

# 2013 Michigan State University Combined Research and Extension Plan of Work

Status: Accepted

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## I. Plan Overview

### 1. Brief Summary about Plan Of Work

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 MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) is to engage in innovative, leading-edge research that combines scientific expertise with practical experience to generate economic prosperity, sustain natural resources and enhance the quality of life in Michigan, the nation and the world. AgBioResearch strives to maintain a balance between basic and applied research and relies heavily on the input of its constituents in identifying research priorities. 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 AgBioResearch and MSUE are fueled by close ties with each other, as well as close linkages to state agencies, commodity groups and other stakeholders, plus outstanding legislative support.

Agriculture is Michigan's second largest industry. The state's agrifood system accounts for \$71.3 billion in total economic activity (direct and indirect) and more than 1 million jobs. The direct economic impact of the agrifood system is estimated to be \$42.6 billion; the direct economic impact of the agrienergy system (ethanol) is estimated to be \$600 million. In total, the agricultural/food system employs a quarter of all people working in Michigan. The system is likely second only to the auto industry in importance to the state's economy. Michigan also has one of the most diverse agricultural industries in the United States. With more than 200 commodities, the state is second only to California in variety of crops grown. These range from field crops such as corn, wheat and soybeans to fruits such as cherries, apples, grapes and blueberries; to horticultural crops, including ornamental trees and flowering plants; and livestock, honey and fish.

At the same time, Michigan is a state defined, literally, by water. Without the Great Lakes, Michigan's peninsulas and much of the state's agriculture, shipping and tourism offerings wouldn't exist.

For Michigan and MSU, the possibilities to expand ties between industry and agriculture go far beyond alternative energy. The state is uniquely positioned to build a new biobased economic sector upon the existing foundation of its agriculture, forestry, natural resources, industrial and manufacturing sectors. The result would be the advancement of a new, sustainable biobased sector that provides a competitive advantage in meeting the growing global demand for renewable sources of materials, chemicals and energy in products, processes and packaging.

AgBioResearch and MSUE have the research, education and outreach capabilities to partner with other MSU units and with other Michigan universities to drive Michigan forward to achieve this goal. AgBioResearch and MSUE have created a statewide, cohesive plan that uses the MSU research capability and knowledge base. This plan fosters economic development, improved quality of life, a healthy environment and a plentiful and secure food supply for all Michigan residents.

It is important to note that this plan reflects only a portion of AgBioResearch and MSUE efforts and not the whole breadth of research and educational initiatives. AgBioResearch's total budget for 2011 was \$110.4 million, with this report representing \$4.7 million in federal Hatch dollars and equivalent match. MSUE's total funding in 2011 was **over \$83.58 million** with this report representing approximately **\$8 million** federal formal dollars and equivalent match. Due to the complexity of the funding sources, matching of funds and inadequate information systems this Plan of Work was limited to federal dollars and match.

**Estimated Number of Professional FTEs/SYs total in the State.**

Year	Extension		Research	
	1862	1890	1862	1890
2013	178.0	0.0	65.0	0.0
2014	178.0	0.0	65.0	0.0
2015	178.0	0.0	65.0	0.0
2016	178.0	0.0	66.0	0.0
2017	178.0	0.0	66.0	0.0

**II. Merit Review Process**

**1. The Merit Review Process that will be Employed during the 5-Year POW Cycle**

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

**2. Brief Explanation**

The challenges facing Michigan agriculture and natural resources are increasingly complex and diverse. AgBioResearch programs are continuously evaluated for relevance and progress. A strategic visioning process, linked to those of AgBioResearch-affiliated colleges at MSU (Agriculture and Natural Resources, Veterinary Medicine, Engineering, Human Ecology, Social Science and Natural Science), has identified key strategic priority areas that will drive the AgBioResearch agenda over the next decade. This process also involves industry experts, university faculty members, the interested public, elected officials and MSU Extension and AgBioResearch 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, natural resources and bioeconomy 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, 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 of MSUE's 21 working groups (formerly Area of

Expertise - AoE - teams) reviews the county needs, agents' plans, and research to support these programs, as well as others that may reflect emerging trends. In addition, the working group's goals are reviewed by state leaders and industry experts for quality and relevance. Collectively these plans are reviewed by MSUE and AgBioResearch directors who not only evaluate them, but use them in their regional and statewide presentations to describe future plans.

Jointly, MSUE and AgBioResearch 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. District and County (especially large counties between Detroit and Flint) 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 14 AgBioResearch centers. The MSU Extension and AgBioResearch Council serves as a liaison among county councils, field station advisory groups and state agencies and organizations.

### **III. Evaluation of Multis & Joint Activities**

#### **1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?**

As the state's land-grant institution, MSU is charged with generating research-based knowledge and educational programs so that people can make informed decisions to improve their lives. To accomplish this important mission, MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) and MSUE are constantly evaluating and updating the areas they focus on to best meet the ever-changing needs of Michigan's people, industries and communities. As the state's priorities change, research and educational programs, research agendas and external relationships also must change.

AgBioResearch and MSUE work collaboratively to gather public input on the issues of greatest concern to Michigan citizens. An issues identification process, Advance Michigan, was launched in April 2010 to revisit priorities from the previous survey and gather new information to inform continuing and new research and educational programming over the next five years (2010-2014). Both organizations continue to use and fine-tune this input to guide state-level decisions for research priorities and program support. Additional surveys, focus groups, conferences and meetings build on and enhance baseline data collected. Due to stakeholder input, MSUE and AgBioResearch have focused more sharply on biobased products that can help boost the Michigan economy, including biofuels, chemicals, nutraceuticals and food products, as well as youth and family issues, the environment, land use issues and biotechnology.

#### **2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?**

Soil, Water and Natural Resources: Urban sprawl and community vitality research and education programs are partnering with local urban agencies and groups that have never worked with MSUE or AgBioResearch before. Program and Institute directors have made sure that under-served people are members of advisory and planning boards. Plant Sciences: Of the 52,800 farms in Michigan, about 205 are classified as organic with 45,500 certified organic acres. Organic growers and growers who are considering incorporating more organic production practices into their operations have been asking for research on pest control methods that meet organic certification standards. In partnership with Michigan Food and Farming Systems (MIFFS), the USDA Risk Management Agency and the Black Farmers Association, programs are reaching underrepresented racial/ethnic farm operators. Economics, Marketing and Policy: Destination marketers and technology managers

are non-traditional audiences. Many research programs employ multi-cultural graduate and post-graduate students. Human Health, Environment, Family, Youth, Society and Community: Individuals, families and communities that are low income, at risk, and underserved are targeted in this area through family resource management, parenting and community development programs. 4-H afterschool programs are used to target non-traditional audiences. Global Food Security and Hunger: A number of research initiatives in this planned program will foster innovation in fighting hunger by addressing food security for vulnerable populations, as well as ensuring access to nutritious, healthy food. Food safety: These programs will provide critical research to make the entire food supply chain safer and help educate consumer and food safety professionals across ethnicities and income levels. Childhood Obesity: The focus of much of this research will be on overweight and obesity as they relate to low-income and other underserved populations and communities.

### **3. How will the planned programs describe the expected outcomes and impacts?**

Each of the planned programs have specific outcomes that are expected to happen during the five-year plan of work. In some programs, the specified outcomes and impacts are scheduled to happen in the first or second year, but other outcomes will continue to occur throughout the five-year period and beyond. Under each planned program, specific progress toward the outcomes and impacts are documented as objectives and milestones are reached. MSUE will utilize Institute Work Teams to develop logic models and plans that identify special audiences and needs, integrate research into educational outreach programming, and work with the North Central Region in building multi-state programs and indicators.

### **4. How will the planned programs result in improved program effectiveness and/or**

MSUE and AgBioResearch programs have a well-documented history of increasing efficiency and improving productivity, both of which result in better quality of life for the state's residents. Because of their close working relationship, MSUE education programs are research-based, and the results of MSUE programs inform AgBioResearch efforts, while basic and applied research provides innovation and new approaches to address wicked and new challenges. Specific examples of this tightly integrated interaction are provided in each planned program section.

## **IV. Stakeholder Input**

### **1. Actions taken to seek stakeholder input that encourages 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
- Other (Conferences and meetings)

### **Brief explanation.**

A variety of strategies and approaches were used in the past year to encourage stakeholder participation for a number of key activities and undertakings:

In 2010, MSU Extension concluded a major restructuring effort to reinvent itself to better meet the challenges of the 21st century. MSUE staff participation was encouraged by: publishing weekly newsletters from the MSU Extension Director to share information on the progress of the restructure and to solicit staff feedback; using the MSU Extension portal to post information and collect feedback from staff; and holding Town Hall meetings at various locations across the state to discuss the MSUE restructuring plan and solicit staff input to guide the plan and to identify and develop four new institutes within the MSU Extension framework

- Preparing Michigan's Children & Youth for the Future
- Enhance Michigan's First Green Industry: Agriculture and Agribusiness
- Improve Health and Nutrition for Michigan Residents
- Greening Michigan: Leveraging Natural and Human Assets for Prosperity

Further, numerous individual meetings were held with staff, stakeholder advisory groups and the MSU Extension AgBioResearch State Council related to the development of MSU Extension institute areas and what they should be. Meetings were also held with the Michigan Association of Counties and state legislators.

With the framework for the redesign and the four institutes established, a comprehensive needs assessment -- Advance Michigan -- was conducted to seek input and direction from staff, internal and external stakeholders, and the general public on what the programmatic priorities should be within each of the institutes. The survey will be launched in April 2010 and run through June 2010. Survey results are in the process of being compiled and used to develop a logic model for specific program priorities in each institute and a statewide plan of work. A more specific accounting of the results of this survey and its use in logic model development and educational programming will be addressed in next year's report.

In 2011, AgBioResearch rebranded itself -- the Michigan Agricultural Experiment Station is now MSU AgBioResearch. This decision was not made lightly. Since the Michigan Agricultural Experiment Station was created in 1888, it has had a proud history of making significant contributions to the world of agriculture as well as ensuring the wise use of natural and community resources, and enhancing the quality of life in Michigan, the nation and the world. The new name, along with the tagline, 'Leading innovation in food, natural resources and energy' better reflects the breadth and relevance it does while remaining true to its land-grant mission. The process included a SWOT analysis and extensive discussions with both internal and external stakeholders. 'gy,' better conveys the breadth and relevance of the work we do while remaining true to our land-grant mission in support of Michigan agriculture." "Our new name, along with the tagline 'leading innovation in food, natural resources and energy,' better conveys the breadth and relevance of the work we do while remaining true to our land-grant mission in support of Michigan agriculture." T

## **2(A). A brief statement of the process that will be 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 engage in innovative, leading-edge research that combines scientific expertise with practical experience to generate economic prosperity, sustain natural resources and enhance the quality of life in Michigan, the nation and the world, MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) has an extremely broad and long list of stakeholders. In reality, every Michigan citizen is an AgBioResearch and MSUE stakeholder. Using the methods checked above, the emphasis is on keeping up-to-date on key internal and external stakeholders, legislative contacts and the "interested public" and using a blend of traditional and online platforms to reach individuals and groups and collect input from them.

The Advance Michigan online issues identification process initiated (and the previous 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 AgBioResearch priorities and MSUE educational programming during the years ahead.

Statewide surveys and citizen focus groups are used to identify the major issues and opportunities in Michigan and assign a priority ranking to each.

Community-based discussions in all Michigan counties, involving the local AgBioResearch advisory committees, MSUE councils and others are held to discern what issues and opportunities stakeholders believe should be addressed related to research and programming. Community groups, commodity and producer groups and other state and local partners are periodically asked what specific issues and opportunities should be addressed.

Faculty focus groups, with representatives from MSU colleges and units, are held as needed to glean faculty perceptions on emerging Michigan issues and opportunities and identify ways that MSU science might address them. MSU faculty and AgBioResearch/MSUE staff surveys are used as needed to develop a better understanding of the university's ability to respond to issues identified in faculty focus groups.

County teams, including AgBioResearch center managers, synthesize and submit local priorities identified by local councils and advisory committees.

Working Groups (formerly Area of Expertise - AoE - teams) synthesize and prioritize content-specific program and research needs generated from the input of their advisory bodies and continue to fine-tune these needs as additional input is received.

**2(B). A brief statement of the process that will be 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.**

Several methods are used to collect stakeholder input:

MSU Extension is completing a major restructuring effort to reinvent itself to better meet the challenges of the 21st century. MSUE staff participation was collected via the MSU Extension portal, Town Hall meetings at various locations across the state, numerous individual meetings with staff, stakeholder advisory groups and the AgBioResearch/MSU Extension State Council. Meetings were also held with the Michigan Association of Counties and state legislators. A comprehensive needs assessment -- AdvanceMichigan -- to seek input and direction from staff, internal and external stakeholders, and the general public on what the programmatic priorities should be within each of the institutes was launched in April 2010 and ran through June 2010. Survey results are being used to develop a logic model for specific program priorities in each institute and a statewide plan of work.

In 2011, AgBioResearch rebranded itself - the Michigan Agricultural Experiment Station is now MSU AgBioResearch. This decision was not made lightly. Since the Michigan Agricultural Experiment Station was created in 1888, it has had a proud history of making significant contributions to the world of agriculture as well as ensuring the wise use of natural and community resources, and enhancing the quality of life in Michigan, the nation and the world. The new name, along with the tagline, 'Leading innovation in food, natural resources and energy' better reflects the breadth and relevance it does while remaining true to its land-grant mission. The process included a SWOT analysis and extensive discussions with both internal and external stakeholders. "Our new name, along with the tagline 'leading innovation in food, natural resources and energy,' better conveys the breadth and relevance of the work we do while remaining true to our land-grant mission in support of Michigan agriculture." "Our new name, along with the tagline 'leading innovation in food, natural resources and energy,' better conveys the breadth and relevance of the work we do while remaining true to our land-grant mission in support of Michigan agriculture." "Our new name, along with the tagline 'leading innovation in food, natural resources and energy,' better conveys the breadth and relevance of the work we do while remaining true to our land-grant mission in support of Michigan agriculture." T

**3. A statement of how the input will be considered**

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

**Brief explanation.**

Stakeholder input provides the foundation for the research and educational programs developed by MAES and MSUE. Stakeholders help decide the future direction for MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) through programs such as Project GREEN, the Animal Agriculture Initiative, the Rackham Endowment, commodity advisory teams and the Working Groups

(formerly Area of Expertise teams). Due to stakeholder input, AgBioResearch has focused more sharply on biobased and renewable energy products, materials and processes that can help boost the Michigan economy, including fuels, chemicals, nutraceuticals and food products; the environment, including climate change and land use issues; and biotechnology. Stakeholder input has changed the direction of youth programming to focus on job readiness and health, which have not been traditional program areas.

More specifically for FY 2010-11:

**Rebranding process for the Michigan Agricultural Experiment Station** - On Jan. 1, the Michigan Agricultural Experiment Station became MSU AgBioResearch.

The new name, along with the tagline, "Leading innovation in food, natural resources and energy," better conveys the breadth and relevance of the work we do while remaining true to MSU's mission in support of Michigan agriculture.

The new name was selected following a yearlong process that included a self-assessment of our strengths, weaknesses and opportunities moving forward, as well as dozens of discussions with both internal and external stakeholders about their perceptions of us and what we could do to better convey the value of our mission. Examples of our stakeholders include commodity groups, agricultural producers, food processors and the tourism, fisheries and forestry industries just to name a few.

Things we heard from our stakeholders: The current name - Michigan Agricultural Experiment Station - is out-of-date and not expansive enough to fully describe what we do; words such as 'natural resources' and 'environment' need a greater role in the organization's description; make sure that research and MSU stays current and addresses newer technologies; continue to build and maintain strong partnerships both within and outside of MSU; the solutions and innovations that come from our research will be even more critical in the future for MSU, for Michigan and the world.

We learned a great deal about ourselves and our stakeholders' perceptions of us -- what we came away with is invaluable and will inform our direction and research priorities well into the future as we work to fuel Michigan's economic recovery.

We are committed to working closely with our stakeholders to turn new discoveries into practical, real-world solutions that generate economic prosperity, sustain natural resources and enhance the quality of life for Michigan residents. It's going to take the efforts of all of us to be successful.



**V. Planned Program Table of Content**

<b>S. No.</b>	<b>PROGRAM NAME</b>
1	Human Health, Environment, Family, Youth, Society and Community
2	Soil, Water and Natural Resources
3	Plant Sciences
4	Economics, Marketing and Policy
5	Animal Production and Protection
6	Global Food Security and Hunger
7	Climate Change
8	Sustainable Energy
9	Childhood Obesity
10	Food Safety

## **V(A). Planned Program (Summary)**

### **Program # 1**

#### **1. Name of the Planned Program**

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

#### **2. Brief summary about Planned Program**

Michigan's children are among the most inactive and sedentary in the nation. Many other health risks also face children, including poor diets, teenage smoking, unintended pregnancies, infectious diseases and lead poisoning. By high school graduation, more than 80 percent of all students have been harassed or bullied by classmates. Food safety is a concern to Michigan residents, as is keeping themselves and their families safe. The past several years have been very difficult for the Michigan economy. The slumping auto industry has deeply affected the state's finances. Downturns in other manufacturing sectors and record-high gasoline prices have pushed the situation from bad to worse. To improve the health and safety of Michigan's adults, youth and communities, AgBioResearch and MSU Extension have developed broad and comprehensive research and education programs to address specific Michigan needs. Youth development, community development, nutrition and food safety research and education, and family and parenting skills are focus areas that stakeholders have identified as important.

Programs in this area will:

- Help Michigan residents eat healthier, become more active, be better caregivers, and prevent and manage chronic health conditions.
- Help develop better models for the human health and human services sectors.
- Explore how environmental pollutants, especially ozone and endocrine disruptors, affect human health.
- Study the function of nutrients and other components related to human health.
- Improve management of financial resources by individuals and families.
- Help prepare youth for life and work.
- Assist Michigan communities in making critical policy decisions and functioning more smoothly with citizen involvement.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
702	Requirements and Function of Nutrients and Other Food Components	1%		2%	
703	Nutrition Education and Behavior	5%		3%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	1%		5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	1%		5%	
721	Insects and Other Pests Affecting Humans	1%		1%	
723	Hazards to Human Health and Safety	7%		10%	
724	Healthy Lifestyle	11%		25%	
801	Individual and Family Resource Management	13%		0%	
802	Human Development and Family Well-Being	12%		14%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	3%		10%	
805	Community Institutions, Health, and Social Services	5%		15%	
806	Youth Development	40%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

It is becoming increasingly apparent that the relationship between family lifestyle factors (e.g., physical living environment, education, food choices, physical activity) and general health and well-being are closely linked and critically important to understand in order to address the challenges families and communities face in this arena.

For example, the accessibility of healthy food choices varies considerably depending on an individual's geographic location. A number of recent studies have quantified and mapped links between demographics, food accessibility and diet. Research in this area is being done to analyze community demographics and then develop atlases of nutritional accessibility for cities to better inform consumers.

By the time a child is three, 85 percent of the brain is developed, but many children enter school unprepared to learn. Many parents and caregivers lack knowledge of developmentally appropriate practices, physical health and wellness, social competence, emotional well-being and cognitive development. Families lack family communication skills. Affordable, high-quality childcare supports business productivity and quality of life for families.

According to a report of the Governor's Commission on Higher Education and Economic Growth,

many students are not prepared for life and work. In a recent State of the State survey, 80 percent of respondents identified youth job training as a high priority. Tenth graders who aren't involved in extracurricular activities are 57 percent more likely to drop out of school. Michigan's high-school graduation rate is only 74 percent.

Antibiotic resistance, bacterial pathogens, food allergies and viruses continue to be issues in food safety, especially *Listeria*, *Salmonella*, *E. coli* O157:H7 and *Campylobacter*. New solutions to time-temperature control in food are needed, as are new methods to detect pathogens quickly, accurately and efficiently.

Research by the Federal Reserve indicates that household debt is at a record high relative to disposable income. The average American family carries nearly \$20,000 in credit debt. Bankruptcy rates have increased tenfold in five years. U.S. life expectancies have risen, but many people are not prepared to successfully manage their finances in anticipation of retirement. Fewer than half of all minority and low-income families own their residence.

Many communities are not prepared for the health care, housing and transportation needs of seniors.

Leaders in urban centers look for help revitalizing struggling downtowns; government officials in municipalities of all sizes need assistance with economic development. In many communities, multicultural differences are not recognized, understood and appreciated. Citizens lack awareness of the level and funding of public services, the complexity of public issues and the methods of citizen involvement.

## 2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension

## V(D). Planned Program (Assumptions and Goals)

### 1. Assumptions made for the Program

Assumptions:

- Funding for these research projects and educational programs will remain constant or decrease; therefore, some expertise will be lost.
- The methodology used to determine program direction is sound.
- People who are trained in nutrition and food safety will change their nutritionally unsound behavior and handle food safely.
- Given appropriate information and tools, people with chronic medical conditions will manage their condition effectively.
- Financial literacy training will result in better financial decisions.
- Training parents and caregivers will improve children's readiness to enter school. •Improved parenting and family management skills will improve quality of life.
- Given accurate information, communities will act positively to meet the needs of seniors.
- Citizens and local officials who are trained will use the information learned to improve their communities.
- Helping Michigan communities of all sizes with economic development will provide improved quality of life, a more robust economy and a more attractive business climate for Michigan.
- Preparing youth for meaningful, well-paying careers will lead to better employment opportunities,

which will improve their quality of life and boost the state's economy.

**2. Ultimate goal(s) of this Program**

The ultimate goals of this program are:

- To ensure that all Michigan residents have access to safe, healthful, affordable food.
- To develop new tests to detect current and emerging food pathogens quickly, accurately and efficiently.
  - To help guide public health recommendations for dietary intakes of specific micronutrients and bioactive food components to prevent the development of allergic disorders, especially in the context of airway disease.
    - To better understand community capacity in the management and decision making around natural resources, specifically water and sanitation.
    - To evaluate the role of migrating waterfowl and shorebirds in the dispersal of pathogens that pose significant health threats to wild and domestic animals as well as humans.
    - To give individuals, parents and caregivers the knowledge and tools to choose healthful food, physically active lifestyles and behaviors consistent with federal dietary guidelines.
    - Individuals will gain financial literacy, management and organizational skills, including credit, budgeting, savings and investing, homebuying, energy and affordable housing options. This will increase savings and reduce consumer debt.
    - To ensure that children enter school ready to learn by teaching parents and caregivers how to use developmentally appropriate practices to ensure their children's physical health and wellness, social competence, emotional well-being and cognitive development.
      - To strengthen family relationships.
      - To prepare communities to meet the health care, housing and transportation needs of seniors.
      - To prepare public officials to seek and hold office and gain knowledge about funding, the most efficient and effective ways to provide services, strategic planning, conflict management, communication, engaging the public in policy development, and intergovernmental cooperation. This will enable local public officials to be confident, efficient, effective leaders in their communities.
        - To ensure that Michigan citizens are knowledgeable, prepared and willing to serve in public roles and make good decisions.
        - To ensure that youth have the knowledge and skills needed for well-paying, fulfilling employment and to meet the challenges of a changing world, as well as enhanced physical, social, emotional and cognitive health and well-being.
          - To enhance the personal growth of youth through volunteering in community service.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	53.0	0.0	10.5	0.0
2014	53.0	0.0	10.5	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2015	53.0	0.0	10.5	0.0
2016	53.0	0.0	10.5	0.0
2017	53.0	0.0	10.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research programs to:

- Assess the impact of school tobacco policy on preventing and reducing Michigan youth smoking.
- Develop a better understanding of public benefits for policy development in recreation and tourism resource management.
  - Increase understanding about how environmental pollutants, especially ozone and endocrine disruptors affect human health.
  - Establish new programs and policies to help young people move successfully from foster care to independent living after they are too old for foster care.
  - 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.
  - Increase understanding and develop more effective environmental management systems.
  - Develop better models for the human health and human services sectors.
  - Identify the nutritional determinants of allergic immune disorders.
  - Develop an understanding of how n-3 polyunsaturated fatty acids affect human health and disease, especially cardiovascular disease and inflammation. ....

Educational programs to:

- Teach how to choose healthful food, physically active lifestyles and behaviors consistent with dietary guidelines.
  - Teach consumers to keep their food safe by offering programs on food safety, home food preservation and healthy, hygienic food-handling practices.
  - Teach people living with chronic medical conditions to manage their condition effectively.
  - Teach financial literacy and prepare individuals to manage their finances in anticipation of retirement.
  - Teach caregivers and parents how to prepare children for school.
  - Increase access to affordable, high-quality childcare.
  - Prepare communities for the health care, housing and transportation needs of seniors.
  - Educate citizens and public officials about funding methods, service provision and intergovernmental cooperation.
    - Provide counties and municipalities with technical assistance related to intergovernmental contracting, consolidating services and financial and strategic planning.
    - Assist government officials in leadership, conflict management, communication and engaging the public in policy development.
    - Prepare youth with knowledge and skills needed for life and employment.
    - Enhance the physical, social, emotional and cognitive health and well-being of youth.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> </ul>	<ul style="list-style-type: none"> <li>● Newsletters</li> <li>● TV Media Programs</li> <li>● Web sites other than eXtension</li> <li>● Other 1 (News Releases)</li> <li>● Other 2 (Annual Report/Magazine)</li> </ul>

**3. Description of targeted 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 age 9 to 18 are targets of youth development programs.

**V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of research programs on human health, environment, family, youth, society and community.
  - Number of adult participants trained in healthy lifestyles.
  - Number of youth participants trained in healthy lifestyles.
  - Number of adult participants trained in human development and family well-being.
  - Number of youth participants trained in human development and family well-being.
  - Number of adult participants trained in youth development.
  - Number of youth participants trained in youth development.
  - Number of adult participants trained in family resource management.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.



**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs to determine the relationship between family meals/lifestyle factors, education/food choices, general health and environmental influences, physical activity and general health.
2	Number of research programs to understand how environmental pollutants, especially ozone and endocrine disruptors, affect human health.
3	Number of research programs to develop better models for the human health and human services sector.
4	Number of adult participants with increased knowledge about healthy lifestyles.
5	Number of youth participants with increased knowledge about healthy lifestyles.
6	Number of adult participants with increased knowledge of human development and family well-being.
7	Number of youth participants with increased knowledge of human development and family well-being.
8	Number of adult participants with increased knowledge of youth development.
9	Number of youth participants with increased knowledge of youth development.
10	Number of research programs to develop more effective environmental/natural resources management systems.
11	Number of adult participants with increased knowledge of family resource management.
12	Number of research programs that study the function of nutrients and other components related to human health.

### **Outcome # 1**

#### **1. Outcome Target**

Number of research programs to determine the relationship between family meals/lifestyle factors, education/food choices, general health and environmental influences, physical activity and general health.

**2. Outcome Type :** Change in Action Outcome Measure

#### **3. Associated Knowledge Area(s)**

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

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 2**

#### **1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 723 - Hazards to Human Health and Safety
- 805 - Community Institutions, Health, and Social Services

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 3**

#### **1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 805 - Community Institutions, Health, and Social Services
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 4**

**1. Outcome Target**

Number of adult participants with increased knowledge about healthy lifestyles.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

Number of youth participants with increased knowledge about healthy lifestyles.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 724 - Healthy Lifestyle
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 6**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of adult participants with increased knowledge of youth development.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 9**

**1. Outcome Target**

Number of youth participants with increased knowledge of youth development.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 10**

**1. Outcome Target**

Number of research programs to develop more effective environmental/natural resources management systems.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 723 - Hazards to Human Health and Safety
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 11**

**1. Outcome Target**

Number of adult participants with increased knowledge of family resource management.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 801 - Individual and Family Resource Management

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 12**

**1. Outcome Target**

Number of research programs that study the function of nutrients and other components related to human health.

**2. Outcome Type : Change in Condition Outcome Measure**

**3. Associated Knowledge Area(s)**

- 702 - Requirements and Function of Nutrients and Other Food Components
- 723 - Hazards to Human Health and Safety

**4. Associated Institute Type(s)**

- 1862 Research

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect 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.)

**Description**

A drastic change in population could necessitate a change in priorities to meet the needs of the target audiences. Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars are base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

## **V(A). Planned Program (Summary)**

### **Program # 2**

#### **1. Name of the Planned Program**

Soil, Water and Natural Resources

#### **2. Brief summary about Planned Program**

Michigan has more than 36 million acres of land with more than 11,000 inland lakes and 36,000 miles of streams. No place in Michigan is more than 85 miles from one of the Great Lakes. The state's land and water support the plants and animals that provide shelter, food and fiber. They provide minerals and other inorganic materials and are the final repository for all the state's waste. Agriculture and natural resources industries -- the two most economically important industries in Michigan after the automobile industry -- depend completely on the state's soil and water resources to remain viable.

To preserve, protect and enhance these resources, MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) and MSU Extension have extensive research and education programs addressing specific Michigan needs. Soil conservation, waste management and use of waste products, ecosystem management, water research (quality, watershed management, and water use for agriculture and natural resources businesses) are all areas of focus that have been identified as important by stakeholders.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes



**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
101	Appraisal of Soil Resources	1%		15%	
102	Soil, Plant, Water, Nutrient Relationships	19%		11%	
111	Conservation and Efficient Use of Water	12%		12%	
112	Watershed Protection and Management	15%		12%	
123	Management and Sustainability of Forest Resources	8%		5%	
131	Alternative Uses of Land	18%		15%	
132	Weather and Climate	1%		0%	
133	Pollution Prevention and Mitigation	12%		15%	
134	Outdoor Recreation	1%		5%	
135	Aquatic and Terrestrial Wildlife	5%		10%	
806	Youth Development	8%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)****1. Situation and priorities**

Michigan is a state defined, literally, by water. Without the Great Lakes, Michigan's peninsulas would not exist. Nor would much of the state's agriculture, manufacturing, shipping and tourism offerings. Water is necessary for life -- every human needs water to live, as do the plants and animals that provide food and shelter. Michigan has more households -- 1.12 million -- served by private wells than any other state.

At the same time, Michigan's land resources provide food, shelter and space and materials for the state's industries, as well as recreation.

Research and education are needed to:

- Identify the trends, causes, and consequences of urban sprawl and to provide recommendations to state government to minimize the negative effects of current land use patterns on Michigan's environment and economy.
- Determine the best way to remove pollutants from soil and water and turn over these areas into safe, productive sites.
- Provide farmers with techniques to maintain the health and productivity of their soils.
- Offer growers a more thorough understanding of the relationships among crops, nutrients and water and how crops can be grown efficiently and productively with the fewest inputs possible.
- Keep Michigan's surface and groundwater clean and make all citizens aware of why this is a critical issue.
- Ensure that a safe, secure and plentiful water supply is available for the state's citizens, industries, wildlife and natural areas.

- Develop tools and technology to help Michigan's natural resources-based tourism industry grow by meeting consumer demands.
- Determine how wildlife, fisheries, and natural resources areas respond to habitat management to encourage management for sustainable benefits.

These priorities have been identified as important by Michigan citizens, farmers, state government representatives, private industry and commodity groups.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

The assumptions made for this planned program are:

- Determining the causes of undesirable outcomes will lead to techniques to change the undesirable outcome into a desirable outcome.
- Developing best practices to remove pollutants will lead to safe, healthy soil and water resources. Farmers depend on their land for their livelihoods. They want to ensure that it is sustainable and productive. All Michigan citizens should have access to clean land and water. Two of Michigan's top industries (agriculture and tourism) depend on the availability of clean land and water.
- Farmers will adopt new production methods if the methods are proven to work and will enhance the farmers' profitability.
- Sustainable forests, land and water benefit Michigan's economy and quality of life.
- Funding will remain constant or decrease.

### **2. Ultimate goal(s) of this Program**

The ultimate goals for this planned program are to:

- Identify the trends, causes, and consequences of urban sprawl and provide recommendations to state government to minimize the negative effects of current land use patterns on Michigan's environment and economy.
- Determine the best way to remove pollutants from soil and water and turn over these areas into safe, productive sites.
- Provide farmers with techniques to maintain the health and productivity of their soils.
- Offer growers a more thorough understanding of the relationships among crops, nutrients and water and how crops can be grown efficiently and productively with the fewest inputs possible.
- Keep Michigan's surface and groundwater clean and make all citizens aware of why this is a critical issue.
- Ensure that a safe, secure and plentiful water supply is available for the state's citizens, industries, wildlife and natural areas.
- Develop tools and technology to help Michigan's natural resources-based tourism industry grow by meeting consumer demands.
- Determine how wildlife, fisheries, and natural resources areas respond to habitat management to encourage management for sustainable benefits.

- Foster positive resource management attitudes and stewardship actions.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	26.8	0.0	8.0	0.0
2014	26.8	0.0	8.0	0.0
2015	26.8	0.0	8.0	0.0
2016	26.8	0.0	9.0	0.0
2017	26.8	0.0	9.0	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research programs and Extension activities to:

- 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 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
- 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. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Public Service Announcement</li> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (News Releases)</li> <li>• Other 2 (Annual Report/Magazine)</li> </ul>

**3. Description of targeted audience**

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

**V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of research programs on soil, water and natural resources.
  - Number of adult participants trained in soil, plant, water and nutrient relationships.
  - Number of adult participants trained in watershed protection and management.
  - Number of youth participants trained in watershed protection and management.
  - Number of adult participants trained in management and sustainability of forest resources.
  - Number of adult participants trained in alternative uses of land.
  - Number of youth participants trained in alternative uses of land.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs to discover new knowledge about the composition, organization and fluctuations of microbial populations in the soils.
2	Number of adult participants with increased knowledge of watershed protection and management.
3	Number of youth participants with increased knowledge of watershed protection and management.
4	Number of adult participants with increased knowledge in management and sustainability of forest resources.
5	Number of research programs to determine how wildlife responds to ecosystem management decisions in natural resource and agricultural systems.
6	Number of adult participants with increased knowledge of alternative uses of land.
7	Number of adult participants with increased knowledge of soil, plant, water and nutrient relationships.
8	Number of research programs that deal with fish population dynamics and the management of Great Lakes fisheries.
9	Number of research programs that deal with the security, stewardship and management of Michigan's water resources.
10	Number of research programs that analyze key soil characteristics to better assess their agricultural and environmental contribution, including crop yield.
11	Number of research programs that explore the occurrence, transport and fate/effect of organic contaminants, chemicals, pesticides, pharmaceuticals and particulates in soils.
12	Number of research programs to develop new land use models for Michigan communities.

**Outcome # 1**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 2**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 4**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 123 - Management and Sustainability of Forest Resources

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 123 - Management and Sustainability of Forest Resources
- 135 - Aquatic and Terrestrial Wildlife

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 6**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure



**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management
- 134 - Outdoor Recreation
- 135 - Aquatic and Terrestrial Wildlife

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 9**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 10**

**1. Outcome Target**

Number of research programs that analyze key soil characteristics to better assess their agricultural and environmental contribution, including crop yield.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 133 - Pollution Prevention and Mitigation

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 11**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure

### **3. Associated Knowledge Area(s)**

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation

### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 12**

#### **1. Outcome Target**

Number of research programs to develop new land use models for Michigan communities.

#### **2. Outcome Type : Change in Action Outcome Measure**

### **3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 131 - Alternative Uses of Land
- 135 - Aquatic and Terrestrial Wildlife

### **4. Associated Institute Type(s)**

- 1862 Research

## **V(J). Planned Program (External Factors)**

### **1. External Factors which may affect 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.)

### **Description**

Michigan's soil, water and other natural resources are all in a delicate balance. If one part of the equation changes, through a new public policy, funding allocation change or a drought or other extreme weather event, it will affect all the other natural resources in the state.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars are base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

## **V(A). Planned Program (Summary)**

### **Program # 3**

#### **1. Name of the Planned Program**

Plant Sciences

#### **2. Brief summary about Planned Program**

Michigan produces more than 200 commodities, making the state second only to California in terms of crop diversity. Michigan growers continue to need new varieties, cultural techniques and pest management strategies whether they are growing corn, apples, cherries, blueberries, turfgrass, petunias, or ornamental crabapple trees.

Michigan is one of the country's top producers of specialty crops. Because the acreage of these crops is lesser than that of corn, wheat, rice and soybeans, it isn't economically attractive for chemical companies to make developing pesticides for them a priority. So the state's growers of these smaller-acreage commodities look to MSU AgBioResearch (formerly the Michigan Agricultural Experiment Station) and MSU Extension to provide the research and education on pesticides and management techniques.

Since 1915, Michigan State University plant breeders have released more than 300 varieties of plants, from corn, wheat and alfalfa to zinnias, strawberries and spruce trees. Each breeder works closely with Michigan growers to improve the desirable traits in each crop while keeping yields high. At the same time, AgBioResearch scientists and MSUE educators work continuously with growers to develop and test new management techniques to provide protection from insects, weeds, diseases and undesirable weather. As the demand for organic food increases, researchers and educators work to provide producers with cultural and pest management techniques that meet USDA organic standards.

MSU Extension proposes to create a new Federally-Recognized Tribes Extension Program (FRTEP) servicing four federally-recognized tribes in the Eastern Upper Peninsula and Northern Lower Peninsula of Michigan. The proposed program will represent the first FRTEP servicing any tribal government in the Northeastern United States. The tribes partnering on the project are the Bay Mills Indian Community, the Hannahville Indian Community, the Little Traverse Bay Bands of Odawa Indians and the Sault Ste. Marie Tribe of Chippewa Indians. The project seeks to improve the health, well-being, energy independence and financial independence of these four Michigan Indian tribes through the creation of two full-time Extension educator positions that will assist the tribes in advancing their agricultural and renewable resource programs. Agricultural and horticultural program activities will focus on enhancing the production and profitability of small-scale tribal agriculture projects and improving tribal member wellness. Renewable resource and sustainable development program activities will use educational processes to facilitate the incorporation of renewable energies into tribal households, tribal governmental offices and tribal businesses and increase tribal capacity to develop forest and agricultural-based renewable resources in ecologically and economically sustainable ways.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
201	Plant Genome, Genetics, and Genetic Mechanisms	5%		15%	
202	Plant Genetic Resources	6%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	7%		10%	
204	Plant Product Quality and Utility (Preharvest)	5%		5%	
205	Plant Management Systems	30%		18%	
206	Basic Plant Biology	3%		11%	
211	Insects, Mites, and Other Arthropods Affecting Plants	3%		5%	
212	Pathogens and Nematodes Affecting Plants	15%		10%	
215	Biological Control of Pests Affecting Plants	3%		13%	
216	Integrated Pest Management Systems	20%		5%	
806	Youth Development	3%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Michigan growers continue to need new varieties, cultural techniques and pest management strategies to remain competitive and thrive in a global economy. AgBioResearch scientists and MSU Extension educators aim to meet the following priorities:

- Develop new varieties that meet Michigan growers' needs (this includes fruit, vegetable, forestry, horticulture and field crop varieties).
  - Identify and isolate novel genes, markers and genetic pathways that can benefit crops important to Michigan agriculture through higher yields, improved quality, better insect and disease resistance and greater tolerance to environmental stresses.
  - Identify and isolate novel genes, enzymes and other phytochemicals that may benefit human health and determine how these beneficial compounds can be made available to people.
  - 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.
  - Develop biological controls for pest insects and diseases to minimize effects on the environment.
  - Develop integrated management systems for Michigan crops that recognize that what is done in one area, say control aphids on soybeans, has an affect on the whole farm environment, including soil, air, water, and beneficial insects and microbes.

- Evaluate new crop varieties and make the results widely available so growers have the most up-to-date information before planting.
- Develop a deeper understanding of the role specific genes and mutations play in crop quality, insect and disease resistance and environmental stress tolerance.
- Determine whether genes that impart desirable characteristics can safely and efficiently be incorporated into other species.
- Programs for underserved ethnic and racial groups - IPM scouts for Hispanic farmers & farm workers. •Build tribal capacity in the area of small scale sustainable agriculture.

These priorities have been identified as important by Michigan citizens, farmers, state government representatives, private industry and commodity groups.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

The assumptions made for this planned program are:

- New varieties will keep Michigan growers competitive and thriving in a global agricultural economy.
- Developing a deeper understanding of the genetic and metabolic processes in plants will allow the creation of higher-yielding, higher-quality plants with improved resistance to pests, diseases and environmental stress.
- Unlocking the genetic secrets of plants also will allow scientists to identify and isolate plant compounds that may benefit human health.
- New techniques to manufacture and dispense these beneficial compounds and vaccines may result.
- Integrated management and cultural practices will ensure that agriculture is sustainable and productive because fertile soil, water and air will continue to be available to support it.
- Integrated management strategies also ensure that the environment will be a safe and secure place to support human, animal and plant life.
- Funding will remain constant or decrease.

### **2. Ultimate goal(s) of this Program**

The ultimate goals of this planned program are to:

- 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 educational programs for fruit, field, vegetable,

floriculture, Christmas tree and forestry crops that maximize the efficiency of resource inputs 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 any effects on the environment.
- 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.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	20.4	0.0	14.0	0.0
2014	20.4	0.0	14.0	0.0
2015	20.4	0.0	14.0	0.0
2016	20.4	0.0	14.0	0.0
2017	20.4	0.0	14.0	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research programs to:

- 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.



Extension activities to:

- 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.
- Train Native American adults in sustainable agriculture.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (News Releases)</li> <li>• Other 2 (Annual Report/Publications)</li> </ul>

**3. Description of targeted audience**

Michigan growers (traditional and organic), commodity groups, agriculture and natural resources industry representatives (including herbicide, pesticide and insecticide suppliers), green industry/landscape/turf professionals, state agricultural agencies, Native American growers and the interested public.

**V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of research projects on plant sciences.
  - Number of adult participants trained in plant management systems.
  - Number of youth participants trained in plant management systems.
  - Number of adult participants trained in pathogens and nematodes affecting plants.
  - Number of adult participants trained in integrated pest management (IPM).
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

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 and/or cultural and management strategies for organic crops.
5	Number of research programs to develop biological controls for pest insects and diseases to minimize any effects on the environment.
6	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.
7	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.
8	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.
9	Number of research programs to develop improved varieties of economically important crops for Michigan and the region.
10	Number of adult participants with increased knowledge of plant management systems.
11	Number of research programs to develop weed control methodologies, protocols and practices.
12	Number of research programs to develop controls for pathogens and nematodes affecting plants.
13	Number of research programs to develop production protocols and environmental and cultural strategies for the floriculture/nursery industry.

**Outcome # 1**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 212 - Pathogens and Nematodes Affecting Plants

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

Number of research programs to develop insect and disease control and/or cultural and management strategies for organic crops.

**2. Outcome Type :** Change in Condition Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

#### **Outcome # 5**

##### **1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Research

## **Outcome # 6**

### **1. Outcome Target**

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. Outcome Type :** Change in Condition Outcome Measure

### **3. Associated Knowledge Area(s)**

- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology

### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

## **Outcome # 7**

### **1. Outcome Target**

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. Outcome Type :** Change in Condition Outcome Measure

### **3. Associated Knowledge Area(s)**

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

### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 8**

#### **1. Outcome Target**

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. Outcome Type : Change in Condition Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 206 - Basic Plant Biology
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 9**

#### **1. Outcome Target**

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

#### **2. Outcome Type : Change in Condition Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology

#### **4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 10**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 11**

**1. Outcome Target**

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

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 12**

**1. Outcome Target**

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

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 212 - Pathogens and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants



- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 13**

#### **1. Outcome Target**

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

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Research

### **V(J). Planned Program (External Factors)**

#### **1. External Factors which may affect 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.)

#### **Description**

Public reaction to biotechnology affects the breeding and plant genetic work of AgBioResearch scientists. In order to meet grower demands and satisfy the public's demand for safe food, breeders must use a variety of technologies. Also, weather plays a large role in the prevalence of weeds, pest insects and diseases. New priorities may emerge as the environment changes.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars are base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- The research and education will be evaluated in a variety of ways. To determine whether knowledge/behavior has changed, we will query participants. To determine if new management strategies have benefited growers and the environment, we will survey growers as well as independently sample environmental parameters. New varieties will be evaluated by yield, pest and environmental stress resistance and grower adoption.

## **V(A). Planned Program (Summary)**

### **Program # 4**

#### **1. Name of the Planned Program**

Economics, Marketing and Policy

#### **2. Brief summary about Planned Program**

All Michigan agricultural producers benefit from improving their business and financial management skills, whether they raise dairy cows or grow blueberries. Marketing, distribution and other economic variables also play a critical role in the success and profitability of the state's agriculture and natural resources industries. The most perfect product in the world won't be deemed successful unless it gets into the hands of consumers who desire it.

Surrounded by the Great Lakes, Michigan also plays a key role in domestic and international shipping. Michigan exports about one-third of its agricultural commodities each year. In 2010, the state's annual exports generated about \$1.75 billion and employed over 14,000 residents. Michigan ranked 18th in agricultural exports for fiscal year 2010. Soybeans, feed grains, wheat, fruits and vegetables and related products accounted for approximately 80 percent of the state's agricultural exports.

Research and education on international trade and development, economic policy, domestic and foreign policy, and community resource planning and development will help Michigan growers and producers navigate governmental regulations both here and abroad, as well as connect them with foreign buyers and markets.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
601	Economics of Agricultural Production and Farm Management	20%		18%	
602	Business Management, Finance, and Taxation	12%		12%	
603	Market Economics	3%		7%	
604	Marketing and Distribution Practices	5%		5%	
605	Natural Resource and Environmental Economics	22%		16%	
606	International Trade and Development	3%		11%	
608	Community Resource Planning and Development	26%		10%	
609	Economic Theory and Methods	3%		10%	
610	Domestic Policy Analysis	5%		6%	
611	Foreign Policy and Programs	1%		5%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Agriculture production in Michigan has always been a business of narrow margins. Spring freezes, fluctuating prices and demand, drought, diseases and insects, production costs, land prices, development, and the availability of farm labor coupled with public policy changes make more than getting by a challenge under the best of conditions. Michigan's growers, consumers and agencies have identified the following priorities:

- 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.
- 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. Market data show that citizens prefer small, mixed-use communities in which they can meet their basic needs within a five-minute walk.

**2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

The assumptions made for this planned program are:

- Research on economics, management, policy and marketing will keep Michigan producers' operations growing and profitable.
- Meeting producer needs will also ensure that Michigan citizens have access to a plentiful, secure, high-quality food supply and a clean, sustainable environment.
- Funding will remain constant or decrease.

**2. Ultimate goal(s) of this Program**

The ultimate goals of this planned program are to:

- Enhance the profitability of Michigan agriculture and natural resources industries.
- Enhance rural and urban community development.
- Identify current and emerging key public policies addressing trade, environmental, agricultural and food issues of particular import to policymakers, taxpayers, consumers and business persons.
- Understand how food system conflicts can be transformed into opportunities for citizens to have a voice related to this area.
- Develop and implement effective youth smoking intervention programs that involve school tobacco programs. Provide Michigan citizens with a healthy environment and a secure, plentiful food supply; and help communities use planning and zoning effectively to meet community goals.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	25.8	0.0	4.0	0.0
2014	25.8	0.0	4.0	0.0
2015	25.8	0.0	4.0	0.0
2016	25.8	0.0	4.0	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2017	25.8	0.0	4.0	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research programs to:

- 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.
- 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.

Extension program activities to:

- 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. Type(s) of methods to be used to reach direct and indirect contacts**

Extension	
Direct Methods	Indirect Methods

- Education Class
- Workshop
- Group Discussion
- One-on-One Intervention
- Demonstrations

- Newsletters
- TV Media Programs
- Web sites other than eXtension
- Other 1 (News Releases)
- Other 2 (Annual Report/Magazine)

### 3. Description of targeted audience

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

### V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

### V(H). State Defined Outputs

#### 1. Output Measure

- Number of research programs on economics, marketing and policy.
- Number of adult participants trained in economics of agricultural production and farm management.
- Number of adult participants trained in business management, finance and taxation.
- Number of adult participants trained in natural resource and environmental economics.
- Number of adult participants trained in community resource planning and development.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of adult participants with increased knowledge in economics of agricultural production and farm management.
2	Number of adult participants with increased knowledge in business management, finance and taxation.
3	Number of adult participants with increased knowledge in natural resource and environmental economics.
4	Number of adult participants with increased knowledge 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 and human resources management practices of Michigan farm markets, greenhouses and other green industry retailers.
8	Number of research programs to develop a framework to understand and analyze domestic and international trade policies and assess their impact on Michigan.
9	Number of research programs to develop models to estimate the demand for and value of recreational fisheries and wildlife resources.



**Outcome # 1**

**1. Outcome Target**

Number of adult participants with increased knowledge in economics of agricultural production and farm management.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of adult participants with increased knowledge in business management, finance and taxation.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of adult participants with increased knowledge in natural resource and environmental economics.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 605 - Natural Resource and Environmental Economics

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 4**

**1. Outcome Target**

Number of adult participants with increased knowledge in community resource planning and development.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 608 - Community Resource Planning and Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

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. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 6**

**1. Outcome Target**

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. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 7**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 602 - Business Management, Finance, and Taxation
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 8**

**1. Outcome Target**

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

**2. Outcome Type :** Change in Action Outcome Measure

### **3. Associated Knowledge Area(s)**

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

### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

## **Outcome # 9**

### **1. Outcome Target**

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

### **2. Outcome Type : Change in Action Outcome Measure**

### **3. Associated Knowledge Area(s)**

- 603 - Market Economics
- 605 - Natural Resource and Environmental Economics

### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

## **V(J). Planned Program (External Factors)**

### **1. External Factors which may affect 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.)

## **Description**

Agricultural and natural resources markets and economies are affected by a variety of natural factors and public policy changes. Changes in population will affect farm labor.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- All research and education programs on policy, management and economics will be evaluated to see how well they work, as well as how many people adopt them and the changes that result.

## **V(A). Planned Program (Summary)**

### **Program # 5**

#### **1. Name of the Planned Program**

Animal Production and Protection

#### **2. Brief summary about Planned Program**

Animal agriculture and its associated products -- milk, meat, wool, eggs, cheese and butter -- make up a significant portion of Michigan's economy. The state is 5th in the country in milk production, 13th in hog production and 28th in cattle production. Cash receipts from Michigan cattle and calf marketing was \$380.8 million in 2010, with 1.09 million head; and the value of poultry production -- including eggs and chickens -- was \$162.8 million in 2010. Besides food animals, Michigan also has prosperous horse racing, pleasure and sport riding industries.

Enhancing profitability and quality in animal agriculture means research on new methods to combat diseases and parasites, as well as work on selecting animals with desirable traits and studies on nutrition and animal management systems. Because almost all animal production involves large up-front investments, research on improving animals' reproductive performance and reducing environmental stress is also critically important. The MSU Center for Animal Functional Genomics offers researchers the opportunity to use technology that allows them to track animals' response to stress from disease, giving birth, shipping and other environmental factors at the cellular and molecular levels. The center is allowing MSU researchers and educators to become national leaders in understanding immune system response at the genetic level in addition to other critical research efforts in animal production and protection.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
301	Reproductive Performance of Animals	3%		15%	
302	Nutrient Utilization in Animals	5%		15%	
303	Genetic Improvement of Animals	2%		10%	
304	Animal Genome	4%		11%	
305	Animal Physiological Processes	5%		9%	
307	Animal Management Systems	41%		13%	
308	Improved Animal Products (Before Harvest)	1%		1%	
311	Animal Diseases	28%		16%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals	4%		0%	
315	Animal Welfare/Well-Being and Protection	3%		10%	
605	Natural Resource and Environmental Economics	1%		0%	
806	Youth Development	3%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)****1. Situation and priorities**

Michigan animal industries face different, and, one could argue, more numerous challenges than their crop-producing counterparts. While both groups have to deal with weather, insects and diseases, animal producers also have to worry about their animals' reproductive health and efficiency, nutrient management, feeding/milking schedules, as well as the stress of shipping, weaning, crowding and giving birth.

Michigan animal producers have identified several research and educational priorities for the coming years:

- Continue to develop and update the Michigan Agriculture Environmental Assurance Program guidelines and offer more education and outreach on the program.
- Develop new management strategies to increase profitability for animal producers.
- Develop tracking mechanism to quickly and accurately control populations when outbreaks of infectious diseases occur.
- Develop new systems and strategies to keep animals healthy and to identify and treat diseases before they spread through herds.
- Develop systems and strategies to ensure the welfare of animals from birth to rendering.
- Develop new technologies to identify animals with superior reproduction capability to increase

profitability.

**2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

The assumptions made for this planned program are:

- Research and education will help keep Michigan animal producers' operations profitable and growing, their animals healthy and their products high quality.
- Research on reproduction, nutrient utilization, genetics, environmental stresses, management systems, diseases and disease tracking, and animal welfare will meet these needs of producers, as well as ensure that Michigan residents have access to high-quality, plentiful animal products.
- Funding will remain constant or decrease.

**2. Ultimate goal(s) of this Program**

The ultimate goal of this planned program is:

- To provide new strategies and technologies to keep Michigan animal producers thriving and profitable, to provide a safe, high-quality supply of animal products to Michigan residents, and to ensure the humane treatment, health and well-being of animals.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	15.4	0.0	6.5	0.0
2014	15.4	0.0	6.5	0.0
2015	15.4	0.0	6.5	0.0
2016	15.4	0.0	5.5	0.0
2017	15.4	0.0	5.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**



Research programs to:

- Understand the processes that control/influence reproduction at the molecular and genetic level.
- Develop and test new cropping, grazing and feeding strategies for food animals.
- Develop and evaluate management/training strategies for race horses to reduce injuries.
- 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.
  - Understanding of the environmental fate and biological effects of vaccines, steroids and other drugs fed to animals.

Extension activities to:

- 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. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Public Service Announcement</li> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (News Releases)</li> <li>• Other 2 (Annual Report/Magazine)</li> </ul>

**3. Description of targeted audience**

Michigan animal producers, agriculture and natural resources industry representatives, animal pharmaceutical industry, animal welfare organizations, state agency representatives, state and local elected officials and the interested public.

## V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## V(H). State Defined Outputs

### 1. Output Measure

- Number of research programs on animal production and protection.
- Number of adult participants trained in animal management systems.
- Number of youth participants trained in animal management systems.
- Number of adult participants trained in animal diseases.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

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 add to the understanding of various food animal genomes by improving and integrating genetic maps.
6	Number of research programs to develop and evaluate new tools and strategies to detect, prevent and control emerging and reemerging livestock and poultry diseases.
7	Number of research programs to understand the environmental fate and biological effects of vaccines, steroids and other substances fed to animals.
8	Number of research programs to develop and evaluate management/training strategies for horses to reduce injuries.
9	Number of research programs to add to the understanding of animal behavior and welfare.
10	Number of research programs to test new cropping, grazing and feeding strategies for food animals.

**Outcome # 1**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 311 - Animal Diseases

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

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

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 311 - Animal Diseases
- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of adult participants with increased knowledge of animal diseases.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 311 - Animal Diseases

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

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

**2. Outcome Type :** Change in Condition Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 301 - Reproductive Performance of Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals

##### **4. Associated Institute Type(s)**

- 1862 Research

#### **Outcome # 5**

##### **1. Outcome Target**

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

**2. Outcome Type :** Change in Knowledge Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 304 - Animal Genome
- 305 - Animal Physiological Processes

##### **4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 6**

**1. Outcome Target**

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. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals
- 305 - Animal Physiological Processes
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 7**

**1. Outcome Target**

Number of research programs to understand the environmental fate and biological effects of vaccines, steroids and other substances fed to animals.

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 8**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 9**

**1. Outcome Target**

Number of research programs to add to the understanding of animal behavior and welfare.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 307 - Animal Management Systems
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 10**

**1. Outcome Target**

Number of research programs to test new cropping, grazing and feeding strategies for food animals.

**2. Outcome Type** : Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)

#### **4. Associated Institute Type(s)**

- 1862 Research

### **V(J). Planned Program (External Factors)**

#### **1. External Factors which may affect 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.)

#### **Description**

There are a number of important issues related to livestock production and the public perception of animal production on a global basis, including consumption of animal products and human health, global warming, biotechnology and animal rights, that could affect the outcome of activities in this area.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

### **V(K). Planned Program - Planned Evaluation Studies**

#### **Description of Planned Evaluation Studies**

Research -- As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- As new management strategies are introduced, producers will be surveyed before and after education and training to see how many change their practices.



## **V(A). Planned Program (Summary)**

### **Program # 6**

#### **1. Name of the Planned Program**

Global Food Security and Hunger

#### **2. Brief summary about Planned Program**

The term "food security" is used to describe not only the availability of food, but the ability to purchase food. Food security means having a reliable source of food and sufficient resources to purchase it. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Increased demand will come primarily from population and income growth in middle-income countries. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Increased demand will come primarily from population and income growth in middle-income countries. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization.

Agriculture--including crops, livestock and aquaculture--is a powerful poverty reduction tool. According to the World Bank, for every one percent growth in agriculture, poverty declines by as much as two percent. And because the majority of those who are hungry live in rural areas and depend on agriculture and natural resources for their livelihoods, investing in agriculture is the most efficient way to target those in need.

Research activities in this program will focus on: the genetic improvement of key agricultural crops related to yield, quality, drought/cold tolerance and pest resistance; better understanding the processes and factors that influence growth, meat quality and production efficiencies in food animals; enhancing sustainability and reducing risk for agricultural systems; identifying current and emerging key public policy issues on trade, environmental, agricultural and food issues -- including food security for vulnerable populations.

Extension activities will focus on active market research, education and outreach on the global market for Michigan products, including distribution, tariff and tariff compliance issues, food safety and global standard compliances, and identification of opportunities for Michigan products.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%		4%	
102	Soil, Plant, Water, Nutrient Relationships	10%		16%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		23%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		5%	
205	Plant Management Systems	30%		12%	
307	Animal Management Systems	20%		6%	
308	Improved Animal Products (Before Harvest)	0%		11%	
603	Market Economics	40%		3%	
604	Marketing and Distribution Practices	0%		5%	
606	International Trade and Development	0%		12%	
610	Domestic Policy Analysis	0%		3%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

The term "food security" is used to describe not only the availability of food, but the ability to purchase food. Food security means having a reliable source of food and sufficient resources to purchase it. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Increased demand will come primarily from population and income growth in middle-income countries. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization. Ensuring global food security will only become more challenging in the future as demand for food is projected to increase by 50 percent over the next 20 years. Increased demand will come primarily from population and income growth in middle-income countries. Growth in agricultural productivity, already lagging globally, also faces increasing threats from climate change, scarce water supplies, and competition for energy resources from industry and urbanization.

Agriculture—including crops, livestock and aquaculture—is a powerful poverty reduction tool. According to the World Bank, for every one percent growth in agriculture, poverty declines by as much as two percent. And because the majority of those who are hungry live in rural areas and depend on agriculture and natural resources for their livelihoods, investing in agriculture is the most efficient way to target those in need.

Research priorities will be: the genetic improvement of key agricultural crops related to yield, quality, drought/cold tolerance and pest resistance; gaining a better understanding of the processes and factors that influence growth, meat quality and production efficiencies in food animals; enhancing sustainability and reducing risk for agricultural systems; and identifying current and emerging key public policy issues on trade, environmental, agricultural and food issues -- including food security for vulnerable populations.

Extension will focus its outreach efforts on Michigan agricultural businesses that are competing for market share and profits domestically and in a world economy. This will examine issues and barriers that include food safety concerns, highly volatile energy prices, an aging population of active farmers, tax law changes, weather-related disasters, credit availability and cost are challenges. The Michigan economy is threatened by a global recession that has increased unemployment, threatening agriculturally related job retention and job growth.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension
- Multistate Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

The assumptions for this planned program are:

- New and improved plant varieties will help provide a safe, nutritious food supply.
- Genetic improvements and the control and management of food animal diseases will help ensure a safe, nutritious food supply.
  - Developing a deeper understanding of the genetic and metabolic processes in plants will allow the creation of higher-yielding, higher quality plants with improved resistance to pests, diseases and environmental stress.
    - Integrated management and cultural practices will ensure that agriculture is sustainable and productive because fertile soil, water and air will continue to be available to support it.
    - Domestic and international trade policies and practices will ensure a safe and secure food supply for all.
    - Funding will remain constant or decrease.

### **2. Ultimate goal(s) of this Program**

The ultimate goals of this planned program are to:

- Develop improved varieties of dry beans, potatoes, wheat, rice, apples, strawberries, blueberries, sweet and tart cherries and vegetable crops to ensure a safe and adequate food supply.
  - Better understand the processes and factors that influence growth, meat quality and production efficiencies in food animals.
    - Identify current and emerging key public policy issues on trade, environmental, agricultural and food issues to ensure a fair, equitable and sustainable food marketing and distribution system, both globally and nationally.
      - Develop strategies and approaches that enhance sustainability and reduce risk for agricultural production systems.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	10.2	0.0	8.0	0.0
2014	10.2	0.0	8.0	0.0
2015	10.2	0.0	8.0	0.0
2016	10.2	0.0	8.0	0.0
2017	10.2	0.0	8.0	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research programs to:

- Genetically improve dry beans, rice, soybean, wheat, vegetable crops (e.g., potatoes, tomatoes) and fruits (e.g., strawberries, blueberries, tart and sweet cherries) for yield, pest resistance and food quality.
- Better understand the processes and factors that influence the growth, meat quality and other economically important traits in food animals.
- Increase the efficiency of milk production in dairy cattle
- Identify current and emerging public policy issues on trade, environmental, agricultural and food issues to ensure food access and security to all.
- Develop strategies and approaches that enhance the sustainability of vegetable production systems.
- Identify beneficial plant-microbe interactions and soil properties and their influence on crop yield.

Extension and outreach activities to:

Financial tools instruction such as enterprise analysis, partial budgeting, breakevens, and cost of production (including Annie's Project)

Resources for growers scaling up production to new markets (local through global) to include:

- Applied market demand research (local through global)
- Target market research and education
- Pricing strategies
- Facilitating grower/buyer relationships

Marketing strategies and information on emerging and evolving business practices and market structure throughout the food supply chain

Active market research on the global market for Michigan products, including distribution, tariff and tariff compliance issues, food safety and global standards compliances, and identification of opportunities for Michigan products.

Commodity marketing for commercial production agriculture producers

Provide support to farmers and other land owners in understanding and negotiating contracts, leases and agreements (mineral, right-of-way and wind power).

Labor/ employee management training

Business succession and estate planning training (incl Annie's Project)

Demonstrate food production and distribution model that directly engages producers on a local/regional scale teaming with modest size food processing facilities and large scale institutional and private-industry consumers.

Conduct and publish applied research in support of value added agriculture on local, multi-state and national levels

Risk Management Tools Including Crop Insurance, USDA Programs(Farm Bill) ACRE, SURE  
Development of and information sharing related to Agricultural Policy

Support for start-ups, including limited resources and minority farmers and their employees.  
Identify local experts to network with new start-ups.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> <li>● Other 1 (Field days)</li> <li>● Other 2 (Tours of research centers)</li> </ul>	<ul style="list-style-type: none"> <li>● Public Service Announcement</li> <li>● Newsletters</li> <li>● TV Media Programs</li> <li>● Web sites other than eXtension</li> <li>● Other 1 (Annual Reports)</li> <li>● Other 2 (Magazines)</li> </ul>

**3. Description of targeted audience**

Agricultural producers (crop and livestock), commodity groups, state agency representatives, food chain supply industry representatives, state and federal elected officials and policymakers, national and international policy and standards boards and councils, and the interested public.

## **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of research programs on global food security and hunger.
- Number of producers and processors trained in national and international policy issues that impacts the industry competitiveness.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs that deal with the genetic improvement of key agricultural crops related to yield, quality, drought/cold tolerance and pest resistance.
2	Number of research programs to understand the processes and factors that influence growth, meat quality and production efficiencies in food animals.
3	Number of research programs to identify current and emerging key public policy issues on trade, environmental, agricultural and food issues.
4	Number of research programs to develop strategies and methods that enhance sustainability and reduce risk for agricultural systems.
5	Number of producers and processors with improved understanding of national and international policy issues and the impacts on their own firm and industry competitiveness.

**Outcome # 1**

**1. Outcome Target**

Number of research programs that deal with the genetic improvement of key agricultural crops related to yield, quality, drought/cold tolerance and pest resistance.

**2. Outcome Type** : Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of research programs to understand the processes and factors that influence growth, meat quality and production efficiencies in food animals.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

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

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 3**

**1. Outcome Target**

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

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 603 - Market Economics



- 604 - Marketing and Distribution Practices
- 606 - International Trade and Development
- 610 - Domestic Policy Analysis

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 4**

#### **1. Outcome Target**

Number of research programs to develop strategies and methods that enhance sustainability and reduce risk for agricultural systems.

#### **2. Outcome Type : Change in Condition Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 205 - Plant Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 5**

#### **1. Outcome Target**

Number of producers and processors with improved understanding of national and international policy issues and the impacts on their own firm and industry competitiveness.

#### **2. Outcome Type : Change in Knowledge Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 604 - Marketing and Distribution Practices
- 606 - International Trade and Development
- 610 - Domestic Policy Analysis

#### **4. Associated Institute Type(s)**

- 1862 Extension

## **V(J). Planned Program (External Factors)**

### **1. External Factors which may affect Outcomes**

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

#### **Description**

At this point, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Weather also plays a large role in the annual yield and quality of crops, in addition to the prevalence of weeds, pest insects and diseases.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars are base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

**V(A). Planned Program (Summary)**

**Program # 7**

**1. Name of the Planned Program**

Climate Change

**2. Brief summary about Planned Program**

As the red rises in thermometers worldwide, MSU is positioning itself to play a leadership role in addressing emerging climate changes issues and opportunities.

Research and Extension will undertake activities that: ensure sustainable crop and livestock productivity in the face of climate change; determine the impact of global warming on the Great Lakes water budget and fisheries as well as it's costal shoreline; develop effective tools and agricultural management practices for air emission mitigation related to greenhouse gas reduction on agricultural lands and operations; and to take advantage of emerging economic opportunities offered by climate change mitigation technologies.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :**Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
112	Watershed Protection and Management	10%		15%	
131	Alternative Uses of Land	10%		12%	
132	Weather and Climate	50%		27%	
133	Pollution Prevention and Mitigation	30%		33%	
135	Aquatic and Terrestrial Wildlife	0%		7%	
136	Conservation of Biological Diversity	0%		6%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Whether you believe in prophecies that foretell of horrendous natural disasters signaling the "end of days" or that human activity is a major cause of global warming, scientific experts agree that the Earth's climate is changing. Research shows that the world is now hotter than at any time during the past 1,000

years. Climate model projections summarized by the Intergovernmental Panel on Climate Change indicate that average global surface temperature will likely rise an additional two degrees to 11 degrees F by 2100.

Like global temperatures, average temperatures in the United States are on the rise. According to the U.S. Climate Change Science Program, the past decade was the warmest in more than a century. Along with temperature, increases in the number of heavy precipitation events and changes in snow cover have also been observed. Climate trend data paint a similar picture for Michigan and the Great Lakes region.

Scientific experts worldwide are predicting rises in sea levels, increased plant and animal extinctions, changes in species ranges, changes in agricultural yields, more intense and frequent storms, and increased drought, fire, flooding and heat waves if current climate trends continue.

Priorities include: ensuring sustainable crop and livestock productivity in the face of climate change; determining the impact of global warming on the Great Lakes water budget and fisheries to help inform natural resource and fisheries managers on the best approaches to climate change adaptation; developing effective tools and agricultural management practices for air emission mitigation related to greenhouse gas reduction on agricultural lands and operations; and to taking advantage of emerging economic opportunities offered by climate change mitigation technologies.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

The assumptions made for this planned program are:

- Identifying the potential effects of climate change will help producers, natural resource managers, communities and individuals plan for and make informed decisions so that they can adapt to changing environments.
  - Climate change knowledge will help to sustain economic vitality and help producers, natural resources managers, communities and individuals take advantage of emerging economic opportunities.
  - Funding will remain constant or increase.

### **2. Ultimate goal(s) of this Program**

The ultimate goals of this program are to:

- Analyze and identify climate change mitigation strategies to address greenhouse gas emissions and other climate-altering factors and activities related to agricultural lands and urban environments.
  - Develop an agricultural system (and supporting ecosystem) that maintains high productivity in the face of climate change.
    - Help producers, natural resource managers and the general public plan for and make informed decisions to adapt to changing environments.
      - Sustain economic vitality
      - Capitalize on emerging economic opportunities offered by climate change mitigation processes and technologies.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	5.0	0.0	4.0	0.0
2014	5.0	0.0	4.0	0.0
2015	5.0	0.0	4.0	0.0
2016	5.0	0.0	4.5	0.0
2017	5.0	0.0	4.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research will be undertaken to: ensure an agricultural system (supported by its surrounding environs) that maintains high productivity in the face of climate change; analyze and identify climate change mitigation strategies and technologies to address greenhouse gas emissions and other climate-altering factors and activities related to agricultural lands and urban environments; address the effect of climate change on water resources and aquatic and terrestrial life.

Extension and outreach will focus on the establishment of expedient response groups/other means of information sharing structured to provide information to Michigan food producers on critical information related to production at crucial times that will include for example, in-season training and meetings, timely fruit pest monitoring and reporting, updates on control measures, prediction models, weather reports to assist Michigan fruit growers to produce high-quality and profitable crops.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> <li>● Other 1 (Research center days)</li> <li>● Other 2 (Presentations at conferences)</li> </ul>	<ul style="list-style-type: none"> <li>● Public Service Announcement</li> <li>● Newsletters</li> <li>● TV Media Programs</li> <li>● Web sites other than eXtension</li> <li>● Other 1 (Annual Report)</li> <li>● Other 2 (Magazine feature articles)</li> </ul>

**3. Description of targeted audience**

Target audiences include agricultural producers, natural resource managers, environmental organizations, commodity groups and industry representatives, elected officials and policymakers at all

levels, and the interested public.

### **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

### **V(H). State Defined Outputs**

#### **1. Output Measure**

- Number of research programs on climate change.
- Number of producers trained in responding to food production issues resulting in less production and marketing losses

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs to help ensure an agriculture system (and its surrounding environs) that maintains high productivity in the face of climate change.
2	Number of research programs to analyze and identify climate change mitigation strategies and technologies to address greenhouse gas emissions and other climate-altering factors and activities related to agricultural lands and urban environments.
3	Number of research programs that address the effect of climate change on water resources and aquatic life.
4	Number of producers that decrease time taken to respond food production issues resulting in less production and marketing losses.

### **Outcome # 1**

#### **1. Outcome Target**

Number of research programs to help ensure an agriculture system (and its surrounding environs) that maintains high productivity in the face of climate change.

**2. Outcome Type :** Change in Condition Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 136 - Conservation of Biological Diversity

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 2**

#### **1. Outcome Target**

Number of research programs to analyze and identify climate change mitigation strategies and technologies to address greenhouse gas emissions and other climate-altering factors and activities related to agricultural lands and urban environments.

**2. Outcome Type :** Change in Action Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 3**

#### **1. Outcome Target**

Number of research programs that address the effect of climate change on water resources and aquatic life.



**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 112 - Watershed Protection and Management
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 4**

**1. Outcome Target**

Number of producers that decrease time taken to respond food production issues resulting in less production and marketing losses.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 132 - Weather and Climate

**4. Associated Institute Type(s)**

- 1862 Extension

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

Like global temperatures, average temperatures in the United States are on the rise. According to the U.S. Climate Change Program, the past decade was the warmest in more than a century. Along

with temperature, increases in the number of heavy precipitation events and changes in snow cover have been observed.

Climate trend data paint a similar picture for Michigan and the Great Lakes region. For example, several recent studies have concluded that the average temperature in Lake Superior has increased almost 5 degrees F. since 1979 and that the lake's water level is at its lowest point in eight decades. Water levels also have receded in the other Great Lakes since the late 1990s. Although, in general, a warmer, wetter climate in Michigan has been good for most crops, the cutting edge work in this area will be looking at some of the indirect effects, including the effects of weeds, insects and plant disease. These indirect effects could be deal-breakers or, at least, very difficult to take care of or to manage.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

## **V(A). Planned Program (Summary)**

### **Program # 8**

#### **1. Name of the Planned Program**

Sustainable Energy

#### **2. Brief summary about Planned Program**

olar power It's no secret that the past several years have been very difficult for the Michigan economy. The slumping auto industry has deeply affected the state's finances, and downturns in other manufacturing sectors have pushed the situation from bad to worse. Researchers and educators from all disciplines are pondering how to reverse the state's economic decline. Part of the solution is to build a new biobased economic sector on the existing foundation of agriculture, forestry and natural resources, and industrial and manufacturing sectors. The result will be the advancement of a new, sustainable biobased sector that provides a competitive advantage in meeting the growing demand for renewable sources of materials, chemicals and other bioenergy-related products.

A summary of research activities in this planned program include: the development of biomass for use for biofuels, the development of new biofuel compounds, the design of optimum forestry and crops for bioenergy production, the development of management practices for bioenergy feedstock production systems, the production of value-added biobased industrial and chemical products, the development of innovative bioelectrocatalytic reactors that achieve mediated electron transfer to dehydrogenases, and the examination of the influence of plant viruses proposed for use in biofuel production.

Extension activities will engage agriculture more fully in development of bioproducts and bioenergy sources that include:

- Development of new bioproducts and markets for bioproducts
- Increased adoption of bioenergy technologies
- Improvement of technology at the farm scale
- Policy development and comprehension

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :**Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		20%	
202	Plant Genetic Resources	0%		27%	
205	Plant Management Systems	20%		13%	
402	Engineering Systems and Equipment	0%		15%	
511	New and Improved Non-Food Products and Processes	70%		13%	
605	Natural Resource and Environmental Economics	10%		12%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

The fundamental transformation of the nation's current extractive fossil fuel energy economy to a sustainable energy economy is a critical challenge facing the United States today. Broad, science-driven approaches can help to promote national security through increasing U.S. energy independence, enhancing environmental stewardship, reducing energy and carbon intensity, and generating continued economic growth through innovation in energy technologies and expansion of green jobs.

In Michigan, renewable energy can provide Michigan with the economic base and energy it needs to revitalize its own economy and to compete in today's global economic climate, while -- at the same time -- creating a cleaner environment and reducing dependence on expensive imported fossil fuels.

Research priorities for this planned program are: to connect Michigan industries with the research, education and entrepreneurial activity needed in the basic sciences, engineering, plant science and production agriculture to provide Michigan with a foundation for the vigorous development of a new biobased economic sector; to develop biomass for use in biofuel production; to develop improved and novel biofuel crops and compounds; to design optimum forestry and crops for bioenergy production; to develop management practices for bioenergy feedstock production systems; produce value-added biobased industrial and chemical products; and develop processes and technologies for biofuel, biomaterial and biomanufacturing production systems.

MSU Extension will provide training and technical assistance to special audiences and to the public with scientifically based information about bioenergy and production. Through these activities significant investments by private and public sectors into research and development of renewable and sustainable biofuels will shape agriculture for the future. Not only will we grow food, but energy as well.

**2. Scope of the Program**

- In-State Extension
- In-State Research

- Multistate Research
- Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

The assumptions for this planned program are:

- Preliminary technology, processes and protocols are available to help lay the foundation for Michigan's emerging bioeconomy, however, they need to become more cost effective and efficient in order to ensure industry profitability and sustainability -- including an environmentally-sound framework.
- Funding in this area will remain constant or decrease.

**2. Ultimate goal(s) of this Program**

The ultimate goals of this planned program are to:

- Help ensure the sustainability of Michigan's emerging bioeconomy developing biomass for use in biofuel production.
- Design optimum forestry and crops for bioenergy production.
- Produce value-added biobased industrial, chemical and pharmaceutical products. The research also has national and global applications as well.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	3.2	0.0	3.0	0.0
2014	3.2	0.0	3.0	0.0
2015	3.2	0.0	3.0	0.0
2016	3.2	0.0	3.5	0.0
2017	3.2	0.0	3.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research activities for this planned program include: developing linkages to connect Michigan industries with the research, education and entrepreneurial activity needed in the basic sciences, engineering, plant science and production agriculture to provide Michigan with a foundation for the vigorous development of a new biobased economic sector; developing biomass for use for biofuels; developing new biofuel compounds, designing optimum forestry and crops for bioenergy production, developing management practices for bioenergy feedstock production systems; and producing value-added biobased industrial and chemical products.

Extension activities will engage agriculture more fully in development of bioproducts and bioenergy

sources that include:

- Development of new bioproducts and markets for bioproducts
- Increased adoption of bioenergy technologies
- Improvement of technology at the farm scale
- Policy development and comprehension

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Tours to research centers)</li> </ul>	<ul style="list-style-type: none"> <li>• Public Service Announcement</li> <li>• Billboards</li> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (Magazine)</li> <li>• Other 2 (Annual Report)</li> </ul>

**3. Description of targeted audience**

Agriculture and natural resources industry representatives, commodity groups, biofuel/bioenergy producers, biotechnology company representatives, state agencies, elected state and federal officials and other policymakers, entrepreneurs and the interested public.

**V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of research programs in sustainable energy.
- Number of adults trained in sustainable bioenergy crop production.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs to identify and isolate novel genes, markers, mechanisms and identify genetic pathways that can be used in the development and production of biofuels and other biobased materials and products.
2	Number of research programs to examine and improve efficiencies in bioenergy feedstock production and processing systems.
3	Number of research programs that investigate and/or evaluate the economics of a biobased economy and/or corporate environmental management.
4	Number of participants that increased in their understanding of sustainable bioenergy crop production.



**Outcome # 1**

**1. Outcome Target**

Number of research programs to identify and isolate novel genes, markers, mechanisms and identify genetic pathways that can be used in the development and production of biofuels and other biobased materials and products.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 201 - Plant Genome, Genetics, and Genetic Mechanisms
- 202 - Plant Genetic Resources
- 402 - Engineering Systems and Equipment
- 511 - New and Improved Non-Food Products and Processes

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of research programs to examine and improve efficiencies in bioenergy feedstock production and processing systems.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 402 - Engineering Systems and Equipment
- 511 - New and Improved Non-Food Products and Processes

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 3**

**1. Outcome Target**

Number of research programs that investigate and/or evaluate the economics of a biobased economy and/or corporate environmental management.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 605 - Natural Resource and Environmental Economics

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 4**

**1. Outcome Target**

Number of participants that increased in their understanding of sustainable bioenergy crop production.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 511 - New and Improved Non-Food Products and Processes

**4. Associated Institute Type(s)**

- 1862 Extension

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

**Description**

The prospects for success in this arena depend, to a significant extent, on whether nations can work together to ensure that the necessary financial resources, technical expertise, and political will are directed to accelerating the deployment of cleaner and more efficient technologies in the world's rapidly industrializing economies.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes

are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Global conditions and attention paid by other countries to the food supply chain challenges will also affect the degree to which research progress and new technologies are embraced and implemented. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

## **V(A). Planned Program (Summary)**

### **Program # 9**

#### **1. Name of the Planned Program**

Childhood Obesity

#### **2. Brief summary about Planned Program**

During the past 20 years, there has been a dramatic increase in obesity in the United States and rates remain high. In 2010, no state had a prevalence of obesity less than 20%. Thirty-six states had a prevalence of 25% or more; 12 of these states (Alabama, Arkansas, Kentucky, Louisiana, Michigan, Mississippi, Missouri, Oklahoma, South Carolina, Tennessee, Texas, and West Virginia) had a prevalence of 30% or more. This planned program focuses on basic and applied research to ensure that nutritious foods are affordable and available and the provision of science-based guidance so that individuals, families and communities are able to make informed decisions about their health and well-being.

Research priorities are:

- Providing science-based information to individuals and families so that they can make informed decisions about their health and well-being.
- Examining and identifying environmental and cultural influences on health behaviors contributing to overweight in children.
- Providing the research necessary to develop effective community-based environmental and policy supports for physical activity and healthy eating.

Extension priorities are:

- Improve dietary quality of children, youth, adults, and seniors
- Increase physical activity of children, youth, adults, and seniors
- Increase social and emotional health of children throughout their developmental stages

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	40%		35%	
724	Healthy Lifestyle	40%		32%	
801	Individual and Family Resource Management	10%		16%	
802	Human Development and Family Well-Being	10%		17%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

1. Situation and priorities

Over the past 35 years, the percentage of U.S. mothers who hold down a job while raising kids has soared, from less than 50 percent to more than 70 percent. The childhood obesity rate -- which is now close to 17 percent -- has more than tripled during the same time frame. Overweight kids have a 70 to 80 percent chance of becoming overweight adults. More than 60 percent of Michigan residents are overweight. Physical inactivity and obesity are the leading health indicators targeted for intervention by the Centers for Disease Control. Health care costs have skyrocketed, with the effects of physical inactivity cost billions annually. More than 61 percent of youth don't participate in any organized physical activity outside school. Children involved in after-school programs are much less likely to be obese than nonparticipants. Eighth-graders who do not participate in supervised after-school activities double their risk of smoking, drinking and using drugs.

Almost two out of three Michigan residents are overweight or obese. Studies show that a lack of competitively priced fresh produce in urban grocery stores contributes to obesity, as does a lack of consistent, easy-to-understand information about nutrition or the health-related effects exacerbated by obesity and overweight.

Research priorities are:

- Providing science-based information to individuals and families so that they can make informed decisions about their health and well-being.
- Examining and identifying environmental and cultural influences on health behaviors contributing to overweight in children.
- Providing the research necessary to develop effective community-based environmental and policy supports for physical activity and healthy eating.

Extension priorities are:

- Improve dietary quality of children, youth, adults, and seniors
- Increase physical activity of children, youth, adults, and seniors
- Increase social and emotional health of children throughout their developmental stages

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

The assumptions of this planned program are:

- Addressing obesity and overweight issues through science-based research, particularly those related to children and youth, will reduce healthcare costs and improve people's quality of life.
- Exploring and developing effective nutrition assessment protocols and dietary guidelines for pediatric caregivers will optimize nutrition and reduce risk for childhood obesity.
- Infant nutrition can be greatly improved through the enhancement of workplace support and by strengthening family dynamics around infant feeding in the first year of life.
- Investigating the associations between food and agricultural systems and community health outcomes will help individuals and communities make more informed decisions and better respond to systemic changes and inequities related to the access of affordable, nutritious food.
- Funding for this program will remain constant or possibly decrease.

**2. Ultimate goal(s) of this Program**

The ultimate goals of this program are to:

- Provide science-based information to individuals and families so that they can make informed decisions about their health and well-being.
- Better identify the relationship between obesity and key diseases such as cancer and hypertension.
- Examine and identify environmental and cultural influences on health behaviors contributing to overweight in children.
- Provide the research and resources necessary to develop effective community-based environmental and policy supports for physical activity and healthy eating.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	11.4	0.0	1.5	0.0
2014	11.4	0.0	1.5	0.0
2015	11.4	0.0	1.5	0.0
2016	11.4	0.0	1.5	0.0

Year	Extension		Research	
	1862	1890	1862	1890
2017	11.4	0.0	1.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research activities for this program include:

- Dissemination of science-based information to individuals and families so that they can make informed decisions about their health and well-being, especially related to obesity and overweight.
- Identification and documentation of environmental and cultural influences on health behaviors contributing to obesity and overweight in children that can be shared with individuals, families and communities to improve health and well-being.
- Development of effective community-based environmental and policy supports for physical activity and healthy eating.

MSU Extension has a long history of collaborations and partnerships through out Michigan and the United States of America, at the national, state, county and local level. In particular, MSUE Nutrition and Physical Activity work team will continue to partner with other states such as Colorado, national associations such as SNE and ASNNA, as well as WIC - Michigan Department of Community Health, the Department of Human Services, Michigan's Food Assistance Program, Michigan Department of Education, Public and Private Schools, Head Start programs, other youth education sites such as YMCA/YWCA, boys and girls clubs, 4-H, parks and recreation site, community fairs, farmers markets, work sites, State Dietetic Association, MiSNAC, community coalitions, medical centers and physicians serving people with limited incomes, community centers, community action agencies, homeless shelters, domestic violence shelters, child abuse prevention programs, libraries, public housing sites, churches, adult rehabilitation centers, food stores, food pantries, and food banks. From these agencies and at these venues, trainings will focus on healthy eating (portions and type of food), physical exercise and social/emotional well-being.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Public Service Announcement</li> <li>• Billboards</li> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (Annual Report)</li> <li>• Other 2 (Magazine)</li> </ul>

**3. Description of targeted audience**

State and community agencies, schools and organizations that deal with healthy eating and physical activity as a pathway to wellness; pediatric caregivers; individual consumers, particularly mothers; food

marketers/retailers (especially those targeting children), producers and processors; and other researchers and institutions conducting childhood obesity research.

### **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

### **V(H). State Defined Outputs**

#### **1. Output Measure**

- Number of research programs in childhood obesity.
- The number of adults trained in controlling food portions.
- The number of youth trained in controlling food portions.
- The number of youth trained in healthy physical activities.
- Number of youth trained in various positive coping skills.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.



**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of research programs that address obesity and diet quality and dietary attitudes and behavior of children and youth.
2	Number of research programs that address school and community-based supports for physical activity and healthy eating, with a focus on children and youth.
3	Number of research programs that address the association between diet, obesity and disease.
4	Number of adults that increase their knowledge about controlling their food portions that align with the food guidelines.
5	Number of youth that increase their knowledge about controlling food portions according to the food guidelines.
6	Number of youth that increase their physical activities.
7	Number of youth that increase their positive coping skills.

**Outcome # 1**

**1. Outcome Target**

Number of research programs that address obesity and diet quality and dietary attitudes and behavior of children and youth.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

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

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of research programs that address school and community-based supports for physical activity and healthy eating, with a focus on children and youth.

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 3**

**1. Outcome Target**

Number of research programs that address the association between diet, obesity and disease.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 4**

**1. Outcome Target**

Number of adults that increase their knowledge about controlling their food portions that align with the food guidelines.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

Number of youth that increase their knowledge about controlling food portions according to the food guidelines.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 6**

**1. Outcome Target**

Number of youth that increase their physical activities.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of youth that increase their positive coping skills.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle
- 802 - Human Development and Family Well-Being

**4. Associated Institute Type(s)**

- 1862 Extension

**V(J). Planned Program (External Factors)**

**1. External Factors which may affect Outcomes**

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

## **Description**

The current economic challenges facing Michigan and much of the rest of the country could adversely affect funding for research and outreach in this area, particularly related to underserved populations. There would be a domino effect related to informed guidance and direction of public policies and regulations that require science-based research in order to set effective protocols, guidelines and policies, and information and resources provision to community-based health care providers, as well as families and individuals.

Further, the current state of Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Reduction in funding resources could also affect/delay progress and outcomes.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Research - As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.

## **V(A). Planned Program (Summary)**

### **Program # 10**

#### **1. Name of the Planned Program**

Food Safety

#### **2. Brief summary about Planned Program**

Although "farm to fork" is a relatively easy concept to sink one's teeth into, the task of consistently delivering safe food to the consumer is becoming increasingly complex. Globalization of the food supply chain, new disease agents, outdated laws, changes in the U.S. population (a growing proportion of people 60-plus years old who are more susceptible to certain types of infections) and new dietary patterns present significant challenges to our food safety system.

In an effort to help improve food processing technologies and minimize the risk of food-borne illness, AgBioResearch scientists are exploring effective ways to make and keep our food supply safe.

Research in this planned program seeks to to: ensure the microbial safety of foods; develop effective biosensors, RFID tags and other technologies for track, trace and security issues; develop sustainable packaging systems to enhance food quality and shelf life; enhance the economic and nutritional value of food products through post-harvest and food processing technologies; identify and control/eliminate the causes of microbial resistance to contaminants; and improve the diagnosis and prevention of known and emerging infectious diseases of livestock and poultry.

Extension activities in this area include: train producers about food safety and issues and policies/legislation related to food safety; train food handlers about storage and cooking temperatures of food; and teach youth about importance of hygiene when handling food.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**V(B). Program Knowledge Area(s)**

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
402	Engineering Systems and Equipment	0%		15%	
404	Instrumentation and Control Systems	0%		6%	
501	New and Improved Food Processing Technologies	40%		20%	
502	New and Improved Food Products	10%		25%	
503	Quality Maintenance in Storing and Marketing Food Products	10%		11%	
701	Nutrient Composition of Food	0%		7%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	10%		8%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	30%		8%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Each year, about 76 million people in the United States get sick from contaminated food. According to the U.S. Food and Drug Administration's Bad Bug Book, more than 50 bacteria, viruses, parasites and toxins are considered food-borne pathogens.

Food safety issues have become front page news. The names of bacteria such as E. coli O157:H7 and Salmonella are becoming household words as product recalls are more and more a part of our daily news diet. According to food safety experts, contaminated food outbreaks in the United States have more than tripled since the early 1990s, from 100 per year to more than 350 annually, and an estimated one in four Americans suffers from food-borne illness each year.

In an effort to help improve food processing technologies and minimize the risk of food-borne illness, scientists are working with producers, food suppliers, food processors, Extension educators and others to help improve food processing technologies and minimize the risk of food-borne illnesses, both locally and abroad.

Research priorities in this planned program include: reducing the incidence of food-borne illness; providing a safer food supply by addressing and eliminating causes of microbial resistance to contaminants and developing food processing technologies to improve safety; designing biosensors that can rapidly and accurately detect a broad spectrum of harmful organisms in food and water; and developing packaging systems that enhance food safety, quality and shelf life.

Extension priorities in this area include: producers delivering high quality food; food handlers preparing and storing food safely; and youth washing their hands when appropriate to reduce health and safety issues.

## 2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

The assumptions for this planned program are:

- Genetic improvements and the control and management of food animal diseases will help ensure a safe, nutritious food supply.
  - Developing a deeper understanding of the genetic and metabolic processes in plants will allow the creation of higher-yielding, higher quality plants with improved resistance to pests, diseases and environmental stress.
    - Improving food processing technologies is a significant piece of ensuring a safe and secure food supply.
    - Domestic and international trade policies and practices will ensure a safe and secure food supply for all.
    - Funding may remain constant or decrease.

**2. Ultimate goal(s) of this Program**

The ultimate goals for this planned program are to:

- Ensure the microbial safety of foods.
- Develop effective biosensors, RFID tags and other technologies for track, trace and security issues.
- Develop sustainable packaging systems to enhance food quality and shelf life.
- Enhance the economic and nutritional value of food products through post-harvest and food processing technologies.
  - Identify and control/eliminate the causes of microbial resistance to contaminants; and improve the diagnosis and prevention of known and emerging infectious diseases of livestock and poultry.

**V(E). Planned Program (Inputs)**

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2013	6.9	0.0	5.5	0.0



Year	Extension		Research	
	1862	1890	1862	1890
2014	6.9	0.0	5.5	0.0
2015	6.9	0.0	5.5	0.0
2016	6.9	0.0	5.5	0.0
2017	6.9	0.0	5.5	0.0

**V(F). Planned Program (Activity)**

**1. Activity for the Program**

Research activities in this planned program seek to to: ensure the microbial safety of foods; develop effective biosensors, RFID tags and other technologies for track, trace and security issues; develop sustainable packaging systems to enhance food quality and shelf life; enhance the economic and nutritional value of food products through post-harvest and food processing technologies; identify and control/eliminate the causes of microbial resistance to contaminants; and improve the diagnosis and prevention of known and emerging infectious diseases of livestock and poultry.

MSU Extension will focus it's activities in this area on helping producers improve the quality of food delivered to markets and address food safety issues, education will be provided to food handlers in restaurants on food safety issues, training the public on cooking temperatures and storage, and training to youth regarding hygiene.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>● Public Service Announcement</li> <li>● Billboards</li> <li>● Newsletters</li> <li>● TV Media Programs</li> <li>● Web sites other than eXtension</li> <li>● Other 1 (Magazines/Special Publications)</li> <li>● Other 2 (Annual Report)</li> </ul>

**3. Description of targeted audience**

Food safety professionals, consumers, public health and other state agency representatives, commodity groups, agricultural producers (crop and livestock), food chain supply industry representatives, retail food stores, restaurants, farmers markets.

## V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## V(H). State Defined Outputs

### 1. Output Measure

- Number of research programs in food safety.
- Number of producers that are trained on food safety issues.
- Number of producers trained on federal and state legislation regarding food safety.
- Number of front-line food handler staff trained on how to that reduce cross contamination.
- Number of front-line food handler staff trained in proper cooking and storing temperatures.
- Number of youth trained on hand washing practices.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	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, etc.
2	Number of research programs to improve the microbial safety and quality of food.
3	Number of research programs to develop packaging systems that enhance food safety, quality and shelf life.
4	Number of research programs to reduce economic losses and food safety risks associated with livestock and poultry diseases.
5	Number of programs to improve harvest, post-harvest and processing technologies related to food safety and product quality.
6	Number of research programs to examine the function and effect of dietary nutrients on immune response and other metabolic functions.
7	Number of producers that become more knowledgeable about food safety issues by participating in GAP audits and other food safety programs.
8	Number of producers that gain knowledge about federal and state legislation regarding food safety.
9	Number of front-line food handler staff and fellow workers that improve in cross contamination.
10	Number of youth that improve on hand washing practices.

**Outcome # 1**

**1. Outcome Target**

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, etc.

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 402 - Engineering Systems and Equipment
- 404 - Instrumentation and Control Systems
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of research programs to improve the microbial safety and quality of food.

**2. Outcome Type :** Change in Condition Outcome Measure

**3. Associated Knowledge Area(s)**

- 402 - Engineering Systems and Equipment
- 501 - New and Improved Food Processing Technologies
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 3**

**1. Outcome Target**

Number of research programs to develop packaging systems that enhance food safety, quality and shelf life.

**2. Outcome Type :** Change in Condition Outcome Measure

### **3. Associated Knowledge Area(s)**

- 402 - Engineering Systems and Equipment
- 404 - Instrumentation and Control Systems
- 501 - New and Improved Food Processing Technologies
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources

### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 4**

#### **1. Outcome Target**

Number of research programs to reduce economic losses and food safety risks associated with livestock and poultry diseases.

#### **2. Outcome Type** : Change in Knowledge Outcome Measure

### **3. Associated Knowledge Area(s)**

- 502 - New and Improved Food Products
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 5**

#### **1. Outcome Target**

Number of programs to improve harvest, post-harvest and processing technologies related to food safety and product quality.

#### **2. Outcome Type** : Change in Condition Outcome Measure

### **3. Associated Knowledge Area(s)**

- 402 - Engineering Systems and Equipment
- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products

- 701 - Nutrient Composition of Food

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 6**

**1. Outcome Target**

Number of research programs to examine the function and effect of dietary nutrients on immune response and other metabolic functions.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 701 - Nutrient Composition of Food

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 7**

**1. Outcome Target**

Number of producers that become more knowledgeable about food safety issues by participating in GAP audits and other food safety programs.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 711 - Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of producers that gain knowledge about federal and state legislation regarding food safety.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 503 - Quality Maintenance in Storing and Marketing Food Products

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 9**

**1. Outcome Target**

Number of front-line food handler staff and fellow workers that improve in cross contamination.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 10**

**1. Outcome Target**

Number of youth that improve on hand washing practices.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

#### **4. Associated Institute Type(s)**

- 1862 Extension

### **V(J). Planned Program (External Factors)**

#### **1. External Factors which may affect Outcomes**

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

#### **Description**

Global conditions and attention paid by other countries to the food supply chain challenges will affect the degree to which research progress and new technologies are embraced and implemented.

Further, Michigan's overall economy has resulted in significant cuts to higher education -- including research and extension activities -- and additional cuts and appropriation changes are expected to continue over the next several years. The current economic environment is also intensifying competing public priorities and programmatic challenges. Public reactions to and perceptions of food safety and quality will influence the research and its outcomes. Reduction in funding resources could also affect/delay progress and outcomes.

### **V(K). Planned Program - Planned Evaluation Studies**

#### **Description of Planned Evaluation Studies**

Research - As Hatch dollars constitute base funding for faculty salaries, there is a built-in evaluation mechanism through annual reviews of overall performance, research productivity and the leveraging of additional research dollars. In addition, many of the research projects have an evaluative element that is required by state and federal-level funding sources that provides documentation related to project assumptions, goals and outcomes. This information is used to determine the overall success of research initiatives; their contribution to providing practical, real-world solutions and resources to address challenges and problems; and whether continuation funding and/or new dollars are appropriate and necessary as funds are available.

Extension -- Evaluations of Extension activities are done regularly using a variety of approaches. To determine whether knowledge/behavior has changed, we will assess participants. To determine whether the environment/human health has improved, we will use agreed-upon parameters to evaluate any benefits/risks. Extension also uses pre- and post-program surveys to determine the change in competency level of participants in educational programs.



