Title:	University of Massachusetts, Amherst Integrated Pest Management Program

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Program Code: QQIPM **Program Name:** Extension Integrated Pest Management -

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Non-Technical Summary

The UMass Extension IPM Program has a thirty-year history of regional leadership in IPM Research and Extension. Based on faculty and professional FTEs committed to IPM, and the number of regional collaborations we lead, UMass is the largest IPM program in New England. IPM activities address stakeholder-identified needs for high value, high input, or intensively managed crops, conservation partnerships, recreational lands, green industries (consumer/urban), diagnostics, and pests of housing and other structures. All programming is multi-disciplinary and focused on tactics that represent alternatives to conventional pesticide use. Demonstration and training activities support National IPM Roadmap goals of improved economics, reduced human health risks and minimizing adverse environmental effects from pests / pesticides. Diagnostic services are provided statewide and linked to the NPDN by a well-equipped laboratory supported by two diagnostic professionals. We expect the following outcomes. Specialty Crops: Enhanced profitability through use of cost-effective IPM tactics; Reduced potential human health risks by eliminating or reducing use of higher risk pest management practices or increased use of lower risk ones; Minimized adverse environmental impact particularly on non-target organisms including pollinators and natural enemies of insect pests. Conservation Partnerships: Outcomes will include greater, more widespread knowledge and understanding of IPM among growers and NRCS staff; increased adoption of IPM practices; increased numbers of EQIP applications by growers, increased levels of IPM use within current EQIP contracts, increased use of low-risk pesticides and biological controls, lower levels of use of high-risk pesticides, increased crop quality and yield. These outcomes will result in long-term benefits to the environment, especially protection of water quality in and near farm fields. Adoption of lower risk pesticides and tactics and/or reduction in use of higher risk materials will also result in lower human health risk on the part of farm workers and pesticide applicators as well as reduction in off-site movement of riskier pesticides. Bedbugs: This and the following project address the overarching IPM goal of reducing potential human health risks from pests and pest management practices. This project will provide training and education to an underserved clientele regarding a topic that is of critical importance to the community. While bed bug IPM technology is not perfected at this time, our project can improve the quality of life to hundreds of individuals, by improving the success rate of bed bug control and by reducing their spread in the community. Further, it will reduce the exposure of inner city residences to improperly selected and applied pesticides. Ticks: Ultimately, we would hope that our program has an impact on the incidence of tick-borne diseases in the Northeast, and on increased adoption of personal protection and self-examination for ticks. Through the tick assessment clinic, people will use information to determine a course of action for the treatment of tick-borne diseases.

Accomplishments

Major goals of the project

Through provision of research-based knowledge to end users, the overarching goal of the Massachusetts Extension IPM Program is to insure high rates of IPM adoption by agricultural producers, landscape managers, and multi-unit housing managers. By so doing, we anticipate achieving improved economic profitability, reduced human health risk, and improved environmental quality, goals described in the National IPM Roadmap. IPM Program Coordination: to ensure that multi-disciplinary Extension Faculty and professional staff are working together in-state as a functioning team that addresses stakeholder-identified needs, conducting quality applied research, extending the University's research base to target audiences, competing for extramural grants, and documenting impacts of the programming provided. IPM Implementation in Specialty Crops: 1) Develop a comprehensive, multi-disciplinary approach to IPM education and implementation for diversified farm operations through a combination of novel (e.g., Comprehensive IPM Information Portal) and established (e.g., on-farm meetings, publications) methods to include participation in pest forecasting network (NEWA), 2) address unmet critical needs for identified crops through traditional and participatory research and demonstration, 3) to integrate project primary and secondary emphasis areas (especially Conservation Partnerships). IPM Coordination within Conservation Partnerships:1) Increase the number of conventional or organic vegetable and fruit farms, or acreage, enrolled in EQIP contracts that include the Pest Management Conservation Practice Standard (595), 2) expand use of IPM on EQIP-enrolled vegetable and fruit farms, as measured by higher scores in the Massachusetts Crop-specific IPM Guidelines, and 3) integrate the Pest Management with other NRCS conservation practices on participating farms, to achieve protection of water and soil resources, beneficial organisms and human health. IPM Training and Implementation in Housing: The primary goal of this project is to improve the health and quality of life of people in living in urban areas of Massachusetts. The project also concerns the significant economic burden on urban dwellers and the community organizations, which serve them as well as the economic impacts on travel/hotel industry and, increasingly, the public at large. IPM in Public Health: The primary goal of this project is to improve the health and quality of life of people living in Massachusetts and the tick-infested regions of the Northeast. Pathogen infected ticks are common in the Northeast. Our program seeks to teach people about appropriate tick mitigation and risk reduction in the landscape and on their persons, reducing risks from both Lyme disease (and other tick-borne diseases) and inappropriate pesticide practices. They will use information from the tick diagnostic clinic to make appropriate decisions about their health and will avoid unnecessary antibiotic use.

What was accomplished under these goals?

Primary Area, Specialty Crops IPM

Mentor farms were the main vehicle through which the Project personnel worked to understand, improve and implement advanced IPM on diversified fruit and vegetable farms. Mentorship went both ways between Extension and farmers; timely field-based information flowed from these farms to hundreds of others via Extension newsletters and pest alerts, and face to face at on-farm meetings. All mentor farms had high on-farm crop diversity and grew numerous vegetable and fruit crops. Farms varied in the age and size of the farm, types of markets, location, approach to pest management (conventional or organic) and level of previous experience with IPM. Each farmer set his/her own unique IPM goals for specific crops and pests at a face-to-face pre-season meeting with Extension. On-farm scouting was performed biweekly with farm and Extension staff followed by discussion of best management decisions and written recommendations from Extension. Technical support included disease diagnostics, soil and tissue testing, traps for monitoring, and NEWA-linked weather station on or near the farm. Six mentor farms participated in 2011, expanding to 13 per year in 2012 and 2013. Farms 'graduated' from the project after 2 or 3 years making way for new mentor farms. Farms were expected to share their farm and knowledge through on-farm meetings; in 2013 six farms hosted meetings attended by over 200 people.

Mentor Grower Evaluation Data

To evaluate growers' increased knowledge and use of advanced IPM in 2013, we used **three general categories of IPM practice (IPM Action Codes):**

AC1) **PEST** scouting, trapping, monitoring, forecasting, and identification, including weather data;
AC2) **CULTURAL** practices to maintain crop health and prevent pest damage, including biological controls;
AC3) **PESTICIDE** practices such as spraying by thresholds, using reduced risk products, and rotating chemistries to prevent resistance.

Throughout the growing season in 2013, detailed timelines were kept for each Mentor Farmer that chronicled the observations and recommended actions made at each farm visit. The implementation and success of each recommended action was recorded in structured post-season interviews with mentor growers. On the 13 mentor farms, 346 recommended actions on 5 fruit and 15 vegetable crop groups were documented and analyzed. About one third of these recommendations fell within each of the three action codes (AC) described in goals above.

The percent responses were as follows:

Action was taken/followed by the grower as recommended or with some modification.

AC 1 PEST, 84%;	AC2 CULTURAL, 74%;	AC3 PESTICIDE 76%	AVG 80%

Action was moderately or largely successful.

AC 1 PEST, 97%;	AC2 CULTURAL, 59%;	AC3 PESTICIDE 72%	AVG 81%

The farmer would do the recommended action again next year.

AC 1 PEST, 82%;	AC2 CULTURAL, 58%;	AC3 PESTICIDE 77%	AVG 63%

In addition we did whole-season evaluation for 11 crops on 10 farms (n=45); responses are as follows:
Were you able to reduce, limit, or change your pesticide use? 80% yes
Were you able to reduce or limit the damage or loss from diseases and pests? 75% yes
Were you able to improve crop quality? 71% yes
Were you able to improve crop yield? 51% yes
Were you able to reduce on-farm inputs (e.g. water, fertilizer, tillage, fuel)? 20% yes
Results indicate that, with direct on-farm IPM support, growers were able to improve their crop quality using a full suite of IPM strategies on highly diversified farms, and plan to continue those practices.

Primary Area, Specialty Crops IPM:

Applied research/ Partner farms – Results and Outcomes

Cucurbits/Phytophthora capsici. Greenhouse bio-assays to test the effect of Caliente cover crop as a fumigant on a susceptible host (pepper) in biofumigated and non-fumigated soil from the same field. Potted sols were inoculated with P capsici. Disease ratings (#plants out of 5 w/ P. capsici) were lower in Caliente (2.5) compared to oat (3.5) and sterile soil (4.2), and plant vigor ratings were higher. Growers gained knowledge of seeding, timing and incorporation methods for Caliente**.**

Brassicas/Cabbage maggot fly. Spring 2014 experiment: under high CRM pressure cyantraniliprole applied as transplant tray drench significantly reduced root damage and increased plant vigor and yield relative to all other treatments, while spinosad applied as soil drench at planting and again at peak flight was equal to industry standard chlorpyrifos and better than control. On farm trials: 1) spinosad applied to cabbage as banded drench at planting and at peak flight reduced injury compared to untreated control or drench at planting alone. 2) In cabbage and kale, where eggs exceeded threshold, cyantraniloprole as furrow drench at transplant provided complete control 3) in spring radish, chlopyrifos treatment had the lowest root injury and injury on cyantraniliprole was minor and did not render roots. Results suggest that cyantraniliprole and spinosad offer effective, reduced-risk alternatives to current organophosphates, with spinosad offering a much needed tool to organic growers.

Brassicas/flea beetle (FB). In 2013, a border trap crop of mustard and arugula followed by cash trap crop of organic bok choy (6 acres) were sprayed for FB at threshold (1 FB/plant) and protected adjacent organic kale & collards (8 acres) from exceeding threshold, saving 8 sprays and reducing total sprayed area by 46%. After this trial the grower had confidence to continue this practice in 2014. Two other farms used bok choy & Chinese cabbage beds as sprayed or unsprayed trap crop to protect beds of kale and cabbage, using the same system on a smaller scale.

Biological control in beans, pepper. The egg parasitoid Trichogramma ostriniae was released in pepper (4 releases/ farm at 120,000 wasps/A) at 4 farms in 2012 and 2 in 2013, targeting the 2nd generation European corn borer (ECB) which causes fruit damage and reduces yield of high-value ripe fruit. Non-release control plots were not feasible due to small field sizes. ECB flights were low, peaking at 14 -30 moths/week. Fruit samples (>100 per variety) were 0-5% infested with ECB. Three of 4 growers reported they will continue making releases due to low cost, ease of use, high crop value, and improved yield of colored ripe peppers. Trials of the larval parasitoid of Mexican bean beetle, Pediobius faveolatus, were conducted at 5 small farms over 3 years in ¼ to 1 acre of succession-planted snap beans, with 2-3 releases per farm. In-season impact was inconsistent; MBB was reduced in the following season on 2 farms.

Apple/apple scab. For orchards where Fall scab inoculum (PAD) was below threshold, growers delayed scab sprays by 9 days and saved 1-2 sprays. Where PAD was above threshold, growers used sanitation only. Cultural practices (leaf-chopping and urea) reduce inoculum by at least 85%. Growers have learned in depth about the disease and how to use weather based models (NEWA and Orchard Radar) to link spray timing to infection periods, increasing pesticide efficiency and efficacy.

Cranberry/cranberry fruitworm. 2011: On-station trials showed high efficacy for two diamides and one spinosyn; Altacor (chlorantraniliprole) received EPA approval for chemigation application in cranberry. 2012: 8 growers successfully tested Altacor using modified timing (50% out-of-bloom) followed by foliar spinetoram (Delegate) 10 days later; bogs with low to high egg pressure all had <3% infestation at harvest, except one that applied late. Handler restrictions and residue tolerances for US and export markets were resolved. 2013: As measured through industry survey, >90% of cranberry growers adopted the newer reduced risk insecticides targeting cranberry fruitworm. Bee-friendly products allow spray during bloom, the critical period for egg hatch. New recommendations were disseminated through Extension publications and programs.

What opportunities for training and professional development has the project provided?

Primary Area, Specialty Crops IPM: Educational Programs organized/cosponsored. From 2010 to 2012, UMass Cranberry IPM organized 14 educational programs attended by 1173 farmers and agricultural professionals, with 6 more in 2013 attended by 577. Vegetable and fruit IPM programs included 8 for fruit growers, 4 for vegetables, and 10 with a curriculum that combined vegetables and fruit, with attendance over 1,000. Of these 15 took place on commercial farms in the field. In addition, 1,400 growers were reached at the 2013 New England Vegetable and Fruit conference, a 3-day biennial program which is organized jointly by Extension programs across New England.

Secondary Area: Conservation Partnerships. Vegetable & Fruit IPM: The goal of this project was to support enrollment, planning and implementation of IPM Practice 595 on vegetable and fruit farms as part of their EQIP contracts with MA Natural Resource Conservation Service (NRCS). **Work with NRCS state and district staff:** We held two group meetings NRCS state and district staff regarding methods used to generate EQUIP contracts, IPM plans and ways of implementing plans and practices with cooperating growers. NRCS staff participated in all EIPM Advisory meetings. We interacted with the district staff regarding individual growers to develop, implement and assess their EQIP 595 IPM plans. **Assist growers with EQIP 595 IPM contracts:** We developed a reduced risk pesticide plan for vegetable growers enrolled in 595. We helped two growers develop their IPM plan for EQIP 595 contracts, to be submitted for review by NRCS staff. Two growers were asked to respond to resource concerns identified in WN-PST, associated with 'intermediate risk' from pesticides that they had been using. With the growers, we developed a plan to replace higher risk with lower risk products that would be effective against the target pests. At another farm, a new EQIP 'high level IPM' 595 contract was awarded to a mentor farm, as a result of combined farmer and UMass staff monitoring and IPM management. NRCS continued to use UMass-generated checklists which describe detailed IPM methods for specific fruit and vegetable crops to assist growers in their 595 IPM plans (checklists posted at https://extension.umass.edu/vegetable/publications/ipm-guidelines).NRCS staff reported that the specific goals and IPM methods developed by UMass in partnership with growers was very helpful in preparing EQIP contracts. Records of IPM practices helped growers receive EQIP payments, and achieve recognition for advanced IPM.
Secondary Area: Housing IPM. Bed Bugs: Training programs were tailored for the needs and of specific interest groups. Foreign language translators (especially Russian and Spanish) were used where needed. Nine training sessions on bed bug biology and management were held in 5 cities and reached a total of 135 landlords, personal care providers, and housing authority staff and tenants. These training sessions have been shown to be effective in increasing knowledge. Training sessions for personal care providers were evaluated by conducting pre- and post-tests. In pre-tests, participants scored a mean of 45%, with a range from 0 to 100%. In post-tests, participants scored 85%, with a range from 60% to 100%.
Secondary Area: Public Health IPM. Tick-Borne Disease Education: Training sessions were offered on tick identification, biology, personal protection and management in the landscape. Seven programs in 5 towns were provided to a total of 348 pest and land management professionals, vegetable control workers, and members of the public in 2012 and 2013.

How have the results been disseminated to communities of interest?

Primary Area: Specialty Crops IPM
Newsletters
Berry Notes: 2010-2014, Volume 23-26, No. 1-12. S. G. Schloemann, ed. https://extension.umass.edu/fruitadvisor/publications/berry-notes. Circulation approx 450 annually. Seasonally relevant information on production, marketing, research, and IPM including pest alerts, scouting results, and reminders for timely management activities.
IPM Berry Blast, 2011-2014. S. G. Schloemann, ed. Six to twelve issues annually. Circulation approx.. 450 annually. A periodic e-message that highlights specific, timely pest issues.
Cranberry Station Newsletter: In 1-2014, 5-7 issues/ year. Sandler, H.A., M. Sylvia, A. Averill, eds. http://www.umass.edu/cranberry/pubs/newsletter.html. Reached 327 recipients in 2013-14, primarily in MA but also national and international. Weekly IPM pest alerts were issued from May to August as a phone message and at http://www.umass.edu/cranberry/cropinfo/ipmmessage.html.
Healthy Fruit: 2010-2104. J. Clements, ed. Newsletter published weekly to 100 paid subscribers, March to October and as needed for alerts year-round, 23 issues/year. Includes pest alerts, meeting announcements, fact sheets and updates to the New England Tree Fruit Management Guide. https://extension.umass.edu/fruitadvisor/publications/healthy-fruit
Fruit Notes: Autio, W. and W. Cowgill, editors. 2010-2014. Published quarterly at the Stockbridge School of Agriculture, UMass.http://extension.umass.edu/fruitadvisor/publications/fruit-notes
Vegetable Notes, Volume 22-25, Issues 1-23, 2010-2014. R.V. Hazzard, K. Campbell-Nelson, S. Scheufele, & L. McKeag, eds. Published weekly May-September and monthly in winter, with timely pest alerts and articles to a broad spectrum of vegetable farmers state and region-wide. Email subscription list reached 1500 in 2013 and 2000 in 2014. http://extension.umass.edu/vegetable/
Survey of Vegetable and Fruit Newsletter Subscribers
The impact of vegetable and fruit newsletters and Extension educational programs on their readers was assessed in winter 2014 through an online survey. The total response was 347, of whom 255 are farmers. Seasoned farmers (>20 yr farm experience) comprised 45% of the respondents while beginning farmers (<10 years) comprised 36%; about half farm conventionally and half organically. We asked respondents to indicate which of a list of practices they have done, as a result of information provided by UMass newsletters, publications, websites or educational programs. These practices were tagged to one of five categories of IPM practice, and the % of farmers doing at least one practice in each category as follows:
1 - Pest scouting, monitoring and forecasting: 73%
2- Pest Identification: 76%
3- Maintaining optimum conditions for crop health: 70%
4- Use of cultural practices to control pests: 69%
5- Optimizing spray program: 73%

in crop health, soil quality, and environmental safety, respectively, resulting from changes in IPM practices such as proper pest id and monitoring, using cultural practices, and using chemical controls responsibly (e.g., spraying based on thresholds, using reduced-risk materials, and using rotating materials). Impact on grower and farmworker health and on consumer health was reported by 50 and 42%, respectively. Fifty-one percent reported improved profitability. Overall these responses indicate that readers are using a wide range of IPM practices and seeing environmental and economic improvements on their farms as a result.

IPM websites.
To provide a portal to IPM information on diverse commodities, our IPM website (http://extension.umass.edu/ipm) was updated to serve as a gateway to IPM information on vegetable (http://extension.umass.edu/vegetable/), fruit (http://extension.umass.edu/fruitadvisor/), cranberry (http://www.umass.edu/cranberry/index.html) and other commodity websites.

Invasive Pest IPM: Fruit/Spotted Wing Drosophila and Brown marmorated stink bug network and alert system:
Data from the statewide reporting network is gathered into a centralized web page which disseminate alerts and management updates to multiple channels automatically (email, cell phone, web page posting, facebook, etc.).
Webpages located at:
https://extension.umass.edu/fruitadvisor/brown-marmorated-stink-bug
https://extension.umass.edu/fruitadvisor/spotted-wing-drosophila
Sample Alerts:
http://extension.umass.edu/fruitadvisor/bmsb-update-week-july-7
https://extension.umass.edu/fruitadvisor/news/swd-update-week-june-9-15-2013
https://www.facebook.com/umassipmteam

Educational Presentations.
In 2013, 10 project personnel gave presentations in 20 different programs, reaching 1400 growers and agricultural service providers with project-related information. Several programs included multiple Extension presenters. A sample of titles (& presenters) includes: Native Pollinator Research, Native Pollinator Conservation, (Averill), Herbicide and Weed IPM update, Cranberry production and IPM (Sandler), Weather Stations, Range of Options and Disease Models, Updates of Tree Fruit Disease and Insect IPM (Cooley, Clements), Winter moth/new pests/ MRLs (Sylvia), BMSB Monitoring and Management for 2013 (Tuttle), IPM for Apple Maggot and Spotted Wing Drosophila (Garofalo), Spotted Wing Drosophila ID and Management Update, IPM in Diversified Berry Production (Schloemann), IPM for Brassicas (Hazzard).

Commonwealth Quality Standards.
UMass project participants worked with the MA Dept. of Agricultural Resources in 2011 to develop fruit and vegetable standards and checklists for their new Commonwealth Quality certification program, http://thecqp.com/ , based on UMass Extension Best Management Practices. Standards include soil conservation and health, IPM, worker protection, and food safety. In 2014, the program now certifies fifty vegetable and fruit farms, and provides recognition and market access for locally sourced products that are grown, harvested, and processed right here in Massachusetts using practices that are safe, sustainable and don't harm the environment. This program addresses one of the key concerns raised by our EIPM Advisory Panel, public education and marketing about the value of IPM practices. See checklists at http://ag.umass.edu/agriculture-resources/commonwealth-quality.

Secondary Area: Conservation Partnerships. Vegetable & Fruit IPM.
Publicizing NRCS EQIP programs. We published articles about NRCS programs 1-2 times per year in vegetable and fruit newsletters.
Collaborative educational programing: Specific outputs included field walks in Seekonk, Millis, Waltham, Bristol and Deerfield, MA attended by NRCS staff where they learned IPM practices pertinent to farmers holding EQIP contracts for 595 (IPM) and other conservation practices. Two soils work shops were co-hosted with NRCS in April in South Deerfield and Dighton MA where farmers, NRCS staff, and UMass staff (total attendance of 80) all learned soil conservation methods and simple assessments for soil health.

What do you plan to do during the next reporting period to accomplish the goals?

{Nothing to report}

Participants

Actual FTE's for this Reporting Period

Role	Non-Students or faculty	Students within Stuffing Roles			Computed Total by Role
		Undergraduate	Graduate	Post-Doctorate	
Scientist	1.1	0	0	0	1.1
Professional	2.3	0	0	0	2.3
Technical	2.4	0	0	0	2.4
Administrative	0	0	0	0	0
Other	0	0	0	0	0
Computed Total	5.8	0	0	0	5.8

Student Count by Classification of Instructional Programs (CIP) Code

{NO DATA ENTERED}

Target Audience

Specialty Crops (Primary): vegetable and fruit farmers including beginning and established farmers, immigrant farmers, and organic farmers; crop consultants; farm workers and interns; USDA agency personnel; non-profit organizations serving farmers.
Secondary areas: Conservation Partnerships same as above, plus NRCS agency staff; Housing – Bedbug IPM: staff of housing authorities and departments of health in central and western MA, landlords, structural pest control industry, personal care attendants, tenants, social justice advocates, home owners; IPM in Public Health (Tick Disease Assessment and Public Education): pest managers for public and private lands, general public.
The EIPM Advisory Panel for Specialty Crops (primary) and NRCS (secondary) Projects convened annually in March from 2011 to 2014 to get information about the project, offer direction and feedback and plan for the coming season. Its 15 Members represented the audience as described above including participating farmers, along with UMass Extension project personnel. Eight to 10 growers attended annually, some for 4 years.
Panel-defined needs & barriers related to IPM: Readily accessible online pest information (scouting, thresholds, biology, controls) that is timely, includes wider range of vegetable and fruit crops, and is linked to local weather; more efficacy trials under local conditions on the many new, reduced-risk pesticides; public education about IPM to support marketing for farms that use IPM; in-person IPM training and coaching during the season on pest management – another pair of eyes; resources about crop rotation and other cultural practices for crop health.
Impact/feedback from mentor & partner growers: In 2013, growers reported that their increased knowledge and use of weather stations, pest monitoring and crop scouting have helped them improve crop health, avoid crop losses and save costs. They consulted the NEWA late blight, early blight, apple scab, and fire blight models to time their preventative fungicide applications and to avoid unnecessary applications. This would not have been possible without the introduction of weather stations to their farms as part of the current EIPM grant. Monitoring for Spotted Wing Drosophila and other pests resulted in better timing of sprays and less crop loss. UMass training in related practices such as nutrient management and reduced tillage has helped growers improve crop quality, drought tolerance, and soil health. All growers unanimously agreed that the on-farm, one-on-one regular support provided by UMass staff, made possible by this grant, was invaluable. In 2014, value of biweekly visits to mentor farms was again expressed, as was the need for public education about IPM.

Products

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2011	YES

Citation

Averill, A.L. 2011. Nest location in bumble bees: effect of landscape and insecticides. American Bee Journal 151:1187-1190.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2013	YES

Citation

Cooley, D.R. and T. Green. 2013. Does increased fungicide use in eastern apples mean greater pesticide risk? An evaluation using PRiME. Phytopathology. 103 (S2):S9.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2013	YES

Citation

Sandler, H.A. 2013. Response of four cranberry varieties to delayed applications of dichlobenil. Weed Technology 27:108-112.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2012	YES

Citation

Ghantous, K.M. and H.A. Sandler. 2012. Mechanical scarification of dodder seeds with a handheld rotary tool. Weed Technology 26:485-489.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2012	YES

Citation

Ghantous, K.M., H.A. Sandler, W.R. Autio, and P. Jeranyama. 2012. Hand-held flame cultivators as a management option for woody weeds. Weed Technology 26:371-375.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2014	NO

Citation

Lesky, T.C., V. Hock, G. Chouinard, D. Cormier, K. Leahy, D. Cooley, A. Tuttle, A. Eaton, and A. Zhang. 2014. Evaluating electrophysiological and behavioral responses to volatiles for improvement of odor-baited trap tree management of Conotrachelus nenuphar (Coloptera: Curculionidae). Envir. Ent. 43(3): 753-761.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2011	NO

Citation

O'Connell, J., H.A. Sandler, L.S. Adler, and F.L. Caruso. 2011. Controlled studies further the development of practical guidelines to manage dodder (Cuscuta gronovii) in cranberry production with short-term flooding. Renewable Agriculture and Food Systems 26:269-275. http://journals.cambridge.org/repo_A84kD7as. doi:10.1017/S1742170511000184.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Published	2010	NO

Citation

Sandler, H.A. 2010. Managing Cuscuta gronovii (swamp dodder) in cranberry requires an integrated approach (invited paper). Sustainability 2:660-683. http://www.mdpi.com/2071-1050/2/2/660/. doi:10.3390/su2020660.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	NO

Citation

Ghantous, K.M., H.A. Sandler, and W. Autio. 2013. Seasonal timing and frequency of flame cultivation treatments impact dewberry control. North American Cranberry Research and Extension Workers conference, Quebec City, QC. August 25-28, 2013.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	NO

Citation

Ghantous. K.M., H.A. Sandler, and W.R. Autio. 2013. Effects of timing and frequency of flame cultivation treatments on dewberry. Joint meeting of the Weed Sci. Soc. of America and Northeast Weed Sci.Soc. Annual Meeting, Baltimore, MD. http://wssaabstracts.com/public/17/abstract-198.html.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	YES

Citation

Hazzard, R. 2013. Insects and Diseases on Brassica Crops in Proceedings of the New England Veg. & Fruit Conf., Manchester, NH, 12/17/13. http://www.newenglandvfc.org/2013_conference/proceedings2013.html

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	NO

Citation

Sandler, H.A., K.M. Ghantous, and K. DeMoranville. 2013. Efficacy of napropamide and mesotrione on new cranberry plantings. Joint Annual meeting of the Weed Sci. Soc.of America and Northeast Weed Sc. Soc., Baltimore, MD. http://wssaabstracts.com/public/17/abstract-344.html.

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2014	YES

Citation

Scheufele, S.B., Campbell-Nelson, K., McKeag, L., and R. Hazzard. 2014. Evaluation of diamide seed treatments to control cabbage root maggot (Delia radicum) in broccoli, 2014. Arthropod Management Tests. (Submitted).

Type	Status	Year Published	NIFA Support Acknowledged
Journal Articles	Submitted	2014	YES

Citation

Scheufele, S.B., Campbell-Nelson, K., McKeag, L., and R. Hazzard. 2014. Evaluation of insecticide drench treatments to control cabbage root maggot (Delia radicum) in cabbage, 2014. Arthropod Management Tests. (Submitted).

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2013	NO

Citation

Schloemann, S.G. 2013. Strawberry Insect and Disease – What to be ready for and IPM practices. in Proceedings of the New England Veg. & Fruit Conf., Manchester, NH, Brassica session, 12/ 17/13. http://www.newenglandvfc.org/2013_conference/proceedings2013.html

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2012	NO

Citation

Sandler, H.A. and K.M. Ghantous. 2012. Challenges for dodder management in cranberry: Biology, application, and politics. Weed Sc. Soc. of America Annual Mtg, Waikoloa, HI. http://wssaabstracts.com/public/9/abstract-348.html.

Type	Status	Year Published	NIFA Support Acknowledged
Conference Papers and	Published	2012	NO

Citation

Sandler, H.A. 2012. Injury from delayed applications of dichlobenil on four cranberry varieties. Proc. of the Northeastern Weed Sci. Soc. 66:77.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	NO

Citation

Hazzard, R.V., J. Howell, M.B. Dickow, R. Bonanno, editors. 2014-2015 New England Vegetable Management Guide. UMass Extension Publication. 290 pp. www.nevegetable.org.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	NO

Citation

Bonanno, R. & R. Hazzard, editors. 2014 edition, Northeast Vegetable & Strawberry Pest Identification Guide. 60 pp. UMass Extension Publication.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	NO

Citation

Averill, A.L., H Sandler, and M. Sylvia. Cranberry 2013 Chart Book: Management guide for Massachusetts. UMass Extension Publ. http://www.umass.edu/cranberry/pubs/chart_book.html

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	NO

Citation

Schloemann, S.G., et al. 2013-2014 New England Small Fruit Management Pest Guide. UMass Extension Publication. 122 pp. https://extension.umass.edu/fruitadvisor/ne-small-fruit-management-guide.

Type	Status	Year Published	NIFA Support Acknowledged
Other	Published	2013	NO

Citation

Cooley, D., W. Autio, D. Greene, J. Clements, C. Conklin, T. Bradshaw, H. Faubert, G. Koehler, and G. Hamilton, editors for the New England edition. 2014 New England Tree Fruit Management Guide. UMass, UCONN, UNH, UMAINE, UVM, and URI Extensions. 276 pp. adapted from Cornell Univ. Extension publication “2014 Pest Management Guidelines for Commercial Tree Fruit Production”. https://extension.umass.edu/fruitadvisor/publications/new-england-tree-fruit-management-guide

Other Products

Product Type

Other

Description

Primary Emphasis Area: Specialty Crops IPM

Pest Alert Networks and Weather-based Decision Support

Weather-based Decision Support and Forecasting. To increase access to relevant weather data and use of weather based IPM models we deployed 23 weather stations at collaborating farms which with 22 airport stations offer 45 sites linked to the Network for Environment and Weather Applications (NEWA) (http://newa.cornell.edu/). We helped growers learn how to use local data to run GDD and disease and insect models available on NEWA for pests of apple, onion, potato, sweet corn, crucifers, cucurbits, tomato and other crops to enhance timing of frost control, trapping, scouting, sprays, and biocontrols. This data was also used to generate pest alerts related to Winter Moth management in eastern MA, where this pest has been devastating to fruit growers in recent years. See http://eepurl.com/xS4sL and http://eepurl.com/x9QLH.

Invasive Pest IPM: Fruit/Spotted Wing Drosophila (SWD, Drosophila suzukii) and Brown marmorated stink bug (BMSB, Halyomorpha halys) network and alert system: A monitoring, alert, and mitigation plan was created to assist fruit and vegetable growers cope with these two new invasive pests after August 2011 arrival of SWD in MA caused up to 100% crop loss in fall berries. In 2013, the statewide network of 19 SWD and 26 BMSB on-farm monitoring sites reported trap data. Alerts were sent to grower networks and posted at centralized website. Eight IPM trainings on these pests reached 258 growers.

IPM Working Group Participation: Project personnel participated in 3 active regional Working Groups - Northeast Small Fruit IPM Working Group (2011-2013), Spotted Wing Drosophila Working Group (2012-2014) and Brown Marmorated Stink Bug Working Group (2010-2014). In addition, project personnel participated in IPM activities as part of the Northeast EcoApple Project (2008-2014) and the New York New England Small Fruit IPM weekly call-in with colleagues from PA to Ontario (2011-2014).

See Accomplishments/Dissemination for more details on dissemination of pest alerts.

Mentor farms were the main vehicle by which the Project personnel could understand, improve and implement advanced IPM on diversified fruit and vegetable farms. Mentorship went both ways between Extension and farmers; timely field-based information flowed from these farms to hundreds of others via Extension newsletters and pest alerts, and face to face at on-farm meetings. All mentor farms had high on-farm crop diversity and grew numerous vegetable and fruit crops. Farms varied in the age and size of the farm, types of markets, location, approach to pest management (conventional or organic) and level of previous experience with IPM. Each farmer set his/her own unique IPM goals for specific crops and pests at a face-to-face pre-season meeting with Extension. On-farm scouting was performed biweekly with farm and Extension staff followed by discussion of best management decisions and written recommendations from Extension. Technical support included disease diagnostics, soil and tissue testing, traps for monitoring, and NEWA-linked weather station on or near the farm. Six mentor farms participated in 2011, expanding to 13 per year in 2012 and 2013. Farms ‘graduated’ from the project after 2 or 3 years making way for new mentor farms. Farms were expected to share their farm and knowledge through on-farm meetings; in 2013 six farms hosted meetings attended by over 200 people.

Product Type

Other

Description

Primary Emphasis Area: Specialty Crops IPM: Applied research/ Partner farms – Goals and Methods.
Applied research trials and IPM demonstrations were conducted on ‘partner farms’ and at UMass research stations and are summarized below:

Cucurbits/Phytophthora capsici. Suppression with mustard (cv. Caliente) incorporated in spring: 5 on-farm

trials and one UMass trial which used greenhouse bioassays to compare soils with oat cover crop or no cover crop to soils biofumigated with Caliente.

Brassicas/Cabbage maggot fly. Use alternative soil treatments to suppress root injury: four replicated experiments and 3 on-farm trials conducted. In 2014, soil drenches with diamide and spinosad, and nicotinoid seed treatments were tested.

Brassicas/flea beetle. Use preferred brassica species (bok choy, Brassica rapa) as trap crop to reduce damage and pesticides on main crop (B. oleraceae); two on farm trials conducted (2013, 2014).

Biological control in beans, sweet corn, pepper. Trichogramma ostriniae for control of European corn borer: trials in early sweet corn on 4 farms and in pepper on 4 farms (2012-2014). Pediobius faveolatus, for control of Mexican bean beetle: trials for 3 years in fresh market snap beans on 5 farms.

Apple/apple scab. Advanced IPM methods for scab management include measuring scab inoculum (PAD) in the fall, reducing inoculum before spring green tip with improved sanitation (leaf chopping, urea application), and implementing weather based decision tools to time sprays accurately. Trials were conducted over 3 years, including new farms each year up to 20 orchards in 2013. Most orchards had treatment and control blocks..

Cranberry/cranberry fruitworm. Three year testing (1 on-station replicated trial, 5 paired bog trials, 12 demonstration trials) resulted in phase-in of selective bee-friendly insecticides (diamides & spinosyns) to replace OP's for control of this number one cranberry pest.

Product Type

Other

Description

Secondary Emphasis Area: IPM Training and Implementation in Housing—Bedbug IPM.
The project formed a bed bug taskforce for the cities of Springfield, Holyoke and Westfield Hampden County, which included professionals associated with housing authorities, social justice advocates, departments of health, landlords and the pest control industry.

Secondary Emphasis Area: IPM in Public Health—Tick Disease Assessment and Public Education.
Pathogen-infected ticks are an increasing public health concern in the Northeast. The goal of this project is to teach people about appropriate tick mitigation and risk reduction in the landscape and on their persons, reducing risks from tick-borne disease) and inappropriate pesticide practices. Information from the tick diagnostic clinic will help individuals to make appropriate decisions about their health and avoid unnecessary antibiotic use.

The UMass Extension Tick-Borne Disease Diagnostics Clinic identified tick samples received from the general public and assessed them for the presence of Borrelia burgdorferi, the pathogen responsible for Lyme disease and, optionally, for the pathogens nine other diseases. From January-June 2013, 913 ticks were submitted for analysis, a 43% increase in tick submissions over the same period the previous year. 30.1% of ticks were found infected with Borrelia, continuing a trend of increasing infection rates since 2006. Of 163 ticks tested for Anaplasma, 3.1% tested positive and of 181 ticks tested for Babesia, 1.1% were positive. Ticks were submitted from 37 states including 448 from MA.
To determine the impact of our tick analysis service, we conducted a brief email survey (>99% of clients received email reports) in winter 2013. We contacted 238 clients: 109 (45.8%) responded. Over 83% located the testing service via the internet or recommendations from friends. 98% found the information important to very important (81%). All people answering the survey would recommend the service to friends. At least half the people used the results in making a medical decision.

Changes/Problems

- **Primary Area, Specialty Crops IPM:** : Changes in staff occurred when two key project participants, A. Brown and C. Cavanagh, transferred to different jobs after year 2, and new staff needed to be hired. This meant that some project activities

were delayed, requiring a no-cost extension through 2014 to complete certain projects.

- **Secondary area: conservation partnerships**. During the project, there were changes in workload priorities of NRCS field staff which reduced their availability to work on IPM plans as a component of EQIP projects.