Northeastern IPM Center – IPM Partnership Grants – 2010 – Proposal
Project Description

SECTION 1. a.:
Project Directors: **William M. Coli (P.D.) and William A. Miller (Co-P.D.)**
Project Title: **Soybean IPM Adoption Survey in Delaware, Maryland, Virginia and West Virginia**
Project Type: **IPM Planning and assessment Document**

SECTION 1. b.: Project Summary
Extension and research professionals, crop consultants and Department of Agriculture staff in the 4 Mid-Atlantic States of Delaware, Maryland, West Virginia and Virginia comprise a sub-group of the Northeastern IPM Working Group. Over the past year (2008-2009) they have collaborated to develop a draft of an IPM Guideline for soybeans relevant to their states. Over the winter of 2009-2010, the Working Group specialists will solicit further review of the current Guideline (See Appendix A) from industry contacts, and participate in converting the completed Soybean IPM Guideline to a Dillman Method mail survey.

Funding is sought for the resources needed to implement this survey beginning after soybean harvest in Fall, 2010. Using a statistically valid sample of the total 4-state soybean grower population, we will assess current soybean grower IPM adoption levels on a tactic-by-tactic basis and summarize them along a continuum of adoption. The survey will provide a baseline against which to measure changes in grower knowledge, behavior, and condition into the future. Further, retrospective questions will ask about IPM practices that growers have adopted over the past 5-10 years. These results will provide immediate data on impacts of IPM programming in the four states. They also will help soybean specialists to better understand future research and/or extension activities needs.

SECTION 1. c.: Background and justification
Section 1.c.i: The Problem/challenge
Private and public sector adoption of IPM during the 1980's through 1990's was widespread. An increase in use of such key IPM practices as pest population sampling and action thresholds as well as an understanding of the benefits of natural enemy conservation, classical bio-control and resistance management, often coincided with a dramatic reduction and/or optimization of pesticide use. IPM adoption, coupled with significant regulatory actions by USEPA, additionally resulted in a movement away older, riskier pesticides. Nonetheless, a 2000-2001 report from the Government Accounting Office (GAO) noted that total pounds of pesticide used had increased over the preceding 6 years and stated that: "A related management shortcoming of the federal IPM initiative is that USDA has not devised a method for measuring the environmental or economic results of IPM implementation." (Stephenson, 2001 p 15).

Section 1.c.ii: The specific need
Thus, it is critical that IPM practitioners nationally be able to document not simply IPM activity, but IPM impacts as well. In addition to the need identified in the GAO study, the Northeast Research, Extension, and Academic Programs-IPM (NEREAP-IPM) Coordinating Committee

has also identified a clear need for a focused effort to develop consistent means to document positive impacts of IPM to date, and to measure progress toward the goal of reduced risk IPM.

An additional indicator of need is the fact that more and more granting agencies now require evidence of an impact assessment plan. Land Grant researchers and educators, with a typical focus on disciplines such as entomology, plant pathology and weed science, are not ideally prepared to design and conduct impact assessments. The experience of the Project Director over the past several years has indicated that IPM domain experts value and utilize available help in planning for and actually conducting program evaluation.

Section 1.c.iii: Who will benefit?

Soybean growers and agency policy-makers will also benefit by better understanding the economic, environmental or human health benefits of IPM. This knowledge change will make it more likely that they will adopt research-based, reduced-risk pest management materials and tactics they may currently not be using. Growers will also benefit by being able to compare the practices used on their farms against those used by other growers in their and in other states. Survey data, in concert with the Soybean IPM Elements, will serve as tools for self-assessment and possible improvement. Such as self assessment may also facilitate their participation in cost-sharing programs operated through USDA NRCS.

Land-Grant faculty and Extension professionals will be better able to identify research and educational needs of their private sector target audiences. Participating in adoption measurement will also help these individuals compete for external funding by providing justification for ongoing or new IPM activities to granting entities as well as to document positive impacts of their work to key stakeholders and policy-makers.

Section 1.c.iv: Review of ongoing or recently completed work.

Describing all the components of an IPM system and using these to measure extent of IPM adoption are well established methodologies (Boutwell and Smith, 1981; Rajotte et al, 1987; Tette et al, 1987; Calvin et al., 1992; Cross and Dickler, 1994; McDonald and Glynn, 1994; Vandeman et al., 1994; Benbrook, et al., 1996; Coli and Hollingsworth, 1996;Cowles, 1999; Owen et al., 2000; Hollingsworth and Coli, 2001; Cornell University, 2007; IPM Institute, 2007 a; IPM Institute, 2007 b; Coli et al., 2008).

Robertson et al. (2005) used an identical approach to assess the level of adoption of integrated pest management (IPM) by South Carolina cotton growers. Zalom and colleagues at UC Davis have conducted surveys of IPM adoption in almonds on 2 different occasions approximately 10 years apart, enabling them to track changes in IPM practices used over time. (Brodt et al., 2005). Guidelines/Elements or protocols have now been developed for a wide array of crops/sites in several states (e.g., Hawaii, Massachusetts, New Jersey, New York, and Ohio).

Although many possible survey methodologies can be used, the Project Directors have had success using the Dillman Total Design Method (Dillman, 1978: Salant and Dillman, 1994) and have completed numerous surveys covering cotton, apples, strawberries, bedding plants, vegetables, greenhouse crops and wine grapes. The method is designed to reduce to the greatest

extent possible, non-coverage error, sampling error, non-response error and measurement error (Dillman, 1991).

Now that the agricultural sub group has completed a working draft of a soybean IPM Guideline for the mid-Atlantic states (**See Appendix A**), the initial building blocks are in place leading to an adoption survey and documentation of end-user behavior and condition changes consistent with national evaluation activities.

Section 1.c.v: Applicability to other regions

The proposed activities are consistent with approaches that have worked previously, and are well integrated with processes being used at the national level. As such, they are applicable to all other regions.

Section 1.d: Objectives and Anticipated Impacts

The sole objective of the project is execution, analysis, and summarization of a large-scale Dillman Method mail survey of soybean growers in Delaware, Maryland, West Virginia and Virginia. The proposed activity will support goals of the national IPM roadmap by bringing together a motivated core group of domain experts to help evaluate impacts of IPM an important crop in the region.

Summarized survey results will facilitate educational programming in concert with the Soybean IPM Elements, and each will be valuable teaching tools to reach growers, crop consultants and other field personnel. The adoption survey will also serve as a needs assessment to indicate where further research or extension emphasis is needed.

Other anticipated impacts of the project include: Improved regional coordination and cooperation among Land Grant specialists; enhanced ability of IPM Specialists and IPM consultants to encourage further adoption of IPM by demonstrating concrete, local examples of positive economic, health or environmental outcomes; enhanced ability to plan for future evaluation when designing new programs; increased opportunities for end users to present themselves as "good stewards" by documenting their use of IPM; increased public awareness of IPM benefits to society as a whole; and, enhanced policy-maker support for IPM funding.

Section 1.e.: Approach and Procedures

The P.D. and Co-P.D. will provide overall coordination for activities over a twelve-month period beginning April 1, 2010. As described in a related IPM Working Group Proposal Land Grant specialists will meet (with separate funding) in the mid-Atlantic region in late winter, 2010. At that time, participants will finalize there concept of the soybean IPM Elements and subsequently seek out feedback on the draft from producers, crop consultants and other industry representatives.

As soon as possible after release of funding (assumed to be April, 2010), a Dillman Method mail survey (see Hollingsworth and Coli, 2001) will be implemented to measure actual adoption. The method consists of a series of measure that research has show are most likely to enhance recipient participation. These include an initial postcard to notify recipients that the survey will be forthcoming, development of a "social utility argument" cover letter promising anonymity

and designed to show them why the group to which they belong (soybean growers in their state) will benefit by its completion, stamped pre-addressed return envelope, a one-week follow-up reminder postcard, and, a three week follow up cover letter with survey and return envelope.

Consistent with the methodology, care will be taken in the construction of the survey to reduce non-coverage error, sampling error, measurement error and non-response error (Dillman, 1991). Given a total population in the four participating states of approximately 5,000 commercial scale growers (>200A), a total of 880 usable surveys would be need to operate at the 95% confidence level plus or minus a sampling error of 3 % (Salant and Dillman, 1994). Although Dillman Method surveys often achieve response rates in excess of 50%, we would propose a sample of 1800 growers to achieve the desired level of confidence. The survey will ask questions about IPM tactics now in use and will ask retrospective questions in an effort to determine changes in practice use (Intermediate Term Behavioral Impacts).

Additional conference calls and email exchanges will occur as well to further the WG activities

Assuming successful acquisition of funding, the soybean specialists, with expertise and facilitation provided by the P/D. and Co-P.D., will design the adoption survey using the Soybean IPM Guideline as its basis, beginning immediately upon availability of funds (anticipated as summer, 2010). So as to not conflict with grower activities, and to allow soybean Extension staff to provide advance publicity, the survey will be deployed after fall harvest, analyzed, summarized and published in Extension media in early winter, 2010.

Section 1.f.: Evaluation Plans: Logic model in non-graphical format

Inputs needed: Time, human resources, funding for personnel, travel and telephone

Target Audiences: Land grant (1862 and 1890) research and extension faculty and staff, state Dept. of Agriculture staff, private consultants, soybean growers

Activities: Meetings, conference calls, surveys

Outputs: Large-scale impact soybean IPM Adoption assessment

Short-term knowledge impacts for growers: In the context of its use with the IPM Guideline, survey results will help mid-Atlantic soybean growers evaluate their IPM practices in comparison to cohorts in the region, increase their knowledge of lower risk IPM tactics, of the value of IPM to conserving non-target organisms, of conservation programs to protect non-target organisms, and of their knowledge of cost effectiveness and efficacy of IPM tactics such as proper pest identification, pest biology, and scouting techniques.

Short-term knowledge impacts for agricultural sub-group members: Members will increase their knowledge of how to design and use surveys to measure the extent of IPM adoption of soybean IPM in their region, and of future research and extension needs of soybean growers.

Intermediate-term behavioral impacts: Because the project will not be directly result in education of external target audiences, it is impossible to predict behavioral changes that might occur on the part of such groups. However, surveys will provide baseline data against which future practice change can be measured and may also provide some retrospective information on changes already made to date.

Long-term condition change impacts: Similarly, long-term changes in target audience condition can not be directly assessed unless grants funds are sought in subsequent years.

Over time, periodic surveys of tactic use changes and reference to third party data should provide evidence of long-term impacts of IPM.

Section 1.g.: Cooperation, Institutional Units and Key Personnel Involved

Participants represent research and extension staff from Cornell, Delaware, Maryland (U. Maryland and U. Maryland Eastern Shore), Pennsylvania, West Virginia, Virginia, and McConnell Agronomics. Participant activities are described above, but specifically involve participating in meetings, conference call and email exchanges to design a Dillman Method mail survey of a large sample of soybean growers in 4 Mid-Atlantic states.

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Appendix A. December, 2009 Draft Soybean IPM Elements

November 9, 2009 DRAFT

Mid-Atlantic States Soybean IPM Elements

The Mid-Atlantic Charts that follow contain current pest management and cultural practices for soybeans. The intention is to form a general working definition of Integrated Pest Management (IPM) on soybeans grown in the Mid-Atlantic. Although a checklist could be used for a number of purposes, the first planned use of this document is to develop a system of assessing how far along the IPM continuum growers are, and if their operation has adopted enough core practices to qualify them as IPM practitioners under these guidelines.

Please evaluate this document and its six sub headings (Educational, Pre-plant, At-plant, In-season, & Post-harvest) as a checklist of possible IPM practices. There is a point value associated with every IPM practice; the higher the number the more important the practice. Growers should only count the points of activities they perform on a crop. The goal is to accumulate 80% of the points in each of the six areas **and / or** 80% of the total points available, which is simply the sum of the scores from each section (comprehensive).

This document is intended to help growers identify areas in their production system that possess strong IPM qualities and also point out areas for improvement. Growers should attempt to incorporate the majority of these specific techniques into their usual production practices, especially in areas where they fall short of the 80% goal.

Primary Pest, Environmental and Cultural Concerns in MidAtlantic Soybean

Weeds	Diseases	Insects/mites/slugs	Nematodes	Environmental/Cultural
Annual grasses	Brown Spot	Bean Leaf Beetle	Soybean Cyst	Soil Moisture
Annual broadleaf weeds	Bud Blight	Corn Earworm	Root-knot	Soil Fertility
Perennial weeds	Charcoal Rot	Dectes Stem Borer		Soil Structure
Resistant biotypes	Downy Mildew	Grasshoppers		Soil temperature
Familiarity with major Soybean	Frog Eye	Green Cloverworm		Tillage

Herbicide Groups				
	Pod and stem blight	Mexican bean beetle		Weather Patterns
	Purple Seed Stain (Cercospora)	Slugs		
	Rust	Soybean Aphid		
		Stink bugs		
		Twospotted spider mites		

Educational IPM Considerations

Education	Activity	Points
	Producer/IPM Practitioners stays current with pest and crop production issues pre-season, during the season and post season through newsletters, winter meetings, in-season field days, classroom trainings, reading current extension publications, personal contact with professionals, etc.	25

Marginal adoption **Full adoption**

0 pts ⟶ **20 pts Goal** ⟶ **25 pts**

Pre-plant IPM Considerations

Management	Activity	Points
Fertility	Soil tests for nutrient concentrations, pH and lime requirement have been done on fields within the last 1-3 years depending on the soil type by a soil testing laboratory.	5
	Apply compost, fertilizers or manure according to soil test recommendations.	5
	Conserve organic matter with no-tillage, minimum tillage or cover crops where feasible. (depends on soil texture, soil moisture and drainage, soil temperature, pest issues and lay of the land)	5
Equipment	Application equipment is calibrated at the beginning of the season.	5

	Avoid cross contamination between production areas by cleaning equipment	5
Crop Systems	Avoid planting continuous soybeans based on multiple pest considerations.	25
	Maintain accurate records of planting dates, field locations, varieties, fertilizer and spray applications.	5
Disease	Use soybean cyst nematode resistant varieties in fields with soybean cyst nematodes, but only if used in combination with a crop rotation sequence designed to reduce nematode populations.	5
	Consider the impact of surface and subsurface drainage issues on disease and nematode management.	5
Weed	Weed control programs and herbicide rates are selected based on tillage, soil factors, knowledge about weed populations (species composition and severity) and future field use.	5
	Cultural practices are manipulated to minimize weed populations and maximize competitiveness of the crop. (examples: narrow spacing, timely planting, etc.)	10
	Rotation of herbicide mode of action over years and crops is practiced to minimize the risk of development of herbicide-resistant weed populations.	5
Insects	Consider planting time, tillage and weed management where slugs are present and where slugs and seed corn maggot have been a problem in previous seasons.	10
	Consider row spacing for potential in-season insect management considerations (example: Dectes stem borer)	5

Marginal adoption **Full adoption**

0 pts ⟶ **80 pts Goal** ⟶ **100 pts**

At-planting IPM Considerations

Management	Activity	Points
Disease	Plant only well cleaned, high quality, disease-free seed with a germination of 85 percent or greater. Consider seed treatments for seed lots that have 85 percent or better germination only if they are to be planted in cold wet soils. Treat seed if germination is between 75 and 85 percent due	15

	to fungal seed infection.	
Weed	Use weed-free crop seed to minimize spread of weeds.	10
	Using herbicide mixture with multiple modes of action	10
Insects	Consider seed treatments only where the potential for bean pod mottle virus (transmitted by the bean leaf beetle) is high and in fields where there is a history of soil insect pests (example: seed corn maggot), and tillage practices and weather conditions favor their development.	15

Marginal adoption **Full adoption**

0 pts ⟶ **40 pts Goal** ⟶ **50 pts**

In-season IPM Considerations

Management	Activity	Points
Equipment	Maintain proper equipment calibration.	10
	Select proper nozzles for proper coverage and application conditions	5
Crop Systems	Rely on scouting, economic thresholds, crop and environmental conditions to determine treatment needs.	15
	Keep records of pest and beneficial populations, pesticide applications, cultural pest management practices, and biological control techniques used.	10
	Consider the impact on the environment, natural enemies and end user quality requirements when making pest management decisions.	10
Insect	**Choose one of the following three statements that best describe the type of field monitoring.**	---
	Fields are monitored for insect/mite/slug problems on a weekly basis from plant emergence through plant senescence	15
	Field are monitored for insect/mite/slug problems based on IPM calendars which indicate when pests are likely to attack	10
	Fields are monitored for insect/mite/slug problems as a result of information in newsletters and in-season pest alerts	5
Nematode	Fields are sampled for nematodes when symptoms appear in the crop.	15
Disease	**Choose one of the following three statements that best**	---

	describe the type of field monitoring.	
	Fields are monitored for diseases on a weekly basis from plant emergence through plant senescence	15
	Fields for diseases based on IPM calendars which indicate when pests are likely to attack.	10
	Fields are monitored for diseases as a result of information in newsletters and in-season pest alerts	5
Weed	**Choose one of the following two statements that best describe the type of field monitoring.**	---
	Fields are scouted weekly from seedling stage to canopy closure for weeds. The weed species, location and severity of the weeds are recorded and used to make management decisions in-season and for the next year.	15
	Fields are scouted for weeds at seedling stage and just before canopy closure. The weed species, location and severity of the weeds are recorded and used to make management decisions in-season and for the next year.	5
Pest Management		
	Insect controls decisions are based on the use of economic thresholds that vary with crop value, control costs, market quality requirements, environmental and human impacts.	15
	Weeds management decisions consider the role weeds play as hosts for insects, mites and slugs.	5
	Weeds management decisions consider the role weeds play as hosts for diseases and nematodes.	5
	Herbicide are used in post-emergence programs are minimized through better timing of application (when weeds are small and actively growing) and cultural practices.	5
	If sequential applications are required, employ different modes of action when available.	5
	The need for spot or rescue herbicide treatments is based on potential yield loss and potential increase in weed seed bank.	5
	Cultivation is minimized through better timing of herbicides (when weeds are small) to avoid soil degradation.	5

Marginal adoption **Full adoption**

0 pts → **120 pts** → **150 pts**

Goal

Post-Harvest IPM Considerations

Management	Activity	Points
Weed	Use spot treatments of herbicides for perennial weed management	10
	Establish cover crops for weed and or nematode suppression and to scavenge leachable nitrates and other nutrients. Keep field history of disease and nematodes in mind when choosing cover crop.	30
Nematodes	Collect samples for nematode analysis following nematode diagnostic laboratory sampling procedures.	10

Marginal adoption **Full adoption**

0 pts → **40 pts** → **50 pts**

Goal

Comprehensive IPM Score

(Add scores of previous 6 sections)

Marginal adoption **Full adoption**

0 pts → **300 pts** → **375 pts**

Goal