection of dairy cows from environmental mastitis.

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 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.

Smith-Lever Fund expenditure for Goal 1: $1,497,119 EXTENSION FTE's: 21.4
Hatch expenditures for Goal 1: $3,836,498 OARDC FTE: 38.0

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), Grain Marketing Research and Innovative Strategies (GRAINS), 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.

b. **Impact** - Newsletter surveys have indicated that agronomic crop producers saved over $12.4 million dollars in chemicals used from implementing management practices presented in the *CORN* newsletter and over $4.2 million from utilizing marketing tips found in our *GRAINS* newsletter. The OSU Extension beef team Web site, released in May 1997, had more than 9,400 hits during October, 2004. 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 3.8 billion dollars. In the 2004 *BYGL* Evaluation Survey, over 2,000 respondents indicated that *BYGL* saved their businesses over $4.1 million. Over 65% of the respondents indicated that the *BYGL* changed their pest management practices. Through newsletters, media and other sources, respondents indicated that *BYGL* reached over 2.1 million people in 2004. 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: Adding Value to New and Old Agricultural Products

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

a. **Description of Activity** - Research in the plant area at OARDC goes from the very basic to the applied as it does at most agricultural experiment stations. Applied research is exemplified by such routine exercises as variety performance testing while examples of basic research include such projects as the genetic basis for tolerance to cold, drought, or diseases, quorum signaling in plants, and the regulatory role of sterols in plant development. Any or all of these may eventually have economic / environmental impacts but obtaining quantitative data demonstrating those impacts are often not possible. The Battelle group was therefore faced with a formidable task of measuring the economic impact of OARDC research. They chose a few examples for which concrete data were available. One such example was soybeans.

The two most important agronomic crops in Ohio are corn and soybeans, each of which contributed over $1 billion per year, on average, to direct farm income for the calendar years of 2003 and 2004. While corn production is a major

source of Ohio farm income and OARDC does conduct research on this important crop, corn varieties are less dependent upon local growing conditions than soybeans. Thus, corn varieties can be developed for larger geographical areas, and because of this expanded market opportunity, tend to have greater involvement of commercial seed companies.

Soybean sales have been a major source of income to Ohio producers. Table 1 shows data on soybean production and income to soybean farmers for the past five years.

Table 1. Soybean production data for past five years for Ohio.

Year	Acres harvested (thousands)	% of croplan d	% of farm land	Bushels per acre	Dollars per bushel	Income $ (millions)
2000	4440	44.1	30.2	42	4.63	863
2001	4580	45.5	31.2	41	4.46	838
2002	4720	46.9	32.1	32	5.59	844
2003	4280	42.5	29.1	38.5	7.20	1186
2004	4420	43.9	30.1	47	5.15	1070
AVG	**4488**	**44.6**	**30.5**	**40.1**	**5.40**	**$971,831**

In contrast to corn, soybean varieties are extremely sensitive to factors such as length of day, temperature characteristics, soil types, pests and pathogens that are unique from one region to another. Therefore, soybeans have long been the subject of intense research at OARDC. The soybean breeding program 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. Between 1985 and 2004, OARDC released 23 varieties adapted to Ohio growing conditions. The Battelle report provided evidence of the economic value of the soybean breeding program to Ohio producers.

The Battelle Phase I report estimated the percentage of Ohio's soybean production which came directly from the 19 varieties released by OARDC through 2002 by determining the acreage used for seed production of these varieties. As shown Figure 1, adoption of the OARDC varieties by Ohio growers increased dramatically from 1985 to 1994. After 1994 through 2002, planting of varieties specifically adapted to Ohio growing conditions decreased just a dramatically as Ohio growers chose to plant varieties with the glyphosate-resistant (Roundup Ready) gene.

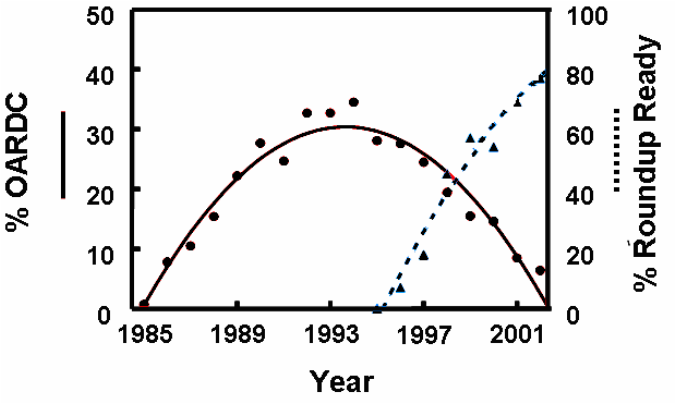


Figure 1. Percentage of Ohio soybean acreage planted to varieties developed by OARDC and to Roundup Ready varieties.

Soybean growers have the difficult task each spring of deciding which variety of soybeans to plant. Varieties developed at OARDC have emphasized resistant to phytophthora root rot because this disease is the single biggest threat to Ohio's soybean production. The number of counties in which the disease is found has been constantly expanding over the past 20 years. It is particularly a problem in clay soils in years in which a wet spring is followed by a prolonged dry period. A second major problem in large areas of Ohio is soybean cyst nematodes (SCN). Again, like phytophthora root rot, the best defense against SCN is genetic resistance and OARDC varieties have been developed which exhibit such resistance. Even so, SCN resistance is only effective with proper management, including control of weeds which can harbor the pests over winter. These genetic qualities must be balanced against the advantages of glyphosate-resistant (Roundup Ready) varieties, some of which also exhibit at least partial resistance to phytophthora and soybean cyst nematodes.

As can be seen from Figure 1, Ohio growers have increasingly chosen the glyphosate-resistant varieties to the point that about 90% of the soybeans grown in Ohio in 2004 were glyphosate-resistant. In addition to the esthetic quality of weed-free fields, Roundup Ready soybeans may provide greater yields because they can be planted closer together since they do not require post-planting cultivation. Research has shown that yield can increase by 1/3 bushel per acre for every inch reduction in width from 30 inches. Most soybeans in Ohio are grown in row widths of less than 10 inches.

During the past several years, work has been underway to incorporate glyphosate- resistance into the soybean varieties developed by OARDC for Ohio growing conditions. The procedure used began by obtaining glyphosate-resistant material from the developer under license and crossing this material with disease-resistant, Ohio-adapted lines, using traditional breeding procedures. Since this project began, a new, very effective gene for resistance to phytophthora root rot, Rps8, was discovered and has been incorporated into some glyphosate-resistant varieties. Adding the glyphosate-resistance gene to the varieties developed at

OARDC specifically for Ohio's growing conditions will allow Ohio growers to take advantage of the benefits of both attributes rather than forcing an either / or decision.

Figure 2 shows that about one-third of Ohio soybean growers who opted for non-GMO soybeans planted OARDC varieties. While some soybean farmers deliberately avoid GMO soybeans for a variety of reasons, some of the producers chose non-GMO soybeans because they chose to plant food grade soybeans. High-protein, food-grade soybeans now constitute a significant proportion of Ohio soybean production and these are always non-GMO varieties.

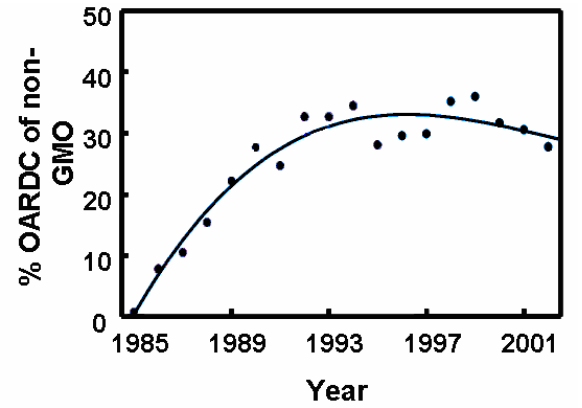


Figure 2. The percentage of non-glyphosate-resistant soybeans planted to OARDC varieties.

The protein content of soybeans is determined by a combination of the plant's genetics, soil and environmental conditions. OARDC research faculty ascertained years ago that a niche market could be developed for food grade soybeans if high-protein cultivars adapted to Ohio growing conditions could be produced. A breeding program to produce food grade soybeans was initiated in the mid-1980s. The first release of two new food grade cultivars, "Ohio FG1" and "Ohio FG2," was on August 1, 1994. Food grade soybeans are used to produce traditional soyfoods, such as soymilk, tofu, miso, and tempeh, all of which are particularly popular in East Asia. Food grade soybean characteristics believed to be important for the production of tofu and other soy-based foods include high protein content, especially soluble protein, large seed weight acceptable color and high sugar content. In the production of soymilk and tofu, high soluble protein leads to a higher yield of product and, in the case of tofu, a more satisfactory gel.

Up until the release of Ohio FG1 and Ohio FG2, the most popular food grade soybeans produced in Ohio were "Beeson 80" and "Vinton 811" which provided some resistance to a common Ohio disease, Phytophthora root rot. In the three years prior to release, Ohio FG1 and Ohio FG2 were tested in the Ohio Large-Seeded Test. While both of the new cultivars had protein content of about 42% which was similar to "Beeson" and "Vinton", the average yield of about 48 bushels per acre was statistically significantly higher than either of two previously used varieties in the head to head test. Data from the Battelle report show that

Ohio FG1 (but not, for some reason, Ohio FG2) was quickly adopted by Ohio soybean producers, beginning in 1995.

In August, 2001, a third food grade soybean cultivar, named Ohio FG3, was released by OARDC. This cultivar was released because of its earlier maturity, higher protein content (44% versus 42%) and improved disease resistance (particular to *phytophthora sojae*) in relation to Ohio FG1.

Finally, two new food grade soybean varieties, Ohio FG4 and Ohio FG5, were released in August 2003. In tests conducted during 2000 to 2002, seed of Ohio FG4 and Ohio FG5 had similar protein content of previous releases but greater yield. The new cultivars also carry the gene Rps3a which confers race-specific resistance to *phytophthora sojae*.

b. **Impact -** The Batelle report calculated the percentage of Ohio soybeans grown from varieties developed by OARDC, based on the production of certified seed. That percentage is shown in Figure 1 above for the years 1986 through 2002. The economic contribution of OARDC to Ohio soybean producer income for those years was calculated from that percentage, based on the total bushels of soybean produced in Ohio and the average price per bushel for each of those years. As shown in Figure 3, income attributable to varieties developed by OARDC reached a peak of $337 million in 1994. Over the 17 year period, the calculated total from OARDC varieties was about $3.38 billion for an average of just under $200 million per year. The estimate is conservative since it does not account for the use of private production of soybeans which may be hybrids of OARDC varietal releases.

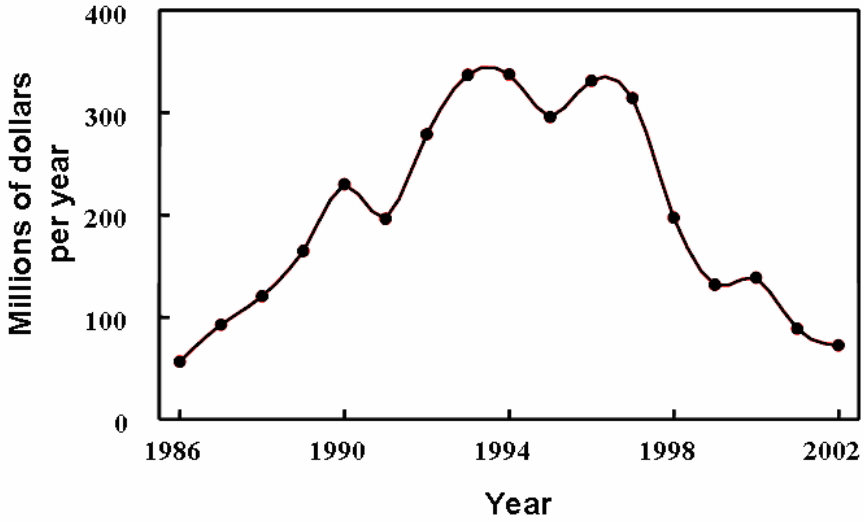


Figure 3. Income to Ohio soybean farmers from soybean varieties developed by OARDC.

One of the most striking features of this graphical depiction of income to Ohio farmers from OARDC developed soybean varieties is that the system seemed to be working very well until the mid 1990s, after which income from OARDC varieties declined rapidly. As shown in Figure 1, this decline coincided

with increased adoption of glyphosate-resistant (Roundup Ready) varieties by Ohio farmers. While most glyphosate-resistant varieties of soybeans may have some resistance to phytophthora root rot, growers planting these varieties rather than the OARDC-developed varieties with greater resistance are taking a chance that the disease will not be a significant problem in a given year. That is, phytophthora root rot is particularly a problem in clay soils when a particularly wet spring is followed by limited rainfall during the summer. Such a weather pattern occurred during the 2002 growing season, which may have accounted for the remarkably low average yield of soybeans experienced by Ohio producers that year (Table 1). Although it cannot be stated with mathematical certainty, it seems likely that if most of the soybeans planted in 2002 were glyphosate-resistant and also were genetically resistant to phytophthora and soybean cyst nematodes, then yields and income would have been substantially greater. The newly developed varieties give Ohio soybean producers that option. The Battelle report provides a model for discovering the impact of these new releases at some time in the future. That is, from the knowledge of the acres devoted to seed production and yield, the number of acres planted to these varieties can be estimated.

Until glyphosate-resistant soybeans became available in the mid-1990s, Ohio producers had increasing planted soybean varieties released by OARDC that were adapted to Ohio growing conditions, presumably because they provide greater profitability. The switch to glyphosate-resistant varieties presumably occurred for the same reason. It is reasonable to assume that incorporation of glyphosate-resistance into varieties adapted to Ohio conditions will once again result in greater adoption of these varieties and thereby increase the profitability to Ohio soybean producers.

In addition to direct income from soybean production, the Battelle report used an input / output model to calculate an additional indirect economic benefit from Ohio soybean production. For example, it was calculated that in 2002, direct sales of soybeans from OARDC released varieties amounted to $72.5 million with an additional $118.5 million from indirect sales. Together, this amounted to $191 million in annual economic output and generated 4,000 jobs in Ohio.

It should be noted that the Battelle analysis used data from 2002 simply because those were the last available. It undoubtedly underestimated the long-term contribution of production from OARDC released soybean varieties because 2002 yield per acre turned out to be substantially below that usually obtained. If, for example, the same percentage of soybean acreage (6.4%) were planted to OARDC varieties in 2003 as occurred in 2002, direct income would have been over $100 million and total economic output would have been over $250 million. With the combining of glyphosate-resistance genes into soybean varieties adapted to Ohio conditions, it can be anticipated that adoption of these varieties will once again become 35 to 40%.

It was reported by the Phase I Battelle report that soybean exports amounted to about $460 million per year over the decade of the 1990s. Many of these exports were food grade soybeans for the East Asian market, especially Japan. Media have reported anecdotes that containers used to ship automotive

parts to the Honda assembly plant in Marysville, Ohio are returned to Japan filled with Ohio food grade soybeans.

The first food grade soybean variety released by OARDC, Ohio FG1, in 1994, became increasing popular and by 2002, represented almost half of the OARDC-released varieties planted by Ohio soybean producers. The adoption rate is somewhat surprising because this high-protein variety generally has a lower yield per acre than standard field grade soybeans. There is often a premium for food grade soybeans, ranging from a dollar to as much as five dollars per bushel (identity preserved or "organic") but the usual premium often does not make up for the lower yields.

Ohio FG3 was released in 2001 because it had a higher protein content and greater disease resistance than Ohio FG1. In 2003, two other food grade soybean varieties, Ohio FG4 and Ohio FG5, were released because performance testing indicated that these had greater yields and they carried genes that made them even more resistant to root rot. It is anticipated that the improvement in protein content, yield and disease resistance will make these even more popular with Ohio producers. Quantitative data on planting rates will be available in subsequent years using the Battelle model of assessment. In that model, the quantity of seed production will be used to calculate acres planted. From the acres planted, yield, and the average price per bushel, including any premiums, can then be used to calculate the additional income to producers.

The development of high-protein varieties adapted to Ohio growing conditions had an additional, fortuitous effect. Cargill announced in the spring of 2002 that a new soybean protein processing facility would be opened in Sidney, Ohio in the fall of 2002. The plant uses a new proprietary system to first extract the oil by pressure instead of solvents which leaves the protein in its native state (i.e. not denatured). The protein is then extracted and dried to make a soybean protein isolate useful for the addition to a variety of foods. The new protein isolate, sold under the trade name of "Prolisse," is essentially tasteless and specifically is devoid of the nutty flavor previously associated with isolated soybean proteins. The bland flavor means that the product can be added to any food without disrupting the flavor of that food. Cargill stated in 2002 that the soy foods had annual sales of $1.75 billion and was growing by double digits. A Cargill spokesman stated that the reason the company built the plant in Western Ohio was because of the abundance of high-protein soybeans in the area. The production capacity, the number of employees and the payroll from this new plant is considered proprietary information and is not released by Cargill but there was information available that in 2002, the plant added about $10 million to the local economy. In any event, the plant provides a ready market for high-protein Ohio soybeans.

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

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

3. Key Theme: Plant Production Efficiency

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

a. **Description of Activity** - In 2002, OARDC released its newest tomato variety, the seventeenth since 1991. Appropriately, this latest release was named *Ohio Bicentennial Tomato* in honor of the bicentennial year of Ohio statehood, celebrated in 2003, because the history of tomato cultivation and the state of Ohio are intertwined.

Tomatoes are native to South America and from there made their way to Europe. They became popular in Southern Europe, especially Italy, during the 17th century but were not popular in Northern Europe, especially England. Similarly, in America, tomatoes were grown and consumed as early as the 17th century in the South but tomatoes were avoided by inhabitants of the Northeast, some of whom thought they were poisonous.

Alexander W. Livingston of Reynoldsburg, Ohio, is credited with the development and commercialization of tomatoes as we know them today. Until his pioneering work in the middle of the 19th century, tomatoes were commonly ribbed, hard cored and generally hollow fruit. His goal was to produce fruit that was smooth skinned, uniform in size and having better flavor. He released his first variety, the Paragon, in 1870 and in doing so established Ohio as the birthplace of commercial tomatoes, as well as the Livingston Seed Company, originally called the Buckeye Garden Seed Company. Tomatoes remain important to the Ohio economy and the state is third in the nation in the production of fresh tomatoes (behind California and Florida) and also third in the production of processing tomatoes (behind California and Indiana).

Over many years there have been continual improvements in tomato varieties available for the Ohio producer. Primary consideration must be to the production of quality fruit under the humid growing conditions typical of Ohio's summers, with good yield. Since the causative agents of the fungal diseases fusarium wilt and verticilium wilt are common in Ohio soils, it is essential that varieties used here have genetic resistance to these diseases, as well as common bacterial diseases. For fresh tomatoes, flavor and appearance, including color, shape and size are important attributes. The Ohio Bicentennial Tomato is a Roma type of tomato intended for the home gardener and is suitable for fresh consumption and home canning. It performed very well in relation to other common varieties in quality characteristics with both taste and appearance panels as well as objective measures.

OARDC also released two varieties in 2002 intended for use as processing tomatoes. Both of these mid-season processing tomato lines adapted to high population transplant culture, machine harvest and bulk handling under humid growing environments. Both are suitable parent lines for the development of hybrids used in the production of peeled, whole-canned and diced tomatoes. Both lines have exhibit excellent resistance to the fungal diseases fusarium wilt and verticilium wilt and partial resistance to bacterial spot. Yield in test plots

averaged 43.8 tons per acre over three years of testing which was greater than other inbred lines and comparable to hybrid varieties.

b. **Impact -** Fresh tomatoes, the kind that have the flavor and appearance that people like to consume in summer, do not travel well. While California and Florida occupy the number 1 and 2 spot, respectively, above the amount of tomatoes produced in Ohio, getting the good tasting tomatoes from their original home to the Midwest is a formidable task. About 10 years ago, an attempt was made to genetically modify tomatoes by inactivating the enzyme which softened the fruit when it ripened so it could be picked ripe and shipped from California across the country without damage.

The "Flavr Savr" tomato was not a commercial success but the idea of allowing tomatoes to ripen on the vine and thus develop full flavor is still desirable to consumers. Perhaps this is the reason for the remarkable increase in income to Ohio producers from the sale of fresh tomatoes over the three years from 2000 to 2002 shown in Figure 4. (The Ohio Agricultural Statistics Service does not show more recent data for tomato production.) Income from the sale of fresh tomatoes did not occur at the expense of the sale of processing tomatoes because the latter remained static over the five year period. This increase in income to Ohio producers from the sale of fresh tomatoes occurred because both acreage harvested and yield per acre increased. Unfortunately, the relevant

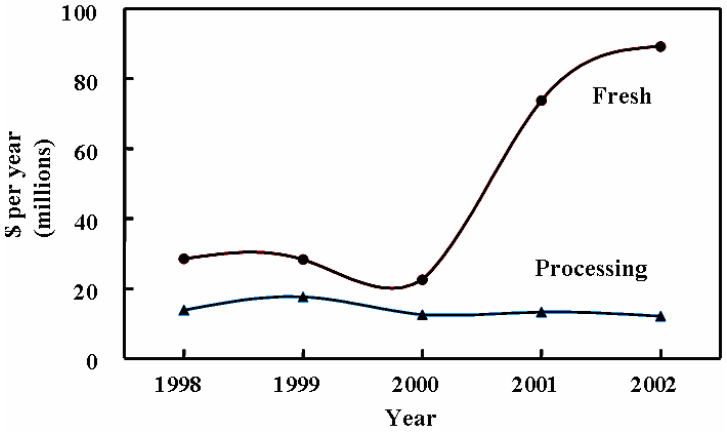


Figure 4. Income to Ohio producers from the sale of fresh and processed tomatoes for the five years from 1998 to 2002.

data (like that used by the Battelle report to calculate soybean income) are not available to determine how much of this increased productivity of fresh tomatoes can be attributed to varieties released by OARDC but industry leaders credit OARDC for developing varieties that do well under Ohio growing conditions. Tomato seed, like fresh tomatoes, do not travel well. That is, tomato varieties developed for sunny and dry California would not be expected to produce as well in Ohio because of different climate, soil, and disease pressures. It is not clear why there was such an increase in land devoted to fresh tomato production but it could be argued that producers saw an increased marketing opportunity coupled with an opportunity to obtain higher yield with new varieties.

c. **Source of Federal Funds** - Hatch
d. **Scope of Impact** – State Specific

4. Key Theme: Animal Health

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

a. **Description of Activity** - While the total value of grains and oilseeds produced in Ohio in 2002 is listed by the National Agricultural Statistics Service as about $1.5 billion, the combined value of animals and animal products sold in the same year was about $1.9 billion. With such a large income from animal agriculture, clearly a major outbreak of disease in any segment of animal agriculture would be very costly to the Ohio economy. In terms of income, the rankings of animal and animal products sold in the state are: poultry and eggs – 2nd; milk and dairy products – 3rd; cattle and calves – 5th; and hogs and pigs – 6th.

Over the past decade, Ohio has become a leading egg producing state with the second highest inventory of layers and pullets. Eggs sales added $374 million to the economy in 2003. A common poultry disease is caused by a virus, called the infectious bursal disease virus or IBDV. Some strains are highly contagious and have high mortality. Other strains result in permanent suppression of the immune system. Chickens are usually infected at 2 to 4 weeks of age and, if they survive, have such suppressed immune systems so they do not respond adequately to vaccinations which are an essential part of poultry management system. They are also much more susceptible to respiratory and enteric diseases. OARDC scientists have developed and successfully tested a vaccine effective against some strains of IBDV.

Unfortunately, there are several different strains of this virus so choosing a vaccine effective against the particular strain responsible for an outbreak has been difficult. OARDC scientists have now developed a method to determine the most effective vaccine available for the specific infectious strain. Real time polymerase chain reaction (RT-PCR) is used to compare sequence homology and thereby identify the vaccine that matches or most closely matches the nucleotide sequence of the pathogenic virus.

After poultry and egg production, the second most important animal and animal product category to the Ohio economy is dairy. The most common infectious disease of dairy cattle and the most costly to the dairy industry is mastitis, an infection of the udder. With effective control procedures for the contagious pathogens *Staphylococcus aureus* and *Streptococcus agalactiae*, Acute Coliform Mastitis (ACM) mastitis is now the most common form of environmental mastitis in dairy cows. The bacteria that can cause coliform mastitis - primarily Escherichia coli, but also various species of Klebsiella and Enterobacter - are common in dairy operations. This is because cows carry these bacteria in the intestinal tract and pass them in their manure, making it easy to contaminate the environment.

There have been a number of attempts to produce vaccine-like products but with limited success. OARDC scientists have taken a different approach based upon the nutritional requirement for iron by the infective bacteria. A milk protein, lactoferrin, is considered an anti-bacterial agent because it binds iron and thereby limits iron availability to bacteria. Even so, most iron requiring bacteria have developed a very efficient iron transport mechanism which actively transports iron, especially when it is in short supply. This adaptive mechanism involves the production of membrane proteins by the bacteria that bind and transport iron across the membrane into the bacteria. One of these iron binding proteins specifically targets ferric citrate, a chemical formed in milk by a chemical reaction between iron (ferric ion) and the abundant citrate present in milk. The basic idea behind the OARDC work is that a vaccine that inactivated the ferric citrate binding protein on the bacterial cell surface would deprive the organism of this form of iron and thus inhibit bacterial growth. Results of tests so far appear promising. For example, a vaccine produced by injecting the E. coli ferric citrate binding protein into cows resulted in the cow producing antibodies (immunoglobulin G) which was then found to reduce iron uptake by E. coli *in vitro*.

b. **Impact** - The possibility of massive disease outbreak is of increasing concern because of the recent trends of very large numbers of animals in relative small spaces. One Ohio egg producing firm is reported to be housing 12 million hens in 100 barns in only three locations. In 2003, there were 51 egg farms in Ohio with over 500,000 hens per farm. Similarly, 21% of hogs raised in Ohio in 2003 were from herds of greater than 5000 head per herd. And dairy herds have been expanding rapidly nationally as well as in Ohio. Although the average heard size in Ohio is only 51 cows, this figure is misleading because it includes a large number of Amish farms with very low census. In 2003, 26% of Ohio dairy cows were in herds of 200 or more and five Ohio farms had over 2,000 dairy cows per farm.

Even without a major outbreak, the constant disease pressure takes its toll. It is estimated that on a national basis, the cost of animal diseases to producers each year is approximately 17% of the value of animals and animal products. In Ohio, that would translate into a cost of over $300 million per year. Thus, control of animal diseases continues to be a priority of the OARDC research program.

It is generally agreed that infectious bursal disease virus (IBDV) is a major economic problem for the poultry industry world wide. Since there are so many strains of the virus which are more or less affected by the available vaccines, the discovery of a simple system to ascertain which vaccine would be most effective is a breakthrough discovery. The impact cannot yet be calculated but will eventually become apparent by reduced incidence of this potentially devastating disease.

The milk and dairy industry is important to the state of Ohio, not only because of direct milk sales ($588 million in 2003) but because it forms the basis of a large cheese industry. Cheese production in Ohio was 166 million pounds in 2003 ($1.78 per pound or about $280 million), 102 million of which was Swiss

cheese which made Ohio the number one producer of this specialty product. If left unchecked, coliform mastitis can cause severe economic losses from a number of factors: reduced milk production and quality, increased labor and treatment costs, and increased culling rate and death losses. The economic consequences of mastitis are huge, costing the U.S. dairy industry an estimated $1.5 to $2 billion annually. An effective vaccine against environmental mastitis and proper management to control contagious forms of the disease would save the dairy industry in Ohio and nationally millions of dollars annually.

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

d. **Scope of Impact** – Multi-state

5. Key Theme: Plant Health

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

a. **Description of Activity** - Phytophthora root rot, the second leading cause of soybean yield loss in the U.S., is likely the single biggest threat to soybean production in Ohio. The disease caused by the fungus *Phytophthora sojae* infection is a greater problem in the Midwest because of heavy clay soils. Heavy rains saturate the soil producing areas of standing water, providing an outlet for the pathogen to infect plant roots. The fungus grows in the roots and into the plant stem, eventually killing the plant. There are some management opportunities that reduce losses from the diseases, including: keeping fields well drained since standing water provides an outlet for the pathogen to attack the plant; tilling fields, particularly if compaction is a problem; and, rotating crops.

Still, the most effective way of reducing losses are to plant varieties that have resistance to the disease. Unfortunately the disease-causing organism is adapting to cultivars planted. In a two-year study beginning in the late 1990s, Phytophthora isolates were recovered from 82 of 86 locations in 20 counties in northwest and southern Ohio. Many of the isolates killed plants carrying six specific resistant genes (Rps1a, Rps1b, Rps1c, Rps1k, Rps3a and Rps6) found in commercial soybean cultivars. The results indicated that Phytophthora populations in Ohio are prevalent throughout fields and have adapted to those resistance genes that are found in commercial soybean cultivars. An OARDC scientist explained: "It's a normal biological process. The pathogen finds a way to adapt to keep from dying out. We've finally reached that point where the single-resistant genes that have been deployed throughout the state are beginning to lose their effectiveness."

OARDC scientist responded by studying wild germplasm soybean lines and varieties from other countries, such as North Korea and South Korea, to locate additional single-resistant genes. Researchers recently evaluated 1,015 soybean plant introductions -- varieties found in other countries -- and found 32 varieties that exhibited complete resistance. From this survey, a new gene providing almost total resistance was found in a traditional South Korean soybean

variety. The importance of the discovery was not only that the gene shows resistance to root rot but also, using molecular techniques, the gene was found on a completely new area of the soybean genome. The new position made it easier for researchers to breed the new trait into new and existing cultivars, potentially speeding up the pace of its use. Besides, the new position probably meant that the new gene, designated Rps8, hasn't been seen in U.S. germplasm lines before, which suggested a high probability that it will be effective. Indeed, studies conducted during the 2003 growing season indicate that the new gene was effective against isolates collected from 50 locations in Ohio.

This gene has now been incorporated into varieties that were developed for Ohio growing conditions, some of which also have the glyphosate-resistance gene. As shown in Figure 1, RoundUp Ready varieties have become increasingly popular with soybean producers across the U.S. as well as Ohio. The germplasm containing the gene will be licensed for breeding purposes.

b. **Impact** - Reduction in yield from Phytophthora root rot may range anywhere from five to 30 bushels per acre, depending on the resistance package in the variety and climatic conditions. If a million acres of soybeans were infected by this pathogen, that could mean a loss of $120 million for producers. The weather pattern experienced in 2002 (wet spring, dry summer) was ideal for Phytophthora and may have contributed to the lowest yield of soybeans per acre in fifteen years. With the discovery of Rps8 and the incorporation of this resistance gene into soybeans previously developed for Ohio, including varieties with the glyphosate-resistance gene, Ohio producers have the opportunity to obtain higher yields. While it is much too early to assess quantitatively the effect of the discovery and use of Rsp8, future yields of soybeans, particularly related to the use of OARDC varieties which contain the gene, can be used to determine the economic importance using the model described in the Battelle report.

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.

A number of research programs are being conducted to improve both pre-harvest and post-harvest food safety. Scientists in various departments supported by OARDC are conducting research on the prevention of Escherichia coli 0157:H7 contamination at the farm level and at the processing level. A new type of detection system using real-time polymerase chain reaction (rt-PCR) to find contamination of meat before it leaves the processing plant is being developed. Various methods of processing foods to kill contaminating organisms are being investigated. These programs have been described in previous report.

A relatively new area of investigation by OARDC scientists, again from a variety of departments, is the detection of prions, the putative causative agent of mad cow disease, chronic wasting disease of deer and elk and new variant Creutzfeldt-Jacob disease. This method depends upon the use of DNA aptamers which bind to the prion protein at relatively low concentrations. A real-time, effective detection system would substantially reduce public fear and a threat the disease poses for the cattle industry.

Smith-Lever Fund expenditures for Goal 2: $1,240,004 EXTENSION FTE's: 18.4
Hatch expenditures for Goal 2: $139,187 OARDC FTE: 1.1

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 - Spurred by recent incidences of drug residues in junior fair animal carcasses and at the urging of meat processors in the state, the Ohio Department of Agriculture now mandates all junior fair exhibitors must attend a quality assurance training session before they sell certain species of livestock through a junior fair sale. To answer this mandate county Extension educators, with the cooperation of state Extension specialists and vocational agricultural teachers work together to provide educational quality assurance programs which

meet the mandate and the needs of the consumer, and youth exhibitor.

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 processing industries. Several counties reported having no livestock quality assurance issues associated with their junior fair livestock sales in 2004. Examples of impact across the state include:

- In Union County, 1320 4-H and FFA youth learned livestock management practices relating to Quality Assurance. Pre-test and post-test data showed participants in one session improving their scores from an average of 58.7% on a pre-test to 93.4% on a similar post-test covering Good Production Practices and management principles.
- In Clark County (n=2209) project skillathon & judging scores indicated that members are proficient in project knowledge and application of knowledge. 1600 animal graded projects mastered knowledge as 85% of members received A's & B's. 1200 members attended livestock quality assurance (LQA) & pork quality assurance (PQA) programs at the club and county level to learn the importance of producing a safe food product. Thirty-three clubs used the LQA/PQA club kits to teach 739 market project members quality assurance concepts, a 60% increase in use by clubs from 2003. Post evaluations indicated that more than 95% of attendees could explain their role in producing a safe meat & milk product; could explain why quality assurance is important to the animal industry and could name the 10 Good Production Practices.
- In Crawford County, quality assurance programs were used to promote responsible use of animal health products; to avoid drug residue violations; to promote food safety; to improve management practices; to comply with guidelines from several federal agencies. Three hundred and twenty youth (100%) completed the quality assurance education program, gaining information on animal handling and care; injection sites; withdrawal times, reading and following medication labels and inserts, and ethics. Youth and adults attending the quality assurance programs learned; responsible use of animal health products; avoiding drug residue violations; promoting food safety; improving management practices; complying with guidelines from several federal agencies.
- In Jackson County, more than 300 4-H and FFA youth and over 200 parents received training in quality assurance issues regarding the raising and marketing of their junior fair animal project. Each of the youth participants demonstrated their newly gained knowledge at the required skill-a-thon activity prior to the fair and most of the parents offered very positive support for the program with many indicating they had gained new knowledge from the program.

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** - The term “mad cow disease” entered our vocabulary in 1986 when it was described in the United Kingdom (UK) as a disease of cattle but was thought not to be of danger to humans. However, by the mid-1990s, 12 people in UK had been diagnosed with Creutzfeld-Jacob disease (CJD) with symptoms similar to those of “mad cows” and all of whom had eaten beef from cows suspected of having “mad cow disease.” Within a few short years, a new disease had been identified, new variant Creutzfield-Jacob disease (nvCJD). The old CJD had been rare (1 per million per year) and was almost never found in people under 55 years, but the nvCJD also occurred in people aged 19 to 39 years.

“Mad cow disease” is also known by its scientific name, bovine spongiform encephalopathy (BSE) and is characterized by a spongy appearance of brain. The more generic term for the disease is transmissible spongiform encephalopathies (TSE). The exact cause of the disease is unknown but it is often asserted that the likely infectious agent is a type of protein, prions. But diseases are almost always attributable to either viruses or microorganisms and therefore some scientists are still looking for a “nucleic acid-based” infectious agent. There is a normal cellular prion protein (PrPc) while the disease state is characterized by an abnormal form of the prion protein (PrPSc). TSEs are thought to occur when exposure of the normal prion to the abnormal form causes the normal form to take on the structure of the abnormal prion. Supposedly the abnormal prion enters the body, and then nervous tissue, by the consumption of abnormal prions in meat of diseased animals. In the case of cows, the source of abnormal prions is thought to be meat scraps from diseased animals (e.g. sheep with “scrapie”) which was added to cow feed. The use of meat scraps in cow feed has long been prohibited in the U.S. and was banned in the UK in 2000. A case of the disease was observed in a cow in 2003 but it had been imported into the U.S. from Canada. Another TSE, prion-based disease, called chronic wasting disease, is present in deer and elk. As far as is known, this disease is not passed to domestic animals or humans but either is possible.

Even though only one case of BSE has been identified in the U.S., the cattle industry is understandably concerned that more cases would have a negative public reaction as it did in the UK and therefore adversely affect the cattle market. At present, definitive diagnosis is only possible post-mortem. An ante-mortem detection system is very much needed. Research to develop a detection system at OARDC has shown promising preliminary results.

The system is based on finding DNA-aptamers from large DNA library (1015 distinct nucleic acid sprecies) using standard methods. DNA-aptamers are segments of DNA with base sequences which bind to proteins much like monoclonal antibodies. From the DNA library, 8 aptamers were found to bind to human recombinant prion protein at concentrations of 10^{-6} to 10^{-8} M, a level comparable to monoclonal antibody detection. The aptamers also bound prion protein from brain of healthy sheep, calf, pig and deer. A grant from the Department of Defense contributed to the support of this research.

b. **Impact** - The phrase “mad-cow disease” engenders such fear that a few cases

nationwide, especially if it resulted in even one case of nvCJD, could be devastating to the cattle industry. A major problem is that at the present time, diagnosis can only be done at autopsy. A determination that a slaughtered cow had the disease could come too late for the meat to be withheld from consumers. Real-time detection of the disease prior to slaughter would obviously prevent such a scenario. The method being developed with the use of DNA aptamers could not only provide such a detection system but could also make the production of a vaccine possible. According to the present theory of disease transmission, prions consumed in feed (or food) must be absorbed from the GI tract and then transported via blood to the brain and nervous tissue. Blood as a transmission route provides the best opportunity to detect, and possibly to inactivate with a vaccine, the causative agent of the disease.

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

d. **Scope of Impact** – Multi-State

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 their 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 29 qualified instructors who are recognized by the state 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 29 qualified instructors.

b. **Impact -** This program has been in existence for Ohio State University Extension for 5 years. To date there have been 70 programs held with 721 participants in the managers course. In addition, over 40 employee trainings have been held with 760 participants. In 2004 alone, there were 354 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 92%. 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 dinning. Volunteer quantity cooks learn how to protect their clients through an extension program to train them in safe food handling procedures. The workshops held this year will benefit each of the people who eat the food prepared; thus, this program represents a train-the-trainer program that will impact many more than those who actually attend the workshops. A team of three educators teamed up with the Sysco Corporation to teach the course.

b. **Impact -** There were five Occasional Quantity Cook workshops held in 2004. There were 132 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. One Fruit and Vegetable Food Safety Workshop was 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 a creating the draft of 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, 246 people participated in the workshop. All of the participants were from an under-served group, while 100 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, responses to 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 2004.

This year, two multi-state/institutional initiatives were conducted on the topics of food safety for senior adults, and food safety for high-risk populations. To raise risk awareness and promote prevention of foodborne diseases among high-risk individuals, 22 food safety educational materials prototypes were developed.

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 2002 were Campylobacteriosis (1270), and Salmonellosis (1425). 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 2002 was $29,486,860 and $96,874,350 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 -** There were 3316 contacts made in 2004 in general food safety programming. Nearly half of these contacts (1481) were with individuals who are traditionally underserved by extension programming. A similar number of contacts (934) were with individuals who are from under-represented groups. There were 15 volunteers who assisted county educators and program assistants with food safety programming statewide. The continued emphasis on food safety in all types of programs will ensure that Ohioans will continue to enjoy safe food.

The research-based educational materials developed high-risk audiences provide useful educational tools for educators and health care providers who work with these patients and/or their caregivers. The 37 students who participated in the graduate education course on food safety for high-risk audiences gained valuable insights on the interrelationships between immune function and risk for specific foodborne pathogens as well as important lessons on how to target educational materials to specific audiences.

Summary Table

Program	# Participants	Under-served	Under-represented	Volunteers	Multi-state
Food processing and HACCP	707	12	53	8	No
ServSafe	354	37	32	9	No
Specialty Crops Initiative	246	246	100	0	No
Volunteer Quantity Cooks	132	15	15	0	No
General Food Safety	4055	1687	1056	15	Yes
Totals (wo/FNP/EFNEP)	5494	1997	1256	32	

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

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.

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.

The field of Nutrition has increasing emphasized prevention of health hazards. Programs for the prevention and treatment of the national problem of obesity are ramping up. Research for the possible prevention of chronic diseases by appropriate food choices are continuing. While there are OARDC research programs across all of these areas, those dealing with the area of nutraceuticals will be highlighted here.

One of these programs deals with the bioavailability of the carotenoid responsible for the red pigment in tomatoes. Specifically the effects of processing and the geometric forms on absorption and function are being investigated. Similarly, the bioavailability and routes of absorption of the hormone mimics from soybeans, isoflavones, are the subject of a research project. Finally, the dietary manipulation of dairy cows has been found to affect the concentration of a nutraceutical, conjugated linoleic acid, in milk.

Smith-Lever fund expenditures for Goal 3: $1,756,952 EXTENSION FTE's: 25.8
Hatch expenditure for Goal 3: $61,516 OARDC FTE: 0.7

Goal 3 Key Themes

1. Key Theme: Food Stamp Nutrition Education

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

a. Description of Activity - The FY2004 Ohio Family Nutrition Program (FNP) received $2,584,458.66 from the United States Department of Agriculture through Ohio Department of Job and Family Services to conduct Nutrition education in 73 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 Food Guide Pyramid.

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 FY2004 the Ohio FNP program reached 68,563 direct contacts and 348,549 indirect contacts. Participants received 5,251 interventions in nutrition, 1,207 in food safety, and 1,334 in thrifty food shopping. 56,272 participants indicated they learned new information and 52,641 reported they planned to make changes in their food related behaviors. 35% of the participants completing an end of class survey indicated some degree of food insecurity. Individuals reported the types of food assistance they were receiving, 36% reported using food stamps, 26% reported using WIC, 16% had family members utilizing child nutrition programs, 7% reported using commodity foods, 16% utilized local food pantries, and 6% utilized soup kitchens.

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. There is a survey tool for each objective and one for the programs that discuss a broad range of topics. The results of for FY2004 are below. Each question is listed with the mean score before the program followed by the mean score after the program.

General: n= 1073

- I use the "Nutrition Facts" on the food label to make food choices. (2.55, 3.43)
- I shop using a grocery list (2.71, 3.25)
- I eat 3 or more servings of vegetables each day. (2.96, 3.49)
- I eat 2 or more servings of fruits each day (2.95, 3.54)
- I wash my hands with soap and water before preparing the food. (3.73, 4.16)
- I run out of food before the end of the month. (2.24, 2.24)
- I use the Food Guide Pyramid to select a variety of foods (2.23, 2.99)
- I use a thermometer to check if foods were fully cooked. (1.73, 2.16)
- I am physically active (Walking, gardening, sweeping, etc.). (3.10, 3.51)

Nutrition: n=3705

- I use the "Nutrition Facts" on the food label to make food choices. (2.53, 3.39)
- I use the Food Guide Pyramid to select a variety of foods. (2.30, 3.04)
- I eat 3 or more servings of vegetables each day. (2.80, 3.40)
- I eat 2 or more servings of fruits each day. (2.85, 3.42)
- I am physically active (Walking, gardening, sweeping, etc.). (2.87, 3.34)

Food Safety: n=787

- I wash my hands with soap and water before preparing the food. (3.87, 4.54)
- 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.

(3.85, 4.44)

- I leave meat or leftovers like a casserole at room temperature for more than two hours. (3.43, 3.86)

Thrifty Food Shopping: n=692

- I plan meals ahead of time. (2.73, 3.43)
- I compare prices before buying food. (3.15, 3.84)
- I shop using a grocery list. (2.90, 3.55)
- I run out of food before the end of the month. (2.38, 2.43)

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

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

2. Key Theme: Nutrition Education – Collaboration with community agencies

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

a. **Description of Activity** - The goal of food stamp nutrition education (FSNE) is to provide educational programs that increase, within a limited budget, the likelihood of food stamp recipients making healthy food choices and choosing active lifestyles consistent with the most recent advice reflected in the Dietary Guidelines for Americans. The FSNE program works with the 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 Family Nutrition Program (FNP) partnered with another 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. They receive reimbursement for the meals they serve and their operating costs. Sponsors may be schools, units of local government, public or nonprofit private residential summer camps, 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. FY04 seven pilot counties participated, Guernsey, Greene, Logan, Lorain, Marion, Shelby, and Van Wert.

During the 8-9 weeks of the school summer break 8377 children aged from 1-18 participated in nutrition education activities conducted by the FNP Program Assistant in seven pilot counties in Ohio. Two hundred sixty-eight interactive, hands-on educational interventions occurred. The primary topic discussed was nutrition, including the targeted messages; consume more fruits and vegetables, include physical activity in their daily routines and the importance of hand washing in promoting food safety and maintaining a healthy lifestyle. Each lesson included a parent component that would extend the messages taught in the class to the child's home life.

b. **Impact** – This program resulted in 5377 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 site location and the needs of the children lessons, activities and food demonstrations were provided. Site locations included schools as part of the summer intervention programs, in nonprofit agencies, faith based agencies, in city or community parks, or in parking lots where the lunches would be dropped off by the sponsor. In some counties the FNP program assistant 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 346 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 benefit to the children. They felt the children really looked forward to the days when there were additional activities, teachers indicated 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, very willing to continue writing letters of support. Others hoped we could 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 five program assistants working with the adult phase of the Expanded Food and Nutrition Education Program reached 6,198 parents of young children. As a result, 89.8% of 5,805 '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 two percent (72%) 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). Forty five percent (45%) improved in two areas. Seventy eight percent (78%) 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 56% improved in at least 2 categories.

Seven Nutrition Educators taught 13,832 young people nutrition information. Eighty six percent (86%) of 1523 selected youth surveyed report that as a result of the information learned in the program, they eat a greater variety of foods, and 93% of 3,229 selected youth reported an increased knowledge of nutrition.

Thirty five program assistants working with the adult phase of the Expanded Food and Nutrition Education Program reached 6,198 parents of young children. As a result of the food safety education taught to them, at graduation 57% of homemakers showed improvement in their food safety practices (thawing and storing foods properly).

Seven Nutrition Educators (5.7 FTE) taught 13,832 young people food safety information. As a result of this teaching 81% of 1523 selected youth reported improved food safety and preparation practices.

Cooperating agencies, organizations and local OSU Extension offices contributed nearly $150,000 in support of education of low income parents of young children through EFNEP.

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

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

4. Key Theme: Nutrition Education - Dietary Guidelines/Weight Management

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

a. **Description of Activity –** Research indicates that high numbers of Americans are not eating right. The number of Americans who are overweight or obese has risen dramatically. High numbers of children and youth are overweight. A healthy diet has been shown to decrease the risk of cancer. Proper nutrition is necessary for growth and development. Nutrition education is important in helping Americans to learn to eat right. By educating people on the nutrients necessary for them, they will be healthier and feel better. Goal for these programs were various including: teaching the food guide pyramid, and adopting eating and lifestyle behaviors that are consistent with the Dietary Guidelines and the Food Guide Pyramid.

b. **Impact** - Forty eight (48) counties reported conducting nutrition education programs for adults and youth who were not a part of the Expanded Food and Nutrition Program or Food Stamp Nutrition Education Program. Of the 18,416 participants attending these programs, 10,286 reported gaining new knowledge, 4286 planned to adopt at least one nutrition recommendation, and 3288 actually adopted at least one nutrition recommendation. Examples of impact across the

state include:

- In one county 986 participants applied their gained knowledge from the Dietary Guidelines to reducing the amount of sodium, fat or sugar in their diets.
- In another county, where 18 different nutrition education programs were offered to local participants, 99% indicated that they learned something new and 99% planned to adopt one or more of the recommended practices. Practices identified most often included exercising more, making healthier food choices, and watching portion sizes. A pre- and post- test of 4th graders following a 5 day food and nutrition education series found a 279% increase in nutrition knowledge.
- The Dietary Guidelines message was the topic of newsletters, newspaper columns, and radio programs in most of Ohio's 88 counties. Personal phone calls to the county Family and Consumer Science Educator resulted in over 2000 phone consultations on the subject.
- Four thousand one hundred forty two (4142) people in 28 counties participated in Extension programs that promoted the specific Dietary Guideline to increase physical activity. Two hundred ninety six (296) people reported that they learned something new, 639 planned to make recommended changes, and 1934 adopted recommendations, primarily by participating in OSU Extension and Parks and Recreation or county Health Dept. sponsored walking programs. Newsletters, newspaper columns, and radio programs were also used to broadcast the physical activity message.
- The Lorain Co. Walks Collaboration and the Ashtabula Co. Walks Coalition saw 1780 and 300+ participants respectively in their programs increase physical activity.
- Weight management was the Dietary Guideline emphasized in programs in 6 counties. Eighty (80) participants worked hard to manage their weight, with all reporting that they learned something new. Seventy two (72) reported plans to adopt at least one of the recommended practices, and 49 actually did. At the end of an eight-week session in one county the 24 participants lost an average of 5.5 pounds and understood how the BMI relates to a healthy body weight; 79% chose food differently based on the Volumetric principles, 89% learned a new healthy lifestyle that can be followed for life and have a positive attitude about losing weight, 99% learned to use nutrition labels to choose nutritious low-fat, low calorie and low energy-dense foods. Adults and youth learned how to make gradual changes that will last a lifetime and develop habits for a happy and healthy life. One participant stated "liked the flexibility the plan offered" After two years, 75% were using the Food Guide Pyramid to plan their menu, 81% were reading and using the nutrition labels to plan their menu, and 82% were modifying their recipes to make them more volumetric; 69% were doing aerobics 3 times per week and 54% were doing strength training.

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** - In 2004, 22 of 88 counties in Ohio offered Dining with Diabetes instruction to their county residents. Two counties have done the initial planning, anticipating training in early 2005. Over 1060 participants attended Dining with Diabetes workshops. Seven hundred eighty eight (788) people reported that they learned something new as a result of attending the workshops, and 643 planned to adopt one or more recommended practices. Follow-up evaluation of some individuals indicated that at least 472 people adopted one or more recommendations.

Selected evaluations brought these results:

- In one county, at least 82% (of 126) stated they were considering portion sizes when making meal selection. At least 55% increased their use of the Nutrition Facts label to plan their meals and 45% were using more herbs and spices instead of salt. At least 75% of the people planned to make improvements by eating more fruits, vegetables, and whole-grains. Three of 8 people in one county program reported understanding the role of calcium and dairy products in the diabetic diet.
- 100%(16) of respondents in one county correctly answered a question on the post-test about what foods raise blood sugar levels while 50% answered correctly on the pre-test. Regarding a question about using the portion of the plate occupied by a specific food to evaluate meals, 100% answered correctly on the post-test while 62% answered correctly on the pre-test. 100% responded that they now use the Nutrition Facts label frequently or always to plan meals compared to 50% on the pre-test. When asked about controlling carbohydrates, 75% stated that they now do so frequently or always compared to 57% on the pre-test. Participants indicated that they learned how to count carbohydrates rather than sugar grams, and how to use sugar substitutes to produce palatable foods.
- In one county, 5 of 13 participants indicated they were eating fried foods less often, 4 of 13 indicated they had increased their vegetable and fruit consumption and 5 of 13 were eating 3 servings/day of dairy products more frequently. Seven (7) of 13 were considering portion sizes of foods when eating and 6 of 13 were controlling their carbohydrate intake and using the nutrition facts food label for food purchasing more often than they previously

had.

- In another county fourteen (14) of the twenty (20) participants completed pre and post-tests. Participant knowledge about nutrition and healthy cooking improved. Paired t-test confirmed that mean knowledge scores significantly ($p<.05$) improved by 1.2 points. Participants averaged 6.5 out of 11 points on the pre-test and then 7.8 out of 11 on the post-test. Self-reported behavior change related to healthy eating improved from pre to post-test. 67% demonstrated an improvement in overall healthy eating. Out of 42 points on the healthy eating index, the mean pre-test score was 30.3 as compared to 32.1 at post-test (paired t $p<.1$). At the end of the series of classes, participants were also asked to write down what they had learned or something that surprised them. Qualitative themes that emerged from participants' responses include: 1. Individuals were surprised to learn what serving sizes really looked like. 2. Individuals learned that all foods could be included in a diabetic meal plan. 3. Low-sodium, low-fat low-sugar recipes actually taste good! 4. The role of carbohydrates on blood-glucose levels. 5. Poly and mono-unsaturated fats are more heart-healthy than saturated fats.
- One Ohio county addressed the diabetes-health-nutrition connection from a slightly different perspective. That county held its second Diabetes Health Fair attended by approximately 150 people. The day included 10 educational classes, 3 cooking classes, 20 manned displays and free foot exams, blood pressure, cholesterol and hemoglobin A1c testing. In addition the FCS Educator and Registered Dietitian conducted one "Strategies for Success: Living Well with Diabetes" full day seminar, attended by 7 people; and the FCS Educator spoke to two lunchtime groups. As a result of these sessions 205 people reported learning new information.

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

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

6. Key Theme: Human Health

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

a. **Description of Activity** - Over the past several years, it has become apparent that food is more than simply a source of required nutrients. In addition to the well known nutrients (vitamins, minerals, protein, carbohydrate, fat and fiber) who's physiological and metabolism are well established, food contains other chemicals which can have physiological effects and may promote health. These substances have been given the general name of "nutraceuticals."

One class of these nutraceuticals and perhaps the best known, are antioxidants. While oxidative metabolism is essential for life because it is the mechanism which forms useful cellular chemical energy, ATP, excess oxidative capacity can damage cellular constituents. In fact, two to three percent of the oxygen we breathe becomes a highly reactive oxygen species, "super oxide." While we have enzyme systems (e.g. super oxide dismutase) and endogenous antioxidants to inactivate this pernicious form of oxygen, some remains to do

damage. Usually the damage is to polyunsaturated (i.e. two or more double bonds) fatty acids to form "free radicals." Damage of the nucleic acids in DNA by these free radicals can lead to mutations and, in some cases, this can lead to cancer. Oxidation of fatty acids in a lipid carrying particle in the blood stream (low-density lipoprotein or LDL) can prevent removal of the damaged particle from blood by the liver. It is thought that this "oxidized LDL" left in blood can damage the artery wall, leading to atherosclerotic plaque and heart disease. Thus, antioxidants coming from the diet which prevent these types of damages are thought to reduce the risk of cancer and heart disease, respectively.

There is no doubt that foods contain antioxidants but these are not necessarily of physiological benefit. Food scientists often measure the "total antioxidant capacity" of plant material *in vitro*, usually with one of three methods. Such studies have demonstrated that plants contain literally hundreds of antioxidant chemicals but it has also been established that only a relative few of these constituents are actually absorbed into the blood. Only those constituents that are absorbed and biologically available are physiologically beneficial. Thus, the study of bioavailability of antioxidants is essential to understand which of the numerous plant antioxidants are useful and, more importantly, how to increase their bioavailability.

It is well established that processing often improves the availability of some nutrients. For example, carotene is 7 to 14 times more absorbable from cooked compared to raw carrots. Epidemiology studies indicate tomatoes are much more effective in preventing prostate cancer when they are processed before consumption than when they are consumed as fresh tomatoes. Presumably it is an antioxidant, lycopene (the red color compound in tomatoes) that is protective which suggests that heating / processing affects the absorption of lycopene. Work at OARDC has used both artificial digestive systems and human clinical trials to study the factors involved in lycopene absorption and metabolism. OARDC scientists found that the geometric form of lycopene is all-trans in both fresh and processed tomatoes but is partially converted to the cis-form during or after absorption. OARDC horticultural scientists, working with the project, have genetically modified a tomato variety to contain higher levels of lycopene.

A second type of nutraceutical which has drawn research attention is hormone mimics or homone blockers. Soybeans contain a family of estrogen-like chemicals which apparently can do both. This class of compounds is called isoflavones and the chemical genistin is a representative. Some research indicates that these isoflavones can relieve some symptoms of menopause by acting as an anti-estrogen (i.e. blocking normal estrogen interaction with its receptor) while other research indicates that isoflavones can increase bone health by acting like estrogen itself. This ability to act as both an inhibitor of and substitute for estrogen is shared by the anti-cancer drug tamoxifen, used to treat breast cancer. It appears that in some tissue, isoflavones attach to the estrogen receptor, thereby preventing the endogenous estrogen from binding so the isoflavone is acting as an anti-estrogen. In other tissues, the isoflavone can bind to the estrogen receptor and trigger the sequence of events as if estrogen had been bound.

Work by OARDC scientists using human subjects and pigs with ileal cannula showed that the majority of isoflavone absorption occurred in the small

intestine although bioactive metabolites are formed by bacteria and absorbed from the large intestine. Further studies on the interaction of soybean and tomato products showed that isoflavones from soy did not interfere with the absorption of lycopene.

A third type of nutraceutical is a variant of a normal essential fatty acid called “conjugated linoleic acid” or CLA. Unlike most nutraceuticals which come from plants, the best source of this particular one is milk and dairy products. In fact, CLA and its precursor forms come from bacteria that inhabit the rumen of dairy cows. Work by others indicates that CLA may be protective in animal models against some types of cancer. CLA may also be a “nutrient partitioner” which increases lean muscle mass and promotes weight loss in animal models. Given the apparent health benefits, work at OARDC was designed to determine dietary regimens which can increase the concentration of CLA and its precursors in milk. Allowing cows to pasture feed increases CLA content of milk. It can also be increased by manipulation of the fat content of the cows diet with grains, fish oil and calcium supplements.

b. **Impact** - The basis for the recommendation that Americans increase consumption of fruits and vegetables is that these foods contain nutraceuticals beneficial for health. However, the number and quantity of fruits and vegetables to be consumed on a daily basis appears to be far greater than most people want to do. Three possibilities form the basis of much current research. The first is that the protective ingredients be found and made available to the public in a concentrated form but it may be a mixture, not a single ingredient that is protective. A second possibility is fruit / vegetables be concentrated (e.g. freeze drying) so that more could be consumed but this may result in the consumption of more calories, a prospect that most Americans do not need. A third possibility is increasing the amount of a nutraceutical in a food and improving the amount of specific nutraceuticals absorbed from each food, that is, bioavailability.

Results from the research with dairy cows will form the basis of formulating practical feeding regimens to increase the CLA content of milk. Milk has many nutritional benefits and the increase in nutraceutical content would make it a more desirable food.

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

d. **Scope of Impact** – Multi-state

Goal 4. Greater Harmony between Agriculture and the Environment

Executive Summary

Ohio, being both an industrial and an agricultural state has obvious opportunities for pollution of the environment, especially creating problems with water quality. This report highlights two of the many research programs dedicated to improvement of the environment. One of these programs deals with the clean-up of industrial waste and the other deals with a long-term program designed to return a polluted stream back toward its previously pristine condition.

The industrial waste project has discovered that an inexpensive agricultural chemical, diammonium phosphate, will bind and thereby prevent the leaching of cadmium and zinc into ground and surface water. The cost of this method of amelioration of the problem is 300 fold less expensive than the removal and refilling of contaminated areas.

In 1998, the Sugar Creek watershed was determined by the Ohio Environmental Protection Agency (EPA) to be the second most degraded watershed in the state. OARDC scientists, in partnership with farmers and other community members in the area have initiated a program to reverse some of the degradation. A grant from the Ohio EPA was used to subsidize the construction of exclusion fencing to exclude cattle from streams to prevent fecal and therefore coliform bacteria contamination. Likewise, farmers were subsidized to plant cover crops to reduce soil erosion and deposition of soil into streams. More importantly, the partnership program has created a sense of self-empowerment solve their own environmental problems.

Technology for the composting of sewage sludge has been successfully converted to a plant in the Akron, Ohio area which converts sludge into a composted additive for gardeners. Of even greater value to the Ohio economy, tree bark has been successfully converted to potting soil which is naturally disease resistant. This saves millions of dollars in the production of nursery stock and is credited by leaders in the nursing industry with being the basis for the remarkable expansion of the nursery industry in the state.

Another 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.

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: $1,285,599 EXTENSION FTE's: 18.6
Hatch expenditures for Goal 4: $1,197,515 OARDC FTE: 10.2

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** - 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.

b. **Impact** - The Third Annual Manure Science Review (MSR) program reached over 350 animal producers, agency and private consultants dealing with animal manure issues. 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.

Ohio Compost Operator Education Course combines research and engineering knowledge to deliver an educational course on the science and art of composting, including composting principles, site design, facility operation, feedstock selection, equipment, operational management, as well as health, nuisance and environmental issues related to large-scale composting. Twenty-five individual were certified and received continuing education credit for wastewater certification and registered sanitarians in 2004. Participants receive continuing education credit for wastewater certification and registered sanitarians

As animal production, especially large scale CAFOs, increases, awareness

of air quality issues pertaining to human and animal health as well as quality of life issues arise, and are becoming a major concern. Recently increased public concerns and environmental regulation have created a major challenge for the viability and growth of livestock industry. The management of aerial pollutants is a major issue that the animal sector will have to face. A systematical approach to address air emission and air quality issues associated with animal feeding operations is underway. Currently this program focuses on aligning OSU faculty expertise, and the establishment of base-line agricultural air emission and air quality parameters, scientifically. A 2005 Air Quality Conference has been planned.

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 2003. 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** – CNMP developed through private consultants is costing Ohio producers in excess of $4,000 per plan. LEAP, Level 2 saves producers money by helping them compile and organize the necessary data to complete a CNMP. It is expected that organized data will reduce the time required to develop and certify a completed plan. This multi-agency and interdisciplinary program has trained more than 160 professionals who work with livestock, dairy, and poultry farmers. In addition to helping protect the environment and natural resources, this program will save livestock, dairy and poultry farmers as much as $5,000 by developing their own CNMP.

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

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

3. Key Theme: Water Quality

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

a. **Description of Activity** - Ohio is an agricultural state where the production of food and fiber is a major industry. At the same time, it is a highly populated state with a relatively high water table. The production of agricultural and forestry products are aided considerably by the plentiful supply of clean water but the high water table means that contaminants from communities and industries can rapidly move into Ohio's ground and surface water.

Historically agriculture, forestry, and many other industries, as well as communities, have added contaminants to the soil and water. Many of those contaminants still persist today. In addition to trying to mitigate the impact of today's waste stream, scientists are seeking ways to mitigate past impacts. Cleaning up of contaminated sites to insure a clean supply of water for both industrial and public use is critical.

Scientists at OARDC are evaluating biosolids and other residuals on trace element retention / release / mobility in soils. Research is focused on the use of biosolids for soil augmentation and the mitigation of impacts from both present and past trace elements. Given that 98% of Ohio's rural domestic water supply

and 45% of its total water supply are from groundwater, such studies are crucial. Food and agriculture systems are dependent upon a clean water supply. Thus, water quality is central to the social, economic and ecological health of Ohio

Methods for the inexpensive on-site (*in situ*) treatments of contaminated soil are in high demand given the economic costs of excavation and land filling of these soils. Land excavation and filling also has social and political costs. Even those agricultural contaminants that are historic in nature are often tied in public perception to the food and fiber industry of today.

Three chemical immobilization materials, agricultural limestone (AL), mineral rock phosphate (RP) and diammonium phosphate (DAP), were evaluated. Solute transport experiments were used to determine the ability of these agents to reduce heavy metal transport in contaminated soils. Of the three, DAP was by far superior in that it reduced zinc by more than 77% and cadmium by more than 91%.

b. **Impact** - These studies have shown that diammonium phosphate (DAP), an inexpensive phosphorus fertilizer commonly used for crop production has the ability to bind and immobilize heavy metals in contaminated soils and thereby protect ground and surface water. This *in situ* treatment of contaminated soil with DAP is estimated to cost only $2.50 per square meter down to a depth of 60 centimeters. The cost of excavation and land filling to the same depth is about $730 per cubic meter. The reduction of costs by a factor of 300 is obviously significant and there are also savings in terms of infrastructure (e.g. roads used in hauling) and social impact costs.

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

d. **Scope of Impact** – Multi-state

4. Key Theme: Ecological Based Management

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

a. **Description of Activity** - In 1998, the Ohio Environmental Protection Agency determined the Sugar Creek watershed to be the second most degraded watershed in the state. The Ohio EPA identified four problems: 1) stream sediments from soil erosion and channelization; 2) Riparian habitat destruction leading to decoupling of natural carbon cycles; 3) excessive nitrogen (N) and phosphorus (P) loadings; and 4) high levels of fecal coliform bacteria. The report identified agriculture as a principal source of degradation, and the watershed was one of the first to undergo Total Maximum Daily Load (TMDL) planning in Ohio for the purpose of reducing nutrient (principally N and P) inputs to streams that degrade downstream options, and ultimately impact the Gulf of Mexico.

A stakeholder watershed alliance of farmers, OARDC and agencies was formed in response to the Ohio EPA's selection of the Sugar Creek as a target for planning and restoration. Farmers, other land owners, municipalities and industry within the watershed, faced with costly corrective measures to meet EPA regulatory water quality standards, proactively, took the opportunity to improve

their environmental quality and resource base while creating a model system for community wide response to a major environmental issue.

For four years, an interdisciplinary team of OARDC scientists has been developing a research and education framework for redesigning agroecosystems in the Sugar Creek watershed. The research objectives have emphasized: 1) community based organizations that lead to effective water quality improvement; 2) models of effective conservation improvement that can be replicated in other Ohio watersheds; and 3) methodology to benchmark water and habitat quality. The goal of the work continues to be the understanding of key social and environmental components of complexity in this watershed, and refinement of a conceptual model for linking human and environmental systems directed toward watershed restoration.

In October, 2002, the Ohio Environmental Protection Agency awarded $4.4 million for local watershed efforts throughout Ohio. The OARDC research team received an award of $474,978 for the Sugar Creek project. The grant was designated to address best practice management practices including exclusion fencing, conservation tillage and pasture management. From those and matching funds from OARDC and other sources, the research team has established a program to help farmers in the watershed area to fence streams to exclude cattle. Qualified farmers are reimbursed 60% of the cost of commercial fence installation or, if the farmer chooses to provide the labor, the materials are furnished. An additional program for the Sugar Creek watershed farmers it that the planting of cover crops are underwritten. In this program, qualified farmers are paid $15 per acre for planting cover crops which can cut wind and water erosion as well as enrich the soil.

b. **Impact** - The exclusion fencing has reduced the coliform bacteria in streams and the cover crop program, began this fall, will undoubtedly reduce soil erosion into streams. These are two of the four reasons why the Ohio EPA found the Sugar Creek watershed the second most degraded watershed in the state.

The cumulative economic benefits are multiple. For example, a Winesburg based Alpine Cheese nutrient trading permit to lower environmental pollution in the Sugar Creek Watershed has been negotiated and will allow plant expansion. The expanded plant facility will create 12 new jobs through increased production. To be phased in between 2005 and 2006, the plant will process approximately 900,000 pounds of milk per day — 250,000 pounds more per day than in 2004. Ninety-five percent of this milk will be Ohio-produced Grade A Class III milk, valued at $14-15/cwt to the producer. This increase in local milk usage amounts to $36,000 per day or the equivalent production of 126 small diary farms each with 40 cows. The amount of Jarlsberg Cheese produced will be a 25,000 pounds/day increase and will retail for $6-10 per pound ($200,000/day). The phosphorus to be reduced by the farmer’s conservation measures is valued at $800,000 over 5 years, the difference between the cost of a filtering system to reduce the P to 1ppm and the cost Alpine Cheese will pay the farmers.

The pollution remediation of the Sugar Creek project adds value to local farm production and local community health in many forms. While it may require a number of years to calculate the additional economic value, the social returns of a community being self-empowered to address it’s own environmental problems

while continuing to be productive is already evident by actions taken to date.

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

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

5. Key Theme: Forest Resource Management

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

a. **Description of Activity** - The Forest Resource Management program once again offered landowner classes through the Ohio Woodland Stewards Program. State Specialists, Extension associates, regional specialists and county educators offered 19 classes across the state in 2004. The program also published 3 editions of the program's newsletter, 'Ohio Woodlands, Watersheds and Wildlife'. The web page for the program saw over 30,000 visitors who stayed an average of 3.5 minutes. Under the Ohio Woodland Stewards Program umbrella is also the forest wildlife course COVERTS – a one time, multi-day class that instructs interested woodland owners on managing their forests for wildlife. This program also saw 29 new graduates.

Included in the 2004 programming efforts were a Tri-State Woodland and Wildlife Workshop. Ohio, Michigan and Purdue Extension along with DNR's from Indiana and Ohio participated while the workshop itself was held in Bryan, Ohio. The workshop had 160 attendees and a dozen vendors participate. In late 2004 a group from the Tri- State area also was working on putting together an Emerald Ash Borer workshop for both woodland owners and homeowners in April of 2005.

Three pesticide applicators courses were also offered through Ohio State. These sessions were attended by about 345 people.

b. **Impact** - There were around 475 participants in 20 classes conducted by the Ohio Woodland Stewards program in 2003. These participants, 75% of whom were first time attendees, represent nearly 12,500 acres of privately owned forestland across the state.

- The participants in these programs indicated that the information would be put to use and shared with others in their professional lives as consulting foresters, OSU Extension staff, property managers for parks and arboreta, wildlife rehabilitation people, and schoolteachers.
- The participants in the Tri-State programming efforts came mostly from Ohio but represented woodland owners from Ohio, Michigan, Indiana, Missouri, West Virginia and New York.
- The attendees of the Tri-State Woodland and Wildlife Workshop indicated that they felt somewhat better able to manage their woodland after attending this workshop. In the early part of 2005 a follow up survey will be done to those who attended.

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

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

6. 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 hobbyists, 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 their desire to receive information and participate in OSU Extension programs.

b. Impact –

- 338 commercial maple producers in Ohio and 125 commercial maple producers in Massachusetts received in-depth training on various aspects of maple production.
- 130 potential and small scale producers in Ohio received training on the fundamentals of maple product production and marketing.
- Several OSU Extension and non-Extension faculty have undertaken an extensive survey of the Ohio maple industry to identify its demographics, production and marketing practices, and information needs. The results of this surveyn will be invaluable in developing future educational programming and publications to serve that industry.
- 90 Christmas tree growers in Ohio received in-depth training on various aspects of Christmas tree production.
- 240 Christmas tree growers from around the country learned the latest production techniques for Canaan fir, a relatively new Christmas tree species, the development of which is supported by extensive research at The Ohio State University.
- 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 has been a persistent and consistent theme from both the executive and legislative branches of the Ohio government. Indeed, the budgetary support from the state government has been relative flat or negative for the past few years except that additional funds were appropriated to OARDC specifically for support of economic development programs. As a response, OARDC has initiated a program under the title of food and agricultural technology commercialization and economic development (ATECH) which is designed to maximize the commercialization of OARDC research discoveries. In addition, OARDC has established an agricultural research park to attract start-up companies to exploit scientific discoveries. Funding from the state of Ohio anticipates that these initiatives will enhance economic development in the state.

Since ATECH has just begun, the impact has yet to be determined. The Battelle report did highlight one research area which can clearly be credited with economic expansion in some of the economically deprived areas of the state, namely the wine industry. In partnership with industry and the Ohio Department of Agriculture (ODA), the wine industry in Ohio has enjoyed resurgence, fueled by research programs at OARDC, educational programs from Ohio State University Extension and marketing programs of the industry and (ODA).

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: $5,247,142 FTE's: 79.4
Hatch expenditure for Goal 5: $341,725 OARDC FTE: 3.1

Goal 5 Key Themes

1. Key Theme: Economic Development

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

a. Description of Activities - The Battelle report describes the resurgence of the wine industry in Ohio and shows how this resurgence has provided an economic boost to the Southern and Northeastern portions of the state. These areas of the

state have had economic difficulties in the past few years due to dramatic reductions in the coal and steel industry.

Ohio has had a long but checkered winemaking history. In 1820, Nicholas Longworth planted the firt Catawba grapes in the Ohio River Valley. This domestic variety was hearty enough to stand Ohio's winters and produced a light, semi-sweet wine which was different from the strong wines of the day. By 1860, Ohio led the nation in wine production. But crop diseases, such as black rot and mildew, began to be a problem for growers and the Civil War left them short of man power. As the Southern vineyards were lost, a new growing area developed in the Lake Erie Islands. The surrounding lake buffered the temperature which provided a longer growing season and also insulated the vines from spreading diseases. The wine industry flourished until Prohibition.

The Ohio wine industry remained dormant until the Ohio general assembly established an Ohio Grape Industries Center in 1981. The Center was a consortium composed of OARDC, the Ohio Department of Agriculture and representatives from the grape industry. The purpose of the Center was to support research and marketing, financed by an excise tax on all wines sold in Ohio. Research at OARDC was supported in the areas of enology, entomology, pathology and viticulture. Research is conducted at Columbus and Wooster as well as a dedicated Grapes Research Facility in Northeastern Ohio. The Grape Research Facility has made significant contributions through:

- Identifying appropriate juice, table, wine cultivars for the climatic and soil conditions of the state;
- Conducting research to enhance grape quality through studies of rootstock-scion interactions, chemical growth regulators, plant nutrition and general viticulture practices; and
- Conducting research on cold hardiness and other characteristics to help enhance grape production in the state.

b. **Impact** - The Ohio wine industry has expanded from only 37 wineries in 1997 to 80 in 2003. Grape production continues to increase from 5,800 tons in 2002 to 8,100 tons in 2003. According to statistics from the Ohio Department of Agriculture annual report for 2003, the value of grapes from Ohio farms was $2.79 million, an increase of 18% over 2002. The Battelle report estimates that the wine industry in Ohio in 2002 represents $70 million in new growth value, with another $10 million in the production of grape juice. Ohio wine country is also attracting tourists, especially in Amish areas. This economic engine for Ohio is not only important because of the amount, it is even more significant that the economic development is occurring in the parts of the state, i.e. the Northeast and South, that have become economically depressed because of loss of coal and steel industries.

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

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

2. **Key Theme - Jobs/Employment**

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

Being)

a. **Description of Activities** - Community Development Program Areas work in economic development issues is centered on working in partnerships to create and enhance economic opportunities. Fifteen full-time Community Development Educators, five Program and Research Assistants and many dual-program Extension Professionals contribute to this effort. Work reported includes tourism development activities, retention & expansion programs, attraction of businesses, downtown revitalization, economic analysis studies, small business planning and training, farm financial planning, job preparation skills and assistance to local economic development boards.

b. **Impacts** - Educators reported assisting local communities in the creation or retention of nearly 574 jobs. Local economic development assistance helped existing businesses ranging from downtown revitalization efforts to a $20,000,000 in new property investment in one county through incentives programs. The use of a $980,000 grant program assisted to build stronger businesses in Appalachian Ohio. Financial planning seminars helped farm based businesses better manage their financial resources leading to successes such as a $250,000 dairy expansion and another operation find $26,000 saving in interest payments. Assistance provided to nurseries in the development of tree liners lead to the establishment of two Ohio nurseries initiating production.

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

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

3. Key Theme: Community Development

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

a. **Description of Activities** - Community Leadership: Elected local government officials often take office without any formal training for the leadership responsibilities they assume once in office. Most elected officials have received on the job training as they have worked their way through community civic and political processes. However, once in office they are faced with a number of challenges relating to the way they conduct themselves in office. Extension Educators and Specialists have developed a number of programs to help local elected officials gain leadership skills, understanding of planning methods and awareness of community issues. Programs include Appreciative Inquiry Methodology, the Ohio Local Government Leadership Academy, custom designed programs in regional planning and technology development.

b. **Impact** - Each program was very successful based on common feed back from participants. Structured and customized Elected Government Leadership programs indicated approximately 292 existing and potential officials gained awareness of their responsibilities and legal requirements for discharging their duties, gained knowledge regarding technology issues for communities, regional planning duties and confidence to run for office. The Appreciative Inquiry training provided approximately 178 participants with a new method to involve

residents in creating strong communities based on asset based strategies.

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

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

4. Key Theme - Community Development

(Reference OSU Plan of Work Extension Programs 5F: Community Development and 5H: Land Use Issues)

a. **Description of Activities** - Land Use Issues: During the calendar year 2004, Extension Educators and specialists assisted public officials, community leaders and the general public dealing with land use issues. Educational workshops were held regarding zoning and planning tools. Information was provided on land use planning and farmland preservation tools such as conservation easements. Comprehensive Land Use Plans began in 2002 and 2003 and were completed in 2004 and additional programs began.

b. **Impact** - Attendance at various information sharing meetings held on land use issues was over 1100 people. The Land Use Tools Team continued to provide training for residents and officials throughout Ohio. Of particular interest is the Hamilton County program that moved Extension's Land Use training into a major urban area. The program also provided 109 hours of continuing education credits for real estate and development professionals.

The creation of comprehensive land use planning projects in Carroll, Van Wert, Champaign, Tuscarawas and Coshocton Counties, plus the City of Kent. Coshocton County's Plan progressed to a draft stage and is being reviewed for changes and additions. Van Wert has organized and began their planning process. The Carroll and Kent processes are focused on sustainable development concepts. Carroll County's plan was written and awaiting public hearing remarks. The City of Kent's plan has been adopted by the City Council. Kent's plan brought together the local university and the city in determining strategies for downtown revitalization efforts. In addition agreement was reached on development priority for a crucial site that is following wise environmental planning to protect neighboring conservation and preservation sites. Comprehensive Land Use programs also have begun in Fayette, Madison and Morrow Counties as well as Marietta Township 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

5. Key Theme - Community Development

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

a. **Description of Activities** - Public Issues Education: Seven sessions on Land Use and Zoning issues and 2 sessions on Biotechnology and Food were conducted

across the state during 2004

A Civic Engagement Institute was conducted with collaborative from universities in Ohio and Kentucky. The Moderator Training sessions consisted of assistant participants in learning how to:1) consider alternative choices to problems, 2) weigh the pros and cons of each choice and 3) identify common concerns around these choices. Participants learned the basic concepts behind deliberation including citizens as primary actors, making trade-offs, choicework, public judgment, and common ground for action.

b. Impacts - An emerging public issue in Ohio's land area is quickly becoming urban and suburban centered. Because of work in land use issues, an emphasis on smart growth policies has been targeted. In 2003 a resource guide on land use issues was created. In 2004 public forums on this topic began and will continue into 2005. Legislators and other community leaders have access to the surveys conducted in conjunction with these forums.

Citizens are becoming active in the zoning and land-use planning issues in the state. A second public issues program involves citizens deliberated public policy options concerning biotechnology and its effects on our food, health and environment in a public forum. The goals of the forum were to involve local citizens in a public discussion of agricultural and food policy, and gather the thoughts shared to make them available to decision-makers. Results were then shared with public officials in their respective communities.

The Civic Engagement Institute was a joint collaboration involving Ohio State University Extension, University of Kentucky Cooperation Extension Service, Xavier University, Northern Kentucky University and Northern Kentucky Public Policy Forums. Over 68 participants were trained in becoming a moderator and how to convene a forum. Practice forum on "Terrorism" and "Examining Health Care" were used to guide participants. Using materials provided by the National Issues Forum (NIF) workshop participants learned how to moderate a deliberative meeting with a goal of helping the group find common ground. At the end of the training, citizens would be able to deliberate forums, learn and facilitate the concepts that support the value of deliberation, and practice moderating a deliberative meeting. The Institute was attended by those working in government and politics, schools boards, law enforcement, civic literary groups and college students. Over 15 counties in both Kentucky and Ohio were represented.

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

d. Scope of Impact - State Specific

6. 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. Programs of particular note include the creation of a statewide Ohio Byway Marketing Plan and the Agri-

Tourism Training Workshop.

b. **Impact** - A statewide marketing plan for Ohio Scenic Byways was completed for the Ohio Department of Transportation in cooperation with Ohio Byways Links including seventeen byways. The plan is moving into the implementation phase where key market strategies will be funded. In addition Extension Educators in three counties provided educational assistance that led to the submittal of three additional byway corridors for state consideration (currently awaiting approval). The agri-tourism emphasis lead to two workshops to provide educational information to better the agri-tourism experience and to give the details of what one needs to do if they are thinking of starting an agri-tourism business. 120 participants attended these workshops.

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

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

7. Key Theme - Farm Safety

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

a. **Description of Activities** - The Farm Safety Day Camp program is a partnership between OSU Extension and the Ohio Farm Bureau; statewide sponsors include Nationwide Insurance Enterprise and the Ohio 4-H Foundation. "Farm Safety Round-Ups" have received recognition with media, state legislators and the rural public. Designed to create awareness of hazards on farms and in rural areas, the camp staff works closely with community organizations and agri-businesses to create unique learning experiences for youth.

Numerous agricultural safety studies report children are put in high-risk situations with regards to farm work. Each year, over 100 children die and more than 24,000 youth experience serious injury as associated with agricultural activities. However for the most part, the homesite is the worksite for these children and the hazards are abound. For the farm family, it's difficult to define where the backyard ends and the barnyard begins. The perplexity of the situation lies in the fact that unlike other occupations, farming attracts and includes family members of all ages. As a way of life, this culture will not change.

Over 1,500 youth attended a Farm Safety Round-Up in 2004. Camps were held in the following Ohio counties: Belmont, Fayette, Harrison, Monroe, Morrow, Stark, Putnam, and Wood. Two additional communities offered agricultural safety camps and programs that were not sponsored by the "Round-Up" program; however OSU Extension personnel were directly involved in these programs and many utilized educational support prepared through the Round-Up curriculum.

Curriculum is hands-on opportunities for youth to see "what happens when" an accident occurs on the farm. Campers watch a dummy being pulled into a working Power Take-Off shaft, then they test their own reaction time to see how quickly they can react to a situation. Miniature gravity wagons and grain bins demonstrate the hazards of flowing grain. A remote-controlled tractor helps youth recognize the importance of a Rollover Protective Structure on a tractor, and why being a second rider on agricultural equipment is not safe. Many

community fire departments have a Fire House and the electric co-ops have an Electric Town they bring to the camps. Local YMCA, ODNR and Water Rescue Teams provide resource people for water safety sessions.

Over the years, youth have identified their favorite camp sessions to include 1) tractor and machinery safety, 2) livestock safety, 3) ATV safety, 4) fire safety and 5) electrical safety. National and state data identifies the tractor as the most hazardous agent for youth on farms. Machinery, livestock, drowning and suffocation related incidents follow. It is of significant interest that the campers are learning and enjoying the educational sessions that are on the "most dangerous" list as prepared by fatality statistics. It is always difficult to identify the incentive to learn about safety; enjoying the topic is certainly the first step towards educational growth and attitudinal change. If youth can recognize the value of protective factors and avoid dangerous situations, then the objectives of the day camps will have been met.

b. **Impacts** - Two evaluations were performed on the day camp program in 2004. Statewide evaluations are administered to every camper participating in the Round-Up program. Aggregated descriptive statistics support the camper's satisfaction and knowledge gain with an average mean of 3.30 points on a 4-point scale.

A focused evaluation was conducted in Putnam county, where 13 elementary schools participated in the day camp. Nearly 600 3rd graders attended the safety program. The specific objectives of the evaluation were to 1) measure knowledge retention of key safety concepts learned at the day camp, 2) quantify exposure 3rd graders have to agricultural hazards, 3) quantify the number of agricultural injuries sustained by the students, 4) measure the self-efficacy of 3rd graders to follow safety rules, and 5) determine the importance of day camp programs as perceived by the parents of participants.

Students completed the survey with an 89% response rate. Third graders were able to recall ten out of twelve safety messages taught at the day camps with a minimum accuracy level of 70%. Youth self-reported they had more exposure to lawn mowers and yard/garden chemicals than other rural hazards. Youth also reported a low injury rate, with most injuries occurring from exposure to livestock or chemicals. Over 50% of the youth surveyed said they could follow safety rules "all of the time;" and 40.3% agreed they could follow safety rules "most of the time."

Parents completed the survey with an 87% response rate. The majority of parents (80%) felt the program was a beneficial experience for their children, yet 60% would not have taken their child to the day camp if it were not a part of the school field trip. Parents classified safety topics into categories of importance with bicycle, electrical, water and lawn mowers ranking the highest. Parents also reported exposure rates and injury rates congruent with the youth responses. Interestingly parents reported a higher confidence level (97%) than their corresponding children responses (91.8%), that their children were able to follow safety rules "all" or "most" of the time.

Addressing self-efficacy is an important consideration for this age group. If day camp participants believe they have the ability to make good choices and follow safety rules, they are more likely to believe they can impact their personal

safety behaviors and ultimately lower their injury rate. Interestingly parents reported a higher confidence level (97.0%) than their corresponding children responses (91.8%), that their child was able to follow safety rules "all" or "most" of the time. Knowing how parents judge their children in making safety decisions can also impact intervention programs. Take home information from the safety day camp, written for parents, can increase the likelihood that safety messages will be reinforced once the campers return home.

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

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

8. 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 2004 State 4-H Leadership Camp objectives were achieved ranged from 6.3 to 6.8 (Agree to Strongly Agree), as outlined on the table below (scale: 7=strongly agree/excellent to 1=strongly disagree/very poor) (n=89):

As a result of the 2004 State 4-H Leadership Camp, participants…

- Developed collegial leadership abilities – **6.5**
- Contributed leadership in helping groups shape & achieve goals and gain support – **6.5**
- Developed leadership skills such as envisioning, consensus-building, negotiation, perspective-taking, p.r., group building and recognition – **6.5**

- Realized the degree of control they have over their lives – **6.3**
- Were encouraged to take initiative to try new things and not be afraid of failure or success – **6.4**
- Gained in physical, intellectual, emotional and social development & became more competent, caring and contributing individuals – **6.4**
- Gained ideas to improve their clubs, communities, country & world – **6.5**
- Developed new friendships – **6.8**
- Provided real leadership in committees, leadership groups & cabins – **6.5**
- Had fun – **6.6**
- Evaluation data were analyzed using the *SPSS 12.0.5 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, 90% of the 2004 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

9. Key Theme: Youth Development/4-H

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

a. **Description of Activities -** In Ohio, 113,227 youth participated in organized community clubs, 60,234 youth participated in special interest and day camp programs, 32,047 youth participated in resident camps, and 95,000 youth participated in school enrichment opportunities.

b. **Impact -** 4-H youth participants enrolled in over 198,672 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

10. Key Theme: Communication

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

a. **Description of Activities –** Marriage Matters (MM) is a quarterly newsletter available to the public on-line and for counties to print/distribute locally. MM consists of fact sheet quality articles that include research-based information, suggestions and activities that can help couples enhance the quality of their relationship. Six (6) county Extension units submitted reports on efforts to increase knowledge, skills and attitudes that will positively impact family, couple, marital, and general interpersonal communication. Additionally, the Marriage Matters Newsletter was created and distributed to couples and families throughout the state. Three issues of Marriage Matters were developed and distributed, reaching 19,500 households; the online version received about 20,300 hits.

b. **Impact -** Nine hundred twenty-seven (927) individuals where reached with educational messages. Nine hundred six (906) attended educational sessions. Of those, 72% (651) indicated they had learned new information and 38% (346) planned to adopt one or more recommended practices. When follow-up contact with program participants was made and the question asked, 49 individuals indicated they had actually adopted one or more of the recommended practices they had learned. Twenty-three volunteers 184 hours valued at $3,162.96. A few county-specific communication skills impact examples:

- Of the 150 women who participated in the "Women in Ag" program, 92% stated they would make changes to their personal life, 70% indicated they had gained knowledge, and 60% reported the information from the program will increase their family's communication on the farm (Wood).
- 92% of program participants indicated they learned new information and 72% reported they plan to adopt one or more of the recommended communication techniques (Muskingum).
- 100% of program participants stated they learned new information that will help improve their interpersonal communication skills, 65% reported they actually had changed one or more poor communication behaviors as a result of attending the program (Portage).

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

d. **Scope of Impact** - State Specific (except for website)

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.

Program Review Process

Merit Review
(Note: The merit review process has not changed in FY 2004.)

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 2004.)

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 three 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 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 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 200,000 subscribers.

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

2. Key Theme: Agricultural Communications

a. Description of Activity - Purdue/DTN 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 and livestock production.

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.

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

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: Water Quality

a. Description of Activity - 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, University of Wisconsin Extension, and Michigan State University Extension) on a USDA-CSREES 406 Regional Water Quality Coordination Grant. The grant is spearheaded by the Great Lakes Regional Water Quality Leadership Team (WQLT) comprised of the State Extension Water Quality Coordinator from each participating university and project Liaison. 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, Drinking Water and Human Health, Environmental Restoration, and Water Policy and Economics, in accordance with the CSREES Priority Water Quality Themes. 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 Educators, Specialists, and Associates working in the area of water quality. In FY2004, OSU Extension personnel collaborated with their peers from the other Great Lakes Region states to develop and complete a variety of multi-state water quality projects, in the following four priority areas: 1)Animal Waste Management Nutrient, 2) Pesticide Management, 3)Watershed Management, and 4) Drinking Water and Human Health. The first two priority goals are highlighted in Goal 4 Key Theme 1 of this report. Objectives of the second two

priority goals follow:

Watershed Management

Federal funds were used to support the Ohio Watershed Network Web-site and the Ohio Watershed Academy professional development course. The Ohio Watershed Academy is a five month long professional development course for watershed coordinators, citizen volunteers, and agency professionals who want to learn more about community-based watershed planning. The course is located at http://ohiowatersheds.osu.edu/owa/index.html . Funds supported web-site development, which included instructional modules on various aspects of watershed planning, including how to create GIS-based maps to improve decision-making. Funds for Web-development also allowed us to create the most comprehensive directory of watershed groups in Ohio, including a map of Ohio which allows the user to easily identify the watershed groups in their county.

Great Lakes Regional Water Quality grant funds were used to supplement travel for Watershed Team members. One of the primary roles of the Watershed Team is facilitation and support of local watershed planning efforts. Team members work with watershed groups around the state facilitating public participation, decision making, and strategic planning processes; writing watershed action plans and grant proposals; creating instructional maps and geographic information systems; and designing and conducting educational programs.

Federal funds were used to support the Ohio Watershed Leaders 2004 Workshop. The Ohio Watershed Leaders conference is a Team project held every year. Over 60 watershed professionals and volunteers spend two days networking and learning about a variety of topics. OSU Extension specialists in wildlife and forestry presented at the 2004 OWLs conference.

Drinking Water and Human Health

OSU Extension is participating in the "Building Capacity of E.coli Monitoring by Volunteer Networks" project with several states in the Great Lakes region. This project is funded through the USDA-CSREES 406 water quality grants. Currently, volunteer monitors are collecting water samples from watersheds in Southern Ohio for fecal coliform testing. In 2005, these same volunteers will use a variety of test kits to determine the efficacy of field tests for measuring fecal coliform contamination. Fecal coliform are indicators of bacterial contamination of surface and ground water that can lead to serious health effects. Quick results from volunteer monitoring efforts could reduce the risk of human exposure to waterborne bacteria and other parasites.

b. **Impact –** Watershed Team members were involved in the development of twelve watershed plans in 2004. Ten of these plans have been submitted to and endorsed by Ohio EPA, making those watershed groups eligible for federal funding through the Clean Water Act, Section 319 program. Watershed Team members have been directly involved in forming new watershed groups, including the Friends of the Lower Olentangy Watershed, Friends of Big Walnut Creek, and the Blanchard River Watershed Council. More than sixty water resource professionals and volunteers participated in the two-day Ohio Watershed Leaders workshop in 2004. Evaluations indicated that participants were able to develop new professional relationships and developed new ideas for watershed protection

strategies in their watersheds.

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

5. 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 two years. New programming efforts in 2004 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 2004, in addition to continuing established activities, grant funding allowed expansion of these efforts to include day camp programs, an aerospace day, a canoe trip, and a farm tour, 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 was asked to submit 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 will allow expansion of efforts to youth in families of the National Guard and Reserve 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 2004, over 300 youth participated in 4-H military programs. A new addition to the program was 4-H day camping, with 15 days of camp conducted for over 100 youth. 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.

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. The major project currently in the works is the *Operation Purple* camp. (“Purple” is the term used when all branches of the military are involved.) This residential camp is scheduled for July 24-29, 2005 at 4-H Camp Graham. It has grown from the original Camp Wright Patt that has been conducted for the past three years. The move to Camp Graham will allow us to accommodate 140

youth, more than double the number reached through last year's camp. It will also allow us to reach an at-risk audience (youth in deployed families) and to provide further integration with on-going 4-H programming.

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

Integrated Research and Extension Activities

1. Key Theme: Workforce Preparation - Youth and Adult

a. **Description of Activity -** Workforce Preparation Across the Life Span program incorporates the multi-state project, "Rural Low-Income Families: Tracking their Well-Being and Functioning in the Context of Welfare Reform." The principal investigator in Ohio is Sharon Seiling. The other states involved are California, Colorado, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New York, Ohio, Oregon, Utah, Wyoming.

This is a research study of rural low-income mothers with at least one child age 12 or under. The study is assessing the impact of welfare reform on their lives and on the community. Each state interviewed 20-40 mothers in one or two counties over three years. In Ohio, the investigators interviewed participants in two counties, one Appalachian and one non-Appalachian. From the qualitative and quantitative data collected on these families, the research is providing insights to agencies and policy makers in the counties of study, the state of Ohio and the other states regarding family economic well-being, workforce attachment, health, and food security within their rural communities.

As part of the study in Ohio, government officials and agency representatives, employers, and non-profit agency representatives we re interviewed about the employment opportunities and community support for families in the county. The data were analyzed to more fully understand the employment and economic well-being issues and to assist in better meeting the needs of low-income families in rural counties in Ohio.

b. **Impact** - Most families in the Ohio study had at least one adult working. Two-thirds of the mothers (20 of 30) and 15 of the 18 partners were working. The mothers averaged 30 hours per week, whereas the partners had an average work week of 48 hours. The mean hourly wage for mothers was $7.12, and for partners it was $9.05. Mothers were employed in five types of jobs: laborers/helpers, production, service, administrative support and sales. The partners were employed in jobs classified as laborers/helpers, production, service, transportation and mechanics. By the third year, mothers were earning $7.60 on average, while partners wages had increased to $10.66. Two-thirds of mothers had at least one work change during the three years, with 30% changing work status and 35% changing jobs. Mothers who kept the same job had higher wages ($8.09) than did those who changed jobs ($5.58) and those who had not worked the year before ($4.87). Fewer mothers had work benefits than their partners: health insurance for self 29% and 56%, respectively. Their children were typically covered my

Medicaid. Most adults had no health insurance coverage. Families relied on family and friends for support. Two-thirds had family members who provided child care, 17% lived with family or friends, 60% had help with transportation, and 49% borrowed money from family or friends. Informal support provided about one-fourth of value of their overall support.

The typical family in the study involved a working mother with two children who was married or was living with a partner. The mother had completed high school or had a GED and her partner had the same level of education. Their household income was $16,272, which put them below the poverty level. They received benefits from WIC and Medicaid and had gotten the Earned Income Tax Credit in the previous year. They relied on their extended family for childcare and other types of support. The mothers were more likely to be clinically depressed and food insecure than the population as a whole. Although not significant in the small OH sample, in the larger study families' food security was significantly related to depression and money management practices, but not to amount of income, indicating the improving money management practices could go a long way to helping families become or remain food secure.

Community leaders, members of the business community, and social service professionals identified five strengths of the organizations in the county of study that enhance their ability to serve the needs of families. They were 1) the capacity to create informal networks and practices, 2) entrepreneurial thinking, 3) an inclusive view of the community, 4) inter-agency collaboration, and 5) organizational alliances.

In 2003, data from the three-year longitudinal family study and from the interviews of business, non-profit and government sectors of the community were shared with community leaders, elected officials and social service and economic development professionals. During that meeting Extension educators and researchers led small groups of leaders and professionals in assessing community needs and making plans for community change based on study results.

In 2004, the multidisciplinary team has already forged a large multi-state effort in the project with five years of experience working together. The team, made possible by the multi-state alliance, consists of family scientists, family economists, nutritional scientists, psychologists, and sociologists. Furthermore, a number of extension specialists are project leaders or co-project leaders in many of the states. Extension specialists are key players in translating the findings of this research into content programs that will enhance the lives of rural families in underserved and underrepresented communities. The multi-state, multidisciplinary approach allows us to better understand the many facets and complexities faced by rural low-income families within the context of their communities. The majority of the team is poised to continue with some minor personnel changes and additions. The study will provide policy makers with data on rural families that will present an alternative to the urban model of social welfare, employment and economic self-sufficiency for all families to reduce the detrimental effects of policies for rural families and communities.

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

2. Key Theme: Food Safety for High Risk Populations

a. Description of Activity - The continuing education course is designed to educate professionals who work with high risk audiences about this increasingly important topic of food safety. Participants complete six one-hour modules along with brief pre- and post-questionnaires for each module. The modules consist of voice-accompanied PowerPoint® slides with references for additional information. Those who complete registration and evaluation forms and achieve a score of 70% or higher on the post test receive a certificate of completion.

Module Topics and Objectives:

As a result of this Continuing Education Program, participants will be able to:

Module 1 - Overview

- Identify populations at increased risk for foodborne illnesses and factors that affect that risk.
- Recognize pathogens of most concern for various groups at increased risk for foodborne illnesses.
- Recognize associations between groups of pathogens and key food handling behaviors.
- Identify key food safety guidelines important in reducing the risk of foodborne illness.

Module 2 – Immunity

- Recognize the complexity of the immune system, differences between the innate and adaptive immune system, and the roles of each.
- Recognize the effects of pregnancy, life stage, disease and pharmacological therapy on immune response to pathogen invasion.

Module 3 – Pregnancy

- Identify how pregnancy increases risk for illness from certain pathogens.
- Recognize risky food safety behaviors associated with the pathogens of most concern during pregnancy.
- Illustrate to pregnant patients and clients foodborne illness and food safety recommendations to follow while pregnant.

Module 4 – HIV

- Recognize how HIV/AIDS increases risk for illness from certain pathogens. Identify risky food safety behaviors associated with the pathogens of most concern for HIV-positive individuals.
- Illustrate to HIV-positive patients and clients foodborne illnesses and food safety recommendations that will reduce their risk of foodborne illness.

Module 5 – Cancer and Transplant Patients

- Recognize how cancer therapy and organ transplantation increase risk for illness from certain pathogens.
- Identify risky food safety behaviors associated with the pathogens of most concern for cancer and transplant patients.
- Illustrate to cancer and transplant patients foodborne illness and food safety recommendations that will reduce their risk of foodborne illness.

Module 6 – Food Safety across the Lifecycle

- Recognize how life cycle (young, old) affects risk for foodborne illness.
- Identify risky food safety behaviors associated with the pathogens of most

concern for infants, children and the elderly.

- Illustrate foodborne illness and food safety recommendations that will reduce the risk of foodborne illness for infants, children and the elderly.

b. **Impact** – One hundred five Extension and Health Professionals from across the country completed a pilot project, including; 30 Extension educators (11 from Ohio), 46 Registered Dietitians, 9 Nurses, 6 Sanitarians and 13 unspecified professions. All participants successfully completed pre/post knowledge assessments (70% minimum score for passing) and received 6 hours of continuing education credit from their professional associations (American Dietetics Association, American Association of Family and Consumer Sciences or Ohio Nursing Association)

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

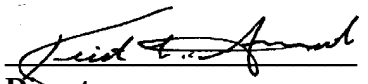
U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution The Ohio State University
State Ohio

Check one: _X_ **Multi-state Extension Activities**
____ **Integrated Activities (Hatch Act Funds)**
____ **Integrated Activities (Smith-Lever Act Funds)**

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Goal 1: An Agriculture System that is Highly Competitive in the Global Economy	$142,444	$219,561	$185,440	$119,641	$147,144
Goal 2: A Safe and Secure Food and Fiber System	$10,028	$22,425	$41,796	$3,693	$12,106
Goal 3: A Healthy Well-nourished Population	$2,733	$15,851	$19,493	$5,459	$4,824
Goal 4: Greater Harmony Between Agriculture and the Environment	$16,735	$57,128	$114,230	$173,162	$136,033
Goal 5: Enhanced Economic Opportunity and Quality of Life	$27,207	$79,532	$128,595	$182,881	$212,906
Total	$199,147	$394,496	$489,554	$484,836	$513,012



Director

March 31, 2005
Date

Form CSREES-REPT (2/00)

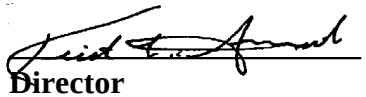
U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Supplement to the Annual Report of Accomplishments and Results
Multi-state Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution The Ohio State University
State Ohio

Check one: ____ Multi-state Extension Activities
____ Integrated Activities (Hatch Act Funds)
_X_ Integrated Activities (Smith-Lever Act Funds)

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Goal 1: An Agriculture System that is Highly Competitive in the Global Economy	$120,796	$227,424	$381,872	$341,828	$371,518
Goal 2: A Safe and Secure Food and Fiber System	$9,557	$9,386	$89,928	$3,350	$23,098
Goal 3: A Healthy Well-nourished Population	$15,306	$38,709	$2,066	$26,682	$14,471
Goal 4: Greater Harmony Between Agriculture and the Environment	$26,052	$67,776	$135,602	$180,585	$228,250
Goal 5: Enhanced Economic Opportunity and Quality of Life	$26,070	$148,626	$78,157	$122,957	$76,583
Total	$197,781	$491,921	$687,625	$675,402	$713,919



Director **March 31, 2005**
Date

Form CSREES-REPT (2/00)

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
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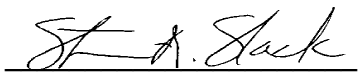
Multi-state Extension Activities and Integrated Activities
(Attach Brief Summaries)

Institution The Ohio State University
State Ohio

Check one: ____ **Multi-state Extension Activities**
_X_ **Integrated Activities (Hatch Act Funds)**
___ **Integrated Activities (Smith-Lever Act Funds)**

Actual Expenditures

Title of Planned Program/Activity	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004
Goal 1: An Agriculture System that is Highly Competitive in the Global Economy	$651,790	$395,139	$432,880	$888,336	$813,070
Goal 2: A Safe and Secure Food and Fiber System	$81,856	$0	$39,798	$5,820	$5,854
Goal 3: A Healthy Well-nourished Population	$0	$0	$12,138	$876	$18,277
Goal 4: Greater Harmony Between Agriculture and the Environment	$291,330	$167,482	$234,099	$336,216	$460,412
Goal 5: Enhanced Economic Opportunity and Quality of Life	$95,974	$99,214	$0	$18,637	$123,606
Total	$1,120,950	$661,835	$718,915	$1,249,885	$1,421,219



Director **March 31, 2005**
Date

Form CSREES-REPT (2/00)

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.

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.

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.