

2012 University of Wisconsin Research Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

Operating Philosophy/ Program Overview:

The Wisconsin Agricultural Experiment Station (WAES) is committed to investigator-driven and peer-reviewed research. Our guiding 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 is 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 131 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 FY13 (beginning Oct. 1, 2012), was initiated in June, 2011, approximately 16 months prior to when projects were to begin. Proposals were due September 10, 2011. 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 has 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. Representative projects are reported as impacts below:

Title: Dissection and enhancement of soybean resistance to soybean cyst nematode

Impact nugget: A team of University of Wisconsin-Madison researchers has identified a set of three neighboring genes that--in multiple copy numbers--make soybeans resistant to Soybean Cyst Nematode, the most damaging disease of soybean. This finding opens the door for plant breeders and plant biotechnologists to further improve nematode resistance in this economically important crop.

Issue (who cares and why): Soybean Cyst Nematode (SCN) is the most economically damaging disease of soybeans in the United States, causing more than \$1 billion in U.S. soybean losses every year. Originally a problem only in Southern states, SCN has become common in America's North Central "soybean belt" region, and it continues to spread each year. Although resistant varieties exist, they aren't 100 percent effective. Improved varieties with strong SCN resistance could save growers up to \$1 billion dollars each year.

What has been done: Farmers' preferred defense against SCN right now is to plant soybeans that have been bred to contain a genetic structure called Rhg1. Farmers plant millions of acres of these soybeans, even though scientists don't understand much about how Rhg1 works. Through this project, which was supported by Hatch funding and the United Soybean Board, the UW-Madison team and their collaborators from University of Illinois at Urbana-Champaign have been able to show that Rhg1 is composed of three genes that work together to confer nematode resistance. Interestingly, a single copy of this trio of genes does not make the plant resistant; multiple copy numbers are required. The scientists found that plants with 10 copies of this three-gene structure grow well in a field infected with the nematode.

Impact: Thanks to this work, the scientific community knows a lot more about Rhg1, a genetic structure that protects soybeans from Soybean Cyst Nematode. It is now known that Rhg1 is composed of a trio of genes that work together and that multiple copies of the structure are needed--as many as 10--for Rhg1 to be effective. Specific biochemical functions can now be hypothesized for Rhg1 gene products. These results were published in the journal Science in late 2012 and should help plant breeders to quickly identify resistant plants, speeding the quest to breed soybeans with stronger nematode resistance. Biotechnologists can also now work with these genes to achieve better nematode resistance. Improved varieties could save soybean growers up to \$1 billion each year.

Funding: WIS01070

More information: Andrew Bent, 608-265-334, afbent@wisc.edu

Knowledge area(s): 201, 206, 212

Title: Exploring symbiotic associations between antibiotic-producing bacteria and honey bees

Impact nugget: New research into the microbial communities associated with healthy honeybee hives may pave the way for new methods to diagnose and treat hives suffering from Colony Collapse Disorder. Already, this work has led to the discovery of a number of promising new antibiotic-like compounds.

Issue (who cares and why): Honeybees are vital to our food system. U.S. farmers count on them to pollinate about \$15 billion worth crops each year. But today's bee colonies are at risk. Since 2006, commercial hives have been plagued by what's known as Colony Collapse Disorder (CCD), a perplexing phenomenon in which large numbers of bees abruptly disappear. Scientists aren't sure what causes this to happen, but they speculate that a number of factors may be involved--from mites and diseases to malnutrition and pesticides. More needs to be known to effectively protect our honeybees.

What has been done: By investigating the microbial communities that live inside healthy honeybee hives, a team of University of Wisconsin-Madison researchers is expanding our scientific understanding of what's involved in CCD--particularly how the bee's microbial partners might fit in. The team has gathered baseline data about the microbial community found in a typical, healthy hive. They found that the make-up of a hive's microbial community varies from one part of the hive to another, and these differences are consistent across hives. By establishing what's normal, scientists can now begin to look at if and how microbial communities shift when hives are under stress from disease or other causes.

Impact: Now that scientists know what a healthy hive's microbial community is supposed to look like, they are in a position to use this information to develop an inexpensive and quick way to identify hives that are sick or becoming sick--by monitoring changes in hives' microbial communities. Information gathered through this project may also help cure sick hives someday. As the team studied the hive microbes they collected, they came across a number of promising, previously unknown antibiotic-like compounds. One of them, it appears, inhibits the growth of a common hive parasite and, if administered to sick hives, it could possibly help bolster honeybee health and protect hives from CCD.

Funding: WIS01321

More information: Cameron Currie, 608-265-8034, currie@bact.wisc.edu

Knowledge area(s): 211, 311

Title: Molecular mechanisms regulating skeletal muscle growth and differentiation

Impact nugget: By investigating a key protein of heart and muscle cells in rats, a team of UW-Madison animal scientists discovered how RBM20, a gene known to be involved in hereditary dilated cardiomyopathy and sudden death in humans, causes disease.

Issue (who cares and why): Dilated cardiomyopathy affects approximately one in 500 people. Of those, somewhere between two and three percent of cases are caused by problems with the RBM20 gene. For all, the effects are severe. Sufferers have enlarged hearts, with thin walls, that don't pump blood very well. People with this disease need heart transplants and, without them, tend to die quite early: between ages 25 and 30. Scientists first linked the RBM20 gene to hereditary dilated cardiomyopathy and sudden death in humans in 2009, but they didn't understand how a faulty RBM20 gene worked--or didn't work--to cause disease inside the body.

What has been done: A team of University of Wisconsin-Madison researchers set out to study a major protein found in muscle, called titin, that gives muscle its elasticity and is also found in heart tissue. Working in rats, they came across an unexpected finding, and subsequently figured out that some of their rats were carrying a rare genetic mutation. This mutation affected how the titin protein was being processed, making the proteins too large in adult rats. They set out to identify the source of the mutation, and found that it wasn't in the titin gene itself, but in a gene known as RBM20. The RBM20 gene, which was first mentioned in a publication in 2009, creates a protein that's involved in RNA splicing. Without it, the research team found, titin's RNA isn't correctly processed, creating extra-large titin proteins. The RBM20 gene had previously been linked with hereditary dilated cardiomyopathy and sudden death in humans, but now scientists understood how: without functional RBM20, the titin protein found in heart tissue is too long.

Impact: Through this work, which was published in Nature Medicine in 2012, scientists figured out the mechanism by which a faulty RBM20 gene causes hereditary dilated cardiomyopathy. Early in this work, the team stumbled upon a group of rats with a rare mutation in their RBM20 gene. These rats make a great animal model to study and test treatments for one human form of hereditary dilated cardiomyopathy. Early results from this Hatch-funded research helped the principal investigator secure significant NIH funding to further support this work.

Funding:WIS01556

More information: Marion Greaser, 608-262-1456, mgreaser@ansci.wisc.edu

Knowledge area(s): 305,308

Title: The demand for green-collar jobs in Wisconsin

Impact Nugget: The promise of an economy that creates good jobs while protecting and restoring the environment has ignited enthusiasm in the United States and around the world. Between 8 and 40 million green-collar jobs could be created in the U.S. alone by 2030. Yet little information is available about how much demand there is for green jobs and what types of education and training programs are needed to support them. This study is one of the first attempts to document how Wisconsin is faring in that sector.

Issue (who cares and why): While the potential for green-collar jobs is vast, and young people in particular are drawn to them, we need to know how many such jobs already are available and/or are likely to be available in the near future. We especially need this information for current members of the workforce who are considering retraining and high school graduates and college students who are weighing career options. In addition to training and education institutions, other stakeholders include economic development organizations, workforce development boards, government agencies and various business, environmental and political groups wishing to track current developments and help forge directions for growth.

What has been done: Green's team conducted employer surveys and extensive interviews with training and education institutions (including administrators, faculty and students), economic development professionals, and government officials in three regions of the state to determine what green-collar jobs are available, what kind of training/education programs are available to support them now and in the future, and what other activities communities are doing to promote green-collar business development and employment.

Researchers found that most of the communities have not produced many green jobs. Many of the jobs created are related to retrofitting old buildings and increasing energy efficiency, although researchers did identify several firms that have found a niche in producing green products.

The central problem with green job training in Wisconsin--reflecting a more general problem nationwide--is primarily related to demand. In some cases, the training institutions found very few employers that were hiring workers in green occupations. Some training institutions were offering more general programs in sustainability, but employers indicated very little interest in those programs, even when their training was certified. Overall, students found the green training programs interesting and hoped to apply their skills in the workforce. Employers tended to be skeptical about the "bottom line" with regard to green job training, and especially more general sustainability training.

Impact: Green's team included their findings in a report for Barron and Polk counties on the labor market, business retention and green jobs. They also wrote a piece for a blog produced by the Rural Policy Research Institute and a chapter for the book *The Business of Sustainability* (Berkshire Publishing Group). The measures developed in this research will permit economic development organizations and training institutions to track the growth of green jobs and to provide a better match between the demand for and supply of workers in this sector. As the project moves forward, the team is working with several technical colleges to trace the success of graduates of green job training programs to assess the quality of jobs they obtain and the extent to which they utilize skills from their training. The team also will examine more closely how effective a variety of local policies and programs are in promoting green jobs.

Funding: WIS01510

More information: Gary Green, 608-262-2710, gpgreen@wisc.edu

Knowledge area(s): 608

Title: Quantifying carbon sequestration in bioenergy cropping systems

Impact nugget: Researchers are employing a simple and affordable methodology to determine whether three ethanol feedstock crops are net sources or sinks of carbon. The type of data they're collecting is needed to validate models that can be used at any scale to predict whether growing bioenergy feedstocks on ag land can help mitigate future buildup of greenhouse gases.

The issue (who cares and why): Much of the discussion about cellulosic ethanol has focused on using perennial grasses, notably switchgrass, as a feedstock. One of the arguments is that the thick sod and deep roots of this native prairie grass could store large quantities of carbon, which has been released into the atmosphere through many decades of tillage. But a large-scale shift to switchgrass represents a significant investment by all parties involved. Bioenergy firms need to install appropriate systems for handling and processing the crop. Farmers need to retool and endure the learning curve and financial uncertainties inherent with adopting a new cropping system. And the public sector needs to invest in research, extension and incentives--e.g. energy credits--to encourage farmers and biofuel firms to go in this direction. Before committing these resources, it's important to test out assumed benefits, including how much carbon will be sequestered by various crops. And it's not enough to understand how much carbon these crops can store in today's fields. Climate is expected to change over the decades, so we need to know how much carbon these crops can store under different weather-related conditions including temperature, precipitation, humidity, and radiation. This requires measuring carbon exchange directly from the plant and the adjacent soil while varying some of these factors. A common method of measuring ecosystem CO₂, the eddy covariance technique, involves mounting gas analyzers on towers that stand well above the canopy. This system has many strengths but also some shortcomings. It's expensive; it samples CO₂ from large area much larger than many research plots; and it doesn't provide detailed data about the carbon exchange happening at the leaf or soil surface--the entry points between the atmosphere and the crop system. What's needed is an affordable, small-plot-friendly method for collecting the detailed data needed to create and validate models that can be used to forecast carbon exchange for these crops at any scale--the field, the watershed, the region of the entire globe--now and in the future.

What has been done: A research team led by UW-Madison agronomy professor Chris Kucharik is evaluating three bioenergy cropping systems to see how they breathe--how much CO₂ is taken in by the plants through photosynthesis, and how much is expired by the soil as microbes break down organic matter. They're measuring three crops: corn, switchgrass and hybrid poplar. Corn was picked to represent the status quo, since it's the dominant crop across much of the Midwest. Poplar represents a popular, fast-growing crop for people who want to grow trees as a bioenergy crop. Switchgrass represents a very productive monoculture grass. The researchers also believe that there is a wide range between the three crops in terms of the amount of carbon exchanged with the atmosphere. The research tool is a portable infrared gas analyzer that can be connected to one of two types of environmental chambers. One chamber sits on the soil and measures the rate of CO₂ exchange from the soil surface. The other gets clamped to the plant leaf and measures CO₂ exchange between the atmosphere and the plant. The plant chamber can be set up to alter temperature, light and humidity within that small space during the period of analysis. The project is also set up to continually monitor soil temperature and moisture and to take regular readings of light, leaf canopy and other metrics.

Impact: This project is still underway, and it's too early to say which of the three cropping systems will win out in terms of carbon sequestration. A confounding factor in the project has been weather extremes during the first three sampling years: 2010 was very wet, 2011 fairly "normal" and 2012 extremely dry (these anomalies do have an upside: they give insight on how such extremes affect CO₂ exchange). However, enough data is on hand for the team to begin building statistical tools needed to "fill in the blanks" between the periodic sampling points to be able to model the change in carbon levels over the entire season. And the project has demonstrated how this relatively low-cost piece of analytical hardware can be employed on very small plots to collect rich, detailed data on carbon exchange. The results will be used to validate carbon exchange models for use on a very large scale. Sharing of information to date has been largely informal, but it has led other researchers to begin to employ these methods into their carbon sequestration measurement projects. The team is developing an analytical and statistical methodology that will be useful to other groups that want to collect rich, detailed data about carbon exchange in the field at the leaf and soil surface.

Funding:WIS01419

More information:Chris Kucharik, 608-890-3021, kucharik@wisc.edu

Knowledge area(s):102, 206

Title: Physical and chemical interactions responsible for the development of yogurt texture

Impact nugget: UW-Madison food scientists have been unraveling the chemical and biological processes that underlie the creation of yogurt and other cultured dairy products. Information they generated is helping U.S. dairy processors introduce new products--notably an "Americanized" Greek yogurt--that have surged in popularity, spurring economic activity and creating new markets for U.S. milk.

Issue (who cares and why): While yogurt is an age-old food product, it's relatively new to U.S. supermarket shelves. A very small percentage of the nation's population was consuming the product 30 years ago. Today there's a yogurt section in every dairy case. Many of the first products were geared toward kids, who were happy with a gooey or paste-like product as long as it was sweet and came in a cute package. But in recent years, yogurt manufacturers have focused on more sophisticated adult consumers who care about things like fat and protein content and subtle differences in texture and flavor, and who don't want to see a string of unfamiliar chemical names on the ingredient list. The industry recently hit a towering home run with the introduction of a Greek yogurt tailored to U.S. consumers (more protein and less fat than the European version). Virtually unknown here six years ago, Greek yogurt now accounts for 30 percent of U.S. yogurt sales and has caused an increase in demand for milk that the dairy industry is scrambling to accommodate. Having seen the potential, processors are eager to follow up by

introducing other lesser-known cultured-milk products to the American mainstream. But making a high-quality cultured milk product is complicated. It requires supplying the right microorganisms with the right milk components in the ideal environment. It's not easy to make a product of consistent quality that meets the exacting standards of today's adult consumers without added stabilizers and flavors. Being able to control this complex interplay of chemical, physical and biological factors requires a thorough understanding of what's happening at the molecular level. This is relatively new territory to U.S. dairy processors, and they're eager to build expertise.

What has been done: Over the past fourteen years, researchers in John Lucey's cultured products lab have undertaken a series of Hatch-funded projects geared toward generating a thorough understanding of the intertwined chemical and microbiological processes that account for sometimes subtle, but important differences in yogurt texture. In one recent study they evaluated the role of a number of factors--temperature, acid development, pH, concentration of milk salts and others--on the formation of yogurt gels. Such studies have given them an understanding of what processors need to do to consistently avoid defects such as wheying off (the pooling of water at the top of a yogurt container) and to create the ideal consistency (not mushy, not springy) without having to add stabilizers.

Impact: Useful findings from the experiments have been conveyed to the dairy food industry in a number of ways. The researchers share their findings through cultured dairy product short courses held at the UW-Madison Center for Dairy Research. They have also provided one-on-one advice and counseling that has enabled several yogurt manufacturers to correct defects in their products. A scientist from a major U.S. yogurt manufacturer spent nine months in Lucey's lab to learn about new technologies and how to implement them in his firm's plants. Through these efforts, U.S. yogurt manufacturers have been able to adopt several of the methods created through Lucey's research. Results have also been shared with the scientific community at conferences in the U.S. and abroad, and through eight peer-reviewed papers and five book chapters.

Funding:WIS01083

More information:John Lucey, 608-265-1195, jlucey@cdr.wisc.edu

Knowledge area(s): 502

Title: Mastitis resistance to enhance dairy food safety

Impact nugget: New research is shedding light on mastitis-causing bacteria on Wisconsin's dairy farms, pointing the way to improved testing and management approaches to control mastitis infections, and expanding our general understanding of what's going on with antibiotic-resistant bacteria on the state's farms.

Issue (who cares and why): Mastitis is a bacterial infection affecting the udders of dairy cattle. A variety of bacterial pathogens are linked to mastitis, and the malady is regarded as the single biggest cause of financial loss to dairy businesses through reduced milk production, expense of treatment and increased culling. Treatment requires the use of antibiotics, which poses a potential risk to the consumer milk supply and raises questions about bacterial resistance to the treatment medicines.

What has been done: In 2010, a team of University of Wisconsin-Madison researchers visited 52 large, modern dairy farms in Wisconsin to survey the elements contributing to mastitis on these farms. The research uncovered a rapidly evolving landscape of new types of mastitis-causing bacteria. In one surprising result, the team found that 25 percent of the dairy cows that exhibited classic symptoms of mastitis had milk samples that tested negative for mastitis-causing bacteria. Many of these negative cases, the researchers found, were likely due to cows clearing certain types of bacterial infections on their own, without medicine. This shows that antibiotics are not needed for all mastitis treatments, and that improved

mastitis tests and on-farm diagnostics can go a long way to help farmers reduce the use antibiotics while maintaining good herd health.

The team also found that the bacteria most commonly associated with mastitis such as E. coli and Streptococcus have predictable, stable proportions of their populations that are resistant to the antibiotics used to fight mastitis. However, the research found no evidence for increasing rates of antibiotic resistance among these bacterial populations.

Impact: The findings of this project are being used to improve management practices to control of mastitis on modern dairy facilities. For example, an increasing number of dairy farms are now using on-farm tests to determine the specific type of bacteria responsible for their farm's mastitis infections. Such refinements in diagnostics have the potential to reduce the use of unneeded medicines and to lower the risks associated with antibiotic use. Additionally, the discovery that antibiotic resistance is not increasing among mastitis-causing bacteria on Wisconsin's dairy farms is an important piece of science-based information that can help guide informed decisions about appropriate use of antibiotics on dairy farms.

Funding:WIS01185, WIS01343, and WIS01591

More information: Pamela Ruegg, 608-263-3495, plruegg@wisc.edu

Knowledge area(s):307, 308,311, 315,712

Title: Barriers and benefits in the delivery of public health genetics programming in Wisconsin

Impact nugget: Genetic discoveries have led to the creation of genetic tests that can help predict a person's risk for getting a number of potentially fatal or life-impairing diseases, including breast and colorectal cancers. This study revealed that in spite of improved availability of genetic services--which include tests and follow-up counseling--in cities and surrounding suburbs in recent years, more must be done to increase their use among particular ethnic minority groups. In a related study, researchers found that one clear barrier is lack of insurance coverage for many types of genetic testing.

Issue (who cares and why): "Public health genetics" is an emerging area in science and public policy, and across the nation, state health departments have rolled out genetic service plans. Offering equal access to these services, which have been shown to increase the likelihood of early detection of disease--allowing for early treatment and reductions in sickness and death--is a critical component of providing equal access to health care for all and could tremendously reduce health care costs. This is the first study to offer a comprehensive look at how racial and ethnic minority communities in urban Wisconsin are accessing genetic services, including identifying barriers and how stakeholders might work together to reduce them.

What has been done: A team of University of Wisconsin-Madison researchers examined the structure and implementation of the state's public health genetics program, focusing in particular on a number of state-subsidized genetic outreach clinics that were opened in Milwaukee, Kenosha, Racine and surrounding suburbs in response to concerns about health inequalities among racial and ethnic minorities. Surprisingly, while the UW team found an increase in the number of Latino patients using genetic services, they did not see a substantial increase in African-American residents, suggesting that outreach efforts must be better tailored to specific ethnic groups. Moreover, due in part to budget constraints, the new clinics meant shifting resources away from rural parts of the state, which then bore the consequences of reduced genetic services.

The team also found that health insurance coverage for genetic testing and counseling is severely limited, even for conditions such as hereditary breast cancer, pointing to a need foreducational programs targeted toward insurance executives and health plan administrators.

Impact: These and other findings were presented to the Wisconsin Genetics Advisory Council, which includes state health officials, primary care physicians, medical geneticists, genetic counselors and representatives of consumer advocacy organizations, and at the annual meeting of the American Public Health Association before an audience that included representatives from federal agencies that fund maternal and child health services as well as program officials from other states facing similar challenges.

Notably, a new NIH grant (funded in July 2012) will allow Senier to expand this research to Michigan, Utah, New York and Connecticut. The National Human Genome Research Institute's strategic plan argues that genomic medicine will only achieve its full potential to improve health when its innovations are available to all. Senier's team will identify strategies that will help states modernize public health genetics programs in ways that are ethical, equitable and cost-effective.

Funding: WIS01542

More information: Laura Senier, 608-890-0981, senier@wisc.edu

Knowledge area(s): 805

Title: Integrated research and extension to improve the safety of natural and organic processed meats by increasing antimicrobial impact

Impact nugget: By studying the ability of alternative materials and processes to enhance the food safety of organic and natural processed meat products, University of Wisconsin-Madison researchers are finding new ways to make these products safer and more flavorful, and helping to support the nation's growing market for these popular foods.

Issue (who cares and why): Sales of organic and natural foods are growing at an impressive rate, with double-digit percentage gains almost every year. And of all the types of organic and natural foods available on the market, the demand for meat products is the largest. Food processors, which must process these meats according to organic and natural label requirements, are unable to use the vast majority of the antimicrobial agents that are employed in standard meat processing. Because of this, they are scrambling to find alternative materials and processes that meet organic/natural label requirements, but also create products with the safety and flavor attributes that consumers demand.

What has been done: A team of University of Wisconsin-Madison researchers has been testing the ability of various natural products--including extracts of cranberry, celery, lemon and cherry--to protect the safety and flavor of organic/natural meat products. They are testing these extracts in the context of various processing methods to see if they can come up with an alternative meat processing approach that matches the level of antimicrobial protection found in standard processed meats. The assessment includes rigorous "challenge testing," where pathogenic agents are added to the products during various stages of processing to ensure that the new materials and processes are able to block microbial growth during all stages of processing and during storage.

Impact: In addition to ruling out a number of natural ingredients that do not work to preserve organic/natural processed meats, this project has identified a powerful mixture of materials that works particularly well: cherry powder in combination with celery powder. This combo is already being adopted by processors that make organic/natural meats, and this information is being actively shared with the nation's cured meats community through all possible channels: email, telephone, seminar, published papers, technical training courses, and research posters and papers shared at relevant scientific gatherings.

Funding: WIS01523

More information: Jeff Sindelar and Kathy Glass, 608-262-0555, jsindelar@wisc.edu

Knowledge area(s): 501, 712

Title: Rational redesign of phytochromes for agricultural benefit

Impact nugget: By manipulating the structure of phytochrome, a light-sensing molecule, in plants, scientists are developing a technology that could enable food crops to grow at much higher densities in the field and flower at different times of the year. This technology has the potential to boost corn production, for instance, by as much as 50 percent.

Issue (who cares and why): The Food and Agriculture Organization of the United Nations estimates that the world will need to produce 70 percent more food by 2050 to keep pace with population growth and increased demand for calories. This productivity boom will have to occur despite a diminishing supply of suitable land. One solution to this problem is to engineer food crops so they can grow at higher densities in the field or at different latitudes, while maintaining or improving yields.

What has been done: Phytochromes are light-sensing molecules in plants that affect plant architecture, timing of reproduction and the response to competition--or encroachment--by nearby plants. A team of scientists at the University of Wisconsin-Madison has created a suite of phytochrome mutants and is testing them in Arabidopsis plants, looking for characteristics that could benefit agriculture. One mutant shows particular promise: it's super-sensitive to light, which tricks the plant into "thinking" it's getting plenty of light, even when it's being shaded by neighboring plants. This mutant, called Y361F, could be engineered into crop plants to make them more tolerant to low-light conditions experienced in crowded fields. Instead of needing 30 inches between rows, corn plants with this mutant phytochrome molecule might only need 20 inches to grow well.

Impact: UW-Madison researchers have created a mutant phytochrome molecule that helps plants grow like normal in low-light conditions. Engineered into food crops, this mutant could help crops thrive in crowded fields, vastly boosting agricultural productivity. The research team is in the process of patenting this technology, and a large agri-business company is already lined up and ready to commercialize it.

Funding: WIS01440

More information: Richard Vierstra, 608-262-8215, vierstra@wisc.edu

Knowledge area(s): 204, 206

Total Actual Amount of professional FTEs/SYs for this State

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	154.0	0.0
Actual	0.0	0.0	150.4	0.0

II. Merit Review Process

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

- Internal University Panel
- Expert Peer Review

2. Brief Explanation

Program Review Process:

Hatch, Hatch Multistate, McIntire-Stennis, and Animal Health funds support specific projects solicited in an annual Call for Proposals. These are reviewed and funded based on a peer-review system. Animal Health proposals are reviewed at the School of Veterinary Medicine; Hatch, Hatch Multistate, and McIntire-Stennis proposals are reviewed in CALS.

CALS Process:

The following is published in the Call for Proposals as guidance to the scientists requesting Hatch, Hatch Multistate, or McIntire-Stennis grants. This process occurred in November 2011 for 50 new proposals.

The Faculty Review Panel (FRP):

The Associate Director of the WAES selects members of the Research Advisory Committee (RAC). Two members of the RAC and ad hoc reviewers review each proposal. The two RAC members are designated primary or secondary reviewer. The RAC members select the ad hoc reviewers, and where possible, ad hoc members are CALS faculty. However, other reviewers, both on and off campus, may be appointed as needed. The selection criteria for RAC members and ad hoc reviewers are scientific excellence, appropriate disciplinary expertise, and overall balance. No member of the RAC may have a proposal being reviewed under this Call. When submitting a proposal, applicants may request an individual(s) be excluded from selection as a reviewer. Conversely, applicants may also suggest individuals for consideration as reviewers.

Review Criteria for Reviewers:

Reviewers are asked to critique and evaluate proposals in a constructive manner, identifying both strengths and weaknesses of the proposal(s) under review. Reviews should be concise and include comments addressing each of the following:

- An evaluation of the scientific significance of the objectives and alignment of project goals and funding source. This appropriateness criterion is equally important to scientific merit and PI record of achievement.
- A judgment of the potential for solving Wisconsin problems is a key element of the Formula Grant funding guidelines.
- An evaluation of the research team's ability to accomplish the stated objectives, and the match between these objectives and available resources. For teams with multiple investigators, the PIs are to include a plan of coordination across team members.
- Multistate and integrated activity priorities.

III. Stakeholder Input

1. Actions taken to seek stakeholder input that encouraged 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 on 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, over the past six months, CALS has held listening sessions with a number of stakeholder groups as part of the college's yearlong strategic planning exercise. We held sessions with a group of agriculture industry leaders, heads of state agencies, our own Board of Visitors, alumni and students. There were also sessions with specific commodity groups, including the Wisconsin Cranberry Growers and the Wisconsin Potato and Vegetable Growers.

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

1) In 2012, CALS helped host the first-ever UW-Madison corporate open house, which showcased UW "services" for representatives from more than 40 firms and explored how partnerships with the university can help strengthen corporate competitiveness. During one afternoon breakout session, CALS animal scientists talked with executives from a dozen meat firms about opportunities to collaborate to develop new high-value non-food products from inedible parts of animal carcasses.

2) The audience for this year's Wisconsin Agricultural Economic Outlook Forum included representatives from virtually every Wisconsin organization connected to the production or processing of food and fiber. About 150 attended the event and dozens more participated online. UW ag economists and commodity specialists talked about the situation and outlook for the state's major commodities and the financial health of its farm families.

3) The centennial celebration of the Marshfield Ag Research Station drew a who's who of the state's dairy industry as well as a U.S. Senator, a U.S. Representative, numerous state and local elected officials and local farmers and other area residents. The event coincided with the dedication of a new USDA-ARS dairy research facility, so it was an opportunity for a broad conversation about the next century of agricultural research.

4) We also learn from stakeholders who come to CALS to learn. Several CALS units hold short courses for professionals in the industries they serve. For example, food manufacturers send their R&D staff here to gain knowledge that helps them make a better, more consistent product. As our scientists help these professionals address their problems, they usually get an earful on the challenges these industries face.

5) A number of CALS researchers connect with stakeholders by serving on advisory boards or similar bodies that are comprised primarily of leaders in specific industries or interest areas. For example, a CALS forestry professor serves on the Wisconsin Council on Forestry, a group

appointed by the Governor that includes representatives from the timber, wood products and green industries as well as environmental groups and state and local government.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups

Brief explanation.

CALS and WAES employ 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 was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- 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 gather from stakeholders is 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.

Below is a list of Agricultural Reserach Station Field Days:

Grape Pruning Workshop
Peninsular Fruit School
Grape Pruning Seminar in Garden
Shiitake Mushrooms 1010
Flight of the Timberdoodle
Master Gardeners Plant Sale at Peninsular
Lichens!
Bats and Roost Monitoring
MIAD Field Experience Presentations
Migration and Foraging Patterns of Common Loons
Wolf and Human Conflict in Wisconsin
Potato Field Day
Garden Door" Open House
Vegetation of Wisconsin
How to Capture and Share Nature's Beauty
WPVGA Potato Field Day
WTA Summer Field Day

Batty about Bats
Our Bountiful Forests
Midwest Food Processors
Hidden Treasures in our Waters
Marshfield Centennial Open House
Sheep Day
Twilight Garden Tour
2012 National Manure Expo
Agronomy and Soils Field Day
"Garden Door" Pesto Festo
Horticulture Field Day
Grape Grower Field Day
Beef Pasture Field Day

Below is a list of Stakeholder meetings attended by the Administrative Leadership Team:

January

Farm Bureau Leadership, Madison, WI

March

World Dairy Expo Meeting, Madison, WI
Wisconsin Farm Credit Legislative Conference & Lunch, Madison, WI
Wisconsin Organic Advisory Council, Madison, WI
Wisconsin Farm Bureau/CALS/UW-Extension Meeting, Madison, WI

April

NCRA Meeting, Indianapolis, IN
International Cheese Technology Expo, Milwaukee, WI
Meat Advisory Board, Madison, WI

May

Meat Industry Hall of Fame Induction, Madison, WI
Ag. Coalition, Madison, WI
Eckburg Foundation Board Meeting, Madison, WI

July

Sesquicentennial of the Land Grant Act, Burlington, VT
Wisconsin Potato & Vegetable Growers, Rhinelander, WI
Farm Technology Days, New London, WI
Woods Orchard personnel and other fruit growers, Sturgeon Bay, WI
Professional Dairy Producers of Wisconsin, Madison, WI
Wisconsin Turfgrass Association Summer Field Day, Madison, WI

August

Midwest Food Processors Association, Hancock, WI
VitaPlus, Madison, WI
Wisconsin Farm Bureau/CALS/UW-Extension Meeting, Madison, WI
Rennebohm Foundation, Madison, WI
Johnsonville, Madison, WI

September

WALSAA Fireup, Madison, WI
Renk Seed Company, Sun Prairie, WI
ESS/SAES/ARD Workshop and Meeting, Portsmouth, NH
FairShare CSA Coalition, Madison, WI

October

Discovery Farm Graduation, Darlington, WI
Promega, Middleton, WI
Cranberry growers, Marshfield, WI

November

Monsanto, Madison, WI
APLU Meeting, Denver, CO

December

Wisconsin Farm Bureau/CALS/UW-Extension Meeting, Madison, WI
World Dairy Expo Board Meeting, Madison, WI

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. For example, in the past year we decided to hire a new faculty member to focus on potato research. Input from the state's potato growers and processors about that industry's needs helped inform this decision, and the industry was represented on the search committee.

CALS makes an effort to get stakeholders directly involved in important decisions that will set the course of the college for years to come. For example, the private sector was represented on the search committees that hired our new CALS dean and two new associate deans. And there are stakeholders on the committee that's undertaking our current yearlong strategic planning exercise, the results of which will guide many important decisions.

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. 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.

Brief Explanation of what you learned from your Stakeholders

In meeting with stakeholders, we learned of their interest in many areas related to agriculture, natural resources and environment, food, energy, rural life and health issues and rural economic development. Examples include:

1) Weather and climate. Last summer's extreme heat and drought moved this topic to the forefront. There are strong and diverse opinions about agriculture and climate change -- the extent to which farms contribute, the need to mitigate, and the need to help farms adapt.

2) Expanding U.S. ag exports. For example, the state's dairy industry is very interested in Asian markets for dairy products, equipment and services. Cranberry growers are concerned about meeting testing and labeling requirements of international markets.

Each year the CALS Center for Dairy Research sponsors sessions at the Wisconsin Cheese Industry Conference, where its staffers provide a science perspective in discussions of opportunities and challenges confronting this sector. In 2013 sessions focused on everything from food safety in dairy plants to opportunities in emerging products such as fresh cheeses, Greek yogurt, kefir and quark.

We learn about needs of organic farmers and processors through the three faculty and staff members who represent CALS and Extension on the Wisconsin Organic Advisory Council. This group is convened by the Wisconsin Secretary of Agriculture, Trade and Consumer Protection in part to provide a conduit for the organic agriculture community to voice its concerns and priorities--including research priorities.

CALS turf researchers learn about green industry priorities by maintaining close contact with the Wisconsin Turfgrass Association. WTA itself funds several grad student fellowships, and turf researchers learn a lot about industry needs as they confer with WTA about which students and projects it wants to support. Many Formula-funded projects also have WTA support.

The CALS administrative leadership team keeps current on ag stakeholder concerns by meeting 2-4 times a year with the Wisconsin Ag Coalition, a group made up of leaders of major ag producer and processor organizations. Last year the Chancellor of the UW-Madison sat in on one of these meetings to get an industry perspective.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	6384258	0

2. Totalled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	5620863	0
Actual Matching	0	0	5620863	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	11241726	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	4292914	0

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

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
112	Watershed Protection and Management			5%	
123	Management and Sustainability of Forest Resources			5%	
135	Aquatic and Terrestrial Wildlife			11%	
136	Conservation of Biological Diversity			9%	
301	Reproductive Performance of Animals			5%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			5%	
304	Animal Genome			5%	
305	Animal Physiological Processes			5%	
601	Economics of Agricultural Production and Farm Management			5%	
603	Market Economics			3%	
604	Marketing and Distribution Practices			3%	
608	Community Resource Planning and Development			3%	
609	Economic Theory and Methods			3%	
701	Nutrient Composition of Food			3%	
702	Requirements and Function of Nutrients and Other Food Components			11%	
723	Hazards to Human Health and Safety			3%	
724	Healthy Lifestyle			3%	
805	Community Institutions, Health, and Social Services			5%	
901	Program and Project Design, and Statistics			3%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	154.0	0.0
Actual Paid Professional	0.0	0.0	37.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	1344153	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1344153	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012
 Actual: 2

Patents listed

Title: EXPRESSION PROFILES AND DNA POLYMORPHISMS OF ID3 AND BMP4 GENES ARE ASSOCIATED WITH FERTILITY TRAITS IN CATTLE

Inventors: Hasan Khatib

Hatch Grant #: 12-CRHF-0-6055

Date Reported to the Federal Government: 2/14/2012

Title: GENES ASSOCIATED WITH BULL FERTILITY IN CATTLE

Inventors: Hasan Khatib

Hatch Grant #: 12-CRHF-0-6055

Date Reported to the Federal Government: 5/8/2012

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	51	0

V(F). State Defined Outputs

Output Target

Output #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:

Year Actual

2012

31

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	51

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program. This list of stakeholders includes:

- *General agriculture
- *Food processing and marketing industry
- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
- *Green industry (turf, ornamentals, etc.)
- *Biotechnology
- *Bio-energy and bio-economy groups
- *Sustainable and organic food producers
- *Environmental groups and interests
- *Consumer and non-traditional groups
- *Governmental agencies and officials
- *Scientific community

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 131 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (which address critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2012, the Wisconsin Agricultural Experiment Station funded projects resulted in 239 publications, 10 patents, and 131 graduate students trained. The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
304	Animal Genome
305	Animal Physiological Processes
601	Economics of Agricultural Production and Farm Management
603	Market Economics
604	Marketing and Distribution Practices
608	Community Resource Planning and Development
609	Economic Theory and Methods
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
723	Hazards to Human Health and Safety
724	Healthy Lifestyle
805	Community Institutions, Health, and Social Services
901	Program and Project Design, and Statistics

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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 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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Global Food Security and Hunger

Reporting on this Program

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			4%	
201	Plant Genome, Genetics, and Genetic Mechanisms			7%	
202	Plant Genetic Resources			7%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			3%	
204	Plant Product Quality and Utility (Preharvest)			7%	
205	Plant Management Systems			4%	
206	Basic Plant Biology			4%	
211	Insects, Mites, and Other Arthropods Affecting Plants			4%	
212	Pathogens and Nematodes Affecting Plants			13%	
213	Weeds Affecting Plants			3%	
215	Biological Control of Pests Affecting Plants			4%	
216	Integrated Pest Management Systems			4%	
301	Reproductive Performance of Animals			4%	
302	Nutrient Utilization in Animals			4%	
303	Genetic Improvement of Animals			4%	
304	Animal Genome			5%	
305	Animal Physiological Processes			5%	
307	Animal Management Systems			7%	
311	Animal Diseases			4%	
722	Zoonotic Diseases and Parasites Affecting Humans			3%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	57.0	0.0
Actual Paid Professional	0.0	0.0	52.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	2201386	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	2201386	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012

Actual: 3

Patents listed

Title: KILLING BACTERIA EMBEDDED WITHIN BIOFILMS BY BENIGN SOIL AMOEBAE

Inventors: Marcin Filutowicz, Katarzyna Borys, Dean Sanders

Hatch Grant #: 13-CRHF-0-6055

Date Reported to the Federal Government: 5/16/2012

Title: SEROTONIN INCREASES CALCIUM MOBILIZATION AT THE TRANSITION PERIOD (FROM PREGNANCY TO LACTATION)

Inventors: Laura Hernandez

Hatch Grant #: 13-CRHF-0-6055

Date Reported to the Federal Government: 2/8/2012

Title: DCAP: A BROAD-SPECTRUM ANTIBIOTIC THAT TARGETS THE BACTERIAL MEMBRANE

Inventors: Douglas Weibel, Ye Jin Eun, Marie Foss

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 2/14/2012

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	113	0

V(F). State Defined Outputs

Output Target

Output #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:

Year	Actual
2012	47

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	113

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program.

This list of stakeholders includes:

- *General agriculture
- *Food processing and marketing industry
- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
- *Green industry (turf, ornamentals, etc.)
- *Biotechnology
- *Bio-energy and bio-economy groups
- *Sustainable and organic food producers
- *Environmental groups and interests
- *Consumer and non-traditional groups
- *Governmental agencies and officials
- *Scientific community

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 131 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2012, the Wisconsin Agricultural Experiment Station funded projects resulted in 239 publications, 10 patents, and 131 graduate students trained. The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
307	Animal Management Systems
311	Animal Diseases

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Climate Change

Reporting on this Program

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			4%	
102	Soil, Plant, Water, Nutrient Relationships			20%	
111	Conservation and Efficient Use of Water			4%	
112	Watershed Protection and Management			4%	
131	Alternative Uses of Land			6%	
132	Weather and Climate			7%	
133	Pollution Prevention and Mitigation			11%	
135	Aquatic and Terrestrial Wildlife			2%	
136	Conservation of Biological Diversity			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			2%	
204	Plant Product Quality and Utility (Preharvest)			2%	
205	Plant Management Systems			4%	
213	Weeds Affecting Plants			2%	
216	Integrated Pest Management Systems			2%	
307	Animal Management Systems			7%	
402	Engineering Systems and Equipment			2%	
403	Waste Disposal, Recycling, and Reuse			9%	
601	Economics of Agricultural Production and Farm Management			2%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			2%	
903	Communication, Education, and Information Delivery			4%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	21.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	676002	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	676002	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Our faculty have initiated several projects that anticipate the impacts of climate change on agricultural and natural 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 ecosystem 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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Year: 2012
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	22	0

V(F). State Defined Outputs

Output Target

Output #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:

Year	Actual
2012	19

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program.

This list of stakeholders includes:

- *General agriculture
- *Food processing and marketing industry
- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
- *Green industry (turf, ornamentals, etc.)
- *Biotechnology
- *Bio-energy and bio-economy groups
- *Sustainable and organic food producers
- *Environmental groups and interests
- *Consumer and non-traditional groups
- *Governmental agencies and officials
- *Scientific community

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 131 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (which address critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2012, the Wisconsin Agricultural Experiment Station funded projects resulted in 239 publications, 10 patents, and 131 graduate students trained. The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
213	Weeds Affecting Plants
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
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
903	Communication, Education, and Information Delivery

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Sustainable Energy

Reporting on this Program

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			5%	
104	Protect Soil from Harmful Effects of Natural Elements			5%	
125	Agroforestry			5%	
131	Alternative Uses of Land			5%	
205	Plant Management Systems			10%	
206	Basic Plant Biology			10%	
211	Insects, Mites, and Other Arthropods Affecting Plants			5%	
402	Engineering Systems and Equipment			10%	
511	New and Improved Non-Food Products and Processes			5%	
601	Economics of Agricultural Production and Farm Management			10%	
603	Market Economics			5%	
605	Natural Resource and Environmental Economics			10%	
610	Domestic Policy Analysis			5%	
723	Hazards to Human Health and Safety			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	9.0	0.0
Actual Paid Professional	0.0	0.0	13.4	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	421989	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	421989	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012
 Actual: 1

Patents listed

Title: IMPROVED PROCESS TO PRODUCE FURFURAL IN HIGH YIELD FROM A FRACTIONATED BIOMASS

Inventors: Troy Runge, Anurag Mandalika

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 7/30/12

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	13	0

V(F). State Defined Outputs

Output Target

Output #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:

Year	Actual
2012	11

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	13

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program.

This list of stakeholders includes:

- *General agriculture
- *Food processing and marketing industry
- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
- *Green industry (turf, ornamentals, etc.)
- *Biotechnology
- *Bio-energy and bio-economy groups
- *Sustainable and organic food producers
- *Environmental groups and interests
- *Consumer and non-traditional groups
- *Governmental agencies and officials
- *Scientific community

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 131 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (which address critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2012, the Wisconsin Agricultural Experiment Station funded projects resulted in 239 publications, 10 patents, and 131 graduate students trained. The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
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
402	Engineering Systems and Equipment
511	New and Improved Non-Food Products and Processes
601	Economics of Agricultural Production and Farm Management
603	Market Economics
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis
723	Hazards to Human Health and Safety

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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 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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)**Program # 5****1. Name of the Planned Program**

Childhood Obesity

 Reporting on this Program**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
305	Animal Physiological Processes			33%	
702	Requirements and Function of Nutrients and Other Food Components			34%	
703	Nutrition Education and Behavior			33%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	4.0	0.0
Actual Paid Professional	0.0	0.0	2.1	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	87298	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	87298	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	1	0

V(F). State Defined Outputs

Output Target

Output #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:

Year	Actual
2012	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program.

This list of stakeholders includes:

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- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
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- *Biotechnology
- *Bio-energy and bio-economy groups
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- *Environmental groups and interests
- *Consumer and non-traditional groups
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What has been done

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4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Food Safety

Reporting on this Program

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			3%	
211	Insects, Mites, and Other Arthropods Affecting Plants			3%	
212	Pathogens and Nematodes Affecting Plants			5%	
302	Nutrient Utilization in Animals			7%	
305	Animal Physiological Processes			7%	
308	Improved Animal Products (Before Harvest)			5%	
311	Animal Diseases			12%	
315	Animal Welfare/Well-Being and Protection			2%	
403	Waste Disposal, Recycling, and Reuse			2%	
501	New and Improved Food Processing Technologies			12%	
502	New and Improved Food Products			10%	
503	Quality Maintenance in Storing and Marketing Food Products			2%	
701	Nutrient Composition of Food			3%	
702	Requirements and Function of Nutrients and Other Food Components			7%	
704	Nutrition and Hunger in the Population			3%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			17%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890

Plan	0.0	0.0	25.0	0.0
Actual Paid Professional	0.0	0.0	23.6	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	890035	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	890035	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

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. Brief description of the target 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.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	0	0	0	0

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

Patent Applications Submitted

Year: 2012

Actual: 4

Patents listed

Title: DISPOSABLE-TIP ELECTRODE DESIGN

Inventors: Sundaram Gunasekaran; Jiang Yang

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 10-19-2011

Title: ELECTROCHEMICAL DETECTION OF MILK ALLERGEN, B-LACTAGLOBULIN (BLG)

Inventors: Sundaram Gunasekaran, Jiang Yang

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 3-16-2012

Title: ELECTROCHEMICAL METHOD TO REMOVE MILK FOULING

Inventors: Sundaram Gunasekaran, Jiang Yang

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 3-16-2012

Title: COCKTAILS OF NATURALLY OCCURRING CHEMICALS FOR INDUCING APOPTOSIS IN CANCER CELLS

Inventors: Kirk Parkin

Hatch Grant #: 11-CRHF-0-6055

Date Reported to the Federal Government: 11-15-2011

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	39	0

V(F). State Defined Outputs

Output Target

Output #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:

Year	Actual
2012	21

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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. 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:</p>

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	39

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin Agricultural Experiment Station has a broad list of stakeholders who potentially benefit from the research and extension/outreach from the Wisconsin Formula Grant program. This list of stakeholders includes:

- *General agriculture
- *Food processing and marketing industry
- *Animal and dairy related agriculture
- *Plant and cropping system interests including vegetables
- *Green industry (turf, ornamentals, etc.)
- *Biotechnology
- *Bio-energy and bio-economy groups
- *Sustainable and organic food producers
- *Environmental groups and interests
- *Consumer and non-traditional groups
- *Governmental agencies and officials
- *Scientific community

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 131 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (which address critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2012, the Wisconsin Agricultural Experiment Station funded projects resulted in 239 publications, 10 patents, and 131 graduate students trained. The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
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
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

External factors which affected outcomes

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

Brief Explanation

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(I). Planned Program (Evaluation Studies)

Evaluation Results

N/A

Key Items of Evaluation

N/A