Michigan Agricultural Experiment Station

FY2005-FY2006 Plan of Work Update

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Introduction

The mission of the Michigan Agricultural Experiment Station (MAES) is to generate knowledge through strategic research to enhance agriculture, natural resources, and families and communities in Michigan. This mission, productively executed by more than 300 researchers in five colleges at Michigan State University, has enabled the MAES to be one of the most successful experiment stations in the country. This accomplishment is fueled by close ties with MSU Extension, state agencies, and commodity groups and other stakeholders, as well as outstanding legislative support.

To fulfill its mission, the MAES strives to maintain a balance between basic and applied research and relies heavily on the input of its constituents in identifying research priorities. MAES research programs are constantly evaluated for relevance and progress.

This FY2005-FY2006 Plan of Work Update outlines the changes made to the FY2000-FY2004 Plan of Work.

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

Statement of Issue:
Michigan agriculture continues to be the state's second largest industry, accounting for more than $37 billion in annual economic activity and more than 500,000 jobs. As discussed in the FY2000-FY2004 Plan of Work, the MAES had three main areas of focus under this goal: value-added products, plant agriculture and animal production systems. Earlier issues have been successfully addressed, so the MAES has updated and refined its research issues, adding the two areas outlined below.

Estimated resources

	FY 2005	FY 2006
Hatch Funds		
Hatch Regular	2,295,264	2,249,359
Multi-State Funds	543,447	543,447
Other CSREES Funds*	7,527,335	7,527,335
Other Federal Funds*	12,161,291	12,161,291
Total Federal Funds (est.)	22,527,337	22,481,432
State Match for Hatch Funds	2,838,711	2,792,806
Remaining State Appropriations	15,995,596	15,099,786
Self Generated Funds*	2,133,931	2,133,931
Industry Generated Funds*	4,362,325	4,362,325
Other Non-Federal Funds*	1,767,529	1,767,529
Total State Funds (est.)	27,098,091	26,156,376
Total Estimated Funds	49,625,428	48,637,808
Scientist Years	71.7	71.7

Enhanced Profitability for Michigan Agricultural Producers

Despite agriculture's continuation as Michigan's second largest industry, many rural areas in Michigan are economically depressed, and more than 1.2 million acres of farmland were converted to non-agricultural use between 1982 and 1997. Much of this conversion stems from a lack of profitability in farming businesses, many of which rely on commodity markets for outlets. Revitalizing the agriculture, food and natural resource sectors will require these businesses to convert from a commodity orientation to a differentiated product orientation, using the best technology, best product development and best supply chain practices. The research initiatives focus on continuing support for profitability in commodity production and the transformation to value-added differentiated production and marketing.

Short-term Research Issues

- Continue support for profitable commodity production; production and marketing economies of scale and revenue maintenance; management of economic, biosecurity and environmental risks; and cost, yield, pest, disease and nutrition management.

- Identify niche and other high-value market opportunities for Michigan producers.
- Research ways to convert consumer attribute demands into economic, social and scientific research priorities.
- Develop a social science-based understanding of the role of entrepreneurship in rural development.

Intermediate-term Research Issues

- Conduct research on the transformation from commodity production and marketing to value-added, differentiated production and marketing; niche marketing; supply chain coordination; consumer attribute demands; and market opportunities in natural resources, agritourism and food.
- Conduct interdisciplinary research on bioenergy, biofuels and biomaterials to determine potential for new markets and products.
- Conduct research on the use of technology and/or management practices to enhance economic, environmental and community sustainability.
- Conduct research on the role of food safety, traceability and security in profitable agriculture.
- Conduct research on the role of trade, especially between Michigan and Canada, in developing profitable markets for Michigan agrifood products. What are the non-tariff barriers to trade between Michigan and Canada that retard the development of export markets?

Long-term Research Issues

- Transform consumer preferences for product attributes into actual products that address those preferences.
- Conduct research on consumer preferences across national boundaries.
- Conduct research on changing U.S. demographics and how these changes will alter the agrifood sector, including functional foods, nutraceuticals, ethnic foods and convenience foods.

Enhancing Profitability by Developing Enhanced Plants and Animals

Genetic advances will enhance disease resistance, improve nutrient uptake, increase feed conversion rates and result in more productive plants and animals. Opportunities to enhance nutritional value, produce pharmaceutical products and generate industrial precursors in plants and animals may result in high-value production contracts with industrial partners for agricultural producers. These changes may also result in vertical integration through farmer-owned business structures. All of these potential opportunities to enhance profitability for Michigan agricultural producers rely on research advancing the understanding of the genetic makeup of living organisms, improvements in transformation technologies and traditional breeding approaches.

Short-term Research Issues

- Development of marker-assisted breeding technologies.
- Development of model plant and animal genomic maps.

Intermediate-term Research Issues

- Enhance the knowledge of gene function and transcription.
- Improve transformation technologies for recalcitrant plants.
- Enhance animal cloning efficiency.
- Advance cataloging of genetic diversity among domesticated and wild species for targeted use in plant and animal breeding programs.

Long-term Research Issues

- Advance the understanding of transgenic manipulation of plant and animal organisms.
- Advance the understanding of stem cell development in animal embryos for the production of human therapeutic cells and organs.

Goal 2: A Safe and Secure Food and Fiber System

Statement of Issue:
A safe and secure supply of raw commodities and processed products from domestic food and fiber industries is crucial for the economic well-being of the United States, as well as a high quality of life for Americans. In the FY2000-FY2004 Plan of Work, the MAES had two main areas of emphasis in goal 2. In the wake of September 11 and growing concern for the security of the nation's food and fiber system by a number of stakeholders, the MAES has expanded its research focus areas to include the five areas outlined below.

Estimated resources

	FY 2005	FY 2006
Hatch Funds		
Hatch Regular	254,261	261,577
Multi-State Funds	67,753	67,753
Other CSREES Funds*	451,037	451,037
Other Federal Funds*	4,174,843	4,174,843
Total Federal Funds (est.)	4,947,895	4,955,210
State Match for Hatch Funds	322,014	329,330
Remaining State Appropriations	2,375,312	2,233,130
Self Generated Funds*	75,526	75,526
Industry Generated Funds*	353,682	353,682
Other Non-Federal Funds*	574,638	574,638
Total State Funds (est.)	3,701,172	3,566,306
Total Estimated Funds	8,649,066	8,521,516
Scientist Years	9.7	9.7

Protection from Invasive and Exotic Species
Inadvertent and intentional introductions of exotic plant pests threaten Michigan's natural and landscape ecosystems. The presence of zebra mussels in the Great Lakes has been linked to water quality deterioration in several community water systems. New research indicates a potential link between zebra mussels and toxic blue-green algae blooms. Ash trees are threatened by the emerald ash borer, which was inadvertently introduced to Michigan. Best case scenarios estimate that the majority of the state's 700 million ash tress will be lost and more than $200 million will be spent to control this insect. Soybean farmers worry that soybean rust will be introduced into North America from South America, where the disease has reduced yields by 40 percent.

Short-term Research Issues
- Develop molecular diagnostic technology for rapid detection of known high-risk invasive species.
- Develop a national database of invasive organism detections for rapid information dissemination.

Intermediate-term Research Issues

- Establish a monitoring network of plants native to the United States growing in other countries under different environments to document how species adapt to non-native environments.
- Assist public policy-makers to develop science-based legislation and regulations to prevent the introduction of unwanted invasive exotic species.

Long-term Research Issues

- Improve understanding of host specificity among pathogens and correlate life history traits to potential invasiveness.
- Improve understanding of life cycles of high-risk plants, animals, arthropods and pathogens that are candidates for intentional introduction by bioterrorists.

Protecting the Health of Food and Fiber Plant Commodities

Plant agriculture in Michigan is very diverse, and this diversity means more complexity in the types and numbers of disease and insect problems. Even with the judicious and proper use of pesticides that result in healthier crops with minimal residues, public concern about pesticide safety continues. Protecting Michigan's plant-based industries requires diagnostic tools and expertise for rapid detection of exotic pests and pathogens. Managing endemic and invasive pathogens and pests requires the use of practices that are both environmentally and economically sound.

Short-term Research Issues

- Develop rapid diagnostic techniques for the early detection of pathogens and pests.
- Develop a centralized interactive disease and pest management information center.

Intermediate-term Research Issues

- Develop biotechnological approaches to disease and pest management.

Long-term Research Issues

- Improve understanding of plant-pest-pathogen molecular and cellular interactions.
- Carry out ecological studies on the dynamics of pathogen and pest populations.
- Genetically characterize high-risk pests and pathogens for the development of diagnostic and control technologies.

Protecting the Health of Animal Production Systems and Communities

The majority of new infectious diseases in humans during the past decade are zoonotic (diseases that transfer from animals to humans). The ability to understand the microbial evolution and transmission of zoonotic disease organisms is key to limiting the impact of emerging infectious diseases on U.S. health and the economy. Research advances into the ecology of infectious diseases, genetic evolution of pathogens, virulence mechanisms, host specificity of pathogens and livestock biosecurity mechanisms will be required to maintain acceptable levels of safety.

Short-term Research Issues

- Development of best management practices for livestock biosecurity.
- Development of a centralized foreign animal and zoonotic disease information resource center.
- Development of improved methods of carcass/meat disposal.
- Development of improved diagnostic technologies.

Intermediate-term Research Issues

- Development of risk assessment and disease models for naturally occurring and terrorist-introduced infectious disease pathogens.
- Development of new technologies to decontaminate agricultural and food processing facilities.
- Development of vaccines and immunomodulators for specific or non-specific emergency immune intervention measures.

Long-term Research Issues

- Improved understanding of pathogenesis of foreign animal and high-consequence zoonotic diseases.
- Improved understanding of the genetic and molecular evolution of emerging zoonotic agents and host-pathogen interactions.
- Improved understanding of the epidemiology of zoonotic diseases.

Providing Adequate Quantities of Safe Water and Protecting Water Supplies

Water is a basic requirement for life and civilization. History is full of examples of how quickly societies break down without adequate supplies of safe water. It is clear that the world needs a better understanding of the natural and anthropogenic processes that affect water quality and the impacts of water quality on human health. Multidisciplinary research focusing on linking cellular and molecular processes to the classic risk assessment paradigm in the health sciences is needed.

Short-term Research Issues

- Creation of inventories of surface and groundwater.
- Creation of inventories of agricultural, industrial and community water consumption demands.
- Refinement of hydrologic models for impact analyses to fit the unique conditions of the Great Lakes Basin.

Intermediate-term Research Issues

- Development of monitoring technologies.
- Development of predictive models of waterborne pathogenesis.
- Improved understanding of agricultural and natural resource industry non-point source contributions to local watersheds and drainage basins.

Long-term Research Issues

- Improved understanding of impacts of aquatic biological organisms and geochemical toxins on public health.

- Improved understanding of the interactions among geologic, physical, chemical and biological processes affecting water quality and flow.

Protecting the Safety of Processed and Raw Food Products

Public confidence in the safety of raw and processed food products has been shaken by recent *E. coli* O157:H7 outbreaks and the discovery of bovine spongiform encephalopathy (BSE) or "mad cow disease" in the United States. Differing pesticide residue and genetically modified organism regulations between the United States and other countries concern many consumers. Assuring the safety of the food supply is a challenge to public health officials and customs agents, as well as agricultural producers and processors.

Short-term Research Issues

- Development of on-farm best management practices to minimize microbial and pesticide residue contamination of meat, vegetables and fruit.

Intermediate-term Research Issues

- Development of on-farm best management practices to eliminate antibiotic resistance in pathogenic organisms.
- Development of predictive models to forecast risks from endocrine disruption in humans, livestock and wildlife.
- Development of bioterrorism response models to food threats.

Long-term Research Issues

- Improved understanding of the evolution of pathogenesis in food-borne microbes.
- Improved understanding of the economic and cultural aspects of developing sustainable community food systems.
- Improved understanding of vegetable and fruit pest management to minimize pesticide residue associated with Michigan agricultural products.
- Improved understanding of the risk factors associated with the introduction of genetically modified organisms into natural and cultivated ecosystems.

Goal 3: A Healthy, Well Nourished Population

Statement of issue:
To achieve a healthy and well-nourished population, it is important to develop an integrated research approach that ranges from behavioral modification of dietary patterns to fundamental elucidation of mechanisms associated with chronic diseases and other health anomalies. In the FY2000-FY2004 Plan of Work, the MAES had one area of emphasis under goal 3: food and nutrition. As research projects have been completed and new scientists hired, the MAES has expanded its areas of emphasis under goal 3 to include the three topics outlined below.

Estimated resources

	FY 2005	FY 2006
Hatch Funds		
Hatch Regular	126,321	129,956
Multi-State Funds	44,156	44,156
Other CSREES Funds*	139,864	139,864
Other Federal Funds*	1,499,465	1,499,465
Total Federal Funds (est.)	1,809,806	1,813,441
State Match for Hatch Funds	170,477	174,112
Remaining State Appropriations	1,051,203	986,485
Self Generated Funds*	5,340	5,340
Industry Generated Funds*	91,887	91,887
Other Non-Federal Funds*	102,807	102,807
Total State Funds (est.)	1,421,715	1,360,631
Total Estimated Funds	3,231,521	3,174,072
Scientist Years	4.7	4.7

Community Nutrition
Food and diet affect health – approximately 50 percent of rising healthcare costs can be attributed to lifestyle choices. Clearly what people choose to eat affects healthcare costs, demand for services and viability of regional agriculture.

Short-term Research Issues
- Recruitment of new community and clinical nutrition researchers to strengthen MAES expertise in these areas.

Intermediate-term Research Issues
- Collaborations with community groups to evaluate the nutritional status and food behaviors of adolescents, young adults and limited-income people.
- Creation of linkages between various stakeholder groups in local communities to achieve improved health and visible outcomes.

Long-term Research Issues

- Expanding the MSU Food and Nutrition Database Research Center to include more data; using that information to perform original research, collaborate with scientists at other institutions, and assist private industry and government organizations.
- Using integrated health communications to promote the health and well-being of children and youth.
- Providing research results that affect Michigan's food and health issues to policy-makers.
- Using nutrition and social science research to identify, prevent and ameliorate dietary risk and manifestations of chronic diseases (obesity, diabetes, hypertension and cancer).

Nutritional Immunology and Health

The size of the human body's immune system and its high cell turnover rate cause it to use a high proportion of the body's nutrients. Because of this, the immune system is immediately affected by any change in nutritional status. Poor diet is known to compromise host defense, increasing the number of infections and their duration, and resulting in poor wound healing and suboptimal response to vaccinations. Many chronic diseases -- such as AIDS, cancer, renal disease and gastrointestinal disorders -- reduce the body's assimilation of nutrients and compromise the immune system. The high-fat, caloric-dense diets of many in the United States have led to distressing increases in obesity, diabetes and cardiovascular diseases. These diseases deregulate the immune system and cause undesirable inflammatory reactions. Food pathogens and allergens can cause intense, life-threatening immune responses.

Intermediate-term Research Issues

- Create a nutritional immunology program at Michigan State University (MSU), linking scientists from the departments of Food Science and Human Nutrition, Biochemistry, Medicine and Animal Sciences.

Long-term Research Issues

- Link agriculture to human health objectives through joint research programs between MAES scientists and faculty members in medical colleges at MSU.
- Develop a world-class Center for Nutritional Immunology that attracts faculty members and students from around the world. The center would focus on research and training.
- Increase the public's awareness of the potential value of functional foods, especially probiotics, in preventing or reducing such diseases as colitis, irritable bowel syndrome, Crohn's disease and colon cancer.
- Determine the efficacy of a variety of plant foods and phytochemicals in reducing colon cancer in animal models of colon carcinogenesis, and reduce and manage obesity-induced cardiovascular diseases.
- Investigate the therapeutic and prophylactic use of fish oil, eicosapentaenoic acid and docosahexaenoic acid on allergic immune response to tree nuts.

Nutritional Genomics

In theory, plant foods can provide almost all the vitamins and minerals essential for human nutrition. In practice, however, most plant-based foods, especially those derived from world staple food crops, do not contain sufficient levels of vitamins and minerals to meet even minimum daily dietary requirements. As a result, more than 3 billion people in the world suffer from micronutrient malnutrition, with the heaviest concentrations in Africa and Southeast Asia. The increases in susceptibility to disease, impaired mental and physical development, and inability to work effectively have major ramifications that permeate the African social and human infrastructure. This has led to a major commitment to research to understand and manipulate plant metabolism to improve crop nutritional quality through genetic and molecular approaches, and to use these improved crops in environmentally, economically and socially sustainable ways.

Short-term Research Issues

- Recruit MAES faculty members with expertise in plant molecular engineering.
- Augment the universitywide research infrastructure in plant genomics.

Long-term Research Issues

- Improve the health and well-being of the world's poor and malnourished by using modern molecular, genetic and genomic technologies to engineer staple food crops that are rich in micronutrients.
- Demonstrate the soundness of the nutritional enhancement concept in model plant systems by encouraging genes involved in the biosynthesis of essential vitamins and accumulation of essential minerals.
- Analyze the consequences of nutritional enhancements on nutrients and bioavailability.
- Assist plant breeders in identifying molecular markers to nutritionally important genes for incorporation into molecular breeding programs.

Goal 4: Greater Harmony Between Agriculture and the Environment

Statement of Issue

Few areas are more intimately involved with environmental science and policy than agriculture and natural resources. Policies for sustainable use of the nation's forests, rangelands, wetlands and agricultural lands need to be grounded in sound science. In the FY2000-2004 Plan of Work, the MAES had two areas of emphasis under goal 4: land use and cover, and environmental stewardship. As a result of successful research partnerships and an influx of new faculty members, the MAES has expanded and refined its areas of emphasis under goal 4. Working with the newly formed MSU Environmental Science and Policy Program (ESPP), the MAES plans a program of research that will tackle critical environmental issues with state-of-the-art science analyses in six areas:

- Biogeochemistry, including nutrient management.
- Impact assessment of climate change and variability.
- Invasive species.
- Environmental valuation, including the valuation of ecosystem services not captured by market prices.
- Water and aquatic systems.
- Land use and land use policy.

Because land use and land use policy now make up a major area of emphasis for the entire university, that issue and its short-, intermediate- and long-term research issues will be discussed in a second section under goal 4.

Estimated resources

	FY 2005	FY 2006
Hatch Funds		
Hatch Regular	966,673	994,488
Multi-State Funds	208,839	208,839
Other CSREES Funds*	3,934,420	3,934,420
Other Federal Funds*	6,829,702	6,829,702
Total Federal Funds (est.)	11,939,635	11,967,449
State Match for Hatch Funds	1,175,512	1,203,327
Remaining State Appropriations	6,800,307	6,373,702
Self Generated Funds*	612,751	612,751
Industry Generated Funds*	1,777,463	1,777,463
Other Non-Federal Funds*	2,111,013	2,111,013
Total State Funds (est.)	12,477,046	12,078,255
Total Estimated Funds	24,416,680	24,045,703
Scientist Years	40.1	40.1

Short-term Research Issues

- Assess the importance of agricultural management practices in dealing with changes in global nutrient cycles, especially carbon and nitrogen.

- Develop methods and tools to help characterize regional climate variability and incorporate that variability into models of agricultural and economic change.
- Develop of the scientific integration needed for a more systematic approach to invasive species.
- Improve understanding of the subtle ecosystem effects of invasive species, especially as they induce changes that have implications for human health and the provision of ecosystem services.
- Link concerns about biotic and abiotic threats to human and ecosystem health.
- Improve understanding of the link between water quality and quantity.

Intermediate-term Research Issues

- Improve understanding of the value of alternative agricultural management regimens, including regimens for animal agriculture and better management of biogeochemical cycles (carbon, methane and nitrogen) that have local impacts.
- Investigate closely targeted sectors to better understand the dynamics that may be influenced by climate change and variability.
- Improve understanding of the effects that climate change and variability and land use change have on invasive species, as well as their ability to facilitate or retard invasives' impact on ecosystem structure and function.
- Improve understanding of the influence of alternative patterns of land use and land development on the provision of ecosystem services.
- Develop tools for policy-makers that incorporate risk and uncertainty into environmental valuation models.
- Improve understanding of the interconnections between exogenous stressors such as climate change, land use change and invasive species and the ability of watersheds to provide the ecosystem services necessary for agriculture, the use of natural resources and human well-being; and the influence these changes have on waterborne risks to human and ecosystem health.

Long-term Research Issues

- Develop new monitoring and analysis systems, using genomics/proteomics and nanotechnology.

Land Use and Land Use Policy

Land use is one of the most important issues facing Michigan. Personal and community health, urban sprawl, rural and urban prosperity, property tax burdens, traffic congestion, farmland retention, agricultural viability, performance of the tourism industry and state economic stability are strongly shaped by land use dynamics. Michigan's future sustainability and quality of life of life are largely dependent on land use decisions being made today. The land use problems that Michigan is facing present major challenges to state and local policy-makers but also are opportunities to shape the state's future.

The nature of land use issues is particularly complex in Michigan. More than 80 percent of Michigan residents live in the metropolitan regions of the state, where serious land use issues are surfacing. The health and economic performance of the state are directly tied to the social, fiscal and physical conditions of such areas. Michigan's central cities

are losing residents and businesses to suburban areas and are deteriorating from lack of infrastructure maintenance. Detroit, the state's largest city, is the most affected city in the nation in job and population loss, urban decay and abandoned infrastructure. These dynamics have also compromised urban fringe areas, where low-density development is threatening natural habitat and valuable farmland. Between 1997 and 2002, farmland acreage in Michigan decreased by nearly 360,000 acres, or 3.5 percent. In addition, low-density development patterns are straining the budgets of local governments because of increased costs for public services (sewer, police and fire protection) in non-metropolitan areas.

Short-term Research Issues

- Determine the characteristics common to vibrant viable cities at various scales.
- Identify the characteristics of people moving into urban areas and compare and contrast them with those of established residents.
- Develop a Michigan smart growth "how to" guide.
- Determine the characteristics of the next generation's housing preferences.
- Create an Urban Environmental Collaboratory to research methods to improve urban redevelopment.
- Conduct a feasibility analysis for venture capital funds for new agriculture.
- Conduct a series of studies that propose alternative funding opportunities for farmland and open space preservation (revenue stability, revenue capacity, equity insurance, equity mortgages and political feasibility).
- Conduct a study of critical mass and agglomeration economics in agriculture (determine the critical mass of resources and support infrastructure for various forms of agriculture to survive).
- Establish ecosystem threshold levels for sustainability in each land-based industry (LBI). What quantities or specific critical factors do we need to protect to preserve ecosystem function while allowing for optimal development in each LBI?
- Enhance the Michigan Natural Features Inventory and prioritize restoration and preservation efforts.
- Propose methods for improving comprehensive land use planning.
- Coordinate updating of the Michigan Resource Information System.
- Create a public Web site for land use that acts as a data clearinghouse and has decision support tools.
- Assess abandoned housing in neighborhoods.
- Study the correlation between urban design and car/pedestrian accidents.
- Hold a yearly land use summit to draw together the leaders in land use throughout the state.
- Analyze the impacts of the 1996-97 Land Division Act reforms.
- Propose recommendations for mobile and modular home standards to which local planners can refer.
- Organize a consortium of writers engaged in translational research writing to support communication and outreach efforts.
- Develop a Hannah professor land use series in statewide newspapers.
- Create an outreach incentive package for faculty members.

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- Conduct cost/benefit analysis of compact development and sprawl.
- Conduct fiscal impact analysis for every municipality in the state.
- Examine the relationship between population dynamics, land use and fiscal impacts.
- Develop the Land Policy Program Web site.
- Establish an annual Washington congressional seminar on land use.
- Initiate an on-campus distinguished speaker series on land use.

Intermediate-term Research Issues

- Perform a fiscal impact study of alternative housing densities.
- Conduct primary research on the costs and benefits of smart growth design tenets.
- Review and provide policy recommendations on tax policy and tax base sharing.
- Develop guidelines on how to spend state and federal funding to encourage compact growth.
- Develop a guide for regional infrastructure and economic development plans.
- Develop context–sensitive design guidelines for transportation corridors.
- Create an urban experiment station.
- Develop guidelines for integrating natural resources and environmental considerations into planning.
- Create a green plan "how to" primer.
- Conduct an MSU-Lansing economic development project.
- Develop alternative design guidelines for storm water management.
- Analyze the economics of urban revitalization (establish linkages between urban revitalization and the health and vitality of non-urban areas).
- Assess the economics of urban decentralization (implications for urban and suburban areas, such as the duplication of infrastructure).
- Propose policy recommendations for improving access to titles of abandoned homes.
- Create an urban core mayors' training program.
- Analyze the relationship and opportunities between brownfield redevelopment and the establishment of greenways.
- Conduct a business retention survey.
- Create a data clearinghouse on growth and decline trends and their underlying causes.
- Create a "how to" guide on land banking in Michigan.
- Determine which barriers in the public sector can be removed to foster the private sector adoption of smart growth.
- Assemble a semiannual information and education forum for developers and realtors.
- Evaluate economic development strategies (TIFs, redevelopment fast tracts, etc.) and their land use implications.
- Perform regional studies that improve information on the numbers and types of brownfields and abandoned houses.
- Conduct a study on typical costs, benefits and timelines for redevelopment in various categories of brownfields.

- Perform a cost/benefit analysis of the farmland preservation system in Michigan.
- Examine development strategies for "new use" agriculture: ethnic vegetables, value-added products, nutraceuticals, etc.
- Conceptualize catalytic ranking systems for the state's farmland preservation system.
- Define determinants of viability of agriculture in Michigan: impacts of market technology and policy-induced factors.
- Develop farmland/open space preservation priorities, including biodiversity values.
- Identify alternative income opportunities in Michigan agriculture.
- Analyze the effects of zoning on sprawl and land consumption (up-zoning and down-zoning).
- Examine the effectiveness of PDR, TDR, CREP and other property ownership programs.
- Evaluate marketing and distribution of agricultural products in Michigan.
- Understand farmland loss in Michigan (critical mass, impermanence syndrome and intergenerational transfer).
- Define Michigan's agricultural crisis: where are we and where are we going?
- Analyze the impact of deer and other wildlife on agricultural profitability and viability.
- Conduct an institutional and legal review of the Right to Farm Act in Michigan.
- Assess the viability of open space and habitat in Michigan.
- Define the nature and characteristics of urban fringe agriculture in Michigan.
- Provide a policy recommendation study on establishing agricultural preservation areas (APA).
- Determine how to remove the barriers to recycling in residential, commercial and industrial contexts.
- Conduct status and condition studies designed to articulate future opportunities and direction for each LBI.
- Perform research and outreach that provides guidance on watershed best management practices.
- Examine innovative technologies and management techniques for nutrient management.
- Synthesize findings of past studies on best management effectiveness.
- Develop umbrella guidelines in conjunction with other Great Lake states and Canada that more directly aim to manage the entire ecosystem and its subsystems.
- Devise a comprehensive policy and implementation plan for addressing abandoned wells.
- Develop a comprehensive method and implementation plan for inventorying and monitoring impervious surfaces.
- Conduct a policy study on the farm bill and its impacts on land use and natural resources.
- Provide guidance and technical assistance on implementing Phase II storm water management plans that specifically address combined sewer overflows and NPDES permitting.

- Foster the creation of an Association of Watershed Groups.
- Provide guidance for a coordinated statewide effort to address wellhead protection, and the protection of potable water supplies.
- Provide guidance and technical assistance on nutrient management plans for farm operations, including confined animal feeding operations.
- Explore expansion of agricultural environmental management incentive programs.
- Add a conflict resolution module to the Citizen Planner Program.
- Expand delivery of the Citizen Planner Program.
- Propose incentives to foster regional updating/developing of comprehensive plans.
- Develop a strategic plan for joint planning commissions.
- Create a land use SWAT team.
- Determine the health and social capital implications of sprawl and land use.
- Define indicators of quality of life, sprawl, quality education and managed growth.
- Improve access to fruits and vegetables in urban areas and develop opportunities for urban agriculture.
- Investigate housing choices and neighborhood preferences of walkers.
- Understand the correlation between obesity and recreational opportunities in Michigan's urban areas.
- Examine the incidence of school walkability (including determinants and benefits).
- Develop a "healthy schools" project (linking community characteristics to school performance).
- Analyze how state policies and programs affect land use patterns.
- Analyze successful land use innovations within home-rule states.
- Carry out a series of studies on the impacts that infrastructure has on land use change.
- Direct fiscal impact studies of sprawl in all counties throughout the state.
- Promote the creation of a state land use caucus or roundtable.
- Create and expand educational programs on collaborative planning.
- Create a land use and environmental report card.
- Propose policy recommendations for strengthening mechanisms in planning coordination.
- Refine the scale of the land transformation model to better predict changes in land use categories over time as a result of policy decisions, and add an economic module to the model.
- Undertake a focus group study to uncover the land use information needs of the public.
- Devise a series of one-minute public service announcements on the science of sprawl.
- Engage a team to conduct/guide communities in project-specific planning charts.
- Provide a visioning service that helps communities plan for the future, and then provide the tools to implement the vision.

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- Develop Web-based, computerized visualization tools to help clarify design elements and focus community and individual preferences.
- Evaluate communication/education efforts as effective measures for changing behavior.
- Produce monthly educational/outreach material about land use.
- Organize a writers' series on land use.
- Expand MSU Extension's Land Use Area of Expertise (AOE) team, which assists local communities with planning, to each state planning region across the state.
- Conduct a study on the role of income and prices in land consumption and development.
- Perform tipping point studies for land-based industries.
- Perform statewide annual land use and land cover updates.
- Develop a strategic plan for land use data collection and management.
- Examine the effects of real estate mix on school districts.
- Promote MSU land use speakers in other states.
- Help MSU to take leadership in creating Centers of Excellence on Land Use by leveraging federal funding.
- Conduct a study that identifies Michigan's niches in land use.

Long-term Research Issues

- Develop quality of life indicators for Michigan towns and cities.
- Conduct a study on the changing nature of work and location of jobs and implications for inner cities.
- Prepare a policy report on transportation, particularly public transit.
- Conduct a study on how the placement of schools influences development patterns.
- Evaluate differential equity and ethical implications of policy in land use decision making.
- Develop a Detroit "Central Park" project.
- Conduct a study on zoning and its effect on school-age populations.
- Conduct a study that analyzes safety, crime and quality of life in Michigan cities (evaluating the status of these variables and econometrically determining the linkages between them).
- Evaluate affordable housing gaps by city in Michigan (income, affordability, demand and supply of housing for low-income state residents).
- Conduct a study on infrastructure and service costs vs. population density.
- Conduct a study on the future of suburbs.
- Conduct research and provide policy recommendations on the barriers to land agglomeration.
- Perform a study on the influence of property taxes on the market.
- Analyze state and regional housing availability and the cycle in housing stock.
- Determine the impacts of Michigan agricultural competitiveness in the context of global production change.
- Enhance opportunities in agricultural tourism and farm-based recreation in the state.

- Establish strategic partnerships with non-traditional agricultural industries and clients.
- Promote integration of agriculture into other top Michigan economic industries and population centers.
- Determine the effects of greenfield impact fees and credits.
- Determine the public impact of unmanaged wildlife populations (fatalities from deer-auto accidents, etc.).
- Perform legal, institutional and financial analysis of the Soil Conservation Districts in Michigan.
- Conduct research on landfill location and provide technical assistance for establishing sites.
- Examine the impact of development on the Great Lakes fishery.
- Create a statewide mining and gas inventory.
- Conduct research and provide subsequent policy recommendations on water supply and demand and the constraints they pose to development.
- Develop a state water management plan that coordinates individual watershed plans throughout the state.
- Conduct a study on alternative political boundary options for improved coordination of planning.

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- Analyze the relationship between land use, social capital and health.
- Research the physical requirements of social capital networks.
- Outline the infrastructure needed for healthy communities, including mental health.
- Determine the likely consequences of new life-extending and -enhancing medical technologies on human settlement patterns.
- Define the characteristics of obesity and other exercise-related ailments (socioeconomic, demographic and community).
- Study the relationships between land use and obesity, osteoporosis, and other diet- and exercise-related problems.
- Analyze the impact of land use on community health.
- Conduct a study that analyzes alternative policy scenarios for key land use policies (European model, etc.).
- Conduct an analysis on the effectiveness of using conflict resolution techniques on land use disputes.
- Create a Youth for Responsible Land Use summer camp.
- Develop a virtual university class on land use.
- Review policy responses to land use change.
- Perform a comparative study of Michigan land use with international examples.
- Conduct ecosystem valuation studies.
- Model the geography of land use change and rank the drivers of change.
- Analyze speculative behavior in land.
- Perform impact assessment of potential policies.
- Examine community change resulting from land use change.
- Create an annual national conference on the future of land use.

Goal 5: Enhance Economic Opportunity and Quality of Life for Americans

Statement of Issue:
Michigan policy-makers have identified critical issues for families and the economy. These include obesity, a growing public health problem that significantly affects quality of life. Michigan ranks eighth in the United States for adult obesity and second in overweight population. At the same time, hunger in America is a growing problem, with 14 million children living in homes where food is scarce. These conflicting trends point to a need for understanding and improving the relationship between families, children, food and health. Scholarship on children, youth and nutrition must be diverse – not only addressing hunger or physical activity but also "feeding" young people's self-esteem and nurturing healthy behaviors. In the FY2000-FY2004 Plan of Work, the MAES has four main areas of emphasis under goal 4: children, youth, families and communities; farm management; natural resources initiatives; and leadership programs. As a result of collaborations with policy-makers, the MAES has refined its goal 4 areas of emphasis and is now focusing on the following three areas:

- Family economics -- resource allocations, impact of financial policies and economic trends on family units and families and households, welfare reform, working poor, workforce development issues, savings and consumption, sustainable science issues and resource thresholds.
- Family health -- chronic diseases, obesity, healthy lifestyles, communicable diseases, economics of care, food insecurity, community nutrition and health, social justice and mental health.
- Family services and systems -- literacy and literacy support efforts, out-of-school programs, community service coordination, early childhood and childcare programs, and innovations in preventive programming.

Estimated resources

	FY 2005	FY 2006
Hatch Funds		
Hatch Regular	248,168	255,309
Multi-State Funds	57,563	57,563
Other CSREES Funds*	1,163,218	1,163,218
Other Federal Funds*	227,529	227,529
Total Federal Funds (est.)	1,696,479	1,703,620
State Match for Hatch Funds	305,732	312,872
Remaining State Appropriations	1,669,166	1,563,281
Self Generated Funds*	11,686	11,686
Industry Generated Funds*	63,731	63,731
Other Non-Federal Funds*	173,909	173,909
Total State Funds (est.)	2,224,224	2,125,479
Total Estimated Funds	3,920,703	3,829,098
Scientist Years	6.7	6.7

Short-term Research Issues

- Support a universitywide coalition of scientists – the Families and Communities Together (FACT) Coalition -- as a mechanism for coordinated and innovative research around families and health, education, child and youth development, and community vitality.
- Examine priority issues for Michigan children and youth, including parenting, obesity and literacy, through collaborations between MSU, state agencies and community organizations; enhance child well-being by involving parents, reaching vulnerable populations, training childcare providers, and developing and mobilizing community involvement.
- Support new approaches to youth development by investing in projects on healthy communities, strong families and confident youth; explore critical issues and emerging trends that affect children and youth development and success; examine impacts of community engagement with youth, including those from diverse backgrounds, on critical issues affecting them.
- Examine trends and models of youth leadership with a focus on recreation and leadership of youth.
- Create a multidisciplinary, integrated program on obesity and overweight to address issues related to healthy lifestyles across the lifespan, including nutrition education, physical activity, breast-feeding, diet and community food systems.

Intermediate-term Research Issues

- Address the strengths and challenges facing communities, as well as successful programs and ways to work in and learn about communities.
- Support children and youth's optimal growth by identifying effective strategies for parenting and literacy, nutrition, diet and physical activity to reduce obesity.
- Improve understanding of the optimal features of communities and policies that support development of recreation options, engage families in activities and promote economic development.
- Investigate the links between tourism and production agriculture in specific areas in Michigan.
- Link MAES natural resources research to other key MAES initiatives, including land use and water quality in food and health.

Long-term Research Issues

- Improve health outcomes for children, youth and families by examining and analyzing interventions, programs and policies that promote and sustain healthy outcomes.
- Develop analytical frameworks and research on youth assets and resiliency and youth-based community development.
- Support an Institute of Food Grades and Standards that will evaluate and develop new analysis techniques that are appropriate for tactical and operational decisions, and investigate the usefulness of information systems to support and improve the decision-making process by Michigan agricultural firms.

- In collaboration with the MSU Natural Resources Coalition, convene and sponsor multidisciplinary teams and projects and serve as a clearinghouse for statewide information on MSU natural resources and natural resources-based industries and businesses.
- Determine sustainable engagement models for community participatory research that addresses priority issues for Michigan families.

Estimated resources

ALL GOALS TOTAL FUNDS

	FY 2005	FY 2006
Total Hatch Regular Funds	3,890,688	3,890,688
Total Multi-State Funds	921,759	921,759
Total Other CSREES Funds	13,215,874	13,215,874
Total Other Federal Funds	24,892,831	24,892,831
Total Federal Funds (est)	42,921,152	42,921,152
Total State Match for Hatch Funds	4,812,447	4,812,447
Total Remaining State Appropriated Funds	27,891,585	26,256,383
Total Other State Funds	14,218,215	14,218,215
Total State Funds (est)	46,922,247	45,287,045
Total Federal and State Dollars	89,843,399	88,208,197
Total Scientist Years	132.90	132.90

Stakeholder Input Process Section

Actions taken to seek stakeholder input that encourages their participation
Industry and community needs continue to be addressed by linking together research, education, extension and stakeholders. The collective input has been instrumental in meeting the MAES mission.

Area of Expertise (AoE) Teams: These teams serve as an educational delivery system for plant and animal agriculture. They were formed as a direct result of stakeholder demands in the plant and animal industries in Michigan. The AoE teams focus on meeting the needs set by stakeholders in producing programs and products that are timely and customer-focused with a multidisciplinary systems approach. This team approach meets the need for joint planning and programming, collaborative professional activities, resource allocation and communication between organizations. The stakeholders do not distinguish between research and extension programs.

CANR Stakeholder Advisory Board: The CANR dean serves as chairperson and appoints 30 members to serve staggered three-year terms. These stakeholders represent broad interests in the agriculture and natural resources industries.

FACT (Families and Communities Together): Created to provide an ongoing tie to stakeholders, this team engages in issues affecting families and communities. Due to the extent of MAES programs, stakeholders also include faculty members, the MSU Provost's Office and the Vice President's Office for Research and Graduate Studies.

Plant Industry Coalition: The coalition holds biannual meetings with stakeholders including plant commodity groups and industry leaders. They discuss research and extension priorities with MAES faculty members and administrators, MSUE specialists and administrators, CANR department chairs of plant-related departments, the state department of agriculture and agricultural organization representatives. Research/extension programming under Project *GREEEN is a major focus of discussion at the meetings.*

Southwest Michigan Research and Extension Center (SWMREC): This board is select based on commodity and geographic distribution. Comprised of 15 members, the board meets four to six times per year with SWMREC field station administrators, research faculty members and MSUE specialists.

Process used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them
Our stakeholders are identified as individuals who benefit from our programs and are considered an integral part of MAES. With the stakeholders input MAES provides research aimed at the betterment of Michigan's future. MAES developed a visionary approach in assessing Michigan's needs and then engaged in discussion with MAES faculty members from five MSU colleges, field station administrators, state

governmental units, both rural and urban, to identify individuals and groups as stakeholders. These selected stakeholders work with MAES in futuristic planning. Stakeholder input is gathered through various methods:

AoE Teams: Stakeholder input is required in determining a program/project, direction and evaluation. They are invited to attend the AoE meetings or project activities to provide program/project evaluation. The stakeholders participate on a regular basis in educational programming by AoE Teams. Their feedback is requested on emerging needs and issues facing the industry or interest group to give direction to the teams. The stakeholders are also involved in the hiring process of AoE Team members.

CANR Stakeholder Advisory Board: These stakeholders represent a wide range of agriculture and natural resources industries. They meet a minimum of three times per year and are quite active in major stakeholder conference days, held annually.

FACT (Families and Communities Together): They hold annual forums which include MSU and MAES faculty members, MSUE and community grant seekers from across Michigan. At these forums attendants can exchange research ideas and find partners for their work.

Plant Industry Coalition: These stakeholders made up of commodity groups and agribusiness representatives summarize and document their research and extension priorities and needs at their biannual meetings. These documents are placed on the Project GREEEN Web site.

Southwest Michigan Research and Extension Center (SWMREC): Members of the board are appointed by local fruit and vegetable grower commodity groups and organizations and the university. Recently this board appointed a minority grower.

How collected stakeholder input was considered

As earlier outlined, stakeholder input provides the foundation to much of the research and extension activities developed by MAES and MSUE. The success of MAES is predicted on the university-state government-stakeholders model, which has been in effect for more than 20 years. Stakeholders help decide the future direction for MAES through programs like Project GREEEN, Animal Industry Initiative, FACT, commodity group advisory boards and the AoE Teams. Due to stakeholder input in recent years more focus has been placed on non-traditional agriculture. This direction has also caused traditional agriculture to include the human element of rural and urban communities, the environment, land use issues, biotechnology, and the new emerging green industries.

Examples:

CANR Stakeholder Advisory Board: At each meeting the stakeholders are asked questions for their input. The collected stakeholder feedback is used to make decisions regarding the effectiveness and impact of CANR, MAES and MSUE programs. At one meeting,

stakeholders were asked to consider the five programmatic themes when answering these questions:

0) Are the CANR, MAES and MSUE working on programmatic themes that best serve Michigan?
0) What are the most important programmatic ideas to carry out in each theme?
0) Given the tight budgets, give guidance on creating a "what not to do list."

FACT (Families and Communities Together): MSU faculty, administrators, and Extension faculty and community partners are facilitating, participating and supporting two self-directed work groups. These work groups focus on the topics of children, youth and nutrition, and youth development. Each group develops research and outreach initiatives to advance work in their area. In addition, these groups create and implement a plan for the collective betterment of work in each area, promote professional development activities and measure the impact of their efforts.

Plant Industry Coalition: The stakeholders' priorities outlined in Project GREEN are the basis in considering research project funding.

Program Review Process

There have been no changes in the program review process since MAES submitted the 1999-2004 POW.