

2013 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 general philosophy is to allocate formula funding to support specific, peer-reviewed projects rather than to distribute block grants to departments. The largest portion of our allocation goes to support graduate student education. The expenditures that we allow to be covered with formula funding are laid out in a set of guidelines that are reviewed annually by a faculty committee. The formula funds are matched at the state level primarily in the form of state support of salaries for investigators and research staff. As in prior years, we administered a small percentage of our funds to address emerging issues or critical needs.

ALLOCATION OF FUNDS

We use formula funds to support approximately 130 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 two representatives 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 and 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, and 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. 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 October of each year is initiated in June, approximately 16 months prior to when projects are to begin. Proposals are due annually in September. A copy of the Call for Proposals, guidelines and merit criteria are available at <http://www.cals.wisc.edu/waes/application/proposals.html>.

EVALUATION OF PROPOSALS

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

Call for Proposals document referenced above.

ASSESSING OUTCOMES AND IMPACT

WAES uses several indicators to assess the impact and outcomes of a research project. We consider peer-reviewed publications, efforts to share results with client groups through workshops or other venues, patent disclosures and graduate students trained. The list of indicators may be expanded in the future 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 annual reports in the REEport 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. Following are some examples of projects that address these high-priority issues.

Title: The Central Sands Water Initiative--managing the interface between agriculture, climate change and water use

Impact Nugget: A University of Wisconsin-Madison-led effort to better understand groundwater issues in the Central Sands region of Wisconsin paved the way for a major Wisconsin Department of Natural Resources groundwater study in the area.

Issue (who cares and why): Numerous lakes and streams are drying up in Wisconsin's Central Sands region, the heart of the state's potato and vegetable growing industry. The area is dotted with thousands of high-capacity wells, each capable of pumping 100,000 gallons of water per day to irrigate the area's crops. Many people who worry about the area's disappearing surface waters see the wells as the obvious culprit, yet the science hasn't been clear--for instance, there's some evidence that climate change could be a major contributing factor. A better understanding of the problem(s) will lead to successful solutions and buy-in from all stakeholders.

What has been done: A team of University of Wisconsin-Madison researchers helped found the Central Sands Water Initiative, an effort to bring together scientists, government agency staff, farmers, residents, environmental advocates and other stakeholders to shed light on the groundwater problems in the Central Sands region and pave the way toward solutions. Initiative leaders hosted a series of meetings to get the process started. They developed a statistical model that describes how groundwater levels have changed in the area over time, and allows them to differentiate between the natural vs. human-induced factors involved. They produced a thorough, peer-reviewed White Paper, which is about to be published, that describes the current state of the scientific understanding of the interactions between the Central Sands' groundwater and surface water resources, as well as a framework to move forward with solutions.

Impact: The Hatch-supported work completed through the Central Sands Water Initiative (CSWI)--including the stakeholder meetings, the statistical model and the White Paper--helped prompt the Wisconsin Department of Natural Resources (DNR) to fund a major groundwater study in the area. In another outcome, the Wisconsin Geological and Natural History Survey (WGNHS) and the U.S. Geological Survey (in collaboration with CSWI scientists, DNR staff and others) are now working to develop a sophisticated computer model for the Little Plover River, a trout stream that has dried up intermittently in the area. When completed, this model will be able to home in on short-term, specific impacts on stream

flow, such as the impact of turning off one high-capacity well near the stream during a dry spell. As recommended in the White Paper framework, this modeling effort will include stakeholder engagement from the very beginning with the goal of building trust in the research and its outcomes among members of the Central Sands community. Ultimately, these various efforts could help lead to innovative approaches to manage groundwater in the Central Sands region of Wisconsin and beyond. Along the way, the work and findings of the CSWI have been shared at numerous stakeholder and community meetings, including a public hearing hosted by Wisconsin Senator Julie Lassa in the village of Plover in January 2014 that drew more than 300 people.

Funding: WIS01603

More Information: Alvin Bussan, ajbussan@wisc.edu

Knowledge area(s): 102,112,131,132,133,134,135,136, 216

Title: The role of the human Zip13 (SLC39A13) zinc transporter in cellular zinc storage and homeostasis

Impact Nugget: Basic nutritional research has led to a fuller understanding of how cellular zinc storage works--including the discovery of what appears to be a novel cellular vesicle used for zinc storage--and also revealed a promising treatment for a rare genetic disorder of the connective tissue.

Issue (who cares and why): Cells need a certain amount of zinc for the proper function of various enzymes and cellular systems, yet too much can be toxic. One way cells protect themselves is to sequester extra zinc inside cellular compartments, where the metal can be safely stored until needed. While nutritional scientists don't fully understand how this zinc storage works, including the identity of the compartment involved, it is generally agreed that a membrane-bound protein known as Zip13 is probably involved in releasing zinc from storage. Recently, a mutation in the gene for Zip13 was linked to a rare genetic disorder of the connective tissue known as the spondylocheiro dysplastic form of Ehlers-Danlos Syndrome (SCD-EDS). Patients with SCD-EDS have joint hypermobility, tapered fingers, loose skin and spinal malformation. The goal of this Hatch project was to better understand how the Zip13 protein works, with the hope of revealing its role in SCD-EDS.

What has been done: Previously, a number of research groups hypothesized that zinc was likely stored in the cellular organelle known as the endoplasmic reticulum (ER), meaning that Zip13 proteins should be found on the ER's surface. According to this model, the genetic mutation associated with SCD-EDS would cause zinc to build up inside the ER (because it can't be released without functional Zip13), while the rest of the cell was "starving" for zinc.

Through a series of experiments, a team of University of Wisconsin-Madison researchers found this not to be the case. Instead, after ruling out all known options, they concluded that Zip13 appears to be associated with a previously undescribed vesicle used for zinc storage. According to this new model, the genetic mutation associated with SCD-EDS would cause zinc to build up inside this unnamed zinc-storing vesicle, causing the rest of the cell--including the ER--to be starved for zinc.

Impact: These findings suggest a simple, inexpensive treatment for SCD-EDS, one that wasn't suggested by the previous model: zinc supplementation. Already, a small human clinical trial is underway in Switzerland to see if zinc supplements can help mitigate some of the symptoms of SCD-EDS. This work, which also confirmed Zip13's role in releasing zinc from storage and may ultimately lead to the description of a novel cellular vesicle, has been published in a number of peer-reviewed journal articles.

Funding: WIS01323

More Information: David Eide, eide@nutrisci.wisc.edu

Knowledge area(s):702

Title: Using grass in dairy diets to reduce non-fibrous carbohydrate

Impact Nugget: A new forage analysis tool is yielding information about which forages positively affect milk production when added to the dairy diet. This information is helping farmers gain management flexibility, increase animal health and improve environmental stewardship on their farms.

Issue (who cares and why): Dairy farmers have a broad list of possible forages available to feed cattle, but many of the choices have tended to negatively affect milk production. As a result, there has been an increasing reliance on alfalfa and whole plant corn silage as the basis of rations fed to dairy cattle. This heavy reliance on just corn and alfalfa, however, is linked to metabolic problems in dairy cattle. Previously, there was no reliable way to predict how forages would work in the diet, or to troubleshoot issues with quirky rations. Now, thanks to the development of a new, rapid, inexpensive analysis for forage materials, it is possible to evaluate specific plant species--and even specific varieties within species--for the ability of those plants to meet the metabolic needs of high-producing dairy cattle.

What has been done: A team of University of Wisconsin-Madison scientists planted a series of field test plots with many common forage species and varieties, including pure alfalfa, alfalfa mixed with brome grass, timothy, orchardgrass, tall fescue, meadow fescue, meadow bromegrass and reed canarygrass. The team then conducted a feeding trial and tested these forages using the forage analysis tool they developed. They discovered that certain grasses, when used as a partial ingredient additive or substitute in a dairy ration, can actually help improve milk production, while also reducing many metabolic issues associated with high-producing cattle. They also found that there's a wide range of quality between forage species, and also between varieties of the same species.

Impact: New information about how forages affect milk production is taking the guesswork out of adding forages to the dairy ration. Researchers can now make specific recommendations to dairy farmers and consultants about which plants to choose, how to manage and grow such plants, and ultimately how to feed the forage ingredients for the greatest milk production and animal performance. Nutritionists are starting to use this new information, sales of grass seed appear to be increasing, and interest in this topic is growing throughout the dairy business community. Down the road, this could lead to more grass being grown on the landscape, something that could help improve manure management, improve soil management and improve the economics of the dairy farm. Findings from this work are being shared via published papers, industry seminars, trade shows and media, with the goal of reaching farmers and helping them adopt practices that enhance dairy farm sustainability.

Funding: WIS01438

More information: Daniel Undersander, djunders@wisc.edu

Knowledge areas(s): 204, 302

Total Actual Amount of professional FTEs/SYs for this State

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	154.0	0.0
Actual	0.0	0.0	133.0	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 occurs in November with an estimate of 53 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.

How we go about collecting stakeholder input depends on the type of meeting or activity at which we're connecting with stakeholders. Most often, this involves either personal contact between someone on the UW-Madison WAES/CALS administrative leadership group and a traditional or non-traditional stakeholder group or individual, or meetings that are open to the general public or selected individuals. For example, this year we met with beef and cattle industry representatives about their research needs. We also met with staff from the international trade bureau of the Wisconsin Department of Agriculture, Trade and Consumer Protection to discuss our plan for offering training abroad. And we asked alumni of our Farm and Industry Short Course Alumni for ideas about how to improve our practical training for current students.

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

- 1) A visit to the Hancock Agricultural Research Station with our new University of Wisconsin-Madison Chancellor Rebecca Blank. More than 40 growers attending an afternoon roundtable with the chancellor, the dean and research station officials to discuss current issues in potato and vegetable production in Wisconsin's Central Sands region.
- 2) CALS Dean VandenBosch and Governor Walker both attended this year's International Cheese Technology Expo in Milwaukee to discuss the importance of dairy product development in the state and celebrate the remarkable success of Wisconsin specialty cheese makers. The meeting also focused on planning for an expansion of the college's dairy product research facilities. The \$36 million renovation and expansion is set to break ground in the next 18 months.
- 3) Dean VandenBosch spoke with growers at the Wisconsin Cranberry School in Stevens Point in January. The growers identified more than a dozen research priorities, including: identification, evaluation and registration of new reduced-risk pesticides; cultural practices such as flooding for pest control, sanding and winter floods; sensitivity of vines moving in and out of dormancy; oxygen-winter protection and bud hardiness and tolerance to temperature.
- 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 serve on advisory boards 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 attends field days, hosted at our 12 agricultural research stations located throughout the state. These field days and other public events allow college leaders regular interaction with a variety of producers and growers representing the breadth of Wisconsin agriculture.

The Administrative Leadership Group also gets input by part participating in many public or stakeholder-sponsored meetings and field days, many of which are held at our outlying Agricultural Research Stations.

Below is a list of Agricultural Research Station Field Days:

Potato Field Day
Wisconsin Turfgrass Association Field Day
Commercial Flower Growers of Wisconsin
Garden Tour
Organic Field Day-West Madison
Organic Field Day-Arlington
International Carrot Conference
Marshfield Field Day
Spooner Sheep Day
Urban Horticulture Day
Vegetable Breeding Institute Field Day
Agronomy Field Day
Potato Variety Harvest Expo
Pest Management Field Day
Switchgrass II
Wisconsin Potato Vegetable Growers industry talk
Wisconsin Crop Diagnostic Workshop
Taste of the Garden Door

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

January

8 CIAS Citizen Advisory Board, Madison, WI
14 Tom Talbot meeting and tour of plant, Montello, WI
19 Tom Lochner--cranberry meeting, Warrens, WI
22 Wisconsin Cranberry School, Stevens Point, WI

February

14 Growing Power, Milwaukee, WI
10 International Cheese Technology Expo, Milwaukee, WI
13 Meat Advisory Board, Madison, WI

March

5 World Dairy Expo Meeting, Madison, WI

26 Madison Growing Power Facility, Madison, WI

April

3 Wisconsin Farm Bureau Board of Directors Meeting, Madison, WI
19 Board of Visitors Meeting, Milwaukee, WI

May

22 Eckburg Board Meeting, Madison, WI

June

7 World Dairy Expo Board Meeting, Cross Plains, WI

July

2 Professional Dairy Producers of Wisconsin, Darlington, WI

September

7 WALSAA Fireup, Madison, WI
8 Wisconsin Sheep and Wool Festival
18 2013 Bioscience Vision Summit: Growth by Association

October

2 World Dairy Expo
7 World Bank Dairy Programs Meeting
9 Agricultural and Natural Resources Conference
16 Bioenergy Showcase

November

1 Agency Heads Meeting with Department of Agriculture, Trade and Consumer
Protection
8 Dairyvative Technologies
15 Wisconsin Beef Industry
19 Hancock ARS visit with Chancellor Blank

December

7 Farm Bureau Extravaganza
10 World Dairy Expo Board Meeting

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 is represented on the search committees when hiring new CALS 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) Water. The past two years have brought Wisconsin a summer of drought followed by one of intense but sporadic rain. Growers and communities throughout the state have expressed concerns about changing levels of lakes and water tables. Researchers have been asked to provide data to inform community-based discussions about water policies in the state.

2) Breeding. Because of changing climate conditions and international food labeling policies, more industries are asking for the development of new plant varieties. New projects underway include vegetable varieties for organic systems, new potato varieties for fresh markets, and cranberries with increased herbicide tolerance.

3) Representatives from the Wisconsin beef industry met with CALS officials on three occasions this year to discuss their research needs and their interest in starting some new UW beef research projects in Western Wisconsin.

4) The Department of Dairy Science held an all-day "research showcase" in the fall. This was an opportunity for industry leaders to talk about current challenges and to learn about new research from assistant professors, post-docs, graduate students and undergraduates focused on dairy genetics, nutrition and business management practices.

5) 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 university hosted one of this group's quarterly meetings on campus and provided tours of recently completed research facilities.

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	5877906	0

2. Totaled Actual dollars from Planned Programs Inputs				
Extension			Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	6148947	0
Actual Matching	0	0	6148947	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	12297894	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	4876697	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
102	Soil, Plant, Water, Nutrient Relationships			3%	
112	Watershed Protection and Management			5%	
123	Management and Sustainability of Forest Resources			5%	
131	Alternative Uses of Land			5%	
135	Aquatic and Terrestrial Wildlife			9%	
136	Conservation of Biological Diversity			11%	
205	Plant Management Systems			3%	
301	Reproductive Performance of Animals			5%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			5%	
305	Animal Physiological Processes			5%	
403	Waste Disposal, Recycling, and Reuse			3%	
502	New and Improved Food Products			3%	
601	Economics of Agricultural Production and Farm Management			5%	
608	Community Resource Planning and Development			3%	
610	Domestic Policy Analysis			5%	
701	Nutrient Composition of Food			3%	
702	Requirements and Function of Nutrients and Other Food Components			11%	
805	Community Institutions, Health, and Social Services			3%	
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: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	154.0	0.0
Actual Paid Professional	0.0	0.0	28.2	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	1334880	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1334880	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

2013	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: 2013

Actual: 1

Patents listed

Title: EXPRESSION LEVELS OF CDKN1C AND PHLDA2 ARE ASSOCIATED WITH EARLY EMBRYO DEVELOPMENT

Investigator: Hasan Khatib

US provisional: 61/752,969 filed 1/15/2013

US utility: 14/156,403 filed 1/15/2014

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	37	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
2013	27

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
2013	37

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Title: Spatially-explicit survival in recovering population of gray wolves (*Canis lupus*)

Impact Nugget: New computer models have yielded important information about the population dynamics of gray wolves in Wisconsin. This information is being used by state game managers in the Wisconsin Department of Natural Resources to help make wolf management decisions.

Issue:

Nearly extirpated from the continental United States by 1960, the gray wolf has been making a comeback in some of the nation's Northern states, including Wisconsin, and the gray wolf was recently removed from the federal endangered species list. In Wisconsin, reintroduction efforts and in-migration from surrounding areas have brought population levels up to the point where the state recently decided to institute a wolf hunt. The hunt is controversial, however, and the topic of wolves is an emotional one for many people. Some view wolves as an important part of a healthy environment, while others see them as predators of livestock and nuisances that spoil the deer hunt. Solid, science-based information about wolf population dynamics is important to better understand our state's wolves, educate stakeholders and the general public about wolf populations and behaviors, set limits for hunting and trapping, and determine where to focus management resources.

What has been done

For 30 years, wildlife researchers have radio-collared wolves in Wisconsin and the upper Midwest. This data has yielded a picture of habits and population trends in the wolf population in the state. Recently, this pool of data was subjected to several new computer models that focused on factors affecting wolf mortality. These models considered such variables as age, sex, deer density in the area, pack membership, habitat quality, human interaction and more. The researchers analyzed the information to assess the impact of each factor on wolf survival. The analysis revealed a previously unknown cause of wolf mortality: illegal killing. It was found to be a significant cause of death among wolves. The models confirmed other, known causes of death: cars/highways, disease, starvation, inter-species conflict and legal removal.

Results

Impacts:

Wisconsin Department of Natural Resources staff is now factoring in information about the illegal killing of gray wolves as they make decisions about hunting quotas and where to focus management efforts. Results from the research have been presented in scientific journals, reported widely in the media, shared at government informational hearings, and made publicly available through web sites and other media.

Funding: WIS01439

More information: Tim Van Deelen, trvandeelen@wisc.edu

Knowledge area(s): 135,136

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
205	Plant Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
403	Waste Disposal, Recycling, and Reuse
502	New and Improved Food Products
601	Economics of Agricultural Production and Farm Management
608	Community Resource Planning and Development
610	Domestic Policy Analysis
701	Nutrient Composition of Food

702	Requirements and Function of Nutrients and Other Food Components
805	Community Institutions, Health, and Social Services
901	Program and Project Design, and Statistics

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 mission 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			6%	
202	Plant Genetic Resources			7%	
204	Plant Product Quality and Utility (Preharvest)			5%	
205	Plant Management Systems			3%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
212	Pathogens and Nematodes Affecting Plants			11%	
216	Integrated Pest Management Systems			5%	
301	Reproductive Performance of Animals			3%	
302	Nutrient Utilization in Animals			7%	
303	Genetic Improvement of Animals			5%	
304	Animal Genome			5%	
305	Animal Physiological Processes			7%	
307	Animal Management Systems			7%	
311	Animal Diseases			5%	
315	Animal Welfare/Well-Being and Protection			3%	
601	Economics of Agricultural Production and Farm Management			3%	
721	Insects and Other Pests Affecting Humans			2%	
722	Zoonotic Diseases and Parasites Affecting Humans			3%	
805	Community Institutions, Health, and Social Services			3%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	57.0	0.0
Actual Paid Professional	0.0	0.0	48.3	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	2097187	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	2097187	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

2013	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: 2013

Actual: 1

Patents listed

Title: GENETIC MARKERS FOR A MAJOR GENE FOR BOVINE OVULATION RATE

Investigator: Brian Kirkpatrick

US provisional: 61/841,723

Date Reported: 7/1/2013

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	108	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
2013	48

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
2013	108

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

Impact Nugget: A suite of easy-to-use, online management tools is helping dairy farmers make day-to-day business management decisions.

Issue:

Dairy farmers must consider a lot of factors as they make business management decisions: the age, stage of lactation, milk production, breed, genetic value, economic potential and cost of each animal, as well as the potential productivity of a replacement animal. Traditionally, farmers have relied on experience and intuition to make decisions. This has become more difficult and confusing on the modern farm, where new equipment and software can generate thousands of data points each day. While this additional information can be overwhelming, it also represents a new opportunity for farmers make science-based decisions to improve their operations. To do so, however, farmers need computer programs that can crunch all of this data and deliver straightforward information to aid in decision-making.

What has been done

Taking into account the known parameters involved in dairy business management, a team of University of Wisconsin-Madison researchers has created a suite of robust, yet user-friendly economic decision support computer programs that are widely adaptable to the complex decision-making scenarios involved in dairy production. From this effort, there is now a powerful lineup of risk management tools available for use by dairy farmers and consultants. These tools are designed to help facilitate decisions about reproduction, feeding, heifer management, milk production, finances, price risk, the environment, as well as to quantify the value of an individual dairy cow.

Results

Impact:

In a business that changes by the hour and is affected by many outside influences such as the weather, markets and government policy, these new decision support tools can help dairy farmers navigate the choices they need to make to enhance profits, achieve sustainability, and manage land and water resources in environmentally sound ways. Awareness of these tools has been generated through scientific papers, scores of professional presentations, many agricultural media mentions and trade magazine articles. These programs are being used in a UW-Extension outreach program called "ReproMoney", which helps create management teams on dairy farms and uses science-based information to address challenges in dairy herd reproduction. The programs are also available online at the UW-Madison Dairy Management Website (<http://DairyMGT.info>) for any farmer or business consultant to use, and can be used to run comparative business scenarios. The most popular of the online programs, the "Economic Value of a Dairy Cow," can boast more than 1,500 uses in a month.

Funding: WIS01577

More information: Victor Cabrera, victor.cabrera@uwex.edu

Knowledge area(s): 301,307

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
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes 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
315	Animal Welfare/Well-Being and Protection
601	Economics of Agricultural Production and Farm Management
721	Insects and Other Pests Affecting Humans
722	Zoonotic Diseases and Parasites Affecting Humans
805	Community Institutions, Health, and Social Services

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			16%	
111	Conservation and Efficient Use of Water			4%	
112	Watershed Protection and Management			4%	
131	Alternative Uses of Land			6%	
132	Weather and Climate			9%	
133	Pollution Prevention and Mitigation			9%	
135	Aquatic and Terrestrial Wildlife			4%	
136	Conservation of Biological Diversity			6%	
205	Plant Management Systems			2%	
206	Basic Plant Biology			2%	
213	Weeds Affecting Plants			4%	
216	Integrated Pest Management Systems			4%	
306	Environmental Stress in Animals			2%	
307	Animal Management Systems			6%	
403	Waste Disposal, Recycling, and Reuse			12%	
601	Economics of Agricultural Production and Farm Management			2%	
605	Natural Resource and Environmental Economics			2%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			1%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			1%	
	Total			100%	

V(C). Planned Program (Inputs)**1. Actual amount of FTE/SYs expended this Program**

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	2.0	0.0
Actual Paid Professional	0.0	0.0	20.0	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	1062338	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1062338	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 wild ecosystems in the upper Midwestern US. The State of Wisconsin has initiated a Wisconsin Climate Change Initiative (WICCI) group that brings together our faculty and interested clientele from other agencies and industries to discuss and plan for research on, and adaptive response to, climate change. Current projects include work on development of monitoring systems for detecting changes in ecosystems structure and processes over time, soil carbon management practices, silvicultural practices to help ameliorate ecosystem changes resulting from anticipated climate change, remote sensing detection of insect and disease problems associated with climate change, and modeling of conservation practices and land use patterns that might result from climate change.

2. 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

2013	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: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	25	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
2013	22

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
2013	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Title: Whole farm dairy and beef systems: Gaseous emissions, P management, organic production and pasture-based production

Impact Nugget: A new means of analyzing forage fed to dairy cattle is changing conventional methods for balancing diets, altering the way crops are managed and developed, improving feed efficiency, enhancing environmental sustainability, and stimulating new business. Use of this new analysis tool can increase milk production, while reducing associated feed costs; allow greater cropping flexibility; and increase forage harvests from a given land base.

Issue:

Energy is a limiting factor for high-producing dairy cows. To meet this high energy requirement, more corn and highly-digestible forages are typically used, but the use of corn-heavy diets in dairy cattle presents a metabolic challenge for the animals that often results in allied illnesses and chronic conditions such as lameness. To offset these effects, fiber sources are commonly added to the ration. Unfortunately, adding fiber often slows digestion, may reduce milk production, and limits flexibility for the dairy. A fiber digestibility test could help farmers make better choices about which fiber sources to use.

What has been done

The forage and feed analysis tools that farmers currently use to make ration balancing decisions are 30 years old. It's clear they don't take into account every forage/feed variable, as unexplained outcomes occur. A team of University of Wisconsin-Madison researchers set out to discover these unknown variables and to develop a fast, accurate and reliable test for those unknown characteristics. Through this work, the researchers uncovered the reason for fiber digestion variability between feedstuffs, and then developed a means to quickly and accurately test for those attributes. The new test, which has been patented, is now being adopted by the dairy business.

Results

Impact:

The new patented test, known as "total tract neutral detergent fiber digestibility" or TTNDfD, was introduced to the dairy business first through scientific papers, then seminars and meetings, webinars, popular agricultural media and business networking. During the first year the test was offered commercially, it was run on more than 5,000 samples, and its use has continued to trend upward rapidly. Dairy consultants use its availability to prospect for new customers, troubleshoot dairy ration problems, and they are beginning to incorporate its use into routine ration analysis. The use of this test on the dairy farm has resulted in greater milk production and better feed and land use efficiencies. Plant breeders are using it to help develop improved grasses for forage, as well as grasses for pasture-based dairy systems, that have greater fiber digestibility. Farmers can now make science-based decisions about what types of crops are best suited for the dairy ration, the environmental conditions and the management practices specific to their area and their individual farm.

Funding: WIS01539

More Information: David Combs, dkcombs@wisc.edu

Knowledge area(s): 133,307,903

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
205	Plant Management Systems
206	Basic Plant Biology
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
306	Environmental Stress in Animals

307	Animal Management Systems
403	Waste Disposal, Recycling, and Reuse
601	Economics of Agricultural Production and Farm Management
605	Natural Resource and Environmental Economics
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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
102	Soil, Plant, Water, Nutrient Relationships			4%	
104	Protect Soil from Harmful Effects of Natural Elements			4%	
131	Alternative Uses of Land			4%	
201	Plant Genome, Genetics, and Genetic Mechanisms			4%	
202	Plant Genetic Resources			4%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants			4%	
205	Plant Management Systems			10%	
206	Basic Plant Biology			14%	
215	Biological Control of Pests Affecting Plants			4%	
216	Integrated Pest Management Systems			4%	
511	New and Improved Non-Food Products and Processes			14%	
601	Economics of Agricultural Production and Farm Management			4%	
603	Market Economics			4%	
605	Natural Resource and Environmental Economics			10%	
608	Community Resource Planning and Development			4%	
610	Domestic Policy Analysis			4%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			4%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Extension	Research
-----------	----------

Year: 2013	1862	1890	1862	1890
	Plan	0.0	0.0	9.0
Actual Paid Professional	0.0	0.0	10.9	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	523568	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	523568	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

2013	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: 2013
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	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
2013	12

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
2013	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Title: Insect Resistance in Biofuel Poplars

Impact Nugget:

Poplar tree species and hybrids have been identified as one of the nation's most promising woody feedstocks for the production of cellulosic ethanol, a biofuel. Multiple research efforts are underway worldwide to explore how genetic modifications may further improve poplar's utility in biofuel production. This research explored whether particular genetic modifications might have the undesirable side effect of reducing poplar's natural resistance to pest insects, leading to crop loss or additional need for pesticide-which proved not to be the case. These genetic modifications may be used to enhance hybrid poplar as a biofuel crop without substantially affecting pest resistance.

Issue:

Cellulosic biofuel is a source of renewable energy that could one day reduce our dependency on oil, coal and other diminishing, environmentally harmful sources. Poplars offer numerous advantages (including high cellulose content and carbon sequestration, fast growth and low resource requirements) over other biofuel crops, particularly edible row crops that are now at the center of a growing "food versus fuel" controversy. The ability to genetically modify poplars to

enhance their utility as biofuel feedstock is good news for biofuel development.

What has been done

A team of University of Wisconsin-Madison researchers explored insect pest resistance in two types of genetically modified poplar trees that had been altered to improve their use as a biofuel feedstock. One type had modified levels of the growth hormone gibberellic acid (GA) to increase the trees' above-ground stem (i.e. wood) production. The other type had altered lignin, a tough compound in the plant cell walls, to make it easier to break down and release plant sugars during biofuel processing.

The study, which was conducted over a two-year period on greenhouse (University of Wisconsin) and outdoor (Purdue University) hybrid poplars, found that these genetic modifications don't substantially alter the trees' natural insect resistance traits. Nor do they affect the performance (growth, survival, reproduction) of several insect pests of poplar.

Results

Results from the work have been presented at professional meetings, including symposia hosted by the Entomological Society of America and the International Congress of Entomology, as well as at the International Biomass Conference Exposition and an Ecological Society of America conference. Results also have been incorporated into classroom teaching, and soon will be published in professional journals (several papers have been submitted). Researchers on this project interact with the emerging network of researchers associated with the Great Lakes Bioenergy Research Center at UW-Madison, and information exchange and collaborations formed with colleagues and peers at Oregon State University, Purdue University, the University of Georgia and Umea University have greatly improved collective knowledge of genetic modification of poplar.

Long term, the greatest impact may be on the emerging biofuel industry, with genetically modified poplar tree species and hybrids rising as a promising feedstock option.

Funding: WIS01336

More information: Richard Lindroth, lindroth@wisc.edu

Knowledge area(s): 125, 211

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
131	Alternative Uses of Land
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
215	Biological Control of Pests Affecting Plants

216	Integrated Pest Management Systems
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
608	Community Resource Planning and Development
610	Domestic Policy Analysis
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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 # 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			16%	
502	New and Improved Food Products			16%	
701	Nutrient Composition of Food			8%	
702	Requirements and Function of Nutrients and Other Food Components			16%	
703	Nutrition Education and Behavior			20%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			8%	
724	Healthy Lifestyle			8%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities			8%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	4.0	0.0
Actual Paid Professional	0.0	0.0	7.3	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	248635	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	248635	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 Food Science are assessing the causes and consequences of childhood obesity. Ongoing projects include work in nutritional aspects of diabetes, pancreatitis, 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

2013	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: 2013

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	9	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
2013	8

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
2013	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Title: Dietary Management of Pancreatitis

Impact Nugget:

Chronic pancreatitis is an inflammatory disease that attacks the pancreas, a vital gland organ that produces digestive enzymes and insulin. People suffering from chronic pancreatitis experience severe and often constant abdominal pain as the disease progresses. They may also develop diabetes or pancreatic cancer. There is no treatment other than cessation of alcohol and tobacco along with pain management. This research examines the promise of a dietary treatment to offer patients optimal digestive health while decreasing stress on the pancreas.

Issue:

Chronic pancreatitis results in more than 122,000 outpatient visits and 56,000 hospitalizations in the United States each year. An effective dietary treatment would improve and save lives as well as considerably reduce health care costs.

What has been done

Nutritional science researchers are identifying the importance of dietary fat, carbohydrates and amino acids in preventing the onset of pancreatitis and maintaining organ health. Their studies also seek to provide a molecular understanding of the signaling pathway by which acinar cells, the cells that secrete digestive enzymes into the gut, respond to dietary signals in the intestine.

In one ongoing study, rats were placed on varying diets and then induced with pancreatitis. It is expected that a particular combination of fat, carbohydrate and protein will reduce the severity of the disease and allow the pancreas to "rest". Researchers are paying particular attention to dietary effects on the enzyme trypsinogen; a premature activation of this enzyme is considered key in causing pancreatitis.

In a parallel study, rats and mice on a protein-free diet are being treated with varying courses of the mTOR inhibitors rapamycin and PP242, which are being developed for use in chemotherapy. This study may uncover a previously unforeseen use of these compounds in the treatment of pancreatic disease.

Results

Results generated through this study were presented at the annual meeting of the American Pancreatic Association in 2012 and published in a peer-reviewed journal in 2013.

Data generated so far has led to a better understanding of enzyme formation and maturation during dietary adaptation of the pancreas and how altering this maturation process by changing the diet is a potential means of preventing and treating pancreatic disease.

Funding: WIS01583

More Information: Guy Groblewski, groby@nutrisci.wisc.edu

Knowledge area(s): 305, 702, 703

4. Associated Knowledge Areas

KA Code	Knowledge Area
305	Animal Physiological Processes
502	New and Improved Food Products
701	Nutrient Composition of Food
702	Requirements and Function of Nutrients and Other Food Components
703	Nutrition Education and Behavior
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
724	Healthy Lifestyle
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

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 mission 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
212	Pathogens and Nematodes Affecting Plants			6%	
302	Nutrient Utilization in Animals			3%	
305	Animal Physiological Processes			9%	
308	Improved Animal Products (Before Harvest)			3%	
311	Animal Diseases			10%	
501	New and Improved Food Processing Technologies			15%	
502	New and Improved Food Products			15%	
503	Quality Maintenance in Storing and Marketing Food Products			6%	
701	Nutrient Composition of Food			3%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources			6%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			24%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2013	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	25.0	0.0
Actual Paid Professional	0.0	0.0	18.2	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	882339	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	882339	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, milk fat production, 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

2013	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: 2013

Actual: 3

Patents listed

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

Investigator: Douglas Weibel, YeJin Eun, Marie Foss

US provisional: 61/657,126 (filed 6/8/2012)

US utility: 13/913,912 (filed 6/10/2013)

Title: Solid Working Electrode with Replaceable Tip

Investigator: Sundaram Gunasekaran

US provisional: 61/620,257 (filed 4/4/12)

US utility: 13/759,490 (filed 10/10/13)

Title: Electrochemical detection of beta-lactoglobulin

Investigator: Sundaram Gunasekaran

US utility: 13/833,438 (filed 3/15/13)

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2013	Extension	Research	Total
Actual	0	27	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
2013	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 Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2013	27

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Title: Characterization of the synergistic interaction between *Salmonella enterica* and *Xanthomonas vesicatoria* in the tomato phyllosphere

Impact Nugget:

By exploring how human pathogens survive on plants, University of Wisconsin-Madison researchers are generating information that could help prevent outbreaks of foodborne illnesses linked to contaminated produce.

Issue:

Salmonellosis is one of the leading causes of acute bacterial gastroenteritis in the United States, responsible for an estimated 1.4 million cases of illness annually, with an estimated cost of \$2.5 billion. Each year, these infections lead to approximately 15,000 hospitalizations and 400 deaths. In recent years, there have been more salmonellosis illnesses associated with people eating fresh produce than those linked to people eating eggs, chicken and other animal products combined. Very little is understood about these produce-associated outbreaks, including basic information about how human pathogens survive on plants. A better understanding could lead to new strategies to prevent such outbreaks.

What has been done

Previously, this UW-Madison research team discovered that salmonella, a human pathogen, requires the presence of a plant pathogen to grow on leaves. In this project, they sought to better understand how this works. In one colorful series of experiments utilizing fluorescent dyes, they assessed whether *Salmonella enterica* (colored blue) makes a multi-species biofilm with a common plant pathogen of tomato known as *Xanthomonas vesicatoria* (colored green) as part of its survival strategy. Previously, other researchers had found examples of human and plant pathogens co-colonizing plant surfaces. Surprisingly, in this case, the two pathogens kept to separate places, with salmonella congregating in the junctions (the seams where two plant cells meet) and at the base of trichomes (hairs on leaves) and xanthomonas growing in the leaf interior via the stomata (the pores that plants use to exchange gases). In another set of experiments, the team discovered an important gene/protein involved in salmonella's ability to colonize leaf surfaces.

Results

The gene/protein found by this team that enables salmonella to colonize plants makes a great molecular target, one that could lead to the discovery of new compounds or other strategies to block salmonella growth on plants. The study's other main finding, that salmonella and xanthomonas don't co-colonize leaf surfaces, is good news for growers. It means that xanthomonas, which is a common plant pathogen, isn't protecting salmonella by forming a biofilm with it. But there is also bad news for farmers in the findings: salmonella grows better on plants when they are sick. Down the line, this information will help farmers make science-based decisions about whether or not to use irradiation or other treatments to kill human pathogens on their produce. Pieces of this work have been published in four peer-reviewed journal articles so far.

Funding: WIS01574

More information: Jeri Barak, barak@plantpath.wisc.edu

Knowledge area(s): 712

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
308	Improved Animal Products (Before Harvest)
311	Animal Diseases
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
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

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