

2012 University of Wisconsin Research Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

Program Overview/Operating Philosophy

The Wisconsin Agricultural Experiment Station (WAES) is committed to investigator-driven and peer-reviewed research activities. Our general philosophy in allocating Formula funding is to provide support for specific, peer-reviewed projects rather than to distribute block grants to departments. At the University of Wisconsin, the largest portion of our allocation is targeted for graduate student education using our formula funding. Expenditures on projects are allowed under a series of guidelines reviewed annually by a faculty committee. Matching funds come primarily from state support of salaries for investigators and research staff. As in prior years, a small percentage of our funds were administered based on emerging issues or critical needs.

Formula funds are managed via yearly budgets allocated to approved projects. Approximately 160 projects are funded using formula funds each year with budgets that include personnel (mainly graduate students) as well as supplies, student hourly help, and travel. Funding of capital equipment items is prioritized by departments and distributed in a separate exercise, with some capital equipment items shared by several projects. Funds for travel to multistate research meetings comes from a central pool of funds and is provided for one official representative per project.

The Research Program in this Plan of Work is composed of a number of projects with individual review and reporting. The Program may extend for multiple years, but the contributing projects are a constantly shifting portfolio that can be quickly redirected. Projects are approved for periods of one to four years with the majority on a three or four-year cycle. Proposals for new projects require an evaluation of productivity from previous Formula fund support; this is used as one of several criteria for ranking proposals and for evaluating the ability of the PI/team to complete the research project successfully. Multistate revised proposals are required to be reviewed and approved at least once every 4 years. Each year, approximately 20% of the research portfolio is redirected depending upon the priorities and needs of Wisconsin and the nation, as identified in the annual RFP.

The process of continual re-examination of our portfolio allows us to address short-term, intermediate term and long-term issues. A small number of new projects may be started at mid-year as new faculty members are hired or as emerging problems trigger an early start at the discretion of the Associate Dean for Research and the Assistant Director of the WAES, following discussion with the WAES/College of Agricultural and Life Sciences Administrative Leadership Group. These processes ensure that projects are relevant to the REE and NIFA national goals and emphasis areas and focus on current state research needs.

The WAES follows a general "logic model" process in which input is sought from diverse stakeholders, including both traditional and non-traditional agriculture, natural resource, human health and community groups, to establish a set of research priorities. Input is also sought via public meetings such as field day events held at our Agricultural Research Stations or through other Extension venues. Priorities are also solicited from Extension issue-based teams composed of University of Wisconsin/Extension faculty and county based educators. Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger

- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These revised goals will be identified as priorities for projects to be funded in the WAES Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into a single category. Research projects frequently intersect two or more disciplines, priorities and interests. We view this inter-disciplinary engagement of our researchers as an important feature of our program.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, the CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to propose a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed periodically and information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes derived from recent WAES Calls for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

These Wisconsin priorities along with the National Goals are provided to faculty to use in developing proposals for funding under the Formula Grant programs. They are also provided to the review panel that provides recommendations for funding. We feel that there is a strong relationship between the national goals and Wisconsin priorities. These priorities along with other criteria such as Extension/Integrated activity, Multistate, under-represented populations/groups and past Formula Grant productivity are also used in the merit evaluation of proposals subsequently submitted.

The Call for Proposals for projects to be supported beginning in FY12 ((beginning Oct. 1, 2011), was initiated in June, 2010, approximately 16 months prior to project initiation. Proposals were due September 10, 2010. A copy of the Call for Proposals, guidelines and merit criteria are available at <http://www.cals.wisc.edu/waes/application/proposals.html>.

Proposals are evaluated by an internal panel of faculty, called the Research Advisory Committee (RAC). The RAC is composed of 10 faculty, and the Associate and Assistant Directors of the Agricultural Experiment Station. Faculty are chosen to represent the broad cross section of the college and serve rotating three year terms. Proposals are assigned to primary and secondary reviewers from the RAC members and two other appropriate scientific reviewers not on the RAC. These reviewers may be either internal, external or a combination of both. The criteria for choosing the reviewers is the reviewer's ability/knowledge base to judge the merit of the proposals. The RAC convened in late November to rank the proposals based on the established criteria.

This process is detailed under "Nature of the Proposal reviews for Hatch, Hatch Multistate, and McIntire-Stennis Proposals" included at the end of the Call for Proposals document referenced above.

We monitor several outcomes/indicators to assess program effectiveness and impact, including peer-reviewed publications, workshops provided to client groups, patent disclosures and graduate students trained. Future indicators may be expanded to include other criteria. This information will be used not only to assess current program effectiveness and accomplishments, but also as a consideration in determining future Formula Grant funding priorities.

The College of Agricultural and Life Sciences (CALs) feels that Wisconsin accomplishments relate very well to high priority issues cited earlier. Publications in refereed journals, books, and extension bulletins have been reported on projects using the AD-421 annual reports in the CRIS system. UW-Madison-CALs was rated first among peer institution in the Scientific Impact Factor of its publications. We feel this is representative of our entire research portfolio including Formula Grants. Formula funding of research often leads to significant funding from other sources. CALs also rates very high in extramural funding awarded to land-grant universities and public institutions, as well as private universities. Representative projects are reported as impacts below.

Title:Immigrant Farm Labor in the Wisconsin Dairy Industry

Impact nugget: Reports suggest that immigrant dairy workers often experience racial discrimination and rejection within their adopted local communities, yet no research has directly investigated their own experiences of community reception in Wisconsin.

Issue (who cares and why): Many U.S. farmers, including Wisconsin's dairy producers, depend on immigrant labor for their survival. Because these laborers are now and for the foreseeable future a permanent part of our economy and our communities, it is essential that we gather the data needed to improve understanding and help inform immigration policy.

What has been done: Most information gathered rested on confidential interviews with immigrant farmworkers at more than 83 dairy farms, as well as extensive interviews with county extension agents, farm labor advocates, immigrant advocates, education system representatives, elected officials, law enforcement representatives, and health clinic representatives. Immigrant worker interviews shed light on how they and their families experience social relationships within their rural communities as well as barriers they face to integration and upward mobility. Interviews with other groups provided a birds-eye perspective of the farm labor force and the social and economic impacts of its changing demographics. In addition to surveys, project personnel participated in conversations at immigrants' regular meeting groups (such as immigrant support groups and hometown associations) and observed behavior at public festivals and rallies.

Two top findings emerged. First, that Wisconsin dairy farms are rapidly increasing their reliance on immigrant hired workers. Forty percent of all hired workers on Wisconsin dairy farms are Latino, and most of those were hired in just the past 10 years. Second: At least half of those workers live in constant, debilitating fear of being apprehended by law enforcement, by virtue of the fact that they or a close family member lack legal status to be in the U.S. and because U.S. law enforcement has in recent years increased policing of suspected unauthorized immigrants.

Impact: First, this research has shown immigrant advocacy organizations and worker service institutions (including such state institutions as the Wisconsin Department of Workforce Development) that they need to direct resources toward the dairy sector because there are thousands of workers on dairy farms in need of their services. They previously had no resources directed to dairy workers, because they assumed that there were few hired workers on dairy farms. Second, this project--as well as investigator Harrison Pritikin's participation on the Wisconsin Governor's Council on Migrant Labor and on the board of the Wisconsin Migrant Coalition--has helped state policymakers realize that immigration reform is crucial to the future of Wisconsin's primary agricultural industry (dairy) and its rural communities, which pivot around

dairy farms and other industries that rely heavily on immigrant labor. Finally, these research findings have been showcased by numerous news outlets around the state and at several major immigration summits, thus helping to raise the visibility of immigrant worker issues among the broader public. Major outlets included: Milwaukee Journal-Sentinel (2/24/09), The Country Today (11/4/09 and 11/11/2009), The Capital Times (11/11/09), The Janesville Gazette (5/8/10), Isthmus (June 2010), Cheese Market News (June 2010), Wisconsin Watch (Nov 2009, Dec 2009, April 2010, May 2010, July 2010), Al Jazeera English television (September 2010), Grow magazine (UW-Madison College of Agricultural and Life Sciences, Summer 2009).

Funding: WIS01272

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Knowledge area(s): 610, 803

Title: Vitamin D Nutrition and Optimal Immunological Health

Impact nugget: The prevalence of Multiple Sclerosis decreases dramatically with increased exposure to sunlight. A better understanding of how this phenomenon works--particularly, how sunlight-derived vitamin D prevents disease at the molecular level--could lead to new prevention and treatment strategies for this disease.

Issue: Across the nation, around 500,000 people suffer from Multiple Sclerosis (MS), with 200 new cases diagnosed each day. This debilitating neurodegenerative disease causes a highly variable pattern of troublesome symptoms including weakness, loss of dexterity and balance, disturbances in vision, and difficulty thinking and remembering. People who suffer from this autoimmune disorder are commonly diagnosed around age 30, wheelchair bound within 15-20 years, and bedridden by age 60. First-line approved treatments are expensive, costing upwards of \$30,000 per year. Worse, they only reduce the frequency of periodic attacks about 35 percent in about one-third of sufferers. They have no effect on the insidious accumulation of disability and cause adverse side effects. Better and safer treatments are desperately needed. Vitamin D may reduce the attack rate 50% or more and decrease disability progression without safety concerns at a cost of less than \$100 per year.

What has been done: Previously, a team of UW-Madison researchers discovered that vitamin D can prevent the onset of MS in a mouse model of the disease, and, further, that a bioactive form of vitamin D, known as calcitriol, can actually reverse the course of disease--cure it--once started. In this Hatch project, the team explored how this works at the molecular level. They found that for calcitriol to fight disease, there must be adequate levels of Vitamin D Receptor (VDR) on the immune T cells circulating in the central nervous system, and that VDR levels are controlled by interferon-gamma, a small molecule. Through this important pathway--involving interferon-gamma, Vitamin D Receptor and calcitriol--the body ensures that autoimmune T cells that have infiltrated the central nervous system (to protect this important region from pathogens) are eliminated before they start attacking nervous system cells there, the "rogue behavior" that causes MS.

Impact: This work provides the first direct scientific evidence gathered entirely in vivo showing how calcitriol, a bioactive form of vitamin D, and the Vitamin D Receptor on autoimmune T cells function to prevent and treat Multiple Sclerosis in a mouse model of the disease. A portion of the research was published online in the European Journal of Immunology. Additional papers and talks are in the works. The project's principal investigator has strong ties to the Wisconsin chapter of the National Multiple Sclerosis Society, and she regularly shares research updates with the MS community through presentations at MS Society gatherings and through MS Society newsletters. This work is providing guidance to public health initiatives around the world seeking to optimize vitamin D nutrition to reduce the prevalence and severity of MS. These initiatives have the potential to significantly reduce the impact of MS on patients, their families

and health care systems. According to the principal investigator's estimates, health care savings in the U.S. could be as high as \$5 to \$10 billion annually.

Funding: WIS04143

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Knowledge area(s): 305

Title:Improvement of Thermal and Alternative Processes for Foods

Impact nugget: Manufacturers of whole-muscle beef jerky must use heating and drying processes that attain government-mandated safety standards for destroying harmful bacteria that may be present on raw beef. However, validating the safety of those processes cannot currently be done in a meat plant because organisms needed for testing them, such as E. coli O157:H7 and Salmonella, cannot safely be brought into a meat plant. The investigators have developed a method in which safe starter culture bacteria are used as "stand ins" or surrogates for harmful bacteria in ground-and-formed beef jerky processing.

Issue (who cares and why): Food safety has become a top public health concern as recent outbreaks of illness caused by E. coli O157:H7, Salmonella, and other disease-causing bacteria have taken lives and shaken consumer confidence in the protection of food safety regulations. Beef and other meat jerky is a popular snack--the Nielsen Company estimates that the total sale of such meat snacks in the U.S. has grown 65 percent since 2003, reaching about \$1.2 billion in 2008. The inability of commercial jerky processors to prove that their processes are able to meet government-mandated safety standards for destroying E. coli O157:H7, Salmonella, L. monocytogenes, and S. aureus is an important weakness in ensuring a safe food supply.

What has been done: Commercial lactic acid bacteria (LAB) starter cultures that might serve as surrogates for pathogenic E. coli O157:H7, Salmonella, L. monocytogenes, and S. aureus were evaluated for survival in beef jerky during three representative laboratory-based jerky-processing schedules. A surrogate LAB culture and necessary LAB population decrease for assuring safety were identified and used to evaluate six commercial processes for making whole-muscle beef jerky. Studies were done in the laboratory and in a commercial Biosafety Level-2 smokehouse facility in Lodi, Wisconsin (Alkar Rapid-Pak, Inc.).

Impact: Based on their findings, researchers are making recommendations and developing an in-plant protocol to evaluate the safety of whole-muscle and ground-and-formed jerky processed commercially. The LAB starter culture in effect is used as a "crash-test dummy" in industrial jerky-making processes to ensure that they are safe.

Investigators will teach the validated LAB surrogate method to meat processors and regulators through multimedia extension materials, including web-based information, CDs/DVDs, and workshop presentations. Evaluations will be obtained from collaborating Wisconsin jerky processors and meat inspection personnel. Summative evaluation will consist of establishing the percentage of whole-muscle beef jerky manufacturers in Wisconsin that have used the LAB surrogate. The investigators will also attempt to track implementation of the LAB surrogate method nationwide.

Further studies will examine the use of the LAB surrogate to ensure destruction of newly recognized types of disease-causing E. coli in jerky-making. These types of E. coli, known as non-O157 STEC (Shiga-toxicogenic E. coli) are an emerging food safety hazard.

Funding: WIS01238

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Knowledge area(s): 712

Additional funding: This work was partially funded by a grant from the Wisconsin Beef Council.

Title:Sustaining Local Food Systems in a Globalizing Environment: Forces, Responses, Impacts

Impact nugget: Our food system is turning into a polarized business structure in which firms are either very large or very small. This project explores strategies and initiatives being undertaken by farmers and food processors to reconstruct a "middle ground" in which mid-size firms can flourish.

Issue (who cares and why): More and more citizens are interested in "eating locally," i.e. purchasing food that is grown and marketed in their regions, in the interest of better nutrition, environmental sustainability, and supporting their local economies. They are motivated by increasing recognition in public health about the preventability of a number of chronic diseases through improved access to fresh produce and by acknowledging the carbon footprint and other damage done to our environment by transporting food from faraway places. A thriving layer of medium-size firms is needed to serve and strengthen this growing "locavore" movement.

What has been done: This project has involved implementation of many research, outreach, and capacity building activities. Project personnel supported the development and maturation of a local, nonprofit food system organization called Research Education, Action and Policy on Food Group (REAP). In cooperation with REAP and the UW Center for Integrated Agricultural Systems (CIAS), the project launched annual editions of an ongoing Farm Fresh Atlas listing farms, businesses, restaurants and farmers' markets that sell goods directly to customers. Project personnel worked with REAP and CIAS to maintain and expand the Wisconsin Homegrown Lunch (WHL) program, a farm-to-school project serving counties around Madison, and developed CHOW (Cooking Healthfully in Wisconsin), a program bringing chefs into middle schools. The project also initiated a Buy Fresh, Buy Local (BFBL) campaign intended to diversify production capacity by developing a market for fresh and locally produced products. Both WHL and BFBL involved extensive outreach to consumers, farmers, food service professionals, school administrators, and other stakeholders via a variety of channels including community meetings, media coverage, and presentations at professional and academic meetings. Project personnel also were involved in coordinating a national initiative on renewing an "agriculture of the middle."

Impact: This project has demonstrated the potential of local food systems to work together and serves as a model of effective cooperation between community groups and a university. The REAP Food Group has emerged as a visible, influential actor on community food issues in Southwestern Wisconsin. REAP's Food for Thought Festival has reshaped the way regional consumers think about and interact with food. Its Farm Fresh Atlas is used by more than 45,000 people each year, and REAP assisted organizations in five other regions of the state to develop their own versions. The Wisconsin Homegrown Lunch program has reached more than 10,000 students in over a dozen schools and has influenced curriculum, food service operations, school fundraising procedures, and school board policies. WHL has influenced the direction of farm-to-school programs nationwide, and an article about it by investigators Kloppenburg and Hassanein has been a major intervention in the debate over the value of such programs. Research based on the performance of WHL has provided guidance to many practitioners. The national stature of WHL is reflected in the appointment of CIAS-REAP as Regional Lead Agency for the Great Lakes Region for the Community Food Security Coalitions's national Farm-to-School Program, and project personnel were instrumental in creating a Dane County Food Council.

Funding: WIS04717

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Knowledge area(s): 604

Title: West Nile Virus and Mosquito Control

Impact nugget: West Nile Virus and other diseases are transmitted by mosquitoes. Controlling these insect pests and understanding the mechanisms of disease transmission are keys to improved public health and safety.

Issue: West Nile Virus is carried and transmitted by mosquitoes in Wisconsin, with about 10-20 illnesses and a few deaths reported during an average year. At this point, researchers need to figure out how mosquitoes are transmitting the virus to humans so that effective control measures can be developed and deployed.

What has been done: A team of UW-Madison scientists discovered that the Culex mosquito species thought to be involved in the transmission of WNV on the east coast of the United States are not attracted to humans in southern Wisconsin. They are now in the process of pinpointing the species involved in disease transmission in the area. In another set of experiments, they found that, compared to natural wet sites, man-made storm water management features--ditches, retention ponds, etc.--are the primary breeding sites for WNV vectors. Working with staff at the Wisconsin Department of Natural Resources (WDNR), the team tried introducing fathead minnows into various ditches and catch basins in the Madison area in the hopes that the fish would eat the mosquito larvae growing in the water. The experiment worked, showing that fish can be deployed as a powerful biological control agent against mosquitoes. The team is also investigating the ability of micro-crustacea to perform a similar control function. In the course of their fieldwork, the team identified one species of mosquitoes never before seen in the state, including one that's a potential vector for several viruses, including LaCross virus and WNV.

Impact: Information gathered through this Hatch project is helping health officials better monitor and control the West Nile Virus in Wisconsin. In addition to working with WDNR staff, this project has led to several productive and ongoing collaborations with local, state and national agencies, including the National Wildlife Health Laboratory, the Wisconsin Department of Public Health, Dane County Public Health, and the health departments in Madison, Milwaukee and La Crosse. During mosquito season, the team reports their WNV test results on a weekly basis to county and state agencies, as well as the national Centers for Disease Control. After seeing promising results, Dane County Public Health has opted to support additional biological control experiments. Project findings have been shared via numerous scientific journals and conferences, as well as through news stories, public talks, a website and various local/state government channels.

Funding: WIS04968

More information: Susan Paskewitz, 608-262-1269, paskewit@entomology.wisc.edu

Knowledge area(s): 721

Title: Unlocking the Secrets of Corn starch Digestibility by Dairy Cows

Impact nugget: Until recently, the effective use of corn to feed dairy animals was based as much on intuition as science. As the cost of using corn has increased, the need for specific means to reduce the quantity of corn used in the dairy ration, and to improve the return on the corn that is used, has increased.

Issue: Dairy cattle are regularly fed corn, but the starch in corn kernels is only partially digestible in these animals. Improving starch digestibility improves the efficiency of corn use, thereby leading to increased milk production and/or the ability to feed less corn, and thus helps dairy producers increase income or manipulate costs.

What has been done: University of Wisconsin-Madison scientists began the quest to understand corn starch digestibility by dissecting the corn kernel into its parts: pericarp, germ, and endosperm. Research uncovered a matrix of starch and protein in the endosperm that varied greatly in corn. One type of corn endosperm could have more or less "vitreousness," or hardness, than another. As the vitreousness increased, starch digestibility decreased. Further, corn kernels high in "prolamin-zein" had lower digestibility and were associated with greater hardness. However, there existed no practical means for testing or analyzing corn for the differences in prolamin-zein in corn on a commercial basis by feed testing labs. The scientists developed a chemical test to determine prolamin-zein content of corn that could be used in commercial feed testing labs, thereby enabling a scientifically-based means for assessing a major factor influencing starch digestibility and the energy value of corn in the dairy animal's diet.

Impact: A test to evaluate corn starch digestibility is now being widely adopted by the animal nutrition business community. Improved corn digestibility in the ration of a lactating dairy animal can easily boost milk production by 2.5 lb per cow per day, increasing milk revenues by about 40 cents per cow per day. Conversely, reducing the amount of corn fed proportionally can save about 25 cents per cow per day in feed costs for dairy producers, given current costs. Dairy producers and their nutrition consultants can now manage the corn they use for its greatest efficiency. An objective test for assessing corn starch digestibility also opens the door to selecting corn for specific purposes--for feeding dairy cattle, producing ethanol, making food products or serving the export market. What were once subjective decisions about how to use corn in dairy rations are now decisions made on the basis of objective, scientifically-based tests.

Funding: WIS01088

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Knowledge area(s): 206, 302

Title:Anti-inflammatory Properties of Conjugated Linoleic Acid (CLA)-enriched Butter on Rodent Models of Inflammation

Impact nugget: Conjugated Linoleic Acid, a natural anti-inflammatory compound found in the milk and meat of ruminant animals, is a promising treatment option for people suffering from inflammatory diseases.

Issue: Numerous diseases are linked to problems of inflammation: rheumatoid arthritis, asthma, lupus, inflammatory bowel disease, atherosclerosis, heart attacks and some cancers. The associated medical costs are staggering. Rheumatoid arthritis, for one, affects around 3 million Americans, at the cost of \$60,000 to \$120,000 per year per patient. Many of the existing drugs used to treat these diseases are useful, but also have powerful and unpleasant side effects. Research and clinical studies show that Conjugated Linoleic Acid, a healthy fat known to prevent body fat accumulation, can also significantly dampen inflammation, raising the hope that this natural compound can be incorporated into various treatment regimens.

What's been done: A team of UW-Madison researchers found that a fat molecule present in milk, butter and cheese known as "c9,t11-CLA" has strong anti-inflammatory properties. In a mouse model of arthritis, they found that the level of CLA present in regular butter was enough to significantly dampen inflammation, if butter was the only fat source the animals received. Pure, synthetic CLA added to the diet also protected arthritic mice. Based on another group's finding that levels of c9,t11-CLA can be easily ramped up in milk fat--up to 5 percent or more--just by feeding cows on pasture, the UW-Madison team performed a set of experiments to see if this kind of CLA-enriched milk is also effective at reducing arthritic inflammation, and found that it is. These results suggest that dairy producers, using simple and natural

management tools, can generate CLA-enriched milk, butter and cheese that could function as medical foods without having to be a major part of the diet. The team partnered with a second research group to find the key biomarkers associated with healthy mice and, separately, arthritic mice. They went on to show that feeding CLA to arthritic mice restored their biomarkers to the healthy state, a promising finding that implies CLA may be able to treat inflammatory diseases without causing side effects.

Impact: This work shows that dairy products containing CLA help dampen inflammation, opening the door to a promising whole foods approach to treating inflammatory diseases--an approach that could reduce the use of expensive anti-inflammatory drugs, as well as their side effects. Already, this Hatch work, which has been featured in a handful of peer-reviewed journal articles and scientific talks, has inspired a number of medical doctors to conduct human clinical trials exploring CLA's ability to reduce inflammation in people suffering from asthma, allergies and heart attacks. The results have been very promising. In the regulatory arena, CLA was recently approved by the U.S. Food and Drug Administration for use in select human foods, paving the way for a new market for dairy processors who develop CLA-enriched medical foods.

Funding: WIS01508

More information: Mark Cook, 608-262-7747, mcook@wisc.edu

Knowledge area(s): 702, 724

Title: Dissection and Enhancement of Soybean Resistance to Soybean Cyst Nematode

Impact nugget: A team of UW-Madison researchers pinpointed the key gene responsible for protecting a popular soybean variety from Soybean Cyst Nematode, a major pest of soybean. This finding opens the door for plant biotechnologists to try to manipulate this gene to further improve nematode resistance in this economically important crop.

Issue: Soybean Cyst Nematode (SCN) is the most economically damaging disease in soybeans in the U.S., causing more than \$700 million in lost production every year. Originally a problem only in Southern states, SCN has become common in America's North Central "soybean belt" region, and it continues to spread each year. Although resistant soybean varieties exist, they aren't 100 percent effective. Improved varieties with stronger SCN resistance could save growers millions of dollars each year.

What has been done: Over the past decade, industry and academic scientists have spent a lot of time and money studying a gene widely believed responsible for SCN resistance in a popular soybean variety known as PI88788. In this Hatch project, UW-Madison researchers set out to experimentally confirm the function of this gene, with the plan to then genetically tweak the gene to try to boost its SCN-killing properties. Surprisingly, they discovered that the much-studied gene does not in fact contribute to SCN resistance--not in a major way, at least. Next, using advanced gene silencing technology that they modified for use in soybean, the scientific team went on to pinpoint the real resistance gene, the one that functions to protect PI88788 soybeans from Soybean Cyst Nematode.

Impact: It's rare for "negative" scientific results to get published, but in this case the UW-Madison research team's negative findings were too important to ignore: They found that a well-studied gene believed to protect soybeans from the Soybean Cyst Nematode doesn't actually play a major role in protecting the plant. This finding frees industry and academic scientists working on this gene to redirect their time, energy and money to other, more fruitful projects. In the second phase of this Hatch project, the team discovered a powerful SCN resistance gene, which they are in the process of patenting. The patent application will also include information about how to tweak the gene to improve it. Patenting is important as it will encourage one or more large biotech seed companies to license the technology and use it to

further improve soybean. Starting in the project's second year, this Hatch-funded work helped the principal investigator leverage an additional \$100,000 per year in research funding from the United Soybean Board and the Wisconsin Soybean Board. Two papers have been published featuring the team's initial findings, and other papers are in the works. Findings have been presented at a handful of conferences and talks. Four graduate students and four undergrads were trained while helping to conduct experiments for this project.

Funding: WIS01070

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Knowledge area(s): 201, 206, 212

Title: Connecting Wisconsin Prairie Chicken Populations through a Private and Public Land Partnership

Impact nugget: By surveying landowners' views about preserving habitat for greater prairie chickens, a team led by wildlife ecologist David Drake has gained information that will help in designing a program to establish habitat on private lands to build "bridges" between isolated populations now living on four public wildlife reserves.

Issue (who cares and why): The greater prairie chicken's engaging nature and interesting behavior make it a favorite of wild bird enthusiasts. Unfortunately, Wisconsin now lists this native species as "threatened," mostly because its native grassland habitat is becoming relatively scarce and fragmented. Before settlement the bird was found in prairies across southern Wisconsin, and as land was cleared, its range expanded to every part of the state. But farming's decline in the north and development in the south have squeezed the prairie chicken into four central Wisconsin (public) reserves separated by inhospitable habitat. There's not much reproductive mixing across these populations, leading to shrinking genetic diversity. This is a concern not just for the bird's stake, but also because the prairie chicken's well-being is a proxy for the health of the prairie ecosystem, which is essential for many plant and animal species. In the mid-2000s, state wildlife biologists began an effort to translocate prairie chickens from western Minnesota to central Wisconsin, but this effort has been expensive and moderately successful at best.

What has been done: Drake is collecting information related to a new strategy aimed at encouraging preservation and expansion of grassland habitat on private lands. This would both expand the total amount of suitable habitat available and also provide grassland "bridges" between public reserves to make it easier for the isolated populations to intermix. He is conducting a survey of central Wisconsin landowners to identify parcels that contain suitable habitat and whose owners are amenable to preserving it. Drake's team surveyed central Wisconsin landowners to learn about attitudes and land use plans and goals. He found that while about 70 percent of respondents favored the idea of preserving or establishing habitat, only about a third had done so, and only a quarter had received information on the topic that might make them more amenable to doing so.

Impact: As they continue to analyze data, the researchers have embarked on an effort to share their findings with wildlife agencies and conservation groups. These efforts have included presentations at the annual Prairie Chicken Festival sponsored by the Golden Sands Resource Conservation and Development Council. The work has been featured in newspaper and broadcast media both in the Madison area and in central Wisconsin. The researchers plan to map their data in a GIS database, making it easier for wildlife managers to identify parcels that are suitable for prairie chicken habitat and are owned by people who are open to the idea. They also anticipate developing extension-style publications providing information on how to set up partnerships and how to best manage the habitat.

Funding: WIS01322

More information: David Drake, 608-890-0445, ddrake2@wisc.edu

Knowledge area(s): 131, 134, 136

Title: Ecology and Management of European Corn Borer and Other Lepidopteran Pests of Corn

Impact nugget: U.S. corn producers benefit from Bt corn whether or not they use this product. Corn borer suppression achieved by planting Bt corn has been worth about \$6.9 billion to Midwestern corn growers from 1996 to 2009, and more than half of those benefits accrue to growers who didn't plant Bt corn. This underscores the importance of managing Bt corn use to avoid the evolution of insect populations that are resistant to its built-in pesticidal properties.

The issue (who cares and why): Over the past 15 years, agricultural biotech firms have released lines of corn that are genetically modified to produce the same toxin produced by the bacterium *Bacillus thuringiensis*, which is lethal to lepidopteron insect pests, including the industry's most devastating pests: European corn borer and western corn rootworm. These products are effective and very popular--they are planted on about 63 percent of corn acres nationwide in 2010--but they are more expensive. There's also a risk that a preponderance of Bt in the nation's cornfields will lead to the development of a Bt-resistant pest population. Therefore, farmers who plant Bt corn are required to plant a fifth of their corn ground with non-Bt corn. It's the seed companies' job to see that farmers comply, and they say that this rule is difficult to monitor and enforce. So the firms propose a different strategy: Allow farmers to plant only 5 percent of their corn acreage to non-Bt corn, but package Bt corn as a mix with non-Bt corn, so that there would be some non-Bt corn in every field. Many pest management experts worry that this won't be enough to prevent the development of resistant pests. For regulators to make an informed decision, they need more information about the effectiveness of various resistance management strategies, about the importance of such efforts, and about the costs and benefits of Bt corn in general.

What's been done: UW-Madison agricultural economist Paul Mitchell is part of a multi-state, multidisciplinary team of researchers that is working to provide answers to policy and management questions related to Bt corn. Part of Mitchell's role has been to incorporate the findings of the team's crop and insect specialists into an economic analysis--a dollars-and-cents measure of the costs and rewards of using these products. He says that all told, the combined economic value of the corn borer suppression attributed to Bt corn in five Midwestern states from 1996-2009 was worth \$6.9 billion to corn producers in those states. He also found that 62 percent of that economic benefit went to producers who did not use Bt corn, who benefit from an area-wide suppression of corn borers without paying the higher prices of Bt corn. These findings underscore not only the benefits of using Bt corn, but also the importance of sticking to an effective resistance management strategy in order to ensure the continued success of this valuable pest management tool.

Impact: The researchers have shared their findings via research articles, committee reports and informal contacts with university and USDA entomologists, EPA regulators and biotech companies. These research findings also have been disseminated widely across the nation and around the world, in the agricultural community and beyond. Much of the attention came after the researchers published an article on the findings in the Oct. 8, 2010 issue of *Science*. Well over 200 media outlets have featured the research.

Funding: WIS01426

More information: Paul Mitchell, 608-265-6514, pdmitchell@wisc.edu

Knowledge area(s): 211, 601

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

Year	Extension		Research	
	1862	1890	1862	1890
2012	0.0	0.0	154.0	0.0
2013	0.0	0.0	154.0	0.0
2014	0.0	0.0	154.0	0.0
2015	0.0	0.0	154.0	0.0
2016	0.0	0.0	154.0	0.0

II. Merit Review Process

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

- Internal University Panel
- Expert Peer Review

2. Brief Explanation

Proposals for Formula Grant funding on the UW-Madison campus are reviewed by a 10 person faculty committee. This committee, the Research Advisory committee, is appointed by the College of Agricultural and Life Sciences Associate Dean for Research. Each proposal receives two reviews from the panel members (designated primary and secondary reviewers) and two reviews from outside the committee using established experts in the field from the Madison campus, other UW campuses, WI state agencies, non-governmental organizations and scientists from other states. Panel reviews are discussed by a primary and secondary reviewer from the campus committee and the entire group ranks the proposals using three criteria that include merit, quality of science, and ability of the researchers to complete the project.

Merit includes relevance to program guidelines and to National Goals and Emphases Areas, pertinence to state problems and priorities, relationship to multistate projects, and inclusion of integrated activity.

Recommendations of the Research Advisory Committee are used by the Associate and Assistant Directors of the Wisconsin Agricultural Experiment Station in making funding and programmatic decisions.

Some Wisconsin faculty are cooperators in multistate committees in the North Central, North East, Southern, and Western Region as well as a few National (NRSP) projects. Each

region has a review process with slight modifications. Details on North Central projects, guidelines, review process and links to other regions are available online at <http://www.wisc.edu/ncra/>.

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?

The planned programs rely on annual input from stakeholder groups to identify critical issues of strategic importance. These priorities are conveyed to faculty who competitively apply for project support from Formula Grant funds (along with national goals which have been established by USDA, NIFA). These priorities are also used by the Research Advisory Committee who evaluate the project proposals as described in the Merit Review section. These goals are then used by the WAES Associate and Assistant Directors in making final program funding decisions.

A small pool of Formula Grant funds (5-10% of total) are not allocated through the competitive process, but are used to meet critical needs which arise outside of the normal funding cycle. Usually about one half of this pool is ultimately used to provide capital support to ongoing projects. This amount will vary based upon the number of emerging issues needing attention.

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

The University of Wisconsin-Madison campus is actively engaged in promoting a diversity initiative, Plan 2008 (see <http://www.provost.wisc.edu/plan2008>) charged to increase diversity of our students, staff and faculty and to create an awareness and understanding of diversity issues among our population. This plan is currently under review and redirection. A National Science Foundation funded program has promoted inclusion of more women in under-represented sciences. The College of Agriculture and Life Sciences has developed a memorandum of understanding with the Menominee Nation that is bringing college and pre-college students to both campuses for reciprocal visits and education.

We have also recently created an Office for Graduate Studies and Professional Development, whose role is to assist prospective graduate students in locating and investigating graduate programs suited to their interests, and to help current graduate students get the most out of graduate studies by highlighting opportunities to expand and enhance the training they already receive in their individual graduate programs. The Director and the Advisory Group work to guide graduate programs and graduate students toward a secure and bright future. Our efforts include securing institutional support for graduate education, addressing issues of professional development not currently addressed by individual programs, and implementing strategies to recruit and retain students of under-represented groups.

Part of this effort includes a new program entitled Graduate Research Scholars. This program strives to enhance the experiences of underrepresented graduate students in the College of Agricultural Sciences and the School of Medicine and Public Health. SciMed GRS coordinates professional development opportunities and community gatherings of graduate scholars.

We are using such broad based programs to promote awareness of needs of the under-served community. Many societal needs such as those related to health, nutrition and economic development often affect the under-served and under-represented disproportionately. Our portfolio currently addresses problems related to small farms, organic products, youth, nutrition, minorities, and rural communities. We are committed to continue to provide research results that will improve the lives of all of our population.

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

The planned programs will describe the outcomes and impacts in a number of ways. Initially, we will use three indicators to measure outcomes: Patents (as the single required outcome indicator), number of publications, and graduate students trained based on the project portfolio. We believe that patent disclosures might be a better long term indicator, since the patent process may not come to completion until well after the active research project has terminated.

We are hopeful that the "One Solution" reporting system under development will allow us the flexibility to add outcomes specific to our Plan of Work. Inclusion of such flexible fields would greatly help us track indicators on an annual basis as part of our required reporting process.

We will continue to develop impact statements on projects that we feel have contributed not only to the advancement of the Knowledge Areas, but which have had a greater impact in terms of Extension programming or societal benefits.

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

The planned program results in improved program effectiveness and/or efficiency in that it is annually being reviewed and being re-directed to issues that are newly emerged or considered most relevant to national and state needs. As part of the merit review and application process that is used, past output performance by the faculty/scientists is considered. Evidence of productivity is an important consideration in reviewing and rating projects for approval. The annual proposal process also allows for updating stakeholder input on a regular basis. These changes are published in the Call for Proposals and are presented to the proposal review panel for use in making recommendations on project proposals.

IV. Stakeholder Input

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

- 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

Brief explanation.

Methods of collecting stakeholder input vary depending upon the type of meeting or activity around which the input process is organized. Most generally this involves personal contact with someone from the UW-Madison WAES/CALS Administrative Leadership Group meeting with a traditional or non-traditional stakeholder group or individual or meetings that are open to the general public or selected individuals. For example, in August 2007, the WAES/CALS Administration hosted a listening session at the West Madison Agricultural Research Station for input on the bio-energy/bio-economy initiatives that are emerging. Participants were invited from traditional agricultural/energy stakeholders such as the Farm Bureau, Farmers Union, commodity groups and various Wisconsin energy utilities. Also invited were representatives from non-traditional stakeholder groups such as the Audubon Society, Nature Conservancy and other environmental social interest groups. All groups or individual participants were asked to provide input to a broad set of questions related to the bio-energy/bio-economy and were given the opportunity to provide a general statement of interest.

Other examples of such face-to-face stakeholder contacts include:

1) Meeting with commodity related groups such as the potato and vegetable growers, cranberry producers, the grazing conference, specialty and bulk cheese producers, Wisconsin Swine Producers, Wisconsin Cattleman's Association, Farm Bureau, Federation of Cooperatives, and various dairy related groups. This is not meant to be inclusive, as a full list of contacts is given in our Annual Report.

2) A potato summit meeting, held in November, 2008, which brought together industry, public sector, government agency, and regulatory agency scientists, as well as farmers and university researchers, to discuss key issues relating to potato production in Wisconsin. This meeting had a number of significant outcomes, including strategic planning for potato research facilities and programs for 2009 and beyond.

3) Meetings with fruit industry personnel and commodity groups supporting fruit industry interests in 2008. These meetings were designed to solicit input on the ways we as a college can best support fruit industry interests and the interests of farmers in our faculty and staff hiring decision-making. One of the tangible results of these meetings was the release of a faculty position in fruit crops extension.

4) Input from participants at UW-Madison/CALS Agricultural field day events. These field days, whenever possible, are attended by representatives of the WAES/CALS Administrative Leadership Group to interact with participants and solicit input.

5) We routinely meet with representatives of traditional and non-traditional stakeholder groups or individuals with specific personal interests. Numerous examples are cited in our Annual reports.

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

Brief explanation.

UW-Madison relies heavily on advisory boards to help identify stakeholders. The College of Agricultural and Life Sciences through its Administrative Leadership Group maintains a close relationship with stakeholders and through these face to face interactions obtains information on needs and on other potential stakeholders. Departments, department chairs and faculty can also recommend contacts.

To encourage participation across the broad groups identified above, we have used a very common strategy; reaching out to individuals and groups in a way that makes them feel that their input is welcomed. This means that there is a special invitation to that group or individual; that there is as much personal contact as possible, both before the actual invitation to cultivate the relationship and in follow-up: and that there is follow-up or follow through after their input to insure that they felt the message was heard and that we are seen as responsive. We also try to meet, to the extent possible, at their location, business or institution. This seems to be regarded as a "signal of importance" to the individual or group and is generally appreciated.

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

Brief explanation.

Almost all comments received from stakeholders are oral, but occasionally we receive electronic communications and even US mail that contains suggestions or comments from stakeholders interested in some facet of one or more of our more of our programs. Many individuals have very specific concerns, e.g. pest concerns with crops, or a need for information about management practices. Other stakeholders are more concerned with broader 'quality of life' issues and wish to remind us of our larger role here. We rely upon the essentially continuous engagement of deans, faculty, staff and others to listen for suggestions or ideas from clientele that would enable us to serve them better.

Stakeholders' input for the development and conduct of research relating to state needs is accomplished in a tiered system. Many departments, centers, and institutes maintain advisory committees that meet periodically with researchers in the units. Departments convey this input to the CALS Administrative Leadership Group. The College of Agricultural and Life Sciences has a central Advisory Board that meets twice a year with the Administrative Leadership Group. Members of the committee are selected from a wide range of producers,

industry, consumer, environmental groups, and state agencies. This Board not only advises on research and outreach needs, but also advises on contacts for constituency groups and individuals.

In addition to advisory groups, the CALS Administrative Leadership Group periodically meets with focus groups representing organizations within Wisconsin in a series of meetings called CALS Roundtables. Focus groups include traditional and non-traditional stakeholders. Input from these stakeholders is used to help identify areas of research need. A listing of these focus groups follows at the end of this section. The primary goal of the CALS Roundtable is to improve communication between the College and the individuals it serves and to provide feedback to the College. The Roundtable provides periodic opportunities for leaders of user groups to interact informally with CALS Administration and faculty to discuss: a) user group needs and opportunities; b) current CALS programs and program proposals and their effectiveness; and c) ways to increase cooperation among user groups, the university, and state and federal agencies. Discussions focus primarily on issues related to CALS research, education, and extension/outreach programs.

Focus Group List:

- General Agriculture
- Food Processing and Marketing
- Animal Agriculture
- Plant Groups
- Environmental and Natural Resources
- Green and Forestry
- Biotechnology
- Sustainable and Organic Food Produces
- Consumer and Non-Traditional Groups

The Administrative Leadership Group also participates in many public or stakeholder sponsored meeting/field days for public input. Normally, we would participate in 50-100 of these events per year, including field days at our Agricultural Research Stations.

3. A statement of how the input will be considered

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

Brief explanation.

Stakeholder input is considered in a variety of ways by the CALS Administrative Leadership Group. One of the most important ways it influences future direction is through the faculty-position allocation process. CALS Leadership makes use of this input in prioritizing faculty positions to be allocated to departments for hiring. These hires determine the capacity that will be available to meet current and emerging needs. A successful strategic hire will be able to address current needs as well as the ability to alter a course for newly emerging areas of need. In making these hires, we are setting priorities, and identifying emerging areas, setting new direction for research programs with the new hires, and making budget commitments.

While we are using this information to set a long-term course (in the case of faculty hires), we also use this information for making more immediate decisions. Examples include investing funding to direct current faculty and their research into emerging issues such as bio-energy and the bio-economy. One example would be our recent investment in support of sustainable agriculture by working closely with the Wisconsin Institute for Sustainable Agriculture (WISA) program. We also consider this input in other activities such as annual budget allocation, providing feedback to departments and faculty and most importantly in setting priorities in our Formula Grant research Call for Proposals and the making decisions on allocation of these funds.

V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Wisconsin Competitive Research Program
2	Global Food Security and Hunger
3	Climate Change
4	Sustainable Energy
5	Childhood Obesity
6	Food Safety

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Wisconsin Competitive Research Program

2. Brief summary about Planned Program

Wisconsin Competitive Research Program

The Wisconsin Competitive Research Program is an evolutionary program that attempts to support the best science relative to national, regional, and state needs and priorities. The program process reallocates approximately 20% of the Hatch portfolio each year based upon a competitive process among our faculty. The program uses the national goals and emphasis areas established in the REE and NIFA strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process allows us to continually update our portfolio, because projects are generally approved for 3-4 years. At the end of each project, faculty must re-apply documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

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 : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			8%	
112	Watershed Protection and Management			8%	
131	Alternative Uses of Land			6%	
133	Pollution Prevention and Mitigation			5%	
135	Aquatic and Terrestrial Wildlife			8%	
136	Conservation of Biological Diversity			6%	
302	Nutrient Utilization in Animals			6%	
305	Animal Physiological Processes			5%	
307	Animal Management Systems			5%	
601	Economics of Agricultural Production and Farm Management			3%	
603	Market Economics			3%	
604	Marketing and Distribution Practices			3%	
608	Community Resource Planning and Development			3%	
609	Economic Theory and Methods			3%	
702	Requirements and Function of Nutrients and Other Food Components			11%	
723	Hazards to Human Health and Safety			3%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			3%	
805	Community Institutions, Health, and Social Services			5%	
901	Program and Project Design, and Statistics			3%	
903	Communication, Education, and Information Delivery			3%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.
2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.
3. Funding of the program will continue in a stable manner.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.
2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	154.0	0.0
2013	0.0	0.0	154.0	0.0
2014	0.0	0.0	154.0	0.0
2015	0.0	0.0	50.0	0.0
2016	0.0	0.0	50.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Formula funds are being used to address a number of state priority research activities that cannot be classified as 'Global Food Security', 'Climate Change', 'Sustainable Energy', 'Childhood Obesity', and 'Food Safety'. We have grouped these ongoing projects under the rubric of the "Wisconsin Competitive Research Program", but funds supporting these projects will be redirected to the new national

priorities in the future. These projects do contribute to a variety of important state needs and are focused in several areas, including water resource issues, animal health, including wildlife and non-farm animals, applied statistics in support of agricultural research, policy analysis for use in land use planning and commodity programs, immigrant farm labor issues, management of invasive exotic organisms and bio-waste management.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Field Days) 	<ul style="list-style-type: none"> ● Web sites other than eXtension ● Other 1 (Press Releases)

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder information section provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.

Graduate Students Trained:

- 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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Condition Outcome Measure

2012:150 2013:150 2014:150 2015:90 2016:50

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 131 - Alternative Uses of Land
- 133 - Pollution Prevention and Mitigation
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes
- 307 - Animal Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods
- 702 - Requirements and Function of Nutrients and Other Food Components
- 723 - Hazards to Human Health and Safety
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 805 - Community Institutions, Health, and Social Services
- 901 - Program and Project Design, and Statistics
- 903 - Communication, Education, and Information Delivery

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

Description

A variety of factors could affect the outcomes of this project including those listed above. However, the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger

2. Brief summary about Planned Program

The Global Food Security and Hunger Program is a new program that attempts to support the best science relative to national, regional, and state needs and priorities. To support the priorities of USDA, NIFA, Wisconsin will begin to direct proposals towards this priority as well as the other four priorities. This program will use the national goals and emphasis areas established by USDA, NIFA to develop strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process will allow us to continually update our portfolio. At the end of each project, faculty will be required to submit a new proposal, documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

3. Program existence : New (One year or less)

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 : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships			5%	
133	Pollution Prevention and Mitigation			2%	
201	Plant Genome, Genetics, and Genetic Mechanisms			10%	
202	Plant Genetic Resources			7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			3%	
204	Plant Product Quality and Utility (Preharvest)			7%	
205	Plant Management Systems			3%	
206	Basic Plant Biology			6%	
211	Insects, Mites, and Other Arthropods Affecting Plants			7%	
212	Pathogens and Nematodes Affecting Plants			16%	
213	Weeds Affecting Plants			4%	
215	Biological Control of Pests Affecting Plants			3%	
216	Integrated Pest Management Systems			8%	
301	Reproductive Performance of Animals			2%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			3%	
304	Animal Genome			3%	
601	Economics of Agricultural Production and Farm Management			4%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			1%	
721	Insects and Other Pests Affecting Humans			1%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.
2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.
3. Funding of the program will continue in a stable manner.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.
2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	57.0	0.0
2013	0.0	0.0	57.0	0.0
2014	0.0	0.0	57.0	0.0
2015	0.0	0.0	57.0	0.0
2016	0.0	0.0	57.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Faculty working on food security and hunger issues transcend discipline lines and use a variety of biological, physical and social science approaches in working on these issues. The majority of our work involves improvements in the management of important livestock and crop food sources, especially in the upper Midwestern US, but many projects will have broad applications beyond our borders, including herbicide resistance, identification and application of genes of economic significance, practices for maintaining soil fertility, conservation and management of crop genetic resources, technologies to improve fertility in livestock, and management of a variety of globally important micro-organisms. Work is also

occurring in the areas of urban poverty and food security, especially in metropolitan areas and among recent immigrants, and in social network analysis and socio-ecological systems.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Field Days) 	<ul style="list-style-type: none"> ● Web sites other than eXtension ● Other 1 (Press Releases)

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder section information provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.

Graduate Students Trained:

- 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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Condition Outcome Measure

2012:90	2013:90	2014:90	2015:90	2016:90
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3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 133 - Pollution Prevention and Mitigation
- 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
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 304 - Animal Genome
- 601 - Economics of Agricultural Production and Farm Management
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 721 - Insects and Other Pests Affecting Humans

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

Description

A variety of factors could affect the outcomes of this project including those listed above. However, the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Climate Change

2. Brief summary about Planned Program

The Climate Change Program is a new program that attempts to support the best science relative to national, regional, and state needs and priorities. To support the priorities of USDA, NIFA, Wisconsin will begin to direct proposals towards this priority as well as the other four priorities. This program will use the national goals and emphasis areas established by USDA, NIFA to develop strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process will allow us to continually update our portfolio. At the end of each project, faculty will be required to submit a new proposal, documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

3. Program existence : New (One year or less)

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 : No

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			7%	
102	Soil, Plant, Water, Nutrient Relationships			21%	
112	Watershed Protection and Management			4%	
132	Weather and Climate			7%	
133	Pollution Prevention and Mitigation			15%	
136	Conservation of Biological Diversity			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			4%	
204	Plant Product Quality and Utility (Preharvest)			4%	
205	Plant Management Systems			4%	
213	Weeds Affecting Plants			4%	
307	Animal Management Systems			11%	
402	Engineering Systems and Equipment			4%	
403	Waste Disposal, Recycling, and Reuse			4%	
903	Communication, Education, and Information Delivery			7%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.
2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.
3. Funding of the program will continue in a stable manner.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.
2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	2.0	0.0
2013	0.0	0.0	2.0	0.0
2014	0.0	0.0	2.0	0.0
2015	0.0	0.0	8.0	0.0
2016	0.0	0.0	8.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Our faculty have initiated several projects that anticipate the impacts of climate change on agricultural and wild ecosystems in the upper Midwestern US. Most of these projects are currently supported using McIntire-Stennis formula funds, but we anticipate that more Hatch funds will be directed here in the future. The State of Wisconsin has initiated a Wisconsin Climate Change Initiative (WICCI) group that brings together our faculty and interested clientele from other agencies and industries to discuss and plan for research on, and adaptive response to, climate change. Current projects include work on development of monitoring systems for detecting changes in ecosystems structure and processes over time, soil carbon management practices, silvicultural practices to help ameliorate ecosystem changes

resulting from anticipated climate change, remote sensing detection of insect and disease problems associated with climate change, and modeling of conservation practices and land use patterns that might result from climate change.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Field Days) 	<ul style="list-style-type: none"> ● Web sites other than eXtension ● Other 1 (Press Releases)

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder section information provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.

Graduate Students Trained:

- 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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Knowledge Outcome Measure

2012:0	2013:1	2014:2	2015:2	2016:8
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3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 136 - Conservation of Biological Diversity
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 213 - Weeds Affecting Plants
- 307 - Animal Management Systems
- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 903 - Communication, Education, and Information Delivery

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

Description

A variety of factors could affect the outcomes of this project including those listed above. However, the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

The Sustainable Energy Program is a new program that attempts to support the best science relative to national, regional, and state needs and priorities. To support the priorities of USDA, NIFA, Wisconsin will begin to direct proposals towards this priority as well as the other four priorities. This program will use the national goals and emphasis areas established by USDA, NIFA to develop strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process will allow us to continually update our portfolio. At the end of each project, faculty will be required to submit a new proposal, documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

3. Program existence : New (One year or less)

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 : No

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			6%	
104	Protect Soil from Harmful Effects of Natural Elements			6%	
125	Agroforestry			6%	
131	Alternative Uses of Land			6%	
205	Plant Management Systems			11%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
307	Animal Management Systems			6%	
401	Structures, Facilities, and General Purpose Farm Supplies			6%	
402	Engineering Systems and Equipment			11%	
601	Economics of Agricultural Production and Farm Management			6%	
604	Marketing and Distribution Practices			6%	
605	Natural Resource and Environmental Economics			12%	
608	Community Resource Planning and Development			6%	
723	Hazards to Human Health and Safety			6%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be

noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.

2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.

3. Funding of the program will continue in a stable manner.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.

2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	9.0	0.0
2013	0.0	0.0	9.0	0.0
2014	0.0	0.0	9.0	0.0
2015	0.0	0.0	9.0	0.0
2016	0.0	0.0	9.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Our engineering and life science faculty have become heavily involved in the development of sustainable energy systems for the upper Midwestern US. Projects are ongoing in the areas of energy efficient construction technologies for farm buildings, textile material development with energy conservation applications, bioconversion of cellulose to fuel ethanol, value-added uses of byproducts of biofuel production systems, capacity building in support of bio-fuels outreach development, evaluation and production of various new bio-feedstocks, and carbon sequestration issues on private and public lands.

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">• Workshop• Group Discussion• One-on-One Intervention• Demonstrations• Other 1 (Field Days) | <ul style="list-style-type: none">• Web sites other than eXtension• Other 1 (Press Releases) |
|---|---|

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder section information provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.

Graduate Students Trained:

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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Condition Outcome Measure

2012:15 2013:15 2014:15 2015:15 2016:15

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 125 - Agroforestry
- 131 - Alternative Uses of Land
- 205 - Plant Management Systems
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 307 - Animal Management Systems
- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 402 - Engineering Systems and Equipment
- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices
- 605 - Natural Resource and Environmental Economics
- 608 - Community Resource Planning and Development
- 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

Description

A variety of factors could affect the outcomes of this project including those listed above. However, the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Childhood Obesity

2. Brief summary about Planned Program

The Childhood Obesity Program is a new program that attempts to support the best science relative to national, regional, and state needs and priorities. To support the priorities of USDA, NIFA, Wisconsin will begin to direct proposals towards this priority as well as the other four priorities. This program will use the national goals and emphasis areas established by USDA, NIFA to develop strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process will allow us to continually update our portfolio. At the end of each project, faculty will be required to submit a new proposal, documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

3. Program existence : New (One year or less)

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 : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
302	Nutrient Utilization in Animals			17%	
304	Animal Genome			17%	
305	Animal Physiological Processes			17%	
701	Nutrient Composition of Food			17%	
703	Nutrition Education and Behavior			32%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change

- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.
2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.
3. Funding of the program will continue in a stable manner.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.
2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	4.0	0.0
2013	0.0	0.0	4.0	0.0
2014	0.0	0.0	4.0	0.0
2015	0.0	0.0	4.0	0.0
2016	0.0	0.0	4.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

Faculty in Nutritional Science, Biochemistry and Life Sciences Communication are assessing the causes and consequences of childhood obesity. Ongoing projects include work in nutritional aspects of diabetes, promotion of healthful eating campaigns, dietary markers of human health and nutrition, obesity prevention, and related studies.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Field Days) 	<ul style="list-style-type: none"> ● Web sites other than eXtension ● Other 1 (Press Releases)

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder section information provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.
Graduate Students Trained:

- 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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Condition Outcome Measure

2012:5	2013:5	2014:5	2015:5	2016:5
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3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 304 - Animal Genome
- 305 - Animal Physiological Processes
- 701 - Nutrient Composition of Food
- 703 - Nutrition Education and Behavior

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

Description

A variety of factors could affect the outcomes of this project including those listed above. However,

the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety

2. Brief summary about Planned Program

The Food Safety Program is a new program that attempts to support the best science relative to national, regional, and state needs and priorities. To support the priorities of USDA, NIFA, Wisconsin will begin to direct proposals towards this priority as well as the other four priorities. This program will use the national goals and emphasis areas established by USDA, NIFA to develop strategic plans and areas of identified research needs for Wisconsin as priority areas for the process. This process will allow us to continually update our portfolio. At the end of each project, faculty will be required to submit a new proposal, documenting not only need, relevance to program priorities (including integrated activity and multistate programs), and scientific merit, but also productivity of the project to date.

3. Program existence : New (One year or less)

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 : No

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
135	Aquatic and Terrestrial Wildlife			2%	
211	Insects, Mites, and Other Arthropods Affecting Plants			2%	
212	Pathogens and Nematodes Affecting Plants			4%	
302	Nutrient Utilization in Animals			5%	
305	Animal Physiological Processes			9%	
308	Improved Animal Products (Before Harvest)			5%	
311	Animal Diseases			9%	
314	Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals			2%	
315	Animal Welfare/Well-Being and Protection			2%	
403	Waste Disposal, Recycling, and Reuse			4%	
404	Instrumentation and Control Systems			2%	
501	New and Improved Food Processing Technologies			15%	
502	New and Improved Food Products			8%	
503	Quality Maintenance in Storing and Marketing Food Products			2%	
701	Nutrient Composition of Food			2%	
702	Requirements and Function of Nutrients and Other Food Components			7%	
704	Nutrition and Hunger in the Population			2%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			2%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			14%	
723	Hazards to Human Health and Safety			2%	
	Total			100%	

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

1. Situation and priorities

Five goals established by the USDA National Institute of Food and Agriculture (NIFA), include:

- 1) Global Food Security and Hunger
- 2) Climate Change
- 3) Sustainable Energy
- 4) Childhood Obesity
- 5) Food Safety

These goals will be listed as priorities for projects to be funded in the Wisconsin Research program. In using the nationally devised goals and themes as the reporting framework, it also should be noted that research projects frequently do not fit neatly and exclusively into one and only one category. Research projects are frequently at the intersecting points of disciplines and interests. We view this interdisciplinary nature of our research efforts as a strength.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, The CALS Leadership Group and faculty meet regularly with a number of college and departmental advisory groups, commodity organizations, state agencies, consumer groups, and private citizens. Input from these stakeholders, and from those performing the research, is beneficial to assist in highlighting areas of research need. Department Chairs are also asked to provide a small number of research topics from each unit of CALS for use in the Hatch, Hatch Multistate, and McIntire-Stennis Call for Proposals. Input from stakeholders is reviewed and discussed periodically as information is obtained at regularly scheduled meetings of the CALS Administrative Leadership Group. The following is a compilation of common themes established as the result of these discussions, reviews, and updates by College administration. The list below is provided to draw attention to needs currently of interest within the state, and is published annually as part of the WAES's Call for Proposals for our Formula Grant program.

- 1) Mechanisms of pest and pathogen resistance as well as the safe and effective control of pests and pathogens, with minimum effects on environmental quality and human health.
- 2) Effects of change in global climate, human population pressures, and public policy on agricultural production, environmental resources, ecosystem management, and future land uses.
- 3) Identification of socioeconomic or other forces that shape the viability of Wisconsin industries and employment including agriculture, bio-based industry, forestry, wildlife management, recreation, and other land uses.
- 4) Research on food safety, nutritional health, environmental protection, and biotechnology and on providing information on dietary choices, lifestyle and community decisions.
- 5) Sustainable agricultural and forestry production and processing systems that provide improved food safety and security, environmental protection, economically viable communities, protection of public goods, and human well-being. This need requires an understanding of basic life processes and model plant/animal systems in order to manage biotic systems for human use.
- 6) Research and development related to agricultural processes with the potential to enhance the productivity and quality of livestock and food and bio-fuel crops in a sustainable manner.

2. Scope of the Program

- 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 following assumptions are made for this program:

1. The greatest advances in addressing national, regional, and state needs can be made by competitively soliciting the best science and research.
2. Graduate training efforts supported through the UW-Madison competitive Formula Grant opportunity will provide a sound basis for the future of the Formula Grant related sciences and issues.

2. Ultimate goal(s) of this Program

1. To address national and state issues with the science of the highest quality and greatest potential to have an effect in addressing the issues relevant to the Formula Grant mission.
2. Train graduate students to build the human resources needed to address current and future problems relevant to the Formula Grant mission.

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
2012	0.0	0.0	25.0	0.0
2013	0.0	0.0	25.0	0.0
2014	0.0	0.0	25.0	0.0
2015	0.0	0.0	25.0	0.0
2016	0.0	0.0	25.0	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

The development and evaluation of improved technologies in food processing, and on-farm food safety practices have received increasing attention from faculty in several departments. Research is

being conducted on several important food toxins and their causal organisms (e.g. Asprgillus), mastitis resistance as a component of on-farm food safety, the development of new thermal food preservation technologies, biotoxins and food safety, nanotechnology applications in food sensors, residual pesticides in foods, symbiotic associations between antibiotic producing bacteria and honeybees, vitamin D deficiencies, and several other areas.

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"> ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations ● Other 1 (Field Days) 	<ul style="list-style-type: none"> ● Web sites other than eXtension ● Other 1 (Press Releases)

3. Description of targeted audience

Integrated activity for our Formula Grant programs targets a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder section information provided elsewhere in this report.

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

- Output measures for this project include patents, graduate students trained, and publications. This estimated output will be refined as we gain experience with this measure for Formula Grant supported work.

Graduate Students Trained:

- 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	<p>Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.</p> <p>Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.</p> <p>Publications:</p>

Outcome # 1

1. Outcome Target

Outcome measures for this work are both qualitative and quantitative. We will rely on feedback from stakeholder groups, advisory boards, and individual constituents, as well as from UW Extension teams on the relevance, importance and impact of our research program. The output measures listed earlier will also serve as outcome measures in that patents graduate degrees and publications all include an element of critical review and assessment of uniqueness, originality, contribution to the science and knowledge base, or other performance criteria. Finally, we will use the Thomson ISI Essential Science for agricultural science as one of our measures of impact of our research program.

Our target for these outcome measures is to be ranked in the top 5 institutions in the United States. We will continue to develop impact statements for individual projects which have shown exemplary and significant impact.

Publications:

2. Outcome Type : Change in Condition Outcome Measure

2012:50	2013:50	2014:50	2015:50	2016:30
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3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Pathogens and Nematodes Affecting Plants
- 302 - Nutrient Utilization in Animals
- 305 - Animal Physiological Processes
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 314 - Toxic Chemicals, Poisonous Plants, Naturally Occurring Toxins, and Other Hazards Affecting Animals
- 315 - Animal Welfare/Well-Being and Protection
- 403 - Waste Disposal, Recycling, and Reuse
- 404 - Instrumentation and Control Systems
- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 503 - Quality Maintenance in Storing and Marketing Food Products
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 704 - Nutrition and Hunger in the Population
- 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
- 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

Description

A variety of factors could affect the outcomes of this project including those listed above. However, the breadth of the program makes it unlikely that the outputs would be completely disrupted unless there was some major natural, economic, or public policy disruption. A major change in Federal policy or appropriation affecting the Formula Grant program could affect our ability to produce our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt from tuition remission charges in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we continue to discuss alternatives to meeting our Formula Grant missions in order to continue training graduate students. We continue to make graduate student training the priority of our program.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Evaluation studies planned include qualitative and quantitative methodology. We have already described a number of methods used to solicit stakeholder input. At the time input is being sought from these groups, boards, and individuals, we are also soliciting feedback on the pertinence and effectiveness of our current programs. This information is primarily qualitative, but provides important feedback on the program. Similar input will be sought from UW Extension's issue oriented teams.

In the competitive re-application process for WAES projects, project productivity (past performance) and impact are also evaluated. This occurs every 2-4 years and is an important factor in whether a scientist's new project will be approved.

Overall project success will be evaluated by monitoring the number of graduate students trained, peer reviewed publications, and our research impact based on the ISI Essential Science Indicators. While this is an indicator of our overall CALS research program, we believe that it is also representative of our Formula Grant research component.

