

2013 University of Wisconsin Research Plan of Work

Status: Accepted

Date Accepted: 05/24/2012

I. Plan Overview

1. Brief Summary about Plan Of Work

Operating Philosophy/ Program Overview:

The Wisconsin Agricultural Experiment Station (WAES) is committed to investigator-driven and peer-reviewed research. Our general philosophy is to allocate Formula funding to support specific, peer-reviewed projects rather than to distribute block grants to departments. The largest portion of our allocation goes to support graduate student education. The expenditures that we allow to be covered with Formula funding are laid out in a set of guidelines that are reviewed annually by a faculty committee. The Formula funds are matched at the state level primarily in the form of state support of salaries for investigators and research staff. As in prior years, we administered a small percentage of our funds to address emerging issues or critical needs.

ALLOCATION OF FUNDS

We use Formula funds to support approximately 145 projects each year with budgets that cover personnel (mainly graduate students) as well as supplies, student hourly help and travel. Funding of capital equipment items is distributed in a separate exercise and prioritized by departments, with some capital equipment items shared by several projects. We pay for travel to multistate research meetings out of a central pool of funds, covering travel costs of one representative per project.

The Research Program in this Plan of Work consists of a number of projects with individual review and reporting. While the program itself may extend for multiple years, the projects that comprise it are a constantly shifting portfolio that can be quickly redirected. Projects are approved for periods of one to four years, with most on a three- or four-year cycle. Proposals for new projects require an evaluation of productivity of previous projects that received Formula fund support. Past performance is one of several criteria that we use to rank proposals and evaluate the research team's ability to complete the research project successfully. Multistate revised proposals must be reviewed and approved at least once every four years.

Each year, we redirect roughly 20% of our Formula-funded research portfolio to address state and national priorities as spelled out in the annual RFP. By continually re-examining our portfolio, we are able to address short-term, intermediate term and long-term issues. We may fund a small number of new projects at mid-year as new faculty members are hired or emerging problems require immediate attention. These mid-year projects are funded at the discretion of the Associate Dean for Research/Assistant Dean of the WAES with input from the WAES/College of Agricultural and Life Sciences Administrative Leadership Group. This ongoing portfolio review ensures that we invest in projects that are relevant to the REE and NIFA national goals and emphasis areas and focus on current state research needs.

ESTABLISHING RESEARCH PRIORITIES

The WAES establishes research priorities using a general "logic model" process. To identify state priorities, we seek input from diverse stakeholders representing traditional and non-traditional agriculture, natural resource, human health and community groups. We also seek input at public meetings, such as field days at our Agricultural Research Stations and other Extension events. In addition, we ask issue-based teams composed of UW-Extension faculty and county-based educators, about the priorities in their areas.

In addition, our research priorities follow those spelled out in the five goals established by the USDA

National Institute of Food and Agriculture (NIFA): 1) Global Food Security and Hunger; 2) Climate Change; 3) Sustainable Energy; 4) Childhood Obesity; and 5) Food Safety.

Within these national goals, states are asked to draw on stakeholder input to help direct use of Formula Grant funding. In Wisconsin, the CALS Administrative Leadership Group and faculty meet regularly with college and departmental advisory groups, commodity organizations, state agencies, consumer groups and private citizens. What we learn from our stakeholders and from those performing the research helps us identify areas where research is needed. We also ask department chairs to propose a small number of research topics 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.

It should be noted that our research projects often do not fall into a single priority category, but rather intersect two or more. We feel that our researchers' engagement across a breadth of disciplines and priorities is a key strength of our program.

Our research priorities are reflected in the following themes compiled 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.

We provide a list of Wisconsin priorities and national goals to faculty for use in developing proposals for funding under the Formula Grant programs. The panel evaluates each proposal and makes its recommendations using these priorities and other criteria related to Extension/Integrated activity, multistate participation, under-represented populations/groups and the researcher's past Formula Grant productivity.

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 when projects were to begin. 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>.

EVALUATION OF PROPOSALS

Proposals are evaluated by our Research Advisory Committee (RAC), composed of 10 faculty members along with the Associate and Assistant Deans of the Agricultural Experiment Station. RAC members are selected to represent the broad cross section of the college and serve rotating three-year terms. Each proposal is assigned to a primary and secondary reviewer from the RAC members and to two other scientific reviewers not on the RAC. These non-RAC reviewers may or may not be members of our faculty. Reviewers are selected based on their knowledge and ability to judge a proposal's merits. The RAC convened in late November to rank the proposals. 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.

ASSESSING OUTCOMES AND IMPACT

We look at several indicators to assess the impact and outcomes of a program. These include peer-reviewed publications, efforts to share results with client groups through workshops or other venues, 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 have been rated first among peer institutions in the Scientific Impact Factor of its publications. We feel this achievement reflects our entire research portfolio, including projects funded by 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. Repr

Title: Development of a sustainable post-frame building system

Impact nugget: Researchers are developing a way to create more sustainable post frame buildings, a type of construction used for virtually every new structure in modern agriculture and in many other settings. The new system substantially reduces the use of preservative-treated lumber and employs components that can easily be disassembled and reused when the original structure is no longer needed.

Issue (who cares and why): Post frame buildings are ubiquitous across today's rural landscape. Virtually every new structure on a modern farm is built this way, including those used for animal housing, commodity storage, machinery storage and repair. Although they're easy to erect, versatile and cost effective, they have their shortcoming. Most of these structures use a relatively large quantity of preservative-treated lumber. In addition to creating disposal issues, newer preservative treatments tend to leach more copper than older formulations. This increases corrosion rates of metal-framed doors and windows, fasteners and metal siding that are in contact with the treated lumber, and it also results in more copper finding its way to the surrounding environment. For this reason, copper and other heavy metal-based treatments are likely to be banned in the future. With a potential zero future salvage value, installation of treated lumber in new buildings becomes less attractive, especially in farm buildings, which often quickly outlive the use for which they were constructed because of the fast-changing nature of agricultural practices.

What has been done: Our research team has developed a new framing system for post-frame building, known as "Green Frame". Structures built in this manner are more durable and contain less preservative-treated lumber compared to typical post frame buildings. That is because posts are not sunk into the ground; rather they stand atop precast or cast-in-place concrete piers and are connected to the piers with a special steel connecting system. The system uses less wood, partly because rather than employing the heavy timber posts used in traditional post-frame construction, the Green Frame posts are I-shaped assemblies fabricated from a combination of dimension lumber and laminated strand lumber. Another environmentally friendly feature relates to how the frame is connected. Both girts (members that connect and brace the vertical posts) and purlins (members connecting roof trusses) feature special deep end-notches that make assembly easier, safer and more accurate. They also make the framing components easier to disassemble for re-use in new structures when the original building is no longer needed.

Impact: Bohnhoff has shared his findings with builders through refereed articles in technical

periodicals published by the post-frame building industry and by making presentations at industry events at both the state and national level. Some builders are adopting parts of the system, including precast concrete piers and notched girts and purlins. He has several efforts in the works to encourage builders to try these techniques. He will be constructing some demonstration buildings so that builders better understand the system, and is developing standards for builders to follow in using these techniques.

Funding: WIS01167

More information: David Bohnhoff, 608-262-9546, bohnhoff@wisc.edu

Knowledge area(s): 401

Title: Attenuated Strains of Salmonella for Use as Live Vaccine

Impact nugget: University of Wisconsin-Madison researchers have created a mutant strain of Salmonella that has the potential to work as a live vaccine in chickens, pigs and cattle. By protecting our food animals from this bacterial infection, this vaccine could prevent salmonellosis outbreaks in the human population.

Issue (who cares and why): Salmonella infection is one of the leading causes of acute bacterial gastroenteritis in the United States, responsible for an estimated 1.4 million cases of illness annually, with an estimated cost of \$2.5 billion. Each year, these infections lead to approximately 15,000 hospitalizations and 400 deaths. Often, people become infected when they eat contaminated foods, particularly chicken, pork, beef, eggs and raw milk. One way to break the chain of infection--from animals to humans--is to vaccinate our food animals on the farm. This has the potential to stop the infection at its source.

What has been done: A team of University of Wisconsin-Madison researchers has created a mutant strain of Salmonella enterica typhimurium that is much less pathogenic than the normal "wildtype" strain. The mutant lacks the gidA gene, which controls a suite of genes that helps the bacterium invade and infect host animals. Administered to mice like a vaccine, this weakened strain of Salmonella has been shown to protect animals against subsequent inoculation with a deadly dose of the full-strength wildtype strain of the bacterium.

Impact: With further testing and development, this work could lead to new live vaccines against Salmonella for chickens, pigs and cattle. By protecting our food animals from infection, this technology could help prevent some of the 1.4 million cases of salmonellosis that Americans experience each year. This work has been shared with the scientific community through two peer-reviewed journal articles, and the research team is now studying the nature of the immune response that this live vaccine candidate--the gidA mutant--triggers in mice.

Funding:WIS01380

More Information:Amin Fadl, 608-890-2398, fadl@wisc.edu

Knowledge area(s): 712

Title: Conservation of Ecosystem Services in a Biofuel Agricultural Landscape

Impact nugget: As the demand for sustainable energy sources including biofuel increases, the face of our agricultural landscape will change dramatically. Beneficial insects that provide crucial ecosystem services such as pollination and pest control are especially sensitive to these changes in the landscape. One goal of this project is to understand how landscape changes due to an increasing demand for biofuel crops influence the diversity and abundance of native pollinators and the services they provide.

Issue (who cares and why): Animal-mediated pollination, required by 90 percent of flowering plants and 35 percent of crops, is crucial to food production. It's also crucial to human health; the majority of vital nutrients are obtained through pollinator-dependent crops. Given the current crisis facing the domesticated European honeybee (colony collapse disorder), we need to understand and enhance the effectiveness of native pollinators. As biofuel crop acreage expands, the sustainability of pollinator-dependent agriculture will depend on our ability to develop biofuel cropping systems that optimize ecosystem services, including pollination by native bees.

What has been done: In order to address these issues, researchers have used cranberry, a pollinator-dependent crop, as a model system. Wisconsin is the top producer of cranberries in the country and cranberry growers spend thousands of dollars per operation each year to rent honeybees for pollination and could benefit by using native bees instead. For this portion of the study, researchers focused on how landscape factors affect pollinators in commercial cranberry bogs located near varying sizes and mixes of agricultural crops (including biofuel crops) and woodlands in central Wisconsin.

They found that these bees are responding (in abundance and number of species) not only to the type of habitat in the surrounding landscape but also to how the habitat is arranged. Sites could have the same proportion of woodland, for example, but if the woodland near one site is a continuous block and at another is arranged in linear strips, bee diversity near the linear strips will be higher.

A surprising result was the extent of bee diversity. To date researchers have identified about 175 species of native bees in this single cropping system. This was high compared to other studies. Moreover, these species seem to have fairly high turnover from year to year, indicating that this community is constantly shifting. Researchers collected several species of bees not recorded for the state of Wisconsin and documented some 20 individuals of a rare species of bumblebee that has not been seen in Wisconsin for several years.

Impact: This work is generating the information that cranberry growers--and others who grow pollinator-dependent crops--will need to manage their lands to support native pollinators as the surrounding agricultural landscape shifts to include more biofuel crops. If honeybees continue to decline, native bees may be able to provide insurance against crop failure.

The researchers have shared their findings with growers and UW-Extension agents at the North American Cranberry Researcher and Extension Worker Conference and the Wisconsin State Cranberry Growers Association, as well as through professional conferences, including meetings of the Ecological Society of America and the Entomological Society of America.

Funding:WIS01415

More information:Claudio Gratton, 608-265-3762, cgratton@wisc.edu

Knowledge area(s):136

Title:Management systems to improve the economic and environmental sustainability of dairy enterprises

Impact nugget: Using a new approach, dairy producers can reduce the amount of feed it takes to raise dairy replacement heifers to productive maturity, while cutting the amount of manure produced. This new system is helping Wisconsin's dairy farmers enhance the economic performance and sustainability of their operations.

Issue (who cares and why): Wisconsin's dairy producers continuously raise an estimated 1.1 million

female calves to replace aging dairy cattle in the state's milking herd. This effort takes more than four million tons of feed, while producing 12 million pounds of manure per year. Producers would benefit from a more economically and environmentally sustainable way to raise heifers.

What has been done:Typically, young and growing dairy replacement heifers are given all the feed they can eat in order to bring the animals into the milking herd as quickly as possible. An alternative approach, known as limit feeding, limits the amount of feed the animals receive, which helps to cut back on their manure production. But there have been concerns about the short- and long-term effects of this approach. In particular, it may take calves longer to reach their maturity targets, limit-fed cows may have more problems getting pregnant and they may not produce as much milk as cows raised using regular feeding practices. In this multi-year research study, a team of University of Wisconsin-Madison scientists raised calves both ways--using the limit feeding approach and the typical, all-you-can-eat approach--and compared the differences.

They found that the limit feeding approach improved feed efficiency by more than 20 percent over standard practices, while fecal and urine output decreased by 10 pounds per animal per day. Additionally, the research proved that heifers on a limited ration reached target breeding weights on time and their performance in the milking herd could not be distinguished from cows raised using other heifer growing systems. The researchers also found that phosphorus can be reduced in their feed, reducing the amount of phosphorus they excrete in their manure.

Impact:The scientists have shared their findings with more than 5,000 dairy producers and dairy nutrition consultants through international, national, state and local dairy educational conferences. Through this effort, limit feeding is growing in popularity among commercial dairy producers and heifer growers and is now considered a common practice.

Funding: WIS01237

More Information:Pat Hoffman, 715-387-2523, pchoffma@wisc.edu

Knowledge area(s): 102,302

Title:Survey of the availability of phosphorus from various manures and manipulated manures when applied to Wisconsin soils

Impact nugget: New information will help Wisconsin farmers get the most out of the manures they use to fertilize their crop fields, while better protecting the state's surface waters.

Issue (who cares and why):Manure from livestock, which is rich in the essential plant nutrient phosphorus, is a valuable soil amendment commonly spread on croplands to provide nourishment for plants. Manure's application must be carefully managed, however, because excess phosphorus tends to run off into streams, rivers and lakes, where it can cause environmental problems. Currently, different manure types are applied to fields in essentially a one-size-fits-all way, yet it has become increasingly clear that manure doesn't behave the same--in terms of phosphorus. Wisconsin's farmers and surface waters would benefit from updated nutrient management guidelines that take into consideration specific manure types and how they interact with the various soil types found in the state.

What has been done: In this multi-year research trial, a team of University of Wisconsin-Madison researchers assessed the "phosphorus availability" of 50 different manures and manipulated manures--including dairy cow, beef cattle, swine and chicken manures in various forms: whole, liquid, composted, digested/separated, etc.-- on 25 different soils in a lab incubation. It was discovered that there is much more variability between manure types--such as manure from dairy cows versus swine--than was previously known. The researchers also found that each soil type has a different reaction to phosphorus in manure.

Impact: The results of this work are being incorporated into the University of Wisconsin-Extension nutrient management guidelines for manure. Wisconsin growers use these guidelines nearly universally to develop nutrient management plans for their operations, which are required by the state. These changes will help growers get the most out of the manures they spread on their crop fields, while further minimizing risks to the environment.

Funding: WIS01178

More Information: Carrie Laboski, 608-263-2795, laboski@wisc.edu

Knowledge area(s):102

Title: Viticultural Development in Wisconsin

Impact nugget: A UW-Madison project to grow and study wine grapes in Wisconsin is yielding important information for the state's expanding wine grape industry--including science-based recommendations about cultivar selection and disease and pest management.

Issue (who cares and why): In recent years, an increasing number of entrepreneurs have expressed interest in growing wine grapes in Wisconsin, even though the industry suffers from a lack of science-based information on which to make business decisions. Fundamental information--such as which grape varieties are best suited to the state and how to manage for pests and diseases--has largely been left to best guesses and intuition. In order for the industry to gain a solid foothold, growers need credible, local, reliable information to use in establishing and managing vineyards.

What has been done: A UW-Madison research team has established grape variety evaluation plots at three UW-Madison Agricultural Research Stations located in three distinct geographical/climatic regions of the state. At each station, they are collecting annual data on growth, yield, grape quality and winter hardiness for eight promising French-American hybrid wine grape varieties. Through this work, the researchers have already found that two varieties aren't hardy enough to survive in Northeastern Wisconsin, while one particular variety--Marquette--stands out for high yields and high quality at all locations. They plan to use the fruit quality data to create decision-making tools to help growers select the best time to harvest their crop(s) and the optimal processing conditions. Information about weather conditions and pests will likewise guide the development of Integrated Pest Management approaches for the state's vineyards.

Impact: The UW-Madison research team has generated important science-based information about growing, harvesting and managing wine grapes in Wisconsin, and the team is sharing this information with growers at conferences, field days and other meetings around the state. This work helped lead to the creation of a network of growers who are now able to support each other and exchange ideas in both informal and formal methods. In addition, the researchers have created an Integrated Pest Management e-newsletter to disseminate timely information about plant development, optimal harvest time and recommendations for disease and pest control. So far 250 subscribers have signed up to receive these updates, and that number is poised to grow. The state's vineyard and winery business is clearly growing--just three years ago there were around 40 vineyards operating in the state; now there are more than 70.

Funding: 1315

More information: Brent McCown, 608-262-0574, bhmccown@wisc.edu

Knowledge area(s): 204, 206, 216

Title: Cheese Moisture Testing Improvement

Impact nugget: The moisture level in cheese is a dominant factor in determining how a cheese tastes as it is an important control in fermentation of the bacteria. A medium moisture level provides a pleasing texture and helps the beneficial flavors develop and come through. But moisture level also plays a key role in determining the cost and legal definition of the cheese. If moisture tests erroneously high, the cheesemaker has to add expensive fat and protein to counteract the error. For that reason, it is essential to get an accurate measurement of moisture--yet shifts in the cheese composition often lead to incorrectly high moisture readings, prompting the costly, unnecessary addition of fat and protein solids.

Issue (who cares and why): Because the cheese industry operates on such a small profit margin, the high costs associated with moisture errors are significant to a producer's bottom line. Having moisture content that is overestimated by as little as 0.5 percent, for example, can translate into a 1 cent loss per pound. That might not sound like much, but a commodity cheese would only have 2 cents profit at best, based on average commodity market pricing in recent years. An improved cheese moisture test would be of great advantage to producers in Wisconsin and beyond.

What has been done: The project goal is to find factors and develop procedures to reduce incorrect cheese moisture testing, examining such aspects as chemical composition, sample preparation and analytical methodology.

The most important finding thus far is that cheese with residual lactose or galactose sugars will test higher in moisture content. Lactose is normally found in milk and commonly is called milk sugar. Galactose is one of two sugars that make up lactose, the other being glucose. Some strains of starter cultures used in the cheese will only use glucose and therefore galactose will remain in the cheese.

Medium cheddar and mozzarella cheese samples were analyzed for moisture content using a rapid capability microwave system as well as the standard test using a vacuum oven. These cheeses had been made with adding lactose or galactose. They tested as having higher moisture levels as compared to cheeses that had no sugars added. Moisture content in these cheeses was overestimated by approximately 0.5 percent for the cheddar samples and 1.1 percent for the mozzarella samples.

Impact:As noted, erroneous moisture testing is costly for the cheese industry. Looking at the 780 million pounds of cheese produced each year by farmers and farmer-led cooperatives in Wisconsin, about 40 percent of it could have sugar levels that would lead to inaccurate moisture testing--in other words, about 312 million pounds that could cost cheesemakers \$1.5 to \$3 million dollars in the unnecessary addition of fat and protein solids.

The team's initial finding was submitted as an abstract to the American Dairy Science Association and further findings will be shared with peer-reviewed journals, trade journals and professional associations. Methods of improvement developed by this project could lead to regulatory moisture testing changes for the industry.

Funding: WIS01397

More information: Franco Milani, 608-890-2640, milani@wisc.edu

Knowledge area(s): 501

Title: Sulfonamide Antibiotics In The Environment

Impact nugget: Soil chemists are working to understand the mechanisms that govern the transport of sulfonamide antibiotics that are released into the environment

The issue (who cares and why): Sulfonamide antibiotics are widely used in the livestock industry and, to a lesser extent, for human medical treatment. They enter the environment in household and hospital waste and from runoff and infiltration from animal feeding sites and fields treated with manure and effluent from wastewater treatment plants. Because these antibiotics are generally water-soluble, there is concern that they will be carried through the soil profile to groundwater. The fear is that increased exposure of these antibiotics to microorganisms will result in the development of antibiotic resistance. But knowing how big a threat this really is and developing strategies for managing it requires a better understanding of the chemical mechanisms that allow or prevent the movement of sulfonamides and their ability to interact with soil organisms.

What's been done: A research team led by soil chemist Joel Pedersen is engaged in a line of research that is helping to shed light on what happens to the antimicrobials once they've entered the environment. They conducted experiments to investigate the extent to which sulfonamide antibiotics adsorb to clay minerals and organic matter in soils. Their results suggest that there is relatively little adsorption of these antibiotics to clay minerals in soils. However, they have also determined that these antimicrobials covalently bind to organic material in the soil under appropriate conditions, which tends to prevent their movement through soil and limits their availability to microorganisms. A subsequent study examined more closely the mechanisms by which this binding takes place--including the significance of enzymes produced by soil microorganisms in promoting the reactions that form the covalent bonds. Another study characterized a different pathway by which these antibiotics can be broken down to compounds that do not have the antibiotic effect that sulfonamides do.

Impact: These studies have provided a better understanding of the complex mix of factors that influence the movement of antibiotics through the environment. The findings have been widely shared through journal publications (five in Environmental Science and one in the Journal of Environmental Quality) and presentations at scientific conferences in the U.S. and abroad, laying the groundwork for additional research that can help environmental scientists develop strategies to evaluate and mediate the risks involved. Pedersen and UW-Madison colleagues will soon undertake one such study that will focus on the fate of pharmaceuticals contained in waste treatment products that are introduced into agricultural systems through spreading biosolids on fields and irrigating with treated wastewater. The study will examine the uptake of a variety of pharmaceuticals by representative crop plants.

Funding: WIS04621 and WIS04902

More information: Joel Pedersen, 608-263-4971, joelpedersen@wisc.edu

Knowledge area(s): 133

Title: Creating more water-efficient landscapes

Impact nugget: Wisconsin turfgrass researchers are looking at ways to reduce the amount of potable water used to irrigate turfgrass. They're evaluating species that require less water to see how they perform under Wisconsin growing conditions, developing an easier and more accurate way to measure water use on turf, and exploring the efficacy of watering Wisconsin turf with wastewater.

The issue (who cares and why): Although Wisconsin is one of the most water-rich places on earth, a number of the state's communities are finding it more challenging to provide enough potable water to meet growing demand. Waukesha County, for example, finds it can no longer meet demand from its deep wells and is asking permission to pump from Lake Michigan, a controversial request that must be okayed by every state and province in the Great Lakes watershed. Central Sands communities suspect that pumping from high-capacity wells is one reason that lakes and streams are drying up. One way to ease demand is to use less water irrigating Wisconsin's 770,000 acres of turfgrass. This could be done by planting more

drought-resistant turfgrass species, and by watering grass with non-potable water, such as effluent from wastewater treatment. Both practices have been thoroughly researched and are commonly used in the South and West, where water shortages have long been a problem. But soils and climate are much different here. More information is needed to develop guidelines for using these strategies safely and effectively under Wisconsin growing conditions.

What's been done: UW-Madison soil scientist Doug Soldat is conducting research that will help Wisconsin turf professionals and homeowners develop more water-efficient landscapes and facilitate the use of wastewater for irrigating turfgrass in the Badger State. This work breaks down into three parts. One involves comparing several turfgrass species and cultivars. Some of them are known to perform well in Wisconsin growing conditions but must be watered to keep green in dry weather. Others are largely untested in Wisconsin but have been shown to stay green without irrigation in other regions. The UW turf research team has already been evaluating these new, drought-resistant varieties in their ongoing variety trials, but Soldat is now giving them a more rigorous evaluation by growing them in an enclosure that receives no natural rain.

A second part of the research is to develop a new, faster, easier-to-use and more precise way to measure water use in turf. This method, which employs radiometric sensing, will make it possible for turfgrass professionals to accurately measure water use in various microclimates in their landscapes, which are influenced by factors such as shade, slope, soil types, and proximity to concrete and other heat-absorbing features. Knowing the different water needs of these areas will allow the turf managers to adjust their irrigation systems to deliver just the right amount of water to each area.

A third objective is to explore the challenges and potential of irrigating turfgrass with wastewater. One concern about watering with wastewater is that it is often high in salts. But while salts tend to accumulate in the soil in dry regions, Soldat suspects that Wisconsin's plentiful rainfall will dilute and leach the salts out of the soil. He intends to test this hypothesis with the long-term goal of developing guidelines for safe and effective use of wastewater for landscape irrigation.

Impact: Although the research is still underway, Soldat is already sharing what he's learned about drought-resistant species and cultivars with Wisconsin turf professionals. Soldat talked about these grasses during a presentation on organic and reduced risk lawn care at the 2011 Wisconsin Turfgrass Association field day. The turf professionals are very interested. They have been noting how these varieties have performed in the UW turfgrass plots, and some of the pros are trying the drought-resistant grasses on the properties they manage. Soldat has compiled information about drought-resistant grasses in two publications--one aimed at homeowners, the other turf professionals--which are now being distributed.

Funding: WIS01525 and WIS01526
More information: Doug Soldat, 608-263-3631, djsoldat@wisc.edu
Knowledge area(s): 102,103,111,403, 101,112,132, 204, 205, 403

Title: Using microtools to study the differentiation and behavior of swarming bacteria.

Impact nugget: Using microtools, researchers can now grow large numbers of structurally identical bacterial biofilms, creating new opportunities to study--and ultimately combat--these problematic bacterial structures.

Issue (who cares and why): Bacteria are diverse and have evolved to survive in a wide variety of environments. One way they do this is by forming bacterial communities such as biofilms. Biofilms form when groups of bacteria adhere to surfaces--and each other--creating intractable deposits of slime.

Biofilms, which are known to grow on medical implants and clog industrial piping, cost the United States billions of dollars every year in energy losses, equipment damage, product contamination and medical infections. Before we can hope to prevent or eradicate biofilms in these situations, scientists need to learn more about how they are formed and maintained.

What has been done: A University of Wisconsin-Madison research team has developed a simple, inexpensive technique for growing large numbers of structurally identical biofilms, work that will help speed the course of biofilm research. To grow them, the first step is to place a "microfabricated" polymer stencil--with a pattern of tiny holes in it--on top of a surface. The stencil's hole sizes can range from 50 - 400 micrometer in diameter. A solution of bacteria is added on top of the stencil/surface set-up and the whole thing is allowed to incubate. The stencil's holes determine where cells can and cannot attach to the surface. After incubation, the stencil is removed, leaving an array of tiny, structurally identical bacterial biofilms attached to the surface--and ready for study. Scientists can use these arrays to test new anti-fouling surfaces, the affect of various chemicals on biofilm development, as well as the role of individual bacterial genes in biofilm growth.

Impact: Scientists now have the ability to create arrays of reproducible, structurally identical biofilms for study, an important tool for systematically examining the stimuli that regulate biofilm formation. The results have been shared through multiple peer-reviewed scientific articles. Down the line, the discoveries hastened by this new technique could have major implications for medicine, dentistry, ecology, agriculture and industrial processing, potentially saving lives, as well as millions--and possibly billions--of dollars in lost revenue linked to unwanted biofilm deposits.

Funding: 1192

More information: Doug Weibel, 608-890-1342, weibel@biochem.wisc.edu

Knowledge area(s): 203,311

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

Year	Extension		Research	
	1862	1890	1862	1890
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
2017	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 Deans 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 and Life 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 reporting systems under development at USDA 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 being reviewed annually 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 later in our Annual Report.

2) In 2011 and 2012, CALS scientists listened in on a series of meetings between Wisconsin potato and vegetable growers and waterfront property owners who suspect that the growers' irrigation is causing lakes and streams to dry up. That discussion is informing a research initiative aimed at understanding the problem and finding solutions.

3) Each year, the CALS Center for Dairy Research co-sponsors the Wisconsin Cheese Industry Conference, where it's staffers provide a science perspective in discussions of

issues that cheesemakers are confronting. One such forum, in 2012, focused on difficulties of producing and marketing low-sodium cheese.

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 later 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.

CALS and WAES employs a number of strategies to identify stakeholders. We rely heavily on advisory groups both at the college-wide and departmental level. The CALS Administrative Leadership Group maintains a close relationship with leaders of the industries and advocacy groups that have an interest in the disciplines we study. These individuals keep us informed about their needs and issues of concern and help put us in contact with other potential stakeholders. Departments, department chairs and faculty can also recommend contacts.

A guiding principle in our efforts to encourage participation from our diverse constituency is to reach out to individuals and groups in a way that makes it clear that their input is welcome. This entails extending a personal invitation and engaging in as much personal contact as possible, both before making the invitation (to cultivate the relationship) and after we have received the input to confirm that we got the message and explain how we intend to follow through. To the extent possible, we endeavor to meet stakeholders on their turf--their office or farm or business--as a further indication of the value we place on what they have to say.

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.

Most of the input we get from stakeholders are verbal, but we also receive email and even letters with suggestions or comments. Much of what we hear has to do with very specific concerns, e.g. questions about crop pest management or management practices. Other stakeholders are more focused on broader quality of life issues and wish to remind us of our larger role here. We rely upon the essentially continuous engagement of our deans, faculty and staff. It is second nature to them to listen to clientele for suggestions or ideas 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 is advised by a Board of Visitors that meets with the Administrative Leadership Group twice a year. That board includes accomplished and influential individuals representing a number of interest groups, including ag producers, industries, consumers, environmentalists and state agencies. In addition to advising CALS on research and outreach needs, the board also provides a source of contacts for various constituencies.

In addition to advisory groups, the CALS Administrative Leadership Group periodically meets with focus groups on a variety of topics in a series of meetings called CALS Roundtables. These groups include traditional and non-traditional stakeholders. We use their input to help us identify areas of research need. A listing of these focus groups follows.

The Roundtables provide 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 gets input by participating in many public or stakeholder-sponsored meetings and field days, many of which are held at our outlying Agricultural Research Stations. In a typical year, we attend 50--100 such events each year.

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.

The CALS Administrative Leadership Group uses input from stakeholders in a number of ways. Perhaps most significantly, it influences future direction of the college by informing the process of allocating faculty positions. Deciding which departments or areas of expertise get hiring priority determines the college's ability to address both current and emerging issues. A successful strategic hire will enable us to meet existing needs and at the same time reposition for those on the horizon. Our stakeholders help us see into the future to identify those emerging issues.

We also need stakeholder input to make more immediate decisions, such as where to invest funding to direct current faculty and their research into emerging issues such as bioenergy and the bioeconomy. 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 for our Formula Grant research Call for Proposals and deciding how to allocate 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			7%	
104	Protect Soil from Harmful Effects of Natural Elements			2%	
112	Watershed Protection and Management			4%	
123	Management and Sustainability of Forest Resources			4%	
135	Aquatic and Terrestrial Wildlife			11%	
136	Conservation of Biological Diversity			7%	
205	Plant Management Systems			3%	
302	Nutrient Utilization in Animals			7%	
303	Genetic Improvement of Animals			4%	
305	Animal Physiological Processes			7%	
403	Waste Disposal, Recycling, and Reuse			4%	
502	New and Improved Food Products			2%	
603	Market Economics			4%	
604	Marketing and Distribution Practices			4%	
608	Community Resource Planning and Development			4%	
609	Economic Theory and Methods			4%	
701	Nutrient Composition of Food			3%	
702	Requirements and Function of Nutrients and Other Food Components			9%	
805	Community Institutions, Health, and Social Services			7%	
901	Program and Project Design, and Statistics			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, 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
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
2017	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

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 112 - Watershed Protection and Management
- 123 - Management and Sustainability of Forest Resources
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 205 - Plant Management Systems
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 305 - Animal Physiological Processes
- 403 - Waste Disposal, Recycling, and Reuse
- 502 - New and Improved Food Products
- 603 - Market Economics
- 604 - Marketing and Distribution Practices
- 608 - Community Resource Planning and Development
- 609 - Economic Theory and Methods
- 701 - Nutrient Composition of Food
- 702 - Requirements and Function of Nutrients and Other Food Components
- 805 - Community Institutions, Health, and Social Services
- 901 - Program and Project Design, and Statistics

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 are no longer exempt. 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%	
201	Plant Genome, Genetics, and Genetic Mechanisms			8%	
202	Plant Genetic Resources			7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			4%	
204	Plant Product Quality and Utility (Preharvest)			8%	
205	Plant Management Systems			5%	
206	Basic Plant Biology			5%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
212	Pathogens and Nematodes Affecting Plants			16%	
213	Weeds Affecting Plants			2%	
215	Biological Control of Pests Affecting Plants			2%	
216	Integrated Pest Management Systems			6%	
301	Reproductive Performance of Animals			2%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			4%	
304	Animal Genome			4%	
305	Animal Physiological Processes			4%	
311	Animal Diseases			2%	
502	New and Improved Food Products			1%	
601	Economics of Agricultural Production and Farm Management			4%	
	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, 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
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
2017	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

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 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
- 305 - Animal Physiological Processes
- 311 - Animal Diseases
- 502 - New and Improved Food Products
- 601 - Economics of Agricultural Production and Farm Management

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 are no longer exempt. 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			5%	
102	Soil, Plant, Water, Nutrient Relationships			19%	
111	Conservation and Efficient Use of Water			2%	
112	Watershed Protection and Management			5%	
131	Alternative Uses of Land			7%	
132	Weather and Climate			9%	
133	Pollution Prevention and Mitigation			14%	
134	Outdoor Recreation			2%	
135	Aquatic and Terrestrial Wildlife			2%	
136	Conservation of Biological Diversity			5%	
204	Plant Product Quality and Utility (Preharvest)			2%	
205	Plant Management Systems			2%	
206	Basic Plant Biology			2%	
213	Weeds Affecting Plants			2%	
216	Integrated Pest Management Systems			2%	
307	Animal Management Systems			9%	
402	Engineering Systems and Equipment			2%	
403	Waste Disposal, Recycling, and Reuse			2%	
601	Economics of Agricultural Production and Farm Management			2%	
903	Communication, Education, and Information Delivery			5%	
	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, 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
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
2017	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

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 131 - Alternative Uses of Land
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 134 - Outdoor Recreation
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 307 - Animal Management Systems
- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 601 - Economics of Agricultural Production and Farm Management
- 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 are no longer exempt. 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			7%	
104	Protect Soil from Harmful Effects of Natural Elements			7%	
125	Agroforestry			7%	
131	Alternative Uses of Land			6%	
205	Plant Management Systems			7%	
206	Basic Plant Biology			7%	
211	Insects, Mites, and Other Arthropods Affecting Plants			7%	
307	Animal Management Systems			6%	
401	Structures, Facilities, and General Purpose Farm Supplies			7%	
402	Engineering Systems and Equipment			13%	
601	Economics of Agricultural Production and Farm Management			6%	
605	Natural Resource and Environmental Economics			13%	
723	Hazards to Human Health and Safety			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, 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
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
2017	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

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
- 206 - Basic Plant Biology
- 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
- 605 - Natural Resource and Environmental Economics
- 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 are no longer exempt. 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			25%	
701	Nutrient Composition of Food			25%	
703	Nutrition Education and Behavior			50%	
	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, 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
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
2017	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
----------------	------------------

- Workshop
- Group Discussion
- One-on-One Intervention
- Demonstrations
- Other 1 (Field Days)

- 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

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 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 are no longer

exempt. 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			2%	
302	Nutrient Utilization in Animals			6%	
305	Animal Physiological Processes			9%	
308	Improved Animal Products (Before Harvest)			6%	
311	Animal Diseases			10%	
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			9%	
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			6%	
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			15%	
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, 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
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
2017	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

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
- 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 are no longer exempt. 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.

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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.

