Plant Protection Internal Review
December 4, 2007

Introduction

This document provides the self-review update process, the rescoring of the portfolio, summaries of funding trends, and logic models representing success stories and impacts of work/accomplishments in Plant Protection for 2006.

I. Background

- **The following knowledge areas (KAs) are included in the Portfolio.**
  - 211 Insects, Mites, and Other Arthropods Affecting Plants
  - 212 Pathogens and Nematodes Affecting Plants
  - 213 Weeds Affecting Plants
  - 214 Vertebrates, Mollusks, and Other Pests Affecting Plants
  - 215 Biological Control of Pests Affecting Plants
  - 216 Integrated Pest Management Systems

When was the portfolio first reviewed? The Portfolio Review Expert Panel (PREP) conducted an on-site review of this portfolio in February of 2005.

Portfolio score from the PREP in 2005: The Plant Protection portfolio received an overall score of 80 from the panel in the 2005 PREP.

Table I-1 below shows the panel scores for each dimension of the R&D criteria.

Table I-1. Scoring of Plant Protection Portfolio by the PREP Expert Panel

Criteria		Panel Score	2006 Score	2007 Score
Relevance (40% of total score)				
1. Scope coverage of work of portfolio		3	3	3
2. Focus on critical needs		2	2.5	2.5
3. Emerging Issues		3	3	3
4. Integration of REE		2	2.2	2.2
5. Multi-disciplinary balance of the portfolio		2	3	2.5

Table I-1. (Continued) Scoring of Plant Protection portfolio by the PREP Expert Panel				
Criteria		**Panel Score**	**2006 Score**	**2007 Score**
Quality (30% of total score)				
1. Significance of findings		2	2.5	2.5
2. Stakeholder (constituents) inputs to the portfolio		2	2.5	3
3. Alignment of portfolio (with current science-based knowledge)		3	3	3
4. Methodology appropriate		2	2.7	3
Performance (30% of total score)				
1. Productivity		3	3	3
2. Comprehensiveness		2	2	2
3. Timeliness		2	2	2
4. Agency guidance		2	2.7	2.5
5. Accountability		2	2.2	2.5
Overall score		**80**	**89**	**90**

Summary and Conclusions of the PREP Panel.
Overall the panel concluded that the Plant Protection related-program of the CSREES was very impressive and the quality of the work was good. The Panel sensed that the Plant Protection Portfolio was well integrated and found it to be impressive. With respect to funding, the fact that CSREES only has a 4 percent administrative cost was viewed as remarkable. The Panel believed that, for the amount of funding provided and invested, the National Program Leaders (NPLs) do a great job. The Panel also recognized IR-4 reporting, SARE partnerships, The Plant Diagnostic Network, IPM Regional Centers, and the Invasive Weeds program as areas of particular visibility and success.

The panel recognized that NPLs have many responsibilities and are very busy, but their dedication to a high quality product and the portfolio review process was evident. The PREP panel also recognized that significant time and effort was invested into putting the portfolio self-study together and this was appreciated by the Panel. Also, the honeycomb feature was regarded as especially creative and useful. It was well received among Panel members as an effective tool to describe working relationships and program interactions. Panel comments addressed the specific areas of the portfolio in order to score the portfolio using the PART as required. Areas within sections of the portfolio where the panel had specific comments have been restated in the form of recommendations by the Office of Planning and Accountability.

National Program Leaders working across areas related to Plant Protection have addressed these "recommendations" and have completed a revised update and a self-score for the Portfolio within this document.

II. CSREES Response to PREP Recommendations That Cross All Portfolios

In response to directives from the Office of Management and Budget (OMB) of the President, CSREES implemented the Portfolio Review Expert Panel process to systematically review its progress in achieving its mission. Since this process began in 2003 eleven expert review panels have been convened and each has published a report offering recommendations and guidance.

These external reviews occur on a rolling five year basis. In the four off-years an internal panel is assembled to examine how well CSREES is addressing the external panel's recommendations. These internal reports are crafted to specifically address the issues raised for a particular Portfolio. However, despite the fact that the external reports were all written independent of one another on Portfolios comprised of very different subject matter, several themes common to the set of review reports have emerged. This set of issues has repeatedly been identified by Portfolio Review Panels and requires an agency-wide response. The agency has taken a series of steps to effectively respond to those overarching issues.

Issue I: Getting Credit When Credit is Due

For the most part panelists were complimentary when examples showing partnerships and leveraging of funds were used. However, panelists saw a strong need for CSREES to better assert itself and its name into the reporting process. Panelists felt that, often times, principal investigators who conduct the research, education and extension activities funded by CSREES do not highlight the contributions made by CSREES. Multiple panel reports suggested CSREES better monitor reports of its funding and ensure that the agency is properly credited. Many panelists were unaware of the breadth of CSREES activities and believe their lack of knowledge is partly a result of CSREES not receiving credit in publications and other material made possible by CSREES funding.

Issue I: Agency Response:

In 2005, in an effort to address the issue of lack of credit being given to CSREES for funded projects, the Agency implemented several efforts likely to improve this situation.

First it developed a standard paragraph about CSREES's work and funding that project managers can easily insert into documents, papers and other material funded in part or entirely by CSREES. Second, the Agency is in the process of implementing the "One Solution" concept. The One Solution will allow for the better integration, reporting and publication of CSREES material on the web. In addition, the new Plan of Work (POW), centered on the Logic Model framework, became operational in June 2006. The Logic Model framework is discussed in more detail below. Because of the new Plan of Work requirements and the Plan of Work Training conducted by the Office of Planning and Accountability (also described in more detail below), it will be simpler for state and local partners to line up the work they are doing with agency expenditures. This in turn will make it easier for project managers to cite CSREES contributions when appropriate.

Issue II: Partnership with Universities

Panelists felt that the concept of partnership was not being adequately presented. Panelists saw a need for more detail to be made available. Questions revolving around long-term planning between the entities were common as were ones that asked how the CSREES mission and goals were being supported through its partnership with university partners and vice versa.

Issue II: Agency Response:

CSREES has taken several steps to strengthen its relationship with University partners. First, to the extent possible, partners will be attending the CSREES strategic development exercise which is intended to help partners and CSREES fully align what is done at the local level. Second, CSREES has realigned the state assignments for its NPLs. Each state is now assigned to one specific NPL. By reducing the number of states on which any individual NPL is asked to concentrate and assigning and training NPLs for this duty, better communication between state and NPL leaders should occur. Finally, several trainings that focused on the POW were conducted by CSREES in geographic regions throughout the country. A major goal of this training was to better communicate CSREES goals to state leaders which will facilitate better planning between the universities and CSREES.

Issue III: NPLs

Without exception, the portfolio review panels were complimentary of the work being done by NPLs. They believe NPLs have significant responsibility, are experts in the field and do a difficult job admirably. Understanding the specific job functions of NPLs was something that helped panelists in the review process. Panelists did, however, mention that often times there are gaps in the assignments given to NPLs. Those gaps leave holes in programmatic coverage.

Issue III: Agency Response:

CSREES values the substantive expertise National Program Leaders bring to the Agency and therefore requires all NPLs to be experts in their respective fields. Given the budget constraints often faced by the agency, the agency has not always been able to fund needed positions and had to prioritize its hiring for open positions. In addition, because of the level of expertise CSREES requires of its NPLs, filling vacant positions quickly is not always possible. Often CSREES is unable to meet the salary demands of those it wishes to hire. It is essential that vacant positions not only be filled but with the most qualified candidate.

Operating under these constraints and given inevitable staff turnover, gaps will always remain. However, the establishment and drawing together of multidisciplinary teams required to complete the Portfolios has allowed the Agency to identify gaps in program knowledge and ensure that these needs are addressed in a timely fashion. To the extent that specific gaps are mentioned by outside panel experts heightens the urgency to fill them.

Issue IV: Integration

Lack of integration has been highlighted throughout the panel reviews. While review panelists certainly noted in their reports where they observed instances of integration, panel reports almost, without fail, sought more documentation in this regard.

Issue IV: Agency Response:

Complex problems require creative and integrated approaches that cut across disciplines and knowledge areas. CSREES has recognized that need and has undertaken steps to remedy this situation. CSREES has recently mandated that up to twenty percent of all NRI funds be put aside specifically for integrated projects. These projects cut across functions as well as disciplines and ensure that future Agency work will be better integrated. Finally, integration is advanced through the Portfolio process which requires cooperation across units and programmatic areas.

Issue V: Extension

While most panels seemed satisfied at the level of discussion that focused on research, the same does not hold true for extension. There was a call for more detail and more outcome examples based upon extension activities. There was a consistent request for more detail regarding not just the activities undertaken by extension but documentation of specific results these activities achieved.

Issue V: Agency Response:

Outcomes which come about as a result of Extension are, by the very nature of the work, more difficult to document than the outcomes of a research project. CSREES has recently shuffled its strategy of assigning NPLs to serve as liaisons for states. In the past one NPL might serve as a liaison to several states or a region comprised of states. Each state will be assigned a specific NPL and no NPL will serve as the lead representative for more than one state. This will ensure more attention is paid to Extension activities.

In addition CSREES has also been in discussion with partners and they have pledged to do their best to address this issue. The new POW will make Extension based results and reporting a priority. With heavy emphasis being place on logic models by CSREES, this will have the effect of necessitating the inclusion of Extension activities into the state's POWs. This in turn will require more reporting on Extension activities and allow for the improved documentation of Extension impact.

Issue VI: Program Evaluation

Panelists were complimentary in that they saw the creation of the Office of Planning and Accountability and portfolio reviews as being the first steps towards more encompassing program evaluation work. However, they emphasized the need to see outcomes and oftentimes stated that the scores they gave were partially the result of their own personal experiences rather than specific program outcomes documented in the portfolios. In other words, they know first hand CSREES is having an impact but would like to see more systematic and comprehensive documentation of this impact in the reports.

Issue VI: Agency Response:
The effective management of programs is at the heart of the work conducted at CSREES and program evaluation is an essential component of effective management. In 2003, the Portfolio Review Expert Panel and subsequent internal reviews was implemented. Over the past three years, eleven portfolios have been reviewed by external panel members and each year this process improves. National Program Leaders are now familiar with the process and the staff of the Planning and Accountability unit has implemented a systematic process for pulling together the material required for these reports.

However, simply managing the process more effectively is not sufficient for raising the level of program evaluations being done on CSREES funded projects to the highest standard. Good program evaluation is a process that requires constant attention by all stakeholders and the agency has focused on building the skill sets of stakeholders in the area of program evaluation. The Office of Planning and Accountability has conducted trainings in the area of evaluation for both National Program Leaders and for staff working at land grant universities. These trainings are available electronically and the Office of Planning and Accountability will be working with National Program Leaders to deliver these trainings to those in the field.

The Office of Planning and Accountability is working more closely than ever with individual programs to ensure successful evaluations are developed, implemented and the data analyzed. Senior leadership at CSREES has begun to embrace program evaluation and over the coming years CSREES expects to see state leaders and project directors more effectively report on the outcomes of their programs as they begin to implement more rigorous program evaluation. The new Plan of Work system ensures data needed for good program evaluation will be available in the future.

Issue VII: Logic Models
Panelists were consistently impressed with the logic models and the range of their potential applications. They expressed the desire to see the logic model process used by all projects funded by CSREES and hoped not only would NPLs continue to use them in their work but, also, that those conducting the research and implementing extension activities would begin to incorporate them into their work plans.

Issue VII: Agency Response:
Logic models have become a staple of the work being done at CSREES and the Agency has been very proactive in promoting the use of logic models to its state partners. Two recent initiatives highlight this. First, in 2005, the Plan of Work reporting system into which states submit descriptions of their accomplishments was completely revamped. The new reporting system now closely matches the logic models being used in Portfolio reports. Beginning in Fiscal year 2007, states will be required to enter all of the following components of a standard logic model. These components include describing the following:

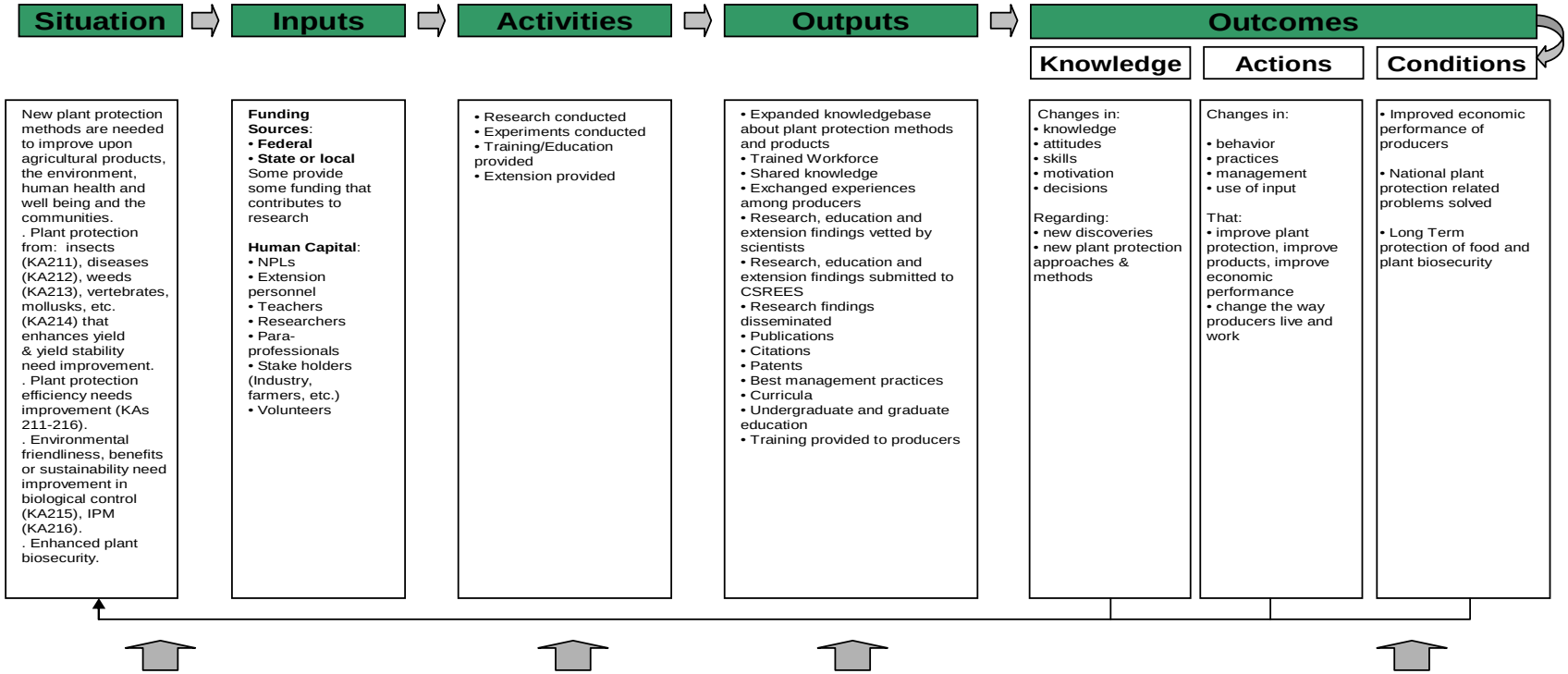
- Program Situation
- Program Assumption
- Program Long Term Goals
- Program Inputs which include both monetary and staffing
- Program Output which include such things as patents
- Short Term Outcome Goals
- Medium Term Outcome Goals
- Long Term Outcome Goals
- External Factors
- Target Audience

The system is now operational and states started using it June, 2006. By requiring the inclusion of the data components listed above, states are in essence, creating a logic model which CSREES believes will help better improve both program management and outcome reporting.

The second recent initiative by CSREES regarding logic models concerns a set of trainings conducted by Planning and Accountability staff. In October and November of 2005 four separate training sessions were held in Monterey, California; Lincoln, Nebraska; Washington, D.C. and Charleston, South Carolina. More than two hundred people representing land grant universities attended these trainings where they were given training in logic model creation, program planning, and evaluation. Additionally, two training sessions were provided to NPLs in December 2005 and January 2006 to further familiarize them with the logic model process. Ultimately, it is hoped these representatives will pass on to others in the land grant system what they learned about logic models, thus creating a network of individuals utilizing the same general approach to strategic planning. These materials have also been made available to the public on the CSREES website.

The logic model originally developed for the Plant Protection Portfolio and updated by the portfolio team is presented below. Logic models for the KAs are presented in Appendix B.

CSREES Plant Protection Logic Model



Assumptions: The Plant Protection Portfolio encourages multi-disciplinary approaches to address the needs of plant agriculture and the American consumer. The portfolio contains a balance of discipline-based components including all major grouping of pests affecting plants and the integration of these into pest management systems.

External Factors – Decrease in funding, changing priorities; farmers' attitudes; natural disasters; invasive species introductions; biosecurity concerns; economic conditions; coordination and cooperation with other government entities; new partners.

III. Plant Protection Portfolio Team's Response to PREP Recommendations

This self-study update and report is a response by NPLs, responsible for the portfolio, to issues identified by the PREP specifically within the portfolio external review. Collectively we have reached consensus and have re-scored the portfolio sections to respond to all issues raised by the panel. Our responses and the associated evidence supporting the update to the portfolio are organized to be aligned with the PREP panel score sheet used in February of 2005. In addition, we have addressed concerns raised by this panel regarding future directions for CSREES as highlighted in the PREP Review Report including: Funding, Leadership, Partnerships, Review Period, and NPL Roles and Responsibilities. A bulleted list of items/topics that have been updated is included in the following Section. (Section III-1)

1. List of updates of the self-assessment paper

- The Plant Protection portfolio self-assessment paper prepared for the external Portfolio Review Expert Panel has been updated to include significant changes which have occurred over the period of FY 2006. This list is provided below.

    1. Data summary (Funding) Tables for the portfolio KAs have been updated to include FY 2006 to bring the portfolio up to date. These data tables are appended at the end of this self-study paper (Appendix A).

    2. Portfolio Logic models have been revisited and updated where we thought this was appropriate. Those logic models are also included at the end of this self study (Appendix B).

    3. Activities of National Program Leaders involved in this portfolio have been categorized and summarized to illustrate the engagement of NPLs across the scope of the portfolio knowledge areas. (This is in response to recommendations from the external panel.)

    4. We have addressed recommendations in areas of the portfolio where the PREP score was below three. Responses to the specific recommendations are included in **Table I-1** as they pertain to the overall portfolio.

    5. We have conducted an internal assessment of the panel score and have rescored the portfolio based on this assessment. The new score and justification for changes in the score are included in this self-study update. (see below)

    6. We have provided a brief analysis of changes in funding that have occurred within the portfolio KAs for funding sources which make up the total dollars dedicated to this portfolio.

    7. Significant accomplishments/impacts have been selected as representative of the work included in this portfolio for FY 2006 (Appendix C).

- Analysis of changes in funding (trends) for each of the KAs within the portfolio. This analysis is based on a comparison of financial data presented in the updated Tables for FY 2000 to FY 2006. Following is a brief analysis of the changes in funding for the entire portfolio. (Table I.2)

I.2 -- Portfolio: Plant Protection (as reported in the Current Research Information System) –All sources $ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	73,930	12,253	20,038	147,061	9,882	31,087	17,670	311,918
2001	90,505	13,939	19,886	155,069	11,150	28,741	18,015	337,304
2002	86,754	16,415	26,526	165,818	11,426	32,252	20,835	360,026
2003	80,976	17,697	33,844	161,727	11,029	33,143	20,257	358,674
2004	87,334	21,122	36,647	166,007	13,734	34,138	20,796	379,776
2005	90,557	27,514	45,208	185,262	17,545	41,382	34,809	442,277
2006	100,453	23,496	38,389	160,598	18,769	36,142	25,257	403,102
Portfolio Total	610,509	108,940	182,149	980,944	74,766	200,743	132,382	2,189,975

I.2 --Portfolio: Plant Protection (as reported in the Current Research Information System) --CSREES $ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	29,115	1,263	2,186	32	13,880	7,370	533	19,552	73,931
2001	28,630	1,247	2,505	16	18,735	18,942	1,922	18,508	90,505
2002	29,421	1,371	2,731	0	19,603	22,375	2,099	9,154	86,754
2003	29,696	1,308	2,420	0	23,240	13,234	772	10,305	80,975
2004	28,514	1,033	1,987	0	22,601	20,139	829	12,228	87,331
2005	27,441	863	2,043	0	23,129	24,161	1,116	11,804	90,557
2006	28,377	1,031	2,386	0	24,082	27,166	1,718	14,196	98,954
Portfolio Total	201,194	8,116	16,258	48	145,270	133,387	8,989	95,747	609,007

There has been steady growth in total funding for Plant Protection since 2000 both from CSREES and other federal as well as non-federal sources. The largest contributors were Hatch, Special Grants, and NRI. Funding tables for the KAs are presented in Appendix A.

- Significant accomplishments/impacts of work to highlight progress for the each KA in this portfolio have been appended at the end of this report (Appendix C).
    - These updated accomplishments/impacts include research, extension and education. The examples are taken from 2006 databases. For these accomplishments/impacts, we have sought (wherever possible) a balance in sources of funding (competitive, formula, special and federal administration grants). Examples have been extracted from the Current Research Information System (CRIS), POW Accomplishments or other CSREES and partner publications. Wherever possible these accomplishments are linked to the funding source and/or the database (e.g., CRIS).

- **Research** accomplishments/impacts include the CRIS accession #, source of funding and supporting information, whenever possible (e.g., pdf of publication, patent, etc.)
- **Extension** accomplishments have also included the source. E.g., POW accomplishment report, Ext. publication, web site, etc.
- **Education** accomplishments have included course/curriculum development, publications pertinent to academic offerings (e.g., texts) and institutional/departmental reviews led/facilitated/participated in by KA members.

- Responses to the specific recommendations are below as they pertain to this portfolio. These responses are brief and somewhat generic, since they represent the responses to the overall portfolio and may not be specifically pertinent to all KAs within the portfolio. Responses take the broad view of the portfolio and not the detail of each KA. The responses are presented below. (Section III-2)

2. Portfolio Team's Responses to PREP Comments and Recommendations

Our score (1-3) for each of the scoring categories [see Attached Table from the Office of Planning and Accountability (OPA) with the PREP scores] is included in the self-scoring document. We have assigned values between the whole numbers to one decimal place (e.g., 2.5) to show incremental progress. Where the National Program Leaders involved in this portfolio have reached consensus on a change (either up or down) we have provided a *brief* rationale for the change. Consensus scores for the portfolio were derived in a meeting of all portfolio participants at a meeting arranged by the CSREES Office of Planning and Accountability. Section III below details our responses to the comments and recommendations of the PREP, illustrates the changes we made, and provides the basis for the changes for each area of the self-assessment scoring template.

RELEVANCE

Scope: Balance the scope by identifying major issues that are relevant to the portfolio but were not covered.

2007 Response: The internal panel score was 3. The National Program Leaders (NPLs) continue to make strong efforts to achieve balance for all areas of the portfolio.

2006 Response: The Previous external panel and internal panel scores were 3s. The National Program Leaders involved in the direction and management of this portfolio will continue to strive for balance across all areas of the portfolio.

Focus: To maintain focus, increase the amount of measurable information that can be evaluated across all areas and the number of funding sources for all areas.

2007 Response: The internal panel score was 2.5. There continues to be an effort to achieve a balanced presentation of accomplishments and impacts for the whole Portfolio. Although there are several excellent examples of research and extension accomplishments, such as the honey bee Colony Collapse Disorder (CCD) issue, the National Plant Diagnostic Network (NPDN) examples, and the IPM Training Consortium involving NRCS, there is still a deficit of adequate accomplishments within the realm of education. Future attempts to include more education examples may involve utilizing the Education Knowledge Area (KA 903).

2006 Response: The previous external panel score was 2 and the internal panel score was 2.5. Portfolio personnel are seeking a balanced, uniform representation of accomplishments and impacts from all areas of the Portfolio, including all Knowledge Areas. Balance across funding sources and the primary functions, research, education and extension, are represented in the annual update.

Emerging Issues: No recommendations from the panel

2007 Response: The internal panel score was 3. There continues to be a high priority on identifying and supporting new issues important to plant protection/production. However, important critical issues have encountered difficulties in the funding process due to legislative language placing them as competitive programs.

2006 Response: The previous external and internal panel scores were 3s. We are continuing to place a high priority on identification and support for emerging issues that are significant for plant protection.

Integration:

- Integrate research and extension more and incorporate higher education in other areas.
- Increase the amount of evidence of extension and higher education in all areas.

2007 Response: The internal panel score was 2.2. Although there are several excellent examples of integration of research and extension as well as disciplines coming from a wide variety of sources (see Appendix C), there is still a paucity of education examples. Remediation of this deficit may be accomplished through the Education KA 903 as well as other active programs such as Ag in the Classroom and Higher Education.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.2. We have provided further and more comprehensive current examples of integration of both functions and disciplines involved in Plant Protection with this update. Reporting through a variety of sources tracks activities that integrated research, education, and extension. Both existing competitive grant programs (such as the NRI and the 406 integrated programs) and proposed Hatch and McIntire-Stennis competitive programs place a high priority on integrated research, education, and extension projects.

Multi-disciplinary: Balance the number of plant professionals among all knowledge areas (KAs), KAs should have an equal distribution of contributing plant researchers, extension professionals, and educators.

2007 Response: The internal panel score was 2.5. Although some hiring for important vacant positions has occurred, there are still several critical positions that remain unfilled due to budgetary constraints. Consequently, this situation negatively affects the balance of expertise in both plant production and protection.

2006 Response: The Previous external panel score was 2 and the internal panel score was 3. With recent retirements and position shifts within the agency and the occurrence of vacancies to be filled at the National Program Leader level we have sought further balance in the senior staff with respect to disciplines involved in both plant production and protection. One entomologist was replaced by a plant pathologist (with particular expertise in plant disease diagnostics and extension and applied IPM). We have added a shared faculty member for organic agriculture to meet a growing need that crosses both plant production and plant protection.

QUALITY

Significance: Clarify if output and outcome information are being received by end-users.

2007 Response: The internal panel score was 2.5. Notable efforts are made to educate end-users concerning important outputs and outcomes. Certain actions, such as hiring a communications specialist, confirm this commitment. However, the losses of tools such as the web-based Science and Impact site have had negative effects on this effort.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.5. We are focusing on reporting significant impacts of work supported by CSREES on end-users. Measurable impact stories are captured in Plan of Work accomplishments reports, CRIS impact statements and through impact reporting by multi-state research/extension committees. The Science and Impact web page reports impacts of work on issues funded through CSREES that are important at the local level.

Stakeholder Input:

- A systematic method needs to be developed to get information into the hands of end-users.
- Additional end-user workshops need to be conducted.
- Information and input from state partners should be used.

2007 Response: The internal panel score was 3. Efforts to keep stakeholders involved in both providing relevant input and receiving important information critical to their livelihoods is extremely important. Consequently, many staff members contribute to workshops geared toward stakeholders. Within limits of existing funds, staff is trying to engage in additional workshops and information exchange opportunities to maximize interactions with diverse stakeholder interests. As mentioned last year, more cost-effective methods are being employed, including webcasts and video-linked conference calls. Input from state partners is solicited on a regular basis.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.5. Discovery and implementation research gets into the hands of end-users through Cooperative Extension system educational programs and to students through formal academic educational programs of our partner institutions. CSREES facilitates these activities through a variety of funding mechanisms. CSREES NPLs participate in stakeholder sessions that include research, extension and academic faculty, as well as agricultural commodity, community and trade groups. Within the limits of existing funds we are trying to engage in additional workshops and information exchange opportunities to maximize our interactions with diverse stakeholder interests. A number of newer, more cost-effective methods are being employed, including webcasts and video-linked conference calls.

Portfolio Alignment: Ensure that there is evidence of alignment in other sciences.

2007 Response: The internal panel score was 3. The National Program Leaders (NPLs) involved in the direction and management of this portfolio will continue to seek alignment with other sciences across all areas of the portfolio.

2006 Response: The previous external and internal panel scores were 3s. The NPLs involved in the direction and management of this portfolio will continue to strive for alignment with other sciences across all areas of the portfolio.

Appropriate Methodology: Increase evidence that all KAs are using cutting edge technology for generating, gathering, and analyzing data.

2007 Response: The internal panel score was 3. Cutting edge technologies are continually being implemented in a variety of situations. Two such major advancements include the Leadership Management Dashboard (LMD) that allows National Program Leaders to achieve unprecedented management capabilities of their program assignments. Another tool is the Pest Information Platform for Extension and Education (PIPE). The PIPE system originated out of the tracking and dissemination of information about soybean rust through USDA's Web site . Given its effectiveness as a coordinated, real-time national pest management framework, PIPE is expanding into other areas of pest management.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.7. The plant protection portfolio of programs fund activities that include important cutting edge technologies ranging from new applications for applied mission-oriented problems to development of new methods of analysis and discrimination for emerging pests and diseases that might have adverse effects on the Nations agricultural bio-security. Examples included as evidence in this update include GIS/GPS technology used in precision application of pest management tactics, DNA barcoding for high throughput screening and identification of potential pest species, sophisticated and advanced pest modeling, decision support software for end-user pest management programs at the farm or grower level, and rapid forecasting tools for pest prediction.

PERFORMANCE

Portfolio Productivity: Panels should have measures of productivity per dollar spent.

2007 Response: The internal panel score was 3. There will continue to be investigations into measuring the return on investment of Federal dollars.

2006 Response: The previous external and internal panel scores were 3s. We continue to examine ways to measure the productivity of our programs per dollar spent so we continue to maximize the return on the investment of Federal dollars.

Portfolio Comprehensiveness:

- Increase evidence of KA comprehensiveness.
- Outputs reporting should be more comprehensive.

2007 Response: The internal panel score was 2. Sub-groups of National Program Leaders (NPLs) are organized reflecting the comprehensiveness of the portfolio by soliciting input from both within and outside of the Plant and Animal Systems (PAS) unit. These sub-groups are developed along the lines of the Knowledge Areas (KAs). However, participation by members outside of PAS has been lacking. Future efforts will be made to solicit involvement by National Research Initiative (NRI) and Higher Education personnel as well as others. Eventually, this should succeed in output reporting that is more comprehensive.

2006 Response: The previous external and internal panel scores were 2s. For this update, and for all future reporting and evaluation updates, we have established sub-groups of National Program Leaders within the portfolio to ensure that reporting for each Knowledge Area follows the same guidelines and reporting

parameters across the portfolio. In this way we will report equally with highly significant accomplishments, outputs, outcomes, and impacts for each area of the portfolio.

Portfolio Timeliness: Provide adequate evidence for project completion time.

2007 Response: The internal panel score was 2. There is evidence that a significant number of projects are not being finished by the proposed dates. However, with the development of better reporting, tracking and information synthesis capabilities; including the Leadership Management Dashboard (LMD) and the electronic filing of Plans of Work and Annual Reports; there should be more reliable statistics available on project timeliness. Issues concerning legitimate no-cost extensions can complicate the situation.

2006 Response: The previous external and internal panel scores were 2s. While the panel believed that most projects were completed on time, evidence that this is the case was not presented. Over time, with development of better reporting, tracking and information synthesis capabilities that are currently underway, including the Leadership Management Dashboard we will be able to provide more concrete statistics on the percentage of projects meeting this desired objective. (see: Agency Response to Appropriate Methodology, below).

Agency Guidance:

- Provide efficient and comprehensive information concerning the Portfolio's management process.
- Better define NPLs management responsibilities.

2007 Response: The internal panel score was 2.5. There appears to be a need for additional administrative guidance concerning projects oriented towards non-agricultural issues. For future external PREP reviews more extensive background information on program management and roles of individuals involved in the portfolio will be provided.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.7. Most of the management processes and the management responsibilities of National Program Leaders are the same for all portfolios across the Agency. For future external PREP site reviews more extensive background information on program management and roles of individuals involved in the portfolio will be presented.

Portfolio Accountability: Increase the amount of sufficient data used for evaluating the Portfolio's accountability.

2007 Response: The internal panel score was 2.5. Progress has been made in improving the reporting of outputs, outcomes/evidence of success. The One-Solution initiative has made it possible for improving the review and oversight of CRIS and Plant of Work reports. Additionally, the development of the Leadership Management Dashboard will allow NPLs to readily retrieve accountability data more effectively and efficiently. The only negative issue has been the loss of the Science and Education Impact reporting system.

2006 Response: The previous external panel score was 2 and the internal panel score was 2.2. CSREES is investing significant effort and resources to improve our ability to extract and synthesize data to increase our level of accountability. The One Solution initiative provides the focal point for these efforts. One Solution will incorporate and improve existing databases for reporting currently in use such as the Current Research Information System, the web-based Plan of Work reporting system, and other reporting systems.

The Science and Education Impact reporting system search capability is currently being improved. The internal grant reporting and tracking system C-REEMS and the web-based Peer Review System are also improving over time and will enable better reporting and tracking of both competitive and non-competitive grants. CSREES has established an internal group, the Planning and Accountability Team, under the leadership of the Associate Administrator, to guide and oversee development of planning and evaluation activities across the Agency in a systematic manner.

IV. Evidence of Success/Impact Statements

Evidence of success/impact statements for each KA is presented in Appendix C to this report**.**

V. Summary

Overall, we believe we have made significant progress across the portfolio of programs, but acknowledge that we can still improve in many areas. An analysis in the funding Tables for the KAs in the portfolio shows growth and focus in the overarching areas of the portfolio. However, whether the growth in some areas represents a trend is uncertain and further analysis awaits the passage of additional funding cycles. Incorporating the higher education component remains a significant challenge. We believe that we have made strides toward achieving a balanced and forward looking portfolio of programs including fundamental and mission-linked applied research and extension and are working toward greater incorporation of the higher education component into the Plant Protection Portfolio.

APPENDIX A
KA Funding Tables

KA 211: Insects, Mites, and Other Arthropods Affecting Plants -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	6,835	138	525	0	2,711	2,185	268	3,249	15,911
2001	6,332	238	558	0	3,817	7,084	1,239	2,734	22,002
2002	7,123	257	500	0	4,073	5,679	752	1,254	19,638
2003	7,046	322	442	0	5,928	3,381	198	2,462	19,779
2004	7,114	410	531	0	5,858	4,686	200	1,066	19,865
2005	6,420	271	540	0	6,531	6,764	205	1,089	21,820
2006	7,320	335	636	0	6,274	5,802	144	2,526	23,036
Total	48,190	1,971	3,732	0	35,192	35,581	3,006	14,380	142,051

KA 211: Insects, Mites, and Other Arthropods Affecting Plants -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	15,911	2,648	5,773	34,746	2,240	5,507	3,558	70,381
2001	22,002	3,812	4,654	35,302	2,319	5,074	3,846	77,009
2002	19,637	4,159	6,307	39,502	2,399	5,959	4,925	82,887
2003	19,779	3,637	8,432	38,133	2,017	6,222	4,912	83,133
2004	19,866	4,378	10,111	39,011	2,135	6,627	5,066	87,193
2005	21,820	6,722	14,118	43,453	3,682	7,438	7,653	104,886
2006	23,036	6,422	10,954	38,002	3,739	7,054	6,479	95,685
Total	142,051	31,778	60,349	268,149	18,531	43,881	36,439	601,174

KA 211 experienced steady growth in total CSREES funding from 2000, showing an increase of over $7 million. State Appropriations showed strong support for KA 211 as well, complimenting the increased funding by other agencies.

KA 212: Pathogens and Nematodes Affecting Plants -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	10,117	162	289	32	4,491	1,732	265	2,651	19,739
2001	10,519	156	351	16	8,439	4,711	613	8,232	33,037
2002	10,082	273	498	0	7,128	11,069	1,110	1,467	31,627
2003	10,632	351	453	0	7,928	4,078	337	1,817	25,596
2004	9,671	274	254	0	7,220	12,840	222	2,741	33,222
2005	10,118	270	297	0	7,895	11,990	191	2,887	33,648
2006	10,284	377	466	0	8,499	15,168	512	1,744	37,050
Total	71,423	1,863	2,608	48	51,600	61,588	3,250	21,539	213,919

KA 212: Pathogens and Nematodes Affecting Plants -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	19,739	4,020	7,720	51,506	3,255	11,627	5,897	103,762
2001	33,036	4,300	8,674	56,456	3,596	12,085	6,658	124,805
2002	31,627	5,560	10,993	62,615	3,960	14,023	7,855	136,634
2003	25,597	7,391	15,937	60,829	3,840	14,726	7,664	135,983
2004	33,222	9,267	15,561	63,033	3,893	14,913	8,150	148,039
2005	33,648	11,135	20,489	70,469	6,736	17,915	15,201	175,592
2006	37,050	9,004	19,600	63,025	7,957	14,858	9,765	161,258
Total	213,919	50,677	98,974	427,933	33,237	100,147	61,190	986,073

CSREES funding for KA 212 has remained stable since 2001 with strongest support coming from Hatch, Special Grants, and NRI. State Appropriations showed the strongest support for KA 212 followed by CSREES and Ind/Gr Agreements. Total funding by these agencies has increased by over $58 million since 2000.

KA 213: Weeds Affecting Plants -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
	HATCH	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	3,436	57	163	0	1,993	756	0	1,523	7,928
2001	3,278	102	162	0	1,613	2,789	0	2,226	10,170
2002	3,209	67	250	0	2,527	2,590	127	999	9,769
2003	3,270	126	192	0	3,567	1,866	208	822	10,051
2004	3,255	70	251	0	3,449	0	31	1,644	8,700
2005	3,446	67	268	0	3,343	2,383	80	1,531	11,119
2006	3,121	54	251	0	3,832	2,291	174	1,651	11,374
Total	23,015	543	1,537	0	20,324	12,675	620	10,396	69,111

KA 213: Weeds Affecting Plants -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	7,927	807	1,697	16,021	2,141	4,499	2,767	35,859
2001	10,171	1,337	1,292	16,583	2,124	4,040	3,072	38,618
2002	9,769	1,423	2,012	18,339	2,098	4,523	2,858	41,022
2003	10,051	1,287	2,003	18,227	2,040	4,141	3,226	40,976
2004	8,701	1,242	1,965	18,113	2,908	4,279	2,970	40,178
2005	11,119	1,172	2,342	22,113	2,880	4,777	4,513	48,916
2006	11,374	1,094	2,115	17,520	2,814	4,854	3,719	43,491
Total	69,112	8,362	13,426	126,916	17,005	31,113	23,125	289,060

CSREES funding for KA 213 has been modest and generally stable since 2000, with strongest support coming from Hatch, Special Grants, and NRI. State Appropriations followed by CSREES provided the strongest support for KA 213 with a modest increase of $8 million since 2000.

KA 214: Vertebrates, Mollusks, and Other Pests Affecting Plants -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	94	0	0	0	0	110	0	0	204
2001	99	0	0	0	233	0	70	0	402
2002	137	8	0	0	611	12	32	0	800
2003	84	27	0	0	534	0	0	0	645
2004	56	7	0	0	927	0	0	0	990
2005	88	16	0	0	360	0	0	0	464
2006	64	8	0	0	427	0	0	0	499
Total	622	66	0	0	3,092	122	102	0	4,004

KA 214: Vertebrates, Mollusks, and Other Pests Affecting Plants -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	204	13	15	974	20	64	94	1,384
2001	403	35	24	880	64	89	65	1,559
2002	799	39	57	712	57	23	64	1,751
2003	644	58	65	573	206	44	21	1,612
2004	990	5	34	428	235	1	46	1,739
2005	464	279	128	395	272	25	92	1,656
2006	499	5	42	138	49	3	55	791
Total	4,003	434	365	4,100	903	249	437	10,492

CSREES funding for KA 214 has been modest and variable with the strongest support from Hatch and Special Grants. State Appropriations and CSREES were the strongest supporters of KA 214, although a drop of more than $800,000 from 2005 to 2006 indicated several agencies withdrawing support.

KA 215: Biological Control of Pests Affecting Plants -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	4,903	384	490	0	1,217	1,939	0	624	9,557
2001	4,610	345	723	0	1,713	3,244	0	1,114	11,749
2002	5,182	370	771	0	786	2,399	78	220	9,806
2003	5,040	260	782	0	756	2,984	29	54	9,905
2004	4,700	114	591	0	1,223	1,453	376	1,038	9,495
2005	4,113	122	508	0	1,204	2,077	592	440	9,055
2006	4,113	122	508	0	1,204	2,077	592	440	9,055
Total	32,661	1,717	4,373	0	8,103	16,173	1,667	3,930	68,622

KA 215: Biological Control of Pests Affecting Plants -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	9,557	2,185	3,408	23,706	1,433	4,244	2,690	47,224
2001	11,749	1,953	3,626	24,664	1,968	2,966	1,929	48,856
2002	9,807	2,260	5,013	23,532	1,493	2,776	1,899	46,780
2003	9,906	2,349	4,434	21,331	1,361	2,999	1,679	44,059
2004	9,495	2,264	5,103	22,828	1,294	3,015	1,751	45,749
2005	9,055	3,121	4,424	22,039	1,353	4,002	3,274	47,268
2006	10,554	2,850	3,681	17,831	1,454	2,686	2,019	41,074
Total	70,123	16,982	29,689	155,931	10,356	22,688	15,241	321,010

CSREES funding for KA 215 has remained stable since 2000, with Hatch and NRI showing the strongest support. There appears to be a growing interest in SBIR grants. Other agencies' support appears to be declining, with a notable drop of $6 million total funding since 2000. State Appropriations and CSREES are the strongest supporters of KA 215.

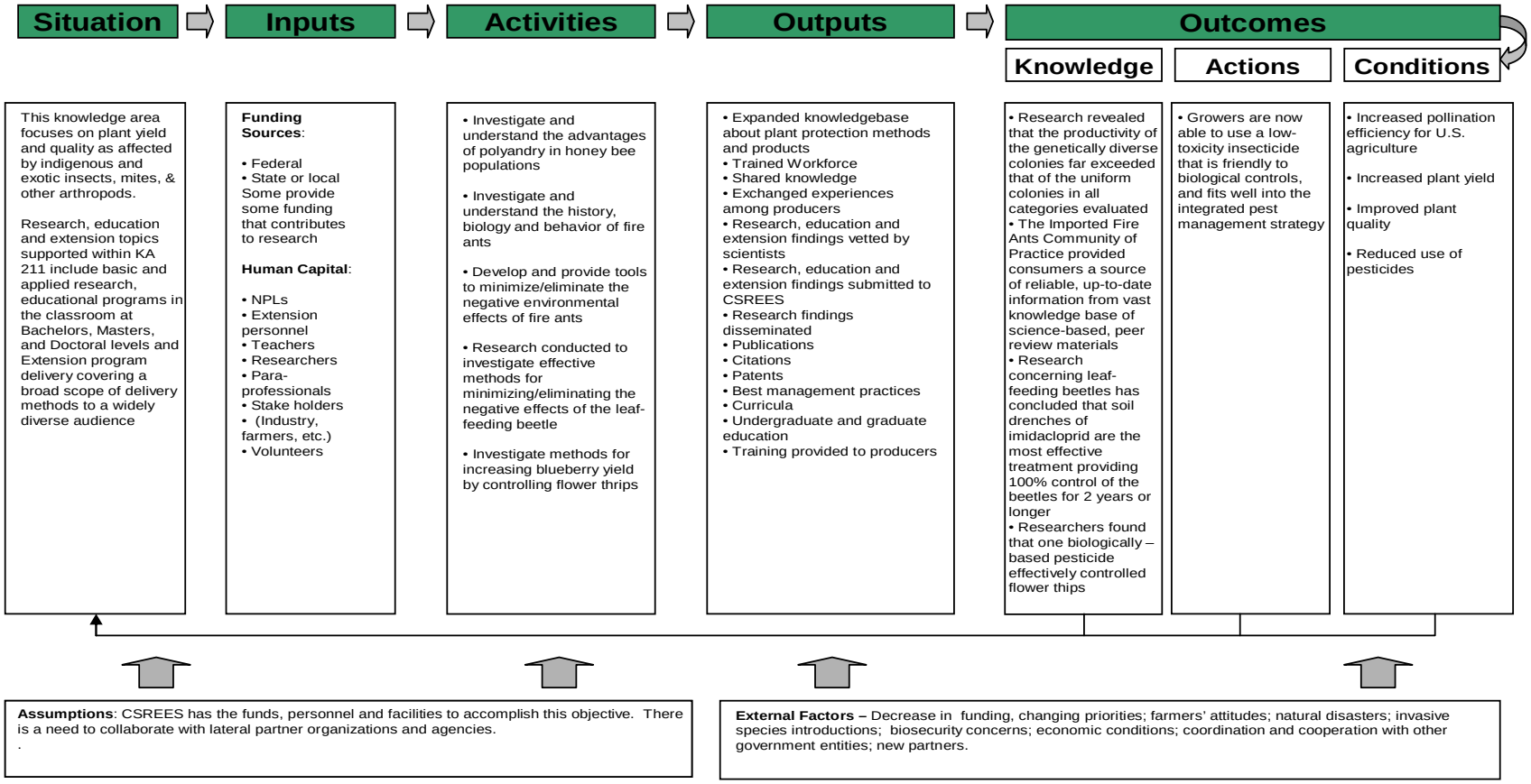
KA 216: Integrated Pest Management Systems -- CSREES Funding									
(as reported by the Current Research Information System)									
$ in the thousands									
Year	**HATCH**	**MC-STN**	**EVANS ALLEN**	**ANIMAL HEALTH**	**SPECIAL GRANTS**	**NRI GRANTS**	**SBIR GRANTS**	**OTHER CSREES**	**TOTAL CSREES**
2000	3,730	522	719	0	3,468	648	0	11,505	20,592
2001	3,792	406	711	0	2,920	1,114	0	4,202	13,145
2002	3,688	396	712	0	4,478	626	0	5,214	15,114
2003	3,624	222	551	0	4,527	925	0	5,150	14,999
2004	3,718	158	360	0	3,924	1,160	0	5,739	15,059
2005	3,256	117	430	0	3,796	947	48	5,857	14,451
2006	3,475	135	525	0	3,846	1,828	296	7,835	17,940
Total	25,283	1,956	4,008	0	26,959	7,248	344	45,502	111,300

KA 216: Integrated Pest Management Systems -- Overall Funding								
(as reported by the Current Research Information System)								
$ in the thousands								
Year	**CSREES Admin**	**Other USDA**	**Other Federal**	**State Appr.**	**Self-Gen**	**Ind/Gr Agrmt**	**Other Non-Fed**	**Total**
2000	20,592	2,580	1,425	20,108	793	5,146	2,664	53,308
2001	13,144	2,502	1,616	21,184	1,079	4,487	2,445	46,457
2002	15,115	2,974	2,144	21,118	1,419	4,948	3,234	50,952
2003	14,999	2,975	2,973	22,634	1,565	5,011	2,755	52,911
2004	15,060	3,966	3,873	22,594	3,269	5,303	2,813	56,878
2005	14,451	5,085	3,707	26,793	2,622	7,225	4,076	63,959
2006	17,940	4,121	1,997	24,082	2,756	6,687	3,220	60,803
Total	111,301	24,203	17,735	158,513	13,503	38,807	21,207	385,268

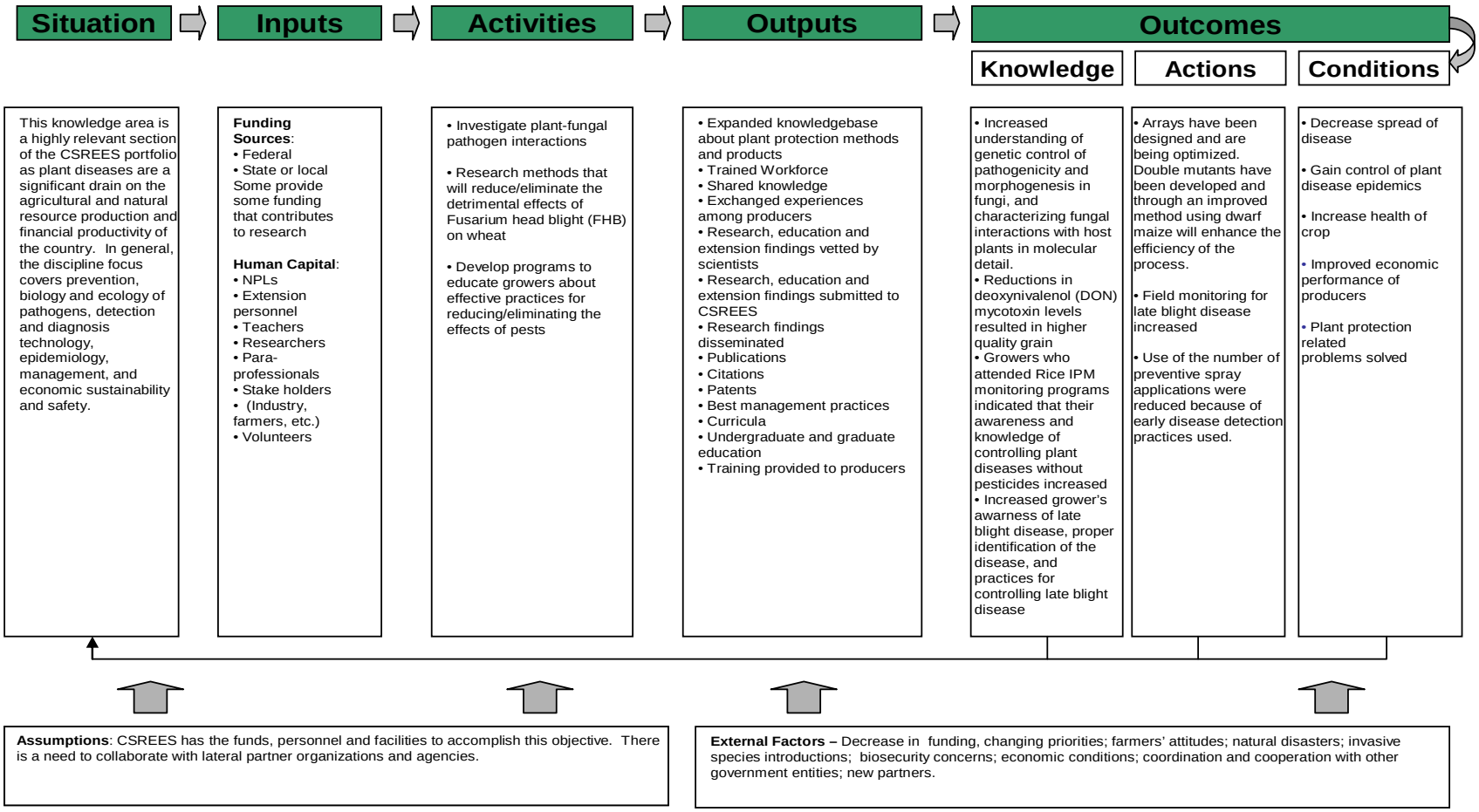
CSREES funding for KA 216 is quite variable, with Hatch, Special Grants, and Other CSREES funding providing the strongest support. There appears to be a growing interest in SBIR grants. Other agencies' support has shown a modest increase trend, with CSREES and State Appropriations providing most of the funds.

APPENDIX B
KA Logic Models

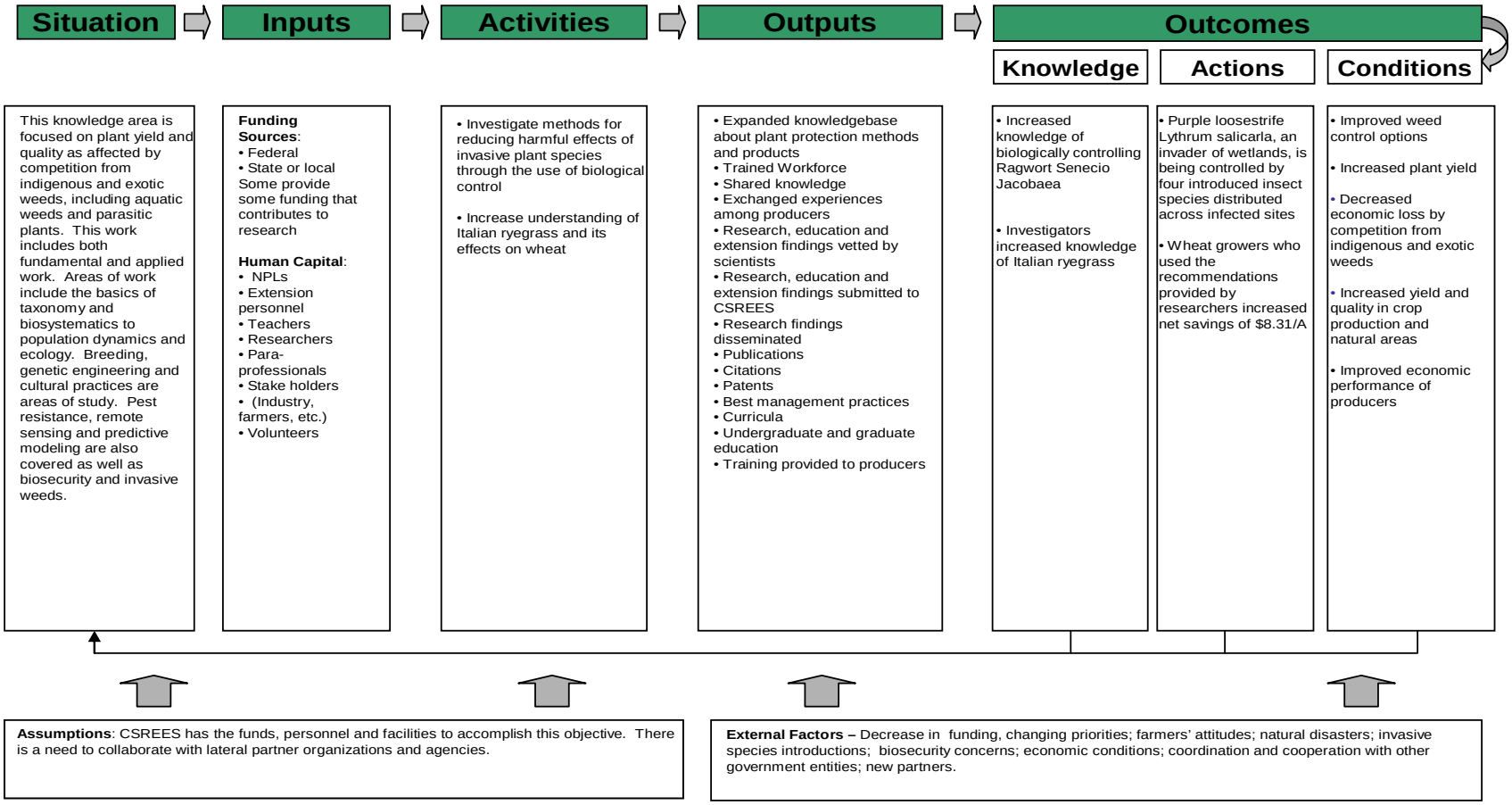
CSREES Plant Protection Logic Model: KA 211



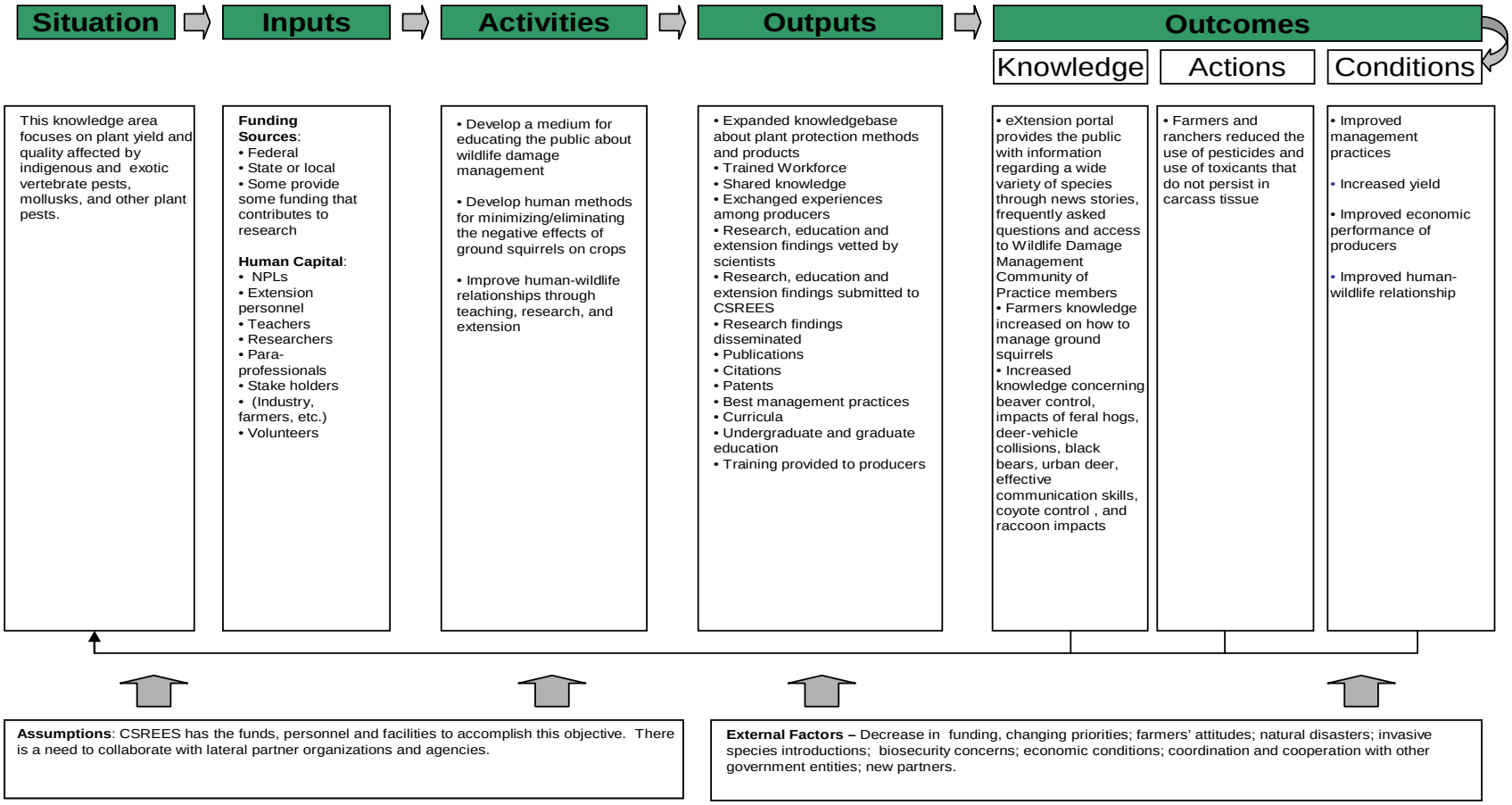
CSREES Plant Protection Logic Model: KA 212



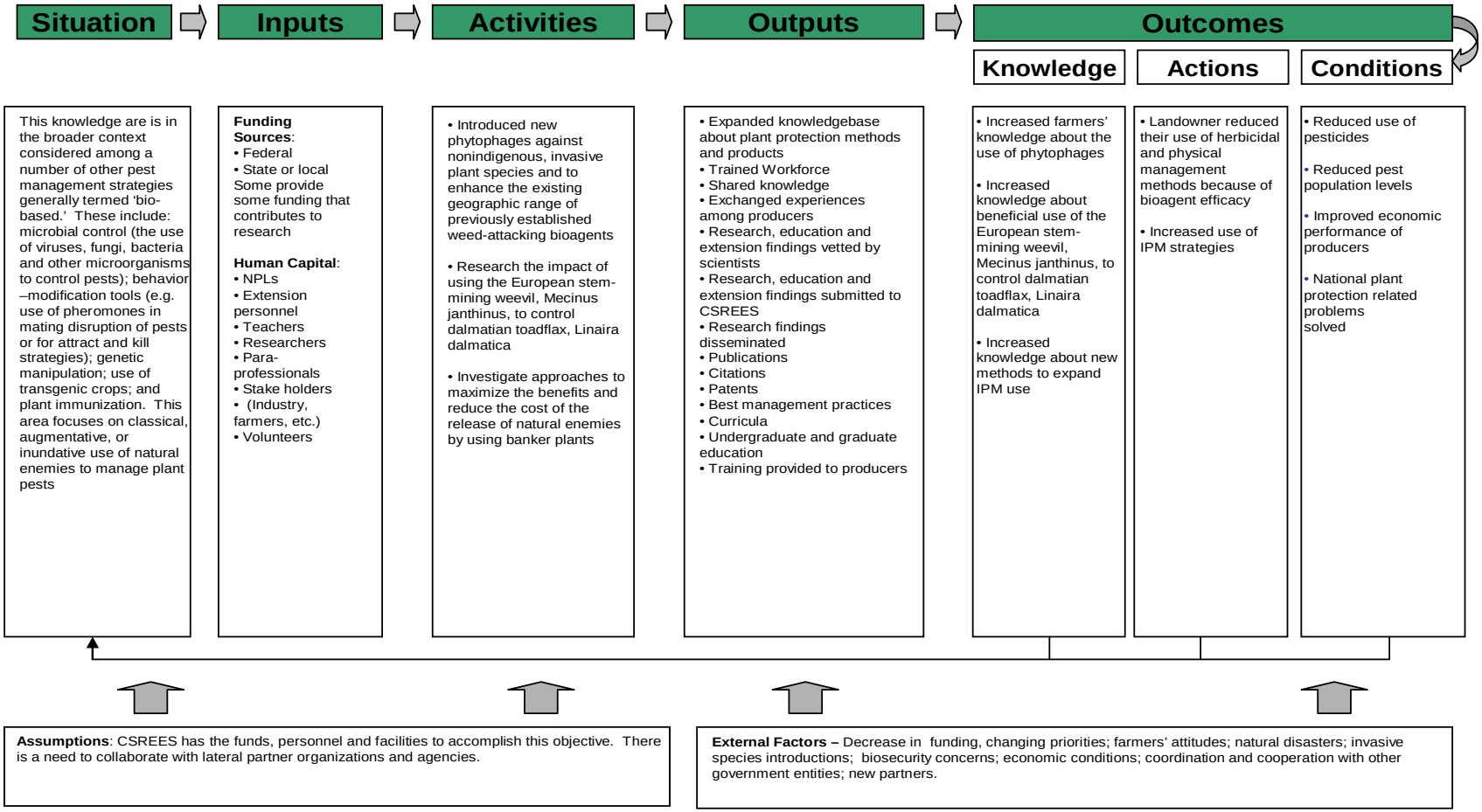
CSREES Plant Protection Logic Model: KA 213



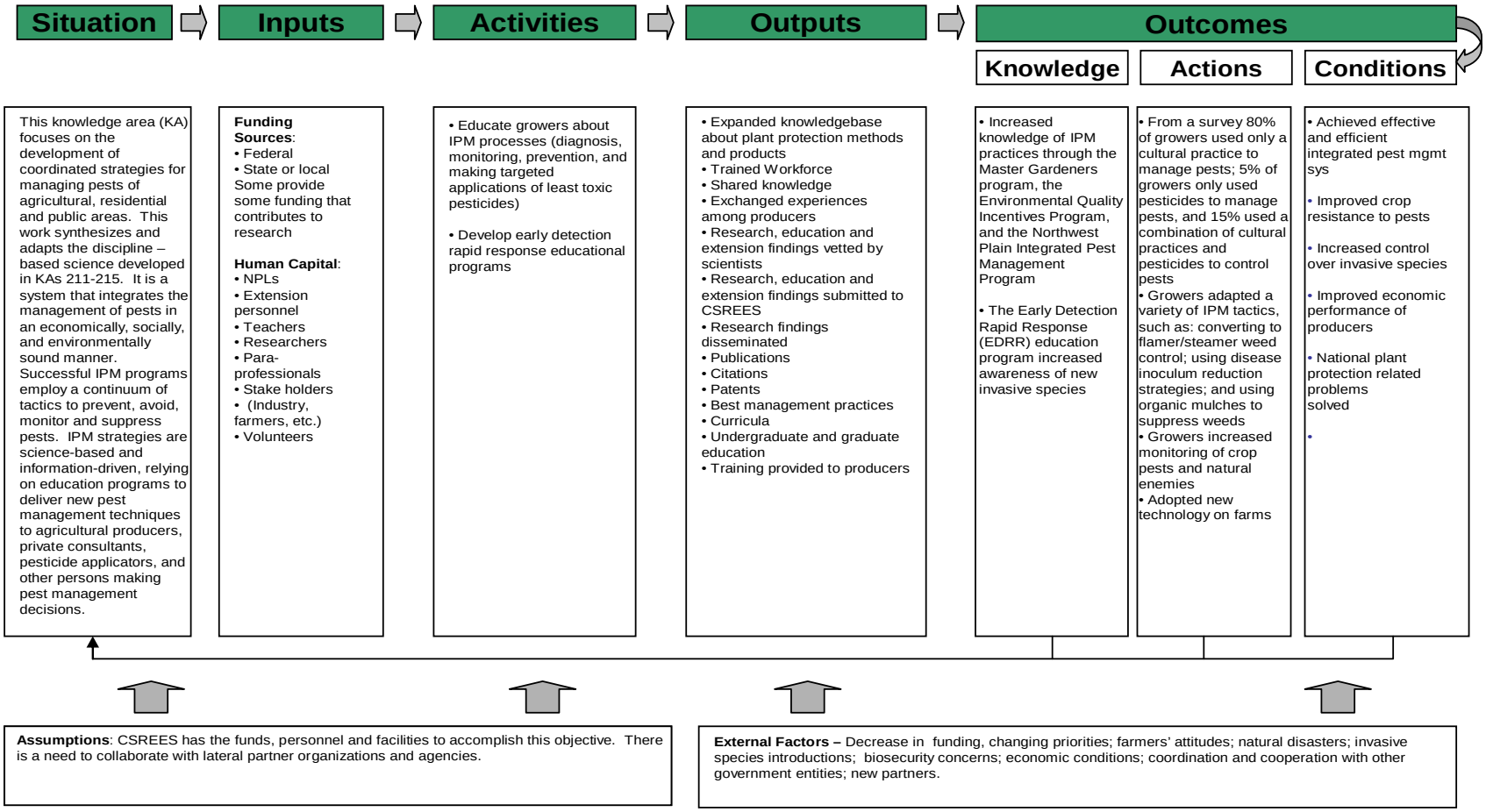
CSREES Plant Protection Logic Model: KA 214



CSREES Plant Protection Logic Model: KA 215



CSREES Plant Protection Logic Model: KA 216



APPENDIX C
Evidence of Progress/Impacts of work by KA

KA 211 - Insects, mites, and other arthropods affecting plants
This Knowledge area (KA-211) is focused on plant yield and quality as affected by indigenous and exotic insects, mites, and other arthropods (including bees and other pollinators). This work includes basic and applied research; educational programs in the classroom at Bachelors, Masters and Doctoral levels; and Extension program delivery covering a broad scope of delivery methods to widely diverse audiences.

Title: Advantages of Genetic Diversity in Mating Bees
KA Addressed: 211 – Insects, mites, and other arthropods affecting plants
Mission Area: Research
Narrative: Bees, unlike many insects, practice polyandry: when the queen mates with multiple, different males. This process promotes genetic diversity within the colony by decreasing intracolony relatedness. Understanding the advantages of polyandry in honey bee populations may lead to improved management of colonies and higher pollination efficiency for U.S. agriculture.

Heather Mattila and Tom Seeley at Cornell University in Ithaca, NY, conducted a study of honeybee swarms to determine if genetic diversity proved to be an advantage or disadvantage to a colony in establishing a new nest. Their work revealed that the productivity of the genetically diverse colonies far exceeded that of the uniform colonies in all categories evaluated. The higher production rates of the genetically diverse colonies early in the study enhanced the growth rates of the swarms later in the study. Production rates were determined by comb construction, food storage, and foraging activity; while the growth rate was determined by brood rearing, population size, and weight gain. These advantages of the genetically diverse population allowed colonies to more effectively survive the winter and produce swarms the following season.

The founding of a successful colony depends on efficient foragers that can quickly supply the colony with food reserves. The results from this study suggest the evolutionary practice of polyandry in honeybees is intimately linked to colony fitness.
Funding Source: NRI Competitive Grant
Source of Example: CRIS Acc. No. 0196233, Proposal No. 2003-01441

Title: The eXtension Fire Ants Community of Practice
KA Addressed: 211 - Insects, mites, and other arthropods affecting plants
Mission Area: Extension
Narrative: The eXtension Fire Ants Community of Practice, a virtual community lead by four Extension professionals from across the country, includes nearly 100 members from land-grant universities and other agencies, including USDA APHIS. The public web site is located at: http://www.extension.org/fire+ants

The goal of the Imported Fire Ants Community of Practice is to promote better understanding of the history, biology, and behavior of fire ants; and to provide tools to help manage fire ant problems in an environmentally and economically sound way. The Fire Ant team's ongoing collaborative work will provide consumers a source of reliable, up-to-date information from a vast knowledge base of science-based, peer reviewed materials.

The web site provides online learning lessons, videos, publications, frequently asked questions, and interactive Decision Modules to help users customize the resources according to their situation. For users that register, the view is customized so the information is customized for their locality (state and county). The Fire Ant community of practice has been funded and developed through funding provided to the eXtension initiative by CSREES.
Funding Source: Smith-Lever 3(d)
Source of Example: eXtension web site: http://www.extension.org/fire+ants

Title: Viburnum Leaf Beetle (*Coleoptera: Chrysomelidae*): Biology, Invasion History in North America, and Management Options
KA Addressed: 211 - Insects, mites, and other arthropods affecting plants
Mission Area: Research
Narrative: The Viburnum beetle, *Pyrrhalta viburni*, a leaf-feeding beetle specializing on plants in the genus *Viburnum*, is becoming a serious pest of landscapes and natural areas in the northeastern U.S. It was first detected in the U.S. in 1994 in Maine and has spread significantly since then. Soil drenches of imidacloprid are the most effective treatment, providing 100% control for two years or longer. Foliar applications are also effective. Acceptable control of larvae was achieved with spinosad and insecticidal soap. Larval populations can also be significantly reduced by pruning out infested twigs before egg hatch.
Funding Source: Hatch Funds
Source of Example: American Entomologist, 2007, Volume 53, Number 2, pp. 96-101

Title: The Nature's Partners: Pollinators, Plants, and You
KA Addressed: 211 - Insects, mites, and other arthropods affecting plants
Mission Area: Education
Narrative: The *Nature's Partners* curriculum is a step toward increasing the public's awareness and sense of responsibility that is essential to a successful conservation program for pollinators. This curriculum focuses on pollinators and the important role they play in providing many of the foods we eat and the plant fiber used in our clothing and household goods, and presents ways young students can help pollinators survive and flourish by protecting and creating pollinator-friendly habitat.

The Nature's Partners Curriculum is an inquiry learning-based curriculum for young people in the 4th through the 6th grade. It is comprised of seven modules. Each module offers three or four activities designed to engage young people in active, investigative science following a learning cycle of

- exploration,
- concept introduction/development, and
- concept application

The activities are appropriate for the formal classroom or for a non-formal educational setting and can easily be adapted to fit the needs of the students and the teaching situation. The context of community is an important aspect of this program. The program will be most effective when the young people are involved in contributing to the community through a service learning project. New funds were awarded to the Coevolution Institute to build on the project initially undertaken by an earlier award to UC Davis.
Funding Source: CSREES Administration Enhancement Funds
Source of Example: Website: http://www.nappc.org/curriculum/intro.php

Title: IR-4 2006 Accomplishments
KAs Addressed: 211 - Insects, mites, and other arthropods affecting plants
212 - Pathogens and nematodes affecting plants
213 - Weeds affecting plants
Mission Area: Research
Narrative: The Inter-Regional Project No. 4 (IR-4) provides safe and effective pest management solutions for specialty crop growers and provides linkage between the Environmental Protection Agency (EPA) and private industry. Some of the major accomplishments for 2006 include 189 new tolerances approved through the U.S. EPA, 804 clearances for conventional crop protection products, 21 Emergency Exemptions. IR-4 Regional and ARS laboratories completed 80 analytical summary reports, Field Research Centers and other research sites completed 650 field trials, Quality Assurance Unit completed reviews on 98 Final Study reports, EPA Biopesticide and Pollution Prevention Division approved 2 packages that support registrations on 306 food crops and numerous ornamental crops, EPA Health Effects Division reviewed and approved three crop group expansion documents, and conducted over 1300 trials with greenhouse and field ornamentals.

Funding for this project comes from USDA and the crop protection industry. In addition it has been estimated that 'in-kind' contributions total over $10 million.
Funding Source: USDA Special Grant
Source of Example: 2006 Year in Review, The IR-4 Project

Title: Integrated Strategies for Controlling Flower Thrips in Southern Highbush Blueberries
KA Addressed: 211 - Insects, mites, and other arthropods affecting plants
Mission Area: Research
Narrative: Blueberry growers in Florida identified flower thrips as one of the most important pest problems with USDA reporting. The thrips cause 40% losses in southern states. Growers have traditionally applied conventional insecticide sprays every two weeks without scouting to determine if thrips were present. This project devised a user-friendly way to sample for thrips prior to spraying. In addition, effectiveness of biologically-based insecticides was compared to conventional chemistries. This revealed that one biologically-based insecticide effectively controlled flower thrips without diminishing the population of a primary natural enemy. Growers now have a low-toxicity insecticide that is friendly to biological controls, and fits well into the integrated pest management (IPM) strategy.
Funding Source: Southern Integrated Pest Management Center competitive grant program
Source of Example: Goals Reached in IPM in the South (GRITS), The Southern Region IPM Center Annual Report 2006

KA 212: Pathogens and nematodes affecting plants
This Knowledge area (KA-212) is a highly relevant section of the CSREES portfolio as plant diseases are a significant drain on the agricultural and natural resource production and financial productivity of the country. In general, the discipline focus covers prevention, biology and ecology of pathogens, detection and diagnosis technology, epidemiology, management, and economic sustainability and safety.

Title: Verticillium Comparative Genomics – Understanding Pathogenicity and Diversity
KA Addressed: 212 - Pathogens and nematodes affecting plants
Mission Area: Integrated Research and Education
Narrative: *Verticillium dahliae* is the primary causal agent of Verticillium wilts that cause billions of dollars in annual losses worldwide and was recently recognized as one of ten plant pathogenic fungi in the "Immediate Priority" group of the American Phytopathological Society's Microbial Genome Sequencing Priority List. *V. albo-atrum*, is closely related to, but distinct from *V. dahliae* in host range and its pathogenicity phenotypes. *Verticillium albo-atrum* is being compared to *V. dahliae* for differences in pathogenicity, differentiation, and host-adapted virulence to enable improved disease detection methods, managing the disease in agricultural practices, and ultimately to developing alternative control strategies.

To broaden the impact of the genomic information generated through this project, an outreach project is being delivered. A genomics workshop for K-12 teachers is being developed; a genomics workshop is being offered to students and instructors from Meredith College, North Carolina Wesleyan College, Peace College, and Fayetteville State University; and an eight-week internship program at North Carolina State University will train minority students in the methods.

In the first year of this two-year project, all the whole genome shotgun (WGS) libraries have been successfully created. Over 378,000 WGS reads from *Verticillium dahliae* and 38,000 reads from *V. albo-atrum* have been deposited at the NCBI trace repository and an optical map for *V. dahliae* with ~300X physical coverage was created, showing that the *Verticillium daliae* genome contains 7 chromosomes with a genome size of ~32 Mb.

During summer 2007, two undergraduates participated in the internship program. Participants were selected on the basis of their credentials and belonging to under-represented groups. The students presented their results at the Sixth Annual North Carolina State University Undergraduate Summer Research Symposium.

Optical mapping is an enabling technology for whole-genome assembly. Since no genetic map is available for *V. dahliae*, the creation of an optical map provides an extremely valuable tool. The integration of the optical map and sequence assembly will offer means to anchor sequence scaffolds to the chromosomes and provide a comprehensive landscape of the genome structure.
Funding Source: NRI Competitive Grant
Source of Example: CRIS ACCESSION NO: 0208328; PROJ NO: MASR-2006-04904

Title: Basidiomycete Specific Virulence Factor Analysis, Sporulation and Host Response in the Maize-corn smut Pathosystem
KA Addressed: 212 - Pathogens and nematodes affecting plants
Mission Area: Research
Narrative: *Ustilago maydis* causes common smut of corn and is also an important model system for the study of plant-fungal pathogen interactions. Sporulation is essential for survival of the pathogen and occurs only within plant galls produced by maize in response to fungal attack. This project will: 1) Better explain the role of a basidiomycete specific pathogenicity determinant

protein Ubc2 which is thought to have a specific role in pathogenicity; 2) Investigate gene expression and function on sporulation through microarray and mutant analyses; and, 3) Characterize the gene expression patterns in the production of galls and collaborate with industry to generate maize mutants to determine the role of specific maize genes in gall formation.

These experiments are aiding in our understanding the genetic control of pathogenicity and morphogenesis in fungi, and characterizing fungal interactions with host plants in molecular detail. Thus far we have shown that the carboxy terminal end of the Ubc2 protein is dispensable for mating and filamentous growth but is absolutely required for pathogenicity, that each of the two SH3 domain in the C-terminal region is independently required for pathogenicity, and have identified a large number of candidate interactor proteins. Arrays have been designed and are being optimized. Double mutants have been developed, and through an improved method using dwarf maize, will enhance the efficiency of the process. A commercial seed and genetics company collaborator is in the final steps of transgenic line production to be evaluated for commercialization.

Impact will be accomplished in the long-term through an increased understanding of the genetic basis of fungal plant diseases. This should eventually lead to novel disease control methods. The identification of the C-terminus of the Ubc2 protein being essential for disease but not for other aspects of the life cycle of *U. maydis* suggests that it could be employed as a target for novel disease control strategies.
Funding Source: NRI Competitive Grant
Source of Example: CRIS ACCESSION NO: 0206103; PROJ NO: GEO-2005-01211

Title: Solving Scab (Fusarium Head Blight)
KA Addressed: 212 - Pathogens and nematodes affecting plants
Mission Area: Extension
Narrative: Scab, also known as Fusarium head blight (FHB), is a disease of wheat and other small grains caused by the fungus *Fusarium graminearum*. The fungus infects the crop when wet weather and high dew points coincide with flowering to early dough stages of kernel development. The disease results in reduced yield, test weight, and the production of a mycotoxin called vomitoxin, or deoxynivalenol (DON). Grain with levels > 0.5 ppm DON is heavily discounted in price.

Losses caused by FHB in North Dakota wheat were estimated at over $2 billion from 1993 - 2004, causing devastating financial losses to producers and the grain industry. Weather was favorable for infection in some areas of ND again in 2005 and estimated losses were over $157 million, a loss which could have been much higher without integrated management strategies in place. In 2006, because of drier weather at flowering, and implementation of integrated management practices, estimated losses in ND were $20 million.

North Dakota State University IPM programs promoted a three pronged, integrated approach to combat FHB: developing resistant varieties which have been embraced by producers and have become industry standards for FHB management; demonstrating that crop rotation reduced FHB levels by 20-50%, and; evaluating fungicides and application technologies, demonstrating that some fungicides significantly reduced FHB and improved yield (23.3%) and reduced DON by 32-40%. Reductions in DON mycotoxin levels as a result use of resistant varieties and improved fungicide efficacy resulted in higher quality grain being brought to the market and less loss to producers in price and less cost to the grain industry to source high quality grain for food products.

Tim Brakke, a wheat producer in Aneta, ND said (January 2007), "When the scab epidemic hit our small grain fields in 1993, and the years following, the losses on our farm were staggering. NDSU has been very helpful in developing the tools and methods to combat this disease and lessen the impact. I rely on their recommendations on varieties to plant and the best time, methods and fungicide to spray… With the tools now available to us, wheat has again become a profitable crop on our farm."
Funding Source: Smith-Lever 3(d) IPM Funds
Source of Example: Performance Planning and Reporting System Successes for 2006

Title: Stem Rot of Rice Reappears
KA Addressed: 212 - Pathogens and nematodes affecting plants
Mission Area: Extension
Narrative: Stem rot is one of the oldest and most important diseases of rice in Arkansas, but had largely disappeared due to the widespread use of potassium sulphate fertilizers through the 1960s. More intensive rotations and the decreased use of potassium fertilizer in rice since 1970 resulted in a reappearance of the disease during the 1990s. Farmers fought back with soil testing and potash and the disease became a non-factor again. Most rice soils in Arkansas have been depleted of essential nutrients by over cropping and shallow tillage farming, and thus must be sampled and fertilized routinely to avoid problems. But, the economics of rice production the past several years has resulted in many cutbacks by farmers, one being potassium fertilizer.

Rice IPM monitoring programs in Lonoke and Prairie counties during 2006 picked up a disturbing trend in several rice fields about midseason. Certain cultivars were stunted, slightly discolored and did not respond to midseason nitrogen fertilizer as expected. Other cultivars suffered leaf tip discoloration and eventual death of upper leaves as stem rot became unexpectedly severe over time.

In some monitoring fields, losses at harvest were estimated as high as 50 bushels per acre, worth more than $200 per acre to the grower. Certain growers sprayed fungicides in response to the changes in the crop, to no avail. Grid sampling of soil and plant tissue in affected fields showed a relationship between potassium deficiency and stem rot intensity. These monitoring results and experiences were used at winter grower meetings to educate area producers about the disease and how to control it without pesticides, simply by effective soil sampling and the proper use of potassium fertilizer. More than 90% of growers attending indicated they increased their awareness and knowledge of this problem and intended to change management practices to solve it during 2007. This is a good example of the relationship of soil factors to pest management and the need to vigilantly monitor production factors in order to manage problems and avoid unnecessary costs from yield losses or ineffective pesticide applications, and benefit the environment.
Funding Source: Smith-Lever 3(d) IPM Funds
Source of Example: Performance Planning and Reporting System Successes for 2006

Title: Regional Center Plant Diagnostic Facility
KA Addressed: 212-Pathogens and nematodes affecting plants
Mission Area: Extension
Narrative: The potential for introduction of multiple plant pathogens and pests into the U.S. agricultural system is significant. Rapid identification influences the ability to respond to new threats and is the first step in containment and control. To respond to this need, a unified network of laboratories at public agricultural institutions has been assembled to identify and respond to high risk biological pathogens in the food and agricultural system. The system is composed of a

hub and spoke arrangement with a core network of five regional plant diagnostic centers. The regional labs operate a two-way, secure communications network with other universities and the USDA diagnostic laboratories in their respective regions and with labs in each of the member states in the region.

The Plant Disease Diagnostic Clinic at Cornell University serves as the regional center for the Northeast (NEPDN) region of the National Plant Diagnostic Network (NPDN). The center maintains a network to quickly detect high consequence, biological pests and pathogens in the nation's agricultural and natural ecosystems and also serves an administrative role in managing subcontracts with the remaining ten states in the region who receive funding to support their diagnostic activities. Diagnostic facilities are regularly upgraded to comply with expectations and to ensure accurate results. Additional specific training in advanced identification techniques is coordinated and provided to member labs for improved diagnostic capabilities. Current facilities reflect capabilities on the cutting edge of accepted methods for plant pest detection. Labs are capable of receiving and processing high consequence samples efficiently, diagnosing accurately, and providing surge capacity for other regional center laboratories and Federal regulatory labs that may be overwhelmed by samples during disease epidemics and new pest discoveries.

All staff members are proficient in testing for all currently defined high consequence pathogens by approved USDA-APHIS-PPQ standard protocols. This program has allowed NEPDN staff to address samples suspected of highly significant pathogens including *Phakopsora pachyrhizi* (Soybean rust), *Phytophthora ramorum* (Sudden oak death/Ramorum blight), and Plum Pox. Discovery of PPV in New York triggered an unexpected deluge of 60,000 samples for processing in one month, a feat that would have been impossible without prior readiness through NEPDN/NPDN infrastructure.
Funding Source: Other grants
Source of Example: CRIS ACCESSION NO: 0194106; PROJ NO: NYC-153576

Title: Late Blight Education and IPM Adoption Reduces Pesticide Applications
KA Addressed: 212-Pathogens and nematodes affecting plants
Mission Area: Extension
Narrative: Impacts from potato late blight disease affect Alaska's potato consumers, potato growers, export markets, the gardening community and retail sales industries. Late blight disease kills potato plants and infects potato tubers, which has the potential to ruin the fresh marketing, storage and resale of this highly desirable crop.

Late blight, a serious disease for commercial potato growers, was found in fields in the Mat-Su Valley in August 2005. IPM Program staff and cooperating faculty provided education, scouting, and disease specimen identification for early detection of this disease. Because horticultural practices utilized by home gardeners (e.g. the growing of greenhouse tomatoes, which is the alternate host for late blight and the primary suspect for late blight infection in potatoes) can readily spread the disease many miles away from the source (due to the late blight spore's ability to move on the prevailing winds) the improper handling of these materials within a 100 mile radius of potato fields has the enormous potential to negatively impact Mat-Su potato producers. A program was developed for the Anchorage Bowl to alert home gardeners on proper identification, disposal of diseased tissue and recommended practices for growing potatoes (and tomatoes). The program included a full-day workshop utilizing faculty from Cooperative Extension Service (CES), the University of Alaska, Fairbanks, Palmer Research Center and Division of Agriculture, distribution of fact sheets at major public events, three newsletter articles, a television spot, and listserv messages to clientele. Late blight was not diagnosed in the

Mat-Valley until the last week in August 2006 and was contained within a small area with minimal impact to the industry.

Education and early detection were key components performed by the CES-IPM Program, which reduced the potential impacts of this plant disease on the industry/state. Through public awareness (which helped to reduce alternate host disease propagation), increased field monitoring, and early disease detection; the number of preventative spray applications were reduced, decreasing the cost/benefit ratio of IPM as well as decreasing both human health and environmental risk.
Funding Source: Smith-Lever 3(d) IPM
Source of Example: PPRS Program Successes for 2006

KA 213: Weeds affecting plants
This Knowledge area (KA-213) is focused on plant yield and quality as affected by competition from indigenous and exotic weeds, including aquatic weeds and parasitic plants. This work includes both fundamental and applied work. Areas of work include the basics of taxonomy and biosystematics to population dynamics and ecology. Breeding, genetic engineering, and cultural practices are areas of study. Pest resistance, remote sensing, and predictive modeling are also covered as well as biosecurity and invasive weeds.

Title: Potato IPM Scouting Manual (A Pocket Guide in English and Spanish)
KAs Addressed: 211 - Insects, mites, and other arthropods affecting plants
212 - Pathogens and nematodes affecting plants
213 - Weeds affecting plants
Mission Area:
A scouting manual, printed in English and Spanish, will fill the need for addressing field scouting for Pacific Northwest potato production. Using existing potato IPM publications and interviews with university specialists, investigators at the University of California Extension Service produced a preliminary outline for the Potato IPM Scouting Manual that includes a "wish list" of pests (including insects, diseases, weeds, and nematodes) and details about when during the crop cycle each pest occurs, when scouting activities should occur, what part of the field and plant need to be scouted, and when damage is present. Investigators then compiled a preliminary inventory of photos that are needed in order to correctly identify each pest and its damage.

The group developed a sample manual and conducted a pilot workshop at the 2005 University of Idaho Potato Conference in Pocatello, Idaho. Information outlined in the sample manual included: a detailed scouting plan, a photograph identifying each pest and the damage it causes, graphics depicting where to scout for each specific pest, its economic threshold, and a place to record data. Attendees were asked to scout for the diseases outlined in the sample manual. Data recorded by the participants were collected and used to evaluate the utility and ease of use of the manual. Attendees also provided comments on how to improve the manual. Subsequent pilot workshops were conducted in Blackfoot, Grace, and American Falls, Idaho in June of 2005 utilizing the revised sample manuals.

Funding Source: Western Integrated Pest Management Center competitive grant program
Source of Example: 2006 Annual Report, Western IPM Center; Website: www.wripmc.org

Title: Biological Control of Weeds
KAs Addressed: 215 - Biological control of pests affecting plants
213 -Weeds affecting plants
Mission Area Addressed: Research
Narrative: Harmful, non-indigenous plant species invade Oregon, threatening agriculture, waterways, native ecosystems, and even human health. This research is helping to reduce harm from invasive plant species through the use of biological control. A conservative estimate of the economic impact of the twelve worst noxious weeds in the state is $67 million annually. Three of the 12 worst weeds (ragwort, purple loosestrife, and rush skeleton weed) currently have detailed research programs at Oregon State University, Botany and Plant Pathology laboratory. Oregon has the largest portfolio of biological weed control systems in the nation, numbering 71 control organism species for 31 weed species. Ragwort, *Senecio jacobaea*, a weed of roadsides, pastures, and grasslands has been successfully controlled by biological methods. Assuming that at least half of the benefits calculated for controlling ragwort at its peak can be attributed to this research, then the annual benefit to Oregon growers and livestock producers amounts to $3 million/year. Purple loosestrife, *Lythrum salicaria*, an invader of wetlands; is being controlled by four introduced insect species distributed across infested sites in Oregon and the rest of the United States.
Funding Source: Hatch Funds
Source of Example: CRIS ACCESSION NO: 0057761 SUBFILE: CRIS PROJ NO: ORE00010 AGENCY: CSREES ORE

Title: Italian Ryegrass in Kentucky Wheat
KA Addressed: 216-Integrated pest management systems
213-Weeds affecting plants
Mission Area Addressed: Integrated (Extension & Research)
Narrative: As much as 85% yield loss in wheat has occurred as a result of Italian ryegrass competition. Growers are especially concerned about Italian ryegrass, since it infests an estimated 20% of Kentucky's wheat acres and spreads easily.

In order to better understand the management of this weed, a total of 14 studies were conducted since 2001 to evaluate application timing, tank mix antagonism, and use of adjuvants with foliar-applied herbicides in wheat. Research results were used to develop recommendations and were discussed in several grower and dealer meetings and made available in 17 articles appearing in newsletters, magazine articles, or research reports.

It is estimated that wheat growers gained a net savings of $8.31/acre by following University of Kentucky recommendations for controlling a modest infestation of just three Italian ryegrass plants/ft2. Without following our recommendations for managing ryegrass, it is estimated the economic loss to growers, in yield loss alone, would exceed $25.00/acre.
Funding Source: Smith Lever 3(d), Hatch Funds, Commodity Grants, State Funds
Source of Example: IPM Performance Planning and Accountability System

KA 214: Vertebrates, mollusks, and other pests affecting plants
This Knowledge area (KA-214) is focused on plant yield and quality as affected by indigenous and exotic vertebrates (including birds and mammals), mollusks (including slugs and snails), and other pests affecting plants.

Title: eXtension Wildlife Damage Management Community of Practice
KA Addressed: 214-Vertebrates, mollusks and other pests affecting plants
Mission Area Addressed: Extension
Narrative: eXtension is an educational partnership of more than 70 universities, found in every state and territory throughout the United States, that provides 24/7/365 access to dynamic and evolving objective, research-based information and educational opportunities. eXtension is new and unique. For the American public: the "best of the best" peer-reviewed information on myriad topics; research-based, objective, information delivered any time, any place, on any Internet-ready device. The eXtension portal (www.extension.org) provides public access to several published Communities of Practice content and programs. Wildlife Damage Management resources are available at this time at http://www.extension.org/human-wildlife+relations.

Wildlife damage management is a diverse and exciting area and the Wildlife Damage Management website reflects that diversity. Wildlife damage management requires the ability to identify the damage, select appropriate mitigation techniques, and suggest ways to prevent future damage. Additionally, the wildlife damage controller must also consider human needs and concerns in addition to issues related to animal welfare and the environment.

The Wildlife Damage Management Community mission is to assist individuals with the complex decision process involving balancing human and wildlife concerns. Its members include nationally recognized wildlife biologists, nuisance wildlife control operators, educators and people interested in the field of human-wildlife relations. Their goal is to help people live in harmony with wildlife and minimize the conflicts that occur in human-wildlife relations. The eXtension Wildlife Damage Management website provides detailed resources on a wide variety of wildlife species, news stories, frequently asked questions, and event calendar, and access to the Wildlife Damage Management Community of Practice members.
Funding Source: Smith-Lever 3(d)
Source of Example: CRIS Accessions No. 0207967; web site, www.eXtension.org

Title: Economic and Technical Guidelines for Control of Ground Squirrels in Alfalfa
KA Addressed: 214-Vertebrates, mollusks and other pests affecting plants
Mission Area Addressed: Research
Narrative: Maximum alfalfa production in Montana has always been limited by ground squirrel activity. A survey of Montana State University County Extension Agents for this project indicated that crop damage from ground squirrels has a major economic impact on agriculture producers in Montana, although actual damage is difficult to quantify. While research from Montana is limited, findings have shown that a single pair of ground squirrels and their offspring can remove 0.25 acre of alfalfa in one growing season. In northeastern California, percentage alfalfa yield loss estimates ranged from 34.6 to 45.9% due to ground squirrels.

As new information developed as part of this project is put in use, Montana farmers and ranchers could save $7 million per year by implementing the techniques. While reducing producer costs through proper timing and management of ground squirrels met the project's major goal, an unexpected result was the bio-friendly level of the project. By reducing the amount of pesticides used to control ground squirrels statewide, the non-target species exposure was greatly reduced. In addition, the recommendations encouraged use of toxicants that do not persist in carcass tissue,

thereby eliminating the possibility of secondary poisoning.
Funding Source: Special Grant
Source of Example: CRIS Accession No. 019679; website:
http://www.animalrangeextension.montana.edu/articles/wildlife/ground_squirrel.htm)

Title: Berryman Institute
KA Addressed: 214-Vertebrates, mollusks and other pests affecting plants
Mission Area Addressed: Education
Narrative: The Berryman Institute is a national organization based in the Department of Wildland Resources at Utah State University and the Department of Wildlife & Fisheries at Mississippi State University. The Berryman Institute is dedicated to improving human-wildlife relationships and resolving human-wildlife conflicts through teaching, research, and extension. The Berryman Institute's mission is to support and conduct effective, science-based research and outreach programs aimed at addressing issues pertaining to wildlife damage management and human-wildlife conflicts. To achieve this goal, the Berryman Institute has developed a program to financially support research and education programs conducted by institutions in the United States that address these issues. Funding opportunities are available each year in all regions of the country.

The Berryman Institute continues to provide research funding, technical assistance, and outreach education through its funding of multiple projects throughout the United States that address the critical issue of human-wildlife conflicts. These projects support or supported 13 undergraduate internships, 20 graduate fellowships, and 17 faculty affiliates. These projects address such relevant issues as beaver control, impacts of feral hogs, deer-vehicle collisions, reforestation, depredation at aquaculture facilities, endangered species, black bear, urban deer, effective communication skills, coyote control, and raccoon impacts. Additionally, the institute continues to train undergraduate and graduate students in the field of human-wildlife conflicts. It also conducted national workshops that positively impacted over 200 professionals.
Funding Source: Competitive grant, Hatch Funds, Smith-Lever, and others
Source of Example: website: http://www.berrymaninstitute.org

KA 215: Biological control of pests affecting plants
This Knowledge area (KA-215) is in the broader context considered among a number of other pest management strategies generally termed 'bio-based'. These include: microbial control (the use of viruses, fungi, bacteria and other microorganisms to control pests); behavior-modifying tools (e.g. use of pheromones in mating disruption of pests or for attract and kill strategies); genetic manipulation; use of transgenic crops; and plant immunization. This area focuses on classical, augmentative, or inundative use of natural enemies to manage plant pests.

Title: Biological Control in Pest Management Systems of Plants (from W1185)
KAs Addressed: 215-Biological control of pests affecting plants
213-Weeds affecting plants
Mission Area Addressed: Research and Extension
Narrative: Increasing restrictions governing herbicide use against invasive plant species occupants of rangeland and riparian habitats or other environmentally sensitive areas has generated statewide interest in biological control as a management tool. The purpose of this project is to introduce new phytophages against nonindigenous, invasive plant species and to enhance the existing geographic range of previously established weed-attacking bioagents. Cooperative linkages were maintained or established with AES, USDA-ARS, US BLM, USFS,

USNPS, USFWS, and numerous state agency personnel involved with undesirable plant suppression activities. Utilization of host-specific,weed-debilitating bioagents by private sector, state, federal, and tribal land managers measurably reduced herbicide use, lowered land maintenance expenditures, increased forage and native plant species survival, and contributed to a noticeable, continued improvement in the overall health of 30,000+ acres of rangeland, wildland, and wetland environments in 20 of Washington State's 39 counties during FY 06.
Funding Source: Hatch (Multi-State Committee W-2185)
Source of Example: CRIS ACCESSION NO: 0164831 SUBFILE: CRIS PROJ NO: WNP00121 AGENCY: CSREES WN.P

Title: Biological Control of Invasive Toadflaxes in Washington
KA Addressed: 215-Biological control of pests affecting plants
Mission Area Addressed: Research
Narrative: Dalmatian toadflax, Linaria dalmatica, is a serious noxious weed of rangeland, forests, transportation rights-of-way, crop, and CRP lands in Washington State. Biological control of this perennial plant using the European stem-mining weevil, Mecinus janthinus, has proven to be a viable strategy in reducing populations of this invasive weed. Adults consume leaves, and chew on stems and buds of shoots, thus weakening/stunting plants and suppressing seed production. Larval feeding within the stems injures the vascular tissues, leading to shoot wilting and desiccation, and impairs nutrient storage in the roots. Intensive deployment of M. janthinus has slowed Dalmatian toadflax invasiveness, restored productivity of once-infested noncropland sites for animal foraging, and contributed to the re-establishment of various native plant species. Landowner utilization of herbicidal and physical management methods has appreciably diminished because of bioagent efficacy. Property owners/managers realized an estimated cost savings of over a half million dollars in FY 06 through the implementation of biological control.
Funding Source: Hatch Funds
Source of Example: CRIS ACCESSION NO: 0192821 SUBFILE: CRIS PROJ NO: WNP00430

Title: Promoting IPM Implementation in Greenhouses: Banker plants, Grower Education and an Assessment of Consumer Attitudes
KA Addressed: 215-Biological control of pests affecting plants**Mission Areas Addressed:** Research, Extension, and Education
Narrative: Growers need cost-efficient and effective methods to replace routine chemical pesticide sprays with biological control for management of their serious arthropod pests. They also need opportunities to learn about these novel IPM strategies. Through this project biological control/IPM practitioners are investigating practical approaches to maximize the benefits and reduce the cost of the release of natural enemies by using banker plants. Their results show that indeed this approach can sustain natural enemies in a greenhouse in the absence of prey. These findings are being disseminated through hands-on grower workshops held in ME, NH and VT every January. Growers indicate that this type of applied research is exactly what they need to increase implementation of IPM. Frequent feedback from the growers indicates that the workshops being offered are the most useful for learning new methods to expand IPM use in their greenhouses, and are the reason they are using biological control today.
Funding Source: Special Grant
Source of Example: CRIS ACCESSION NO: 0203384; SUBFILE: CRIS PROJ NO: VT-0046OG AGENCY: CSREES VT

KA 216: Integrated pest management systems

This knowledge area focuses on the development of coordinated strategies for managing pests of agricultural, residential and public areas. This work synthesizes and adapts the discipline-based science developed in Knowledge Areas 211-215. It is a system that integrates the management of pests in an economically, socially, and environmentally sound manner. Successful IPM programs employ a continuum of tactics to prevent, avoid, monitor and suppress pests. IPM strategies are science-based and information-driven, relying on educational programs to deliver new pest management techniques to agricultural producers, private consultants, pesticide applicators, and other persons making pest management decisions.

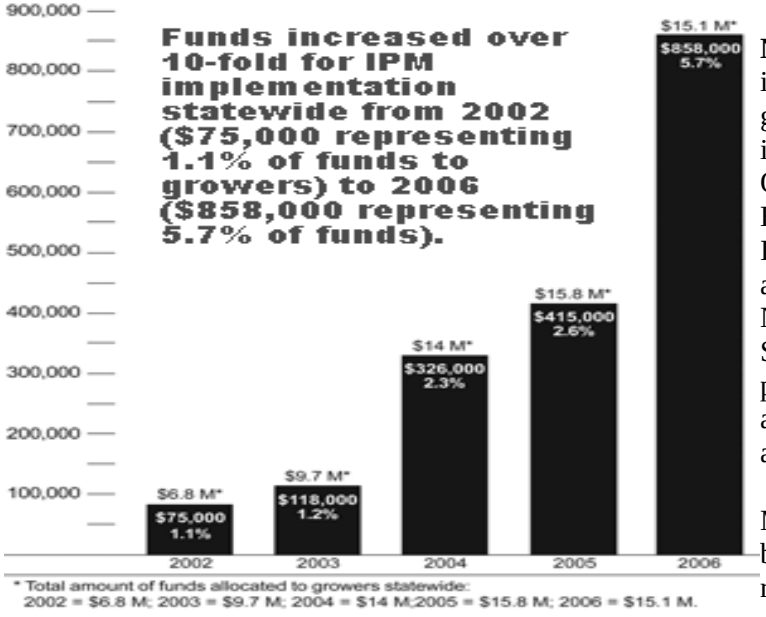
Title: Maryland and Vermont Master Gardener Programs - Reaching Stakeholders
KA Addressed: 216-Integrated pest management systems
Mission Area Addressed: Extension
Narrative: Master Gardeners (MG) are trained to walk clients through the IPM process- from correct diagnosis to monitoring, prevention, and, when necessary, making targeted applications of least toxic pesticides. Volunteers also teach home gardeners how to identify and attract beneficial insects.

The following are some of the impacts of the Maryland Master Gardener Program in 2006:

- 278 new trainees completed the program.
- 970 volunteers contributed 56,500 hours of service.
- Plant Clinic sub-committee worked to improve plant clinic operations.
- MG programs in 11 counties and Baltimore City operated plant clinics at 30 sites.
- Results of evaluation postcards completed by clients (290 responses from 24 plant clinic sites):
    - 94% said MGs identified their problem or answered their question “very much” or “a good deal.”
    - 93% said they learned something new from their interaction with MGs.
    - 30% learned “a good deal” or “very much” about how to reduce fertilizer use.
    - 33% learned “a good deal” or “very much” about how to reduce pesticide use.

In the 2006 growing season, the Vermont Master Gardener Helpline received 3,400 phone calls with 90% directly pertaining to IPM basics and principles including pest identification, pest management using cultural methods, and pest management using a pesticide. A subset of these home gardeners (50 people) were contacted at the end of the season and asked whether they learned about IPM at the time of the call and how had they managed the pest about which they requested information from the Helpline. All respondents (100%) said they learned about IPM practices at the time of the call. Eighty percent indicated they had used only a cultural practice to manage the pest; 5% indicated they had used a pesticide to control the pest; and 15% indicated they had used a combination of a pesticide and a cultural practice as a result of the IPM information supplied by the Helpline staff.
Funding Source: Smith Lever 3(d), Smith Lever b&c, State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Grower and Public Investments in Michigan IPM Pay Off
KA Addressed: 216-Integrated pest management systems
Mission Area Addressed: Extension



Narrative: The 2002 Farm Bill increased funding to assist growers with the expense of initiating conservation practices. One of the funded programs, the Environmental Quality Incentives Program (EQIP) administered by the USDA Natural Resources Conservation Service (NRCS), provides payments to eligible growers for a variety of farm practices such as pest and nutrient management.

Many IPM approaches developed by Michigan State University researchers and Extension specialists reduce risks to environmental and human health. Starting in 2003, the IPM Program partnered with private consultants, commodity groups, the Center for Agricultural Partnerships, and NRCS district conservationists to help Michigan growers implement these IPM approaches through participation in EQIP.

Growers are adopting a variety of IPM tactics using the EQIP financial incentives including:

- Adding electronic sensing technology to sprayers and using shielded sprayers to reduce drift.
- Converting to flamer/steamer weed control.
- Converting to pesticides with low risk potential.
- Removing wild host plants of pests.
- Utilizing disease inoculum reduction strategies.
- Providing nesting structures for predators.
- Implementing pesticide resistance management.
- Using organic mulches to suppress weeds and reduce herbicide use.
- Utilizing pesticide alternatives such as mating disruption.

Funding Source: Smith Lever 3(d), EPA Strategic Ag Initiative, State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Northwest Texas Plains IPM Program Provides Huge Benefits to Growers
KA Addressed: 216-Integrated pest management systems
Mission Area Addressed: Extension
Narrative: Cotton is king on the High Plains of Texas where more than 3.5 million acres are grown each year. Cotton supports not only cotton growers and their families but the area

economy of many rural communities as well. It is important that cotton be grown economically and that production risks are minimized through the use of IPM and other new technology.

The Northwest Plains Integrated Pest Management Program is directed by a volunteer committee including agricultural producers, private consultants and agribusiness personnel. This committee recruits agricultural producers to participate in the Northwest Plains Integrated Pest Management Program, a private/public partnership between Texas Cooperative Extension and the Texas Pest Management Association. Fourteen Bailey and Parmer County producers actively participated in 2006. Educational activities included weekly field scouting from which reports were electronically transferred to producers or delivered by phone, mail or by hand. Pest management plans were developed and implemented based upon these consultations and the data collected. Eighteen applied research trials were initiated to evaluate the use of new technology and group meetings, newsletters and newspaper articles distributed educational information to this group of producers as well as to the remainder of producers in the two-county area.

A retrospective survey instrument completed by growers in the program indicated that 100% regularly monitor all of their cotton acreage for pests and natural enemies, 100% agreed that IPM reduces their production risks, 100% indicated that the IPM program has been instrumental in deciding to adopt new technology on their farms, and 100% agreed that IPM usually maintains or increases yields while reducing input costs resulting in increased net profits. The average amount of increased net profits estimated by growers was $44.72 per acre. The growers estimated that a total IPM program; including monitoring crop development, pests, and natural enemies; conducting applied research; preparing newsletters; and conducting educational programs; was worth $66.40 per acre to them. If applied to all the cotton grown in the two county area, the value would exceed $11 million per year.
Funding Source: Smith Lever 3(d), Industry Funds from Cotton Inc., State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Changing Vermont Greenhouse Grower Production Practices for the Better
KA Addressed: 216-Integrated pest management systems, 215-Biological control of pests affecting plants
Mission Area Addressed: Extension
Narrative: Greater adoption of IPM and use of biological control is a win: win: win situation because chemical pesticide use is reduced and, when used, the chemical are timed to maximize efficacy. Growers are happy because they do not like applying these compounds, which are expensive and pose health hazards to them and their workers and customers. Workers (who are the most likely to be exposed to the toxic pesticides) are happy because their health is protected and their work environment is safer. Customers and the general public benefit because the plants produced are not a source of pollution. Biological control has been available to greenhouse growers for decades, and evidence of its effectiveness is well documented. Nevertheless, growers in Vermont and other northern states have been slow to adopt IPM because, according to surveys, they lacked confidence in its efficacy and the knowledge to make it work. For eight years, the Vermont Greenhouse IPM Program, in cooperation with ME and NH Extension and the respective states' Departments of Agriculture personnel, has offered hands-on grower workshops on biological control and IPM to demonstrate that these biologically-based strategies are effective and economical. Initially workshops focused on pest identification and monitoring, cornerstones of IPM. This ensured that growers had the knowledge needed about pests and their damage symptoms to detect problems early, which is essential for success with biological control. As growers gained expertise in these basic skills, the contents of the workshops have expanded to

cover more advanced subjects dealing with incorporating biological control into their established IPM program.
In the early years of the program, growers commonly said biological control and IPM were interesting subjects but would not work in their operations. They said it was too expensive, labor-intensive, complicated, and unreliable. But times and growers are changing. Now growers express that they have started to implement techniques, such as scouting and sanitation, for which they previously believed they did not have time. Many say that the reason for the change in production practices--utilizing more non-pesticide approaches--is because of the knowledge they have gained and the contacts they made while attending the workshops. Growers clearly indicate that they learn best through hands-on, practical training sessions. As a result, the VT IPM Program continues to develop highly interactive workshops to ensure that the information is disseminated effectively and more readily adopted. In 2006, 75 percent of the Vermont workshop attendees stated they used biological control, compared to 25 percent, based on a grower survey conducted by the program 5 years ago. Over the past 8 years of holding these workshops, more than 95 percent of the growers indicated that they learned new IPM techniques that they intended to implement in the coming year and over 80 percent said they had made new contacts that would help them with IPM in the future.
Funding Source: Smith Lever 3(d)
Source of Example: IPM Performance Planning and Accountability System

Title: Washington Survey Says. . . How Grape Thou Art!
KA Addressed: 216-Integrated pest management systems
213-Weeds affecting plants
212-Pathogens and nematodes affecting plants
211-Insects, mites and other arthropods affecting plants
Mission Area Addressed: Integrated (Research, Extension)
Narrative: During the fall of FY2006, a survey was conducted to determine what arthropod, weed, and disease pests Washington grape growers battled and what strategies they employed in 2005. The survey queried growers on the severity of their pest problems, their pesticide usage, use of IPM practices, fertilizer usage, and their pest management information sources. Based on the responses to the questions on pest management practices and resources, the growers' collective experience and ever-expanding knowledge base contributed greatly to the reduction in pesticide use in grapes. Grape growers were able to assimilate vast amounts of pest management information from a number of sources, including other growers, University Extension personnel and publications, chemical company representatives, and private consultants, and in turn, apply Integrated Pest Management practices successfully in their own vineyard systems.

Following are major impacts that were documented based on the responses to the survey.

- Insecticide/miticide usage in wine grapes dropped by 84% from 1.28 to 0.2 lb ai/acre and in juice grapes, by 52% (0.77 to 0.37 lbs ai/acre).
- Herbicide usage declined by 3% in wine grapes and by 10% in juice grapes.
- Even though 2005 fungicide inputs totaled 391,497 lbs ai applied statewide, this represented a 33% decrease in fungicide use (from 5.80 to 3.88 lbs ai per acre).
- If the paraffinic oil applications are taken out to allow for a more direct comparison between survey years, a 73% reduction in fungicide use was documented (from 5.80 to 1.59 lb ai/acre).
- 89% of the wine grape grower-respondents reported scouting at least three times a month for pests while at least 83% of the juice grape growers scouted one to two times a month.

- 54% of the respondents reported using economic thresholds to guide their pest management programs.

The changes that occurred in grower practices were due to a number of factors:

- The 1996 Food Quality Protection Act and resultant loss of several insecticide registrations which forced growers to seek effective alternative pest control methods,
- An increase in the availability and use of reduced-risk (pose less hazard to humans and the environment) pesticides which are effective at absurdly low rates,
- An increase in Extension outreach programs which served to educate growers on improved IPM-based methods of pest control on grapes.

Funding Source: Smith Lever 3(d), Washington Wine Foundation, State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Early Detection / Rapid Response Efforts Paying Off for Invasive Plant Management in Wyoming
KA Addressed: 216-Integrated pest management systems, 213-Weeds affecting plants
Mission Area Addressed: Integrated
Narrative: Early detection rapid response education (EDRR) has become one of the focal points of invasive plant extension efforts at the University of Wyoming. Years of experience have clearly taught us that an ounce of prevention for new plant invaders today can save millions of dollars in weed control costs in the future. Funded by a grant from the Wyoming Department of Agriculture, the Extension Weed Specialist has been conducting risk assessments to determine what noxious species from surrounding states may become serious pests in Wyoming in the future.

A threefold approach to this problem was used. The first step was to gather the checklist of non-native plants already present in state and the official noxious weed lists of every Western State except Hawaii. This allowed for development of a “hot list” by which to prioritize educational efforts. The second step was to begin surveying the border counties of the states surrounding Wyoming. This allowed scientists, extension personnel and regulators to better understand what species may be “knocking at our door.” In the third step, Wyoming developed educational presentations on the top thirty ranked species from the risk assessment and the species found in border counties and have presented much of this information across the state at various extension and training meetings.

These EDRR educational efforts are already paying off. In 2006, three species have been documented as new records in the state. All are now under eradication to prevent their continued spread.
Funding Source: Smith Lever 3(d), Smith Lever b&c, State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Florida Provides National Leadership in School IPM and Children’s Environmental Health
KA Addressed: 216-Integrated pest management systems
Mission Area Addressed: Extension
Narrative: The Florida pest management industry has the largest market in the U.S., approaching $1.3 billion in annual revenue, including schools. There are approximately 2,864 companies, almost 5,000 certified operators, 250 special I.D. cardholders, and an estimated 25,000 I.D.

cardholders in the state who are authorized to apply pesticides. All of these pest control operators (PCOs) or pest management professionals (PMPs) are required to document their competence. The Florida School IPM Program is working with administrators and their staffs, teachers, custodial workers, cafeteria staffs, maintenance workers, pesticide applicators, and school children to implement IPM programs that reduce children's risk from pests and pest management practices. This training includes: preparing schools for IPM Star certification by the IPM Institute of North America; first responder training for Africanized honey bees; and expansion efforts continue to train school district personnel, pest control technicians, and county faculty in practicing IPM in sensitive environments. Direction for this initiative is provided by the Florida School IPM Advisory Board established by the University of Florida in 1996 with representatives from the urban pest management industry, various school districts, Florida DACS, Florida Department of Health, Florida Department of Children and Families, Florida Department of Education, the U.S. EPA, and UF/IFAS.

To date, this team has provided support to counties wanting to implement School IPM, which has impacted approximately 737,000 students. During 2006, pest inspections were tied to health inspections conducted by the Florida Department of Health. County Extension faculty members were recruited as partners in participating counties. The UF/IFAS School IPM website has been upgraded to serve as the U.S. EPA's official website and as the basis for Extension efforts in "pest management in sensitive areas." IPM Florida involved Florida School IPM leaders in the UF Emerging Pathogens Institute and strategic planning process for national School IPM.
Funding Source: Smith Lever 3(d), Pesticide Environmental Stewardship Program, state and local funds
Source of Example: IPM Performance Planning and Accountability System

Title: Hemlock Wooly Adelgid - the Battle to Save Georgia's Native Hemlock
KA Addressed: 216-Integrated pest management systems, 215-Biological control of pests affecting plants, 211-Insects, mites and other arthropods affecting plants
Mission Area Addressed: Integrated (Extension & Research)
Narrative: The hemlock woolly adelgid (HWA) is an exotic and damaging pest of native hemlock trees in both forest and ornamental settings. Native hemlock occurs in forests, parks, and recreation areas; creating a unique habitat. Hemlock is also widely planted as an ornamental. HWA feeding weakens, and then kills trees, leading to the loss of aesthetics, loss of critical habitat, and increased hazards from falling trees. The HWA is established from Maine to Georgia. HWA spread into Georgia in 2001 and has since spread to seven counties in the northeast. The HWA threatens to virtually eliminate hemlock in much of its eastern range. Unfortunately, there are few options for managing HWA in forest situations. It is not practical or desirable to use insecticides on such a broad scale in a natural environment. Because HWA is an exotic, invasive pest, natural controls are virtually non-existent. However, if HWA goes unchecked, the effect may be similar to chestnut blight; hemlocks will be permanently eliminated.

The Forest Entomology Lab within the Department of Entomology, University of Georgia established the HWA Predator Rearing Lab in November of 2006. The lab's objectives are to prevent hemlock mortality by releasing beetles that feed solely on HWA. Biological control is currently the best long-term and widespread solution against HWA. The Predator Rearing Lab works in close cooperation with the USDA Forest Service and Georgia Forestry Commission to facilitate the beetle rearing and beetle release process. Two adelgid predators, *Laricobius nigrinus* and *Scymnus sinuanodulus*, are currently being reared for release into the Chattahoochee National Forest.

During the first year of the Lab, >15,000 beetles were reared for release, and several beetle releases have already occurred. In addition, the lab is assessing beetle release methods (egg and larva releases) to circumvent lab mortality, which is impacting the rearing process at several major universities and limiting the number of beetles released each year. Initial results from ongoing research are promising which may increase beetle releases each year by 50-90%.
Funding Source: Smith Lever 3(d), State Funds
Source of Example: IPM Performance Planning and Accountability System

Title: Arkansas Sentinel Program Reduces Fungicide Use by 30%
KA Addressed: 216-Integrated pest management systems, 212-Pathogens and nematodes affecting plants
Mission Area Addressed: Extension
Narrative: The primary function of the soybean rust sentinel program is to serve as a warning network for tracking the spread of disease in North American soybean production areas. Stake holders including, county agents, soybean growers and consultants have increased their disease management knowledge and ability to properly identify many diseases common to Arkansas soybean. Fungicide use on soybeans has continued to decline from over 1 million acres sprayed during 2004 to less than 300,000 acres sprayed in Arkansas during 2006. An intensive educational program by researchers and the Cooperative Extension Service, through a sentinel plot program for monitoring soybean rust and other economic foliar diseases, has reduced fungicide applications on soybeans in fields where there was no evidence of disease. The reduction was a result of timing fungicide applications based on disease thresholds, crop growth stage, yield potential and incidence of disease. After the introduction of soybean rust into Arkansas in the fall of 2004, Extension IPM activities were crucial in helping Arkansas prepare for this new threat by increasing the plant disease awareness.

Each year a minimum of 30 sentinel plots continue to be established and monitored statewide in collaboration with extension agents, consultants, tech services personnel, growers, extension specialist, and researchers as they continue to strive to keep abreast of new technology and to reduce the pesticide risk to the agriculture ecosystem. These annual activities include implementing, establishing and monitoring sentinel plots statewide, training first detectors for an alert network, establishing weather stations, developing training modules, and conducting field fungicide trials statewide.

Over 500 first detectors have been trained and are vital in our alert network. Weather stations at five new locations in our soybean growing areas of Arkansas are setup and monitored each year. Training modules for disease monitoring, identification, and management are updated annually. Over 100 fungicide trials are conducted each year as replicated small block studies or replicated large block demonstrations in collaboration with county agents, consultants, technical service personnel, growers, extension specialists, and university researchers to reinforce confidence in Extension recommendations. Reduced total soybean fungicide usage from 0.33 lbs. A.I. per acre soybeans in 2004 to just under 0.10 lbs. A.I. per acre in 2006.
Funding Source: Smith Lever 3(d), Industry Funds, Other CSREES funds
Source of Example: IPM Performance Planning and Accountability System