2008 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 the concept of investigator-driven and peer-reviewed research activities. The general philosophy in allocating Formula funding is to provide support for specific reviewed projects rather than to distribute block amounts to faculty or departments. At the University of Wisconsin, faculty appointments are funded with state appropriations, thus releasing nearly all Formula funding for project support. Expenditures are allowed under a series of guidelines reviewed annually by a faculty committee.Matching funds come primarily from state support of salaries for investigators and research staff.

This process has worked very well during periods of stable funding. However, with significant increases in Formula funding occurring mid-year for FY 2007, we carried over funds into FY 2008. Some of these funds were allocated during FY 2007 using the competitive process to the extent possible, but a significant allocation was made administratively based on the stakeholder input processes described and on national and state priorities. Our allocation for FY 2008 was administered as described in this document, but some carryover is expected. We do expect to again allocate a small percentage of our funds administratively based on emerging or critical issues.

Formula funds are distributed to approved projects with yearly budgets. Normally, approximately 160 projects are funded with formula funds each year with budgets that include personnel (mainly graduate students) and supplies. Funding of capital equipment items, some of which may be shared by several projects, are prioritized by departments and funded in a separate exercise. Travel to multistate research meetings is provided for the official representative from a central pool of funds.

The Research Program is composed of a number of projects with individual review and reporting. Program duration may be extended for multiple years, but the contributing projects are a constantly shifting portfolio that can be quickly redirected. Projects are approved for periods of one to four years with the majority on a four-year cycle. Proposals for new projects require a discussion of the results from previous Formula grant support which is used as part of the criteria for ranking proposals and for evaluating the ability of the team to complete the research project successfully. Although some multistate projects have been continuing for more than 10 years, revised proposals are required for review and approval at least every 4 years. Each year, approximately 20% of the research portfolio is shifted in new directions.

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

The process follows a general "logic model" process in which input is sought from stakeholders, establishing a set of operating priorities. Stakeholder groups include both traditional and non-traditional groups. Input is also sought via public meetings such as field day events held at our Agricultural Research Stations or through other Extension venues including meetings and a set of Extension issue-based teams composed of University of Wisconsin – Madison/Extension faculty and county based educators.

Five national goals established in the Research, Education, and Economics (REE) Mission Area and USDA Cooperative State Research, Education and Extension Service (CSREES) Agency strategic plans continue to be followed. (http://www.csrees.usda.gov/business/reporting/portfolios.html)

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

1. Enhance Economic Opportunities for Agricultural Producers.Empower families and communities to address the economic and social challenges through research-based information and education.

2. Support Increased Economic Opportunities and Improved Quality of Life in Rural America. Enhance environmental quality through better understanding of, and building on, agriculture and forestry's complex links with soil, water, air and biotic resources.

3. Enhance Protection and Safety of the Nation's Agriculture and Food Supply. Ensure a safe and adequate food and fiber supply through improved science-based detection, surveillance, prevention, and education.

4. Improve the Nation's Nutrition and Health.Enable people to make health-promoting dietary choices through nutrition education, research, and development of more nutritious foods.

5. Protect and Enhance the Nation's Natural Resource Base and Environment. Empower the agricultural system with knowledge to improve competitiveness in domestic production, processing, and marketing through research and education.

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

1. Mechanisms of pest and pathogen resistance and safe and effective control, with minimum effects on environmental quality and human health.

2. Effects of change in global climate, population pressures, or 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 in order to manage biotic systems for human use.

These Wisconsin priorities along with the National Goals are provided to faculty to use in developing proposals for funding under the Formula Grant programs. They are also provided to the review panel that provides recommendations for funding. We feel that there is a strong relationship between the national goals and Wisconsin priorities; for example, the first National goal (Enhance Economic Opportunities for Agricultural Producers.Empower families and communities to address the economic and social challenges through research-based information and education) is clearly related to a number of the Wisconsin priorities including:

1. Mechanisms of pest and pathogen resistance and safe and effective control, with minimum effects on environmental quality and human health.

2. Effects of change in global climate, population pressures, or 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.

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 in order to manage biotic systems for human use.

Looking at the fourth National Goal, (Improve the Nation's Nutrition and Health.Enable people to make health-promoting dietary choices through nutrition education, research, and development of more nutritious foods.), the following Wisconsin goals relate:

1. Mechanisms of pest and pathogen resistance and safe and effective control, with minimum effects on environmental quality and human health.

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 in order to manage biotic systems for human use.

Similar relevance can be cited for each national goal: Goal 2, Support Increased Economic Opportunities and Improved Quality of Life in Rural America, is aligned with Wisconsin priorities 2, 3 and 5. National Goal 3, Enhance Protection and Safety of the Nation's Agriculture and Food Supply, relates to Wisconsin priorities 1 and 4. National Goal 5,Protect and Enhance the Nation's Natural Resource Base and Environment, is supported by Wisconsin priorities is supported by all of the Wisconsin priorities.

These priorities along with other criteria such as Extension/Integrated activity, Multistate, under-represented populations/groups and past Formula Grant productivity are also used in the merit evaluation of proposals subsequently submitted.

The Call for Proposals for a fiscal year (for example FY10) beginning Oct. 1, 2009, was initiated in June, 2008, approximately 16 months prior to project initiation. Proposals were due September 12, 2008.A copy of the Call for Proposals, guidelines and merit criteria are available at http://www.cals.wisc.edu/research/waes/applying.html?0?Cp5.

Proposals are evaluated by an internal panel of faculty, called the Research Advisory Committee (RAC). The RAC is

composed of 10 faculty, the Assistant Director of the Agricultural Experiment Station and the Associate Dean for Research. Faculty are chosen to represent the broad cross section of the college and serve rotating three year terms. Proposals are assigned to primary and secondary reviewers from the RAC members and two other appropriate scientific reviewers not on the RAC. These reviewers may be either internal, external or a mix. The criteria for choosing the reviewers would be their ability/knowledge base to judge the merit of the proposals. The RAC will then convene in late November or early December to rank the proposals based on the established criteria.

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

Outcomes being monitored initially to assess program effectiveness and impact include publications, patents and graduate students trained. Future indicators may be expanded to include other criteria. This information will not only be used to assess current program effectiveness and accomplishments, but will be used as a consideration in determining future Formula Grant funding priorities.

The College of Agricultural and Life Sciences (CALS) feels that Wisconsin accomplishments relate very well to high priority issues cited earlier. Publications in refereed journals, books, and extension bulletins have been reported on projects using the AD-421 annual reports in the CRIS system. UW-Madison-CALS was rated first among peer institution in the Scientific Impact Factor of its publications. We feel this is representative of our entire research portfolio including Formula Grants. Formula funding of research often leads to significant funding from other sources. CALS also rates very highly in extramural funding both among land-grant and public institutions. A number of representative projects are reported as impacts in our Annual Report.Several representative examples of projects and their impacts are cited from the WAES 2008 annual report as follows:

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Title: Harvest Fractionation of Alfalfa

Impact nugget: A system being developed to separate alfalfa leaves from stems in the field will add value to the crop both as a livestock feed and as a feedstock for bioenergy

Issue (who cares and why): Alfalfa has long been one of Wisconsin's most important crops, but it could be even more valuable if the plant's two distinct parts—leaves and stems—could be separated in the field. When fed as is, the crop provides both protein (in the leaves) and roughage (the stems), but not necessarily the ideal balance of the two. Separating them would enable farmers to create custom blends of the two or to market the stems separately as a feedstock for ethanol production.

What has been done: The team began by modifying a conventional snap bean harvester to strip off alfalfa leaves while leaving the stems standing to be cut and collected later. This led to ongoing efforts to create a one-pass harvest and separation system. They then redesigned the machine to strip the leaves and blow them into a wagon, while simultaneously cutting the stems and placing them into a windrow for baling. They are now refining the system to work more effectively in a wider range of field conditions. The original research also identified the challenges involved in storing fresh-cut alfalfa leaves. If the fine-textured, high-moisture leaves are simply placed in the silo, they won't ferment properly — e.g., they rot. So Kevin Shinners has enlisted the aid of Richard Muck, an engineer at the UW-Madison based USDA-ARS Dairy Forage Research Center. Richard Muck is looking at various ensiling systems and silage additives to find one that will promote the proper type of fermentation.

Impact: This research has laid the groundwork for a technology that would let farmers turn one crop stream into two. It can give them a means to make a better livestock ration from alfalfa. It would also give them a new cash crop, because they could market the stems for bioenergy production. That's great news for Wisconsin's farmers, who in 2007 planted 2.4 million acres of alfalfa—second only to corn—and harvested 8.3 million tons. It also bodes well for the development of a Wisconsin cellulosic bioenergy industry, which will require a reliable supply of biomass.

Funding: WIS04971

More information: Kevin Shinners, 608-263-0756, kjshinne@wisc.edu

Knowledge area(s): 205, 402

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Title: Vegetative Buffer Strips for Reducing Contaminated Runoff from Urban Areas

Impact nugget: Buffer strips of turfgrass and native prairie plants have been shown to be equally effective at filtering urban storm water runoff, information that will help Wisconsin's policymakers make informed decisions about buffer strip requirements.

Issue (who cares and why): The Wisconsin Department of Natural Resources wants to minimize the amount of sediment and nutrients carried into lakes and streams by stormwater runoff.To this end, in 2002, the DNR considered requiring waterfront property owners to replace part of their lakeside lawns with buffer strips of native plants, based on the assumption that deep-rooted native prairie plants were better than turfgrass at filtering storm water runoff. However, there was no research data showing that native plants were more effective, while years of experience in agricultural settings shows that turfgrass can effectively stem soil erosion. In order to base the state's buffer strip requirements on real scientific findings, the DNR held off writing new requirements while researchers explored the effectiveness of different types and sizes of buffer strips.

What has been done: UW-Madison researchers John Stier and Wayne Kussow conducted studies to assess the effectiveness of both turfgrass and prairie plantings for stormwater filtering and infiltration. They poured slabs of concrete that drained into newly seeded plantings of both types of vegetation. They planted three different sizes of buffers to learn how big a buffer should be relative to the impervious area that drains into it.They collected and measured runoff from these plantings, as well as water that leached through the soil profile. They measured phosphorus and sediment in the runoff and nitrogen in the leachate.They learned that 90 percent of the year's runoff takes place when soil is frozen. For the other 10 percent, both types of

vegetation were equally effective. Prairie and turf lost only about a half-pound of phosphorus per acre (row crops typically lose 10 to 40 pounds per acre). They also found that while a buffer equal in size to the pavement did an adequate job of filtering, one that was twice as big or four times as big did better. However, it's possible to have too big of a buffer, because larger plantings have more decaying leaves, a source of soluble phosphorus.

Impact: The results have been shared through a variety of means with DNR stormwater experts and other policymakers to help them make informed decisions about buffer strip requirements. Findings have also appeared in two professional publications and more are in progress.

Funding: WIS05232

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Knowledge area(s): 112

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Title: Swamp Dodder (Cuscutagronovii) Applied Ecology and Management in Carrot Production

Impact nugget: Crop mowing and non-chemical herbicides are two effective ways to combat swamp dodder, a parasitic weed that reduces carrot yield and quality.

Issue (who cares and why): Swamp dodder, a parasitic weed that draws water and nutrients away from its host plant, has been spreading through Wisconsin's carrot fields, reducing crop yield and quality. At its worst, this weed can reduce a field's yield to zero. Naturally, members of the state's processing carrot industry are very concerned about this problem and have called upon scientists to develop a management system to control swamp dodder that can be quickly implemented across the state's carrot fields.

What has been done: In an effort to better understand the swamp dodder plant and its effects on carrots, a team of University of Wisconsin-Madison researchers conducted two greenhouse studies. In the first, the effect of the timing of swamp dodder infestation was tested by introducing the parasite to carrot plantings at two week intervals. In the second study, researchers tested how mowing at two week intervals affected swamp dodder parasitism and carrot root growth. In addition, a separate field study was conducted in which non-chemical herbicides were evaluated for their ability to control swamp dodder infestation. The mowing and non-chemical herbicide techniques both proved to be effective, environmentally-friendly methods to combat the swamp dodder weed.

Impact: UW-Madison researchers discovered two effective approaches to suppress the parasitic weed known as swamp dodder without negatively affecting carrot root growth. Specifically, they found that strategically timed mowing, as well as certain non-chemical herbicides are able to suppress this weed. The integration of these two methods is expected to greatly reduce the impact of swamp dodder parasitism on carrot production in Wisconsin. These findings have been shared with many of the state's carrot growers, processors and field consultants via carrot grower and processor meetings, field days and tours, and at professional disciplinary meetings.

Funding: WIS01040

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Knowledge area(s): 213, 216

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Title: Conservation, Management, Enhancement and Utilization of Plant Genetic Resources

Impact nugget: Breeding trials explore the potential of corn as a bioenergy crop.

Issue (who cares and why): Biomass—the leaves and stalks of plants—is abundant and inedible, making it an attractive alternative to oil as an energy source in the United States. The potential of recovering economic value from biomass is alluring to farmers, but very little is known about the biomass potential of some of our most common food crops. In fact, many of those crops have been bred over hundreds of years to minimize biomass. For instance, breeders and farmers have long favored tall, narrow corn plants, with few lateral branches, because those varieties can be planted at higher densities, maximizing grain yield. But would this be the best arrangement for a farmer who wished to produce both food and fuel from a corn crop? This project seeks to answer that question.

What has been done: To evaluate the potential of corn as a bioenergy crop, de Leon and her team developed a population of corn that was bred to produce more tillers (lateral branches) than the corn conventionally grown today. In field trials, they planted these new corn varieties in several different physical configurations, including variations in plant density and spacing, to compare per-acre biomass and grain yields to standard corn. After the first year of trials, the researchers observed that leafier varieties of corn can yield more biomass per acre without a significant sacrifice in grain yield, an important finding that suggests that corn can be maximized to produce more biomass while still producing grain. Although these results need to be confirmed with a second year of trials, the team is confident that they have identified a promising new route for breeding corn as a crop for both grain and biomass. At the same time, they are also working to isolate and clone the genes responsible for high tiller output, information that could speed the further development of these new corn varieties through conventional breeding or genetic engineering.

Impact: As the bioenergy economy takes shape, research data is vital to making informed agronomic and policy decisions. Although this project is ongoing, it is providing significant validation of the potential of corn as a bioenergy crop. This is important because, unlike dedicated energy crops such as switchgrass or miscanthus, which can yield only biomass for energy, corn has the potential to yield both food and biomass from the same plant, allowing farmers to reap returns from two markets. This project is providing confirmation that such a system is feasible, while creating the genetic material from which these new forms of

commodity corn could soon be bred.

Funding: WIS01335

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Knowledge area(s): 201, 202, 206

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Title: Viticultural Development in Wisconsin

Impact nugget: Research Plots of Newly Planted Wine Grapes Will Soon be used to Support Wisconsin's Young Wine Industry.

Issue (who cares and why): With 52 existing vineyards, Wisconsin has the potential to develop a significant viticultural industry. But although the state soils are well-suited to support the French-American hybrid grape varieties most commonly used to produce wine in the United States, the performance of grapes varies significantly depending on cultivar, climate and geography. To achieve its full potential, Wisconsin's wine industry needs more data on how different varieties of grapes develop in the state's five geographical regions, as well as improved varieties that are tailored to perform well in those different regions.

What has been done: Taking advantage of the UW-Madison's Agricultural Research Stations located throughout the state, researchers planted modern French American wine grape selections in three distinct climatic and geographical locations in Wisconsin. These varieties are being tested for yield and quality characteristics, with the ultimate goal of identifying which varieties are most ideally suited to particular geographic regions in Wisconsin. The project also has set the stage for future research on preventing disease and controlling pests, problems that are particularly important to Wisconsin grape growers. Through this project, the researchers also worked with vineyard operators to train their staff in the management and pruning of grape vines, and to identify and address farm-specific problems.

Impact: According to a recent survey of Wisconsin grape growers, more than 50 percent of vineyard operators say they want more information on cultivar selection. The results of this research will fill a void in our knowledge of these cultivars and their development, yield, quality and hardiness in Wisconsin. As grape vines require multiple growing cycles to establish and bear fruit, this evaluation is only at its beginning, but the effort of getting the vines planted and established is a significant first step toward supporting a state industry that has great potential for regional and national growth.

Funding: WIS01315

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Knowledge area(s): 204, 206, 216

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Title: Trojan Horse in the Orchard: A Novel Strategy to Combat Erwinia Amylovora, the Fire Blight Pathogen

Impact nugget: Technology originally developed to combat an agricultural pest is now being turned into a commercial product designed to fight bacterial infections in humans.

Issue (who cares and why): In medicine and agriculture alike, antibiotics are used to kill microbes that cause infection and disease. Unfortunately, the widespread use of antibiotics has caused some of these drugs to lose their effectiveness. Over the years, numerous microbes have developed resistance to one or more antibiotics, and worse, the genes that are responsible for resistance are quickly spreading through the microbial community. Experts predict that new antibiotics and antibiotic derivatives will allow us to continue combating microbes in the traditional way for another few decades or so, but they don't actually solve the problem of resistance. To get around it, it is imperative that we develop entirely new kinds of anti-microbial drugs.

What has been done: A team of University of Wisconsin-Madison researchers developed a new way to kill pathogenic bacteria that doesn't rely on conventional antibiotics. Dubbed the "Trojan horse" strategy, this method employs an otherwise benign strain of bacteria to transfer small pieces of DNA—which encode deadly products—to the target bacterium. In this case, the DNA was selectively transferred to Erwinia Amylovora, a bacterium that infects apple and pear trees. Once inside the target bacterium, the small pieces of DNA, known as plasmids, do their dirty work by replicating themselves until they kill the organism.

Impact: This new method to kill bacteria, dubbed the Trojan horse strategy, is a promising alternative to using antibiotics. The technology was patented through the Wisconsin Alumni Research Foundation, and then licensed to ConjuGon, a Madison, Wisconsin-based biotechnology company in 2002. Since then, the company has been developing it into a commercial product to treat infected wounds. In 2007, a team of academic researchers from Loyola University published a paper confirming the ability of this technology to efficiently control drug-resistant *Acinetobacterbaumanni* infections in burn wounds. This strain of bacteria has become a major clinical problem, especially among critically injured soldiers fighting in Iraq and Afghanistan. Over the past couple years, ConjuGon has been awarded $3.6 million in funding from the U.S. Department of Defense to further develop and refine this technology.

Funding: WIS05235

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Knowledge area(s): 212, 215

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Title: Selenium Regulation, Selenium Requirements and Molecular Turkey Nutrition

Impact Nugget: A suite of new selenium biomarkers will help doctors, veterinarians and nutritionists maximize the health benefits of this essential nutrient in humans and animals.

Issue (who cares and why): Selenium is an essential nutrient for humans and animals. Unfortunately, the current methods used to measure selenium levels are inadequate; they don't give accurate information about the true "activity" of this mineral in the body. This problem manifests itself in various ways. For instance, in the past, selenium was reported to reduce the risk of developing prostate cancer by 60 percent. However, a large follow-up study supported by the National Cancer Institute—known as the SELECT study—was recently halted in part because these supplements failed to prevent cancer. This discrepancy could well be explained if there were a better way to measure selenium levels and activity. It is possible that in the first study the selenium levels of the subjects *before supplementation* tended to be sub-optimal (and thus the supplements helped them), whereas the selenium levels of the subjects in the NCI-funded study had been adequate before supplementation (and thus they didn't benefit from the extra selenium). An improved measurement method would also benefit agriculture, where livestock, including turkeys, are routinely over-fed this nutrient, a practice that reduces grower profit and pollutes the environment.

What has been done: By studying the expression of proteins that require selenium to function properly in various animal models (turkeys, chickens, rats and mice), as well as in humans, a team of University of Wisconsin-Madison researchers discovered a number of promising selenium "biomarkers"—molecules that reveal the status of selenium in the body. This team was the first to evaluate the dietary selenium levels required for full gene expression of *the complete set* of selenium-dependent proteins in animal systems.

Impact: Researchers have discovered a suite of new biomarkers that can be used to measure selenium requirement and selenium activity in the body. Although this work was originally funded to help turkey growers manage nutrition in fast-growing turkey poults, it could very well impact human health. Currently, because of these studies, the principle investigator is at the forefront of a burgeoning effort to discover and develop selenium biomarkers in humans for both selenium deficiency and selenium excess. In fact, this work helped him secure a National Institutes of Health grant to further assess these newly discovered biomarkers in humans. In the future, these studies may help the U.S. Department of Agriculture fine-tune the recommended daily allowance for this mineral, and could even help doctors and nutritionists adjust an individual's selenium intake to fit their genetic makeup.

Funding: WIS04909

More information: Roger Sunde, 608-262-4044, sunde@nutrisci.wisc.edu

Knowledge area(s): 302, 311, 702

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Title: Understanding the Biosynthesis of the Broad-Spectrum Antibiotic Streptothricin

Impact Nugget: By studying how an unusual amino acid is synthesized in bacteria, researchers discovered a new method to develop next-generation antibiotics.

Issue (who cares and why): For the past 50 years, antibiotics have been widely used to combat disease-causing microbes. Unfortunately, many antimicrobials are not as effective as they used to be. This is because, over the years, microbes have developed resistance to many of these drugs. Already, diseases such as tuberculosis, gonorrhea, malaria and childhood ear infections are much more difficult to treat than they were a few decades ago, and if this trend continues, common infections will become problematic and even deadly, just as they were during the pre-antibiotic era. In the case of tuberculosis alone, it is estimated that there were 14.4 million new cases and 1.7 million disease-related deaths in 2006.

What has been done: A team of University of Wisconsin-Madison researchers discovered the two key steps involved in the formation of an important structural element—an unusual amino acid—that gets incorporated into streptothricin, an agriculturally important antibiotic, as well as viomycin, a member of an important family of tuberculosis-fighting antibiotics. They did this by studying the molecular structures of the drugs themselves, deducing the likely steps involved in their biosynthesis, and then locating and sequencing the real genes involved in a viomycin-producing bacterium.

Impact: Two key steps in the formation of the antibiotics viomycin and streptothricin are now known. Specifically, the researchers figured out how an unusual amino acid that is subsequently incorporated into these molecules is formed. This information can be used to create novel antibiotics, as well as new derivatives (slightly modified versions) of the original drugs. In the case of viomycin, new derivatives could help preserve the utility of an entire class of antibiotic compounds used as a "last resort" to treat multi-drug-resistant tuberculosis infections. Based on this work, the U.S. National Institutes of Health granted the principal investigator $1.125 million to develop new anti-tuberculosis drugs. The approach has also been patented, and is thus available for commercial or non-profit development.

Funding: WIS04726

More Information: Michael Thomas, 608-263-9075, thomas@bact.wisc.edu

Knowledge area(s): 212, 311, 712

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Title: Environmental and Economic Impacts of Nutrient Management on Dairy Forage Systems

Impact nugget: The Combs-Goeser test gives livestock producers a way to assess an important component of forage quality—fiber digestibility—and is being rapidly adopted by the industry.

Issue (who cares and why): Forage analysis is used to assess the nutritional makeup of forages such as alfalfa, grass, corn silage and similar materials. Livestock producers rely on forage analysis to optimize livestock rations and to make other decisions about the management of their operations. This information is also important to the people who market forage materials to livestock producers. Unfortunately, one aspect of the analysis—fiber digestibility—has long been problematic. A typical example: two different batches of forage produce similar lab reports, yet lead to very different levels of milk production in

dairy cows. In cases like these, the discrepancy has largely been due to problems with the fiber digestibility test, the one aspect of forage analysis known to be notoriously unreliable.

What has been done: A team of University of Wisconsin-Madison scientists developed a new, more reliable method, known as the Combs-Goeser test, to assess fiber digestibility of forages. It is a major improvement over the old method, as it significantly reduces the variation seen from one lab run to the next.

Impact: The Combs-Goeser test, which is in the process of being patented, is already being adopted by forage testing laboratories and the livestock industry. It is poised to be widely used: Nationwide, nearly half of all forages submitted to forage testing laboratories are assayed for fiber digestibility. In Wisconsin alone, about 250,000 forages are tested for fiber digestibility each year, and the improved test results are being used by nutritionists to more accurately formulate diets for dairy cows.

Funding: WIS04344

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Knowledge area(s): 307

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Title: Genetic Selection and Crossbreeding to Enhance Reproduction and Survival of Dairy Cattle

Impact Nugget: For dairy producers interested in breeding for more than just milk production, there is a revised index that takes health, reproductive success and longevity into account.

Issue (who cares and why): When making breeding decisions, dairy producers mainly consider an animal's ability to produce milk—the more the better. However, in the rush to increase milk production, dairy cattle have lost other important traits due to this "one-issue" approach to breeding. For instance, over the past few decades, as milk production has increased, fertility has decreased to the point where getting cows successfully bred is now a major concern for most modern dairy operations. For the long-term sustainability of the dairy business, it is important to start giving more weight to other important traits—such as reproductive success, overall health and longevity—when making breeding decisions.

What has been done: As part of a multistate project, a team of University of Wisconsin-Madison scientists is applying modern molecular genetics tools to this problem, identifying specific genes that affect important traits in dairy cattle. Using data collected from commercial farms and from their own breeding experiments, they have revised a popular dairy breeding index so that it does a better job of taking into account the overall health, survival, reproduction and milk production in Holstein and Jersey breeds.

Impact: UW-Madison researchers have made significant improvements to a federal breeding index commonly used by the U.S. dairy business community. This index, housed on the USDA-ARS's Animal Improvement Programs website, can be accessed at http://aipl.arsusda.gov/dynamic/sortnew/current/index.shtml, and is used by some commercial breeding organizations to improve their proprietary indexes.The changes the team has made to the USDA-ARS index will help improve the overall health, survival, reproduction, calving ability, and milk production in the nation's Holstein and Jersey breeds. However, more needs to be done. Thus, the UW-Madison team continues its efforts to link specific genes to serious health and fertility problems in dairy cattle, work that will further speed the management of these key genetic traits in the future.

Funding: WIS01103 and WIS01193

More information: Kent Weigel, 608-263-4321, kweigel@wisc.edu

Knowledge area(s): 303, 304

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Title: Methods to Increase Reproductive Efficiency in Cattle

Impact nugget: A reproductive management tool for dairy cattle—known as timed artificial insemination—has helped improve the economic bottom line of dairy operations across the nation and beyond.

Issue (who cares and why): Over the past few decades, the American dairy industry has seen substantial increases in milk production. However, there is an unfortunate corollary. As yields have gone up, reproductive efficiency has declined dramatically. This decline has serious economic consequences for dairy producers, because timely pregnancy is essential to optimize milk production from dairy cows. For every day that a cow fails to become impregnated, producers lose $2 - $4. The reproductive difficulties seen in high-producing dairy cows stem from three major problems: (1) dairy cows do not have normal reproductive cycles, (2) they do not demonstrate strong reproductive behavior (estrus), which means it's difficult for dairy producers to know when to breed cows, and (3) they have low fertility after they are inseminated.

What has been done: A team of University of Wisconsin-Madison scientists developed a technology—known as Ovsynch—that vastly improves reproductive efficiency in dairy cows. This technology, which employs natural hormones to stimulate ovulation, causes cows to begin predictable reproductive cycles, allowing farmers to plan and synchronize the fertilization of many cows at once. This approach is referred to as timed artificial insemination, timed breeding and managed breeding. It alleviates two of the three reproduction-related problems listed above, creating normal reproductive cycles in cows and eliminating the need for producers to detect estrus.

Impact: The Ovsynch protocol, which greatly improves reproductive efficiency in cows, was originally developed by a UW-Madison research team in the 1990s. It has become a standard practice in the dairy industry, and costs less than $10 per cow for a course of treatment. By reducing the time it takes to impregnate cows, experts believe that Ovsynch has generated billions of dollars for the worldwide dairy economy. Certainly, it has helped spur the growth of the modern dairy infrastructure. To this day, the UW-Madison team continues to make improvements to this technology.

Funding: WIS04735
More information: Milo Wiltbank, 608-263-9413, wiltbank@wisc.edu
Knowledge area(s): 301
*****

Historically the University of Wisconsin-Extension and the University of Wisconsin-Madison, College of Agricultural and Life Sciences have submitted separate plans and reports. While this remains the case with this plan, the intent on the part of both institutions is to improve the linkage of the plans in areas such as stakeholder and research input, evaluation of integrated activity, and outcome evaluation.

Total Actual Amount of professional FTEs/SYs for this State

Year:2008	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	156.0	0.0
Actual	0.0	0.0	156.9	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 are used for specific projects solicited in an annual Call for Proposals. Animal Health proposals are reviewed at the School of Veterinary Medicine; Hatch, Hatch Multistate, and McIntire-Stennis proposals are reviewed in CALS.

CALS Process:
The following is published in the Call for Proposals as guidance to the scientists requesting Hatch, Hatch Multistate, or McIntire-Stennis grants. This process occurred in November 2008 for 58 new proposals.

The Faculty Review Panel (FRP):
The Associate Dean for Research selects members of the FRP in consultation with the Research Advisory Committee (RAC). Two members of the FRP and ad hoc reviewers review each proposal. The two FRP members are designated primary or secondary reviewer. The CALS Research Division, in consultation with RAC members, selects the ad hoc reviewers, and where possible, ad hoc members are CALS faculty. Ad hoc reviewers may include CALS faculty who have a proposal under review, though they may not review their own proposal. However, other reviewers, both on and off campus, may be appointed as needed. The selection criteria for FRP members and ad hoc reviewers are scientific excellence, appropriate disciplinary expertise, and overall balance. No member of the FRP 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 funding guidelines.
*An evaluation of the research team's ability to accomplish the stated objectives, and the match between these objectives and available resources. For teams with multiple investigators, the PIs are to include a plan of coordination across team members.
*Multistate and integrated activity priorities.

III. Stakeholder Input

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

- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public

Brief Explanation

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

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

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

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

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

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

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

2(A). A brief statement of the process that 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

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

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

2(B). A brief statement of the process that 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

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3. A statement of how the input was considered

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

Brief Explanation

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

While we are using this information to set a long-term course (in the case of faculty hires), we also use this information for making more immediate decisions. Examples include investing funding to direct current faculty and their research into emerging issues such as bio-energy and the bio-economy. One example would be our investment in research to support the NC506 addressing policy and sustainability of the corn ethanol system in the North Central states. We also consider this input in other activities such as annual budget allocation, providing feedback to departments and faculty and most importantly in setting priorities in our Formula Grant research Call for Proposals and the making decisions on allocation of these funds.

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.Bio-energy: While many are excited about the prospects of greater energy independence and economic development, there are also many individuals and groups that are concerned about the long-term sustainability, ownership, energy balance, environmental impact, risk, and affect on the quality of rural life. There are questions on how to move the cellulosic technology forward and how groups and communities can best take advantage of the potential.

2.Water quality and quantity: Competition of animal agriculture, cropping systems, irrigation, industrial and urban uses, and recreational often appear to be conflicting, yet all are concerned about the best strategy to use and protect this resource.

3.Quality of rural life, availability and affordability of health care, and economic rural development are issues on the minds of many rural Wisconsin citizens or organizations that represent them.

4.There are many interests in new, alternative, and value-added agriculture such as organic agriculture, local foods, grazing, bio-energy, and alternative animal cropping systems.

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	5272409	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	5985930	0
Actual Matching	0	0	5985930	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	11971860	0

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

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Wisconsin Competitive Research Program

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Wisconsin Competitive Research 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			9%	
112	Watershed Protection and Management			4%	
123	Management and Sustainability of Forest Resources			5%	
133	Pollution Prevention and Mitigation			3%	
201	Plant Genome, Genetics, and Genetic Mechanisms			5%	
202	Plant Genetic Resources			3%	
205	Plant Management Systems			7%	
206	Basic Plant Biology			4%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
212	Pathogens and Nematodes Affecting Plants			8%	
216	Integrated Pest Management Systems			4%	
301	Reproductive Performance of Animals			4%	
302	Nutrient Utilization in Animals			8%	
303	Genetic Improvement of Animals			5%	
304	Animal Genome			4%	
305	Animal Physiological Processes			4%	
311	Animal Diseases			6%	
502	New and Improved Food Products			3%	
603	Market Economics			4%	
803	Sociological and Technological Change Affecting Individuals, Families and Communities			4%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2008	**Extension**		**Research**	
	1862	**1890**	**1862**	**1890**
Plan	0.0	0.0	156.0	0.0
Actual	0.0	0.0	156.9	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	5985930	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	5985930	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

As a research driven activity, this program is made up of approximately 160 individual research projects addressing national, regional, and state needs, and includes both multistate and integrated activity.

As a research report, we are not reporting activities for the University of Wisconsin-Extension. However, we do integrated activity as part of our Formula Grant programs. A variety of methods are used to accomplish these efforts.

2. Brief description of the target audience

As a research report, we are not reporting activities for the University of Wisconsin-Extension.Integrated activity for our Formula Grant programs target a broad group of stakeholder audiences in agricultural, natural resources, and the public. Examples can be seen in our stakeholder information provided elsewhere in this report.

V(E). Planned Program (Outputs)

1. Standard output measures

Target for the number of persons (contacts) reached through direct and indirect contact methods

	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Year	**Target**	**Target**	**Target**	**Target**
Plan	0	0	0	0
2008	0	0	0	0

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

Patent Applications Submitted

Year	Target
Plan:	3
2008 :	9

Patents listed

A Proline to Histidine Mutation in the POU1F1 Gene is Associated with Longevity and Milk Production in Dairy Cattle
Hasan Khatib, Wen Huang
WIS04736
11-13-2007

Mutations in the STAT5A Gene are Associated with Embryo Survival and Milk Composition in Cattle
Hasan Khatib, Ricky Monson
WIS04736
11-13-2007

A set of genetic markers for predicting twinning and ovulation rate breeding value in cattle
Brian Kirkpatrick, Eui-Soo Kim
WIS04524
3-27-08

Construction of a quadruple enterotoxin-deficient mutant of bacillus thuringiensis
Jo Handelsman, Amy Klimowiczv
WIS04534
2-5-2008

A Genetic Marker for Embryonic Survival in Cattle
Hasan Khatib
WIS01284
WIS04895
6-9-2008

Novel GPCR-like proteins in Arabidopsis that acts as ABA receptors
Michael Sussman, David Nelson, Sarah Assmann, Sona Pandey
WIS04791
5-22-08

Fabrication of biofilm arrays and their application to preventing biofilm formation and improving their removal
Douglas Weibel, Ye Jin Eun
WIS01192
8-15-08

Wisconsin Quality Synthetic Cycle 4 (WQS C4) - a breeding population of corn that is a useful source for developing inbred lines that serve as parents of silage hybrids with excellent nutritional quality and high dry matter yield
James Coors, Natalia De Leon Gatti, Dustin Eilert, Patrick Flannery
WIS04882
WIS04426
8-15-08

The effects of the interferon tau pathway genes on fertilization and embryonic survival rates
Hasan Khatib
WIS01284
9-18-08

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan	0	150	
2008	0	309	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Output measures for this project include patents, graduate students trained, and publications. While we have data on patents with federal support, we have not previously tracked patents specifically linked to HATCH support. This estimated output does not have the same level of confidence as the others measures and will be refined as we gain experience with this measure for HATCH supported work. Graduate Students Trained (Degrees Granted):

Year	Target	Actual
2008	35	55

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O No.	OUTCOME NAME
1	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 Indicator for agricultural science as a measure of impact of our research program. Our target for this outcome measure 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:

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 Indicator for agricultural science as a measure of impact of our research program. Our target for this outcome measure 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	Quantitative Target	Actual
2008	150	309

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

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

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

What has been done

Each year through a competitive, investigator-driven, peer-reviewed process, the Wisconsin Agricultural Experiment Station funds approximately 160 research and integrated activity projects focused on national, regional, and local issues and priorities linked to stakeholder interests. In addition to serving stakeholder needs through these competitively funded projects (which address critical applied research as well as basic science questions), this program sets a priority on training our next generation of applied and science based professionals through its graduate student training mission.

Results

In fiscal year 2008, the Wisconsin Agricultural Experiment Station funded projects resulted in 309 publications, 9 patents, and 55 graduate students trained (degrees). The Wisconsin Agricultural Experiment Station also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five. Examples of representative impacts resulting from individually funded projects within our portfolio are described, to the extent possible, in the Summary of this Annual Report.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
102	Soil, Plant, Water, Nutrient Relationships
311	Animal Diseases
305	Animal Physiological Processes
304	Animal Genome
216	Integrated Pest Management Systems
133	Pollution Prevention and Mitigation
502	New and Improved Food Products
302	Nutrient Utilization in Animals
112	Watershed Protection and Management
123	Management and Sustainability of Forest Resources
803	Sociological and Technological Change Affecting Individuals, Families and Communities
211	Insects, Mites, and Other Arthropods Affecting Plants
301	Reproductive Performance of Animals
603	Market Economics
303	Genetic Improvement of Animals
205	Plant Management Systems
206	Basic Plant Biology

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 meet our outcomes. UW-Madison has implemented a policy change regarding tuition remission. Formula Grants have previously been exempt in the UW-System, but will no longer be exempt in the near future. Since these funds do not allow tuition remission, we have begun discussing some 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.

The other issue that continued to affect the program allocation in fiscal year 2008 was the Federal re-direction of Special Grants into the Formula Grant system. This continued to present some challenges as to how to meet the intent of Congress through the Formula Grant system.

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Retrospective (post program)
- Before-After (before and after program)
- During (during program)

Evaluation Results

N/A

Key Items of Evaluation

N/A