USDA Cooperative State Research, Education and Extension Service Stakeholders' Workshop

Plants and Pest Biology

November 16, 2005

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Agenda
USDA-CSREES Stakeholders' Workshop on
Plant and Pest Biology Research, Education and Extension Priorities
November 16, 2005
Hilton Old Town Alexandria Hotel
1767 King Street, Alexandria, Virginia

8 a.m. – Arrival, registration & continental breakfast

9 a.m. – Welcome & opening remarks. Colien Hefferan, CSREES Administrator

9:10 a.m. – CSREES Program Opportunities and Q&A. Anna Palmisano, CSREES Deputy Administrator, Competitive Programs

9:25 a.m. – Michael Fitzner, Plant Section Director, Plant and Animal Systems

9:35 a.m. -Deborah Sheely, Director of Integrated Programs

9:45 a.m. to 10:05 a.m. – Q&A for CSREES presenters

10:05 a.m. to 10:20 a.m. -- Break and Refreshments

10:20 a.m. to noon - Stakeholder Presentations and Q&A (Anna Palmisano, Moderator)

Noon to 1:15 p.m. – Lunch
Luncheon Speaker, Anne Vidaver, University of Nebraska, "The Far Side of USDA"

1:30 p.m. to 3:15 p.m. – Stakeholder Presentations and Q&A

3:15 p.m. to 3:30 p.m. – Break & refreshments

3:30 p.m. to 4:30 p.m. – Panel Session, Plant & Pest Biology and Interagency Cooperation – USDA NPLs and representatives from ARS, NSF and DOE
Mary Purcell-Miramontes, Gail McLean, Ann Lichens-Park – CSREES CP
Ann Marie Thro – CSREES PAS
Machi Dilworth, NSF
Sharlene Weatherwax, DOE
Kay Simmons, USDA ARS

4:30 p.m. – Summary and reporting out, Anna Palmisano

4:45 p.m. -- Adjourn

Workshop Summary

CSREES held its second Stakeholders' Workshop on Plant and Pest Biology Research, Education, and Extension Priorities on November 16, 2005. This workshop was a follow-up to the first CSREES Plants and Pest Biology Workshop held in November 2002. The Competitive Programs unit and the Plants section of the Plants and Animal Systems unit of CSREES sponsored the 2005 workshop, and the American Society of Plant Biologists coordinated it.

Representatives from scientific societies, commodity groups, and other organizations attended the workshop. Participants presented their priorities in research, education and extension in the context of the CSREES Strategic Goals:

- Enhance economic opportunities for agricultural producers
- Increase economic opportunities and improve quality of life in rural America
- Enhance the protection and safety of the Nation's agriculture and food supply
- Improve the Nation's nutrition and health
- Protect and enhance the Nation's natural resource base and environment

The workshop also provided an opportunity for CSREES to hear if stakeholder issues were being addressed and to learn about possible new areas for consideration. In turn, it informed stakeholders of current CSREES programs and interagency programs. Federal program managers from CSREES, USDA Agricultural Research Service (ARS), the Department of Energy (DOE), and the National Science Foundation (NSF) also attended and participated in a question and answer (Q&A) session on federal activities in plant and pest biology.

CSREES Programs

The workshop began with CSREES providing overviews of its programs and research, education, and extension activities. CSREES Administrator Dr. Colien Hefferan welcomed the participants and reminded them that stakeholder input is essential for CSREES to grow its research, education, and extension programs. She noted that such input enables CSREES to identify problems on the current public agenda and anticipate problems on the horizon. She pointed specifically to the responses to soybean rust and sudden oak death as excellent examples of forethought and communication among research, education, and extension. Dr. Hefferan also indicated that collaborative work with other agencies is vital for CSREES to meet public needs.

Dr. Anna Palmisano, Deputy Administrator for the Competitive Programs unit, provided an overview of the National Research Initiative (NRI) and other competitive programs at CSREES. The presentation included information on CSREES strategic goals, NRI funding history and award sizes, NRI priority setting, and changes to this year's NRI Request for Applications (RFA). Dr. Palmisano pointed out that NRI programs this year have been focused to better address specific national needs in light of the NRI's current budget. She emphasized that CSREES competitive programs, such as the NRI, depend on a shared vision with stakeholders to reach CSREES' long-term goals. A presentation by Dr. Deborah Sheely, the director of Integrated Programs in the Competitive Programs unit, focused on CSREES Integrated Programs, including those supported through NRI and Section 406. She also provided a description of the CSREES Small Business Innovation Research (SBIR) program.

Dr. Michael Fitzner, the plant section leader from the Plants and Animal Systems unit, provided an overview of CSREES support of plant and pest biology. He described projects supported through CSREES formula funding, special grants, and competitive programs. Dr. Fitzner noted that all the funding

mechanisms work together to improve production, profitability, quality, and marketing of agricultural products. He also brought up the question of strategic investment of limited resources: how can CSREES balance funding for applied projects, current and emerging crises, and long-term fundamental science investments? Many stakeholders repeated this concept of strategic investment throughout their presentations, noting the difficulty in balancing long-term fundamental projects with application and technology transfer.

The Q&A session following the first four talks addressed management of special grants, the review process for CSREES programs, and additional mechanisms to provide input and improve communication. One such question dealt with how CSREES manages special grants and maintains accountability. Dr. Hefferan explained that CSREES manages special grants as any other grant; CSREES makes sure that the recipient organization has the capacity to perform the work. Dr. Fitzner commented that grant recipients are quite responsive when CSREES points out potential problems or weaknesses with submitted work plans. Dr. Hefferan acknowledged that concern has been expressed about the lack of a review process for special grants to ensure the highest priority projects are being funded. She explained that a number of special grants have a competitive process as part of the award. An example is the Tropical and Subtropical Agricultural Research (T-STAR) program, a special grant competitively awarded to different institutions. Dr. Hefferan stated that CSREES obviously wants to grow its competitive programs since the competitive process is the most equitable way to get high priority research funded. Still, CSREES makes sure that special grants are properly conducted and with the best possible approach.

Dr. Palmisano addressed stakeholder input and improved communication, noting that CSREES uses a variety of formal and informal mechanisms for obtaining input into competitive programs, including scientific society meetings, workshops, meetings with commodity groups, and talking with individuals. Dr. Sheely stated that each RFA contains a website for comment submission. Dr. Sheely reminded attendees that one of the best ways to provide input is to talk to the national program leaders who direct the program. A stakeholder representative commented that CSREES has a great story to tell regarding the impact of its programs on agriculture but has not done an adequate job of tying results and deliverables to specific programs. While growers understand the importance of genomics and basic research, CSREES needs to communicate how this research results in decreased cost, increased yield, and increased profitability. Dr. Palmisano agreed that communications must improve to show the effects of CSREES programs. Dr. Fitzner added that CSREES needed to do more to show the impacts of its programs but that our partners and awardees also need to make sure they mention our agency as supporting their project.

Funding Opportunities in Plant and Pest Biology and Interagency Cooperation

The afternoon included a panel presentation with program officers from CSREES, ARS, DOE, and NSF. For CSREES, Dr. Ann Lichens-Park, Dr. Mary Purcell-Miramontes, and Dr. Gail McLean provided information on individual NRI plant and pest biology programs; Dr. Ann Marie Thro described CSREES activities in plant genetic resources and breeding, including the Specialty Crops Regulatory Initiative. Dr. Kay Simmons, from ARS, presented a description of ARS activities in plant, microbial, and insect genetic resources, genomics, and genetic improvement. Dr. Sharlene Weatherwax, from DOE, described funding opportunities for plant biology research in both the Office of Basic Energy Sciences and the Office of Biological and Environmental Research. Dr. Machi Dilworth, from NSF, provided information on research and funding opportunities supported by the Directorate for Biological Sciences. This afternoon session highlighted the coordination and cooperation among Federal agencies. CSREES, ARS, and NSF representatives also noted several training programs that foster and encourage interactions between U.S. and international scientists.

Stakeholder Presentations

Workshop invitees were asked to prepare a one-page written summary of their priorities and a 5-10 minute oral presentation. Both the presentations and the written documents provided valuable perspective to CSREES on current and future priorities and needs. The oral presentations revealed several common themes, listed below. Other issues not in this list may be of more significance to certain groups. Individual summaries provide details and areas specific to a group, society, or organization.

Common themes for research priorities that emerged from the oral presentations include:

1. Genomics. Many presentations emphasized the need to link genomic data to agronomic and quality traits of economic value in agricultural plants. The ability to combine genomics and breeding is necessary. Another noted priority was sequencing the wheat genome. Genome sequencing and development of genomic tools in both pathogenic and beneficial organisms, such as honeybee and nematodes, is needed to provide new diagnostics, control strategies, and varieties for enhanced agricultural productivity, yield, and quality. Systems-level integration of genomics knowledge with phenotype and whole-organism biology was seen as a way to generate practical solutions. Support for the development and utilization of genomic databases was also noted as vital for both basic research and practical application of genomics.
2. Improved abiotic stress tolerance. Presenters stated the need to develop agricultural plant varieties with improved tolerance to abiotic stress and harsh environmental conditions, particularly concerning drought and heat stress. Research to develop agricultural plants with improved abiotic stress tolerance will significantly improve profitability and productivity.
3. Improved pathogen, pest, and disease biology. Presenters also noted the need for a better understanding of plant pathogens, pests, and diseases to develop improved detection, treatment, and management. Improved technology to detect and protect against plant pests and disease is an important mechanism to lessen environmental impact of pest and disease control.
4. Bioenergy. Biofuel and biomass research was seen as an important component for increasing economic opportunities and improving rural development in addition to providing an alternative, renewable energy source. Presenters noted that new, creative uses for renewable agricultural resources will be important for profitability of agriculture and may be a new way to keep small farms viable.
5. Enhanced quality. The ability of research to produce fruits and vegetables with enhanced nutritional value and phytonutrient content was seen as a priority. The development of varieties with traits to restrict post-harvest losses is also important.
6. Agroecosystems and the environment. Research to maintain and enhance the natural resource base, including long-term agroecosystem research, is an important aspect for agricultural sustainability. A better understanding of all levels of weed biology was also a priority.
7. Microbial communities. The impact of microbial communities for agricultural production was seen as a priority. Presenters encouraged a systems approach to determine the impact of production and processing on microbial communities as well as to enhance agricultural production. A better understanding of microbial associations could also lead to new approaches to enhance production.
8. Food safety. Presenters noted that improved food safety practices and standards would ensure the safety of the food supply. A better understanding of microbes and their toxins was also an important component of food safety.
9. Multiple uses for agricultural plants. The ability to develop new, novel, and potentially multiple uses for agricultural plants and plant products was seen as an important mechanism for enhancing agricultural profitability and economic opportunities.

Cross-cutting general themes expressed by many presenters include:

1. Long-term support for projects. Many research projects require several years of consistent funding to be successful. While uninterrupted long-term funding is important, the law limits the duration of many grants; for example, no more than 5 years for NRI grants.
2. Balance between basic, fundamental research and applied, practical research. Many presenters emphasized the need to combine practical efforts with basic research. The goal is to move science from the lab, to the field, to the marketplace and, in the process, solve real-world problems.
3. Translation of research into products. Agricultural biotechnology was seen as an important aspect of agricultural productivity and economics. Presenters suggested that a combination of basic and applied research might be achieved best through collaboration between academic researchers and industry. Presenters also noted the need to educate and train scientists in transfer of basic research to product, specifically technology development and transfer including regulatory and intellectual property.
4. Enabling technologies. The ability of research to generate tools and new approaches to solve important agricultural problems was seen as a priority. The development and transfer of these technologies can lead to improved quality of life, enhanced economic opportunities, and protection of the environment.
5. Interdisciplinary projects. Presenters indicated that a combination of disciplines and approaches is needed to solve problems as well as to understand plant and pest biology. A single approach or discipline is not sufficient for problems facing agricultural today or in the future.
6. Education, training, and extension. The need to educate future generations of agricultural scientists and producers was noted. The ability to transfer basic research to application was seen as an important aspect for education. Other needs in this area include education of agricultural producers and scientists in technology use and transfer, education of consumers on the importance of agriculture and agricultural science, and development and use of extension tools to provide the public with information on agricultural advances and challenges.

(Acknowledgement: The workshop was coordinated with grant support from CSREES to the American Society of Plant Biologists. The workshop was planned and organized with the assistance of Liang-Shiou Lin, Gail McLean, and Ed Kaleikau of Competitive Programs, with input from other members of the Competitive Programs and the Plant and Animal Systems units of CSREES.)

American Peanut Council
STRATEGIC PLAN FOR PEANUT RESEARCH
2004-2006

Key Strategic Issues:

Over the next several years, several key strategic issues will be faced by the US peanut industry and its consumers. Chief among them, is a continued emphasis on food safety and nutrition. Consumers will continue to seek out foods which not only provide comfort, but positive health reassurances. To remain competitive, peanut producers will continue to require improved production and processing methods which improve yields, reduce inputs and costs, while finding new uses for their products and by products. Additionally, the industry must be at the forefront of new research designed to improve quality and breeding so as to remain available for all users.

KEY RESEARCH STRATEGIES

Food Safety:

Aflatoxin:

- Non toxigenic competitive fungus
- Resistant varieties
    - Traditional breeding
    - Genetic engineering
- Insect resistance
- Expert systems for production management
- Other means of developing pre-harvest aflatoxin resistance

Food Allergies (peanut focus):

- Industry education programs (GMP focus)
- Educational programs (food allergy management through Food Allergy and Anaphylaxis Network and Anaphylaxis Network Canada)
- Vaccine development
- Peanut sensitization/tolerance
- Population studies
- Wild species screening for reduced allergenicity
- Researcher/consumer group conferences

Peanut Production Management:

- Water utilization and management
- Breeding and/or biological control for disease resistance/reduced cost
    - TSWV resistance
    - Sclerotinia resistance
    - Nematode resistance
    - Leafspot resistance
    - White mold resistance
    - Rust resistance
    - Reduced chemical effectiveness
- Farm management systems
    - Software/expert systems
    - Precision agriculture
    - Alternate crop rotation
    - Improved farm equipment (diggers, combines, dryers)
    - New grading methods

        - Green weight
        - Chemical testing
        - Early detection
    - Improved tillage methods
    - Production management tools/methods
    - Drying technology
- Pesticide management systems

Quality Enhancement

- Reduced foreign material
- Flavor development and enhancement
    - Breeding
    - Curing
    - Control of flavor loss in handling and processing
    - Screening
    - Causes/elimination of off flavors
- Accelerated new peanut varieties with improved
    - Yield
    - Flavor preservation
    - Early maturing
    - Nutritional/Nutraceutical enhancement
    - Shelling/Blanching characteristics
- New end uses/by product utilization
- Protein quality
- Land selection systems
- Maintenance of seed quality
- Maturity detection
- Storage/insect control
- Relationships between cultural practices and final nutritional/quality value
- Origin studies and comparisons

Peanut Nutrition Research

Studies showing positive impact of peanuts in the diet for:

- Weight Loss
- Cardiovascular Disease
- Cancer Prevention
- Diabetes
- FDA Approved Health Claim

The **American Phytopathological Society (APS)**, founded in 1909, is the premiere educational, professional and scientific society dedicated to the promotion of plant health and plant disease management for the common good. The Society, representing the interest of five thousand scientists whose pivotal research advances the understanding of the science of plant pathology and its application to plant health, appreciates the opportunity to submit comment on research and related areas which we feel should be given priority at this stakeholder meeting. The APS is willing to provide science based information to stimulate an increase in funding to support research and education objectives.

The APS has identified three areas where additional funding is needed:

Enhance Protection and Safety of the Nation's Agriculture and Food Supply: The U.S. agricultural enterprise is vulnerable to intentional pathogen or pest introductions by those intending harm. The APS and several partner professional societies have proposed the creation of a National Center for Plant Biosecurity (NCPB) (www.apsnet.org/members/ppb/PDFs/CenterProposal.pdf) to facilitate strategic planning and ensure the coordination of National activities to maintain the security of our crops, forests, rangelands and other plant resources. The NCPB, envisioned at the level of the Secretary of Agriculture, will facilitate planning, communication and coordination among government entities, academia, and private industry to assure a strong and coordinated infrastructure for agricultural security. CSREES's continued support for the National Plant Diagnostic Network (NPDN) is critical to maintain the Nation's ability to recognize and manage new plant pests. One priority for U.S. research and education must be to protect our production systems and thereby maintain consumer confidence in the safety of our food. Investments in basic research are needed to open new directions for applied research, including greater use of plant biotechnology and plant and microbial genomics for prevention, detection, forensics, or recovery from a bioterrrorist attack on our plant resources. (Additional information can be found at www.apsnet.org/members/ppb/natlcenter.asp).

Genomics of Crop Plants and Plant-Associated Microorganisms: Key to continued production of healthy crop plants is the knowledge of how these plants interact with the diverse groups of plant-associated microbes that can cause or prevent plant diseases or enhance plant growth. To intervene in disease and understand the basis of biological control or symbiotic relationships, coordinated genomic analyses of both the crop plants and their interacting microbes are essential. Funding to date has provided valuable sequence data for a few crop plants and plant-associated microbes. However, limited funding has forced the agencies to either focus on increased analysis of one or a few plant species, and to restrict funding for functional genomics of agriculturally-important microorganisms to alternate years. To better exploit the sequence information already in hand, and to fully understand genomic functions involved in plant-microbe interactions, consistent and increased funding focused on genome analysis of crop plants and plant-associated microbes is needed. (Additional information can be found at www.apsnet.org/members/ppb/plantassocinitiative.asp)

Protect and Enhance the Nation's Natural Resource Base and Environment: A key component of increasing environmental quality is to fund research that will support the economic, biological and social aspects of the agricultural enterprise at a systems level. While USDA-CSREES recently has increased funding for systems level agriculture, biologically based pest management (BBPM), an environmentally benign and integrated activity, has not received sufficient priority. Biologically based pest-management will contribute to environmental stewardship, enterprise profitability, and rural development that is paramount for the wide utilization and adaptability of sustainable environmental practices in the myriad of agricultural production operations in the United States. However, development and implementation of BBPM requires significant research and education of producers for adoption. Thus, we recommend that, programs in the NRI soliciting integrated projects be expanded with emphasis on the development of BBPM. (see www.apsnet.org/members/ppb/PDFs/Priorities.pdf)

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Submitted for CSREES Plant and Pest Biology Research Stakeholder Meeting, November 16, 2005, Arlington, VA.

Statement of the **American Seed Trade Association**
Presenter: Dr. Wm. E. Dolezal (*Pioneer Hi-Bred International Inc.*)

The **American Seed Trade Association** (**ASTA**) is one of the oldest trade organizations in the United States. Founded in 1883, its membership consist of about 850 companies involved in seed production and distribution, plant breeding, and related industries in North America. As an authority on plant germplasm, ASTA advocates science and policy issues of industry-wide importance. The strategic plans of both the ASTA & USDA-CSREES have many common actionable components. I have listed a few of ASTA's top strategic policy issues within their comparable goal components found in the USDA-CSREES Strategic Plan for 2004-2009 (http://www.csrees.usda.gov/about/offices/pdfs/strat_plan_04_09.pdf). ASTA has policies that span all of CSREES Strategic Goals (1-5); I have listed a few below. I have chosen to emphasize one key area, those components found in Strategic Goal # 3.

Strategic Goal 1: Enhance Economic Opportunities for Agricultural Producers:

- Intellectual property to ensure that the flow of improved germplasm, biotechnology traits and breeding methods continue to be made available and contribute to the productivity and competitiveness of US agriculture; Research funding in both the public and private sectors; Prevention of a patchwork of state and local initiatives dealing with biotechnology, farm saved seed (intellectual property) and labeling that would impede the movement of seed, other inputs and agricultural output among states.

Strategic Goal 2: Support Increased Economic Opportunities and Improved Quality of Life in Rural America

- Trade in agricultural products that are not impeded by trade distorting domestic subsidies, export subsidies, tariffs, non-tariff barriers or any other means; Domestic agricultural policy that, while providing a safety net for farmers, is not trade or market distorting; Improving market access for American agricultural products in markets outside the U.S.; Improved rural infrastructure including - transportation, education and medical

Strategic Goal 3: Enhance Protection and Safety of the Nation's Agriculture and Food Supply

- The seed industry employs best management practices in quality assurance and tracing and labeling of its products from breeder seed to commercial. These practices are valuable tools in dealing with events relating to food, crop or plant security
- The industry also has a knowledge base of plants, plant diseases, plant pests and pathogens as well as modern laboratories. These together with the industry's crop scouting knowledge of germplasm form a base of both rapid detection and analysis as well as surge capacity if needed. Unfortunately, CSREES, for the most part, has not taken advantage of nor utilized the expertise and capacity of the seed sector (both its human resource capital as well as the potential for using its agronomic and laboratory facilities) in National Plant Diagnostic Network or any other efforts. The USDA-APHIS-PPQ working with ASTA developed the National Seed Health System that includes specific standards for laboratory seed health tests and crop field inspections. (see http://www.seedhealth.org/) Similar efforts are possible with the NPDN. This type of activity support CSREES actionable strategies identified in **Component 3.2**: *Develop and Deliver Science- Based Information and Technologies to Reduce the Number & Severity of Agricultural Pests & Disease Outbreaks.*
- *There is no one organization in the nation that has more expertise on plant germplasm than ASTA.* Any national response plan under Homeland Security Presidential Directive #9 (http://www.whitehouse.gov/news/releases/2004/02/20040203-2.html) must include input from ASTA, along with CSREES & APHIS officials. ASTA is a key partner in the development of an overall protection plan to meet the modern challenges of safeguarding American agriculture.

Summary: ASTA's strategic priorities and objectives are compatible with the strategic objectives of CSREES. ASTA is in the position to contribute in a major way to not only the strategic goals of CSREES, but also to the security of the nation's food supply (physical and supply) and to the competitiveness of American farmers. To take advantage of this opportunity, CSREES should embrace the offer of the seed industry to provide support to CSREES in NPDN and other activities related to CSREES's strategic goals. Such has not been the case to date but we look for future opportunities to work together and leverage the talents and resources of both organizations. The ASTA leadership does appreciate this opportunity for providing input at this CSREES stakeholders' workshop.

AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE
CSREES Stakeholder Priorities

Horticultural crops include hundreds of species valued for food, ornamental and landscape applications, and leisure and sports fields. Dietary Guidelines for Americans 2005 stress as never before the importance of vegetables and fruits with the recommendation that the daily adult diet include 2 1/2 and 2 cups, respectively. Furthermore, a variety of these foods should be included in the weekly diet. The importance of ornamentals in our daily well being is well documented. Horticultural producers are generally small in size compared to major agricultural producers. Accordingly, rural economies are enhanced by producers of high value horticultural crops.

Horticultural Research Priorities

- Develop improved ornamental, fruit, and vegetable plants with tolerance to biotic and abiotic stress.
- Produce vegetables and fruits with enhanced nutritional quality by genetic and cultural manipulation.
- Determine Best Management Practices for sustainable production of horticultural crops.
- Develop horticultural production systems less dependant on nonrenewable resources.
- Develop and improve computer-assisted horticultural production systems.
- Enhance the efficiency of controlled-environment horticultural production.
- Conduct research to enhance organic produce production by development of production and pest management strategies.
- Create novel, value added consumer-ready horticultural products.
- Restrict post-harvest losses of horticultural products by improved harvesting, grading, packing, shipping, and temperature management practices.
- Develop appropriate on-farm, packinghouse, transit, and retail outlet food safety standards that ensure that vegetable and fruit supplies are free of pesticides and pathogens. The standards must include product traceability.
- Develop marketing opportunities for horticultural producers to meet consumer needs.

AMERICAN SOCIETY FOR MICROBIOLOGY

Office of Public Affairs

Presenter: Charles W. Rice, Ph.D., Kansas State University

The American Society for Microbiology (ASM) is the largest single life science organization in the world, with more than 43,000 members who work in academic, industrial, medical, and governmental institutions. The ASM's mission is to enhance the science of microbiology, to gain a better understanding of life processes, and to promote the application of this knowledge for improved plant, animal and human health, and for economic and environmental well-being.

Agriculture's role in society has expanded and understanding of all steps in the process of plant and animal production, soil and water management, and harvesting, storage and processing of agricultural products is necessary. Microbes and their activities are present at each step in the process, and microbial research can enhance the five strategic goals of USDA-CSREES. Below are ASM's recommendations, which can help USDA meet the five CSREES Strategic Goals: Enhance Economic Opportunities for Agricultural Producers; Support Increased Economic Opportunities and Improved Quality of Life in Rural America; Enhance Protection and Safety of the Nation's Agriculture and Food Supply; Improve the Nation's Nutrition and Health; and Protect and Enhance the Nation's Natural Resource Base and Environment.

Research Priorities

In order to remain competitive in the world market, agriculture must continue to innovate. Below are recommendations to foster innovation and accomplish the above goals:

- Study the impact of production and processing practices on microbial evolution, persistence and resistance in animal, plant and the environment.
- Apply systems biology approach to understanding microbial communities in the agricultural production system.
- Develop a more sophisticated understanding of the nature, specificity and adaptation of microbes to food environments and human/plant, and animal hosts and host response to both pathogenic and beneficial organisms.
- Use comparative pathobiology to understand the importance of pathogens that cross animal or plants to humans.
- Pursue multidisciplinary strategies for developing knowledge and technologies to solve food and agriculture problems.
- Facilitate system approaches, long-term projects and multi-disciplinary research in food and agricultural microbiology.
- Provide educational initiatives to supply the human resource needs in the food and agricultural communities.

Increased funding for agricultural research is needed to rebuild the human resource base to answer the continuing and emerging challenges in agricultural and food systems. Microbiology research is an essential component to sustaining and improving production, food safety, and environmental quality. USDA must aggressively seek funding and identify opportunities and needs to facilitate these issues

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Statement of the American Society of Plant Biologists
Presenter: Dr. Roger Innes

The American Society of Plant Biologists (ASPB) represents nearly 6,000 plant biologists. The central mission of ASPB is to promote research and education in plant biology with special emphasis on cellular and molecular plant biology, plant biochemistry, and plant physiology.

Each of the five CSREES major issue areas and strategic goals benefit from research conducted by ASPB members. Basic plant research supported by USDA-CSREES, including the National Research Initiative Competitive Grants Program, provides new knowledge that leads to improved and value-added crops. This enhances economic opportunities for America's farmers (issue one). This in turn benefits rural economies and the quality of life in rural communities (issue two). NRICGP-funded research performed by ASPB members has also led to major advances in enhancing and protecting the safety of the nation's agriculture and food supply (issue three). ASPB members are also studying how plants accumulate nutrients in order to develop crop plants with higher nutrient content (issue 4), and are learning how plants utilize water and soil nutrients (e.g. nitrogen and phosphorous) in an effort to develop crops that require less fertilizer, which would have major environmental, economic and health benefits (issue 5).

Research leading to improved energy crops could boost economies in rural and urban areas of America while reducing dependence on foreign oil. USDA and DOE reported in April how more than 33 percent of our nation's transportation fuels could be supplied by homegrown biofuels compared to the current two percent. This would help cut the nation's trade deficit, while also reducing carbon emissions. The nation's September 2005 trade deficit set an ominous record of $66 billion. A frightening $24 billion of that trade deficit went to purchasing foreign oil. We applaud USDA-CSREES for its own and collaborative efforts with the Department of Energy and National Science Foundation to increase basic understanding of plants for enhanced production of biofuels. Advances in plant research that have helped farmers give Americans the world's lowest cost for food (as the share of personal income) could also lower fuel costs and stabilize energy supplies.

The majority of ASPB members perform research that addresses fundamental questions in plant biology. It is this basic research that leads to unexpected breakthroughs and new approaches to improving crop production. For example, the discovery of RNA interference arose from basic research on the control of gene expression and on virus resistance in plants, but is now revolutionizing research and applications in both plant and human biology. ASPB urges CSREES, including the NRI, to continue supporting world leading basic plant biology research, rather than shift funding to specific agricultural applications. New enhanced crops result from research on crops and on simpler model plants with shared traits, such as Arabidopsis.

Tremendous advancements in our understanding of plant genomes have been made in the last five years. These advancements have greatly accelerated our ability to identify genes controlling important agricultural traits such as disease resistance, flowering time, and drought tolerance. These genomic resources have also greatly enhanced our abilities to use molecular breeding tools to develop superior crop varieties. Such resource development has required significant investments by both the USDA and the NSF, and has been accomplished by consortiums of multiple laboratories. Although continued resource development in some crop plants is still needed, it is time to focus again on solving specific biological questions, which is best accomplished by individual laboratories rather than large consortiums.

Concerns. We have recommended in the past that the USDA-NRI program increase the dollar amount given to individual research grants for both direct and indirect costs, but NOT decrease the total number of grants awarded. This requires additional funding for the NRI program. Unfortunately, the NRI budget for existing programs has not increased substantially. As a result, to accomplish an increase in award sizes, the NRI has had to fund fewer grants. This has caused funding rates to plummet. If such low funding rates are maintained, it will cause many research labs to close and make it difficult for universities to justify maintaining faculty in these areas. It will also make it very difficult to attract new students and faculty into plant biology, just at a time when the opportunities for rapid advancement are unprecedented. A substantial increase (14-percent a year over five years) of the NRI budget would multiply the positive impact that plant biology has on human health and nutrition, environmental quality, clean energy production and farming practices.

American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA/CSSA/SSSA)

Dr. Mark Westgate

The primary missions of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America (ASA/CSSA/SSSA) are to promote effective research and teaching, foster high educational standards, disseminate agronomic, crop, and soil sciences information, encourage professional growth, and to interact with organizations sharing similar goals. With 11,353 members, ASA/CSSA/SSSA are the largest life science professional societies in the United States dedicated to the agronomic, crop and soil sciences. The programs and activities of ASA/CSSA/SSSA are tailored not only to our members' interests and scientific advancement, but also serve the public interest. ASA/CSSA/SSSA publishes six peer-reviewed journals in which over 1100 scientific articles are published yearly.

Recommended Research Priorities from ASA/CSSA/SSSA:

Interdisciplinary Long-Term Systems Level Research: Ensuring a safe and plentiful food supply, developing new and creative uses for renewable agricultural resources, and sustaining of our natural resource base are cornerstones of agricultural research. Acquiring the new knowledge and understanding needed to address these critical areas, and effective deployment of this knowledge requires both interdisciplinary and systems level approaches to research and technology transfer. Such integrative research approaches require higher levels of funding and longer-term funding commitments. Funding interdisciplinary teams for a 5-year period would be more effective than funding smaller groups for 2-3 years. With problems like potato blight or soybean rust, which affect many parts of the US, the most progress can be made by pooling regional studies utilizing interdisciplinary research teams working on these problems at different locations. Field scientists should be included to facilitate extension of lab research results to field tests and determination of practical applications for farmers. Integrative long-tern research approaches could also provide a more effective mechanism for ensuring US citizens and policy makers are prepared for global climate change, and the risks of bioterrorism, ecological concerns, and recovery from natural disasters.

Integrative-Genome Enabled Research: Rapid advances in structural and functional genomics as well as the sequencing of whole genomes have made it possible to investigate, understand, and alter many complex biological traits for beneficial purposes. To a great extent, these advances have been made in single-celled organisms (e.g. bacteria or algae), and in model plant systems (Arabidopsis). The research community is now poised to apply these advances in genomics to traits of economic value in our important agricultural plant species. Funding is needed on several fronts to achieve this goal: continued support is needed for development and utilization of genomics databases for the major crops; support is needed to encourage the integration of functional genomics research at multiple levels of biological complexity; and it is critical to provide increased support for training the next generation of scientist who must be capable of integrating fundamental new knowledge about plants at the genome level with applied research needs at the systems level.

Advanced Use of Digital Technologies for Integrative Research and Teaching Initiatives: A more precise integration of knowledge from multiple disciplines into a comprehensive management system to maximize productivity costs is needed. Future research should coordinate computer- and/or equipment-based systems in decision processes that make these technologies usable in commercial plant production systems. Epidemiological predictive models should integrate one or more disease control practices with agronomic or horticultural crop production schedules. Remote sensing equipment, such as but not exclusive to hyper- or multi-spectral aerial imagery, should improve early detection of plant stresses. Coordinating sensing equipment with meteorological data as part of a computer-based logic system to match types of plant stresses with events, periods of increased water demand, peak of an insect population cycle, or conditions favorable for infection of a pathogen are needed for predicting plant stress. An array of digital capabilities, such as static images, video, sound, zoom, and multi-field display functions, should be investigated to expand competency of technology transfer to students in traditional and distance learning classroom settings. Evaluation of distance learning strategies should encompass the use of supplemental training methods that complement and enhance the use of digital technologies.

Soybean Industry Research Priorities

It is only through cutting edge research that US soybeans will continue to be competitive (price, quality and yield) in world markets. The US must maintain its preeminence in soybean research. We continue to see the potential of genomics technologies as the key to addressing our most serious challenges: 1) biotic and abiotic stresses that lower yields; and 2) improving the composition of the soybean.

Research Needs: Map seed-related genes to provide information on the chromosomal distribution of agronomically and physiologically critical genic sequences. Development of a physical map is under way. Research is in progress to sequence some seed development genes. More work is needed to map gene-rich regions and, ultimately, to sequence the entire soybean genome.

- Continue and expand research to determine the organization of the soybean gene space and repeat sequence space, with emphasis on seed-related genes.
- Determine the function of genes, using technologies such as tilling and transposon mutagenesis.

Research Needs: Rust and other stresses are the most significant drag on yield. Asian soybean rust is not yet well-established in the US, but elsewhere yield losses of 40% have been common, with losses up to 80% in some cases. No soybean varieties have broad resistance to rust. Fungicides are expensive, require multiple applications, and do not provide complete protection.

- Locate new rust resistance genes (possible in closely related legumes such as *Phaseolus),* transform resistance genes into soybeans, and "stack" known soybean resistance genes in soybean germplasm.
- Continue work to increase producer profit by developing germplasm to minimize the impact of biotic and abiotic stress while optimizing the benefits of nitrogen fixation in the environment.

Research Needs: The soybean is unique in its ability to accumulate high levels of high quality, digestible seed protein and oil. Our understanding of seed development and the availability of research methodologies are among the most advanced for any flowering plant. This creates a unique opportunity for soybean genomics research.

- Develop the full range of genomic resources in the reference systems necessary to explore legume as a model family including transcriptomics, proteomics, and metabolomics resources.
- Develop the genomic resources necessary to take full advantage of the tools of nutritional genomics to understand the biologically active compounds in soybean meal that contribute to or detract from soy protein as a renewable dietary source of protein in food and feed.

Biotechnology Industry Organization
Research Priorities Presented to the USDA, CSREES

The agricultural biotechnology industry has celebrated two significant milestones in 2005. First, the year marks the 10th anniversary of commercialized biotech crop plantings, and second, in May, we marked the planting of the one billionth acre of biotech crops. These two points help to demonstrate that agricultural biotechnology is the most rapidly adopted technology in the history of food production.

The development and subsequent adoption of this technology could not have been possible without a strong regulatory system and federal research partnership. We recognize that this dependence on a strong regulatory system and federal research dollars will only increase as we move to the development of what is often referred to as "second generation" biotechnology products.

BIO supports sustaining and enhancing federal funding for food and agricultural research, extension and education to help bring about research outcomes that provide a range of major public benefits. *We believe increased federal support for food and agricultural research and education should be a key component to develop sound food and agricultural policy.*

BIO believes that public funding for agricultural biotechnology research conducted through programs of the USDA in CSREES and ARS is critical to discovery of new biotech solutions toward production of improved, healthful and safe foods that will feed the global population of the future. A recent analysis by the International Food Policy Research Institute of 292 studies of the impacts of agricultural research and extension published since 1953 found an average annual rate of return on public investments in agricultural research and extension of 48% -- an extremely high rate of return by any benchmark. Therefore, BIO supports increased funding for the key competitive grants and for intramural research, including the Biotechnology Risk Assessment Research Grants Program and the National Research Initiative.

Council for Agricultural Science and Technology (CAST)

The Science Source for Food, Agricultural, and Environmental Issues

CAST is a nonprofit 501 (c)(3) organization composed of 37 scientific societies and many individual, student, company, nonprofit, and associate society members. CAST's Board of Directors is composed of 38 representatives of the scientific societies and individual members, and an 8-member Executive Committee. CAST was established in 1972 as a result of a 1970 meeting sponsored by the National Academy of Sciences, National Research Council.

The primary work of CAST is the publication of task force reports and issue papers written by scientists from many disciplines. The CAST Board of Directors is responsible for the policies and procedures followed in developing, processing, and disseminating the documents produced. These publications and their distribution are fundamental activities that accomplish our mission to assemble, interpret, and communicate credible science-based information regionally, nationally, and internationally to legislators, regulators, policymakers, the media, the private sector, and the public. The wide distribution of CAST publications to nonscientists enhances the education and understanding of the general public. Recent publications include an issue paper entitled *Bioenergy: Pointing to the Future* and a CAST Commentary on *Crop Biotechnology and the Future of Food: A Scientific Assessment.* More information about CAST projects and publications is available on the website at www.cast-science.org.

In addition to strong efforts in the areas of plant science and plant pests, involving plant pathologists, entomologists, weed scientists, and nematologists, CAST addresses issues of animal science, food safety, and biotechnology with inputs from economists, social scientists, toxicologists, and legal experts.

Plant Protection Sciences:

- Research to understand the impact of management practices for weeds, diseases, and insects and how they affect agricultural and natural resources, urban environments, and society is critical.
- CAST's role in explaining the state of knowledge and elucidating policy issues regarding the impacts of pests, pest management, and biotechnology on production agriculture, natural resources, and urban environments is important for policymakers and the public.
- A CAST-sponsored symposium on "Nondietary Exposure to Organophosphates and Carbamate Pesticides: Reporting and Estimation of Exposure and Risk" is being planned for 2006.

Plant and Soil Sciences:

- Communication of credible information about plant and soil sciences is of vital importance to those involved in U.S. agriculture: agricultural specialists, policymakers, and farmers.
- Important current topics include water quality and runoff issues; the inadvertent presence of transgenic seeds or other material in conventional and organic crops; agriculture's role in the development of bioenergy resources; and the preservation of genetic resources. Through its Work Group discussions, CAST is actively pursuing these and other topics for publications.
- A workshop entitled "Water Quality and Quantity Issues for Turfgrasses in Urban Landscapes" will be held January 23-25, 2006 in Las Vegas, NV. Full details about the workshop are available at www.castwaterquality.info

Youth Agricultural Essay – In 2002-3 an essay contest was conducted by CAST, in cooperation with CSREES and several stakeholders, for sixth–eighth grade students. The purpose was to educate youth about the science of agriculture. Seven topics were selected for the contest such as "Using Science to Create a Safe and Healthy Food Supply" and "Using Lasers, Robots, and Computers in Agriculture." It is CAST's desire to reinitiate and broaden the project to include a larger number of students and supporting organizations. Local, State, and National winners would be chosen.

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Statement of the International Wheat Genome Sequencing Consortium
Submitted by: Kellye A. Eversole, Executive Director

The International Wheat Genome Sequencing Consortium (IWGSC) is a collaboration of scientists, organizations, and individuals dedicated to sequencing the hexaploid (bread) wheat genome with members in 14 countries.

Wheat is grown on 17% of the world's cultivated land; it is the staple food for 40% of the world's population providing 20% of the calories and 55% of the carbohydrates consumed. Wheat, rice, and maize provide about three quarters of the calories and half of the protein required by the world's population and now wheat is the only one that needs to have a sequencing project underway. The sequence of the wheat genome will result ultimately in healthier and more nutritious food that could lead to vast improvements in human and animal health.

IWGSC Priorities. The IWGSC mission is to advance research by (1) developing DNA-based tools and resources; (2) obtaining a draft sequence of the bread wheat genome; and (3) ensuring that these tools are available for all to use without restriction. We strive to facilitate international cooperation and to coordinate scientific efforts to build the resources for wheat to be the next major species for sequencing. The IWGSC appreciates this opportunity to present its priorities for CSREES plant biology programs. First, we would like to applaud the vision of the CSREES for focusing the $1.5 million FY 2006 NRI program area 52.1C, Plant Genome Structure and Organization, on advancing the knowledge of the wheat genome by exploring pilot draft sequencing approaches, coordinating with international efforts, and coordinating with other U.S. Federal, and state agencies. This program will give us essential insights into the structure of the wheat genome. Further, by announcing this program, CSREES is demonstrating USDA's leadership in advancing genomics for this important crop. The IWGSC encourages the CSREES to expand this program in the coming years and to lead the U.S. efforts for sequencing the wheat genome. The IWGSC strongly encourages the CSREES to lead the efforts to build the foundation for sequencing the wheat genome and to provide significant financial support to the following goals over the next 5 years:

- Developing a physical map and linking it to the genetic map;
- Determining the best approach for sequencing hexaploid wheat; and
- Sequencing and annotating the genic regions of hexaploid wheat.

We do not expect CSREES to fund all of these goals alone. The IWGSC is working to secure broad international funding support for these projects. There is no question, however, that it was the leadership provided by the CSREES that has led to the sequencing of the bovine and porcine genomes. We would like the CSREES to provide a similar level of commitment to the wheat project.

NRI Funding. The IWGSC also supports efforts to increase overall funding for the NRI as this is the premier competitive grants program for agricultural research.

Minor/Specialty Crop Pest Management
Inter-Regional Research Project No. 4 (IR-4)
Cooperative State Research, Education, and Extension Service

Since 1963, the IR-4 Project has cooperated with researchers, producers, the agrichemical industry and federal agencies to secure regulatory clearances that allow companies to achieve registrations for pest management products on specialty crops. Specialty crops are high value/ low acreage crops that make up about 46% of U.S. agricultural crop production and $43 billion in sales. They include vegetables, fruits, nuts, herbs, spices, floral, nursery, landscape, turf, and Christmas trees. Without IR-4 support, most of these specialty crops would not have pest management tools because it would not be economically feasible for companies to invest in the registration costs. IR-4 uses an extensive stakeholder driven process to prioritize research. The success of this program has been due to a three-pronged approach:

1. Partnering with specialty crop stakeholders, land grant universities and USDA-ARS to identify most critical pest management voids and developing data to answer the need.

2. Partnering with agricultural chemical and biopesticide companies to allow access to the best pest management technology.

3. Partnering with the Environmental Protection Agency (EPA) and other regulatory agencies to facilitate specialty crop registrations.

Some of the recent accomplishments of the IR-4 Project include:

- Record 1014 Food Use clearances in 2004
- Over 3900 of the project's total 8300 clearances granted since1998
- Increase research support for Ornamental Horticulture Program
- Biopesticide Demonstration Program jointly funded with the EPA
- Methyl Bromide Alternatives Program (identified potential solutions)
- Crop Grouping Project (to streamline registrations)
- Section 18 (Emergency Registrations) Economic Loss Avoidance of over $10.1 billion from 1998 to 2004.
- Regulatory Partnerships with EPA, California Department of Pesticide Regulation (CPDR), and Canada's Pest Management Regulatory Agency (PMRA)
- Improved communications efforts

Examples of Projects Supported by IR-4

Focus on Reduced Risk Products

- Targeted food residue programs using the newest and safest chemistries.
- Petitions occupying 50% of the EPA's work plan for label expansion since 2002.

Biopesticide Registration Efforts of AF36

- Assisted registration of AF36 by the Arizona Cotton Research and Protection Council.
- When AF36 is applied in cotton fields it displaces the toxin producing *Aspergillus flavus* in the soil, thereby reducing the presence of the mycotoxin in cotton seed and the environment.

IR-4 Supports the Ultra Minor Crops

- Supports Section 18 Emergency Exemptions.
- Over 90% of the products currently used by U.S. hop growers are the direct result of IR-4 registration efforts.
- Label clearance for fenhexamid, a reduced risk product used to control *Botrytis*, a devastating disease on ginseng. The ginseng industry in Wisconsin is relying on the products in the IR-4 pipeline coming through.

Crop Grouping

- Classify crops that are botanically or taxonomically related or culturally similar.
- Tolerances can be established on crop groups based on residue data from representative crops within each crop group.
- In 2003, the IR-4/EPA Crop Grouping Working Group was established to bring these proposals to federal regulation.
- Results in more efficient utilization of resources and facilitates significant global harmonization if adopted by international authorities.

Finding Solutions for Tough Problems

- IR-4's 2004 Food Use Workshop targeted the toughest pest management issues.
- Identified thrips management in onions, *Phytophthora capsici* in cucurbits and peppers, and herbicide safety testing in leafy vegetables.
- Established product performance testing pilot programs at multiple locations throughout the United States leading to the identification of several potential onion thrips solutions (one prioritized at the 2005 Food Use Workshop).

Emerging Pest Issues

- Recently discovered Q-Biotype whitefly is immune to most types of insect management tools. IR-4 was a key participant in efforts to develop innovative strategies to ensure that growers of specialty crops are prepared to control this pest.
- Initiated an Aquatic Herbicide Program to address serious weeds that are clogging irrigation ditches and ponds restricting water flow and specialty crop production.

National Association
of Wheat Growers

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NAWG Priorities for Federal Agricultural Research

November 3, 2005

In preparation for the upcoming CSREES workshop on plant and pest biology on November 16, NAWG submits the following suggestions for CSREES emphasis under its five established issue areas. We do not have specific recommendations in each of the areas, so will only list the areas in which we do have them.

CSREES specified five interest areas in its invitation to the workshop:

1. Enhance Economic Opportunities for Agricultural Producers.
2. Support Increased Economic Opportunities and Improved Quality of Life in Rural America
3. Enhance Protection and Safety of the Nation's Agriculture and Food Supply
4. Improve the Nation's Nutrition and Health
5. Protect and Enhance the Nation's Natural Resource Base and Environment

NAWG Research Priority	CSREES Interest Area				
	1	2	3	4	5
Take a leadership role, both in personnel and funding, for completing a physical map of the hexaploid wheat genome. This step is essential in any future ability for wheat breeders to apply advanced genetic techniques to wheat variety improvement, and wheat is falling dangerously behind other crops in this area.	X	X			
Development of new uses for wheat. NAWG commissioned a New Uses Audit in September 2002 that analyzed and ranked some 20 potential new uses for wheat in terms of volume potential, premium potential, development cost, time to market and technical feasibility. Further developmental research needs to be done on the high-priority possibilities identified in this audit.	X	X			
Continued and increased emphasis in combating plant pathogens, including stripe rust, fusarium gramineum (head scab), karnal bunt and other problem pests.	X		X		X
Continued and increased emphasis in battling invasive weeds.	X				X
Development of reliable and accepted methodologies for quantifying carbon sequestration. These methods will be critical for establishment of carbon trading and measurement.	X	X			X

National Barley Improvement Committee
Priorities

Chair: Mr. Kurt Carstens (grower)
Washington Barley Commission
6209 N. Coulee Hite Road
Reardan, WA 99029

Vice Chair: Dr. Richard Horsley
Department of Plant Sciences
North Dakota State University
Fargo, ND 58105

Executive Secretary: Dr. Mike Davis
American Malting Barley Assoc.
740 N. Plankinton Ave. #830
Milwaukee, WI 53203

The National Barley Improvement Committee (NBIC) represents the entire US barley industry - growers, researchers, and end-users (e.g. malting, brewing, food industries). Federal investment in barley research is needed because barley is primarily a public sector crop. Most barley variety development and research is conducted at state universities and USDA Agricultural Research Service (ARS) facilities. Private seed companies are not investing in barley variety development because of low seed sale potential, since barley is a non-hybrid crop with limited acreage.

Barley production and the manufacture and sale of value-added barley products (malt, beer, food, livestock) have a significant impact on the US economy, supporting millions of jobs and generating billions of dollars in business activity and tax revenue for the US and state governments. Enhanced barley research efforts are needed to keep barley a crop option for US growers and to maintain and enhance value-added job generating enterprises including livestock, malting, brewing, food, and ethanol production. US barley acreage has declined significantly in recent years due to a variety of factors, including those that can be addressed through research to develop improved barley varieties that are more tolerant to biotic and abiotic stress and that have expanded uses due to improved malting, food or feed quality. We should not concede domestic and world markets for barley and its value-added products to our competitors in Australia, Canada, and Europe. This will have a substantial negative impact on the US economy and federal, state, and local tax revenue.

Currently, the primary use of barley in the US is for malt production for beer and other products. Malting barley provides the highest economic return to growers and represents a complicated genetic package providing required agronomic and quality traits. Enhanced research, including utilization of the latest genomic tools, is needed to characterize important traits and develop the malting barley varieties of the future so as to keep it a competitive US crop.

Barley that is unsuitable for malting is utilized in secondary markets for other uses or is grown specifically for those markets. A primary use is as feed, which provides a lower return since prices are driven by other feed crops, primarily corn. Research to characterize and enhance feed quality traits to develop varieties with unique attributes may provide greater returns to growers. With only two percent of barley utilized in food products, growers and the food industry see potential for growth in this market. Barley has unique nutritional and health beneficial attributes (e.g. cholesterol reduction), with additional research needed to discover and enhance other traits. Research is also needed to increase utilization of barley for ethanol production or for new value-added products.

Reversing the decline in barley acreage and increasing its value-added utilization requires research directed at improving its competitiveness and to address production sustainability and risk management issues. The later include biotic threats, such as Fusarium head blight, which is a significant contributing factor to the decline of barley acreage and US malting barley production capacity in the Midwest due to its impact on quality, including the production of mycotoxins. Other biotic threats include barley stripe rust, net blotch, *Septoria*, the potential threat of a new African stem rust, other fungal and viral diseases, as well as insect pests such as the Russian Wheat Aphid. Abiotic threats include heat and drought stress, that not only impact yield but have a substantial impact on quality. For malting barley, wet conditions near harvest may have a significant negative impact on quality due to field sprouting. Research is needed to develop transient dormancy that reduces field sprouting but allows subsequent germination for malting.

Summary Priorities to Enhance Economic Opportunities for Agricultural Producers
National Cotton Council
Andrew Jordan

Cotton producers continue to face economic challenges. One of the most dramatic changes is the shift in markets. A few years ago U.S. produced cotton fiber was processed by domestic textile mills, converted into apparel and home furnishings by American workers and sold to U.S. consumers. Today U.S. textile mills consume less than 30% of the crop production, putting additional pressures on price and quality to meet global demands. Shifting markets combined with volatile prices and skyrocketing input costs make it imperative that new technologies be found to keep U.S. agriculture healthy. Research and extension can play a critical role to enhance economic opportunities.

There is a growing perception that the ability of public sector to meet producer needs is decreasing. Shrinking public sector support creates a void in which private industry including crop consultants and commodity groups must fill. Also, the educational level of farmers is at an all time high and increasingly they are demanding rapid access to high quality information to assist in crop management.

From the biology and agronomic standpoint, the cotton industry is suffering from a void in knowledge on pest management in a reduced-chemical production environment. With a successful boll weevil eradication program and introduction of transgenic pest resistant (Bt) cotton, chemical use has been reduced dramatically. Consequently, thrips, aphids, plant bugs, and stinkbugs are now important pests. Likewise, weed pest management has changing with the rapid adoption of herbicide resistant crops. Better information on how to control weeds to improve and conserve soil, and prevent or manage weed resistance is needed in a practical and cost effective way. Precision agricultural technologies and genetic improvements are thought to be key to the next breakthroughs in efficiency.

Nematodes, especially reniform nematode, represent a serious and growing problem for cotton. Reluctantly, the reniform nematode is used as an example of a growing frustration in our organization on the public sector's inability to respond to critical and changing needs. In 2004 and 2005, a multi-state task force of cotton nematologists put together a comprehensive plan for dealing with the growing nematode economic problem. The plan had short-term educational aspects as well as long-term research components. After vetting the plan with several state and federal public research institutions, the call has yet gone unheeded. This is a symptom that I challenge us to work together to seek increased efficiencies of conducting research and extension. If new funds are not forthcoming, this may call for increased collaboration across states, interregional programs, commodity and foundation support and private industry. These comments are not intended to be negative toward any one agency but to demonstrate the costs due to the lack of a mechanism for addressing quickly and precisely emerging economic problems.

Research Priorities for the National Sorghum Producers

Presented To USDA-CSREES Workshop
By
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The National Sorghum Producers would like to thank CSREES for providing this opportunity to discuss our research priorities with the Agency and other commodities through this particular forum.

Sorghum acres have been declining in recent years due to several factors, some of which are farm policy related, while others relate to a decline both private and public research funding opportunities for the crop. NSP has worked to highlight the inequities within farm policy that have stymied the growth of planted acres and has continued to support Congressional support for funding for research. While sorghum acres have declined, both maize and soybean acres have increased. One reason for that growth has been the lack of a comprehensive public and private research program in sorghum. The lack of a comprehensive program has led to sorghum yields increasing at half the annual rate of corn and to fewer new uses (non-feed, non-food) for sorghum. This fact contributes to the sorghum acreage falling behind the other major crops like corn, soybeans and cotton.

A disparity between private corn and sorghum research exists. The largest privately owned corn breeding company spent over a $100 million on corn breeding research last year, while the entire sorghum research budget (public and private) is roughly $20-25 million. A commitment to the research mentioned above allows the corn industry to have over 550 scientists working on improving that crop, while sorghum has approximately 20 scientists. Dedicated resources to research have increased corn yields 1.4 bushels per acre per year, while sorghum yields have increased at half of that rate 7/10th's of 1%.

NSP has identified five major areas of research: 1) yield within a semi-arid cropping system; 2) sorghum's role in renewable biofuels; 3) biotic stresses, with renewed emphasis on weed control; 4) human and animal nutrition; and 5) genomics.

1) Yield within a semi-arid cropping system: Sorghum has traditionally been a crop of marginal lands and therefore has developed some unique characteristics that provide the crop with coping mechanisms that provide competitive advantages to other crops when faced with various abiotic stresses, especially drought. Understanding these coping mechanisms is a major priority for both our research community and our producers. The "Blue Revolution" will be the next big challenge for agriculture in the US and crops that can make more efficient use of less water will become a more important tool for farmers as they cope with this new reality within agriculture. This applies to not only grain crops, but forage crops as well. We also see early season cold tolerances as a priority. If we could plant sorghum earlier, much like corn, we could take advantage of a longer growing season through use of later maturing sorghums, which tend to have greater yield potential. Finally, we need greater research into the diverse germplasm of sorghum to discover new heterotic pools that can be exploited by plant breeders to improve yield.
2) Sorghum's role in renewable biofuels: Domestically, approximately 10% of our crop is used in ethanol production. While sorghum ethanol yields are comparable to corn, the crop continues to always be behind corn in research emphasis concerning enzymes, fermentation, and co-product evaluation. Sweet sorghum and unique forage sorghums also have potential use in biomass facilities producing ethanol. Sweet sorghums have been used in both India and Brazil to produce ethanol and research into these biomass crops needs further funding and emphasis.
3) Biotic stresses, with renewed emphasis on weed control: Weed technology, in the form of GMO resistant sorghum, is not currently available for sorghum and little new chemistry is being developed that will benefit sorghum. Therefore, new technologies and weed strategies must be developed to help producers control weeds in a timely and efficient manner. New uses of current products, new weed strategies, and bringing new technologies to the crop are essential to the success of our producers in the future. Downy mildew, a long

time pathogen of sorghum, has become a new problem in the southern region of Texas with a new pathotype that is resistant to chemical treatment. New germplasm must be screened and introduced into hybrids in the areas susceptible to this new pathotype.

4) Human and animal nutrition: Most of the world consumes sorghum in various food products. Sorghum is used primarily as an animal feed in the US. Sorghum is a gluten-free product and new uses for sorghum in this area of the health market are meeting the needs for this particular market. Because of its bland flavor and easy of use, sorghum flour may be substituted for wheat flour in many products that can produce a healthy alternative to those suffering from gluten intolerance. Unique sorghums have also been found with high levels of antioxidants and research programs are under way to understand how these characteristics operate in animal systems. These antioxidants may also have a role in animal health nutrition and further research in this area is also needed. In preliminary research, sorghums with unique polyphenols, waxes, and feeding characteristics have been found and further research is needed to study how these properties may be used in food systems.
5) Genomics: The sorghum genome will be the second major cereal crop to be sequenced. While this is extremely exciting news, the work is only just beginning to understand what this elucidation of the sequence will mean. Areas of research include functional genomics, genomic panels for exploitation, and micro-arrays to evaluate how genes are expressed under various growing conditions are needed to add meaning to the sequence.

Though this is not a comprehensive list of all the needs of our producers, each priority contains several avenues of research that will benefit our producers and ensure that sorghum will continue to play a vital role in their profitability in the future.

Society for Range Management
Research Priorities

The Society for Range Management was organized partly to develop an understanding of rangeland ecosystems and the principles applicable to the management of rangeland resources, to assist those who work with rangeland resources keep abreast of new findings and techniques in the science and art or range management, to improve the effectiveness of range management to obtain products and values necessary for man's welfare, and to create a public appreciation of the economic and social benefits to be obtained from the range environment. In this capacity, our research priorities focus on different aspects of each of the CSREES Strategic Goals. While our primary focus has been in the "Protect and Enhance the Nation's Natural Resource Base and Environment" we have interests in working with CSREES to achieve each of the other goals.

Enhance Economic Opportunities for Agricultural Producers
Managed grazing is the predominant form of rangeland-based agriculture, our research priorities center on developing grazing management technologies that protect and/or enhance environmental quality. Other potential rural economic opportunities such as agriculture and eco-tourism, environmental markets (wetlands, carbon sequestration, and wildlife habitat) and energy production also offer opportunities and should be examined.

Support Increased Economic Opportunities and Improved Quality of Life in Rural America
The demography of rural rangeland ecosystems is changing. Research is needed to better understand the ecological and social connectedness between rural rangeland based economies and the overall economic and social well-being of American society and to develop new and innovative rangeland based enterprises that are ecologically and economically sustainable, socially desirable and capable of sustaining rural American communities.

Enhance Protection and Safety of the Nation's Agriculture and Food Supply
Research should focus on developing technologies that protect rangeland resources critical to the production of food and fiber while maintaining and/or enhancing biodiversity. This should include developing effective resource assessment and monitoring technologies that identify long-term trends in the ecological condition and functional capacity of rangeland ecosystems and developing technologies that limit ecological, economic, and social risks associated with such phenomena as drought and wildfires.

Improve the Nation's Nutrition and Health

Protect and Enhance the Nation's Natural Resource Base and Environment
Our research focus is on the management of riparian areas, the manipulation of rangeland vegetation to provided a quality environment for a wide array of uses (e.g., wildlife habitat, declining species, species of concern, endangered species, recreation), developing effective technologies for managing and controlling invasive and noxious weeds, and the functional restoration of degraded rangelands (including, but not limited to productive capacity). Each of our research needs identified in other strategic goals is ultimately related to this goal.

USA Rice Federation
Steve Hensley. Director Regulatory Affairs

Federation staff were unable to attend the November 16 Workshop. In addition, establishing priorities was complicated in the southern rice states by recent natural disasters that also precluded a complete reporting. Below are priorities as reported from three southern, rice-growing states. Different areas have differing cultural practices, seasons and pests.

Arkansas Rice Research Priorities:

1) Variety Development
   A) Transgenic
   B) Marker Assisted Selection
2) Disease control through genetic improvement as well as expedited registration of additional fungicides
3) Insect control through genetic improvement as well as expedited registration of additional insecticides
4) Weed control-all aspects
5) Agronomic practices with major emphasis on environmental implications
6) Climate change and implications on the sustainability of U.S. rice production
7) Numerous areas of post harvest research

Louisiana Rice Research Priorities:

Breeding/Genetics

Number one priority is assignment of gene function for the rice genome. Associated with identification of gene function is the development of suitable markers. Both would facilitate variety development through the use of marker-assisted selection. Also, continue research into the evaluation of the worldwide diversity of rice with the objective of the detection of novel genes.

Pathology

- Priority - Discovery of new resistance genes and a better definition of the minor genes involved with resistance.
- Analysis of gene function and the development of markers with limited definition would facilitate disease resistance.
- Genetic searches for novel genes would benefit development of varieties resistant to other diseases (e.g. sheath blight).
- Alternative management practices of diseases, such as irrigation flood depth and the impact on rice blast, needs to be more fully researched. Certain aspects of the biology, ecology, and life cycle remain unknown for many pathogens.

Rice Production

- Production practices are dynamic. Changes are often a result of government regulations, climatic changes, and a desire by growers to reduce costs. Some changes are perfect opportunities for research to integrate control tactics in response to shifts in pest status or new invasive pests and include all pest management disciplines (weeds, diseases, and insects). Other disciplines also must be included to provide comprehensive research in production and would include plant physiology, nutrition, tillage practices, and crop rotation.

Insects

- Arthropod pests require continued determination of strategies and tactics to mitigate impact and to develop less obtrusive management options including pest-resistant plants, cultural options, and biologically based options.
- Continue to support research on post-harvest pest control.

Texas Rice Research Priorities (not in order of importance):

1) Allow continued use of pest management tools crucial to the survival of our industry
2) Expedite registrations of pest management tools with better environmental profiles than existing tools
3) Support research on increasing main and ratoon crop yields and quality
4) Support research on management of stored product pests
5) Support extension efforts to better serve stakeholders
6) Support research that delivers useable information that provides direct economic benefits to stakeholders
7) Support conservation tillage research--or any research that reduces petroleum-based inputs-- due to skyrocketing cost of fuel
8) Support research that reduces and conserves water use
9) Support research to reduce production costs
10) Support research that enhances collaboration among research agencies---Land Grant Universities and USDA
11) Support any research that potentially can reduce oil input would be highest priority

UNITED FRESH FRUIT AND VEGETABALE ASSOCIATION RESEARCH PRIORITIES

Comments to the USDA CSREES Listening Session November 16, 2005
James R. Gorny, Ph.D. Vice President, Quality Assurance and Technology, UFFVA

Research Priorities To Enhance The Nations Nutrition and Health

1) Phytonutrient Affects on Human Health
2) Improved Fruit and Vegetable Flavor and Taste (Consumer Satisfaction)
3) Improved Fruit and Vegetable Quality Segregation Technologies
4) Improved Produce Genotypes

Fruits, vegetables and nuts are a significant dietary source of many essential nutrients critically important to human health and research has demonstrated their positive health benefits. Greater understanding of the short- and long-term health benefits derived phytonutrient consumption, the underlying mechanisms for the health benefits, and how production and postharvest handling practices may affect phytonutrient compounds is critically needed. Improved genotypes and postharvest handling practices must also be developed to assure that consumers consistently enjoy the experience of eating these foods.

Research Priorities To Enhance Economic Opportunities For Agricultural Producers

1) New Products (e.g. fresh-cut/value added/convenience items)
2) New Markets
3) Byproduct Utilization and/or Mining Phytonutrients

Fruit and vegetable marketers require more "proof of concept" research to assure development of new products as it is well established that increased availability and accessibility to convenient fresh fruits and vegetables will result in increased consumption. Fruits and vegetables are a rich source of phytonutrients and there is great potential for byproduct recovery of phytonutrients to benefit human health.

Research Priorities To Enhance Protection and Safety of the Nation's Agriculture and Food Supply

1) Microbial Ecology of Human Pathogens in Agricultural Environs
2) As of Yet Unidentified Sources of Contamination
3) Background Micro flora Suppression of Human Pathogens
4) Intervention Strategies to Reduce the Potential Risk of Human Pathogens on Specialty Crops
5) Good Agricultural Practices (GAPs)

Human pathogens in agricultural/farm environs are typically present in low numbers and low frequency, making their investigation difficult. Hence there is a significant lack of information regarding human pathogens on the farm and in postharvest specialty crop environments. Understanding the microbial ecology, persistence, niches, harborages, life cycle, and factors affecting survival and growth of human pathogens in an agricultural/farm environment, including water and soil amendments, is essential to developing and implementing intervention and control measures to reduce the risk of contaminating specialty crops. Currently, Good Agricultural Practices (GAPs) rely on management practices which prevent contamination of specialty crops on the farm and during postharvest handling operations. Therefore, identifying of as-yet unidentified sources of contamination is important to assist producers and handlers in reducing risk. Water and soil amendments are two known significant potential sources of human pathogens in the farm environment. A greater understanding is needed to assure that soil amendments and agricultural water are of sufficient microbial quality for their intended purpose is needed to assure the safe and wholesome production of specialty crops.

UFFVA November 2005

Weed Science Society of America

Presenter: Dr. David Shaw
USDA-CSREES Stakeholders' Workshop
November 16, 2005

The Weed Science Society of America (WSSA) would like to emphasize our support for NRI funding of mission-based, application-driven research that directly addresses critical issues in agriculture and invasive weed management. We believe that this viewpoint is in perfect harmony with the NRI Reviewing Guidelines stating that research should be relevant 'to improvements in and sustainability of U.S. agriculture'.

The WSSA would like to express its deep concern with the direction of the NRI Competitive Grants Program 51.9, The Biology of Weedy and Invasive Species in Agroecosystems.

- Program 51.9 now targets not only weedy and invasive plants, but all other invasive species without an increase in funding. The WSSA would like to point out that NRI Programs 51.2, 51.3 and 51.8 that deal with the biology of arthropods, nematodes, and microorganisms were not opened up to invasion biology for their representative organisms. The WSSA would like to see invasion biology for different species placed in their respective NRI Programs.

- The current request for application (RFA) for Program 51.9 appears to be focused on ecological studies on invasive species at the population level and above with no emphasis on weed biology at the suborganismal level on physiology, biochemical, genetic, and molecular aspects. This is surprising with recent initiatives on weed genomics. The WSSA would like to see a balance in research priorities that consider both suborganismal and population level weed biology. Furthermore, this balance in research should address current problems using economically relevant species. There has been a recent trend towards funding NRI projects that seem to focus on model systems and invasive species with limited geographic range and little economic relevance in agroecosystems.

- Only the RFA for Program 51.9 now requires a letter of intent by December 16 after which a committee will decide on invitations by January 1, 2006. This process will not provide much flexibility to consider other programs and limits the grant preparation period to less than 1.5 months.

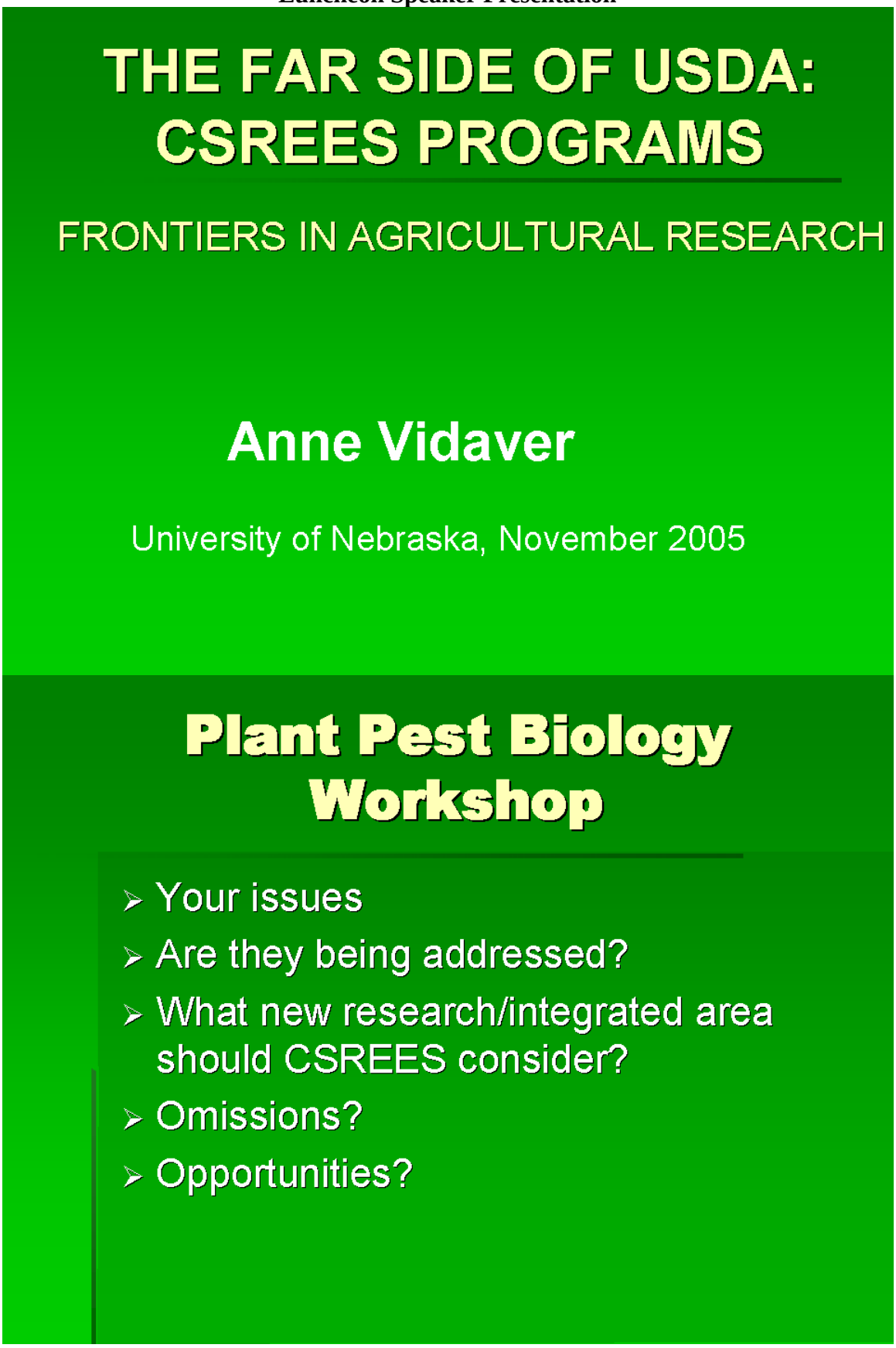
The WSSA would also like to see more funding opportunities in the following areas:

Weed Biology and Ecology- Better understanding of weed biology and weed ecology is needed for development of more effective integrated weed management systems which utilize all tools available including cultural, mechanical, biological and chemical control strategies. Weed biology and weed ecology research is also needed to accelerate progress in several areas of weed management such as GPS/GIS based variable rate herbicide applications, herbicide resistant crops (HRC) and knowledge based decision support systems. The value of these management tools depends greatly on better understanding of the mechanisms of weed, crop and cropping system interactions. This includes research in weed genetics and physiology.

Invasive Weeds- Predictive tools are needed to identify species of concern and potential for invasion into sensitive ecosystems. Systems for early detection and rapid response (EDRR) are also needed to combat potentially serious weed invasions caused by human activity, whether accidental or intentional. Development of tools to assess impacts of weeds on ecosystems, including threatened and endangered species, requires basic research on the mechanisms of plant invasion. Economic assessment tools are also needed to quantify the impacts of the problem and to help set management priorities.

Knowledge Based and Systems-Approach Based Decision Support Strategies- With the proliferation of computer technology there are good opportunities to build decision aids that integrate biology and control data, expert knowledge and grower wisdom with social, economic and environmental perspectives. To build these systems, more long- term and large-scale studies are necessary with growers and advisors included in their development. The variable response of crops and weeds according to species, growth stage and environmental conditions also needs further research.

Luncheon Speaker Presentation



Focus: the FAR side

- New or non-existent programs
- New collaborations
- Politically unglamorous (P.U.) issues

Specific Areas

- 'Pharming' in plants
- Weeds: undeveloped territory
- Aquatic plants
- Phytoses (cross-over pathogens that infect plants and people)
- Community repositories & distribution centers

Government Agencies Planning for Plant Research

- "Plants for the Future", August 2005
- Stakeholders Proposal for a Strategic Research Agenda 2025, Including draft Action Plan 2010
- http://www.plantTP.com

US Government Agency

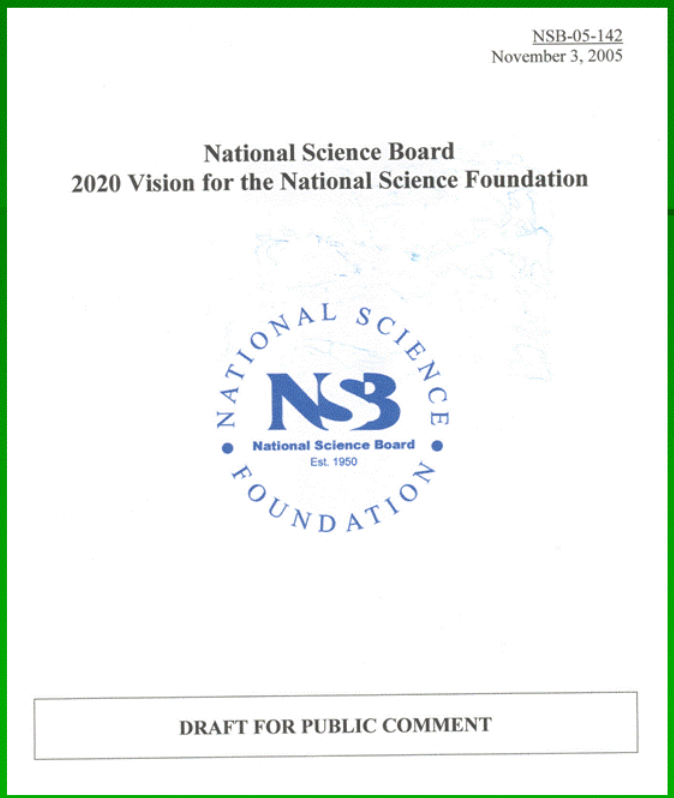
Plants included:

- National Science foundation 2020 Vision for the NSF, November 2005
- Research & Education Investment Principles

  Principle 1: Focus on research at the frontiers of innovations, creativity & transformation

NSF Near-term Goal

Support research that has the capacity to revolutionize existing fields, create new subfields or cause paradigm shifts in thought.



NSB-05-142
November 3, 2005

National Science Board
2020 Vision for the National Science Foundation

NATIONAL SCIENCE FOUNDATION
NSB
National Science Board
Est. 1950

DRAFT FOR PUBLIC COMMENT

Predicting Successful and Innovative Research

'Pharming in Plants'

- Endorsed by EU (Plants for the future)
- National Agricultural Biotechnology Council , June 2005 meeting
- American Phytopathological Society meeting, August 2005

Benefits

- Wide-reaching
- Unrealized
- Fledging industry
- Cost-effective
- New source of income to producers

Benefits (continued)

- Ease & economy of scale-up
- Lack of risk of contamination with human pathogens
- Can be directed to 'Orphan' diseases
- Alternate health needs in developed & developing countries

Concerns

- Use of conventional food crops, esp. corn, soybeans, rice
- Cross-pollination to same/related species
- Dedicated machinery, harvesters
- Disposal of residue, stubble
- Seed/plant mixing

Concerns (continued)

- Effects on non-target species: plants, insects, microorganisms
- New allergens: effect on harvesters
- Water use and re-use issues
- Aim: 'Virtually zero contamination'-Union of Concerned Scientists

Areas of Future Research

- Choices of host plant: species, variety, conditions of production
- Public field trials
- Inadvertent selection/predisposition to plant pests & pathogens: old & new
- If found, pests & pathogens need to be characterized

Plant pest and pathogen threats

- Transformation results in plant highly susceptible to new or known pests & pathogens
- Inadvertent selection for susceptibility
- Insect attack/infection easy, e.g. change in architecture
- Population increases and spread to other varieties, hosts

Potential program

- Ecology of man-made pharmaceutical plants
- Collaboration with industry, especially through SBIR
- Goal: Determine impact on environment
- Purpose: Publication in open literature; alleviate public & scientific concern
- Aim: Avoid suppression of data, good/bad

Potential non-food/commodity hosts

Tobacco – *Nicotiana*

Duckweed- *Lemna*

Chorella sp. (single-celled algae)

Weed research

- Underrepresented
- Usefulness unexplored: genes for hardiness, drought, water stress resistance
- Effective exploitation of genetic resistance to pests/pathogens
- Ecology: Refugia for desired arthropods, birds

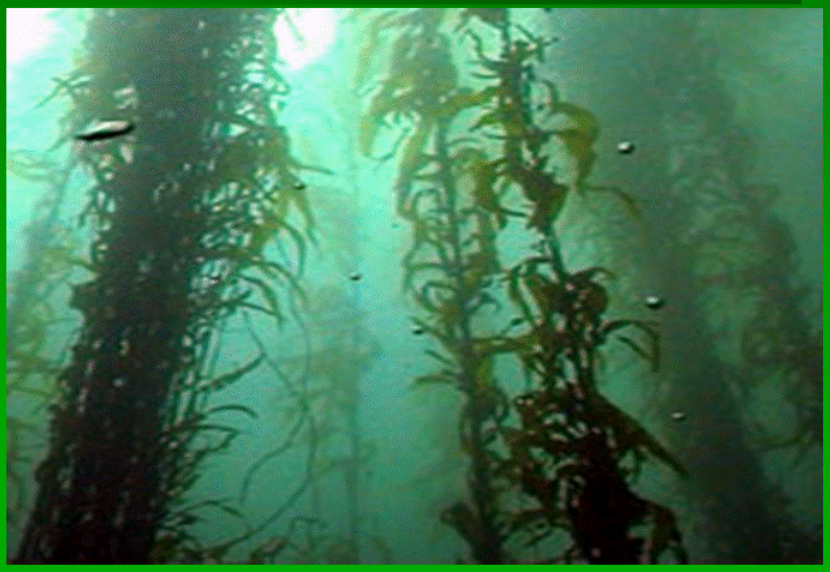
Weed program

- Fit: Genome structure & organization and/or
- Agricultural plants and environmental adaptation
- Partners: NGOs, e.g. Nature Conservancy, Audubon

Aquatic plants

- Virtually all attention to terrestrial plants
- Control of deleterious aquatic plants , e.g. algae , water hyacinths
- Genetics, ecology, cultivation for food, feed, industrial applications lacking
- Scope: Both fresh water & marine plants
- Partnering: NSF (projects in Oceans & Great Lakes); EPA, NOAA, DOE.

Kelp Forest



Phytoses/ Cross-over pathogens

Bacteria

- Gram-positive- 6
- Gram-negative- 16

Fungi

- Ascomycetes (Ascomycota)- 35
- Zygomycetes (Zygomycota)- 3

Vidaver et al: 2006, Am. Soc. Microbiol.

Cross-over bacterial pathogens that infect plants and people (phytoses)

Pumpkin patch affected by yellow vine disease, 1992

Pumpkin vine cross section
Yellow vine disease

Serratia marcescens

- Plants- cucurbit yellow vine disease; alfalfa crown & root rot, endophytic colonization of rice
- Humans- Respiratory tract infections, urinary tract infections, bacteremia, conjunctivitis, endocarditis, meningitis, wound infections

Interagency Program : Phytoses

- Ecological & practical questions on host range, survival, life in plants, interactions with other plant-associated microbes, genetics of plants enabling infection
- Save human lives; productive plants
- Validity of taxa: comparative genomics
- Comparative virulence factors
- New /altered management practices

Phytoses

Agencies for cooperative program

- Centers for Disease Control
  - Dr. Robert Tauxe
  - Chief, Foodborne & Diarrheal Disease Branch
- National Institutes of Health
- Department of Homeland Security

Essential Tools

- Community repositories & distribution centers
- Politically unglamorous: (P.U. centers)
- Short-term for plant genomic resources
- Long-term for crop plants (National Plant Germplasm System)
- Microbial repository: need for reproducible research, new products

Role of Stakeholders & USDA

Plant research: The underpinning of civilization and the environment, indeed of life on earth.

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