

## **Development of a Region-wide Strategic Pest Management Plan for Sweet Corn in the Northeastern U.S.**

**Submitted to the Northeastern IPM Center Partnership Grants Program**

**By the Vegetable IPM Working Group  
Ruth V. Hazzard, Project Director  
January 15, 2004**

**Project Summary.** The Northeastern IPM Vegetable Working Group proposes to develop a region-wide Pest Management Strategic Plan for sweet corn. Sweet corn comprises approximately 40% of vegetable crop acreage and is important to vegetable producers in every state in the Northeast. Pests and pest management concerns in sweet corn are similar throughout the region, and pose serious challenges to producers. Despite the presence of sweet corn IPM programs in many states, sweet corn production depends heavily upon many insecticides and herbicides that are targeted for restriction under FQPA. Sweet corn is the most likely candidate among vegetable crops for widespread adoption of genetically-modified crops for IPM purposes, a prospect which raises far-ranging issues for producers, distributors, consumers, and regulators. Sweet corn is also ranked high in importance to the diet of children. The migratory characteristics of some of the most important insect pests of sweet corn necessitate region-wide communication and cooperation. A focused effort among all northeastern states to collaborate on setting priorities for development of improved sweet corn IPM practices and programs will have the widest benefits to producers, consumers and the environment.

At its 2003 meeting the Vegetable IPM Commodity Working Group set this project as its major goal for the coming year. Funding will enable the CWG to hire staff to coordinate the project and to bring growers and agricultural professionals from the region together for a meeting. We will collaborate with the New England and Pennsylvania Information Network Projects, who will be conducting pest management surveys and preparing crop profiles for sweet corn during the same period. The Penn State Pest Management Information Center director will prepare the preliminary and final documents for the PMSP. The outcome will be a comprehensive Pest Management Strategic Plan (PMSP), which will guide the research and implementation of more advanced integrated pest management systems in sweet corn throughout the region. The project will also lay the groundwork for further region-wide collaboration to address Vegetable IPM priorities.

Objectives for the project are based on the PMSP development process:

*Objective #1: Research and prepare a draft crop profile and documentation for PMSP meeting.*

*Objective #2: Hold a 2-day meeting of a representative, regional sweet corn stakeholder group, to provide input into the PMSP.*

*Objective #3: Develop, review and publish the regional sweet corn crop profile and PMSP.*

*Objective #4: Disseminate and publicize the regional sweet corn crop profile and PMSP.*

This multi-state project will serve the long-term goals for IPM in the region, to i) improve the level of understanding and adoption of IPM among vegetable growers; (ii) develop more

advanced and sustainable IPM systems; (iii) foster collaboration throughout the region in development and implementation of IPM; and, (iii) enhance the productivity and competitiveness of the region's agricultural production system through the advancement of sustainable IPM practice.

This proposal requests funding from the Center's IPM Partnership Grants under two project types: the *IPM Tactics Surveys, Crop Profiles, and Pest Management Strategic Plans (PMSPs)*, and the *IPM Working Group (IWG) Priorities Competitive Fund*. The total funding request for this proposal is \$\$ **31,698.44**. If approved, the project will begin immediately thereafter, and is expected to be completed by October 30, 2005.

#### **D. Introduction & Literature Review.**

The Northeast Vegetable IPM Working Group (VegIWG) was established through the NEIPMC and was carefully selected to represent the diversity of growers, consultants, University and state or federal agency professionals, and environmental groups across the Northeast Region (see Attachment A, membership list). At its first meeting in March of 2002, the Vegetable IPM Working Group set in motion a planning process to identify and prioritize projects for the benefit of the region as a whole. Its first objective, to construct a database of all vegetable IPM resources in the region, has been funded and is currently underway. The group's second priority was to develop a regional Pest Management Strategic Plan for one vegetable crop.

The following criteria were established for choosing which vegetable crop would be suitable:

- Grown region-wide
- Losing control materials.
- Limited recent research base
- Used in both fresh and processing markets.
- No overlap with existing PMSP plans.
- Rising star crop, i.e. highly popular to grow.
- High number of growers and acreage in production.
- Already has one or more crop profiles.

At its second meeting in November of 2003, the group renewed its commitment to a regional PMSP and reviewed the major vegetable crops (sweet corn, pepper, tomato, potato, cucurbits, brassicas) using these criteria. Sweet corn scored the highest. While there are five state crop profiles for sweet corn in the region (dating from 1999-2002), there is no PMSP completed or in progress. Although researchers have identified some advanced IPM techniques that involve low-risk pesticides, biological or cultural controls, these do not address all key pest problems and require further work to be cost-effective on a wide scale.

In the groups' 2004 work plan, obtaining funding for and completing a regional sweet corn PMSP is the major new project (see Attachment B, *2004 work plan for the NE IPM Vegetable Working Group*). The process of bringing this group together will strengthen the Vegetable Working Group and its networking activity and visibility in the region. The development of a regional PMSP will support the broader vision of advancing IPM in the region while building a strategic plan that is specific to sweet corn.

PMSPs serve as information and planning tools that form the basis for decisions about future research and implementation of IPM in the region, and in U.S. agriculture. The existing sweet corn crop profiles need to be compiled to bring together existing data about crop acreage and production practices, key pests and typical pest management practices and pesticides used. The PMSP will build on this information platform, to identify key areas where current practices pose a high risk to environmental or human health, do not adequately manage important pests, or involve chemicals that are likely to be lost under FQPA. Because it draws upon the field experience of farmers and consultants from the region, the PMSP represents the voice of key stakeholders. The goal of this PMSP will also be to assess barriers to adoption of current IPM practices, and why alternative practices (including currently registered pesticides, cultural or biological controls) may not have been adopted. Possible reasons may include regulatory controls, cost, efficacy, pesticide resistance, impact on quality or yield, lack of knowledge and training on the part of farmers, or lack of available field consultants or infrastructure to use and deliver IPM. This PMSP will also identify where the greatest needs are for new alternative practices or IPM resources that will expand the practical application of IPM in the field and develop viable lower-risk alternatives that will have a positive impact on current production systems.

The value of the PMSP process is the strength of input that comes from a diverse group of growers and others with field knowledge of the crop. This input is gained during face-to-face interaction, which allows the group to weigh issues, listen to each other, and reach decisions together. Given importance of sweet corn in our region, along with the diversity of our farms and our geography, accomplishing this on a regional basis is both a challenging and an exciting opportunity. The Vegetable Working Group believes it is uniquely positioned to provide leadership in accomplishing this objective.

Sweet corn is one of the most important vegetable crops produced in the Northeast, in terms of acreage, crop value and number of producers. Thirty seven percent of all acreage in vegetables is devoted to sweet corn, a total of 140,160 acres according to the 1997 Census of Agriculture (USDA/NASS 1998; see also Attachment C, *1997 Census of Agriculture Data for Vegetable and Sweet Corn Production in the Northeast*). Over 7,000 farmers in the Northeast (56% of vegetable farmers) grow sweet corn (1997 Census of Agriculture). Fresh market and processing sweet corn are produced for local, regional, national and international markets. The proportion of acreage devoted to fresh market wholesale and retail and to processing varies among states (Attachment D, *Markets of sweet corn growers in seven Northeastern states*). Based upon survey data from seven states in the region (ME, MA, CT, NJ, PA, DE, & MD; Hazzard et al 1998) and from New York State (Stivers 1999), we estimate that 65% of the crop is grown for fresh market (about two thirds of that in direct retail sales) and 35% for processing. Crop value estimates range from \$400 for processing to \$5000 for retail direct sales in urban and suburban markets (Stivers 1999, Whitney 2000, Christensen 2000). Putting all this together, we calculate an average crop value of \$2100 per acre and total crop value of \$294 million region-wide. Sweet corn plays a key role in vegetable production and marketing in every state in the region, from Maine to West Virginia.

A wide variety of insects attack the crop, causing losses in yield as well as ear quality. The complex of caterpillar pests that cause direct damage to ears (corn earworm, European corn borer, and fall armyworm) have been the focus of IPM monitoring systems, state and regional pest alerts, and research program since the beginning of sweet corn IPM programs in the 1980's

to the present. These pests continue to threaten ear quality every year throughout the region and require significant pesticide inputs in the crop. Ear quality is critical, especially in the fresh market wholesale business. Wholesale buyers of sweet corn can reject entire shipments if damage levels are as low as 10%. (Stivers, 1999). IPM programs for sweet corn have been in place since the early 1980s in some states, and the mid 1990's in others. Sweet corn IPM has a well-documented track record of reducing insecticide inputs in the crop (Adams et al, 1990) and many sweet corn producers throughout the region use sound integrated pest management practices in managing insects and other pests. However, adoption of IPM practices is limited by a number of factors (Coli et al 1998, Hollingsworth et al 1997) and pesticide use remains high, especially herbicides and insecticides. (see Attachment E, *Northeast IPM Vegetable Working Group priorities for pest control, from November 2004 meeting*).

While a relatively large number of insecticides are registered for use, organophosphates remain important tools for resistance management and/or control for pests such as seed corn maggot, flea beetles, and aphids. Weeds are also major pests of sweet corn and herbicides are used in >90% of the acreage. For the key caterpillar pests, carbamates and synthetic pyrethroids are essential tools that are used throughout the region. Without the registration of new, effective materials to replace them, the loss of chlorpyrifos, diazinon, terbufos, atrazine, alachlor, metolachlor, bentazon, and propiconazole, methomyl, or lambda-cyhalothrin would have significant impacts on production and profitability (Stivers 1999, New England Vegetable Management Guide 2004-2005).

There is precedence for regional collaboration in research and delivery of IPM programs and publications. A Northeast sweet corn production manual (Adams & Clark, 1995) has been published, and pest alerts are broadcast region-wide through the Pest Watch website based at Penn State ([www.pestwatch.psu.edu/](http://www.pestwatch.psu.edu/)). Because of the similarity in pest complex throughout the region, migration of some of the key insect pests from southern regions, and the critical need for timely in-season monitoring of pests, this crop lends itself to regional collaboration.

With the exception of rust and seed decay, sweet corn has relatively few disease problems relative to other vegetables; however, the impact of these, especially rust, on yield needs to be further evaluated (see Attachment E, *Northeast IPM Vegetable Working Group priorities for pest control, from November 2004 meeting*). Because it uses high acreage and is not susceptible to the same diseases as most other vegetable crops, sweet corn plays an important role in crop rotation strategies on vegetable farms.

Under the Food Quality Protection Act of 1996, the EPA is required to evaluate children's exposure to pesticide residues in and on foods they most commonly consume. Infants and children may be especially sensitive to health risks posed by pesticides given that they eat and drink more than adults in relation to their body weight possibly increasing their exposure to pesticides in food and water ([www.epa.gov/pesticides/food/pest/.htm](http://www.epa.gov/pesticides/food/pest/.htm)). On the EPA's list of priority crops for review and use data under FQPA, based on their importance in the diets of children, corn is listed as #10 out of the 20 foods on the list (Difonzo, C. 1997).

Genetically modified sweet corn, expressing Bt for protection from certain insect pests, could play an important role in the northeastern IPM programs. However, there are a number of key issues associated with the use of GMO's that must be addressed. Control of genetic property rights, the potential for cross-pollination of GMO with non-GMO plants (especially organic sweet corn) and consumer concerns with health and environmental risks of GMOs are issues that

should be included in the of the identification and development of region-wide IPM strategies (Teisl et al 2002). It is essential that stakeholders develop IPM approaches that address the potential use of GMO sweet corn.

Five states in the region have completed crop profiles for sweet corn: Delaware (Whitney, 2000), West Virginia (2000), New York State (Stivers 1999), Maryland (1999), and Pennsylvania (1997). At least one of these (PA) was based upon a pesticide use survey. Two surveys were conducted Projects regarding sweet corn pest management practices and needs, under the IPM Planning Grant Phase I. One survey focused only on sweet corn and was conducted in 7 states (Hazzard et al, Coli et al 1998, Hollingsworth et al 1997), and the other surveyed diversified vegetable farms in PA, NJ and NYS (Hoffman et al). A more recent survey examined measures of adoption and the economic and environmental effects of sweet corn IPM in West Virginia and Massachusetts (Beddow 2000). However, no PMSP has been completed for sweet corn in any state in the region. If funded, the Penn State University Pest Management Information Center will prepare a crop profile for sweet corn, and the New England Pest Management Network will conduct a new pesticide use survey and report in 2004. All of this information will be used in developing the PMSP. In purpose, staff and timing, these projects will be coordinated and integrated with each other (see Attachments F and G).

### **E. Project Objectives**

The following objectives reflect the step-by-step process of creating a regional PMSP for sweet corn.

*Objective #1: Research and prepare a draft crop profile and documentation for PMSP meeting.*

*Objective #2: Hold a 2-day meeting of a representative, regional sweet corn stakeholder group, to provide input into the PMSP.*

*Objective #3: Develop, review and publish the regional sweet corn crop profile and PMSP.*

*Objective #4: Disseminate and publicize the regional sweet corn crop profile and PMSP to a broad range of stakeholders.*

Because the project is regional in scope, is being initiated and led by the Vegetable Commodity Working Group and will involve substantial interaction with members of that group, the funding type “*IPM Working Group (IWG) Priorities Competitive Fund*” is appropriate. However, since the project focus is a PMSP, it fits into “*IPM Tactics Surveys, Crop Profiles, and Pest Management Strategic Plans (PMSPs)*”. The project and its budget do not lend themselves readily to separation into sections according to these project types. Hence, we will ask the reviewers to allocate from the two funding sources as they deem appropriate.

**F. Procedures.** The following methods and procedures will be used to meet stated objectives:

*Objective #1: research and prepare a draft crop profile and documentation for PMSP meeting.* Kerry Richards of the Pennsylvania State University will take primary responsibility for this work, with support from the VWG leaders and members. This collaborative arrangement was pursued by the VWG given Kerry's current role as manager of the state's Pest Management Information Center, her previous work on a PMSP for mushrooms, and her willingness to

participate in this multi-state project. (Attachment #G, Letter of Support). The proposed work includes the development of a draft crop-profile for sweet-corn in support of the PMSP, as well as the development of a PMSP working draft and the database of pests, pesticides and practices that will be discussed at the meeting. Two concurrent Pest Management Information Centers/Network Projects will, if funded, will contribute new information in support of these documents. One is a sweet corn crop profile for Pennsylvania which will be led by Kerry Richards and the Penn State Pest Management Information Center. The other is a sweet corn pest management survey and report, led by Natalia Clifton under the auspices of the New England Pest Management Network (See Attachment F, Letter of Support). Depending on the time of completion, this information will be incorporated either into the preliminary draft or the final document for the regional sweet corn PMSP. The draft will be reviewed by the VWG members at a fall meeting, in advance of the stakeholder PMSP meeting.

*Objective #2: hold a 2-day meeting of a representative, regional sweet corn stakeholder group, to provide input into PMSP.* The PMSP roadmap provides opportunity for regional stakeholders to voice their opinions on the current crop/pest management status and the future directions and priorities expressed in the PMSP. Farmers and other stakeholders will be selected to ensure geographical representation of the 13 states as well as to represent the diversity in farms and farming practices. We will draw upon the knowledge of VWG members and of other contacts in each state to select members of the core group. Given the size of the constituency we seek to represent, this group will be large. We are budgeting for a total attendance of 40 at the meeting, including staff. The cost of bringing this group together for an overnight meeting is the largest component of the budget. We plan to hold this meeting in December 2004 in Albany, NY. We will use the meeting to address not only pesticide and pest management issues relevant to FQPA and reduced risk IPM, but also to gain insight into the barriers to use of IPM and how they might be overcome. These questions are high on the list of concerns of the Vegetable WG, because they are key to the actual use of IPM techniques.

This part of the project will be coordinated by Natalia Clifton of University of Massachusetts Pesticides Program. Her responsibilities will include coordinating the process of forming the core group, arranging all meeting logistics, and handling expenses include travel reimbursements. She will also coordinate communication among all parties in the project, which is an important role given the ambitious geographical scope of the project and the number of people and groups involved. Facilitation of the meeting will be accomplished through a third collaborative arrangement with the leadership of the NE IPM Center- John Ayers (Penn State/Center Director) and Jim Van Kirk (Cornell Univ./Center coordinator), who have agreed to play this role.

*Objective #3: Develop, review and publish the regional sweet corn crop profile and PMSP.* The PMSP working draft will be revised to incorporate the results of the regional sweet corn stakeholder meeting and updated crop profile information from the PA and New England Pest Management Information Centers. This document will be completed by Kerry Richards as specified under the Statement of Work (Attachment # G) and will be circulated for comment to the attendees of the meeting and the members of the Vegetable Working Group and to Vegetable Extension personnel who are involved with sweet corn IPM throughout the region. An evaluation tool (questionnaire) will be developed to structure and organize constructive comments for the final revision. Final edits will integrate this feedback.

(i) *Objective #4: Disseminate and publicize the regional sweet corn crop profile and PMSP.* A copy of the final document will be made available to all members of the sweet corn stakeholder group, the Vegetable WG, the Center, and the EPA. The USDA and other traditional stakeholders (otherwise known as “insiders”, e.g., grower groups, government agencies, universities, crop consultants, IPM state coordinators) will have access to the document through the Center website as well as state web-sites and newsletters. In an effort to further raise the visibility of the recommendations of the PMSP, a press release will be distributed to non-traditional stakeholder groups (e.g., “outsiders”), including environmental organizations, food distributors, marketing organizations (e.g., The Food Alliance), and select members of the media (e.g., food writers). In addition, members of the Vegetable Working Group will present the findings at grower meetings, grower associations, and through statewide publications in their respective states.

## G. Literature Cited

- Adams, R. G. & J. C. Clark, editors. 1995. Northeast sweet corn production and integrated pest management manual. University of Connecticut Coop. Extension syst. Bull. 95-18. 120pp
- Adams, R. G., T. J. Boucher, N. L. Gauthier. 1990. Impacts of the University of Connecticut Integrated Pest Management Program for Sweet Corn 1984-1987.
- Beddow, J. M. 2000. Protocols for the Assessment of Economic and Environmental Effects of Integrated Pest Management Programs, Thesis submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of Master of Science in Agricultural and Applied Economics
- Christensen, R., M. Sciabarrasi, J. Howell, A. Miller, and R. Hazzard. New England Crop Production Budgets: Sweet corn production budget. University of Massachusetts Extension Publication. First issued 1995; updated 2000.
- Whitney, S. P.; J. Whalen, M. VanGessel, B. Mulrooney. 2000. Crop Profile for Corn (Sweet) in Delaware. <http://pestdata.ncsu.edu/cropprofiles/docs/DEcorn-sweet.html>
- Hazzard, R.V., W. M. Coli, R. Szala, M. Christie, J. Lerner, J. Boucher, G. Dively, S. Fleischer, D. Handley, J. Dill, D. Probst, J. Whalen. IPM adoption and priority needs of sweet corn growers in the Northeast. IPM Planning Grant Final Report, 1998. Northeast Pest Management Center
- Coli, W. M., M. Christie, D. Cooley, R. Hazzard, D. Ferro, T. Smith, S. Schloemann, R. Szala. 1998. Assessing grower adoption of integrated pest management (IPM) systems in the Northeastern USA, and identification of future research, training and extension needs. IPM Planning Grant Final Report, Northeast Pest Management Center.
- Difonzo, Chris. The Food Quality Protection Act of 1996: Michigan State U. Pesticide Education Program, slide set (<http://www.pested.msu.edu/BullSlideNews/FQPA/index.html>)
- Hoffman, M, C Petztoldt, D. Prstoak, S. Fleischer, S. Spangler, T. Zitter, S. Reiners, R. Bellinder, L Eckhardt, M Hetherington, and A. Shelton. 1997. Integrated pest management for diversified fresh market vegetable producers in New Jersey, New York and Pennsylvania: A phase I integrated pest management initiative project report. Cornell University IPM Program. 109pp.

Hollingsworth, C.S., W. M. Coli and B. A. Szala. 1997. Assessment of Sweet corn IPM adoption in New England and Mid-Atlantic states. Poster presentation, Annual meeting of the Entomological Society of American, December 1997, Nashville, TN.

Stivers, Lee, 1999. Crop Profile: Sweet Corn in New York.  
<http://pestdata.ncsu.edu/cropprofiles/docs/nycorn-sweet.html>

Teisl, M. F., L. Halverson, K. O'Brien, B. Roe, N. Ross, and M. Vayda. 2002. Designing a labeling policy for genetically modified food: results of focus group research. Maine Agric. And Forest Expt. Stn. Tech. Bull. 185. 56 pp.

USDA, 1998. 1997 Census of Agriculture, Geographical Area Series, Volume I; Table 29: Acres harvested for all vegetables and sweet corn; by state.

**H. Probable Duration.** If approved, the planned duration of the project is expected to be 18 months from the start-date (i.e., immediately after resources are made available). The expected breakdown of this timeline is as follows:

- (1)Objective #1: May 2004- November 2004;
- (2)Objective #2: May 2004 – January 2005 (PMSP meeting in December 2004)
- (3)Objective #3: December 2004 – September 2005
- (4) Objective #4: September 2005 - ongoing.

## **I. Evaluation Plans**

### **Ongoing evaluation of the progress.**

Throughout the length of the project, working group leaders and other VWG members will remain active in support of PMSP development. To ensure oversight and progress evaluation, a procedure will be put in place that will include: (a) monthly conference calls as check-ins, and/or opportunity for further discussion, among key personnel; (b) a meeting of the Vegetable IWG in November 2004, prior to the stakeholder PMSP meeting, which will include review of the preliminary PMSP document. The latter will also serve as the working group's annual meeting. It will be the responsibility of the project leader to ensure that the project stays on track.

**Evaluation of the PMSP document** will include several phases of review, including:

- 1) distribution to Vegetable working group members and stakeholders who attended the meeting, NE IPM Center leadership.
- 2) distribution to Vegetable Extension specialists and agents in the region who have expertise in sweet corn crop and pest management, vegetable grower associations, and non-profit agricultural service organizations. A database of these people is being prepared by the Vegetable IWG.

An evaluation tool (questionnaire) will be developed to structure and organize constructive comments for the final revision. We anticipate there will be variation among states, maybe even among regions, within states, in the priorities identified by stakeholders so we plan to incorporate

as many region-wide recommendations and priorities as possible while maintaining enough flexibility to include state-specific or area-specific outcomes where appropriate.

**Evaluation of the impact of the PMSP.** This will extend beyond the life of this grant-funded project, but not beyond the life of the Vegetable Working Group. It will be our task to help ensure that the priorities and directions established by the PMSP receive attention and resources and are disseminated to audiences that will make effective use of the information.

#### **J. Cooperation & Institutional Units Involved:**

Unit #1: NE IPM Center's Vegetable IPM Working Group. The role of this group will be to coordinate the project, review the preliminary document, participate in selection of PMSP stakeholder group, and review PMSP document. Leadership will be provided by Ruth Hazzard of University of Massachusetts and Iliana Rivas, co-leaders of the Vegetable IWG.

Unit #2: Pennsylvania State University Pest Management Information Center : Kerry Richards will prepare the preliminary and final PMSP document; and will prepare a sweet corn crop profile for PA; funding will be part of the Penn State Pest Management Information Center .

Unit #3: NE IPM Center: John Ayers, and Jim Van Kirk will facilitate the PMSP meeting.

Unit #4: New England Pest Management Network: A pest management survey will be conducted for sweet corn under leadership of Natalia Clifton with funding from the New England Pest Management Network.

Other network project leaders (New Jersey, New York, and Maryland) have expressed willingness to cooperate with this project, and will be invited to participate in the PMSP review and dissemination.

#### **K. Key Personnel**

Ruth Hazzard: Project Leader. Will coordinate all aspects of the project. (See Attachment J, CV)

Kerry Richards: Writer of the PMSP. (See Procedures for details)

Natalia Clifton: Coordinator of the PMSP stakeholder meeting. (See Procedures for details)

#### **L. Collaborative Arrangements**

NOTE: none of these collaborative arrangements require subcontracts. They are non-budgetary agreements for collaborative work; the funds required are included in the budgets of the respective units/projects.

1. Penn State Pest Management Information Center : A collaborative arrangement has been made with Kerry Richards of the University of Pennsylvania who is currently the manager of the State Pest Management Information Center . (Attachment G, letter of support) to do the research and writing phase of the PMSP for sweet corn.
2. Northeast IPM: A third collaborative arrangement has been made with Center Director (John Ayers) and Center Coordinator (Jim Van Kirk) to facilitate the stakeholder meeting scheduled for December 2004.

## Development of a Region-wide Strategic Pest Management Plan for Sweet Corn

3. New England Network Center. A sweet corn pesticide use/pest management survey will be conducted of all New England states. The report and data will be available for use in the sweet corn PMSP.