2007 Michigan State University Combined Research and Extension Annual Report

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I. Report Overview

1. Executive Summary

Michigan State University (MSU), the state's land -grant institution, is charged with generating research-based knowledge and educational programs people can access to make informed decisions to improve their lives.

The mission of the Michigan Agricultural Experiment Station (MAES) is to generate knowledge through strategic research to enhance agriculture, natural resources, and families and communities in Michigan. The MAES strives to maintain a balance between basic and applied research and relies heavily on the input of its constituents in identifying research priorities. The accomplishments and discoveries outlined in this report are reflective of the reason why MAES continues to be one of the most successful agricultural experiment stations in the country.

Michigan State University Extension (MSUE) helps people improve their lives through an educational process that applies knowledge to critical issues, needs and opportunities.

The success and accomplishments of the MAES and MSUE are fueled by close ties with each other as well aslinkages to state agencies, commodity groups and other stakeholders, and outstanding legislative support.

MAES/Research FY2007 Quick Facts:

•179 researchers representing 83 FTEs •252 active projects

•14 patents awarded (10 U.S., 3 Korean, 1 Bulgarian) •Dozens of patent applications submitted

•270 peer-reviewed publications

Key research accomplishments for FY 2007 include:

Protecting Plant Productivity during Drought Stress- The discovery of a gene that confers drought tolerance through regulating abscisic acid -- one of the plant hormones responsible for transpiration levels -- laying the groundwork for new and enhanced stress-tolerant plant lines.

Jaz(zing) Up Plant Resistance – The discovery of the family of proteins critical to plants receiving and responding to signals to defend themselves from diseases and insects and developed a model for how this interaction works. This study represents a significant advance in the understanding of a major plant hormone and how it works. The hope is to be able to either genetically modify plants or develop compounds that mimic this key plant hormone.

Breeding New Biofuel Crops - The identification of a regulatory gene that signals the expression of the genes required to convert sugars into the building blocks of fatty acids, the main ingredient of oil. MEAS researchers are currently working on transferring the gene to the rutabaga plant to develop a rutabaga line that produces more oil and increasing the oil content in the leaves of other plants, such as canola, to maximize their use as bioenergy crops.

Breeding a Better Potato - The release and adoption of a new line of scab-resistant chipping potato, progress on a series of chipping potato lines that combine scab and late blight resistance and the successful combination of conventional and genetically engineered late blight resistance.

Safeguarding Michigan's Asparagus Industry- The development of new practices to safeguard Michigan's asparagus industry from Phytopthora, a devastating pathogen that attacks below-ground portions of the plant. Asparagus industry leaders are actively adopting these new practices to help turn the Phytopthora problem around. Practices include using crop rotations that reduce Phytopthora levels in asparagus fields, planting crowns from nursery fields that are pathogen-free, and remediating Phytopthora-infected fields so they can be put back into asparagus production.

Fighting Fire Blight Bacteria in Apples – For the past five years, an MAES researcher and his colleagues at other universities have explored ways to limit the devastating effects of this economically crippling disease, which is becoming increasingly resistant to streptomycin – the primary antibiotic used to combat the disease. The group has identified some promising biological control agents for fire blight bacteria in apple orchards. These materials could be registered for use by growers as early as 2008.

Developing Safer Insecticides for Fruit Fly Control - The development of a new organic insecticide -- GF-120 -- a bait formulation that contains ammonium acetate -- to control fruit flies in orchards. Insecticides, such as GF-120, will protect fruit while safeguarding the environment and human health. Field testing will take place over the next two years. The most successful products will be commercialized for widespread use.

Growing a More Efficient Nursery Production System – The development of an effective growing media (an 80-20 mixture of pine back and peat moss) that results in more efficient pot-in-pot nursery systems for trees. Several nurseries in Michigan have installed pot-in-pot systems or have expanded their production. Researchers are also conducting tests to identify the best nutrient

regimes and fertilization. From this data, nutrient guidelines and diagnostic tools for key tree species will be developed.

Beefing Up Reproductive Management in Cattle - The verification that variation in the numbers of follicles and eggs in ovaries is an important factor in cattle fertility. A large-scale fertility trial is underway to further verify the reliability of this data, determine if fertility is a genetically controlled trait and identify genetic or hormonal markers that identify calves with high reproductive potential at an early age. The goal is to select for high fertility during the breeding process to produce offspring with higher reproductive potential. This research also has applications to human fertility research for identifying markers for infertility and then developing therapies to correct them.

Engineering Food Safety for Processed Foods- Pilot-scale studies on food safety of processed foods began in Spring 2007 in a newly-constructed biosafety processing plant at MSU to validate many of the models developed over the past five years. The goal of the program over the next three years is to create a tool for the meat processing industry to verify that their processes and products are safe.

Developing a New Approach to Wildlife Management- MAES researchers have partnered with colleagues from the U.S. Fish and Wildlife Service, Cornell University and the Wildlife Management Institute to write a series of books for wildlife management professionals. The first book, Thinking Like a Manager: Reflections on Wildlife Management, was published in late 2006. The second book, on how to apply new wildlife management approaches is underway, and a third book on leadership in wildlife management is planned.

Improving Management Decisions Using Weather Data – The launch of the MSU Enviro-weather information system, which integrates near-real-time data from 52 weather stations throughout the state with computer modeling projections to inform pest, natural resource and agricultural production management decision making in Michigan. The site is heavily used, averaging 41,650 hits a month, and a total of a half million hits in FY 2007.

Building a Better Mousetrap to Detect Food Allergens – The development of a mouse-based model – the first of its kind – and are working to refine and validate the model so that it may be used to determine the allergenic potential of genetically engineered crops. The model could be available commercially within five years.

Improving Healthcare through Packaging - The development of two new systems to develop healthcare packaging that is easier to access, particularly for aging consumers and people with disabilities. The systems are currently being calibrated and are scheduled to be fully operational in the next two to three years.

Working to Improve the Foster Care System – The development and implementation of a new framework of principles – Connections, Continuity, Dignity and Opportunity -- for the development of young people aging out of the foster care system.

MSUE FY2007 Quick Facts:

•MSUE educated directly 410,085 participants (159,707 adults and 250,378 youth) in 83 counties. •Through federal, state, county, and local partnerships, MSUE funding for 2006-07 was $86.687 Million with $8.2 Million being Federal 3b&c funding (note this report reflects only a portion of these funds due to the reporting requirements and other federal funds that make up the whole picture). It is also true that the majority of all educational initiatives implemented by MSUE were from blended funding. • In FY 2007, appropriated state and federal funds supported approximately 742 personnel.This corresponds to 401 FTE (full-time equivalents). With the additional funding obtained from county partners and other contracts and grants, MSU Extension employed 1,028 people, or 738 FTE.MSU Extension personnel serve in positions as faculty members, specialists, technicians, educators, program leaders, program associates, graduate assistants, and clerical and administrative staff members.In addition to these personnel, Michigan counties employ another 238 FTE (280 people) personnel who work as part of our county Extension staff.

Key MSUE accomplishments for FY 2007 include:

Developing New Economic Opportunities– Michigan's 21st Century Jobs Fund provided monies for 11 MSU research projects, from basic research to applied research that is already resulting in new Michigan companies. Several of the projects are aimed at boosting the bioeconomy, such as projects to develop ethanol fuel engines and research on a continuous production process for biodiesel. Michigan has three operational ethanol plants producing more than 140 million gallons of ethanol per year, and two more are being constructed. Two biodiesel plants also are beginning production, and another is planned. MSU researchers estimate the total economic impact of the biodiesel plant in Bangor to be about $95 million and that of the ethanol plant in Riga to be about $75 million. MSUE and MAES educators and scientists helped the boards of directors of both facilities during the planning and startup phases. MSU's Product Center (funded by MSUE and MAES)has launched 50 ventures, 17 new businesses and 33 business expansions. These ventures created 310 jobs and had annual sales of $41 million and a combined annual payroll of $9.9 million.

Working to Improve Profitability for Dairy Farms – The MSUE Dairy team is working with the MSU animal science department to improve and gain wider use of Ovsynch, a product that helps improve reproductive performance in Michigan dairy herds, thus increasing their profitability. The potential impact in Michigan from using Ovsynch to control calving interval and decrease reproductive culls could increase profits by more than $20,000,000 per year, more than $6,500 per farm.

Building Stronger Structures for Farms– The Farm Management team helps Michigan farmers and

agribusinesses make intergenerational transfers and avoid excessive estate taxes. MSUE educators also work with farm operations on income tax management to help ensure long-term profitability. Average savings were $10,000 per farm for over

3,000 farmer trained.

Improving Farmers Access to Valuable Resources – The USDA Natural Resources Conservation Service offers farmers technical and financial assistance to implement environmental protection practices. In 2002, Michigan farmers received $6.8 million from EQIP funds to protect the state's waters and soils while limiting their need for purchased inputs. The MSU Integrated Pest Management Program began an effort to build awareness of available EQIP funds, and in 2006-07 farmers received $15.1 million for such activities as converting to using pesticides with low pollution risk potential, using flamer/ steamer weed control methods, using organic mulches to suppress weeds and pests, and using disease inoculums reduction strategies.

Improving Biosecurity Practices –MSUE held eight small poultry flock educational sessions across the state to inform more than 300 producers about biosecurity practices. About two-thirds of participants said they would change their management practices as a result of attending the program.

Improving Organic Agriculture Practices –MSUE educators learned about soil quality, weed ecology and insect control, and MSUE specialists facilitated farmer-to-farmer hands-on training in organic agriculture practices through work aimed at building capacity for developing local sustainable and organic farming systems. Forty-one percent of workshop participants, who represented 49,500 acres, said in a survey that they would reduce their use of herbicides for weed control that would result in savings of over $400,000.

Protecting Michigan's Natural Resources– Up to 10,000 wildfires damage Michigan homes and roperties every year; 98 percent are caused by human behavior. MSUE has partnered with the Michigan Department of Natural Resources to produce Extension bulletins (in English and Spanish), a video, television PSAs that reached 300,000 northern and central Michigan households and a 30-minute educational documentary was released to PBS stations.

Improving the Environment Across Multi-states–The 2006 Great Lakes Manure Handling Expo brought more than 1,300 visitors to Fowler, Mich. Farmers from 14 states and three Canadian provinces attended sessions on manure land application topics such as hauling costs, value of manure nutrients, odor, GPS technologies, composting, keeping manure out of tile drain systems and dealing with sand-laden manure. While the producers talked with exhibitors and MSUE educators, a program for state and local government officials gave them the chance to learn about current research and technologies in environmentally sound nutrient management strategies.

Improving the Health of Seniors – Nearly 72,000 Senior Project FRESH coupons were redeemed by senior citizens for fresh produce sold at farm markets in 2007, resulting in $142,388 in sales for local farmers and improved nutrition for seniors.

Improving the Health of Low-Income Families – More than 28,000 WIC clients increased their intake of fruits and vegetables by using the 209,898 Project FRESH coupons distributed by MSUE Family & Consumer Sciences. Aside from the nutrition benefit to WIC clients, the coupons generated $419,796 for Michigan farmers.

Working to Improve the Health of Michigan Families – The MSUE Family & Consumer Sciences Nutrition Education Program enrolled nearly 10,000 individuals; 87 percent of adult graduates of the program report making positive changes in their eating habits, and 43 percent eat at least three servings of vegetables daily, compared with only 25 percent of Michigan adults in general.

Working to Improve the Outcomes for Infants– Ninety-seven percent of women enrolled in the MSUE Family & Consumer Sciences Breast-feeding Initiative initiated breast-feeding, compared with 49.7 percent of women in the overall WIC population. The state saves up to $1,500 per year for every WIC-eligible mother who breast-feeds rather than using formula. In addition, research has shown infants benefit from breastfeeding that include better health and attachment.

Building Stronger Communities – Kids are True Conservation Heroes (KATCH), a 4-H environmental education program, launched 14 local projects in urban, suburban and rural areas throughout Michigan. Nearly 570 youth spent more than 4,400 hours working on these projects, which included riverbank restoration and cleanup, nest box placement and invasive plant control, and positively affected 1,540 acres of terrestrial habitat. Nearly 180 adults gave these projects 2,310 hours of volunteer time worth $41,672. These projects attracted contributions of local goods and services valued at $51,228 from 122 local partnering organizations.

Helping Youth on Future Careers – Although many of the 250,378 Michigan youth who participated in 4-H in 2007 explored career options through their project work, nearly 25,000 engaged in specific career investigation/entrepreneurship activities through 4-H programs in critical thinking, economics, business and marketing.

Total Actual Amount of professional FTEs/SYs for this State

Year:2007	Extension		Research	
	1862	1890	1862	1890
Plan	180.0	0.0	85.0	0.0
Actual	189.0	0.0	83.0	0.0

II. Merit Review Process

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

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

2. Brief Explanation

The challenges facing Michigan agriculture and natural resources are increasingly complex and diverse. MAES research programs are continuously evaluated for relevance and progress. A strategic visioning process, linked to those of MAES affiliated colleges at MSU (Agriculture and Natural Resources, Veterinary Medicine, Engineering, Social Science and Natural Science), has identified five strategic priority areas that will drive the MAES research agenda over the next decade. This process also involves industry experts, university faculty members and MSU Extension and Experiment Station Council members, and includes scientific review by peers (local, national and international) and industry experts. These target areas address the research priorities of Michigan agriculture and natural resources industries, but are also linked to national goals and new initiatives. The target areas are: Food and Health, Environmental Stewardship and Natural Resources Policy and Management, Enhancing Profitability in Agriculture and Natural Resources, Secure Food and Fiber System, and Families and Community Vitality.

Michigan State University Extension (MSUE) uses several continuous processes that assist in setting priorities and evaluating program goals and plans. At the county level, the public, local government officials, advisory group members, extension council members, staff members and industry experts are involved in both the stakeholder process and review of the county and individual agents' plans. Each Area of Expertise (AoE) Team reviews the county needs, agents' plans, and research to support these programs as well as others that may reflect emerging trends. In addition, the AoE goals are reviewed by state leaders and industry experts for quality and relevance. Collectively these plans are reviewed by MSUE and MAES directors who not only evaluate them, but use them in their regional and statewide presentations to describe future plans.

Jointly, MSUE and the MAES address issues of concern in local communities with research and teaching by using a network of citizen advisory groups at the local and state levels. County Extension councils identify and prioritize issues, seek collaborations and resources, and communicate to others the importance of Extension’s educational programming. Citizen Advisory Councils help establish research priorities at the 15 MAES field research stations. The MSU Extension and Experiment Station Council serves as a liaison among county councils, field station advisory groups and state agencies and organizations.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey of selected individuals from the general public

Brief Explanation

During 2005□2006, the MAES and MSUE completed a comprehensive statewide process –Strengthening Michigan's Economy: Roles for MAES and MSUE. Nearly 10,000 people took part in this issues identification process to help define future research and educational priorities for the two organizations. The five strategic priorities that emerged were: developing entrepreneurs, promoting healthy lifestyles, preparing for the expanding bioeconomy, educating and supporting decision makers, and building leaders for today and tomorrow.

In 2007, a variety of activities added to the leveraging of this process. The five strategic priorities were presented to and discussed with the joint MAES/MSUE state council at its spring and fall meetings.

At the fall MSUE meeting, members were asked to demonstrate how the educational and professional development programs being offered fit into the five priority areas and discussed how the process could be used to inform and guide education outreach, research and organizational infrastructure functions. During the fall 2008 conference, there will be five concurrent sessions - one on each priority area - to discuss and gain additional input.

Progress and revisions based on the five priorities are updated on a continuous basis at the county level. An aggregate county report for the past year is being prepared and will be presented to the state coalition in Spring 2008. County staff also submits two partner reports a year to highlight partnership efforts. These are used to customize information provided to county commissioners, state legislators or others who use MSUE/MAES information resources.

MSUE has contracted with the Institute for Public Policy and Social Research (IPPSR) to include questions related to the five priorities on its quarterly state of the state survey (SOSS) for the next three years. The first set of survey questions were sent out in Fall 2007 and queried the general public about the five focus areas and what they thought about them. This data is in the process of being analyzed. The second set of questions is currently out in the field and asks questions about general household energy use and people's willingness to pay to conserve. This surveying will be a continuing source of information to help update and refine how critical issues are approached.

The results of Strengthening Michigan's Economy have also helped MAES and MSUE's Area of Expertise teams do a better job of reporting what they've done and to inform future programming. The five priority areas are being used to better clarify and drive the organizations' programs and resources. This has also translated into asking those seeking internal resources to explain how their proposed project or program fits into one or more of the five priority areas.

Beginning in 2008, MSUE will initiate a major restructure by forming a new unit that combines its 4-H Youth and FCS programs. The major aim of the restructure is to better equip MSUE to determine how its education programs interact with citizens throughout their lifespan. This more consolidated approach will be organized around the priority areas within the broad unit of children, youth and families.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief Explanation

With a mission to generate knowledge through strategic research to enhance agriculture, natural resources, and families and communities in Michigan, the MAES has an extremely broad and long list of stakeholders. In reality, every Michigan citizen is an MAES and MSUE stakeholder.

The Strengthening Michigan's Economy process and ongoing efforts offer multiple ways for people in various roles and locations to help identify the issues and opportunities for MAES research and MSUE educational programming during the years ahead.

Statewide telephone surveys for the State of the State Survey (SOSS) and citizen focus groups were used to identify the major issues and opportunities in Michigan and assign a priority ranking to each. The use of SOSS quarterly surveys to gain insight and input into programming is being continued over the next three years.

A Web based survey asked what people saw as the role for MAES and MSUE related to key issues and opportunities. Similar surveys may be developed and disseminated to seek additional input.

Community based discussions in all Michigan counties, involving the local MAES advisory committees, MSUE councils and others were held to discern what issues and opportunities these stakeholders believed should be addressed by MAES research and MSUE educational programs?

Area of Expertise (AoE) Teams conducted subject specific focus groups comprising a variety of stakeholders and continue to assess and revise their reporting and work.

Community groups, commodity and producer groups and other state and local partners were asked what specific issues and opportunities should be addressed by MAES research and MSUE educational programs.

The MAES/MSUE State Council responded to the question: "Looking at the results of the SOSS survey, what are the implications for MAES research and MSUE educational programming in the future?"

AoE co chairs representing 29 teams were asked to identify emerging issues and opportunities. Each team conducted stakeholder/constituent input sessions and reflected the results in their respective plans of work.

Faculty focus groups, with representatives from all MSU colleges and units, were held to learn faculty perceptions of emerging Michigan issues and opportunities and identify ways that MSU science might be used to address those issues and opportunities.

MSU faculty and MSUE/MAES staff surveys were used to develop a better understanding of MSU's ability to respond to the issues and opportunities identified in the faculty focus groups.

County teams, including MAES field station managers, synthesized and submitted local priorities identified by local MSUE councils and MAES advisory committees.

AoE teams synthesized and prioritized content specific program and research needs generated from input of their advisory bodies and continue to fine tune based on additional input combined with the 2005/2006 survey results.

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

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

Brief Explanation

In 2007, a variety of input/feedback methods were used to leverage the 2005□2006 process. The five strategic priorities were presented to and discussed with the joint MAES/MSUE state council at its spring and fall meetings.

At the fall MSUE meeting, members were asked to think about how the educational and professional development programs being offered fit into the five priority areas and discussed how the process could be used to inform and guide education outreach, research and organizational infrastructure functions. During the fall 2008 conference, there will be five concurrent sessions - one on each priority area □ to discuss and gain additional input.

Progress and revisions based on the five priorities are updated on a continuous basis at the county level. An aggregate county report for the past year is being prepared and will be presented to the state coalition in spring 2008. County staff also submits two partner reports a year to highlight partnership efforts. These are used to customize information provided to county commissioners, state legislators or others who use MSUE/MAES information resources.

MSUE has contracted with the Institute for Public Policy and Social Research (IPPSR) to include questions related to the five priorities on its quarterly state of the state survey (SOSS) for the next three years. The first set of survey questions were sent out in fall 2007 and queried the general public about the five focus areas and what they thought about them. This data is in the process of being analyzed. The second set of questions is currently out in the field and asks questions about general household energy use and people's willingness to pay to conserve. This surveying will be a continuing source of information to help update and refine how critical issues are approached.

The results of Strengthening Michigan's Economy have also helped MAES and MSUE's Area of Expertise teams do a better job of reporting what they've done and to inform future programming. The five priority areas are being used to better clarify and drive the organizations' programs and resources. This has also translated into asking those seeking internal resources to explain how their proposed project or program fits into one or more of the five priority areas.

Beginning in 2008, MSUE will initiate a major restructure by forming a new unit that combines its 4-H Youth and FCS programs. The major aim of the restructure is to better equip MSUE to determine how its education programs interact with citizens throughout their lifespan. This more consolidated approach will be organized around the priority areas within the broad unit of children, youth and families.

3. A statement of how the input was considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

Brief Explanation

As discussed earlier, stakeholder input provides the foundation for the research and educational programs developed by the MAES and MSUE. Stakeholders help decide the future direction for the MAES through programs such as Project GREEEN, the Animal Agriculture Initiative (AAI), FACT, commodity advisory boards and the AoE teams. Due to stakeholder input, the MAES has focused more sharply on biobased products that can help boost the Michigan economy, including fuels, chemicals, neutraceuticals and food products, the environment, land use issues and biotechnology. Stakeholder input has changed the direction of youth programming to focus on job readiness and health, which are not traditional programming areas. The stakeholder input collected in 2005-06 and ongoing data collection and input have guided the creation and in-stream modifications documented in the Michigan 2009-13 Plan of Work for Agricultural Research and Extension Formula Funds for the MAES and MSUE.

Brief Explanation of what you learned from your Stakeholders

As mentioned earlier, MSUE contracted with the Institute forPublic Policy and Social Research for the next three years to include questions in their quarterly phone surveys related to the newly-established MAES/MSUE priorities. The first survey under this contract was conducted between October 10 and November 26, 2007 and included six questions related to the five MAES/MSUE priority areas -- Developing Entrepreneurs, Promoting Healthy Lifestyles, Preparing for the Expanding Bioeconomy, Educating and Supporting Decision Makers, and Building Leaders for Today and Tomorrow. A total of 1,001 interviews were completed. The first five questions asked respondents about each of the priorities and whether they considered it a high priority -- 52% said Developing Entrepreneurs was a high priority; 68% Healthy Lifestyles; 48% Preparing for the Bioeconomy; 54% Educating and Supporting Decision Makers; and 64% Building Leaders. The last question then asked which of the five priorities respondents felt was most important.Healthy Lifestyles (25.7%) and Building Leaders (25.5 %) were identified as the top priorities.

To date, progress reports and discussions have taken place at three state advisory council meetings since the "Strengthening Michigan's Economy" survey was conducted. Council members are pleased that MSUE and MAES continue to integrate the stakeholder input gleaned from the survey and ongoing feedback and feel that survey data has helped MSUE and MAES be more entrepreneurial, more effective in partnering with public and private entities and a more congruent in their application of priorities across research and educational programming and funding processes.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
8296694	0	8811115	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	7862777	0	4567993	0
Actual Matching	8929481	0	4582437	0
Actual All Other	0	0	44305210	0
Total Actual Expended	16792258	0	53455640	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	4764276	0	0	0

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Human Health, Environment, Family, Youth, Society and Community
2	Soil, Water and Natural Resources
3	Plant Sciences
4	Food Quality, Nutrition, Engineering and Processing
5	Economics, Marketing and Policy
6	Animal Production and Protection

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Human Health, Environment, Family, Youth, Society and Community

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
702	Requirements and Function of Nutrients and Other Food Components	3%		10%	
703	Nutrition Education and Behavior	1%		5%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc	2%		2%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	5%		5%	
723	Hazards to Human Health and Safety	3%		15%	
724	Healthy Lifestyle	16%		20%	
802	Human Development and Family Well-Being	19%		8%	
803	Sociological and Technological Change Affecting Individuals, Families and Communities	0%		3%	
805	Community Institutions, Health and Social Services	17%		12%	
806	Youth Development	34%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	54.0	0.0	12.0	0.0
Actual	75.0	0.0	11.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
3329775	0	593839	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
3329775	0	595717	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	5759677	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research activities undertaken in 2007 were conducted primarily to provide new or enhanced knowledge. Key research included:

•Determining the requirements and functions of nutrients and other food components such as dietary fat, zinc, n-3 and polyunsaturated fatty acids, as well as exploring the effects of dietary chemicals on human health and the effects of anti-inflammatory nutrients on obesity-induced systemic inflammation. •Reducing human health and safety hazards by: determining the biological mechanisms that affect the quality and safety of meat food products; improving methods to assess the allergen-causing potential of foods; developing a model to address pulmonary fibrosis among agricultural workers; understanding how environmental pollutants -- especially ozone and endocrine disruptors -- affect human health; and developing new techniques that are fast, efficient, and easy to use and interpret to detect toxins in foods, especially Listeria, Salmonella, E. coli O157:H7 and Campylobacter. •Supporting healthy lifestyles by understanding the relationship between: diet and cancer; obesity and family meals/lifestyle factors; education, food choices and general health; environmental influences and obesity/general health/physical activity; the value of dairy and dairy-based products and diet; and parent/household influences and calcium intake among adolescents. •Promoting human development and family well-being by: developing intervention models for children living with a family member with a serious mental illness; analyzing the relationships among social support, public policy and family characteristics and how they affect the function and well-being of rural low-income families; improving the healthcare system through packaging; developing new programs and policies to help young people move successfully from foster care to independent living; and enhancing the decision-making capacity of communities.

•Protecting food from contamination by pathogenic microorganisms by reducing the transmission of food-borne pathogens and enhancing the microbial safety of foods. •Increasing knowledge about sociological and technological changes affecting individuals, families and communities such as: the effect of spatial patterns of wildlife habitat use in human-modified ecosystems; constructing and evaluating a knowledge management system in resource-based recreation management; and evaluating rural sustainable environmental management.

Educational/Outreach activities in 2007 aimed at:

•Teaching people how to choose healthy food, physically active lifestyles and behaviors consistent with dietary guidelines.

•Teaching consumers to keep their food safe by offering programs on food safety, home food preservation and healthy, hygienic food-handling practices. •Teaching people with chronic medical conditions to manage their condition effectively.

•Preparing individuals to manage their finances in anticipation of retirement. •Teaching caregivers and parents how to prepare children for school. •Increasing access to affordable, high-quality childcare and preparing communities for the health care, housing and transportation needs of its seniors. •Educating citizens and public officials about funding methods, service provision and intergovernmental cooperation. •Providing counties and municipalities with technical assistance related to intergovernmental contracting, consolidating services and financial and strategic planning. •Assisting government officials in leadership, conflict management, communication and engaging the public in policy development. •Preparing youth with knowledge and skills needed for life and employment, and working to enhance the physical, social, emotional and cognitive health and well-being of youth.

2. Brief description of the target audience

Michigan private citizens, state agencies, farmers, food processors, commodity groups and agricultural industry representatives are targets of research programs. Individuals of all ages and life stages are targeted for healthy lifestyle and food-safety education programs. Human development and family well-being programs target parents and caregivers of preschool children, people living with chronic medical conditions and senior citizens. Community institutions, health and social services programs target citizens and public/government officials. Youth aged 9 to 18 are targets of youth development programs.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	3836	7672	4423	6659
2007	5530	11061	4695	9390

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

Patent Applications Submitted

Year	Target
Plan:	0
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	37	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research programs on human health, environment, family, youth, society and community.

Year	Target	Actual
2007	7	39

Output #2

Output Measure

- Number of adult participants trained in healthy lifestyles.

Year	Target	Actual
2007	1449	3303

Output #3

Output Measure

- Number of youth participants trained in healthy lifestyles.

Year	Target	Actual
2007	1342	2120

Output #4

Output Measure

- Number of adult participants trained in human development and family well-being.

Year	Target	Actual
2007	1758	3303

Output #5

Output Measure

- Number of youth participants trained in human development and family well-being.

Year	Target	Actual
2007	845	3042

Output #6

Output Measure

- Number of adult participants trained in community institutions, health and social services.

Year	Target	Actual
2007	138	162

Output #7

Output Measure

- Number of adult participants trained in youth development.

Year	Target	Actual
2007	491	2359

Output #8

Output Measure

- Number of youth participants trained in youth development.

Year	Target	Actual
2007	2236	3674

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Number of research programs to develop an understanding of the function of vitamin A and how it is metabolized in the body.
2	Number of research programs to determine whether and how phytochemicals and probiotic bacteria can reduce the development of cancer cells and chronic diseases.
3	Number of research programs to develop an understanding of how dietary fat affects cell function.
4	Number of research programs to develop an understanding of how zinc affects human immune response.
5	Number of research programs to develop an understanding of how n-3 polyunsaturated fatty acids affect human health and disease, especially cardiovascular disease and inflammation.
6	Number of research programs to develop a stage-based program to increase fruit and vegetable consumption by young adults.
7	Number of research programs to determine the relationship between obesity and family meals/lifestyle factors.
8	Number of research programs to determine the relationship between family lifestyle factors/education and food choices and general health.
9	Number of research programs to determine the relationship between environmental influences and obesity/general health/physical activity.
10	Number of research programs to determine the biological mechanisms that affect the quality and safety of meat food products.
11	Number of research programs to develop improved methods to assess the allergen-causing potential of foods.
12	Number of research programs to develop new techniques that are fast, efficient, easy to use and easy to interpret to detect toxins in foods, especially Listeria, Salmonella, E. coli O157:H7 and Campylobacter.
13	Number of research programs to develop processing techniques to optimize the safety of processed protein-based foods.
14	Number of research programs to develop new methods to reduce the transmission of food-borne pathogens.
15	Number of research programs to develop new methods to control pests in foods that reduce or eliminate chemical residues on food.
16	Number of research programs to understand how environmental pollutants, especially ozone and endocrine disruptors, affect human health.
17	Number of research programs to develop new programs and policies to help young people move successfully from foster care to independent living after they are too old for foster care.
18	Number of research programs to analyze the relationships among social support, public policy and family characteristics and how they affect the function and well-being of rural low-income families.
19	Number of adult participants with increased knowledge about healthy lifestyles.
20	Number of youth participants with increased knowledge about healthy lifestyles.
21	Number of adult participants with increased knowledge of human development and family well-being.
22	Number of youth participants with increased knowledge of human development and family well-being.
23	Number of adult participants with increased knowledge of community insititutions, health and social services.
24	Number of adult participants with increased knowledge of youth development.
25	Number of youth participants with increased knowledge of youth development.
26	Number of research programs to develop agricultural and standards.
27	Number of research programs to increase understanding and develop more effective environmental management systems.
28	Number of research programs to develop better models for the human health and human services sectors.

Outcome #1

1. Outcome Measures

Number of research programs to develop an understanding of the function of vitamin A and how it is metabolized in the body.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Vitamin A is an essential human nutrient found naturally in many foods. In foods of animal origin, the major form of vitamin A is retinol, which is important in vision and bone growth. Adequate supply of vitamin A is especially important for pregnant and breastfeeding women, since deficiencies cannot be compensated by postnatal supplementation. Therefore, it is important to establish precision in the amount of vitamin A foods contain, as well as how this important nutrient is metabolized.

What has been done

Research was done to continue to address the role of vitamin A in human nutrition by studying avian embryonic development related to growth factors and vitamin A deficiencies and to delineate the role of vitamin A in regulating secretion of a protein important to embryogenesis.

Results

Research was completed on studies that looked at the function of vitamin A and retinoic acid in the formation of the forebrain in normal and vitamin A deficient quail embryos. Findings are currently being compiled. In addition, a review chapter on vitamin A was completed for a textbook for physicians to provide more precise information on vitamin A requirements,supplementation and the effects of vitamin A deficiencies and overdoses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components

Outcome #2

1. Outcome Measures

Number of research programs to determine whether and how phytochemicals and probiotic bacteria can reduce the development of cancer cells and chronic diseases.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Aflatoxin is one of the most potent naturally occurring toxins known. Presence of aflatoxin is closely associated with liver cancer in animals that ingest contaminated feed. A close epidemiological association with human liver cancer has also been proposed. Taxol has great potential for the
treatment of breast, lung, skin, and colon cancers. A
major limitation of taxol use as a drug is its short supply because its commercial source is the slow-growing yew tree, so developing alternative systems for taxol production is needed.

What has been done

Research to develop of practical solutions to the aflatoxin problem; and to evaluate the specificity and the structure/function of taxol biosynthesis acyltransferases isolated from taxus plant cultures.

Results

In recent work, a series of natural products synthesized by Aspergillus and/or by plants that control aflatoxin synthesis in culture and on plant materials were identified. The current focus is to determine the mode of action of these natural product inhibitors so they can be developed into effective products that can be used in agriculture to control aflatoxin on economically important products including tree nuts, grains, and groundnuts. Research findings could facilitate the preparation of second generation Taxols that are more effective. Findings have been disseminated via seminars and research proposals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #3

1. Outcome Measures

Number of research programs to develop an understanding of how dietary fat affects cell function.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Understanding the molecular basis for dietary fatty acid regulation of cell function and its contribution to human health is a central issue in modern nutrition research. During the past 50 years, it has been demonstrated that tumor growth can be altered by the amount and type of fat in the diet. Only recently however, have studies been sought to elucidate possible mechanisms that could provide the ability to alter the immune system to better fight the pathology associated with chronic disease.

What has been done

This study focuses on bridging the fundamental gap in the understanding of fatty acid regulation of gene transcription and how the fatty acid metabolism contributes to the control of transcription factor regulatory networks.

Results

The results of this research have provided a proof of concept that endogenous pathways for fatty acid metabolism likely contribute to some of the pathology asssociated with chronic disease. Further research will be conducted to validate this finding.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components

Outcome #4

1. Outcome Measures

Number of research programs to develop an understanding of how zinc affects human immune response.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Since the discovery in the 1960s that zinc deficiency occurs in humans, it is now clear that this deficiency is widespread throughout the world, affecting nearly one billion people. The consequences of zinc deficiency on human health are several and severe. Growth retardation, delayed wound healing, abnormal immune functions and impaired cognitive functions are some of the major effects, which are reversible with zinc supplementation. Mild zinc deficiency in pregnant women is associated with increased maternal morbidity, prolonged gestation and increased risks to the fetus.

What has been done

The study of the zinc deficient mouse (ZD) is a valuable model for elucidating the molecular and biochemical changes made by the immune system to provide a core of host defenses in the face of suboptimal nutrition.

Results

Short periods of deficiencies in zinc (ZD) substantially impair lymphocyte mediated responses in higher animals. ZD also has neuroendocrine affects that lead to elevated production of glucocorticoids that suppress production of lymphocytes. However, we have made the novel discovery that the first line of immune defense (eg. phagocytic cells) are able to survive these stresses. Indeed, neutrophils have longer half-lives and the number of their progenitors in the marrow increases 40-60%. This reprogramming of the immune system as nutrients decline fosters changes in gene expression in phagocytic cells that includes increased expression of anti-apoptotic genes like the inhibitors of caspases. These survival genes protect the phagocytic cells. Preliminary studies suggest that phagocytic cells in nutritionally stressed animals and humans may also be able to attack and kill pathogens very effectively .Thus intermediate protection of the host is provided.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components

Outcome #5

1. Outcome Measures

Number of research programs to develop an understanding of how n-3 polyunsaturated fatty acids affect human health and disease, especially cardiovascular disease and inflammation.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:
Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Polyunsaturated fatty acids (PUFAs) are required for normal human health. In particular, dietary n-3 polyunsaturated fatty acids have effects on diverse physiological processes affecting normal health and chronic disease, such as the regulation of plasma lipid levels cardiovascular and immune function, insulin action, neuronal development and visual function.

What has been done

Research was conducted on mice models to expand the understanding of the relationship between diet, health and disease prevention with particular focus on dietary lipids and to better elucidate the human health benefits associated with functional properties of food constituents.

Results

Considerable progress has been made in understanding how n-3 PUFAs affect cell function. Many mechanisms have been described through this research and new mechanisms are likely to be discovered that will better define how these unique lipids impact human health and disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
702	Requirements and Function of Nutrients and Other Food Components
723	Hazards to Human Health and Safety

Outcome #6

1. Outcome Measures
Number of research programs to develop a stage-based program to increase fruit and vegetable consumption by young adults.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

This project was completed in 2006.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #7

1. Outcome Measures

Number of research programs to determine the relationship between obesity and family meals/lifestyle factors.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Obesity is the fastest growing health concern for U.S. adults and children. Unhealthy diets and increasingly sedentary lifestyles have contributed to this epidemic. Other lifestyle factors contribute to unhealthy eating habits. The increased availability of convenience foods, more meals eaten away from home, fewer family meals and greater portion sizes have increased the potential for weight gain. In addition, obesity-associated coronary heart disease is now the No. 1 cause of mortality in the U.S.

What has been done

Because the diet quality of mothers can relate to their young children, nutrient and food intakes of multiethnic mothers with children in Head Start were examined and compared. Further, inflammation plays a major role in the development of cardiovascular disease and Type 2 diabetes, and strong correlations among obesity and obesity-associated abnormal activation of immune functions have been demonstrated. Recent studies have also suggested that adipose tissue is one of the major sources of obesity-associated increases in inflammatory responses.

Results

The diet quality of 603 mothers, 33% Hispanic American; 43% African American and 24% white, was evaluated. Most mothers in the study exceeded 35% kcal from fat, with Hispanic Americans having the lowest percentage. Overall, 15% of mothers exceeded 25% kcal from added sugars, with Hispanic Americans having 5% with excess intakes. Energy intakes were highest for Hispanic Americans (2017 kcal) and lowest for African Americans (1340 kcal). Hispanic American mothers averaged 5.6 cups of fruit and vegetables/day compared to 3.9 cups/day for African Americans and whites.

Using anti-inflammatory nutrients such as tart cherry extracts and n-3 fatty acids, it was demonstrated that these nutrients have significant inhibitory effects on adipose cell production of inflammatory factors. Some of the intracellular signaling molecules that are involved in anti-inflammatory nutrient inhibition of adipose tissue cell production of inflammatory factors were also identified.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #8

1. Outcome Measures

Number of research programs to determine the relationship between family lifestyle factors/education and food choices and general health.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Overweight children are at serious risk for cardiovascular disease, diabetes and some forms of cancer, and the risk is life long. The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity reports that overweight adolescents have a 70% chance of becoming overweight or obese adults, and this risk increases to 80% if a parent is overweight or obese. Parents can significantly improve the health of their children by initiating family lifestyle changes in activity and eating behaviors.

What has been done

Research is being conducted to examine the influence of parental factors and the environment on calcium intake of children in early adolescence from race/ethnic groups most at risk for osteoporosis; investigate alternate uses for milk and components; determine which foods protect against diseases such as cancer (especially colon cancer), inflammation and microbial infection; and determine the impact of phytonutrients on the absorption, distribution, metabolism and elimination of essential nutrients.

Results

A questionnaire was designed and piloted to measure parental factors influencing the consumption of calcium rich foods among parents and their early adolescent children. The questionnaire will assist researchers with identifying important mediators to change with regard to improving calcium intake among adolescents and their parents.

Currently, collagen films are the only edible alternative to natural casings available to the food industry. The surplus of whey and its functional properties make it an attractive alternative. It was determined that whey films have potential as an alternative to collagen films and casings.

Mice appear to be an appropriate animal model to study the impact of obesity, diabetes and diet on the onset of colon cancer when, as hypothesized, feeding navy beans protected against the development of colon cancer. It was also determined that bean phenolics can impart health benefits via antioxidant activity.

A dietary combination of tart cherry anthocyanins -- antioxidant flavonoids -- and sulindac -- a non-steroidal anti-inflammatory drug -- is more protective against colon cancer than sulindac alone.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #9

1. Outcome Measures

Number of research programs to determine the relationship between environmental influences and obesity/general health/physical activity.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Rates of childhood overweight are increasing, and may lead to adult overweight. Effective interventions to prevent overweight must start early in childhood and address the role of the environment on health behaviors related to overweight.

What has been done

This research is developing a better understanding of the variables that mediate behaviors of infants and children which may place them at increased risk of health problems, including overweight; determining whether specific probiotic bacteria can decrease the production of proinflammatory mediators caused by exposure to bacterial pathogens; and characterizing the role of hypoxia (a shortage of oxygen in the body) signaling in metal induced toxicity using engineered animals and exposure studies.

Results

Focus groups and surveys were used to collect information on environmental variables that affect behaviors that place infants and children at increased risk of health problems. The data will be used to develop programming used by organizations serving youth to improve health behaviors.

Two new mouse models are being used to study the role of hypoxia signaling in lung development. These mice have special importance for various lung diseases, such as chronic obstructive pulmonary disease as it relates to humans and animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

Outcome #10

1. Outcome Measures

Number of research programs to determine the biological mechanisms that affect the quality and safety of meat food products.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The U.S. still has one of the safest if not the safest food supply in the world. However, outbreaks of foodborne illness continue to plague this country and represent not only a serious threat to public health, but a huge economic burden. Each year, an estimated 76 million cases of foodborne illness occur in the U.S., including 325,000 hospitalizations and 5,000 fatalities. The estimated cost of foodborne illness from the five leading bacterial foodborne pathogens is $6.9 billion annually.

What has been done

Research to better characterize the risk of L. monocytogenes contamination and subsequent disease associated with the consumption of deli-sliced ready-to-eat meats; and to understand the structure and function of the protein secretion apparatus responsible for the secretion of toxins in V. cholerae and E. coli.

Results

Research findings are being used to develop scientifically-based best consumed by dating for deli meats and to develop risk communication and education strategies for consumers and deli workers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #11

1. Outcome Measures

Number of research programs to develop improved methods to assess the allergen-causing potential of foods.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food allergies account for more than 200 deaths and 30,000 emergency room visits in the United States each year. Because there is no cure for food allergies, the best course is to prevent problems by strictly avoiding allergy-causing food. One of the biggest problems is verifying whether a particular product contains an allergenic agent. Although protocols are in place to ask questions about the allergy-causing possibilities of genetically engineered crops, no validated test is available to offer definitive answers.

What has been done

An MAES researcher has developed a mouse-based model to determine the allergenic potential of genetically engineered crops.The model also provides the opportunity to better understand how the immune system makes its decision to react as it does to a non-toxic substance in food and why this happens only in certain people.

Results

The model was used to test for reaction to two key allergenic foods -- hazelnuts and sesame seed protein. The test produced allergic responses similar in feature to human allergic reactions. If this model proves effective, it could be available commercially in about five years.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #12

1. Outcome Measures

Number of research programs to develop new techniques that are fast, efficient, easy to use and easy to interpret to detect toxins in foods, especially Listeria, Salmonella, E. coli O157:H7 and Campylobacter.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Escherichia coli are a large and diverse group of bacteria. Although most strains of E. coli are harmless, others pose human health hazards. Some kinds of E. coli can cause diarrhea, while others cause urinary tract infections, respiratory illness and pneumonia, and other illnesses. The most commonly identified Shiga toxin-producing E. coli in North America is E. coli O157:H7. News reports about outbreaks of 'E. coli' infections are usually talking about E. coli O157.

What has been done

Escherichia coli O157:H7 have been shown to be unusually acid resistant, which could account for their low infectious dose and ability to contaminate acidic foods. These genes are unusual among the Enterobacteriaceae in that they occur only in E. coli and Shigella. The nucleotide sequences of the gadA and gadB in 16 strains of pathogenic E. coli were studied to determine acid resistance ability. Another goal is to understand the process of E. coli chromosomal DNA replication and its regulation at the biochemical level.

Results

The results indicate that E. coli O157:H7 strains have superior ability to survive simulated gastric acidity compared to the non-O157 EHEC, and become acid resistant rapidly upon entry into stationary phase, which may underlie the low infectious dose of this pathogen.

A genetic method was developed to select recombinant plasmids containing genes that regulate DNA-a activity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #13

1. Outcome Measures

Number of research programs to develop processing techniques to optimize the safety of processed protein-based foods.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

While processed food has taken much of the work and worry out of meal preparation, it has largely shifted the responsibility for food safety from the consumer's kitchen into the hands of food processors and food service providers. To help ensure that their products are safe, food processors must use methods that meet food safety regulations set forth by the federal government.

What has been done

MAES and MSU researchers are creating and verifying computer models that can predict how pathogenic bacteria are affected by food characteristics and food processing methods. Pilot studies began last spring in a newly constructed bioisafety processing plant at MSU to validate many of the models developed over the past five years.

Results

The central goal over the next three years is to create a tool for the meat processing industry so they can plug in their product and verify whether it's safe.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #14

1. Outcome Measures

Number of research programs to develop new methods to reduce the transmission of food-borne pathogens.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With more than 200 known diseases capable of transmission through food, there are no simple approaches to diagnose foodborne illness. More than 350 million episodes of diarrhea are estimated to occur annually in the United States, according to the Centers for Disease Control and Prevention. Approximately 75 million of these are thought to be due to foodborne disease, accounting for an estimated 325,000 hospitalizations and 5,000 deaths.

What has been done

The goal of this research is to assess the risk of foodborne trichothecenes to humans and ameliorate this risk by dietary intervention. The two primary objectives of this project are to: (1) determine the molecular mechanisms by which trichothecenes induce inflammatory gene expression and immune cell death and (2) develop prophylactic and therapeutic approaches to prevent trichothecene toxicity by nutritional supplementation with omega-3 fatty acids.

Results

Research findings provided new mechanistic data on how foodborne ribotoxic chemicals act and how their toxicity can be prevented. This data was disseminated in presentations at several conferences and shared with students in undergraduate and graduate courses at Michigan State University.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #15

1. Outcome Measures

Number of research programs to develop new methods to control pests in foods that reduce or eliminate chemical residues on food.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

This project was completed in 2006.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc

Outcome #16

1. Outcome Measures

Number of research programs to understand how environmental pollutants, especially ozone and endocrine disruptors, affect human health.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Michigan residents are exceptionally vulnerable due to chromic exposure to complex mixtures of endocrine disruptors that include legacy environmental contaminants within the Great Lakes basin (e.g. dioxin, PCBs, DDT), numerous pesticides and herbicides from the diverse and intense agricultural activities within the state, and the broad range of industrial activities that contribute to the overall pollution burden.

What has been done

Comprehensive omic approaches will be integrated with complementary existing tests to elucidate the mechanistic linkages between molecular phenotype and toxicity outcomes.Emerging technologies (e.g., microarrays, metabolomics) will be used to assess the toxicity of endocrine disruptor mixtures.

Results

Results from this study will provide valuable data to assist with the risk assessment of endocrine disruptors on the health of Michigan residents. Beneficiaries of this research will not only include the regulatory agencies that assess this potential problem, but also Michigan industry and agriculture that may be economically affected as a result of regulation resulting from risk assessments based on questionable practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
723	Hazards to Human Health and Safety

Outcome #17

1. Outcome Measures

Number of research programs to develop new programs and policies to help young people move successfully from foster care to independent living after they are too old for foster care.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Last year, 536 foster care children in Michigan and 20,000 nationally, aged out of foster care. These are children who were not adopted and have lived in foster care for much of their lives or who were placed with foster families who cannot provide financial support after they become adults.

What has been done

This purpose of the MAES supported research is to generate knowledge regarding how the experience and impact of multiple placement moves on adults who lived in foster care for at least some portion of their childhoods, impacts their adult lives including educational outcomes. Network, snowball sampling and focus groups resulted in interviews with 88 adults between the ages of 18 and 65 years old, who had formerly lived in foster care.

Results

Preliminary results from this project are the first of their kind to quantitatively define the challenges foster care alumni have in building and maintaining social relationships since leaving the foster care system. A framework of principles titled, Connections, Continuity, Dignity and Opportunity, has been developed and distributed to foster care and related agencies and staff.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being
806	Youth Development
805	Community Institutions, Health and Social Services

Outcome #18

1. Outcome Measures

Number of research programs to analyze the relationships among social support, public policy and family characteristics and how they affect the function and well-being of rural low-income families.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

No programs at this time.

4. Associated Knowledge Areas

KA Code	Knowledge Area
805	Community Institutions, Health and Social Services
802	Human Development and Family Well-Being

Outcome #19

1. Outcome Measures

Number of adult participants with increased knowledge about healthy lifestyles.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1232	2807

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stakeholders report the healthy lifestyle issue is in the top 10 priorities in the state. Poor eating habits and lack of exercise has increased the likelihood of diseases and obesity our general population.

What has been done

Trainings have been done on obesity, food guide pyramid, exercise, and other areas regarding healthy lifestyles. In addition, projects have also been established to provide Project Fresh coupon books to supplement the diets of the seniors.

Results

83% of the participants gained knowledge in nutrion and healthy lifestyles. The senior program found ofthe 1500 coupons distributed 1279 coupons were redeemed for fresh fruits and vegetables from local farmers. This percentile of redemption is 85.27% which greatly exceeded the objective of 70% redemption.

4. Associated Knowledge Areas

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

Outcome #20

1. Outcome Measures

Number of youth participants with increased knowledge about healthy lifestyles.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1141	1886

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Healthy lifestyles was identified as one of the top 10 priority issues of the state. Overweight and obesity are critical health issues in America, and the trend among children is alarming. Nationally, 20-30 percent of children aged 2-19 can be classified as overweight or at risk of overweight. Being overweight as a child may represent the start of lifelong health problems. Serious health conditions, such as high blood pressure, high cholesterol, early maturation and orthopedic problems occur with increased frequency in overweight youth. Type 2 diabetes, once regarded as an adult disease, has increased among children and adolescents in the last few decades. Discrimination, low self-esteem, unsafe dieting practices, and the potential for eating disorders are also risks faced by overweight children.

What has been done

Trainings have been conducted with youth on healthy snacks, exercise, food nutrition, and food safety.

Results

89% gained knowledge on healthy snacks, exercise, food nutrition, and food safety.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development
802	Human Development and Family Well-Being

Outcome #21

1. Outcome Measures

Number of adult participants with increased knowledge of human development and family well-being.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1494	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The quality of parenting is highly correlated with children's outcomes that include academic, social, emotional, physical and intellectual.

What has been done

A parenting program called Building Strong Families taught parents in a series of lessons regarding human development, discipline, use of play for stimulation and attachment, and goal setting. Another exmple of programs in this area is helping adults deal with anger management.

Results

86% of the parents improved on areas described above. In another evaluation in this area that looked at anger management, a selected sample from over 600 adults using matched pre and post tests, found statistically significant change: data indicated 61% reduced screaming and yelling, 54% reduced the number of times they brought up old issues, 27% increased efforts not to hurt emotionally and physically those close to them, and 74% increased abilities in staying calm and talking things through.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
724	Healthy Lifestyle
802	Human Development and Family Well-Being

Outcome #22

1. Outcome Measures
Number of youth participants with increased knowledge of human development and family well-being.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	719	8505

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Stakeholders have identified helping youth increase their knowledge of human development and family well-being in order improve their quality of life as they become adults.

What has been done

Programs using volunteers have been established to teach youth about human development and family well-being.

Results

Surveys indicate approximately 85% of the youth increased in knowledge areas regarding personal development, human development, child development, and parenting and family life education.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
802	Human Development and Family Well-Being
724	Healthy Lifestyle

Outcome #23

1. Outcome Measures

Number of adult participants with increased knowledge of community insititutions, health and social services.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	117	144

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Families with children ages 0-3 are often left to their own accord. There is not a strong support system, particularly in the rural areas, if you do not have immediate family support. The family support one does receive may only be based upon family experience, verses some research based education. Issues such as child abuse and neglect cut across economic classes. Abuse and neglect may occur because the person does not understand the needs of a very young child.

What has been done

One program that teaches adults about health and social services resoruces is Welcome Newborns program. The program provides research based information directly to families and teaches families how to access health and social services in the community.

Results

A survey was created that reviewed the impact of the Welcome Newborns program with families who had aged out of the program. Families with children age three and older received a survey. Parents were asked if utilizing the information and services of Welcome Newborns helped them improve their parenting skills. The following results were noted by the survey. Of the respondents, 84% indicated they had a better understanding of their baby's needs after utilizing Welcome Newborn materials. 93% indicated they were confident in their parenting skills. 84% indicated they were able to keep their temper better when their child was difficult. 84% indicated they felt they were a more informed and better parent. 98% indicated an understanding of the importance of immunizations. 82% indicated they have read to their child since birth. 96% indicated they understood the nutritional needs of their child. 93% indicated they understood the danger of secondhand smoke with their child. 80% stated they increased their knowledge of Sudden Infant Death Syndrome. 89% indicated they could identify local resources that were helpful to them.

4. Associated Knowledge Areas

KA Code	Knowledge Area
805	Community Institutions, Health and Social Services
703	Nutrition Education and Behavior
802	Human Development and Family Well-Being

Outcome #24

1. Outcome Measures

Number of adult participants with increased knowledge of youth development.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	417	2359

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Each year, Michigan 4-H Youth Development involves more than 20,000 adult in providing fun, hands-on learning opportunities to more than 200,000 Michigan young people. 4-H also provides volunteer training opportunities to foster and support positive youth development. It is critical that volunteers have a strong knowledge of youth development.

What has been done

Trainings have been conducted to further develop adult volunteers' knowledge of youth development as well as create safe environments for young people to learn, have fun and develop socially, and ensure that the adults we entrust to work with young people only have the best interests of youth at heart. The Michigan State University Extension Volunteer Selection Process is a tool we use to recruit and orient volunteers who will be involved with young people for long-term, overnight or extended involvement.

Results

Approximately 97% of the adult volunteers trained showed competent levels of youth development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #25

1. Outcome Measures

Number of youth participants with increased knowledge of youth development.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1901	3563

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Each year, Michigan 4-H Youth Development involves more than 10,000 teens in providing fun, hands-on learning opportunities to more than 200,000 Michigan young people. 4-H also provides volunteer training opportunities to foster and support positive youth development. It is critical that volunteers have a strong knowledge of youth development.

What has been done

Trainings have been conducted to further develop teen volunteers' knowledge of youth development as well as create safe environments for young people to learn, have fun and develop socially, and ensure that the teens we entrust to work with young people only have the best interests of youth at heart. The Michigan State University Extension Volunteer Selection Process is a tool we use to recruit and orient volunteers who will be involved with young people for long-term, overnight or extended involvement.

Results

Approximately 97% of the teen volunteers trained showed competent levels of youth development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #26

1. Outcome Measures

Number of research programs to develop agricultural and standards.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In the past, grocery stores basically served as pass-through points for growers and food processors. With the expansion of global and national supermarket chains over the past decade, the focus has shifted away from suppliers simply providing products that meet general, government mandated standards to large grocery stores telling suppliers precisely what they want.

What has been done

Research to examine the increasing role supermarket chains play in standard setting for food systems.

Results

Research has identified and clarified several major trends in the agrifood sector: there has been an uneven shift away from direct government regulation of various aspects of production and processing through regulatory agencies toward the use of public standards certified by private bodies; there has been a rapid rise of global and national supermarket chains as the dominant actors in food supply chains; the certification industry is now a major player worldwide in food supply chains and in and of itself; producers of undifferentiated agricultural products are likely to have difficulty remaining profitable, while those producers with differentiated commodities are often able to command premium prices for their products; and all actors in the food supply chain will need to think and act far more strategically if they are to remain or be successful.

4. Associated Knowledge Areas

KA Code	Knowledge Area
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sourc

Outcome #27

1. Outcome Measures

Number of research programs to increase understanding and develop more effective environmental management systems.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The rural landscape in Michigan and throughout the United States is changing and with it the role of the wildlife professional. As the rural population of farmers and small communities increasingly includes a diverse and urbanized population, fisheries and wildlife scientists and managers must change the way they do business.

What has been done

Research to understand and develop strategies for the multiple scales at which wildlife species react to environmental change; increase management capacity among agencies to better integrate biological and human dimensions of management, such as wildlife health management;and contribute to developing dynamic and interactive computer interfaces in resource-based recreation management.

Results

The Michigan Gap Analysis Project (MIGAP) Web site was launched. MIGAP is a geographic information system based set of maps showing the geographical distribution of land cover types, land ownership and diversity of selected groups of species within a state. The goal of GAP activities is to establish a proactive approach to land management of ecosystems and to provide a geographical basis for prioritizing and implementing additional research as needed.

A series of books is being written to help wildlife professionals. Published in 2006, the first book, 'Thinking Like a Manager; Reflections on Wildlife Management,' explores the challenges faced by contemporary wildlife managers as they integrate social science into the profession. The second book on how to apply new wildlife management approaches is underway, and a third book on leadership in wildlife management is planned.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #28

1. Outcome Measures

Number of research programs to develop better models for the human health and human services sectors.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Healthy, vital communities with active citizenry are better equipped to address the challenges facing many of today's families. Whether the issue is economic development, youth, aging, family dynamics demographics or rural and urban security, better models for the human health and human services sectors are critical to human development and overall well-being.

Community-related research models that benefit Michigan and its residents.

What has been done

Research to develop build one or more models of preventive and early intervention for children living with a family member with a serious mental illness; examine social processes in disability and death for Nonmetro Americans; and develop healthcare packaging that is easier to access, particularly for aging consumers and people with disabilities.

Results

Two new systems were developed to improve healthcare packaging design -- one that measures flexure and extension in the hands and one that measures the pressure that occurs in the interface between people and packages. The systems are currently being calibrated and are scheduled to be fully operational in the next two to three years.

A survey on Social Processes in Disability and Death for Nonmetro Americans found that being either underweight or overweight rather than of normal weight is associated with higher rates of chronic diseases and death among older adults.

4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families and Communities
802	Human Development and Family Well-Being
806	Youth Development

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Time series (multiple points before and after program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation

Program #2

V(A). Planned Program (Summary)

1. Name of the Planned Program

Soil, Water and Natural Resources

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	2%		2%	
102	Soil, Plant, Water, Nutrient Relationships	23%		15%	
111	Conservation and Efficient Use of Water	12%		15%	
112	Watershed Protection and Management	13%		15%	
123	Management and Sustainability of Forest Resources	8%		7%	
131	Alternative Uses of Land	24%		15%	
132	Weather and Climate	1%		5%	
133	Pollution Prevention and Mitigation	12%		15%	
135	Aquatic and Terrestrial Wildlife	5%		8%	
806	Youth Development	0%		3%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	45.0	0.0	15.0	0.0
Actual	30.0	0.0	13.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1065528	0	730879	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1598292	0	733190	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	7088834	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Develop new land use models for Michigan communities. •Offer education to planners, elected officials and citizens on how these new models will reduce sprawl and ensure that the desirable outcomes will become reality. •Create new remediation strategies to clean up polluted soil and water. These strategies will be environmentally friendly, economically feasible and easy to implement with proper training. •Discover new knowledge about the composition, organization and fluctuations of microbial populations in the soils. •Develop a user-friendly computer program for nutrient management for Michigan crop and livestock producers to improve the management of fertilizer and manure nutrients on cropland to protect water resources and boost crop productivity. •Develop greenhouse gas mitigation strategies. •Develop management techniques for potato and vegetable growers that includes cover crops. •Develop new nitrogen application recommendations for turf managers. •Develop a management system for Michigan inland lakes that does not involve sampling the lakes.

•Develop Total Maximum Daily Load (TMDL) assessment tools for evaluation of Michigan watersheds. •Determine how wildlife responds to ecosystem management decisions in forest and agricultural systems. •Quantify the benefits and costs of a sample green roof system installed on campus. •Develop fish population/community computer models for species important to Michigan. These models will be used to evaluate different fishery management strategies. •Develop web-based tools and models for natural resources managers so knowledge can be shared quickly and easily. •Develop computer models to assess how habitat management affects species important to Michigan, including white-tailed deer, salmon, trout and perch.

•Promote and support value-added processing of forest products, including wood products, biofuels, maple syrup and other nontimber products. •Identify, prevent and control exotic invasive pests and diseases of forests. •Conduct educational programs to help farmers improve nutrient management and other practices to maintain and improve quality of groundwater and surface water. •Conduct educational programs with riparians and lake users to enhance their understanding of watershed management and inland lakes water quality issues. •Work with state agencies and local communities to encourage protection of community groundwater supplies through wellhead protection programs. •Educate and train health officials, consultants, engineers and riparians to improve onsite and decentralized wastewater treatment and design.

2. Brief description of the target audience

Michigan farmers, natural resource managers, private citizens, agriculture and natural resources industry representatives, state agencies, riparians and foresters.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	5124	10248	3672	0
2007	5858	11716	4403	0

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

Patent Applications Submitted

Year	Target
Plan:	5
2007 :	5

Patents listed

Bulgarian Letters Patent 65035 -- Imidzolimone-resistant sugar beet plants.
Patent 200 600 005 265 -- Gene tolerance in perennial rye grass.
We are fairly certain that numerous patents were submitted in this planned program ares, but a paucity of patent information in the annual progress reports prevented an accurate count. This situation will be rectified for next year's report.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	34	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research programs on soil, water and natural resources.

Year	Target	Actual
2007	10	38

Output #2

Output Measure

- Number of adult participants trained in soil, plant, water and nutrient relationships.

Year	Target	Actual
2007	800	2456

Output #3

Output Measure

- Number of youth participants trained in soil, plant, water and nutrient relationships.

Year	Target	Actual
2007	234	455

Output #4

Output Measure

- Number of adult participants trained in conservation and efficient use of water.

Year	Target	Actual
2007	767	982

Output #5

Output Measure

- Number of youth participants trained in conservation and efficient use of water.

Year	Target	Actual
2007	711	956

Output #6

Output Measure

- Number of adult participants trained in watershed protection and management.

Year	Target	Actual
2007	1151	1213

Output #7

Output Measure

- Number of youth participants trained in watershed protection and management.

Year	Target	Actual
2007	1422	1604

Output #8

Output Measure

- Number of adult participants trained in management and sustainability of forest resources.

Year	Target	Actual
2007	1352	1243

Output #9

Output Measure

- Number of youth participants trained in management and sustainability of forest resources.

Year	Target	Actual
2007	445	385

Output #10

Output Measure

- Number of adult participants trained in alternative uses of land.

Year	Target	Actual
2007	732	1123

Output #11

Output Measure

- Number of youth participants trained in alternative uses of land.

Year	Target	Actual
2007	763	487

Output #12

Output Measure

- Number of adult participants trained in pollution prevention and mitigation.

Year	Target	Actual
2007	322	378

Output #13

Output Measure

- Number of youth participants trained in pollution prevention and mitigation.

Year	Target	Actual
2007	97	176

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	New land use models for Michigan communities. We will start with identifying areas of the state that have the infrastructure available to support new development and develop land use planning models for them.
2	Number of research programs to create new remediation strategies to clean up polluted soil and water. These strategies will be environmentally friendly, economically feasible and easy to implement with proper training.
3	Number of research programs to discover new knowledge about the composition, organization and fluctuations of microbial populations in the soils.
4	Number of research programs to develop user-friendly computer program for nutrient management for Michigan crop and livestock producers to improve the management of fertilizer and manure nutrients on cropland to protect water resources and boost crop productivity.
5	Number of research programs to develop greenhouse gas mitigation strategies.
6	Number of research programs to develop management techniques for vegetable growers that include cover crops.
7	Number of research programs to develop new nitrogen application recommendations for turf managers.
8	Number of adult participants with increased knowledge of watershed protection and management.
9	Number of research programs to develop a management system for Michigan inland lakes that does not involve sampling the lakes.
10	Number of youth participants with increased knowledge of watershed protection and management.
11	Number of research programs to develop Total Maximum Daily Load (TMDL) assessment tools for evaluation of Michigan watersheds.
12	Number of adult participants with increased knowledge in management and sustainability of forest resources.
13	Number of research programs to determine how wildlife responds to ecosystem management decisions in forest and agricultural systems.
14	Number of youth participants with increased knowledge in management and sustainability of forest resources.
15	Number of research programs to quantify the benefits and costs of a sample green roof system installed on campus.
16	Number of adult participants with increased knowledge of alternative uses of land.
17	Number of adult participants with increased knowledge of soil, plant, water and nutrient relationships.
18	Number of youth participants with increased knowledge of alternative uses of land.
19	Number of youth participants with increased knowledge of soil, plant, water and nutrient relationships.
20	Number of adult participants with increased knowledge of pollution prevention and mitigation.
21	Number of adult participants with increased knowledge of conservation and efficient use of water.
22	Number of youth participants with increased knowledge of conservation and efficient use of water.
23	Number of youth participants with increased knowledge of pollution prevention and mitigation.
24	Number of research programs that explore the occurrence, transport and fate/effect of organic contaminants, chemicals, pesticides,pharmaceuticals and particulates in soils.
25	Number of research programs that analyze key soil characteristics to better asses their agricultural and environmental contribution.
26	Number of research programs that deal with fish population dynamics and the management of Great Lakes fisheries.
27	Number of research programs that deal with the security, stewardship and management of Michigan's water resources.

Outcome #1

1. Outcome Measures

New land use models for Michigan communities. We will start with identifying areas of the state that have the infrastructure available to support new development and develop land use planning models for them.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What we do to our land is intimately tied to our drinking water quality, wildlife habitat, potential for flooding, our recreational open space and tourism, and many other important quality of life issues. For example, urbanization of the rural landscape is claiming some of the countrys richest farmland and creating challenges for areas where rural and urban interests collide. Some reports indicate that by 2020 farmers will have only enough land to meet the nation's domestic food needs.

What has been done

Fragmentation and changing land use in 83 Michigan counties is being analyzed to assess wetland loss or degradation. In addition, a team of researchers are investigating new methods and technologies to monitor the health of ecosystems using sensors to measure and interpret ecosystem sounds. Sounds are being used to assess ecological health and are being tested in different types of ecosystems including row-crop agriculture and forests, and are being monitored in confined poultry operations to assess animal health.

Results

Initial findings indicate that sound, when monitored on a regular basis, provides a useful tool to determine ecosystem and organism health. Researchers have developed a sensor-to-user operational infrastructure which can provide real time access to an index of ecosystem health based on observations and analysis of sensors placed in remote and diverse ecosystems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
132	Weather and Climate

Outcome #2

1. Outcome Measures

Number of research programs to create new remediation strategies to clean up polluted soil and water. These strategies will be environmentally friendly, economically feasible and easy to implement with proper training.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Contamination of the environment with toxic metals, chemicals and other compounds has become a worldwide problem, affecting crop yields, soil biomass and fertility. In the last few decades, researchers have recognized that certain chemical pollutants such as toxic metals, PCEs and dioxins may remain in the environment for a long period of time and accumulate to levels that pose human health risks and water quality problems.

What has been done

Research to discover and characterize novel microbes and their processes that degrade hazardous waste, especially chlorinated chemicals; and determine the structure and composition of soil microbial communities and how they are influenced by environmental forces.

Results

Studies suggest the potential of the mushroom T. versicolor for bioremediation of PCEs at contaminated sites and also identify a novel pathway for the microbial degradation of PCE that has been demonstrated only in mammalian systems so far.

Researchers sequenced and analyzed Burkholderia xenovorans LB400, a well-studied effective PCB degrader. It has one of the two largest known bacteria genomes yet finished and is the first nonpathogenic Burkholderia sequenced.

Research demonstrated that clay minerals are quite important in soil because they can attract and hold certain pollutants so they don't move. The contribution of soil clays to overall sorption may equal or exceed that of soil organic matter.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #3

1. Outcome Measures

Number of research programs to discover new knowledge about the composition, organization and fluctuations of microbial populations in the soils.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Soils constitute a huge reservoir of microbes whose activities have a profound impact on global warming potential, on crop productivity, and on soil fertility and biogeochemistry. However, knowledge of the composition, organization and fluctuations of indigenous microbial populations in soil ecosystems is scarce, even though the metabolism of such microbes drives many ecosystem-level processes.

What has been done

One reason for the paucity of data on microbial communities in soil has been the general inability to isolate and grow the majority of microbes visible in microscopic examinations of soil. For this reason,a combination of approaches including novel cultivation strategies and cultivation-independent molecular techniques were used to explore and advance the understanding of microbes and microbial communities in soil.

Results

Research results revealed unexpected complexity and robustness in the mother cell gene regulatory network beign studied. The findings of this research were disseminated by presentation at national and international scientific meetings and in five publications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources

Outcome #4

1. Outcome Measures

Number of research programs to develop user-friendly computer program for nutrient management for Michigan crop and livestock producers to improve the management of fertilizer and manure nutrients on cropland to protect water resources and boost crop productivity.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As total farmland acreage dwindles and animal production operations become more concentrated, increased focus is being paid to manure nutrient management, particularly related to the environmental impacts -- degraded air and water quality,human and animal health hazards -- of manure application to agricultural land.

What has been done

Research was undertaken to: determine the resource value of various organic and inorganic waste residuals as amendments to cropland; investigate changes in chemical and physical properties of soils receiving waste residual applications and evaluate potential negative impacts of waste constituents on the soil-plant system and/or water resources; and update existing and develop new written materials on the utilization of animal manure and other organic residuals on agricultural soils and on plant nutrient management/soil fertility.

Results

Based on research findings, a computer program was developed and released to assist crop and livestock producers in accomplishing fertilizer and manure nutrient management, as well as pesticide application recordkeeping and assisting with development of nutrient management plans.

4. Associated Knowledge Areas

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

Outcome #5

1. Outcome Measures

Number of research programs to develop greenhouse gas mitigation strategies.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

There are increasing concerns by many that if greenhouse gases continue to be produced at increasing rates, adverse effects such as more severe flooding and droughts, increasing prevalence of insects and weeds and rising sea levels will escalate. These changes to the environment will are also likely to cause negative effects on human health and economic development. The world has been emitting greenhouse gases at extremely high rates and has shown only small signs of reducing emissions until the last few years.

What has been done

In an effort to better understand variation in the production and consumption of greenhouse gases by microbial communities in soils. The global warming potential of 11 different cropping and natural ecosystems was calculated using information on soil carbon sequestration, fertilizer, lime, fuel inputs, and the production of nitrous oxide and consumption of CH4 in these systems.

Results

Research showed that nitrous oxide production continues to be the largest single source global warming potential in all annual crop ecosystems. Methane oxidation is affected by fertilization but not by tillage in noncropped sites; in cropped sites it was shown that methane oxidation is already low and is not further affected by tillage or nitrogen fertilizer. These and other results offer significant promise for reducing the global warming potential of agricultural systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation

Outcome #6

1. Outcome Measures

Number of research programs to develop management techniques for vegetable growers that include cover crops.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farmers have been using cover crops as one way to reduce the amount of nutrients that end up in surface and ground water.
Once established, cover crops absorb excess nutrients in the soil and reduce erosion from rain, snow and wind. For every acre of farmland planted with cover crops, an estimated 6.2 pounds of nitrogen and nearly one-quarter of a pound of phosphorous is prevented from reaching waterways.

What has been done

The long-term research objective is diversification with cover crops to enhance nutrient cycling efficiency and rhizosphere traits for resilient, productive row crop systems. Specific objectives include evaluating cover crop functional traits and integration strategies for cover crop establishment on coarse soils.Strategies for cover crop establishment and management in sandy, well drained soils are being examined for biological efficiency, and economic returns.

Results

Exciting progress has been made in seed establishment technologies, testing practices (such as seed priming and no-till), slurry seeding to enhance germination and winter survival. These management practices show potential to establish cover crops later in the fall and more inexpensively than has been previously possible. This will reduce barriers to farmer uptake and may provide new nitrogen recycling capacity within row crops, with significant policy implications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #7

1. Outcome Measures

Number of research programs to develop new nitrogen application recommendations for turf managers.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Extensive research on nitrate-nitrogen leaching in turfgrass systems indicates that in most cases leaching poses little risk to the environment. Most of the research, however, was conducted on research sites that were either recently disturbed or established, and the potential exists for nitrate concentrations in leachate to increase on mature turf sites.

What has been done

Leachate analysis for 2007 continued on the trend observed from 2004-2006 with even lower concentrations of nitrogen in leachate from both the low and high nitrogen rate treatments -- the lowest mean concentration in leachate for the high nitrogen rate since data collection began in 1998. For the low nitrogen rate, the flow weighted mean concentration also decreased from the previous years.

Results

This research has provided data to develop nitrogen application recommendations for turf managers that has resulted in a drastic reduction in nitrogen leachate from turf operations since the project began in 1998.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #8

1. Outcome Measures

Number of adult participants with increased knowledge of watershed protection and management.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	978	1031

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Results from the Issue Identification process found safe water as one of the top 10 priorities. Knowing water is contaminated, provides residents with information to help them protect their health. Water screening raises awareness of possible groundwater contamination. Screening may also lead people to think more about protecting water quality by activities around their home site.

What has been done

One example in this area is a collaboration with Extension and the Michigan Groundwater Stewardship Program (MGSP). This program is an organized outreach, coordination and the collection of drinking water well samples for screening for nitrates, nitrites and triazine pesticides at AgExpo. This screening introduced many residents to Extension as they were drawn to a free program that they had seen advertised and previously they had no idea where Extension was located or what Extension provided.

Results

The MGSP provided the state-wide, free screening at AgExpo. The MGSP is a cooperative effort between Michigan State University Extension, Michigan Department of Agriculture, United States Department of Agriculture's Natural Resources and Conservation Service, and AmeriCorp with close coordination with the Michigan Association of Conservation Districts, Michigan Farm Bureau, and the Michigan Agri-Business Association. The Northern District agent's region provided 76% of the 1,871 samples screened. These 1,376 samples came from 22 counties. Three wells tested positive (greater than 0.1 parts per billion (ppb)but less than 0.6 ppb)for triazines, a widely-used, highly leachable group of weed killers. Seventy eight samples had greater than 10 but less than 20 parts per million (ppm) nitrate. The national nitrate standard is 10 ppm. Ten ppm or higher is considered hazardous to babies and pregnant women causing the baby's blood to not be able to carry adequate oxygen (methemoglobinemia, otherwise known as blue-baby syndrome). Three samples had greater than 20 ppm nitrate with two wells providing water with 50 ppm nitrate! Only one sample showed high nitrite levels. This sample from Leelanau County had greater than 0.2 ppm nitrite but less than 1 ppm. The U.S. national standard is 1 ppm. There was an inverse correlation between contamination and well depth. These data are not necessarily representative of all wells in the 22 counties since participation was self-selecting and therefore not a random survey. Residents in the 22 counties benefited from $23,392 worth of free water screening accessed through the MGSP. Additionally residents in 8 counties benefited by familiarization with the location of the MSUE office and to the services offered by Extension through the distribution of a brochure when people came to pick up sample bottles and sampling directions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
111	Conservation and Efficient Use of Water

Outcome #9

1. Outcome Measures

Number of research programs to develop a management system for Michigan inland lakes that does not involve sampling the lakes.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

No project at this time. In the future, a project of this nature will be included under the following outcome measure -- Number of research programs that deal with the security, stewardship and management of Michigan's water resources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #10

1. Outcome Measures

Number of youth participants with increased knowledge of watershed protection and management.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1208	1363

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example is where for the past three years, a resident of Pipestone Township in Berrien County, has been monitoring the water quality of the stream that runs through his property. The resident is a township planning commissioner and graduate of MSUE's Introduction to Volunteer Stream Monitoring, Watershed Management Short Course and Citizen Planner programs. One of identified need in this community was to help elementary students learn about stream science and how to monitor streams.

What has been done

A program was conducted with the Sylvester Elementary's students during the 7th Annual Agriscience Day.

Results

120 students learned about the interdependence and interrelationships of living things, and helped the students become involved in scientific inquiry. It is estimated that 86% of the students gained knowledge in this area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
112	Watershed Protection and Management
111	Conservation and Efficient Use of Water

Outcome #11

1. Outcome Measures

Number of research programs to develop Total Maximum Daily Load (TMDL) assessment tools for evaluation of Michigan watersheds.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

This project was combined with a new outcome measure in this planned program -- Number of research programs that deal with the security, stewardship and management of Michigan's water resources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management

Outcome #12

1. Outcome Measures

Number of adult participants with increased knowledge in management and sustainability of forest resources.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1149	1057

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In one example, the Munising District office of the Hiawatha National Forest contacted MSU Extension to assist in the facilitation process of examining the feasibility of starting new businesses in the area of hard wood production in the Upper Peninsula of Michigan.

What has been done

Over a seven year period and a series of meetings, feasibility studies, and trainings - community businessess decided to invest into hardwood production.

Results

This project resulted in the development of business expansion into hardwood markets among at least six small sawmill operators with an estimated increase in business revenues of $10,000. Based on the increased capacity of these mills, a larger hardwood sawmill developed a system for including small volumes of undried hardwood lumber from smaller mills into their production line, creating a new, viable marketing option. The following evaluation of the MSUE educational effort includes evidence of hardwood knowledge increase among participants. 97% of respondents indicated 'some' to 'very high' knowledge increase. Behavioral changes include 72% of respondents indicating increased sawmill business profits based on their participation in the program, 59% of respondents indicating improved skills as a sawmill employee and 78% of respondents indicating 'somewhat' to 'very much' improved contacts with other small sawmill businesses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources

Outcome #13

1. Outcome Measures

Number of research programs to determine how wildlife responds to ecosystem management decisions in forest and agricultural systems.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The project goal is to develop a better understanding of wildlife-habitat relationships as influenced by natural and managed wildlife habitat disturbances. Results will aid wildlife managers and researchers to make more effective natural resources decisions to conserve wildlife populations, communities, and habitat.

What has been done

Research was undertaken to address quantifying wildlife use of forest and agriecosystems, including evaluating white-tailed deer, elk, snowshoe hare, and eastern massasauga rattlesnake movements, population dynamics, and habitat selection patterns in response to land cover and use patterns.

Results

Researchers have quantified how different factors (e.g., socioeconomic, demographic, geographic, and ecological) interactively affect wildlife habitat across human-influenced landscapes. These findings have been disseminated and will aid wildlife managers and researchers in making more effective natural resources decisions to conserve wildlife populations, communities, and habitat.

A new population estimation technique (an aerial survey) was developed to quantify the elk population size in Michigan and provided to the Michigan Department of Natural Resources (DNR).

A habitat suitability model and a population viability model for the eastern massasauga rattlesnake have been developed and shared with the DNR and others to help conserve the species.

Researchers provided the DNR with estimates on deer population dynamics and quantitative descriptions of how landscape patterns and land ownership influence space use to help managers plan more effective habitat and population management practices. Results from the this project have also been disseminated to the public via the southcentral Michigan website, available at: http://www.fw.msu.edu/deer/.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
123	Management and Sustainability of Forest Resources

Outcome #14

1. Outcome Measures

Number of youth participants with increased knowledge in management and sustainability of forest resources.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	379	327

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Schools and other organizations have identified that youth need to learn about Michigan forest history, forest products, wildlife biology, forest use, and photosynthesis in order to better better environmental stewards.

What has been done

MSU Extension has partnered with the Michigan Forest Resource Alliance to deliver forestry education training workshops around the State of Michigan. The main project goal was to train a cadre of volunteers to deliver a pair of programs to elementary students.

Results

In 2007, 385 students were trained with approximately 85% of the youth showing knowledge gains in wildlife biology, forest use, and photosynthesis.

4. Associated Knowledge Areas

KA Code	Knowledge Area
123	Management and Sustainability of Forest Resources
806	Youth Development

Outcome #15

1. Outcome Measures

Number of research programs to quantify the benefits and costs of a sample green roof system installed on campus.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

This project was combined with a new outcome measure in this planned program -- Number of research programs that deal with the security, stewardship and management of Michigan's water resources.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #16

1. Outcome Measures

Number of adult participants with increased knowledge of alternative uses of land.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	622	954

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One need in this area was due to changes in the zoning laws, there was a need to develop an educational program to address these changes. The Michigan Legislature adopted P.A. 110 of 2006, as amended, (being the Michigan Zoning Enabling Act, M.C.L. 125.3101 et seq.). This act combined and repealed the three existing zoning enabling acts in Michigan (Township Zoning Act, City and Village Zoning Act, and County Zoning Act.) The result was about six major changes in procedure and process, along with about 11 additional changes. These changes necessitated every local government in the state to change zoning administration practices.

What has been done

The project was a series of efforts to provide education on the newly adopted P.A. 110 of 2006, as amended, (being the Michigan Zoning Enabling Act, M.C.L. 125.3101 et seq.). These efforts included intensive 24 training programs, development and distribution of eight zoning guideline materials, and a web site on the new act.

Results

A survey regarding updating bylaws and zoning ordinances was conducted to assess the state of bylaws and zoning ordinances in regards to the changes described above as well as assess the impact of the workshops. Of those surveyed 67 percent had attended the spring 2006 programs, and 32 percent had not. Of the 67 percent that did attend MSUE training: 78% indicated their community updated their bylaws for the planning commission 22% indicated they did not. 91% indicated their community updated their zoning ordinance. 8% indicated they did not. Of the 32 percent that did not attend MSUE training: 18% indicated their community updated their bylaws for the planning commission 82% indicated they did not. 20% indicated their community updated their zoning ordinance. 80% indicated they did not. The Land Use Area of Expertise Team concluded the trainings had an immediate impact of increased compliance with changes in the statutory requirements for local government practicing planning and zoning. As a result of this, it is expected that over the longer term, these communities will experience savings in the form of reduced litigation over land use issues because they are in compliance. It is also expected these communities will see better use of natural resources resulting in healthier population and better forms of economic development.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #17

1. Outcome Measures

Number of adult participants with increased knowledge of soil, plant, water and nutrient relationships.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	681	2456

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New Organic farmers need information on soil quality, weed ecology to be successful.
and insect control

What has been done

MSUE specialists and educators facilitated farmer-to-farmer hands-on training in organic agriculture practices through work aimed at building capacity for developing local sustainable and organic farming systems.

Results

Forty-one percent of workshop participants, who represented 49,500 acres, said in a survey that they would reduce their use of herbicides for weed control that would result in savings of over $400,000.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships

Outcome #18

1. Outcome Measures

Number of youth participants with increased knowledge of alternative uses of land.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	649	458

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Educating youth on land use issues will develop better enviornmental stewards in the future.

What has been done

4-H developed clubs focusing on land use issues and information.

Results

Approximately 88% of the youth gained new knowledge in land use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development
131	Alternative Uses of Land

Outcome #19

1. Outcome Measures

Number of youth participants with increased knowledge of soil, plant, water and nutrient relationships.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	199	400

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Educating youth on soil, plant, water, and nutrient relationships will develop better farmers and environmental stewards in the future.

What has been done

4-H developed clubs focusing on soil, plant, water and nutrient relationships.

Results

Approximately 88% of the youth gained new knowledge regarding soil, plant, water, and nutrient relationships.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
806	Youth Development

Outcome #20

1. Outcome Measures
Number of adult participants with increased knowledge of pollution prevention and mitigation.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	273	302

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example is Genesee County has over 430,000 people and three active landfills. The residents of Genesee County need a method to dispose of their hazardous waste.

What has been done

This collection takes potentially polluting materials and gets them recycled or disposed of properly. It keeps the material out of the enviroment where it can damage public health or the natural ecosystem.

This is a strong partnership between GM & UAW, the Genesee County Health Department, Genesee County Planning Commission, and MSUE - Genesee County. GM help provide technical volunteers from the ranks of their chemical and environmental engineers, which helps reduce costs to the county. UAW provides non-technical volunteers. The Genesee County Health Department handles logistics of hiring contractors and arranging sites. MSUE - Genesee County promotes the event, provides year long education about hazardous waste, and helps recruit and train volunteers.

Results

In the six years we have data for, 11,284 people have participated in our collection. The collection has disposed of over 1.6 million pounds of hazardous waste since its inceptions. In spring of 2007, we had a record breaking collection, with over 1340 participants disposing of over 100,000 pounds of hazardous waste in one day!

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

Outcome #21

1. Outcome Measures

Number of adult participants with increased knowledge of conservation and efficient use of water.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	652	835

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Shoreline stabilization bids are frequently limited to traditional sea walls or rock riprap, leaving property owners with few options. The ongoing development of the KBS Shoreline Management Demonstration Area at Gull Lake offered an opportunity for landscapers and others to gain hands-on experience installing more natural, soil bioengineering erosion control techniques. These installations are not only reducing soil erosion into the lake, but are now permanent features of the demonstration area. Soil erosion and sediment delivery into waterways continues to be a problem for property owners, water quality and wildlife habitat. According to the Michigan Department of Environmental Quality, sediment is the number one pollutant to the waters of the state. Stabilizing shorelines and streambanks, using more natural vegetative techniques, not only reduces erosion but restores wildlife habitat and slows runoff from upland areas.

What has been done

A MSUE workshop was implemented that enhanced the ability of local landscapers to provide services to an increasing number of waterfront property owners interested in more natural shoreline stabilization alternatives. The availability of these services, in parallel with continued MSUE shoreline educational efforts, has the potential to increase the amount of natural waterfront areas in southwest Michigan - improving water quality and wildlife habitat in our lakes and streams.

Results

Twenty-one participants dirtied their hands during the two-day workshop entitled, 'Naturally Stable: Soil bioengineered erosion control for lakes and streams.' After one day in the classroom, participants spent the second day installing approximately 200 feet of natural shoreline stabilization techniques. These techniques utilize dormant plant materials in bioengineered structures which root and stabilize eroding shorelines and stream banks. The installations made for the completion of Phase I of this unique project and participants included professional landscapers, shoreline property owners and agency personnel. Seventeen out of 19 post-program survey respondents: 1) described the program as 'very helpful' or 'extremely helpful' and 2) described themselves as being 'more confident' or 'much more confident' in their ability to conduct erosion control using soil bioengineering techniques. Local media coverage included the Kalamazoo Gazette and the Battle Creek Enquirer & News.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water

112	Watershed Protection and Management
131	Alternative Uses of Land
135	Aquatic and Terrestrial Wildlife

Outcome #22

1. Outcome Measures

Number of youth participants with increased knowledge of conservation and efficient use of water.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	604	841

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Teaching youth about water conservation and use of water will be come better enviornmental stewards in the future.

What has been done

4-H developed clubs that addressed these areas.

Results

Approximately 88% of the youth gained knowledge in water conservation and use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
806	Youth Development
111	Conservation and Efficient Use of Water
133	Pollution Prevention and Mitigation

Outcome #23

1. Outcome Measures

Number of youth participants with increased knowledge of pollution prevention and mitigation.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	82	158

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Youth who learn about pollution prevention and water quality are more likely to be better environmental stewards in the future.

What has been done

4-H develop clubs to focus on pollution prevention.

Results

Approximately 90% of the youth gained knowledge in pollution prevention based on past evaluations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
111	Conservation and Efficient Use of Water
806	Youth Development
133	Pollution Prevention and Mitigation

Outcome #24

1. Outcome Measures

Number of research programs that explore the occurrence, transport and fate/effect of organic contaminants, chemicals, pesticides,pharmaceuticals and particulates in soils.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Michigan's 37 million acres of land support the plants and animals that provide our shelter, food and fiber. The land provides us with minerals and fuels our industries and our businesses. At the same time, human activities are generating and releasing large amounts of pollutants -- including pesticides, antibiotics dioxins and other industrial emissions -- that may end up in the soil.

What has been done

The collaborative efforts of MAES crop and soil scientists are contributing to a greater understanding of soil-contaminant interactions and ways to manage and control the effects of contaminants once they enter the soil.

Results

Research findings show that, in addition to soil organic matter, clay minerals are quite important because they can attract and hold certain pollutants so they don't move. The contribution of soil clays to overall sorption may equal or exceed that of soil organic matter. Researchers are using this discovery in studies related to what affect clays might have in the management of Superfund sites where dioxins are one of the big contaminants, and to the role clay might play in keeping antibiotics that find their way into the soil through manure application from interacting with soil bacteria and causing resistance.

4. Associated Knowledge Areas

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

Outcome #25

1. Outcome Measures

Number of research programs that analyze key soil characteristics to better asses their agricultural and environmental contribution.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Understanding the variability of soil and landscape properties and their effect on crop yield is a critical component of site-specific agricultural and environmental management systems. This includes factors such as climate, nitrogen management, soil absorption and other environmental interactions.

What has been done

Research ranged from studying the characteristics of sands used in athletic field and putting green construction to ensure a stable and agronomically sound root zone mixture to using a regional modeling application framework to compute county-specific and regional indices of plant stress and drought in the region for the period 1971-2000.

Results

Specifications were developed for sands used in athletic fields and golf putting greens to help ensure strong and stable materials that will perform well agronomically.

Researchers finalized the North Central Regional Atlas that includes a 30-year climate and crop productivity database for the 1053 counties in the North Central Region. The Atlas was used to develop a plant stress probability index for the region. In addition, researchers, economists and analysts collaborated to add 15 variables of annual socioeconomic data including human population, employment and financial values for each of the counties to enhance the usability of the Atlas.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
133	Pollution Prevention and Mitigation

Outcome #26

1. Outcome Measures

Number of research programs that deal with fish population dynamics and the management of Great Lakes fisheries.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Urban, industrial, and agricultural development have caused remarkable changes in the lakes' flora and fauna and associated habitats over the past 200 years. Today, the lakes have aquatic communities that are structurally and functionally volatile and that exhibit rapid changes in species' number and abundance. Successful fish management of the Great Lakes is now activity focused on the lakes as ecosystems.

What has been done

Studies were conducted to determine how fish population dynamics are affected by the physical, chemical and biological environment; to investigate how human activities bring about changes in aquatic habitats; to develop models capable of predicting response of fish to habitat alteration; and to investigate critical areas of uncertainty for Great Lakes fishery management, particularly sea lamprey control and salmon stocking.

Results

The second year of an adaptive management-based evaluation of a new rapid method for sea lamprey larval assessment was completed. Although less accurate, the new method is considerably less costly than the current method. Results suggest the rapid method will be more cost-effective for lampricide control.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife

Outcome #27

1. Outcome Measures

Number of research programs that deal with the security, stewardship and management of Michigan's water resources.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With growing concern about the connection between health and the marine environment, there is a corresponding emphasis on large freshwater lake ecosystems and human health. The Great Lakes serve as a highway for international maritime commerce and support a $1 billion per year recreational and commercial fishing industry. They also supply drinking water for over 15 million people. Holding about 20% of the world's surface freshwater, the degradation of the Great Lakes ecosystem through chemical and biological contamination presents an enormous challenge for the future.

What has been done

Identify critical questions of importance to Great Lakes integrity including water quality and fish recruitment in order to improve our understanding and management of the Great Lakes ecosystems.

Results

A landscape context database for Michigan lakes that includes ~700 lakes for a variety of different lake and landscape variables has been completed and is being actively used to develop policies related to detection and management of invasive species in Michigan. Findings have been shared with the Michigan Natural Features Inventory, the Michigan Department of Environmental Quality and the US Environmental Protection Agency to help them improve assessment and management efforts directed toward lakes and their catchments within Michigan, across a 6 state region in the northeast U.S. and nationally.

Three surveys were developed to evaluate the level of stakeholder acceptance of best management practices in mid-Michigan. The results of the surveys were analyzed and shared with local communities and agencies working on Phase II Clean Water plans. This data provides best management practices to reduce both animal and human E. coli loading in surface waters.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
133	Pollution Prevention and Mitigation

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation

Program #3

V(A). Planned Program (Summary)

1. Name of the Planned Program

Plant Sciences

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	3%		8%	
202	Plant Genetic Resources	2%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	4%		7%	
204	Plant Product Quality and Utility (Preharvest)	3%		5%	
205	Plant Management Systems	25%		25%	
206	Basic Plant Biology	3%		6%	
211	Insects, Mites and Other Arthropods Affecting Plants	3%		9%	
212	Pathogens and Nematodes Affecting Plants	20%		12%	
215	Biological Control of Pests Affecting Plants	3%		3%	
216	Integrated Pest Management Systems	33%		20%	
806	Youth Development	1%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	27.0	0.0	19.0	0.0
Actual	32.0	0.0	22.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1420704	0	1233358	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1420704	0	1237258	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	11962407	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Develop improved varieties of dry beans, tart and sweet cherries, potatoes, wheat, rice, soybeans, oats, barley, canola, turfgrass, apples, strawberries, blueberries, floriculture crops, chestnuts, vegetable crops, and conifers for Michigan growers. •Continue to identify genes and genetic pathways that control plant response to environmental stresses and develop techniques to insert these pathways into at-risk plants. •Identify and isolate novel genes, markers and genetic pathways that can benefit crops important to Michigan agriculture through higher yields, improved quality, and better insect and disease resistance. •Identify and isolate novel genes, enzymes and other phytochemicals that may have benefits for human health and determine how these beneficial compounds can be made available to people. •Develop integrated management strategies and provide education programs for producers of fruit, field, vegetable, floriculture, Christmas tree and forestry crops that use the lowest possible inputs of resources and improve yield and quality, while minimizing environmental effects, such as leaching and run-off. •Develop cultural, management and insect and disease control strategies for crops that meet USDA certified organic standards so Michigan growers can take advantage of this growing market, if they choose to do so. •Continue to develop biological controls for pest insects and diseases to minimize effects on the environment. •Continue variety trials for crops important to Michigan, including wheat, corn, soybeans and forages. •Conduct educational programs to help farm producers control weeds and more effectively manage high-cost fertilizer inputs while optimizing crop production. •Develop plant disease prediction models. •Conduct educational programs to help plant producers control disease caused by pathogens and nematodes and teach integrated pest management methods. •Provide green industry professionals and homeowners with scientifically sound information to enable them to safely and effectively manage their turf, landscapes and gardens, improving efficiency of resources and controlling pests, while reducing pesticide and fertilizer use.

2. Brief description of the target audience

Michigan growers, private citizens, agriculture and natural resources industry representatives, biotechnology company representatives, and state agencies.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

Year	Direct Contacts Adults Target	Indirect Contacts Adults Target	Direct Contacts Youth Target	Indirect Contacts Youth Target
Plan	7992	15984	1717	0
2007	5632	11264	2662	0

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

Patent Applications Submitted

Year	Target
Plan:	10
2007 :	13

Patents listed

U.S. Patents awarded: Nos. 7,195,784; 7,208,182; 7,211,277; 7,264,831; 7,264,832; 7,264,833; 7,270,836; 7,282,593;
7,264,831 - anti-inflammatory and anti-oxidant activities of apple skin.
Korean Patent 10-0679367; 10-0687380; 10-0707051 -- cashew bark tree/stinking toe fruit, may alleviate inflammatory pain)
US Patent No. 7,256,325 -- electro-transformation that allows for modification of dry bean and perhaps other species.
Patent application for methods on conferring aphid resistance to soybeans.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	66	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects on plant sciences.

Year	Target	Actual
2007	35	70

Output #2

Output Measure

- Number of adult participants trained in plant management systems.

Year	Target	Actual
2007	3996	4445

Output #3

Output Measure

- Number of youth participants trained in plant management systems.

Year	Target	Actual
2007	1717	2662

Output #4

Output Measure

- Number of adult participants trained in pathogens and nematodes affecting plants.

Year	Target	Actual
2007	1332	1350

Output #5

Output Measure

- Number of adult participants trained in integrated pest management (IPM).

Year	Target	Actual
2007	2664	691

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Number of youth participants with increased knowledge of plant management systems.
2	Number of adult participants with increased knowledge of pathogens and nematodes affecting plants.
3	Number of adult participants with increased knowledge of integrated pest management (IPM).
4	Number of research programs to develop insect and disease control strategies for crops that meet USDA certified organic standards.
5	Number of research programs to develop cultural and management strategies for crops that meet USDA certified organic standards.
6	Number of research programs to develop biological controls for pest insects and diseases to minimize any effects on the environment.
7	Number of research programs to develop integrated management strategies for fruit, field, vegetable, floriculture and forestry crops that use the lowest amounts of nutrients possible and improve yield and quality.
8	Number of research programs to identify and isolate novel genes, enzymes and other phytochemicals that may have benefits for human health.
9	Number of research programs to identify and isolate novel genes, markers and genetic pathways that can benefit crops important to Michigan agriculture through higher yields, improved quality, and better insect and disease resistance.
10	Number of research programs to identify genes and genetic pathways that control plant response to environmental stresses and develop techniques to insert these pathways into at-risk plants.
11	Number of research programs to develop improved varieties of economically important crops for Michigan and the region.
12	Number of variety trials for crops important to Michigan, including wheat, corn, soybeans and forages.
13	Number of adult participants with increased knowledge of plant management systems.
14	Number of research programs to develop production protocols and environmental and cultural strategies for the floriculture/nursery industry.
15	Number of research programs to develop weed control methodology, protocols and practices.
16	The number of research programs to identify plant genome and genetic traits and mechanisms to enhance crops economically important to Michigan and the region.
17	Number of research programs to develop more effective controls for pathogens and nematodes affecting plants.
18	Number of research programs to develop more effective post-harvest protocols and practices to minimize loss and control quality.

Outcome #1

1. Outcome Measures

Number of youth participants with increased knowledge of plant management systems.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1459	2343

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Youth who plan to be farmers and/or enviornmentalists in the future need basic knowledge skills about plant management.

What has been done

4-H clubs were developed that focus on plant management.

Results

Approximately 88% of the youth gained knowledge in plant management systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology
211	Insects, Mites and Other Arthropods Affecting Plants
806	Youth Development
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Number of adult participants with increased knowledge of pathogens and nematodes affecting plants.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1132	1147

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Federal Clean Water Act states, roughly, 'keep manure and associated nutrients and pathogens out of surface waters'. The MDA Right to Farm Guidelines establish a list of recommend management practices to accomplish this along with decreasing odor from manures. The big farms are expanding. New farms are being established in areas unaccustom to livestock. Rural housing is not going to decrease. The non-farm public is educated, aware and watching. Animal agriculture is astute enough to know that what was okay when there were 20-50 head of livestock is not sufficient when there are 200 or 2000 or 5000 head of livestock. The new DEQ permit system and USDA/NRCS cost share funds will now require a higher standard of conformance and a greater ability to document farming operations. Although the basic management practices necessary to accomplish the task are not terribly new, the urgency is greater, the learning curve steep and the teachable moment almost necessitates MSU Extension's ability to meet the educational need of improved nutrient, conservation and farmstead management. Extension agents, mostly through the Manure, Crops, Dairy and Livestock AOE's, need to sharpen their skills in manure nutrient management. They also need to be current on the new permit system and the Michigan Ag Environmental Assurance Program option for farms to become environmentally assured.

What has been done

MSUE developed educational programs that included information on regulatory issues and or the Michigan Ag Environmental Assurance Program. The recommendations and suggestions for improved manure management were also used in concert with the regulatory agencies, so there were not mixed messages about best management practices being delivered to producers.

Results

Approximately 92% of the participants gained knowledge in regulatory and best practices in this area.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

Number of adult participants with increased knowledge of integrated pest management (IPM).

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2264	675

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Michigan producers are faced with pest management decisions during the growing season. Having proper scouting and control methods can enhance profitability.

What has been done

Crop producers and agri-businesses throughout Michigan the target audience. Meetings were held in 10 locations in early January through February 2007. Geographically, the meetings reached from Cass County to Presque Isle County. In addition, a meeting targeting agri-business professionals and farmers was held in December 2007 in East Lansing. Total attendance for all meetings was 1021. Note that this is not only one example but only a portion of the audience was reported due to multiple funding sources being used.

Results

From those that were surveyed, more than 80% of growers attending a training indicated that they would use information learned to make management decisions, including pest management decisions. Over 50% felt that the decisions would earn or save them money in the upcoming growing season. Growers expected to save $151,100 over 11,450 acres or an average of about $13.20/acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems
215	Biological Control of Pests Affecting Plants
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants

Outcome #4

1. Outcome Measures

Number of research programs to develop insect and disease control strategies for crops that meet USDA certified organic standards.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Registration of biopesticides, those available for use by USDA-certified organic growers, is crucial. Because of strict requirements for certification, organic growers already have a small pool of pesticide choices. At the same time, sales of organic foods have increased by 20 percent each year. To ensure organic growers continue to be a contributor to this $10 billion market, they need pest control methods that conform to organic standards and allow them to produce plentiful, pest-free crops.

What has been done

Research to organize and conduct field trials and residue analysis to obtain pesticide clearances from EPA for minor use and specialty crops, including ornamental and greenhouse crops, and to assist in the maintenance of current registrations; and further the development and registration of microbial and other natural biopesticides for use in pest management and organic production systems.

Results

To support the registration of pest management agents for specialty crops, including organics,the North Central Region (NCR) program completed and sent to the Interregional Research Project No. 4 (IR-4)headquarters reports for 88 food use field trials and analytical results for 84 residue trials (12 Analytical Summary Reports). These are being used to develop petitions to EPA for critical pesticide and biopesticide clearances.

In addition, because quite a few of the companies manufacturing reduced-risk pesticides aren't familiar with how to submit data to EPA, IR-4project staff works closely with the EPA and USDA as well as growers, to help agrochemical companies through the registration process.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants

Outcome #5

1. Outcome Measures

Number of research programs to develop cultural and management strategies for crops that meet USDA certified organic standards.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The number of certified organic farms and the acres of farmland in certified organic production in the U.S. more than doubled from 1992 to 2005. In 2005, just over 8000 U.S. farmers had more than 4 million acres in certified organic production. Michigan has 205 certified organic farmers and 45,500 certified organic acres. As this only represents about .4 percent of total acreage in Michigan, additional ways to increase production and marketing efficiencies is important if organic growers are to remain economically viable.

What has been done

Passive solar greenhouses were built on farms in three locations where farmers in the study were already selling produce at the same farmers market in each location. The objective was to measure the economic impact of season extension on farm income and the farmer's market when three local farms can provide extended season production. Yield data were also collected for a similar passive greenhouse located on an organic teaching farm.

Results

Research findings indicated that factors limiting production were inadequate site preparation prior to greenhouse construction and limited prior experience with scheduling intensive succession plantings. Market demand for extended season produce was high.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #6

1. Outcome Measures

Number of research programs to develop biological controls for pest insects and diseases to minimize any effects on the environment.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Biological control is the use of living organisms to suppress pest populations, making them less damaging than they would otherwise be. Biological control can be used against all types of pests, including vertebrates, plant pathogens and weeds as well as insects. Insects that were of little economic importance can become damaging pests. When a non-toxic control method is used, natural enemies are more likely to survive and reduce the numbers and damage of potential pest species.

What has been done

Research to develop stable, sustainable management strategies for vegetable insect pests; determine the effectiveness of currently-registered and experimental products for control of insect pests in small fruit crops; and improve control of moth pests by pheromone disruption.

Results

Researchers created a new hand-applied formulation of codling moth pheromone that permitted 6,000 point sources per acre of apples in less time than is required rope dispensers, the industry standard. It also provided better disruption of codling moth mating using similar amounts of the pheromone. This new application methods saves growers about $35 per acre, more flexibility and significant time
savings.

For the past five years, an MAES researcher and his colleagues at other universities have explored ways to limit the devastating effects of this economically crippling disease, which is becoming increasingly resistant to streptomycin – the primary antibiotic used to combat the disease. The group has identified some promising biological control agents for fire blight bacteria in apple orchards. These materials could be registered for use by growers as early as 2008.

Information on pest management in small fruit crops through research publications, field days, IPM workshops and training programs, presentations at research conferences and extension meetings, extension bulletins and through three websites they helped develop: www.grapes.msu.edu, www.blueberries.msu.edu, and www.nativeplants.msu.edu. Information was delivered in person to grower groups in Michigan, North Carolina, and Ontario, and our websites have helped deliver information to people worldwide.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites and Other Arthropods Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #7

1. Outcome Measures

Number of research programs to develop integrated management strategies for fruit, field, vegetable, floriculture and forestry crops that use the lowest amounts of nutrients possible and improve yield and quality.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	5	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Growers livelihoods depend on production systems that are healthy and sustainable -- environmentally, ecologically and economically.

What has been done

Research to decrease reliance on conventional crop protection practices by utilizing low environmental impact fungicides in combination with host resistance; increase the environmental and economic sustainability of small fruit production in Michigan by integrating various disease control options and strategies; and to collaborate on innovative orchard management strategies and technologies.

Results

MSUs small fruit entomology program delivered data findings through research publications, field days, IPM workshops and training programs, extension meetings and three websites they helped develop: www.grapes.msu.edu, www.blueberries.msu.edu, and www.nativeplants.msu.edu. Information was also provided to grower groups in Michigan, North Carolina and Ontario.

In strawberries, trials conducted to study if fungicides and nutritional amendments could ameliorate black root rot symptoms in declining fields showed that Abound and Symbex drenches and ProPhyt sprays appeared promising. Yield increases of 70% were realized in the best treatments.

Cherry trees grown without fungicides were healthier under tunnels and developed better cold hardiness. Fruit size was not as large, but with the addition of pollinators, yield was about equal to non-covered trees.

The MSU Enviro-weather information system, which integrates near-real-time data from 52 weather stations throughout the state with computer modeling projections to inform pest, natural resource and agricultural production management decision making in Michigan was launched. The site is heavily used, averaging 41,650 hits a month, and a total of a half million hits in FY 2007.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Number of research programs to identify and isolate novel genes, enzymes and other phytochemicals that may have benefits for human health.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Plants are an important source of essential nutrients and health-beneficial components that are crucial for human life. Because the intake of these phytochemicals is not always adequate, the resources of plant biotechnology are being used to enhance the nutritional quality of our plant-based food supply.Recent efforts in gene discovery and functional genomics are providing the necessary understanding to develop and evaluate different approaches to manipulate phytochemical composition.

What has been done

Research to discover health-beneficial constituents in generally regarded as safe (GRAS)plants for novel natural products that are biologically active.

Results

Research has confirmed the anti-inflammatory and antioxidant activities of anthocyanins (antioxidant flavonoids that protect many body systems)in red apple skins, resulting in 9 U.S. patents.

Research has also established that the components in cashew bark tree has the ability to ameliorate blood glucose levels and that the terpenoid compound in stinking toe fruit may alleviate inflammatory pain, resulting in three Korean patents.

4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #9

1. Outcome Measures

Number of research programs to identify and isolate novel genes, markers and genetic pathways that can benefit crops important to Michigan agriculture through higher yields, improved quality, and better insect and disease resistance.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	5	15

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As the world population increases and the demand for food and fuel relies more heavily on agricultural products, efficient methods of plant transformation will be required. While conventional breeding will fulfill part of this need, these techniques are limited to the gene pool of the species involved. In contrast, the tools of genetic engineering significantly expand the sources of genes that can be used for variety improvement. Further, current transformation techniques are not applicable to all plant species.

What has been done

Research to develop a novel transformation system that is suitable for large seeded legumes;exploring ways to increase the amount of plant oil that can be produced and extracted from the seeds and tissues of certain crops; breed new varieties of blueberry, strawberry and sour cherry cultivars for Michigan that are resistant to a common array of biotic and abiotic stresses;and determine how to enhance resistance to plant invaders.

Results

Dry bean experiments have been initiated to introduce and express the bar gene that provides resistance to the herbicide glufosinate ammonium. Evidence suggests that this novel transformation system, referred to as electrotransformation, is a promising method of plant transformation that will enable the modification of dry bean and perhaps other species. This discovery has resulted in the award of a U.S. patent.

A regulatory gene that signals the gene expression required to convert sugars into the building blocks of fatty acids -- the main ingredient of oil -- was identified. Research is underway to transfer the gene to the rutabaga plant to see if a line can be developed that produces oil in the root.

A new set of 10-12 elite selections of northern highbush blueberry hybrids are ready for distribution to trialing partners and a new cultivar (MSU47) is ready to be released.

4. Associated Knowledge Areas

KA Code	Knowledge Area
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
201	Plant Genome, Genetics, and Genetic Mechanisms

Outcome #10

1. Outcome Measures

Number of research programs to identify genes and genetic pathways that control plant response to environmental stresses and develop techniques to insert these pathways into at-risk plants.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research on plant resistance to environmental stress is essential to sustainable agriculture. Determining how to develop or enhance resistance is a critical research area. Before plant varieties that are insect- or disease-resistant can be developed, scientists have to find a source of plant resistance and then determine how to cross-breed plants or isolate the responsible genes and move them from one plant to another.

What has been done

Research to determine foliage thresholds based on the assimilation and storage of carbon; test remote sensing techniques and stress response detection;understand the genetic mechanisms by which plants tolerate environmental stresses; examine plant-microbe interactions; and determine how to enhance resistance to plant invaders.

Results

Researchers discovered the active signaling process of the plant hormone jasmonate and and the key regulatory proteins (JAZ proteins) involved in plant insect/disease resistance, representing a significant advance in the understanding of a major plant hormone and how it works.

A novel component of the plant defense pathway that orchestrates defenses against P. syringae -- a plant pathogen which can infect a wide range of plant species -- has been identified. To date, there are no reports linking this component with resistance against this type of bacteria, but the work had laid the foundation for a new paradigm in plant-microbe interactions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
206	Basic Plant Biology
205	Plant Management Systems

Outcome #11

1. Outcome Measures

Number of research programs to develop improved varieties of economically important crops for Michigan and the region.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	6	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agriculture is one of Michigan's top three industries. The state's agrifood system accounts for $63.7 billion in total economic activity and more than 1 million jobs. Michigan also has one of the most diverse agricultural industries in the U.S., from field crops to fruits and horticultural crops. Developing improved varieties of these crops are an important part of sustaining an economically viable agriculture industry.

What has been done

Research to improve the sustainability of intensive production systems through the use of cover crops, soil amendments, and alternative production strategies; develop management practices for improving grain yield and profitability in corn and soybean production systems; reestablish chestnut trees in forest ecosystems, and chestnut cultivars for nut production; and to evaluate the influence of rootstocks on temperate-zone fruit trees characteristics grown under different management systems and environmental conditions.

Results

Potato varieties with foliar late blight and improved tuber blight resistance have emerged from the MSU Potato Breeding Program, with three releases scheduled for 2008. The Web-based forecasting system offered by the program continues to service the potato industry in Michigan and carries new features each year, including true forecasting.

An edible chestnut industry has been established in North America, including Michigan. Research with fresh and mechanically-peeled chestnuts have identified many issues regarding post harvest spoilage that were previously unknown in Michigan.

Apple rootstock G.30T has performed well with McIntosh over 9 years in the sandy, infertile soil at the MSU Northwest Horticultural Research Station, suggesting commercial promise for this region.

4. Associated Knowledge Areas

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology

Outcome #12

1. Outcome Measures

Number of variety trials for crops important to Michigan, including wheat, corn, soybeans and forages.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	8	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Agriculture is one of Michigan's top three industries. The state's agrifood system accounts for $63.7 billion in total economic activity and more than 1 million jobs. Michigan also has one of the most diverse agricultural industries in the U.S., from field crops to fruits and horticultural crops. Conducting variety trials for economically important crops to Michigan are an integral part of sustaining an economically viable agriculture industry.

What has been done

Research to evaluate environmental databases for predicting the occurrence and severity of water, nutrient and disease stresses at regional scales; develop cultural controls for plant-parasitic nematodes; conduct field inoculation trials for wheat and rice; and improve production efficiency of pot-in-pot production systems for landscape nurseries and Christmas tree producers in Michigan.

Results

Research on types of growing media to facilitate tree growth and help reduce container weight in container-based nursery production systems found that an 80-20 mixture of pine bark and peat moss works best for most trees. Several nurseries in Michigan have installed these systems or have expanded their container-based production operations.

A corn model developed by MSU has been incorporated into a modeling applications framework that allows corn phenology (including yields) in relation to environmental variables to be displayed over the entire north central region of the U.S. over a 30 year time span.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
205	Plant Management Systems
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants

Outcome #13

1. Outcome Measures

Number of adult participants with increased knowledge of plant management systems.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3397	3778

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Michigan Organic Food and Farm Alliance's (MOFFA) identified the need to research and educate farmers about the use of cover crops for nutrient management and for weed and pest control in organic production.

What has been done

MSUE conducted both research, educated farmers on the use of cover crops, and evaluated its effect.

Results

One example was the effect of cover crops when added to Michigan celery rotations. The effect of this research on the Michigan celery industry has been dramatic. On-farm trials with brassica cover crops have led to increased adoptions of cover crops by growers (about 60%). When the practice is applied an average of 10% yield increase (corresponding to 150 more boxes per acre) has been reported. With a price range of $8 to $20/box this corresponds to $1,200-$3,000/A benefits. With a total of 1,800 acres harvested in Michigan in 2007 this represents potentially to $216,000 to $540,000 benefit for the industry.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
216	Integrated Pest Management Systems
206	Basic Plant Biology

Outcome #14

1. Outcome Measures

Number of research programs to develop production protocols and environmental and cultural strategies for the floriculture/nursery industry.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The wholesale value of floriculture crops produced in Michigan more than $370 million annually. Michigan ranks third in floriculture production behind California and Florida. There are 659 floriculture companies in Michigan, with over half of them reporting wholesale sales of over $100,000. Total greenhouse cover reported was 48.2 million square feet with an additional 3,620 acres of open ground used for floriculture production.

What has been done

Research to develop protocols that growers and retailers can use to produce and profitably sell perennials as new floriculture crops; determine environmental and cultural strategies to stimulate the branching and flowering of potted orchid hybrids; and evaluate several perennial semi-aquatic or aquatic plants for use in the phytoremediation of nursery runoff water.

Results

Air temperature, plant temperature and light intensity requirements for several species and cultivars of herbacious perennials were verified. Eight presentations were made to industry groups and a presentation was made at the American Society for Horticultural Science 2007 conference. Several trade publications on new crop development were also written and published.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
204	Plant Product Quality and Utility (Preharvest)

Outcome #15

1. Outcome Measures

Number of research programs to develop weed control methodology, protocols and practices.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Weed control is an essential part of all crop production systems. Weeds reduce yields by competing with crops for water, nutrients and sunlight. Weeds also may reduce profits by hindering harvest operations, lowering crop quality and producing chemicals harmful to crop plants. Weeds left uncontrolled may harbor insects and diseases and produce seed or rootstocks that infest fields and affect future crops. It is estimated that U.S. losses due to weeds left uncontrolled exceed $7.5 billion annually.

What has been done

Research to determine of the mode of action, basis for selectivity, and fate of new or potentially new herbicides for weed control in agronomic crops in Michigan; define management strategies that address shifts in weed populations; and identify effective and safe herbicides for weed control in fruit, vegetable and ornamental crops.

Results

A bioassay system was developed and tested related to the effectiveness of targeted soil herbicides in sugar beet test plots. System efficacy was demonstrated and resulted in the award of a patent.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #16

1. Outcome Measures

The number of research programs to identify plant genome and genetic traits and mechanisms to enhance crops economically important to Michigan and the region.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As the world population increases and the demand for food and fuel relies more heavily on agricultural products, efficient methods of plant transformation will be required. While conventional breeding will fulfill part of this need, these techniques are limited to the gene pool of the species involved. In contrast, the tools of genetic engineering significantly expand the sources of genes that can be used for variety improvement. Further, current transformation techniques are not applicable to all plant species.

What has been done

Research to better understand Pack-MULES -- transposable elements that mediate gene evolution in plants; determine the level of genetic variability within and between populations of Michigan monkeyflower; determine how the encoded proteins in chloroplast genes function in plastid division (the site of photosynthesis);and better understand the genetic basis of adaptation.

Results

Research has demonstrated that Pack-MULES are numerous and that they appear to copy themselves prolifically -- some 3,000 times throughout the sequence, carrying various types of genes. They also rearrange a gene -- an instigator of variation that likely makes them newly-discovered players in evolution.

Protocols were developed to inform approaches to transgenic crop improvement and the molecular breeding of economically important plants. These protocols are available via Web site at MSU's Chloroplast 2010 site: www.plastid.msu.edu.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
206	Basic Plant Biology

Outcome #17

1. Outcome Measures

Number of research programs to develop more effective controls for pathogens and nematodes affecting plants.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Nematodes are among the parasites that attack numerous economically important plants reducing their yield potential substantially by destroying the root system of plants. Pathogen epidemics are a constant problem for agriculture and are known to influence natural ecosystems, especially when alien pathogens successfully invade new areas.

What has been done

Research to examine methods and problems associated with controlling disease in agriculture; design and develop integrated management strategies for plant-parasitic nematodes that include consideration of environment and genetic variability.

Results

The development of new practices to safeguard Michigan's asparagus industry from Phytopthora, a devastating pathogen that attacks below-ground portions of the plant. Asparagus industry leaders are actively adopting these new practices to help turn the Phytopthora problem around. Practices include using crop rotations that reduce Phytopthora levels in asparagus fields, planting crowns from nursery fields that are pathogen-free, and remediating Phytopthora-infected fields so they can be put back into asparagus production.

Remarkable advances were made in the understanding of the genetics of the Potato Late Blight organism. These advances will permanently impact and improve characterization of the local and worldwide population genetics of the pathogen and the use of strains in potato and tomato breeding programs.

4. Associated Knowledge Areas

KA Code	Knowledge Area
206	Basic Plant Biology
205	Plant Management Systems
212	Pathogens and Nematodes Affecting Plants

Outcome #18

1. Outcome Measures

Number of research programs to develop more effective post-harvest protocols and practices to minimize loss and control quality.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Farmers and food sellers have been concerned about losses since agriculture began. Yet the problem of how much food is lost after harvest to processing, spoilage, insects and rodents or to other factors takes on greater importance as world food demand grows. Cutting postharvest losses could add a sizable quantity to the global food supply and reduce the need to intensify production in the future. Estimates of total postharvest food loss are controversial and range widely,,generally from about 10% to as high as 40%.

What has been done

Research to elaborate temperature-dependent models for packaging of horticultural products in perforated and non-perforated packaging film materials and evaluate the impact of the differences in atmosphere on product quality; and evaluate postharvest requirements of new and existing fruit varieties.

Results

Data show that the use of plastic bins or packaging compared to wooden bin material or cardboard packaging helps sustain the effectiveness of 1-MCP, a compound used to extend the postharvest shelf life and quality of numerous fruits and vegetables. Wooden bins and cardboard were shown to quickly absorb 1-MCP, reducing its effectiveness.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Evaluation of one of Fruit AoE Programming Goal

Goal : Educate & support decision-makers in the fruit industry. This goal is accomplished in many ways by several Fruit AoE team members, but through the 2007 Great Lakes Fruit, Vegetable and Farm Market Expo, so many team members are involved that it fills a huge role as a major objective to accomplishing the goal set forth by the team to educate and support decision-makers. This annual program jointly sponsored by the Michigan Vegetable Council and the Michigan State Horticultural Society was held in Grand Rapids, Michigan December 4-6, 2007. It constitutes a major educational effort for most members of the Fruit Area of Expertise Team. Our team members organize and coordinate all of the fruit education sessions and help plan some of the general education sessions. The sessions that our team organized or had a role in organizing during the 2007 Expo included: Berries, two Blueberry sessions, two apple sessions, an apple variety showcase, a general tree fruit session, sweet cider, cherry, grape, stone fruits, wine grapes, hard cider, and organic tree fruit production. Team member Bob Tritten, also co-organized five farm market sessions, four farm market workshops and the entire Apple Cider Contest.

Our team members also participated in organizing and coordinating these general sessions: alternative energy, pollination, plasticulture, cultivating organic markets, farm labor, two farmers market sessions, preparing for organic production and certification, water use issues session. Because an farm labor session was included in 2007, this program also filled another goal of the Fruit AoE – Ag Labor Issues – recognize and understand local, national and international labor dynamics to better assist producers with ag labor issues.

Other events at the Expo that are covered by Fruit AoE team members are the Educational Posters and the Education Credits for Pesticide Applicators and Certified Crop Advisors

In total, there were 45 educational sessions offered at the 2007 Great Lakes Fruit, Vegetable and Farm Market Expo. Of those 45, 14 were related to fruit topics, 11 focused on farm marketing aspics and 7 were general sessions that both fruit or vegetable producers would be likely to attend.

While some of the Fruit AoE team members organize sessions, other serve as speakers in educational programs, more than half of the talks presented at the sessions are given by Team members, especially campus based staff. The in-depth survey designed by Dr. Murari Suvedi for the 2005 Expo demonstrated the effectiveness and impact of the Great Lakes Expos programs in educating participants. Current plans are to repeat that survey every five years. Also, surveys were handed out at each and every session during the 2007 Expo.

What need did the program address?:

The Great Lakes Expo addresses ALL of the goals set forth by the Fruit AoE –

- Develop leadership of our membership and the fruit industry.
- Enhance profitability and sustainability of the MI fruit industry
- Promote IPM practices for fruit production.
- Ag Labor Issues – recognize and understand local, national and international labor dymanics to better assist producers with ag labor issues.
- Maintain the safety of MI fruit products to consumers through educational training.
- Educate & support decision-makers in the fruit industry.

At the same time, this program addresses some of the state-wide initiatives Developing entrepreneurs by teaching new skills to fruit producers who are just starting in the fruit business; Promoting healthy lifestyles by education to help producers stay ahead of emerging diseases and pests that threaten the health of ecosystems, plant industries, or environmental health and quality of life; Building leaders for today and tomorrow through programs to help people acquire leadership skills and learn about public policy issues and processes.

What stakeholder input and involvement did you have?:

Session coordinators seek the input of producers of the various fruit crops as well as industry leaders and commodity organizations, such as the Michigan Apple Committee, the Michigan Cherry Committee, The Michigan Wine and Grape Industry Council, Michigan Blueberry Growers, Michigan Peach Sponsors, and the Michigan Farm Marketing & Agri-Tourism Association, among others.

What were the key program components? What were the resources used for this activity?

(i.e., staff, materials, curriculum, research-based information) How did campus and field staff collaborate?

How long was the training or initiative? What was the intensity?:

The educational sessions at the Great Lakes Expo are mostly two hour time slots over three days time. During the session time, many varied topics can be covered by a number of speakers or the time can focus on one general topic with only one presenter.

Resources used to pull this program together come from many sources, but the main resource is people and many of those people are MSU Extension Educators and MSU campus personal, working together to create full and well-rounded educational sessions based on the current needs of the fruit industries.

What was the evaluation framework? What methodology did you use?:

Paper surveys were handed out at every session and not mandatory. Questions were generally the same for each session, but coordinators have the possibility to tailor a survey if they wish. A general survey included the following:

- How helpful was this session?
- Home State
- Type of Operation, i.e. Grower, Shipper, FarmMarket , Packer, Processor, Other
- Do you have specific comments for any of the presenters? (from Growers)
- Do you have specific comments for any of the presenters? (from Farm Marketers)
- Do you have specific comments for any of the presenters? (from Others)
- List at least one thing you learned during this session that you can use in your business:
- What topic(s) do you suggest for future meetings?

Who was the target audience? Is this an underserved audience?

How many people were reached?:

The target audience is fruit growers and farm marketers from Michigan and the general Midwestern states. In 2006, attendees were from 31 states and 5Canadian provinces.

The 2007 Expo set yet another new attendance record of over 3500 attendees, which was about 300 more than the 2006 numbers.

What were the documented outcomes and impacts?:

Since there are so many different sessions, it is imprudent to include them in this format. They are available on-line at: http://www.glexpo.com/evaluation/index.php From this site, you can access individual sessions by topic or see all 59 pages of the evaluation summary with comments in a PDF file.

Key Items of Evaluation

Program #4

V(A). Planned Program (Summary)

1. Name of the Planned Program

Food Quality, Nutrition, Engineering and Processing

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
401	Structures, Facilities, and General Purpose Farm Supplies	3%		3%	
402	Engineering Systems and Equipment	6%		6%	
403	Waste Disposal, Recycling, and Reuse	6%		8%	
404	Instrumentation and Control Systems	11%		9%	
501	New and Improved Food Processing Technologies	22%		16%	
502	New and Improved Food Products	17%		17%	
503	Quality Maintenance in Storing and Marketing Food Products	22%		20%	
511	New and Improved Non-Food Products and Processes	8%		16%	
512	Quality Maintenance in Storing and Marketing Non-Food Products	5%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	9.0	0.0
Actual	0.0	0.0	9.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	502479	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	504068	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	4873573	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Connecting Michigan industries with the research, education and entrepreneurial activity needed to provide the the state with a foundation for the development of a new biobased economic sector. •Identification and isolation of beneficial plant compounds that can be used to make new functional foods, especially related to the safety and nutritional value of protein foods

•Development of processes and technologies to manufacture functional foods. •Development and refinement of new biosensors and DNA chips that rapidly and accurately detect a broad spectrum of harmful organisms in food and water, such as E. coli, Salmonella,Listeria, Campylobacter, Cryptosporidium and Giardia. •Breeding and genetic improvements related to food quality, nutrition and processing. •Development of packaging systems to enhance food quality and shelf life.

2. Brief description of the target audience

Agriculture and natural resources industry representatives, farmers, food manufacturing, packaging and retail industries, biotechnology company representatives, state agency representatives, private citizens, entrepreneurs.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	0	0	0	0
2007	0	0	0	0

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

Patent Applications Submitted

Year	Target
Plan:	5
2007 :	5

Patents listed

U.S. Patent No. 60/837,039 -- models for the design and control of industrial biocatalysts (stability, activity and chemical yield).

Patent Pending 20060247387 -- for hyperbranched polymer modified biopolymers related to biobased materials and process.

Multiple patents applied for biosensor technology to assure food safety and postharvest quality of commodities.

Patent applied for processes related to the manufacturing of biosensors for the detection of animal and human pathogens.

Patent application for orchard management technology to address labor and production cost challenges.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	32	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research projects focusing on food quality, nutrition, engineering and processing.

Year	Target	Actual
2007	22	21

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Number of research programs to develop new processes to break down cellulose from plant biomass into fermentable sugars.
2	Number of research programs to develop and evaluate a continuous production process to create biodiesel from plant-based oil.
3	Number of research programs to help Michigan-based biodiesel companies create business plans and begin production.
4	Number of research programs to develop new processes and technologies to create succinic acid and other platform chemicals from renewable biomass sources.
5	Number of research programs to create a biorefinery for testing concepts, developing applications, creating prototypes for the bioproducts industry, training the growing work force, and spurring innovation and engineering of next generation bioproducts equipment and technologies.
6	Number of research programs to connect Michigan industries with research, education and entrepreneurial activity needed in the basic sciences, engineering, plant science and agriculture to provide the state with a foundation for vigorous development of a new biobased economic sector.
7	Number of research programs to identify and isolate beneficial plant compounds that can be used to make new functional foods.
8	Number of research programs to develop the processes and technologies to manufacture functional foods.
9	Number of research programs to develop new biosensors and DNA chips that can rapidly and accurately detect a broad spectrum of harmful organisms in food and water, such as E. coli, Salmonella, Listeria, Campylobacter, Cryptosporidium and
10	Number of research projects to identify breeding and genetic improvements related to food safety, nutrition and processing.
11	Number of research projects dealing with food and non-food packaging systems and materials.

Outcome #1

1. Outcome Measures

Number of research programs to develop new processes to break down cellulose from plant biomass into fermentable sugars.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Projects in this area have been transferred and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #2

1. Outcome Measures

Number of research programs to develop and evaluate a continuous production process to create biodiesel from plant-based oil.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Projects in this area have been transferred and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
511	New and Improved Non-Food Products and Processes

Outcome #3

1. Outcome Measures

Number of research programs to help Michigan-based biodiesel companies create business plans and begin production.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Projects in this area have been transferred and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment

Outcome #4

1. Outcome Measures

Number of research programs to develop new processes and technologies to create succinic acid and other platform chemicals from renewable biomass sources.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Projects in this area have been transferred and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
511	New and Improved Non-Food Products and Processes

Outcome #5

1. Outcome Measures

Number of research programs to create a biorefinery for testing concepts, developing applications, creating prototypes for the bioproducts industry, training the growing work force, and spurring innovation and engineering of next generation bioproducts equipment and technologies.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Projects in this area have been transferred and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment
511	New and Improved Non-Food Products and Processes
502	New and Improved Food Products
503	Quality Maintenance in Storing and Marketing Food Products
404	Instrumentation and Control Systems
512	Quality Maintenance in Storing and Marketing Non-Food Products
501	New and Improved Food Processing Technologies

Outcome #6

1. Outcome Measures

Number of research programs to connect Michigan industries with research, education and entrepreneurial activity needed in the basic sciences, engineering, plant science and agriculture to provide the state with a foundation for vigorous development of a new biobased economic sector.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	8	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Michigan, along with many other states, is struggling to revitalize its economy. A critical component of the state's (and the nation,s) revitalization effort is to decrease dependence on foreign oil, while creating jobs and encouraging further alternative energy investments. These efforts will have a significant impact on agriculture and manufacturing throughout the Great Lakes region and beyond as sustainable alternatives to petroleum-based products are developed to help boost the state,s economy.

What has been done

MAES scientists from various disciplines (e.g.,basic sciences, engineering, packaging, plant science)are all working to enhance Michigan's economy and environment by providing critical information and developing new processes and technologies to create new products from plants and other renewable resources.

Results

Soy meal and natural rubber blends were successfully processed to create a biocomposite that not only helps environmentally -- because it incorporates excess distillers dried grains produced from corn ethanol industries beyond what the animal feed industry can use -- but creates a new, value-added commercial product.

A comprehensive program was developed to conduct energy audits for the farmstead portion of a dairy farm, including an energy audit manual, a training program to prepare personnel to conduct dairy farm energy audits and criteria for certifying farm energy auditors. Complete farmstead energy audits were conducted for 12 dairy farms in Michigan, and 14 energy auditors completed training and were certified. A Web site was developed for the program, which provides forms and materials, contact information and energy audit calculators.

The development of biosenors for pathogen detection relevant to biomedical and food process engineering (multiple patents applied for).

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
402	Engineering Systems and Equipment
502	New and Improved Food Products
511	New and Improved Non-Food Products and Processes

Outcome #7

1. Outcome Measures

Number of research programs to identify and isolate beneficial plant compounds that can be used to make new functional foods.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:
Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

Two of the programs under this outcome measure were completed in FY 2006; the third was incorporated into another outcome measure.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products

Outcome #8

1. Outcome Measures
Number of research programs to develop the processes and technologies to manufacture functional foods.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:
Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Dwindling farm acreage, more expensive production and processing costs and increased consumer expectations have prompted research into creating new and enhancing existing processes and technologies that manufacture functional foods.

What has been done

Research to develop improved methods for the design and operation of thermal processing systems for protein foods; develop food-grade specialty soybean varieties for Michigan; increase the nutritional composition of nutraceuticals; evaluate the efficacy of processes and ingredients that impact known safety hazards in muscle foods; identify, develop and/or apply postharvest technology to support the Michigan fruit, vegetable and chestnut industries; and develop technologies to support management systems for quality grains and oilseeds.

Results

A new biosafety processing plant was established at MSU to provide researchers with the opportunity to conduct pilot scale studies to validate many of the models developed over the past five years. Tests in 2007 quantified the efficacy of low-energy x-ray irradiation for pasteurization of ground beef patties and verified inactivation rates for innoculated, whole muscle beef.

A novel method to estimate thermal kinetic parameters of neutraceuticals was developed and spray-dried powders from grape pomace and cull blueberries were produced successfully on a pilot-size spray drier.

The continued study of new approaches to improve cooling effectiveness and efficiency in post-harvest handling of tart cherries has resulted in improvements in cooling and indicators of product quality.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

Outcome #9

1. Outcome Measures

Number of research programs to develop new biosensors and DNA chips that can rapidly and accurately detect a broad spectrum of harmful organisms in food and water, such as E. coli, Salmonella, Listeria, Campylobacter, Cryptosporidium and

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The rapid detection of harmful organisms and disease-causing agents in food and water and the ability to track and trace sources is critical to human health and well-being.

What has been done

Significant research has been undertaken to develop biosensor technologies and rapid identification systems assure food supply chain security, quality and safety.

Results

A proof-of-concept electrochemical biosensor for the detection of the Bacillus was developed, tested and validated on selected food products. A data acquisition system to develop a multi-array biosensor was also created.

MSU opened a new Automatic Identification Research & Testing Center to further work in the Radio Frequency Identification (RFID) arena. The newest product is a computer program that automatically collects, sorts, stores, analyzes and develops graphical representations for display of the RFID test results.

Multiple biosensor platforms have been developed to assure food safety and postharvest quality of commodities. These platforms have contributed to the advancement of science and engineering and in multiple patents. An annual national meeting is held at rotating sites to share technology updates and knowledge. The project also provides educational opportunities for graduate and undergraduate students.

4. Associated Knowledge Areas

KA Code	Knowledge Area
404	Instrumentation and Control Systems
503	Quality Maintenance in Storing and Marketing Food Products

502 New and Improved Food Products

Outcome #10

1. Outcome Measures

Number of research projects to identify breeding and genetic improvements related to food safety, nutrition and processing.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Genetic diversity is required to meet current production needs in plant and animal agriculture, to allow sustained genetic improvement, and to facilitate rapid adaptation to changing breeding objectives.

What has been done

MAES scientists are continuously discovering new and more effective ways to develop improved yield, quality, and disease resistance through the study of breeding and genetic improvement. Regionally, 420,000 new hybrid potato seedlings were evaluated this past year - collectively the greatest number of seedlings evaluated in the US. Nineteen replicated yield trials consisting of standard released varieties and over 500 advanced experimental lines of dry bean in nine commercial classes and two organic trials were evaluated in Michigan in 2007.

Results

Potato cultivar research at MSU has resulted in the public disclosure and/or release of 18 potato lines since 2001.

Yields of tested bean varieties averaged 25 cwt per acre and the best lines exceeded 30 cwt per acre, indicating great promise especially for the navy and black bean lines.

An MSU line of soft, white wheat (D8006W) earned the highest ratings of its class in the 2007 quality evaluation by the Soft Wheat Quality Council. It scored higher than other submissions because of its moderate resistance to viruses such as Stripe Rust and Wheat Spindle Streak Mosaic, its superior milling and baking properties, and its low water absorption and gluten strength.

4. Associated Knowledge Areas

KA Code	Knowledge Area
502	New and Improved Food Products
501	New and Improved Food Processing Technologies
511	New and Improved Non-Food Products and Processes

Outcome #11

1. Outcome Measures

Number of research projects dealing with food and non-food packaging systems and materials.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:
Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	{No Data Entered}	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In packaging systems, chlorine dioxide gas is used for vapor-phase decontamination in treating produce before packaging and sanitizing products inside their packages. Yet, very little is known about its effects on packaging material properties and performances.
In terms of containers themselves, use of a reusable plastic-based packaging system would greatly reduce the costs associated with packaging and address environmental issues.

What has been done

This packaging system research addresses safety improvement of fresh and fresh-cut fruits and vegetables by applying a standard chlorine wash coupled with a packaging system that uses chlorine dioxide gas to significantly reduce Escherichia coli and Salmonella. For reusable packaging, researchers are comparing biobased and petroleum based plastics for fresh cut fruits and vegetables and evaluating the quality of fresh mangos in different shipping containers to help develop a standard shipping container that can be used to maintain high quality fruit from various countries.

Results

Reduced oxygen and elevated carbon dioxide in rigid container packaging was found to be beneficial in maintaining quality and extending shelf-life of fresh-cut tropical fruits when the appropriate package was selected. A modified atmosphere of 6% oxygen and 14% carbon dioxide extended the shelf-life of fresh-cut pineapples packaged in Polyethylene Terephthalate (PET) from 6 days to 13 days.

Current research on the performance requirements of reusable plastic containers (RPCs) has found them to have significantly higher strength and improved pre-cooling and temperature control performance. Also, unlike paper based containers, plastic containers are not significantly affected by moisture or water and provide product protection during the entire distribution and retail display cycle. These advantages have led to an increase in the use of RPCs for fresh produce. The estimated cost of using expendable corrugated containers exceeds $7 billion annually in the U.S. Use of a reusable package system would greatly reduce costs associated with packaging and address environmental issues.

4. Associated Knowledge Areas

KA Code	Knowledge Area
512	Quality Maintenance in Storing and Marketing Non-Food Products
503	Quality Maintenance in Storing and Marketing Food Products
511	New and Improved Non-Food Products and Processes

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The vast majority of the biotechnology projects in this planned program have been transferred to a different funding stream and are now under the umbrella of the U.S. Department of Energy (DOE) - funded Great Lakes Bioenergy Research Center, one of three new DOE Bioenergy Research Centers.

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation

Program #5

V(A). Planned Program (Summary)

1. Name of the Planned Program

Economics, Marketing and Policy

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
601	Economics of Agricultural Production and Farm Management	20%		16%	
602	Business Management, Finance, and Taxation	12%		12%	
603	Market Economics	3%		3%	
604	Marketing and Distribution Practices	5%		5%	
605	Natural Resource and Environmental Economics	22%		22%	
606	International Trade and Development	3%		3%	
608	Community Resource Planning and Development	26%		22%	
609	Economic Theory and Methods	3%		3%	
610	Domestic Policy Analysis	5%		9%	
611	Foreign Policy and Programs	1%		5%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	27.0	0.0	11.0	0.0
Actual	28.0	0.0	10.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1245860	0	548159	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1245860	0	549892	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	5316625	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Identify current and emerging key public policy issues on trade, environmental, agricultural and food issues important to Michigan and analyze responses. •Conduct research and education to improve the operations, business and financial management skills of Michigan producers so they can make decisions that are more sound financially and environmentally. •Evaluate the competitiveness and marketing strategies of Michigan farm markets, greenhouses and other green industry retailers. •Identify and evaluate human resources management practices in Michigan agricultural and green industries. •Develop a framework to understand and analyze domestic and international trade policies and assess their impact on Michigan. •Evaluate how Michigan citizens use the Internet when searching for information about a vacation destination or planning a vacation. •Determine rationale for farmland preservation choices and how changes will affect the Michigan tax base. •Develop models to estimate the demand for and value of recreational fisheries and wildlife resources. •Identify and evaluate the policy, technology and marketing issues faced by Michigan organic growers and develop responses. •Teach financial management skills, business organization, estate planning, management information systems, strategic management, alternative sustainable production and marketing systems to agriculture and natural resources producers and businesses. •Assist agencies, organizations, local governmental units and individuals in pursuing a cultural economic development strategy. •Offer business retention and expansion support. •Help people recognize, understand and appreciate multicultural differences. •Provide entrepreneurship education to a broad audience, including individuals, business owners, youth and communities. •Offer communities consultative, diagnostic and educational assistance in planning and zoning to meet community land-use goals.

2. Brief description of the target audience

Agriculture and natural resources producers and industry representatives; tourism industry representatives; state agency representatives; private citizens; local, state and federal elected officials.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	4717	9434	0	0
2007	4703	9406	0	0

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

Patent Applications Submitted

Year	Target
Plan:	1
2007 :	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	45	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research programs on economics, marketing and policy.

Year	Target	Actual
2007	21	33

Output #2

Output Measure

- Number of adult participants trained in economics of agricultural production and farm management.

Year	Target	Actual
2007	861	797

Output #3

Output Measure

- Number of adult participants trained in business management, finance and taxation.

Year	Target	Actual
2007	1734	1750

Output #4

Output Measure

- Number of adult participants trained in natural resource and environmental economics.

Year	Target	Actual
2007	512	632

Output #5

Output Measure

- Number of adult participants trained in community resource planning and development.

Year	Target	Actual
2007	1610	1735

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Number of adult participants trained in economics of agricultural production and farm management.
2	Number of adult participants trained in business management, finance and taxation.
3	Number of adult participants trained in natural resource and environmental economics.
4	Number of adult participants trained in community resource planning and development.
5	Number of research programs to identify current and emerging key public policy issues on trade, environmental, agricultural and food issues important to Michigan and analyze responses.
6	Number of research programs to improve the operations, business and financial management skills for Michigan producers so they can make decisions that are more sound financially and environmentally.
7	Number of research programs to evaluate the competitiveness and marketing strategies of Michigan farm markets, greenhouses and other green industry retailers.
8	Number of research programs to identify and evaluate human resources management practices in Michigan agricultural and green industries.
9	Number of research programs to develop a framework to understand and analyze domestic and international trade policies and assess their impact on Michigan.
10	Number of research programs to evaluate how Michigan citizens use the Internet when searching for information about a vacation destination or planning a vacation.
11	Number of research programs to determine rationale for farmland preservation choices and how changes will affect the Michigan tax base.
12	Number of research programs to develop models to estimate the demand for and value of recreational fisheries and wildlife resources.
13	Number of research programs to identify and evaluate the policy, technology and marketing issues faced by Michigan organic growers and develop responses.

Outcome #1

1. Outcome Measures

Number of adult participants trained in economics of agricultural production and farm management.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	732	733

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example is FIRM Area of Expertise evaluation where they addressed the needs of farms to remain a viable component of the Michigan economy, business succession and transfer is important for their future.

What has been done

MSUE offered a four day in-depth workshop on farm business succession and transfer. Curriculum materials developed and presented by FIRM Team, MSU Extension professional development staff, Iowa State University Extension expert in farm succession and a Michigan attorney with farm estate planning expertise. Program components consisted of setting the groundwork for the current and future projected viability of agricultural businesses, developing short and long-term business goals, enhancing communication skills, identifying personality types, retirement planning, successful farm transition planning, estate taxes and financial planning for succession.

Results

32 participants representing dairy, row crop, beef, hog, and horticultural enterprises. indicated an increase in knowledge in trends in agriculture, farm business succession planning, business mission and vision, family and farm communication, conflict resolution, and personality evaluation.
Participants also learned about their own personality traits, as well as the personality traits of future partners, wrote long-term and short-term goals for their business, as well as mission and vision statements.

The results of the evaluation distributed at the end of the program follow. Participants were asked to rank responses according to a Likert type scale, where a response of 1 indicated a low rating, and a response of 5 indicated a high rating.

Trends in Agriculture

1a. Rate your level of knowledge about this subject prior to this session. - 3.2

1b. This session helped me better understand agriculture trends that will affect my farm's transition. - 3.3

Business Succession Planning

2a. Rate your level of knowledge about this subject prior to this session. - 2.8

2b. This session helped me better understand the differences between Business Succession Planning and Estate Planning. - 3.5

2c. This session outlined the issues of farm succession. - 3.7

Mission

3a. Rate your level of knowledge about this subject prior to this session. - 3.0

3b. This session helped me understand what a mission statement is. - 3.5

3c. This session helped me understand how to effectively write a mission statement. - 3.6

Vision

4a. Rate your level of knowledge about this subject prior to this session. - 2.9

4b. This session helped me understand developing a vision for my farm business. - 3.4

Goals

5a. Rate your level of knowledge about this subject prior to this session. - 3.3

5b. This session helped me understand the differences between long-term and short-term goals. - 4.0

5c. This session will help me develop goals for my farm. - 3.7 Communication

6a. Rate your level of knowledge about this subject prior to this session. - 3.1

6b. This session helped me understand communication skills. - 3.6

6c. This session helped me understand differences in how people communicate. - 3.8

Conflict Resolution

7a. Rate your level of knowledge about this subject prior to this session. - 2.9 7b. This session helped me understand how conflicts develop. - 3.6 7c. This session helped me understand how conflicts may be resolved. - 3.6

True Colors Personality Evaluation

8a. Rate your level of knowledge about this subject prior to this session. - 2.2

8b. I have a better understanding of my personality traits. - 3.9 8c. I have a better understanding of my business partner's personality traits. - 4.0

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #2

1. Outcome Measures

Number of adult participants trained in business management, finance and taxation.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1474	1540

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Tax Management is a high priority that can save producers thousands of dollars. One of the benefits of the TELFARM system for producers is the offering of this educational program to learn of new tax shanges and how to best utilize these law changes to their advantage.

What has been done

'Every Year' is a tax estimate and management session that is part of the MSUE TELFARM program offered every year.

Results

An evaluation of the program foun ninety-four percent (94%) of attendees utilized the tax estimate and tax management process. The average tax deferral per farm was $17,782 or $1,689,260 for all business combined.

4. Associated Knowledge Areas

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

Outcome #3

1. Outcome Measures

Number of adult participants trained in natural resource and environmental economics.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	435	569

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Michigan Forage Council and the state Grasslands Forage Specialist for NRCS have identified the need to work with dairy producers to improve their profitability by using natural grasslands.

What has been done

MSUE coordinated with the National Association of County Agricultural Agents National Conference Forage Tour in the Grand Rapids area to deliver educational sessions. The primary objective was to utilize grazing expertise from producers who were willing to share details and economics of their operation with other Extension professionals.

Results

The evaluation showed that 100% of attendees rated an increase in their competency level on the topic of Dairy Grazing and Profitability as strongly agree or agree. 50% of the people attending strongly agreed that the topic was unique to their programming area, 30% agreed and 20% were neutral. When asked if they would apply the information to their programming area, 60% strongly agreed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures
Number of adult participants trained in community resource planning and development.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:
Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1368	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example in this area comes from the Hematite Township officials requesting assistance with coordinating business assistance that included bonding opportunities, grant requests, funding assistance, industrial development establishment, employee skill training and the coordination required to administer the project.

What has been done

Iron County MSU Extension coordinated sessions with the private business and all local, county, state and federal agency representatives.

Results

Funding for this project included Private investment of $8.2 Million for a new building and state of the art equipment. Michigan Economic Development Corporation assistance of $600,000 toward a water line extension required for fire safety and business needs in the sawmill. Michigan Department of Transportation road improvement of approximately $160,000 submitted by the Iron County Road Commission with a local community match of $40,000 to be provided by the Iron County Economic Development Corporation. USDA Rural Development assistance with water line extension funding in the form of low interest loans up to $200,000 to Hematite Township. Escanaba Lake Superior, MDOT and Pine River Hardwoods, LLC rail improvements at approximately $235,000. Hematite Township provided assistance for the application of tax abatements establishing and Industrial Development District under Public Act 198. Future implications include spin off businesses that would include waste and by-product from the wood products. The forest industry will experience a greater demand for services. The job spin off in Iron County is estimated at 2.8. Lessons learned include the value of successful coordination of local, state and federal agencies and their cooperation to assist economic growth in a community.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development
603	Market Economics
602	Business Management, Finance, and Taxation

Outcome #5

1. Outcome Measures

Number of research programs to identify current and emerging key public policy issues on trade, environmental, agricultural and food issues important to Michigan and analyze responses.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Public policy has taken on a considerable importance to the future of agriculture. The farmer's historic struggle was with the forces of nature and the marketplace, and government policy played a minor role. Government policy at all levels now is a major player in agriculture, especially related to agriculture as an important economic asset, the sustainability of a productive agricultural sector balanced with the preservation of environmental quality, and the importance of prime farmland with respect to the continued viability of the rural economy and of rural lifestyles.

What has been done

Research efforts to identify current and emerging key public policies that address trade, environmental, agricultural and food issues of particular concern to policy makers, taxpayers,consumers,business persons and producers; analyze alternative public policies as to their design, use of economic incentives, cost effectiveness, transaction and administrative costs, incidence and consequences; and analyze alternative private responses and market based responses (e.g. trading of pollution credits) to existing and foreseeable public policies.

Research efforts to identify current and emerging key public policies addressing trade, environmental, agricultural, and food issues; analyze alternative public policies as to their design, use of economic incentives, cost effectiveness, transaction and administrative costs,incidence and consequences; and to analyze alternative private responses and market based responses (e.g. trading of pollution credits) to existing and foreseeable public policies.

Results

Focus group discussions with pork and dairy farmers conducted were analyzed and identified the following required management skill sets in livestock production: Change Agent, Counselor, Model Employee, Motivator, and Housekeeper. These skill sets were compared with research in other industries. The numerous parallels found were encouraging and interpreted as additional validation of the results.

An economic model of hunter site demand for use in valuing recreational access and ecosystem services to hunters was constructed. Manuscripts of the findings are underway.

Research was completed on the impact of full planting flexibility in commodity programs on specialty crop producers in the state of Michigan, and policy options for devolution of federal agricultural policy to the states. Results on planting flexibility were disseminated through 20 outreach programs and USDA research reports to farmers in Michigan and other states. Results on agricultural policy devolution were presented in briefings for staff members of the U.S. House Committee on Agriculture and industry representatives, and disseminated through the California Institute for the Study of Specialty Crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
606	International Trade and Development
610	Domestic Policy Analysis
605	Natural Resource and Environmental Economics
611	Foreign Policy and Programs

Outcome #6

1. Outcome Measures

Number of research programs to improve the operations, business and financial management skills for Michigan producers so they can make decisions that are more sound financially and environmentally.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	8	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research that enhances knowledge and informs risk analysis and management strategies and tactics related to the causes and effects of price, yield and revenue risk in U.S. agriculture and the costs of alternative strategies is critical to the long-term sustainability of the agrifood industry.

What has been done

Research to identify the more important and critical tactical and operational decisions facing Michigan agricultural producers and conduct economic analysis; evaluate and develop new analysis techniques that are appropriate for tactical and operational decisions; and investigate the role and usefulness of information systems to support and improve the decision making process by Michigan agricultural firms.

Results

An improved approach to valuing premium levels for agricultural insurance products was developed to assist in achieving the performance required for the long-term sustainability of firms in the food and agribusiness sector.

Research to evaluate the business level impacts of alternative energy sources resulted in the development of an energy auditing program with dairy operations. Initial results appear to be very promising. In addition, a model earlier developed to evaluate the economics of business-related small wind systems was used to evaluate alternative policy variables that might impact the installation of small wind systems. A paper from this analysis was presented at an International Energy Economist meeting.

A new approach to modeling commodity price volatility that contributes to basic knowledge concerning the risk structure of agricultural commodity prices was developed and findings published. In addition, an examination of spatial market efficiency in Ethiopia and how government policies there influence spatial price relationships and the marketing environment for maize and wheat was completed. Results are being readied for publication.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
602	Business Management, Finance, and Taxation
601	Economics of Agricultural Production and Farm Management

Outcome #7

1. Outcome Measures

Number of research programs to evaluate the competitiveness and marketing strategies of Michigan farm markets, greenhouses and other green industry retailers.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

U.S. produce industries are increasingly integrated with the global economy. As globalization progresses, U.S. buyers are able to meet their needs for a greater number of products from both domestic and imported goods. Similarly, U.S. producers seek access to a greater number of world consumers. For these reasons, it is critical to understand the economic impacts of agricultural production and trade from the world's most rapidly growing economy (China) and implications for Michigan industries.

What has been done

Research to describe market structure and production trends in food industries, their regulation, and implications for Michigan produce markets; analyze the use of trade policies in the global movement of food and food products; evaluate industry competitive strategies in response to real and/or perceived change in agrifood systems and marketing; and develop demand models for the produce sector that can be used to evaluate trade, commodity marketing and labeling programs, traceability systems and structural changes in U.S. produce markets.

Results

Participants in U.S. farm programs currently face restrictions on planting and harvesting of fruits and vegetables on base acres. A data matrix was developed to assess barriers and inducements to market entry including size of capital investment, contracting, labor requirement, expertise, irrigation and others factors to provide producers with an effective tool to make informed decisions and wise choices related to cropping systems and market competition.

Global industry expansion pressures Michigan fruit industries to find new ways of doing business. Research focused on helping Michigan's blueberry growers address strategic change before crisis resulted in identifying a key set of information critical to Michigan horticultural firms seeking to enter markets in China or to understand how Chinese produce might enter the U.S. market, contributing to the long-term survival of an important green industry.

An empirical model of Good Agricultural Practice adoption, food safety certification and consumer behavior patterns was developed to provide comparisons of short-term adjustments in regional production and transportation patterns with implications for long-term adjustments in market structure among fresh strawberry producers. Results indicate that the ability of firms to differentiate plays a strong role in determining the market outcomes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics
608	Community Resource Planning and Development
604	Marketing and Distribution Practices

Outcome #8

1. Outcome Measures

Number of research programs to identify and evaluate human resources management practices in Michigan agricultural and green industries.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Human resource management is the strategic and coherent approach to the management of an organization's most valued assets - the people working there who individually and collectively contribute to the achievement of the objectives of the business. Effective human resource management is the key driver in the overall success and sustainability of any industry.

What has been done

Research to analyze human resource management practices in agriculture, including recruitment, selection, training, evaluation, motivation, compensation/benefit systems, discipline and termination, and safety and health in Michigan and beyond; and examine the interaction among structural and cultural factors affecting the economic viability of rural regions and the relation of those structures to rural poverty and regional efforts to reduce it, addressing labor force and labor market issues.

Results

Focus group discussions with pork and dairy farmers were analyzed and identified the following required management skill sets in livestock production: Change Agent, Counselor, Model Employee, Motivator, and Housekeeper. These skill sets were compared with research in other industries. The numerous parallels found were encouraging and interpreted as additional validation of the results.

Research on advances and declines of the rural working poor, has helped identify a method for more intensive study of case counties by researchers and peers in the North Central U.S. region.

4. Associated Knowledge Areas

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

Outcome #9

1. Outcome Measures

Number of research programs to develop a framework to understand and analyze domestic and international trade policies and assess their impact on Michigan.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The ability to understand the economic, cultural and political factors of domestic and international trade policies to determine the likely changes in the domestic and international trade policies and their consequent market impact is critical to a competitive, sustainable Michigan economy

What has been done

Research to analyze factors that influence the global agribusiness environment; and examine research from India related to buyer-supplier relationships to inform the development of a theoretical model of behavioral relationships between retailers and suppliers based on a firm's degree of market orientation.

Results

Research efforts on international trade and the global agribusiness market produced several research abstracts and a paper published in the International Food and Agribusiness Management Review that was selected as a best paper in 2007. In addition, several presentations were made to peer audiences on the dynamics of the changing agrifood markets, including the International Agribusiness Management Association, the American Agricultural Economics Association and the Sustainable Supply Chains Organization.

Data analysis began on quantitative research from India related to buyer-supplier relationships to determine how India's infrastructure and government policies affect food product distribution in India. Data collected to date has been analyzed, developed into research manuscripts and disseminated to other researchers doing similar research.

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
610	Domestic Policy Analysis
611	Foreign Policy and Programs

Outcome #10

1. Outcome Measures

Number of research programs to evaluate how Michigan citizens use the Internet when searching for information about a vacation destination or planning a vacation.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Americans enjoy the great outdoors and research shows that they are looking more and more to the Internet for information on planning vacations, choosing campsites or checking out the latest gear. This makes it important for those in the vacation and recreation industry to understand why people use the Internet and what destination or activity information drives them there.

What has been done

Research to examine consumer use of information technology in planning vacations and the benefits of linear community-based trails.

Results

Based on survey results, CARRS redesigned their Web site for reflect consumer preferences and value-added material, particularly related to non-motorized trails.

Results shared from a multi-year collection of studies on trails in Michigan with Michigan Department of Transportation planners made the case for funding an additional phase of research on Michigan trails that focuses on health and wellness.

Research to evaluate Michigan's continuing Safe Routes to School program began in fall 2007. By the end of the year, over 50 elementary and junior high schools had participated in the evaluation of attitudes toward and walking and biking behaviors. Many of these schools include Cities of Promise communities, a targeted effort by the Governor's Office to help economically-challenged areas of the state.

Work on wild land fires involved the analysis and reporting of focus group data from three states – Michigan, New Mexico and California. A research report was written for the U.S. Forest Service and community collaborators.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics
605	Natural Resource and Environmental Economics
608	Community Resource Planning and Development

Outcome #11

1. Outcome Measures

Number of research programs to determine rationale for farmland preservation choices and how changes will affect the Michigan tax base.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	2	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Decision making related to farmland preservation choices is especially important for economic and policy reasons: if rural amenity values dominate, farmland protection programs should target the most scenic, rather than the most productive, lands. If farmland amenities dominate, then agricultural productivity, scale, and specific farm attributes should be targeted. The high cost of farmland protection, whether through purchasing development rights or through property tax subsidies, increases the importance of proper targeting.

What has been done

Research to determine the extent to which the agricultural industry in Michigan is reliant on production of commodities in Michigan, and estimate the impact of changes in agricultural land acreage on other sectors within the agricultural industry; determine the extent to which use value taxation has slowed or may slow the rate of farmland conversion in Michigan and across the U.S.; estimate the impact of property tax changes on property values in Michigan and the resulting incentives or disincentives for land use change.

Results

An analysis of Genesee County Land Bank activities in Flint, Michigan was completed. Findings demonstrated that vacant and abandoned residential structures and lots in Flint are negatively affecting the value of nearby properties. The Land Bank Demolition program demolished 435 decrepit structures, preserving more than $1.12 million in nearby property values. Publications from previous research efforts, including understanding the demand for farmland preservation and the needs of local planning officials for land use policy training were produced.

4. Associated Knowledge Areas

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

Outcome #12

1. Outcome Measures

Number of research programs to develop models to estimate the demand for and value of recreational fisheries and wildlife resources.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The natural beauty and outstanding recreation opportunities provided by Michigan draw more than a million visitors a year. Improving ecological conditions and fisheries has the potential to enhance economic and recreational benefits For this reason, it is important for natural resource and wildlife managers to understand the recreational demands and economic benefits stemming from these important resources in order to protect, sustain and market them.

What has been done

Research to develop and extend economic models for estimating the demand for, and value of, recreational fisheries and wildlife resources; develop economic models and methods for estimating the public's preferences and values, including non-user values, for fisheries and wildlife resources; applying economic models to resource management issues; and assess the distributions and benefits of public parks and open spaces in various communities (urban, suburban and rural) throughout Michigan and beyond.

Results

A chapter on recreation and tourism has been included in a new text book, 'Michigan: A Geography.'

A poster titled, 'Geospatial Technologies for Open Space Planning and Management,' was developed and presented at the 2007 Michigan Land Use Summit.

A mail survey of recreational angling was developed and will be sent out in 2008. The survey will provide data to extend previous research on the economics of recreational fishing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
605	Natural Resource and Environmental Economics
609	Economic Theory and Methods

Outcome #13

1. Outcome Measures

Number of research programs to identify and evaluate the policy, technology and marketing issues faced by Michigan organic growers and develop responses.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The number of certified organic farms and the acres of farmland in certified organic production in the U.S. more than doubled from 1992 to 2005. In 2005, just over 8000 U.S. farmers had more than 4 million acres in certified organic production. Michigan has 205 certified organic farmers and 45,500 certified organic acres. For these reasons, it is important for organic growers to understand production, processing and marketing issues and to raise awareness among Michigan lawmakers about the value, importance and needs of organic agriculture.

What has been done

To identify and clarify the policy and technology issues of Michigan organic growers in order to help them articulate research, policy and program needs with respect to production, processing and marketing issues. To complete a Michigan organic marketing map that identifies where and how Michigan organic growers market their crops and livestock and that serves as a starting point for examining how agriculture contributes to rural development in the state. To develop a transatlantic collaborative research program with colleagues in either France or Italy in order to: improve our understanding of the societal implications of organic agriculture; and, contribute to the global network of policy-oriented research on organic agriculture.

Results

The results of the 2006 Survey of Organic Agriculture in Michigan were disseminated and shared in several ways. The survey report was distributed to all MSU Extension offices commodity and agriculture groups in the state,several government agencies, government-supported boards and citizens who requested copies. The results were used in presentations for training Michigan NASS field enumerators and in a presentation during the 2007 Great Lakes Fruit & Vegetable Expo. Results were also shared with wider audiences via radio interviews and numerous articles in trade publications and local newspapers.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
603	Market Economics
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Retrospective (post program)
- Before-After (before and after program)
- During (during program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation

Program #6

V(A). Planned Program (Summary)

1. Name of the Planned Program

Animal Production and Protection

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
301	Reproductive Performance of Animals	3%		10%	
302	Nutrient Utilization in Animals	5%		10%	
303	Genetic Improvement of Animals	2%		6%	
304	Animal Genome	4%		5%	
305	Animal Physiological Processes	5%		2%	
307	Animal Management Systems	44%		30%	
308	Improved Animal Products (Before Harvest)	1%		2%	
311	Animal Diseases	29%		25%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	1%		2%	
315	Animal Welfare/Well-Being and Protection	1%		8%	
806	Youth Development	5%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	27.0	0.0	19.0	0.0
Actual	24.0	0.0	17.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
800910	0	959279	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1334850	0	962312	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	9304094	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

•Understanding of the processes that control/influence reproduction at the molecular and genetic level. •Develop and test new cropping, grazing and feeding strategies for cattle, sheep and other ruminants for maximum profitability and animal health and minimal environmental impact. •Develop and evaluate new nutritional management strategies for non-ruminant animals for maximum animal health and minimal environmental impact. •Develop and evaluate management tools and strategies for animal manure management that is cost-effective, easy to implement and exceeds stringent environmental standards set by the state. •Develop and evaluate management/training strategies for race horses to reduce injuries. •Develop an understanding of the molecular processes that influence growth and meat quality in food animals. •Add to the understanding of various food animal genomes by improving and integrating genetic maps. •Understanding of the genetic and molecular processes that control/influence the immune system in food animals to create new disease detection and tracking technologies.

•Develop and evaluate new tools and strategies to detect, prevent and control emerging and reemerging livestock and poultry diseases, including bovine viral diarrhea virus, leptospirosis, bovine tuberculosis, Campylocacter jejuni, West Nile virus, and bovine spongiform encephalitis. •Understanding of the environmental fate and biological effects of vaccines, steroids and other drugs fed to animals. •Assist beef producers with implementing the mandatory electronic identification system and demonstrate methods to use the system to sharpen management skills. •Provide livestock producers with knowledge and skills to develop and maintain herd-health systems. •Provide animal industry with up-to-date animal health information.

•Improve farm-specific environmental stewardship related to manure management, including developing whole-farm nutrient management plans, manure value, land use and neighbor relations.

2. Brief description of the target audience

Michigan animal producers, agriculture and natural resources industry representatives, biotechnology company representatives and state agency representatives.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	Target	Target	Target	Target
Plan	1853	3706	4265	0
2007	1648	3296	14989	0

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

Patent Applications Submitted

Year	Target
Plan:	6
2007 :	6

Patents listed

Patent application -- direct electro-polymerization used for the detection BVDV. While this was the only application identified in the researchers' progress reports, I'm sure there were several other patents submitted under the animal production, but was unable to confirm submissions at this time due to a paucity of information on patents/patent applications in annual progress reports for this planned program. This will be rectified in the coming year.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	56	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of research programs on animal production and protection.

Year	Target	Actual
2007	19	44

Output #2

Output Measure

- Number of adult participants trained in animal management systems.

Year	Target	Actual
2007	1483	1400

Output #3

Output Measure

- Number of youth participants trained in animal management systems.

Year	Target	Actual
2007	4265	14989

Output #4

Output Measure

- Number of adult participants trained in animal diseases.

Year	Target	Actual
2007	370	438

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	Number of adult participants with increased knowledge about animal management systems.
2	Number of youth participants with increased knowledge about animal management systems.
3	Number of adult participants with increased knowledge of animal diseases.
4	Number of research programs to understand the processes that control/influence reproduction at the molecular and genetic level.
5	Number of research programs to develop and test new cropping, grazing and feeding strategies for cattle, sheep and other ruminants.
6	Number of research programs to develop and evaluate new nutritional management strategies for non-ruminant animals.
7	Number of research programs to develop and evaluate management tools and strategies for animal manure management.
8	Number of research programs to develop and evaluate management/training strategies for horses to reduce injuries.
9	Number of research programs to understand the molecular processes that influence growth and meat quality in food animals.
10	Number of research programs to add to the understanding of various food animal genomes by improving and integrating genetic maps.
11	Number of research programs to understand the genetic and molecular processes that control/influence the immune system in food animals.
12	Number of research programs to develop and evaluate new tools and strategies to detect, prevent and control emerging and reemerging livestock and poultry diseases.
13	Number of research programs to understand the environmental fate and biological effects of vaccines, steroids and other substances fed to animals.

Outcome #1

1. Outcome Measures

Number of adult participants with increased knowledge about animal management systems.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1260	1401

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example of a need identified from the community came from numerous farm visits, phone calls and general interest from prospective pork producers within an underserved Amish community.

What has been done

MSU Extension partnered with the Michigan Department of Agriculture (MDA) to provide educational workshops to pork producers in Amish communities that were considering constructing new barns for pork production.

Results

Overall, participants rated the quality of the workshop a 4.89 out of 5 with 5 representing very useful information. In addition, 91.7% of participants indicated they would likely get assistance from MSU Extension before starting to build new livestock facilities. Furthermore, two operations have requested help from MSU Extension. One swine finishing facility that houses 734 pigs is currently in operation and another swine finishing facility that will house a total of 800 pigs is under construction. This equates to a total of 4,602 pigs per year being raised in these barns.

4. Associated Knowledge Areas

KA Code	Knowledge Area
304	Animal Genome

Outcome #2

1. Outcome Measures

Number of youth participants with increased knowledge about animal management systems.

2. Associated Institution Types

•1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	3625	13190

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Educating youth about aminal management systems will better prepare future farmers to raise animals and have profitable businesses.

What has been done

4-H clubs were developed to focus on animal management systems.

Results

It is estimated from previous evaluations that 88% of the youth gained knowledge in the area of animal management systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
806	Youth Development

Outcome #3

1. Outcome Measures

Number of adult participants with increased knowledge of animal diseases.

2. Associated Institution Types

•1862 Extension
•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	315	385

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

One example is where federal and international officials have expressed deep concern about the wide spread sickness and death of humans should a mutation of the Asian strain high path avian influenza become transmissible from human to human. There would be a resulting severe economic impact from such a pandemic as well. The disease has not been found in the USA to date and the federal government is dedicated to finding outbreaks early and eradicating them. Small flock owners need to know what bird flu would look like and who to call. For this reason, there has been a growing concern by researchers that small backyard flocks are a likely target for Asian strain high path avian influenza and possible human infection.

What has been done

The small flock outreach program was developed by the MSUE AoE Poultry team, MSU Emergency Management, ANR Communications and the MSU Animal Science Department to address this possible threat. The MSU Extension program educates people about the symptoms of this disease in poultry, how it is spread and who they can turn to in the event of a disease outbreak. The program also educates the people about steps they can take to protect themselves and their families from bird flu. The commercial poultry industry is testing their poultry regularly for avian influenza, but this is impractical for small flock owners. So another outreach goal of this program was to open lines of communication with small flock owners to help disseminate important information and answer questions. In the event of an outbreak of Asian strain bird flu, it maybe necessary to impose quarantines, test near by poultry and destroy sick birds to contain and eradicate the disease. Eight regional seminars were held in the evening or on Saturday to accommodate clients that likely work or attend school during week days. Seminars were held in Cass, Monroe, Lapeer, Ingham, Wexford, Chippewa and Delta counties. Overall there were 323 people attending the 8 seminars, an average of 40 per meeting.

Results

Over all clients indicated a very good learning experience and behavior change anticipated. A total of 87 evaluations were collected at several of the meetings. The summary follows.
1. After attending this meeting do you feel that you have a better understanding of good small flock poultry production practices? Yes_75_; Somewhat_11_; No_1_ Yes 85 %, Somewhat 12%

2. Do you have a better understanding about the concerns for bird flu? Yes_78_; Somewhat_8_; No___ Yes 89%, Somewhat 9%

3. Do you feel that you better understand how bird flu is transmitted to poultry? Yes_77_; Somewhat_10_; No___ Yes 88%, Somewhat 11%

4. Do you feel that you understand how to reduce the chances of you or your poultry getting bird flu? Yes_76_; Somewhat_10_; No___ Yes 86%, Somewhat 11%

5. As a result of this meeting, are you likely to change the way you manage your poultry flock to reduce their chance of getting bird flu? Yes_55_; Maybe_24_; No_7_; Don't have poultry _7_ Yes 62%, Maybe 27%, No 8%, Don't have poultry 8%

6. Do you feel that you understand the symptoms of bird flu and who to call if you see them? Yes_66_; Somewhat_11_; No___; Don't have poultry __8_ Yes 75%, Somewhat 12%; No; Don't have poultry 9%

7. Do you have an improved understanding of good food handling procedures to avoid food borne illness? Yes_76_; Somewhat_11_; No__ Yes 86%; Somewhat 12%

8. Are you likely to talk to others about what you learned here today? Yes_79_; Maybe_8_; No_1_ Yes 90%; Maybe 9%; No 1%

The Small Flock Outreach Program also resulted in web documents and links on the MSU Poultry team and Emergency team site and currently the information on 'What You Need to Know about Bird Flu' and a link for reporting dead wild bird's are the headlines (Director's Message) on the MSUE main portal, which is picked up by all 83 county portal main pages! The information about the Outreach Seminars was also listed in the MSU Crop Advisory Team (CAT) Alerts newsletters, which are mailed to subscribers and posted on the web

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
307	Animal Management Systems

Outcome #4

1. Outcome Measures

Number of research programs to understand the processes that control/influence reproduction at the molecular and genetic level.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Unless you are a strict vegetarian or lactose intolerant, chances are that dairy and beef products make up half of your diet. According to the U.S. Department of Agriculture, almost 40% of the average American diet is dairy, and beef makes up about 10%. This makes these products an integral part of our lifestyle and our economy and sustained productivity and animal health critical issues to the cattle industry.

What has been done

Research to investigate potential health effects of exposure to environmental contaminants in humans and animals, with an emphasis on reproductive performance; and to explore methods of improving reproductive efficiency in livestock.

Results

Findings verified a method that can be used to identify the fertility potential of dairy calves. A large-scale fertility trial is underway to further verify the reliability of this method, determine if fertility is a genetically controlled trait, and identify genetic or hormonal markers that identify calves with high reproductive potential at an early age.

Ovsynch is a program developed to synchronize ovulation for timed breeding in lactating dairy cows. Research focusing on improving the competency of the ovulatory follicle has resulted in the development of a new Ovsynch program that is even more effective.

Farrowing rates were reduced when cryopreserved sperm were inseminated regardless of time of AI or inclusion of seminal plasma.

A farm experiencing low sow fertility was investigated for involvement of poor breeding management in the problem. Sows subjected to hormonal control of estrus and ovulation prior to breeding exhibited improved fertility.

4. Associated Knowledge Areas

KA Code	Knowledge Area
304	Animal Genome
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals

Outcome #5

1. Outcome Measures

Number of research programs to develop and test new cropping, grazing and feeding strategies for cattle, sheep and other ruminants.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As production costs rise, environmental concerns increase and consumer expectations become higher, those involved in the agrifood industry are looking for ways to maximize reproductive and performance efficiencies in a way that is economically and environmentally sustainable and protects human and animal health.

What has been done

Research was conducted to develop forage systems that will maximize economic and energetic efficiency of dairy cattle; increase efficiency of protein production and quality of meat and milk in ruminants; improve milk production efficiency by maximizing lactation potential of dairy heifers; develop and demonstrate on-farm strategies that reduce harmful air emissions; and establish measurement/monitoring protocols and models for verification of emissions reductions for dairy/livestock operations.

Results

A model approach of predicting P excretion from dairy cattle as (intake P - milk P) has been developed and now is widely accepted in Michigan and the U.S.A. as a component of the 'mass balance' approach to estimate the amount of P in manure for planning fertilization strategies and development of comprehensive nutrient management plans.

It was demonstrated that feeding 0.21% phosphorus (P) pre-partum is adequate for periparturient Holstein cows with high metabolic demands and genetic potential for milk production. Results have been shared with professional dairy nutritionists and producers in Michigan and elsewhere. Compared with previous practice, the new practice reduces the amount of P excreted in manure during this stage of the lactation cycle (dry period) and improves the metabolic well-being of cows during the transition from pregnancy to lactation.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

Outcome #6

1. Outcome Measures

Number of research programs to develop and evaluate new nutritional management strategies for non-ruminant animals.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

As production costs rise, farms consolidate, environmental concerns increase and consumer expectations become higher, those involved in the agrifood industry are looking for ways to maximize reproductive and performance efficiencies in a way that is economically and environmentally sustainable and protects human and animal health.

What has been done

Research was conducted to evaluate the use of namman oligosaccharides in the diets of laying hens and their effect on egg production/quality and disease; determine the influence of fiber, potassium, copper and zinc sources and protein concentrations on fecal excretion in lactating sows; determine the influence of quantity of feed consumed during lactation and various fiber sources on daily fecal volume of swine; determine the influence of Zn on the structural soundness and productivity of sows; and optimize protein and amino acid nutrition of swine and equine related to performance and efficiency of protein utilization.

Results

Because of the potential outbreak of Avian Flu, research data was used to educate small flock owners about avian flu and discuss nutritional management and food biosecurity issues. Seven workshops were conducted around the state with approximately 100 in attendance at each. These workshops provided a rare opportunity to improve nutritional management of birds for small producers through out the state.

Nitrogen excretion and ammonia emissions can be cut in half with a 3 to 4 percent reduction of protein in swine diets without affecting performance.

Research findings demonstrated that by freeing up the organic phosphorus available in feed grains and feeding dried distillers grains with solubles (DDGS) in swine diets, there is a lot more available phosphorus. As a result, phosphorus doesn't need to be supplemented for pigs close to market. This approach, which provides an economic advantage and greatly reduces the amount of phosphorus excreted, has been adopted by large producers in Michigan,Illinois and other Midwest swine operations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
302	Nutrient Utilization in Animals

Outcome #7

1. Outcome Measures

Number of research programs to develop and evaluate management tools and strategies for animal manure management.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

n/a

What has been done

n/a

Results

This project has been combined with the following outcome measure: Number of research programs to understand the environmental fate and biological effects of vaccines, steroids and other substances fed to animals. Quantitative target will be added there.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems

Outcome #8

1. Outcome Measures

Number of research programs to develop and evaluate management/training strategies for horses to reduce injuries.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	1	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Due to improvements in nutrition, management and health care, horses are living longer, more useful lives. It's not uncommon to find horses and ponies living well into their 20's and even 30's. While genetics play a determining role in longevity, providing proper care and nutrition plays a key role in a horses health, performance and overall well-being.

What has been done

Two projects were conducted evaluating the glycemic and insulinemic responses of horses to various feeds with the theory being that high insulinemic responses are related to health problems such as osteochondrosis and laminitis. An additional study evaluated the preference of horses to feeds with varying amounts and types of fish oils with the idea being that the fish oil will increase the omega-3 fatty acid concentration of the diet which may decrease joint inflammation and improve soundness.

Results

A number of talks were given both domestically and internationally to educate the lay public, equine veterinarians and equine researchers on methods to reduce injuries in performance horses. In addition, Nutrient Requirements of Horses: Sixth Revised Edition, was completed in 2007. This publication serves as the authoritative source of information (in the U.S. and internationally) for feeding horses.

4. Associated Knowledge Areas

KA Code	Knowledge Area
315	Animal Welfare/Well-Being and Protection

Outcome #9

1. Outcome Measures

Number of research programs to understand the molecular processes that influence growth and meat quality in food animals.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	4

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The molecular basis underpinning beef and pork quality is highly complex, and continued advances in understanding the biological processes that contribute to the delivery of consistent quality meat is critical to the sustainability and security of the industry. Knowledge gained from research efforts in this area can be beneficial in defining and optimizing management systems for quality, providing assurance of meat quality and in tailoring quality to suit market needs.

What has been done

Research efforts to discover and evaluate genetic factors that influence growth, carcass merit and meat quality of swine;identify characteristics of skeletal muscles associated with superior and inferior meat quality, and develop strategies for consistent production of high quality meat products.

Results

Research advances in understanding the genetic factors that influence growth, carcass merit and meat quality in swine were made available to the scientific community at the 2007 annual meetings of the American Society of Animal Science and the National Swine Improvement Federation and have been disseminated to the NC-1131 multi-state research group on muscle growth and differentiation.

Fetal myogenesis and postnatal skeletal muscle hypertrophy are critical yet poorly understood processes in growing pigs. Understanding developmental changes in myogenic cell activity will allow targeting of strategies to modify cell activity and effectively improve muscle growth. Microarray analysis of undifferentiated cells from pigs at 105 days gestation and birth revealed no differences in global gene expression. Collectively, these data suggest that the in vivo environment, rather than inherent cellular differences, govern the proliferation and differentiation of myogenic cells during development.

4. Associated Knowledge Areas

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

Outcome #10

1. Outcome Measures

Number of research programs to add to the understanding of various food animal genomes by improving and integrating genetic maps.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Genetic maps are an integral part of several statistical methods that are commonly used to find disease genes. A better understanding of these maps will allow for the development of increasingly accurate models that will provide researchers and producers with reliable estimates in a practical amount of time and will greatly enhance disease prevention and treatment efforts.

What has been done

Research to enhance and integrate genetic and physical maps of agriculturally important animals for cross-species comparisons and sequence annotations; facilitate integration of approaches toward better understanding of biological mechanisms underlying economically important traits; and implement tools to extract, analyze, store and disseminate information.

Results

Chicken genome sequence was assembled and is being used to develop vaccines to combat Mareks disease, a highly contagious, cancer-causing viral disease that costs the poultry industry $1 billion a year worldwide. This data is now available to scientists working on Meraks disease worldwide on two Web sites: the U.S. Poultry Genome Project Web site at MSU and the U.S. Chick EST Database Web site at the University of Delaware.

The new Swine Protein-Annotated Oligonucleotide Microarray (http://www.pigoligoarray.org)has been evaluated and verified for use in transcriptional profiling of skeletal muscle and subcutaneous fat tissues from pigs.

The corticotropin-releasing hormone receptor 2 (CRHR2) gene was investigated in the MSU resource population and were found to be associated with several carcass and meat quality traits previously affected by environmental stressors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
304	Animal Genome
303	Genetic Improvement of Animals

Outcome #11

1. Outcome Measures

Number of research programs to understand the genetic and molecular processes that control/influence the immune system in food animals.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The release of immune-activating and modulating factors has broad implications for improving the immune response of food animals. For dairy cows, a better understanding of the neutrophil system is critical to the sustainability of dairy operations and cow health. Neutrophils are white blood cells that provide the main line of host immunological defense against all forms of mastitis. If cows cannot rapidly mount a defense to mastitis bacteria, they develop clinical mastitis. This results in lost production, vet calls, treatment products, contaminated milk concerns and an occasional dead or culled cow.

What has been done

No research has been published that examines the entire neutrophil system in cows. Research efforts were undertaken to gain a clear understanding of the physiological and genetic mechanisms that mediate changes in the neutrophil defense system of dairy cows about to give birth.

Results

Researchers documented several of the main functional classes of genes that are affected when bovine neutrophils are directly exposed to glucocorticoids in vitro,including those that mediate the cell's protective stress response, tissue remodeling, wound healing and antibacterial activities. This neutrophil gene expression signature suggests that glucocorticoid genetically reprograms circulating neutrophils into a state of final maturation that involves their altered tissue trafficking and extended life span with increased potential for facilitating tissue remodeling and wound healing and changed capacity for fighting bacteria.

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
315	Animal Welfare/Well-Being and Protection

Outcome #12

1. Outcome Measures

Number of research programs to develop and evaluate new tools and strategies to detect, prevent and control emerging and reemerging livestock and poultry diseases.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Animal disease in the United States could seriously damage the livestock and poultry industries. For example, eradication of avian influenza in the U.S. following an outbreak in the mid-1980s, resulted in the destruction of 17 million birds and cost taxpayers nearly $65 million. The collective effort and vigilance of researchers, livestock producers, veterinarians and state and local government officials is needed to ensure adequate disease surveillance and to provide the needed resources to respond and eliminate disease outbreaks.

What has been done

Research to collect and screen for bacterial strains with antagonistic properties for food borne pathogens and test their efficacy; develop better pest and disease control mechanisms and strategies for honey bees that result in increased honey production and more effective pollination of agricultural crops; develop a rapid, low-cost animal side biosensor for detecting cattle persistently infected with bovine viral diarrhea virus (BVDV); and detect new or emerging infectious diseases in livestock and poultry.

Results

After field testing of the Spartan Mitezapper device in 2007 demonstrated a significant suppression of the verroa mite population – the largest pest of honeybees - a working prototype has been developed by Mite Zapper LLC in Detroit and 50 copies will be produced and used for a beta test in early 2008.

Further refinement of the biosensor used to detect BVDV took place in 2007, and a new patent on processes related to manufacturing of the biosensor has been applied for. This research is also the basis of active collaboration between researchers that are expanding the knowledge gleaned from this project in the detection of other important animal and human pathogens, including Mycobacterium paratuberculosis in cattle, and important food pathogens including E.coli and Salmonella.

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
311	Animal Diseases

Outcome #13

1. Outcome Measures

Number of research programs to understand the environmental fate and biological effects of vaccines, steroids and other substances fed to animals.

2. Associated Institution Types

•1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2007	0	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Vaccines, steroids, antibiotics and other substances are added to animal feed to improve growth rates by controlling parasitic and bacterial diseases. The substances not taken up by the animal are introduced into the environment, largely when manure is used to fertilize croplands. Little is known about the environmental fate of many of these compounds. With the recent major expansion in concentrated animal feedlot operations, the potential risks from waste generated by these operations must be assessed.

What has been done

Research efforts to develop analytical methods to measure inorganic and organic substances in a variety of environmental situations; identify the environmental transformations undergone by animal-feed additives and determine their environmental fate; and assess the potential of these substances to alter the immune response of cause severe disease symptoms in animals and humans.

Results

A new model that acts as a surrogate for they study of Campylobacter juni virulence in the host has bee developed. The model will serve as the basis for typing Campylobacters to determine which have genetic attributes capable of causing sever disease. Researchers have also published all the past work on identifying the prevalence and mechanisms of antibiotic resistance in campylobacters from dairy cows.

The use of non-antibiotic antimicrobial proteins can reduce the risk of antibiotics in food products and lower the risk of drug resistance in pre-harvest pathogens. Research demonstrated that nisin is a safe antimicrobial protein that is effective against staphylococcal and streptococcal pathogens, including antibiotic resistant pathogens. On farm studies have shown that through the use of this on-farm pathogen testing many farms can reduce their antibiotic use over 50%. Demonstration farms have been established to measure the economic impact.

4. Associated Knowledge Areas

KA Code	Knowledge Area
308	Improved Animal Products (Before Harvest)
305	Animal Physiological Processes
301	Reproductive Performance of Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

The new format and integration of this report has prompted a review and refinement of how we will determine and report outcome measures moving forward. Our goal in this and the 2008 Annual Report is to combine research programs in a more aggregate way to minimize extraneous text and emphasize results reporting. For this reason, some outcome measures have already been folded into broader outcome measure categories. Further, the targets in this report (and for 2008 if we're not allowed to modify them) compared to actuals aren't necessarily due to unmet goals, but rather a reconfiguration of goal associations and knowledge areas.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- After Only (post program)
- Before-After (before and after program)
- Case Study
- Comparisons between program participants (individuals,group,organizations) and non-participants
- Comparisons between different groups of individuals or program participants experiencing different levels of program intensity.
- Comparison between locales where the program operates and sites without program intervention

Evaluation Results

Key Items of Evaluation