2007 University of Wisconsin Research Annual Report

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I. Report Overview

1. Executive Summary

Operating Philosophy/Program Overview

The Wisconsin Experiment Station is committed to the concept of investigator-driven and peer-reviewed research activities.The general philosophy in allocating formula funds 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.Progress and accomplishments will be reported in our FY 2007 and FY 2008 annual Reports of Work.We expect our allocation for FY 2008 to be administered as described in this document, but some carryover is expected although significantly less than in FY 2007.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 multi-state research meetings is provided for the official representative from a central pool of funds.

The Research Program in this Plan of Work 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 five years with the majority on a four-year cycle.Proposals for new projects require a discussion of the results from previous formula fund 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 multi-state projects have been continuing for more than 10 years, revised proposals are required for review and approval at least every 5 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 Director of Agricultural Programs, WAES, and the Associate Dean for Research.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 have been established in the Research, Education, and Economics (REE) Mission Area and USDA Cooperative State Research, Education and Extension Service (CSREES) Agency strategic plans. (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.The number of current Wisconsin projects is included for each goal in parentheses.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.In many instances, a research project relates to multiple goals and themes.These research projects are then reported in multiple goals.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 Hatch 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 team.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 Colleges call for proposals for our Hatch Research 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 Hatch program.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.

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.Goal 3, Enhance Protection and Safety of the Nation's Agriculture and Food Supply, relates to Wisconsin priorities 1 and 4.Goal 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, is aligned with Wisconsin priorities 1, 4, and 5.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 Hatch productivity are also used in the merit evaluation of proposals subsequently submitted.

The call for proposals for a fiscal year (for example FY09) beginning Oct. 1, 2008, was initiated in June, 2007, approximately 16 months prior to project initiation.Proposals were due September 14, 2007.A copy of the call for proposals, guidelines and merit criteria are available at http://www.cals.wisc.edu/research/WAES/Hatch/.

Proposals are evaluated by an internal panel of faculty, called the Research Advisory Committee (RAC).The RAC is composed of 12 faculty, the Executive Director of the Agricultural Experiment Station (Agricultural Programs Director) and the Associate Dean(s) 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 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 including publications, patents and graduate

students trained.For the FY2007 year currently being reported, Wisconsin AES Hatch funded projects resulted in 182 publications, 6 patents disclosures and 1 patent, and 62 graduate students trained. (The ability to track these indicators and retrieve these data based on the CRIS system and its sorting capability would be greatly appreciated as part of the One Solution approach.Additionally, it would be very helpful to be able to retrieve and track project data based on the Knowledge Areas, around which we are reporting.The Wisconsin AES will also track the Thompson ISI Essential Science indicator as a measure of impact.Our goal is to remain in the top five and we were ranked first in the last published ranking.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 also be used as a consideration in determining future Hatch funding priorities.

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.As cited earlier, 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 Hatch.Hatch funding of research often leads to significant funding from other sources.CALS rates also very high 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 as follows:

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ldquo;Durable Resistance to Common Rust in Sweet Corn, Genetics and Breeding of Vegetative Phase Change and Adult Plant Resistance"

Impact Nugget: Breeding sweet corn to have long-lasting resistance to common rust will save farmers money and protect the environment.

Issue (who cares and why): Common rust is the most serious sweet corn disease in Wisconsin today, where more than 100,000 acres of the crop are grown.Depending on the season and the chemical fungicide used, farmers spend between $25 and $75 per acre each year to minimize the impact of the disease.Before 1999, farmers were growing sweet corn varieties that were resistant to common rust due to a single gene that protected the crop.However, in 1999, the fungus mutated so that the single-gene protection no longer worked.A corn crop with multiple-gene resistance to common rust would give Wisconsin’s sweet corn crop long-lasting protection from the effects of this disease, saving farmers money and reducing the impact of fungicides on the environment.

What’s been done: University of Wisconsin-Madison researchers gathered corn varieties from around the world that display multiple-gene resistance to common rust.Because these exotic strains are not adapted to temperate climates, the researchers crossed them with Wisconsin sweet corn varieties, and selected for increased disease resistance and important quality factors, such as flavor and texture.Already, they have isolated several new hybrids resistant to common rust, and agricultural companies are testing their marketability to consumers.In another research vein, the scientists are breeding for sweet corn with fewer juvenile leaves, which are more susceptible to common rust than adult leaves.They have already developed sweet corn plants with 20 percent fewer juvenile leaves.

Impact: The new sweet corn varieties developed through this research project are expected to exhibit long-lasting protection against common rust and save farmers between $25 and $75 per acre each year on fungicides.Reduced fungicide use will also benefit the environment.In addition to providing the new seeds to agricultural companies for testing, the findings from this study have been shared with the broader agricultural and research community at three conferences and through three journal articles.

Funding: Wisconsin Hatch project #WIS01020

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Knowledge Area(s):201, 202, and 212

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"Reducing Phosphorus Concentration in Lactating Dairy Diets Based On By-Products of the Corn Distilling Industry"

Impact Nugget:To ensure a robust market for distiller’s grains and solubles (a major by-product of corn ethanol production) as a dairy cattle feed, it is important to find ways to remove phosphorus from the feed or to mix it with low-phosphorus feeds in a way that optimizes milk production and protects the environment.

Issue (who cares and why):Thanks to the recent growth in corn ethanol production in Wisconsin, dairy producers have access to a low cost, high quality source of feed known as distiller’s grains and solubles. DGS are a major by-product of ethanol production; for every bushel of corn processed, approximately one-third ends up as feed. DGS contain high levels of protein, an important macronutrient in the dairy ration. Unfortunately, DGS also contain high levels of phosphorus, an element that ends up in manure and then ultimately in groundwater, where it negatively affects water quality. Since dairy farmers are required to manage phosphorus levels on their land, DGS is not an overly attractive option; the way things are now, feeding DGS at an economically attractive level consistent with high milk production makes meeting environmental considerations for good manure management more difficult and expensive.

What’s been done:This study seeks to maximize the use of DGS while minimizing its negative environmental impact using two different approaches: (1) mixing normal DGS with low-phosphorus feeds to create an optimal dairy ration and (2) using chemical or milling processes to reduce the amount of phosphorus in DGS. In one study, University of Wisconsin-Madison researchers performed a feeding trial and found that high levels of DGS—up to 18 percent—supported very good levels of milk production and quality. However, phosphorus levels were too high in all cases, underscoring the need to remove phosphorus from DGS before feeding it to cattle. In a second study, researchers developed a method to remove 85 percent of the

phosphorus from distiller's solubles, one of two by-product streams that are combined and sold as DGS. Distiller's solubles contain the vast majority of phosphorus that ends up in DGS. In the future, distiller's grains—the other, lower-phosphorus part of DGS—may be sold as feed on its own. However, this isn't likely to happen until another use can be found for distiller's solubles.

Impact:Findings from this project will help ensure that the corn ethanol industry has customers for its DGS by-product, while simultaneously guiding dairy producers and their nutrition advisors in the use of DGS to achieve maximum milk yields while maintaining environmentally-sound feeding practices. Results have been presented to producers through educational seminars and direct contact, and the dairy media have published multiple articles based on these findings. Thanks to this work, dairy producers are becoming more aware of the variability of DGS from different ethanol plants, and plants are being encouraged to better identify the contents of their DGS.

Funding:Hatch project #WIS05239

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Knowledge Area(s):302 and 403

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ldquo;Identification of West Nile Virus Mosquito Vectors in Southern Wisconsin"

Impact Nugget:Understanding how mosquitoes transmit the West Nile virus to humans in Wisconsin will lead to better control measures and help reduce infections in the area.

Issue (who cares and why):Although it is believed to mainly cycle between birds and mosquitoes, humans can become infected with West Nile virus (WNV) if they get bit by mosquitoes carrying the virus. While most people infected with the virus do not become ill, about 20 percent experience flu-like symptoms and one percent become severely ill. There is no vaccine or specific treatment. The WNV first showed up in the United States in 1999, and now it is endemic throughout the nation. In Wisconsin, the virus was first found in wild birds in 2001, and then in humans in 2002. In a typical year, Wisconsin has 10-20 reported cases, including a few fatalities. To reduce the number of illnesses and deaths caused by WNV, researchers need to figure out how mosquitoes are transmitting the virus to humans so that control measures can be deployed effectively.

What's been done:In 2006 and 2007, a team of University of Wisconsin-Madison researchers sampled more than 350 sites in Southwest Wisconsin where mosquitoes are likely to breed. At each site, they compared two mosquito-trapping methods: the standard "light and carbon dioxide" trap used by the local government to monitor WNV and the "human trap," where mosquitoes alight on a patch of exposed human skin before being captured. They discovered that mosquitoes caught in the standard trap don't reflect the true population of mosquitoes that bite humans. Specifically, the standard trap captured a high proportion of Culex pipiens, the mosquito widely believed to be the nation's major WNV vector. However, using the human trap method, very few Culex pipiens were captured. Interestingly, of the 600 Culex pipiens captured during the course of this research, very few had WNV. Together, these results suggest Culex pipiens may not be the cause of human WNV infections in Wisconsin. In the 2008 season, the researchers will consider other culprits: Wisconsin's two most abundant mosquito species. The research also clearly shows that man-made water features—ditches, retention ponds, etc.—are the most productive mosquito breeding sites.

Impact: This project will ultimately reveal the mosquito responsible for transmitting West Nile virus to humans in Southwest Wisconsin, information that will help municipalities better monitor and control the virus. The region's current control strategy, for one, may need to be changed if Culex pipiens turns out not to be the main WNV vector in the area. With guidance from Wisconsin's Department of Natural Resources, the team is now assessing the ability of Fat-headed minnows, a native Wisconsin fish, to control mosquito populations in ditches and retention ponds. They are also collaborating with the National Wildlife Health Laboratory to help identify WNV in mammals, and with Dane County's Public Health Department to identify mosquito larvae species collected from monitoring sites. This work has been published in one scientific journal, with more articles to come, and the team plans to work with Dane County neighborhood associations to share their main findings with the public. Tangentially, an invasive mosquito called Ochlerotatus (Aedes) japonicus was discovered in Wisconsin for the first time during sampling for this project. This mosquito is a vector of WNV in other parts of the U.S.

Funding:Hatch project #WIS04968

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Knowledge Area(s):721

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ldquo;The Trojan Horse and the Gypsy Moth: Harnessing Killer Plasmids for Targeted Study of Microbial Communities"

Impact Nugget:Understanding the gypsy moth's microbial gut community will lead to improved insecticides better able to protect North American forests from this devastating insect pest.

Issue (who cares and why):The gypsy moth is a significant threat to natural and managed forests in North America. First released into the wild near Boston in 1869, this invasive specie is well established in the northeast, and has been slowly and steadily spreading to the west and south. Wisconsin is currently situated on the expanding front of the moth's range. During outbreaks, gypsy moths cause damage throughout their range. In Wisconsin, for example, gypsy moth larvae defoliated around 65,000 acres in 2003 and 23,000 acres in 2007, according to the Wisconsin Department of Natural Resources. Currently, the most common way to kill gypsy moth larvae is by spraying infested trees with a bacterium known as Bacillus thuringiensis, or Bt. However, Bt doesn't always work as well as could be hoped and this pest continues to spread.

What's been done: By studying the gut flora of gypsy moth larvae, University of Wisconsin-Madison researchers overturned a long-held theory explaining how Bt works to kill insects, and revealed a new strategy for combating insect pests. For decades,

scientists believed that Bt directly caused death by growing in the insect hemolymph (blood) and causing the insect equivalent of blood poisoning. Instead, the UW-Madison team found that Bt works in concert with a common gut bacterium called Enterobacter to stimulate a fatal response.

Impact:This research will lead to improved insecticide formulations that are better able to kill gypsy moths and other insect pests. For example, these findings immediately suggest one possible new control strategy: an insecticidal spray made up of Bt and Enterobacter. The researchers have also found other bacteria and chemical compounds that boost Bt's insecticidal potency, and they are in the process of developing ones cheap enough for widespread use.

Funding:Hatch project #WIS05234

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Knowledge Area(s):123, 211

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ldquo;Identification of Genes Unique to Highly Pathogenic Erwinia Carotovora Subsp. Carotovora"

Impact Nugget: Control measures are desperately needed to combat Erwinia, the group of bacteria that causes soft rot and other major potato diseases.

Issue (who care and why):Erwinia is the causal agent of economically important potato diseases, including stem rot, soft rot and black leg. On a bad year, experts speculate that these and other closely related diseases can destroy up to 20 percent of the nation's potato crop as it sits in storage. Erwinia species also damage other vegetable and ornamental crops. At present, there are no effective chemical control methods for the field, the greenhouse or the storage locker. Losses are so severe that the Wisconsin Potato and Vegetable Growers Association built a $2.9 million potato storage research facility, and then donated it to the UW-Madison in 2006.

What has been done:A team of University of Wisconsin-Madison researchers is studying Erwinia, searching for the most potent disease-causing genes and their corresponding proteins. To better understand the evolution of these genes, the team is collaborating with another group to determine how the soft rot Erwinia are related to each other, and to other plant and animal bacteria. This work has resulted in the discovery that four different soft rot Erwinia species, which use overlapping but distinct sets of virulence genes, infect vegetables and ornamentals in the United States. At the same time, the team is looking for antimicrobial agents capable of neutralizing the most virulent Erwinia strains. Because plant assays to examine virulence are very time consuming, researchers have been searching for faster methods of assaying virulence protein functions. The team discovered that an important set of virulence genes is required to form a special type of biofilm called a pellicle. Based on this discovery, they developed a novel assay—both fast and inexpensive— that can be used to screen a "library" of chemicals for ones that could function as antimicrobials against Erwinia and other plant pathogens.

Impact:This work has confirmed a number of suspected virulence genes and revealed a number of new ones, whose corresponding proteins would make good targets for antimicrobial chemicals. Also, using the novel assay they developed, the UW-Madison team has discovered a handful of chemicals that appear to mitigate the activity of Erwinia virulence genes. If proven to work outside the lab, these chemicals would be among the first-ever chemical means to control soft rot diseases. This project has attracted the attention of other funding agencies, receiving $1.9 million from the National Science Foundation, as well as a $300,000 National Research Institute grant. This work will also play a critical role in the effort to develop an Erwinia gene chip, a powerful biotechnology tool that allows researchers to quickly "test" the response of every gene in the Erwinia genome to different conditions.

Funding:Hatch project #WIS04767

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Knowledge Area(s):211

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"Using Milk Urea Nitrogen (MUN) as an Indicator of Energy and Nitrogen Balance in Early Lactation Dairy Cows to Improve Management of Health"

Impact Nugget: A new method of determining negative energy balances may be an easy, cost-effective way for farmers to identify metabolic disorders and evaluate dairy herd health in early lactating cows.

Issue (who cares and why): Known by many as America's dairy land, Wisconsin consistently tops national charts for milk and cheese production: In 2006 the state's 1.24 million dairy cows produced more than 23 billion pounds of milk (roughly 18,824 pounds of milk per cow), which aided in the state's production of 2.47 billion pounds of cheese. Making all of this milk can be hard on a cow's body. If the animal doesn't consume enough nutrients to create the milk, she will begin to metabolize her own body reserves of fat (and sometimes muscle), which can lead to a "negative energy balance." Studies have long associated these negative energy balances in early lactation with metabolic disorders which can lead to significant economic impacts. In 2003, these metabolic disorders (in early lactating cows) cost the Wisconsin dairy industry more than $1.0 million. Presently, farmers lack an affordable method of easily identifying negative energy balances in their early lactating cows. The current procedure—testing for non-esterified fatty acids (NEFA) in blood—to identify metabolic disorders is costly. At roughly $9.50 per test, farmers often wait until a cow appears ill before ordering such a test. Early detection of negative energy balances would lower costs for producers while also improving animal welfare and overall dairy herd management.

What's been done: Researchers at the University of Wisconsin-Madison studied the feasibility of using information about Milk Urea Nitrogen (MUN) levels and other data (such as milk production and changes in body weight) as a less expensive proxy

for the "gold standard" NEFA test. MUN levels, which have been associated with negative energy balances, can be determined non-invasively with equipment already used by Dairy Herd Improvement technicians who visit dairy farms on a regular basis. Measuring MUN levels is also inexpensive, running about $0.20 per test. To assess their idea, the research team housed 60 cows from the US Dairy Forage Research Center in a tie stall barn for 5 weeks (2 weeks prior to calving, and 3 weeks post-partum). Because many factors might contribute to negative energy balances, the research team sampled the animals' feed, blood, milk, milk fat and colostrum, and monitored consumption of feed. The researchers found that high initial peaks of MUN seem to be associated with negative energy balance, indicating that MUN (combined with other data such as milk production) can serve as a reliable predictor of negative energy balances in early lactating cows. While the MUN test looks promising, the researchers highlight several key challenges that remain: the low concentrations of milk urea nitrogen, the myriad factors which influence urea which may not yet be fully understood and the way in which milk urea nitrogen is presently analyzed (on many farms, MUN is evaluated for the entire herd instead of for individual cows).

Impact:These findings indicate that farmers may soon have an affordable method for the early detection of negative energy balances in early lactating cows. Using milk urea nitrogen combined with other indicators (such as milk production and changes in body weight) dairy farmers may soon be able to perform regular, non-invasive tests to improve overall herd welfare by effectively identifying animals with negative energy balances at early stages. At roughly $0.20 per test, this would be an inexpensive tool to help monitor herds for costly metabolic disorders.

Funding:Hatch project #WIS01095

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Knowledge Area(s):302 and 305

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ldquo;Mycotoxins in Cereal Grains"

Impact Nugget:Engineering food and feed crops to block production of fungal toxins will safeguard the nation's food supply, preventing sickness and death among humans and animals, as well as economic losses.

Issue (who cares and why):Mycotoxins are natural fungal products that are defined by their harmful effects on humans and animals. The Food and Agriculture Organization estimates that mycotoxins contaminate 25 percent of agricultural crops worldwide, and thus represent—in a global marketplace—a broad and serious threat to food safety. Aflatoxin, a toxin made by various fungi of the Aspergillus species, is associated with organ toxicity at high doses that can lead to death in humans and animals. At low doses, aflatoxin is known to cause cancer. In 2004, one of the largest known outbreaks of aflatoxicosis among humans occurred in rural Kenya, resulting in 317 cases and 125 deaths. The outbreak was eventually linked to contaminated corn. Although there have been no reported aflatoxin-related deaths in the U.S., American farmers struggle to minimize aflatoxin levels in domestic corn and other crops, including peanuts, cotton seed and tree nuts. Aflatoxin is the only mold toxin regulated by the Food and Drug Association. Above a certain threshold, grains and milk containing aflatoxin cannot be legally sold.

What has been done:Capitalizing on a natural system that organisms use to fight off certain viruses, University of Wisconsin-Madison scientists were able to block production of aflatoxin in the fungi Aspergillus flavus and Aspergillus parasiticus. Using what is known as RNA interference (RNAi) technology, the team—in essence—silenced a gene vital for aflatoxin production in each organism.

Impact:The UW-Madison team showed that RNAi technology can indeed be used to turn off mycotoxin production in fungi, and thus opened the door to a novel way to control mycotoxin contamination of crops. The success of this research project led to a large National Research Initiative grant to support the transfer of this technology into corn, wheat and other cereal grains affected by mycotoxins. Already, the UW-Madison team has developed corn varieties that may be resistant to aflatoxin, and studies are currently underway to test for the presence and level of resistance in the new lines of corn. In the future, the team will do the same in wheat, barley and other crops.

Funding:Hatch Multistate project #WIS04558

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Knowledge Area(s):314

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ldquo;Identification and Characterization of Dwarfing Genes"

Impact Nugget:Developing compact crop and ornamental plants will help maximize agricultural yields per acre.

Issue (who cares and why):As the world's population grows, space for agriculture becomes increasingly restricted. One way to increase agricultural yields is to develop and grow more compact crops, a method that has already led to great enhancements in agricultural yields over the past four decades. This project pursues a new strategy to create compact crops: finding and manipulating genes to produce dwarf growth habits in crops and ornamentals.

What's been done:Researchers at the University of Wisconsin-Madison created more than 10,000 Arabidopsis mutants by randomly inserting a DNA sequence designed to increase gene expression into the Arabidopsis genome. The inserted DNA either (1) did nothing, (2) disrupted an existing gene enough to cause a loss-of-function mutation or (3) increased the function of an existing gene near the point of insertion. Using this technique, the team identified three mutants that were similar to the dwarf mutants that occur naturally when plants lack the ability to synthesize or detect gibberellin, a major plant hormone that affects growth. They found that the inserted DNA increased the expression of two novel enzymes that prevent gibberellin precursors from being converted into active gibberellins. The researchers then reproduced the dwarfing effect by activating similar genes in tobacco plants. Other plant species are also expected to have versions of these genes.

Impact:This work gives plant breeders a new method to create dwarf plants, which could increase yields and profits for farmers, while decreasing the amount of land under cultivation. Because of the potential for agricultural applications, the researchers filed a patent through the Wisconsin Alumni Research Foundation on the use of these two genes in agriculture and horticulture to reduce plant stature. The results were published in The Plant Cell, and led to spin off work in other academic labs. Since this work was published, other researchers have manipulated similar enzymes in wheat, petunia and other plants to create compact varieties.

Funding:Hatch project #WIS04662

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Knowledge Area(s):201, 204 and 206

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ldquo;Characterizing Thermal Pollution in Urban Landscapes"

Impact Nugget: Researchers have designed and tested a modeling tool which can be used by city planners and developers to estimate how proposed development projects might inadvertently contribute to thermal pollution of surface waters.

Issue (who cares and why):With nearly 15,000 inland lakes and roughly 33,000 miles of rivers and streams, Wisconsin is a key Midwestern destination. Yet many of the state's surface waters are threatened by thermal pollution which occurs when heated storm water runoff flows into surface waters instead of filtering into the groundwater. The input of this warmer water can lead to reduced dissolved oxygen levels and changes in the food web as well as increased algal growth in lake waters. Cold water species (such as trout) are particularly vulnerable to these temperature changes. Impervious surfaces such as asphalt roads and parking lots are largely to blame for this thermal pollution. These impermeable surfaces easily retain heat from solar radiation and prevent water from infiltrating into the groundwater. As rainwater flows over these surfaces it is warmed and quickly runs off to nearby surface waters.

Understanding how different types of land surfaces—such as sod and paved areas—affect the temperature of storm water runoff is essential for developing methods to reduce thermal pollution. Researchers have designed and tested a computerized modeling tool—the Thermal Urban Runoff Model (TURM)—which can be used by developers and planners to estimate how much thermal pollution would be caused by a new development, what impact that development might have on surface water temperatures and how mitigating structures such as rock cribs (underground rock beds which can cool storm water as it flows through them) can be best designed to reduce this pollution.

What's been done:Researchers at the University of Wisconsin-Madison conducted field studies at the West Madison Agricultural Research Station (WMARS) comparing how similar-sized plots with different types of surfaces (sod and asphalt) contribute to thermal pollution. Through real and simulated (via a sprinkler) rain events the research team measured the temperature and the flow rate of runoff from each of the surfaces. The team also evaluated the effectiveness of rock cribs in reducing runoff temperature. Because many factors contribute to the severity of the thermal pollution, the researchers measured: rainfall temperature and intensity, solar radiation, wind speed, air temperature, pavement temperatures (at various depths and locations), sod temperatures (at various depths and locations) and soil moisture for each plot. They found that the impervious surfaces (asphalt) are major sources of thermal pollution to cold-water ecosystems, and also that the Thermal Urban Runoff Model accurately represented the temperatures of the runoff from these impervious surfaces. The researchers also determined that how well rock cribs work depends on several key factors such as the size, pre-existing water levels in the crib, and the initial temperature of the rock crib.

Impact: Using the Thermal Urban Runoff Model, developers and city planners will be able to identify potential thermal pollution problems and find ways to incorporate structures to slow down and cool the runoff before it reaches surface waters. While this research has yet to be published, an updated version of TURM will soon become available and the research team is already fielding requests from city planners and developers across the nation interested in using this important tool.

Funding:Hatch project #WIS04977

More information:Anita Thompson, amthompson2@wisc.edu, 608-262-0604

Knowledge Area(s):112 and 133

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ldquo;Sustainable Biorefining Systems for Corn in the North Central Region"

Impact Nugget:Analysis is sorting truth from fiction in the fast-changing corn-based ethanol industry.

Issue (who cares and why):In many ways, the Midwest's corn-based ethanol industry is growing faster than our ability to understand its implications on regional economies, agricultural systems and environments. As dozens of new corn-based ethanol plants come online throughout the region, questions remain about the impact of increased ethanol production on commodity prices and the availability of distillers' grains used for livestock feed. Further, economic returns of ethanol plants have been highly volatile in recent years, leading many to seek public support through favorable policies or subsidies. Some states in the north central region have adopted such policies, wither to assist the construction of ethanol refineries or to encourage and/or mandate consumption of the ethanol they produce. This research project was launched to evaluate the potential impact of those policies on a range of variables, including commodity prices, land values and cropping decisions to help policymakers get a handle on how to manage and encourage the growth of this emerging industry.

What's been done:This project has been designed to operate on a tight timeline to maximize the speed of results. In less than a full year of operation, the project has organized research efforts across the 12 states of the north-central region and identified priorities for investigation. Individual ethanol plants have been identified across the region to serve as case studies, and

researchers have completed site visits and collected data about public investments and support for those plants. Additionally, the team is using a large-scale economic model to assess the possible outcomes of two different public policy scenarios related to ethanol consumption. These models predict the potential fallout on prices and cropping decisions if various public policy alternatives were enacted region-wide, such as a mandate that ethanol make up a certain percentage of the region's fuel consumption. The team is in the process of identifying two additional policy scenarios to study with this model, eventually offering possible implications of four different region-wide public-policy approaches to managing the ethanol industry.

Impact:Even in its early stages, this project has produced key findings that clarify murky aspects of the corn-based ethanol industry. For example, Professor Fortenbery's research has dispelled the widely reported belief that 2007's historically high corn prices were due to an increase in demand due to ethanol production. His analysis attributes only about one-third of the price increase to ethanol, while identifying speculation by investors and a high level of exports driven by a weak U.S. dollar as more significant factors in the price of corn. These assessments are helping farmers, investors, bankers and policymakers more accurately assess the impact of the ethanol industry's growth on corn prices. As it moves forward, this project has the potential to identify public economic efficiencies on the order of millions of dollars that can be realized by adopting favorable and consistent economic policies across the region.

Funding:Hatch Multistate project #WIS01290

More information:Randy Fortenbery, trforten@wisc.edu, 608-262-4908

Knowledge Area(s):511, 602, 603, 604, and 610

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ldquo;Understanding Bacterial Wilt from the Inside Out"

Impact Nugget:Research leads to a more reliable way to test for a dangerous plant pathogen.

Issue (who cares and why):Ralstonia solanacearum is a type of pathogenic bacterium known to cause wilt diseases in a wide range of agricultural crops, including potatoes, tomatoes, peppers and peanuts. Though primarily a tropical bacteria, one subgroup of this pathogen, known as Race 3, survives at cooler temperatures and has been listed by the USDA as a potential agroterrorism agent. Because of this listing, growers who find any traces of Race 3 bacteria in their plants are subject to strict quarantine rules. Tests to identify Race 3 bacteria, however, have proved imperfect, leading to misdiagnosis of Ralstonia problems that can be enormously costly for growers. In 2005, for example, an ornamental flower grower based in Florida was barred from shipping plants after a false-positive test for Race 3 bacteria, costing the company hundreds of thousands of dollars in inventory and lost business.

What's been done:As one of the only U.S. labs legally permitted to work with Ralstonia bacteria, Caitilyn Allen's research team has been exploring the basic biology of these pathogens for several years. Their work has uncovered the genetic mechanisms that allow bacteria to detect and communicate with host plants, which may allow breeders to develop plants that appear invisible to the bacteria. This knowledge also put the lab in the perfect position to improve the USDA's process for testing and diagnosis of Race 3 infections. Using their knowledge of the biological differences between Ralstonia strains, Allen's team developed an improved rapid test that detects Race 3 bacteria based on several traits. Additionally, the test is non-destructive, meaning it can be performed on water collected from the plants, rather than destroying plant tissues to run the test.

Impact:The USDA has adopted Allen's new diagnostic test in its labs, and it has been used in spot checks of greenhouse facilities in Guatemala and Kenya. By reducing the risk of false positive tests, this new technology potentially saves millions of dollars for growers while still assuring an accurate way to prevent transmission of a dangerous pathogen into the United States.

Funding:Hatch project #WIS04765

More information:Caitilyn Allen, cza@plantpath.wisc.edu, 608-262-9578

Knowledge Area(s):212

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"Impacts of Air Pollutants on Forest Insect Communities"

Impact Nugget:To best manage the nation's forests for the future, it is critical that we understand how greenhouse gases and air pollutants affect forest insect communities.

Issue (who cares and why):Insects make up the majority of the diversity of life in a forest and have a large impact on forest health. In the future, global environmental changes—particularly elevated concentrations of carbon dioxide and ozone—are anticipated to affect the susceptibility of trees to insect pests, and could have far-reaching implications for food/fiber production, pest control and nutrient cycling. Thus, it is important to understand how changes in atmospheric gases will alter insect communities and naturally occurring chemical defenses in trees. Results will provide policy makers with scientific data to help guide decisions about pollution control and climate change legislation. Likewise, successful forest management decisions or interventions also depend on good information.

What's been done:Researchers at the University of Wisconsin-Madison are studying the effects of elevated levels of carbon dioxide and ozone—separately and combined—on insect communities. The main part of the project takes place at the Aspen FACE (Free Air CO2 Enrichment) facility near Rhinelander, Wisconsin, where forest stands are fumigated with these gases. There, researchers collect and classify insects that occur under each of the experimental conditions, as well as assess insect-caused damage and chemical composition of foliage. So far, the researchers have found that insect communities in aspen trees are significantly different from those found in birch trees. Also, abundances of insect groups appear to be affected by elevated levels of carbon dioxide and ozone. When the statistical analyses are complete, the team expects to find strong support for the idea that, in the future, insect communities exposed to elevated concentrations of these gases will be significantly different

from current communities. They continue to work out the details of this expected change.

Impact:Very few studies have examined the effects of carbon dioxide and ozone on entire, naturally occurring insect communities, and this work is the first to do so for deciduous forest insect communities. This project is creating much-needed information about how insects will affect forest health as levels of these atmospheric gases increase, information that may improve forest management practices, environmental legislation and global climate change models. This research has been shared with the general public through a UW-Madison news release and two articles in UW-Madison's student newspaper, The Daily Cardinal. This project also generated baseline data used to secure a grant totaling $540,000 to further support this line of work.

Funding:Hatch project #WIS04898

More information:Richard Lindroth, lindroth@entomology.wisc.edu, 608-263-6277

Knowledge Area(s):211

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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.This may lead to submission of a single plan for the State of Wisconsin in the future.

Total Actual Amount of professional FTEs/SYs for this State

Year:2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	158.5	0.0
Actual	0.0	0.0	166.1	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, 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 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 or McIntire-Stennis funding.This process occurred in December of 2007 for 59 new proposals.

The Faculty Review Panel (FRP):

The Executive Director of the WAES will choose members of the FRP in consultation with the Research Advisory Committee (RAC).Each proposal will be reviewed by two members of the FRP and at least two other (ad hoc) reviewers.The CALS Research Division, in consultation with RAC members, will make the identification of the ad hoc reviewers.Where possible, ad hoc reviewers will be CALS faculty, though other reviewers both on and off campus may be appointed as necessary.The critical criteria for selection of FRP members and ad hoc reviewers will be scientific excellence, appropriate disciplinary expertise, and overall balance.No member of the FRP will have a proposal under review.

Review Criteria for Reviewers:

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

1. An evaluation of the scientific significance of the objectives and appropriateness of the research approach as indicated in the original Congressional Acts and CSREES Goals.
2. A judgment of the potential usefulness to society of the research, in the short and/or long term.Problem solving is a key feature of the formula funding guidelines.
3. An evaluation of the ability of the research team to accomplish the stated objectives and the match between the objectives and available resources.For teams with multiple investigators, please include a plan of coordination of the work across laboratories or departments.

Review Process:

1. Copies of the proposal will be sent to two members of the Faculty Review Panel (FRP) and at least two ad hoc reviewers.Each reviewer will prepare a written critique of the proposal and rank the proposal from excellent to unacceptable.The reviews will be submitted to the CALS Research Division and recorded anonymously upon receipt.The two FRP reviewers will receive copies of all reviews (anonymity maintained) on which they are primary or secondary reviewers prior to the FRP meeting so they may be prepared to lead the discussion on the proposals assigned to them.
2. A meeting will be held of FRP to discuss proposals.Prior to the meeting, copies of all reviews will be provided to FRP members.
3. At the meeting, the primary reviewer will give a short description of the proposal, the principal investigator's background, and his/her own critique.The secondary reviewer will provide his/her own critique and raise any other points that have been overlooked.Where the FRP has insufficient expertise in the proposal area, an ad hoc reviewer may be brought in as primary or secondary discussant.Comments from ad hoc reviewers will be provided by the primary reviewer and confusing issued clarified.
4. An approximate placement will be made with respect to proposals as discussion takes place.Obviously this placement will involve some degree of reconsideration of previously placed proposals.Because of this process, an inappropriately negative external review will not condemn a proposal.At the end of the process, FRP members will go over the list and look for any inappropriate placement.The prioritized list will be forwarded to the Associate Dean for Research.
5. The primary reviewer of each proposal will prepare a summary of the written review comments and FRP discussion.The summary and reviews from individual reviewers will be returned to applicants.

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

Stakeholder Input

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 these inputs to the Dean's office.The College of Agricultural and Life Sciences has a central Advisory Board that meets twice a year with the Dean and Associate Deans.Members of the committee are selected from a wide range of producers, industry, consumer, environmental groups and state agencies.This Board not only advises on research and outreach needs, but also advises on contacts for constituency groups and individuals.

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

Focus Group List:
•General Agriculture •Food Processing and Marketing •Animal Agriculture •Plant Groups •Environmental and Natural Resources •Green and Forestry •Biotechnology •Sustainable and Organic Food Produces •Consumer and Non-Traditional Groups 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(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

Methods to Identify Individuals and Groups
The Wisconsin AES uses several methods to identify stakeholder individuals and groups.One common method is through interaction of our leadership team members with individuals who have an interest related to Experiment Station activity, and who are themselves a good contact, or who suggest someone or some other group.Often these individuals actually help facilitate an initial contact. We also rely heavily on our Board of Visitors and groups representing key commodity or other interests; for example: dairy, livestock, potato and vegetable, cranberry, forestry, economic development, food processors, environmental interests, etc.Internally, we rely on department chairs and faculty, various standing committees, and other specially organized and focused committees.

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

Stakeholder Input

Stakeholder input is most commonly obtained through meetings with stakeholder groups and/or individuals.Examples of a series of CALS Roundtable discussions were highlighted earlier.In addition, there may be other focus group meetings including broad audiences, selected stakeholder groups or one-on-one meetings with a key farmer, group leader, or other constituent that are held periodically throughout the year.

To the extent possible, the Wisconsin AES likes to rely on face-to face contact to solicit input in an individual or group meeting.As expressed earlier, we also like to do this, when possible, on the "home-turf" of the individual or group.Formats of the meeting will vary with the group or the event, but we feel it is important to make sure that the individual or group feels that we have listened to their issues or comments and have a basic understanding of the issue or what was shared.We make every effort to follow up—even when we cannot respond in the way the stakeholder had hoped.In this case, we try to make sure that they also understand why we have responded in this way and what other issues may have impacted our ability to respond.Even when the immediate response may not have been what the stakeholder had hoped, this interactive approach often results in a positive, longer-term relationship of dialogue and input.

When face-to-face contact is not possible, the Wisconsin AES certainly relies on other forms or written or oral stakeholder input.We follow the same principle discussed earlier on making sure that the stakeholders know we have received their input and that we are perceived as following up.

Because of the commitment of the College's Dean's staff to attend as many public or community oriented forums including field days at our Agricultural Research Stations, significant input is often obtained in informal one-on-one or small group conversations.On an annual basis, 50-100 of such public meetings are often attended.

A list of such events from 2007 follows:

Jan 3 - Organic Valley Tour – La Farge, WI;

Jan 5 - Grazing Conference – Madison, WI;

Jan 9 - NC 506 Meeting – Madison, WI;

Jan 10 - DATCP Board meeting – Madison, WI;

Jan 25 - Cranberry Tour – Central WI;

Jan 26 - Wisconsin Farm Bureau – Madison, WI;

Jan 30 - Berry Growers Meeting – Broixnelles, WI;

Feb 1 - Wisconsin Corn and Soy Expo Wis Agriservice Assoc. – Wisconsin Dells, WI;

Feb 2 - Margaret Krome, Michael Fields – Madison, WI;

Feb 2 - Grazing Conference – Stevens Point, WI;

Feb 5 - WASI Roundtable – Madison, WI;

Feb 6 - Wisconsin Organic Advisory Committee – Madison, WI;

Feb 14 - Green Industry Day at the Capitol – Madison, WI;

Feb 19 - Josh Morby, Wisconsin Biofuel Association, -- Madison, WI;

Feb 23 - MOSES Meeting -- La Crosse, WI;

Feb 28 - Superior Days – Madison, WI;

March 6 - WISC-TV Editorial Board Meeting – Madison, WI;

March 8 - Bill Berry and Wilda Nilsestuen, Future of Farming in Wisconsin – Madison, WI;

March 8 - Grow Wisconsin Livestock – Fen Oak, WI;

March 13 - Ag Leaders' Breakfast – Madison, WI;

March 15 - Wisconsin Potato & Vegetable Growers Assoc Meeting – Stevens Point, WI;

March 16 - Vir-Clare Farms – Fon du Lac, WI;

March 21 - Midwest Bioindustry – Madison, WI;

March 27 - Founder’s Day – Antigo, WI;

March 28 - Listening Session – Antigo, WI;

March 28 - UW Dairy Barn Historical Celebration – Madison, WI;

March 28 - WI Cranberry Meeting – Warrens, WI;

March 30 - Food Safety/Emerging Infectious Disease Meeting – Madison, WI;

April 10 - CERANR/Ag Deans Consortium – Madison, WI;

April 17 - Tom Lochner, WI Cranberry Growers – Madison, WI;

April 20 - Paul DeLong, Amy Smith, WI Dept of Natural Resources – Madison, WI;

April 22 - AWA Breakfast on the Farm – Madison, WI;

April 24 - Founders Day – Dodgeville, WI;

April 24 - Listening Session – Dodgeville, WI;

April 26-27 - CALS Board of Visitors;

May 2 - Ellen Foley, Editor Wisconsin State Journal – Madison, WI;

May 2 - Senator Jim Sullivan – Madison, WI;

May 3 - Dane County Executive Kathleen Falk – Madison, WI;

May 3 - WI Meat Industry Hall of Fame Luncheon – Madison, WI;

May 8 - Holsum-Elm Dairy/Utica Energy/GHD, Inc. – Manitowoc, WI;

May 10 - Retired Agronomists Luncheon – Madison, WI;

May 15 - Future of Farming and Rural Life In Wisconsin – Madison, WI;

May 17 - Phyllis Wilhelm, MGE – Madison, WI;

May 18 - David Ryder, Miller Brewing – Madison, WI;

May 21 - Wisconsin Institutes for Discovery Orientation – Madison, WI;

May 22-25 - Wisconsin Idea Seminar – Various Wisconsin locations;

May 23 - Founder’s Day – Sturgeon Bay, WI;

May 24 - Bures Berry Patch, Inc. Field Day – Barneveld, WI;

May 29 - Dale Secher Farm – Brooklyn, WI;

May 30 - US Dept of Energy Site Visit – Madison, WI;

June 1 - Mayor's Breakfast – Marshfield, WI;

June 1 - Marshfield Dairy Day – Hancock, WI;

June 1 - Wis. Sustainable Ag Picnic – Madison, WI;

June 6 - Craig Culver – Sauk City, WI;

June 19 - WI Security Research Consortium – Madison, WI;

June 19 - Alliant Energy – Madison, WI;

June 21 - NCRA Meeting – Sturgeon Bay, WI;

June 25 - UW Plattville Pioneer Farms – Platteville, WI;

June 25 - Uplands Farm Cheese – Dodgeville, WI;

June 28 - Horticulture Garden Party – Madison, WI;

July 2 - Governor Doyle – Madison, WI;

July 2 - U. S. Rep. Tammy Baldwin – Madison, WI;

July 3 - Robert Dvorak, FuelMakers – Madison, WI;

July 6 - Rep. Shelia Harsdorf – Madison, WI;

July 9 - Dir. WI Office of Energy Independence Judy Ziewacz – Madison, WI;

July 12 - Dane County Executive Kathleen Falk – Madison, WI;

July 13 - Brendon Borrell, Smithsonian – Madison, WI;

July 13 - Growers Open House – Rheinlander, WI;

July 18 - Hancock Research Station Field Day – Marshfield, WI;

July 20 - Marshfield Clinic Board Meeting – Marshfield, WI;

July 21 - Northwest Agriculture and Natural Resources Initiative – Spooner, WI;

July 24 - Turf Grass Field Day;

July 24 - Beef Cattle Field Day – Lancaster, WI;

July 28 - Kickapoo Country Fair – La Crosse, WI;

Aug 1 - Rep. Eugene Hahn – Arlington, WI;

Aug 6 - Wisconsin Cranberry Growers – Madison, WI;

Aug 8 - CALS Life Science Task Force – Madison, WI;

Aug 8 - Pickle Field Day – Hancock, WI;

Aug 9 - Senator Herb Kohl’s Farm Bill Roundtable – Madison, WI;

Aug 9 - WMFPA Sweet Corn & Snap Bean Variety Field Day – Hancock, WI;

Aug 10 - Mayor of Lancaster – Lancaster, WI;

Aug 10 - Profitable Pastures for Southwest Wisconsin Field Day – Lancaster, WI;

Aug 10 - Mark Reichers Farm – Lancaster, WI;

Aug 15 - Investing in Agriculture – Pewaukee, WI;

Aug 16 - Wis Farm Bureau Federation – Madison, WI;

Aug 18 - Urban Horticulture Field Day – Madison, WI;

Aug 21 - MidWestern Bio Ag Field Day – Spring Green, WI;

Aug 22 - Regional Economic Development Council – Madison, WI;

Aug 24 - Sheep Field Day – Spooner, WI;

Aug 24 - International Crane Foundation – Baraboo, WI;

Aug 28 - Grazing Meeting – Madison, WI;

Aug 28 - Miller Brewing Tour – Milwaukee, WI;

Aug 28 - Spooner Garden Twighlight Tour – Spooner, WI;

Aug 29 - Agronomy Field Day – Arlington, WI;

Aug 30 - Regional Economic Development Council – Madison, WI;

Sept 3 - Wisconsin Organic Advisory Committee – Madison, WI;

Sept 3 - World Dairy Expo Corporate Reception – Madison, WI;

Sept 4 - WI Cabinet Secretaries Meeting – Madison, WI;

Sept 12 - Breakfast with UW Extension Chancellor David Wilson – Arlington, WI;

Sept 13 - Wisconsin Technology Council Conference – Milwaukee, WI;

Sept 18 - Wildlife in Suburbia Field Day – Madison, WI;

Sept 19 - Wisconsin Farm Technology Days – Green Co., WI;

Sept 28 - Marshfield Clinic Board Meeting – Marshfield, WI;

Oct 4 - WI Economic Development Conference – Green Bay, WI;

Oct 10 - Klondike Cheese – Monroe, WI;

Oct 12 - Orbitec Tour – Middleton, WI;

Oct 23 - UW Extension ANRE Conference – Wisconsin Dells, WI;

Oct 24 - Bio-economy Listening Session – Madison, WI;

Oct 25 - CALS Honorary Recognition Banquet – Madison, WI;

Oct 31 - Professional Dairy Producers of WI Dairy Policy Summit – Madison, WI;

Nov 6 - Michael Fields Institute – Madison, WI;

Nov 7 - Wednesday Night at the Lab – Madison, WI;

Nov 11 - Wisconsin Seed Association Board Meeting – Madison, WI;

Nov 13 - Federation of Co-Ops Conference – Minneapolis, MN;

Nov 14 - Wisconsin Potato and Vegetable Grower Assoc Research Meeting – Madison, WI;

Nov 15 - CALS Life Sciences Task Force – Madison, WI;

Nov 20 - Grazer Meeting – Arlington, WI;

Nov 28 - MWFPA 80th Processing Crops Conference – Milwaukee, WI;

Dec 3 - Wis Farm Bureau Fed Annual Meeting – Middleton, WI;

Dec 4 - Grow Wisconsin Livestock Meeting – Madison, WI;

Dec 5 - Vitaplus Dairy Summit – Waukesha, WI;

Dec 6 - Cargill Tour – Minneapolis, MN;

Dec 7 - Grazers Listening Session – Arlington, WI;

Dec 10 - Promega Tour – Fitchburg, WI;

Dec 12 - Wisconsin Grocers Association– Madison, WI;

Dec 13 - Wisconsin Clean Cities Annual Meeting – Milwaukee, WI;

Dec 18 - Wisconsin Potato and Vegetable Grower Assoc – Marshfield, WI;

Dec 20 - Regional Economic Development Council – Madison, WI ;

Wisconsin Cooperative Extension has developed 47 system and issue teams comprised of University research and Extension professionals, other agency personnel and producers to develop educational programs directed at farm, rural and industry clientele.System teams conduct applied research and educational programming that address issues and problems specific to commodities (dairy, beef, swine, sheep, grain, crops, forages, vegetable, crops, fruit crops and urban agriculture/horticulture) and community issues (economic development, health, land use).Issue teams deal with integrated issues across the agriculture systems (marketing and risk management, farm business management, nutrient management, land use and agriculture, food safety and quality, and new and emerging farm and agricultural markets).Principal investigators with Hatch, McIntire-Stennis and Animal Health grants are members of both system and issue teams and provide input to the College.

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 University of Wisconsin-Madison CALS and Wisconsin AES administration.One of the most important ways it influences future direction is through the faculty-position allocation process.CALS and WAES leadership make 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, identifying emerging areas, setting new direction for research programs with the new hires, and making budget commitments.

While we are using this information; in the case of faculty hires; to set a long-term course, we also make use of it for making more immediate decisions.Examples include investing funding to direct current faculty and their research into emerging issues such bio-energy and the bio-economy.One such 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 Hatch Research Program Call for Proposals and in 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 heath issues and rurual 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 this potential.

2)Water quality and quantity:Competition of animal agriculture, cropping systems, irrigation, industrialand 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 and 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	8742931	0

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		Research	
	Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
Actual Formula	0	0	4417931	0
Actual Matching	0	0	10178953	0
Actual All Other	0	0	0	0
Total Actual Expended	0	0	14596884	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous years				
Carryover	0	0	4325000	0

V. Planned Program Table of Content

S. NO.	PROGRAM NAME
1	Overall Program

Program #1

V(A). Planned Program (Summary)

1. Name of the Planned Program

Overall 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			3%	
102	Soil, Plant, Water, Nutrient Relationships			6%	
123	Management and Sustainability of Forest Resources			12%	
133	Pollution Prevention and Mitigation			4%	
201	Plant Genome, Genetics, and Genetic Mechanisms			8%	
202	Plant Genetic Resources			2%	
205	Plant Management Systems			4%	
206	Basic Plant Biology			5%	
211	Insects, Mites, and Other Arthropods Affecting Plants			6%	
212	Pathogens and Nematodes Affecting Plants			8%	
301	Reproductive Performance of Animals			5%	
302	Nutrient Utilization in Animals			5%	
304	Animal Genome			5%	
305	Animal Physiological Processes			4%	
311	Animal Diseases			6%	
501	New and Improved Food Processing Technologies			4%	
502	New and Improved Food Products			2%	
604	Marketing and Distribution Practices			3%	
702	Requirements and Function of Nutrients and Other Food Components			5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			3%	
	Total			100%	

V(C). Planned Program (Inputs)

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

Year: 2007	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	158.5	0.0
Actual	0.0	0.0	166.1	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	4417931	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	10178953	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 state project is made up of approximately 160 individual research projects addressing national, regional and state needs, and includes both multi-state and integrated activity.

As a research report, we are not reporting activities for the University of Wisconsin-Extenstion.We have started a discussion with UW-Extension on activities, but truthfully, we have made little progress over the last year.We will attempt to make progress on this in the coming year.

2. Brief description of the target audience

The target audience 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

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
2007	0	0	0	0

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

Patent Applications Submitted

Year	Target
Plan:	2
2007 :	6

Patents listed

1) PI: Jim Nienhuis - Includes 'Snap Bean'
2) PI: William Reznikoff - 'Mutated Tn5 transposase protein and the use thereof'. The application number is 11/195113.
3) PI: Michael Sussman - 'Use of a Gene Encoding a Histidine Protein Kinase to Create Drought Resistant Plants'
4) PI: Aseem Ansari - Includes 'Chemical Mimics of Cellular Proteins that Control Cellular Development'

The department of Bacteriology has indicated that two patent applications were submitted from their department. However, the department has not responded with additional information regarding these patent applications. This information will be included in the FY08 annual report.

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

	Extension	Research	Total
Plan			
2007	0	182	182

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
2007	35	62

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
2007	160	182

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Wisconsin AES has a broad list of stakeholders who potentially benefit from the research and Extension/outreach from the Wisconsin Formula Research 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 AES 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

For FY2007, Wisconsin AES Hatch funded projects resulted in 182 publications, 6 patents disclosures and 1 patent, and 62 graduate students trained. The Wisconsin AES also tracks the Thompson ISI Essential Science indicator as a measure of impact. Our goal is to remain in the top five and we were ranked first in the last published ranking. 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
206	Basic Plant Biology
302	Nutrient Utilization in Animals
212	Pathogens and Nematodes Affecting Plants
305	Animal Physiological Processes
702	Requirements and Function of Nutrients and Other Food Components
311	Animal Diseases
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
501	New and Improved Food Processing Technologies
301	Reproductive Performance of Animals
604	Marketing and Distribution Practices
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
502	New and Improved Food Products
201	Plant Genome, Genetics, and Genetic Mechanisms
304	Animal Genome
123	Management and Sustainability of Forest Resources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
202	Plant Genetic Resources
133	Pollution Prevention and Mitigation

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 Hatch program could affect our ability to meet our outcomes.The UW-Madison is implementing a policy change regarding tuition remission.Hatch and other Formula Grants have previously been exempt in the UW-System, but will no longer be exempt in the next few years.Since these funds do not allow tuition remission, we could be forces to re-evaluate some alternative to meeting our Hatch mission with fewer graduate students being trained.However, we recently have re-affirmed this as a priority for this program.

The other issue that did affect program allocation in FY2007 was the Federal redirection of Special Grants into the Formula Grant system.This presented some challenges as to how to meet the intent of Congress through the Formula system.There were no natural disasters or other factors that had a significant affect.

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

1. Evaluation Studies Planned

- Retrospective (post program)
- During (during program)

Evaluation Results

Key Items of Evaluation