



IPM Institute of North America, Inc.

Harnessing Marketplace Power to Improve Health, Environment and Economics

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*2005 Children's
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Recognition Award,
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Protection Agency
Office of Children's
Health Protection*

December 15th, 2011

To: IPM Institute Board of Directors
From: Kelly Adams

Re: Interim Progress Report

Please review the following progress report for discussion on our call scheduled for Monday, Dec. 19 at 1 PM CST.

Overview

Continued expansion in activities and staffing in 2010 and 2011 included five new projects- three of which leveraged support through work with the NRCS and IPM Working Group. Eight of 19 grant proposals submitted in 2010 were funded, and six of ten in 2011. This includes our second EPA Pesticide Registration Improvement Act (PRIA 2) grant for school IPM, renewal funding for the North Central Region NRCS and IPM and School IPM Working Groups, funds received through Oregon State University for continued development of the Pesticide Risk Mitigation Engine (PRiME), and grants from Great Lakes Protection Fund and Ohio NRCS to expand the BMP CHALLENGE.

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1. 2011 MAJOR PROJECTS AND PROGRESS

Green Shield Certified (www.greenshieldcertified.org) -- Green Shield Certified (GSC) completed initial evaluations for three Pest Management Provider (PMP) services, two facilities and one PMP program in 2011. Ten PMP's and one facility were re-evaluated, bringing the number of certified pest management participants to 37 since 2007. Springfield Hospital in Sykesville, Maryland, became the first health care facility certified under the Green Shield Certified Platinum for Health Care program. Green Shield continues the development of its strategic plan to ensure program sustainability, including recruitment of two additional evaluators in 2011 with a goal of increasing annual certifications by new companies and facilities.

Green Shield, in partnership with the Natural Resources Defense Council (NRDC), Pesticide Research Institute (PRI) and the San Francisco Department of the Environment (SFDE), held a conference call with the US Green Building Council to incorporate changes to IPM standards for the LEED 2012 revisions. Collaborating with PRI, Green Shield created a list of products that meet Tier III criteria of San Francisco's Reduced Risk Pesticide List. The list will be maintained on the IPM Institute website and accessible to the public.

IPM STAR for Schools and Childcare Centers (www.ipmstar.org) –In collaboration with Janet Hurley of Texas AgriLife Extension Service, three new Houston suburb school districts (Katy, Klein and Spring Independent) became IPM STAR certified this year. Fort Drum also earned new IPM STAR certification for their Child, Youth and School Services at their army base in New York.

Salt Lake City School District, Pittsburgh Public Schools and South Kitsap School District completed re-evaluation and re-certification in 2011. IPM STAR also re-evaluated another school district and is working with a community program to re-certify five other districts in that state. We continue outreach to lapsed IPM STAR participants to bring their certification up-to-date and aim to develop a strategic plan for program expansion in 2012.

IPM Voice (www.ipmvoice.org) -- IPM Voice incorporated as a non-profit in 2011 and is focusing time and resources on educating policymakers about the need for continued and expanded support for IPM in the federal budget. IPM Voice was instrumental in saving US Department of Agriculture Regional IPM Centers in the fiscal year 2011 budget by initiating a single contact to a key House decision maker—restoring full funding to the Centers. Thomas Green serves on the IPM Voice Board of Directors and the IPM Institute volunteered 230 hours in 2011 on IPM Voice organizational tasks, including securing membership funding to support IPM advocacy efforts in Washington D.C. The group circulates monthly newsletters to members and regularly updates its website with organization activities and other developments related to IPM. IPM Voice is preparing a session on the future of IPM funding for the 7th International IPM Symposium.

North Central IPM Working Group: Increasing Adoption of IPM in Schools (www.ipminstitute.org/NC_IPMIS_Working_Group/main.htm) – The Working Group continues to provide support for school districts in the North Central region seeking to adopt

IPM. In 2011, the Working Group held monthly conference calls, updated their regional priorities and wrote an article for the [September North Central IPM Connections Newsletter](#). We also supported the efforts of the *School IPM 2015* project by providing feedback for on-going PMSP revision and a new national survey tool, updating the project's website and Facebook page, creating monthly School IPM 2015 newsletters and building a national database of school contacts from a variety of sectors. The Working Group completed demonstration sites in SD, IL, IN and NE. Demonstration schools use proven approaches, such as assessments, workshops, targeted newsletters and pest monitoring to successfully demonstrate IPM in their region and state. We also initiated school IPM coalitions in NE, MO and MI.

School IPM 2015 (www.schoolipm2015.com) – Led by Thomas Green and Dawn Gouge, the national school IPM steering committee collected feedback from multiple stakeholders and made significant edits to the 2009 version of the PMSP document, including updating the national priorities, adding a bed bug section and revising the list of projects to date. PMSP Version 2.0 is available through the [2015 web page](#) and a final version will be submitted to the USDA in early 2012.

We completed our 2008 U.S. EPA Pesticide Registration Improvement Act (PRIA 2) grant (\$250,000) to implement the National School IPM Strategic Plan in March 2011 and initiated activities under our second PRIA 2 grant (\$250,000), which funds coalition-building efforts in 15 new states including assistance to complete a multi-level school IPM survey in participating districts. The steering committee drafted a national survey tool modeled after one developed and implemented in Oregon by Tim Stock of Oregon State University (OSU). The online survey will ask school districts to document asthma rates, pest management practices, including IPM policies and plans, pest management staffing, pest complaints and pest management costs. An additional survey is being developed for school districts interested in EPA Pesticide Environmental Stewardship Program (PESP) recognition to record metrics, increase PESP awareness, and track progress toward receiving gold level recognition.

The national school IPM steering committee continues to participate in monthly conference calls. The steering committee and four regional school IPM working groups coordinate and support coalitions (groups of schools serving as IPM leaders in their area), demonstration sites (one or more schools in a district serving as an IPM-teaching site) and related projects (e.g., development of IPM-oriented K-12 teaching curriculum). We also promote outreach efforts (periodical *School IPM 2015* newsletters, state-based and regional IPM training sessions, Facebook and Blogger accounts, etc.) and maintain a website with current school IPM-related news, resources and opportunities to join the national school IPM effort.

Pesticide Risk Mitigation Engine (PRiME) (www.ipmprime.org) – The PRiME web application is a software tool designed to help growers evaluate pesticide risks using the best-available science in an easy-to-use format. In September 2011, we concluded a four-year Conservation Innovation Grant to develop PRiME for US agriculture. PRiME-beta includes eight risk indices, first-tier pesticide fate and transfer modeling and a database of nearly all pesticide products registered for agricultural use in the US.

In the past year, we have established a development environment at the IPM Institute in order to work more closely with project partners at OSU, where PRiME is housed, and speed the pace of technical development. The development environment includes a standalone version of PRiME running at the IPM Institute and connected to the OSU development server via source control software, allowing team members to create work orders and edit PRiME simultaneously without losing information.

Our primary emphasis has been developing a more novice-friendly user interface as well as bulk importing of large datasets. In 2012, we will make great improvements to our pesticide fate and transfer modeling, making PRiME risk outputs more sensitive to differences in crop type, weather, application methods and landscape features (e.g. soil type, the presence of sensitive sites and the use of conservation practices).

The PRiME team will continue its efforts with funding from USDA National Institute of Food and Agriculture (NIFA) and Great Lakes Protection Fund (GLPF), as well as support from PRiME users. Following recent user interface improvements, we are now preparing for a more user-oriented marketing campaign, striving to support ongoing maintenance through nominal user fees.

Northeast Eco Apple (<http://www.redtomato.org/ecoapple.php>) – Red Tomato began the Eco Apple Project in 2005, offering third party certification to New England orchards to verify their use of IPM and other ecologically sensitive production practices. Growers use the certification to differentiate Eco Apples in the market and gain a premium for their fruit. We continue our partnership with Red Tomato on this project, providing scientific and technical expertise on IPM practices. We updated the production protocol to include approval of, or restrictions on, newly released products. This year the program added 11 new participants for a total of 22 growers and 1,025 enrolled acres. Seventeen of these growers and 798 acres were certified. To date, 2011 Eco Apple sales totaled \$1.2 million to regional wholesalers, supermarkets and direct consumers. We also established a “Transitional Status” for growers interested in becoming Eco Apple producers, but who still need additional experience working with the protocol.

2011 marked the second year of stone fruit grower certifications under an eco protocol. Using the Eco Apple Protocol and self assessment format, this protocol identifies best management practices for IPM in stone fruits, including peaches, nectarines, apricots and plums. This year the program certified three growers and 84.25 acres.

North Central NRCS and IPM Working Group: Growers Incentives for IPM

(www.ipm.msu.edu/work-group/home.htm) – The Working Group secured renewal funding beginning March 2011. We continue updates each month to the Working Group website with call minutes, information on the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and pertinent state and regional resources on agricultural IPM.

With funding through the Southern IPM Center Critical and Emerging Needs Grant program, the Group collaborated with the University of Florida and Glades Crop Care to organize a two-day workshop with Florida NRCS, Extension, IPM Consultants and growers to increase awareness of

opportunities for IPM through NRCS conservation programs in July 2011. The group will also conduct a field day for NRCS in May 2012.

This year the Working Group began development of an IPM practitioner exam for crop advisors with funding through the North Central IPM Center (NCIPMC) Mini-grant Program. Thirteen IPM experts from industry, Extension, EPA, USDA NRCS and NIFA participated in a two-day comprehensive session to establish and set the groundwork for the proper infrastructure, exam components and performance objectives in September 2011. This project has a strong partnership with the National Alliance of Independent Crop Consultants (NAICC) and will be piloted during their annual meeting in 2012. The NAICC has agreed to recognize this exam as part of the criteria toward their Certified Professional Crop Consultant (CPCC) credential, which is recognized by the USDA NRCS to become a Technical Service Provider. In fall 2011 we secured additional funds from the NCIPMC and submitted a proposal to the Western IPM Center competitive grants program to build support for the project in the west.

To date the working group has secured an additional \$22,500 from the North Central and Southern IPM Centers for NRCS & IPM Working Group outreach efforts in 2011 and 2012. In 2012 working group outreach will continue to focus on further development of the exam, performance objectives and study resources for the IPM practitioner exam project and will focus on needed outreach to educate growers, consultants and Extension on significant changes to USDA NRCS programs which support grower adoption of IPM.

Apple IPM Program – IPM Institute continues to offer pest scouting services and technical assistance to apple growers throughout southern Wisconsin and eastern Minnesota. This marks the third year of the Apple Pest-Scouting program, with 15 growers and 874 acres of apples enrolled. The program is financially self-sustaining and generated no program losses the last two years. Scouting reports from each weekly or bi-weekly visit documented: insects, diseases and beneficial insects present, pesticides used and other items of concern to the grower. Growers also relied on the pest scout's knowledge to help understand pest lifecycles, pest thresholds and how to use degree days to predict pest threat levels and time treatments.

True Earth Certified -- In 2011 IPM Institute expanded this market-based IPM certification program with funding received through the EPA Strategic Agricultural Initiative (SAI) for the project "Tree Fruit IPM Grower Network Expansion & High-level IPM Certification." This funding supports work with our Apple IPM Program to help growers increase their level of IPM adoption and establish an IPM certification program in collaboration with a regional packer of the upper-Midwest apple crop. Participating growers receive scouting assistance and training on tree fruit IPM strategies with off-season grower meetings, in-season scouting assistance and training on PRiME. Growers who meet advanced IPM criteria established through the use of the Red Tomato Eco Apple Protocol may also be certified under the TruEarth Certified program through Wescott Agri Products. We certified six growers and 450 acres of apples this year.

Wisconsin NRCS Environmental Quality Incentives Program 595 TSP Services— In 2011 we increased our role in the preparation, review and submittal of USDA NRCS Environmental Quality Incentives Program (EQIP) 595 plans for orchards in Wisconsin. We provided assistance to John Aue of Threshold IPM Services and Jason Fischbach of Bayfield County

Agricultural Extension to complete and submit contracted plans and reports for thirteen growers on 295 acres.

Sysco Sustainable Agriculture/IPM Initiative – We continue to work with Sysco to facilitate adoption of IPM and other sustainable practices among their fruit and vegetable producers. Over 81 suppliers are currently involved in Sysco’s Sustainable Ag/IPM program, representing more than 4,000 growers of agricultural products worldwide. The IPM Institute evaluates suppliers’ Sustainability/IPM programs on an ongoing basis and provides recommendations for improvement. In January of 2011, we assisted Sysco staff in coordinating their bi-annual Sustainable Ag/IPM Conference and Training for suppliers, growers, auditing agencies and other interested parties. The 2011 conference was a success, with 100% of conference survey respondents reporting they would attend again.

Seventh International IPM Symposium, March 27-29, 2012

(www.ipmcenters.org/ipmsymposium12) – The 7th International IPM Symposium will be held in Memphis, Tennessee, focusing on "IPM on the World Stage: Solutions to Global Pest Challenges." The program for the event includes eight plenary speakers with international impact, over 95 hours of concurrent oral presentations, two evenings of poster sessions, an awards banquet, IPM-related tours and numerous networking sessions. The planning committee has conducted extensive outreach through traditional venues such as press releases to media centers, as well as through social media including Facebook, Twitter and LinkedIn. Fundraising has been a challenge in 2011, but the planning committee has secured \$65,000 in support as of December 2011. Margaret Appleby, Ontario Ministry of Agriculture, Food and Rural Affairs; Jill Schroeder, weed scientist with New Mexico State University; Rubella Govindasamy with North Dakota State University and Thomas Green are co-chairs.

McDonald’s Potato IPM Project – In 2011, we continued work with McDonald’s staff and major potato suppliers in the implementation of an online survey for growers to report their pesticide use and best practice adoption. The survey was tested among suppliers and growers, and we are currently working with McDonald’s and others to refine and clarify survey questions based on 2010 results and user feedback.

Boulder IPM Program - IPM Institute, in collaboration with PRI and Osborne Organics, continued work with the City of Boulder to evaluate and propose improvements to their existing IPM program. Project team members are working to finalize a formal report to the City. This review was commissioned in the fall of 2010 and key findings show a significant reduction in pesticide use since implementation of the original IPM plan in 1993.

Great Lakes Protection Fund (GLPF) – Led by the Sandusky River Watershed Coalition and in collaboration with American Farmland Trust and Heidelberg University, IPM Institute secured funding from GLPF in 2010 to build on and use tools developed as part of a larger effort to reduce nutrient and sediment losses from US corn acres including projects targeting the Mississippi River Basin and Chesapeake Bay Watersheds. With leveraged funding from Ohio

NRCS, we also worked with Agren and Heidelberg University to initiate outreach to absentee landowners in the Sandusky River Watershed on dissolved phosphorus challenges and solutions, and Soil and Water Assessment Tool (SWAT) analysis for farmers. We aim to enlist 80 to 100 farmers in this watershed in the next year to implement best practices for reduced phosphorus losses (see **Appendix F**).

BMP CHALLENGE Performance Guarantee Program (www.bmpchallenge.org) – Operated by Agflex in collaboration with American Farmland Trust, the IPM Institute and others, the BMP CHALLENGE offers a risk free yield guarantee to corn producers in 18 states. The program works with farmers to reduce nutrient and sediment outputs to local waterways while offering a financial safety net in case of profit loss. In 2011, Agflex worked with American Farmland Trust through funding provided by the Pennsylvania Department of Environmental Protection and others, to produce a report that analyzed the results of the Planned Nitrogen Reduction pilot project, and studied the long-term effectiveness of nitrogen management performance guarantees and the feasibility of scaling-up to a state level. Additionally, the IPM Institute received a \$60,000 Conservation Innovation Grant for conservation agriculture work in Ohio, and Agflex received \$25,435 from American Farmland Trust for coordinating the BMP CHALLENGE program for sweet corn farmers in Suffolk County, New York. The BMP CHALLENGE program continues to develop through program additions including split nitrogen fertilizer applications in Illinois, and a guarantee program for tomatoes in California.

OTHER ACTIVITIES

We continue to respond to unsolicited inquiries per week from pest management professionals, parents, school administrators and media about IPM and pest-related issues. We keep our website content current with IPM-related news, job listings and resource links. Currently hits to the website average nearly 1942 per day.

In addition, we:

- Participated on the US EPA Pesticide Policy Dialogue Committee, a formal stakeholder body managed by the Office of Pesticide Programs to provide input to EPA on plans and progress on pesticide issues. This committee meets twice annually for two days each.
- Served on the board of directors for the Entomological Foundation, which seeks to engage and sustain interest of school-aged children in science and insects. The Foundation seeks to establish an Educational Fund to distribute grants which help fund new programs, projects and services, as well as to expand the reach of the Foundation's programs and services. <http://entfdn.org>
- Reviewed and updated our employees loaded labor rates for charging staff time to grant and contract-funded projects. This rate allows us to recover all direct costs of having an individual perform tasks including salary, benefits, equipment and administrative support.

- Renewed health insurance benefits for our staff, providing for 60% of the cost of individual coverage. Employees pay for the other 40% and 100% of costs for coverage of other family members.
- Developed a plan to reinvigorate The IPM Institute quarterly newsletter *IPM In The Marketplace*, with a goal of increasing Institute membership and contributions from individual donors. The next issue of the IPM Institute newsletter will be circulated in January 2012.

2. 2011 PRESENTATIONS

Don't Let Your IPM Program Go Down the Drain; Taking Your IPM Program to a Higher Level. Texas IPM Coordinators Annual Meeting. San Marco, TX. T. Green

Identify, Clarify, Speak Out: Turning Young People onto Science Through Insects and Ensuring a Future for Entomology. Program Symposium, Entomological Society of America Annual Meeting. Reno, NV. T. Green

Effective Pest Management in Schools. Midwest Facility Masters Conference. Wisconsin Dells, WI. T. Green

IPM in Schools: Challenges, Opportunities and Implications for IPM in Agriculture; IPM in the Marketplace: What do Walmart, McDonald's and Sysco have to do with IPM?; Pesticide Risk Mitigation Engine: A Farmer-Friendly Online Tool for Field-Specific Risk Assessment and Mitigation. Organization for Economic Cooperation and Development IPM Conference. Berlin, Germany. T. Green

IPM Specialty Certification. Certified Crop Advisor Program Directors Meeting. Charleston, SC. T. Green

Harnessing Marketplace Power to Improve Health, Environment and Economics. National Supermarket Chain Markets Executive Committee Meeting. Boston, MA. T. Green

Experiences with IPM and EQIP in North Central States; Options in Florida for IPM in NRCS Conservation Programs. Florida Small Farms and Alternative Enterprises Conference. Kissimmee, FL. T. Green and P. Werts

Opportunities for Agriculture to Address Resource Management Challenges in the Sandusky River Watershed. Galion and Mansfield, OH. T. Green

Protecting Children in Schools and Outdoor Environments. Promoting Community IPM for Preventing Tick-Borne Diseases, US EPA. Washington DC. T. Green

Feasibility of Financial Safety Net for Farmers to Deliver Substantial Gains in Conservation Adoption. Soil and Water Conservation Society Annual Meeting. Washington DC. T. Green

Establishing IPM Policies and Practices. Federal Green Challenge Webinar, US EPA. T. Green

IPM in the Marketplace: Buzz, Battles, Beef and Implications for the Future of IPM in the Public Sector. Dept. of Entomology, University of Wisconsin. Madison, WI. T. Green

Bed Bugs: IPM in Schools. Second National Bed Bug Summit, US EPA. Washington, DC. T. Green

Cost-Effective Adoption of Best Management Practices and the BMP CHALLENGE. Land Grant and Sea Grant National Water Conference, Washington, DC. T. Green

595 IPM Standard, Conservation Activity Plans. Midwest Course for Fruit IPM Coaches/Consultants. Madison, WI. T. Green and P. Werts

Sysco Sustainable Agriculture/IPM Conference. USDA NRCS IPM Conservation Activity Plans and PRiME: Opportunities for Evaluating and Improving your IPM Programs; Audit: Minimum Standards; Audit: Product-Specific Standards. Houston, TX. T. Green

Healthy Hospitals: Managing Facilities Without Toxic Pesticides Through Integrated Pest Management & Organic Land Care. Green Operations Series, Practice Greenhealth Webinars. T. Green

The Natural Resources Conservation Service Environmental Quality Incentives Program: An Opportunity for IPM. Minnesota Apple Growers Association Annual Meeting and trade Show. La Crosse, WI. P. Werts

The Natural Resources Conservation Service Environmental Quality Incentives Program: An Opportunity for IPM. Minnesota Fruit and Vegetable Growers Association Annual Meeting and trade Show. St. Cloud, MN. P. Werts

NRCS & IPM: Experiences in Expanding Grower Access to NRCS Programs for IPM in the North Central Region. Lincoln University In-Service IPM Training. Jefferson City, MO. P. Werts

Trap Placement and Monitoring Strategies for Apple Maggot and Codling Moth. Wisconsin Apple Growers Association Summer Field Day. Trempealeau, WI. P. Werts

IPM CAPS: An Opportunity for Wisconsin Farmers. Wisconsin State Technical Committee Meeting, Wisconsin NRCS State Headquarters. Madison, WI. P. Werts

3. 2011 PUBLICATIONS

Green, T.A., S. Kegly, C. Osborne and V. Kalkirtz. *Moving IPM Forward in the City of Boulder*. Report submitted to the City Council. 142 pp.

Green, T.A., J. Cubie, R. Ressler, M. Anderson, J. Baird, B. Brandt, J. McCarthy, M. Kieser and J. Gilbert. 2011. *Nitrogen Management Performance Guarantee System for Corn Producers in Pennsylvania: Feasibility to Improve Water Quality in the Chesapeake*. Report submitted to Pennsylvania Dept. of Environmental Protection. 56 pp.

Chambers, K., T. Green, D. Gouge, J. Hurley, T. Stock, Z. Bruns, M. Shour, C. Foss, F. Graham, K. Murray, L. Braband, S. Glick and M. Anderson. 2011. *The Business Case for Integrated Pest Management in Schools: Cutting Costs and Increasing Benefits*. 8 pp.
http://www.ipminstitute.org/school_ipm_2015/ipm_business_case.pdf

Chambers, K., D. Gouge, T. Green, J. Hurley, T. Stock, Z. Bruns, M. Shour, C. Foss, F. Graham, K. Murray and S. Glick. 2011. *Coalition Operating Manual*. 6pp.
http://www.ipminstitute.org/school_ipm_2015/IPM_coalition_manual.pdf

Gouge, D., T. Green, K. Chambers, J. Hurley, T. Stock, M. Shour, C. Foss, L. Braband, F. Graham, K. Murray, S. Glick, Z. Bruns and M. Anderson. 2011. *Reducing Your Child's Asthma Using Integrated Pest Management: A Practical Guide for Parents Around the Home*. National School IPM Steering Committee. 4 pp.
http://www.ipminstitute.org/school_ipm_2015/ipm_asthma_document.pdf

Green, T. 2011. Putting P in its place. *Ohio Farmer*. Nov. P 62. (**Appendix F**)

Green, T.A. January 2011. NRCS seeks to renew its TSP program by engaging more private-sector consultants. *Crops and Soils* 44(1):18-19.

4. 2011 FUNDING OBTAINED

Grants

University of Illinois, \$30,000 for cooperative pesticide recordkeeping program, evaluation and outreach for pesticide recordkeeping on tribal lands.

Ohio Natural Resources Conservation Service, \$60,000 for outreach to absentee landowners in the Sandusky River Watershed on dissolved phosphorus challenges and solutions, and SWAT analysis for farmers.

North Central IPM Center, \$30,000 renewal funding to increase adoption of IPM in schools of the North Central region.

North Central IPM Center, \$30,000 renewal funding to increase collaboration among NRCS and IPM professionals in the North Central region, in collaboration with Michigan State University.

North Central IPM Center, \$17,500, to develop a new certification option for IPM professionals in agriculture.

Southern IPM Center Critical and Emerging Needs Grant Program, \$5,000 to increase awareness of opportunities for IPM through NRCS Conservation Programs, in collaboration with University of Florida and Glades Crop Care

Contracts

Agflex, Inc. Contract for \$5,000 for bookkeeping and grants management services provided by Kelly Adams and Jodi Schmitz for the corn producer guarantee project.

Beyond Pesticides. Ongoing contract for evaluating health care facilities for use of IPM.

McDonald's. Ongoing contract to assist with potato IPM program.

Sysco. Ongoing contract to assist with implementation of Sysco Sustainable Agriculture/IPM initiative with supplier base.

Apple IPM Program. \$22,000 in contracts with Wisconsin and Minnesota apple orchards for pest scouting services.

Red Tomato. Contract for \$11,125 to provide technical assistance for the Northeast Eco Apple Certification program.

Unsuccessful Proposals

EPA School Integrated Pest Management Grant, submitted by the IPM Institute to implement a "Virtual Center of Excellence for School IPM" to deliver four tools to improve outcomes and accelerate adoption of high-level, verifiable IPM in all US Public Schools.

North Central Integrated Pest Management Critical Issues Grant for development of PRiME for field crops.

NRCS 2011 Conservation Innovation Grant, submitted by Red Tomato for an integrated market-based program to increase conservation adoption in specialty crops.

EPA Pesticide Registration Improvement Renewal Act (PRIA 2), submitted by Red Tomato to further develop the Eco Apple protocol and increase IPM adoption among fruit and vegetable producers in the Northeast.

Pending

Western IPM Center Competitive Grants Program, submitted by the IPM Institute to build support for and assist in the development of an IPM practitioner exam for pest management consultants in the Western Region.

North Central Risk Management Education Center 2012 Grants, submitted by the IPM Institute for outreach and guarantee payments to corn producers in Illinois to participate in the BMP CHALLENGE.

USDA National Institute of Food and Agriculture Grant Funds, submitted by the IPM Institute for travel to the 7th International IPM Symposium.

North Central IPM Center Grants Program, submitted by the IPM Institute to increase adoption of IPM in schools in the North Central region through the regional working group

North Central IPM Center Grants Program, submitted by the IPM Institute to increase collaboration among NRCS and IPM professionals in the North Central region through the regional working group, in collaboration with Michigan State University

National Supermarket Chain Market Contract, submitted by IPM Institute to develop a sustainable agriculture/IPM initiative to their food products supply chain.

Natural Resources Defense Council Contract, submitted by the IPM Institute for development of a white paper on working with food companies to reduce pesticide risks to farm workers.

5. Major 2012 Objectives

1. Secure additional funding for School IPM.
2. Expand our work with NRCS to support IPM adoption on a national scale, including further development and outreach to build support for an IPM practitioner exam for crop advisors, development of a strategic plan to operate on a balanced budget and continue to leverage funding from additional sources including Western, Southern and Northeastern Regional IPM Centers.
3. Implement a user-oriented marketing plan in first quarter to ensure sustainable funding through user subscriptions and donations, and finalize PRiME for a fully operational launch in the fourth quarter.
4. Finalize strategic plans for GSC and IPM STAR to increase certification revenue and ensure program sustainability.
5. Expand the BMP CHALLENGE to additional crops and practices, including securing funding for continued program growth.
6. Work with McDonald's to evaluate potato grower survey results; develop and implement action steps to address priority opportunities identified in survey; and develop and implement evaluation strategies to measure and report on progress.
7. Expand Apple IPM Scouting Program to new fruit crops and growers, including recruitment of additional Pest Scout for 2012 growing season.
8. Increase IPM Voice activities by expanding the IPM Voice Board of Directors to better serve constituents and accomplish goals, engaging state-level grower organization

members, pursuing funding support from foundations, continuing advocacy for IPM funding on the federal level and co-sponsoring a summit on synergizing IPM with organic and sustainable production.

9. Execute 7th International IPM Symposium.
10. Recruit additional IPM Institute project assistant for general project support.
11. Recruit at least two new board members and hold two board meetings by teleconference.

Appendix A. Staff

Kelly Adams: May 2008; Financial and grant administration, employee services management, former School IPM Project Coordinator. Kelly has a communications/research background as an Art History major from the University of Wisconsin-Madison. She also attended certificate classes at the Nelson Institute of Environmental Studies, which fueled an interest in sustainable agriculture and environmental health issues, particularly school and community-based projects.

Mark Adelsperger: July 2011; Resource Management Specialist --Great Lakes Protection Fund Project. Mark has a degree in Business Administration from Tiffin University in Tiffin, Ohio and a background in agriculture, sales and customer service. Mark's immersion in agriculture and enjoyment of the rural lifestyle reinforces his viewpoint that farming is an ever evolving way of life.

Matt Anderson: August 2009; School IPM 2015 and North Central School IPM Working Group Project Assistant. Matt is currently a senior at the University of Wisconsin-Madison majoring in International Studies with an Environmental focus in Water Resources Management.

Zach Bruns: May 2008; School IPM 2015 Project Assistant, general IPM Institute Information Technology work.

Zach earned a B.A. in Communications and Rhetoric from the University of Wisconsin-Madison with a background in instructional technology support. He is an active member of Blackhawk Church and participates in the Wisconsin Track Club.

Kelly Chambers: December 2010 - July 2011; School IPM 2015 and North Central School IPM Working Group.

Kelly Humphry: September 2010 – April 2011; School IPM 2015 and North Central School IPM Working Group.

Vicki Kalkirtz: August 2009; Green Shield Certified, IPM CAPs Initiative, Sysco Sustainable Ag/IPM Initiative. Vicki completed her Undergraduate work at the University of Minnesota,

majoring in Environment and Natural Resources (minors in Forestry and Geology) and Masters work at the University of Michigan in Natural Resources. She also has a Masters in Urban Planning from the University of Michigan. Originally from Chicago, she is an avid camper, hiker, traveler and reader.

Wade Moder: March 2011; IPM & NRCS Working Group: Grower Incentives for IPM, Great Lakes Protection Fund. Wade completed his B.S. in Environmental Policy & Planning from UW-Green Bay in 2009. He has been involved in a variety of environmental projects, including watershed management, public land use, invasive species control, urban tree identification and GIS. Currently, Wade serves as Vice President on the Board of Directors for the Yahara River Grocery Cooperative in Stoughton, WI. As a lifelong Wisconsin native, Wade enjoys cooking, playing sports, traveling and being outside.

Leigh Presley: January 2010; Project Assistant: Sysco Sustainable Ag/IPM Initiative, IPM Voice, IPM Symposium and PRiME. Leigh received a B.S. in Landscape Architecture at the University of Wisconsin-Madison in 2009. Natural resource studies in landscape architecture and a summer internship in a county land and water conservation department piqued her interest in sustainable agriculture and conservation.

Wade Pronschinske: November 2007; PRiME Project Manager. After working in airborne intelligence for the U.S., Army, Wade earned a B.A. from Northern Illinois University in Philosophy, followed by a M.A. in History and Philosophy of Science from Florida State University. His interest in environmental ethics led him to his current position as a project assistant in 2007, advancing through project coordinator to project manager in December 2009.

Rebecca Ressler: November 2010; Project Assistant BMP CHALLENGE. Rebecca is a University of Wisconsin-Madison graduate student in Water Resources Management, with a certificate in Business, Environment and Social Responsibility. Her interest in sustainable risk management led her to this position working with corn producers to implement conservation measures while optimizing net returns.

Jodi Schmitz: June 2011; Administrative assistant, Green Shield Certified and IPM STAR, School IPM 2015 and IPM Institute Newsletters. Jodi is originally from Helena, Montana and received a B.A. in English Writing from Carroll College. She then went on to complete the publishing program at the University of Denver Publishing Institute. She is passionate about reading, writing, and yoga.

Caitlin Seifert; May 2011; Green Shield Certified and IPM STAR Project Coordinator. Caitlin has a communications background as a Media Communications major from Webster University and an outreach background as a Madison community organizer. Prior to joining the IPM Institute, she worked in K-12 education for two years which sparked an interest in school IPM.

Peter Werts: May 2009; Apple IPM Program, NRCS-IPM Working Group: Growers' Incentives for IPM, Red Tomato Eco Apple Project and NRCS TSP services. Peter has a BS in Environmental Studies from Northland College in Ashland Wisconsin. Before coming to the IPM Institute he worked as one of the regional interns with the Wisconsin Eco-Apple project in

the Bayfield region. His interest in IPM has been a natural progression building upon his knowledge and skills from his days working on the fruit farms in Bayfield Wisconsin while in college.

Appendix B. 2010 MAJOR PROJECTS AND PROGRESS

1. 2010 MAJOR PROJECTS AND PROGRESS – TO DATE

Green Shield Certified (www.greenshieldcertified.org) –Green Shield Certified (GSC) evaluated eight services in 2010 and certified four new pest management services, bringing the total to 33 certified services since 2007. The New York City Health Department’s Rat Indexing Initiative, a major rodent management program started in 2007, became a Green Shield Certified program. Throughout 2010 Green Shield worked with the University of Florida Department of Housing and Residence Education to finalize certification of the university’s graduate and family housing facilities’ IPM program.

We gained exposure for the Green Shield Certified program as exhibitors at the UGL Unico Sustainability Tradeshow for facility managers in Washington, D.C. as well as the US Green Building Council’s 2010 Greenbuild International Conference and Expo held in Chicago.

IPM STAR for Schools and Childcare Centers (<http://www.ipmstar.org>) – With assistance from regional collaborators, we continue to evaluate and certify schools and childcare facilities around the country. In 2010 we re-evaluated three schools, allowing them to extend their certification for another three years. We secured another contract with the U.S. Army to include training for new IPM STAR evaluators, renewals for certified U.S. Army Child and Youth Services (CYS) programs as well as the evaluation and certification of several new CYS programs.

IPM Voice (www.ipmvoice.org) – IPM Voice is a new organization, formed in 2010 to advocate for progressive IPM to improve environmental, social and economic conditions through the application of accepted scientific principles. Thomas Green serves on the IPM Voice Board of Directors and the IPM Institute volunteers hours on IPM Voice organizational tasks while the group is in its startup phase.

North Central IPM Working Group: Increasing Adoption of IPM in Schools

(http://www.ipminstitute.org/NC_IPMIS_Working_Group/main.htm) – The Working Group continues to provide support for school districts in the North Central region seeking to adopt IPM. Working Group members participate on monthly conference calls and met in August 2010 at the [third annual development meeting](#). In the second quarter, Working Group members started regular training presentations on our monthly Working Group conference calls, including topics such as: bed bugs in schools, how to use the media to disseminate information about IPM, EPA training modules for school IPM, IPM in turf, landscaping and athletic fields, IPM in public agencies, asthma, in-house IPM and start-up advice for coalitions.

The Working Group completed demonstration sites in South Dakota, Illinois, Indiana and Nebraska and initiated coalitions in Nebraska, Illinois and Indiana. With assistance from Sherry Glick of the EPA, the IPM Institute also completed an in-house baseline summary of 2008 School IPM Report Cards including tables, figures and history of the survey.

School IPM 2015 (www.schoolipm2015.com) – Led by Thomas Green and Dawn Gouge, the National School IPM Steering Committee collected feedback from multiple stakeholders and made significant edits to the 2009 version of the PMSP document. PMSP Version 2.0 will be available online in 2011.

We continued school demonstration and coalition activities under our 2008 U.S. EPA Pesticide Registration Improvement Act (PRIA 2) grant (\$250,000) to implement the National School IPM Strategic Plan. We also secured a second PRIA 2 grant (\$250,000) to further fund school IPM coalition-building efforts throughout 2012, with a focus on documenting a reduction in pesticide application and asthma rates. Both grants aim to facilitate adoption of IPM in all U.S. schools by 2015 by creating an active working group of school systems (including administration, teachers, staff parents and the community), state and federal agencies, NGO's and Universities.

The National School IPM Steering Committee continues to participate in monthly conference calls. The steering committee and four regional school IPM working groups coordinate and support coalitions (groups of schools serving as IPM leaders in their area), demonstration sites (one or more schools in a district serving as an IPM-teaching site) and related projects (e.g., development of IPM-oriented K-12 teaching curriculum). We also promote outreach efforts (periodical *School IPM 2015* newsletters, state-based and regional IPM training sessions, Facebook and Blogger accounts, etc.) and maintain a website with current school IPM-related news, resources and opportunities to join the national school IPM effort.

Pesticide Risk Mitigation Engine (PRiME) (<http://www.ipminstitute.org/prime>) – A beta version of PRiME has been operational since early 2010 at www.ipmprime.org. PRiME-beta includes nine risk indices, all of which have been peer reviewed by independent experts, and tier one pesticide fate and transfer modeling.

Since the deployment of PRiME-beta, the development team has extensively bug-tested and improved the performance of the application, conducted pilot testing with a broad range of groups from individual growers to large food processors, analyzing data from over 20,000 acres and six crops, and gathered feedback from a broad range of stakeholders on the usability of the online interface. With this feedback, we have improved our databases, streamlined the use of PRiME-beta from data entry to risk calculation, created data import/export features and developed supporting documents, including help files and frequently asked questions. In the coming months we will make great improvements to our pesticide fate and transfer modeling, making PRiME risk outputs more sensitive to differences in weather, application methods and landscape features (e.g. soil type, the presence of sensitive sites and the use of conservation practices).

In 2010, team members presented PRiME at numerous professional conferences, meetings and workshops. The science and concepts of PRiME have received broad international exposure while the web application itself has been introduced to many potential users through workshops, training sessions and webinars. The online application includes a shopping cart and free guest access. While our “Guest Access” feature allows potential users to try PRiME-beta for free, the shopping cart feature has allowed us to begin drawing revenue by accepting online credit card payments. To date we have collected just under \$400 from PRiME-beta subscriptions; however, we have delayed outreach to solicit subscriptions until we have finished work on the user interface and site-specific water modeling. As CIG funds run out in August 2011, the PRiME team will continue its efforts with funding from USDA National Institute of Food and Agriculture and Great Lakes Protection Fund, as well as support from PRiME users. We will also prepare the user interface and supporting materials for a more user-oriented marketing campaign, striving to support ongoing maintenance through nominal user fees.

Northeast Eco-Apple (<http://www.redtomato.org/ecoapple.php>) – We continue our partnership with Red Tomato on the Eco-Apple project, providing scientific and technical expertise on IPM practices in the apple orchards. We updated the production protocol to include approval of, or restrictions on, newly released products, supervised inspectors, and certified 15 growers with 820 enrolled acres. In 2010 Eco Apple sales totaled \$1.4 million to regional wholesalers, supermarkets and direct consumers.

In 2010 we also worked with Red Tomato to develop an eco protocol for stone fruit production. Modeled after the Eco Apple Protocol and self assessment format, this protocol identifies best management practices for IPM in stone fruits, including peaches, nectarines, apricots and plums. The project team is currently seeking funding to expand the eco program to additional crops in the region.

North Central NRCS and IPM Working Group: Grower Incentives for IPM (<http://www.ipm.msu.edu/work-group/home.htm>) – Funding for the Working Group was secured for another fiscal year scheduled to begin March 2011. The Working Group website continues to be updated each month with call minutes, information on the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and pertinent state and regional resources on agricultural IPM.

In 2010, outreach included the creation of two brochures detailing the core concepts of IPM pest management, which were distributed to five different NRCS state offices. Also, the development of IPM evaluation tools and a sample NRCS IPM Conservation Activity Plan was completed, and the Working Group collaborated with the Minnesota Apple Growers Association to create new EQIP 595 cost share rates and options for orchardists in the state.

We secured additional funding through the North Central IPM Center Mini-grant Program to establish an IPM professional credential for crop advisors. National IPM experts and stakeholders will be invited to participate in a two-day comprehensive session to establish and set the groundwork for the proper infrastructure, components, exam materials and necessary maintenance needed for the Credential. This meeting is scheduled for fall 2011.

Conservation Activity Plans Initiative (<http://www.ipminstitute.org/IPMCAPs/home.htm>) – With funding from the North Central and Northeastern IPM Centers, we created and are leading a national Working Group focused on the NRCS’s new Conservation Activity Plans (CAPs), released in early 2009 for its pilot year. The program provides cost sharing for IPM plan development. The Working Group seeks to ensure effective participation of NRCS personnel, private sector individuals (Technical Service Providers, crop consultants) and growers in the program. The Group is developing a teaching curriculum and planning a national workshop, with a goal of offering regional trainings to educate TSPs on how to accurately write the Plans.

Apple IPM Program – Demand from numerous apple growers and IPM consultants in Wisconsin led to the creation of a program in 2009 to offer pest scouting services and technical assistance to apple growers throughout southern Wisconsin and eastern Minnesota. In 2010, its second year, the program expanded from 693.5 to 879 acres of apples and was financially self-sustaining, generating a surplus to pay for program losses in 2009. Scouting reports from each weekly or bi-weekly visit documented: insects, diseases and beneficial insects present, pesticides used and other items of concern to the grower. Growers also relied on the pest scout’s knowledge to help understand pest lifecycles, pest thresholds and how to use degree days to predict pest threat levels and time treatments.

True Earth Certified -- In 2010 we began an initiative with a Minnesota-based grower and packer of the regional apple crop to develop and implement a market-based IPM certification program. The program relies on the use of the Red Tomato Eco Apple Protocol and Self Assessment to certify growers’ use of IPM practices.

We also received funding through the EPA SAI program for the project “Tree Fruit IPM Grower Network Expansion & High-level IPM Certification.” This funding supports work with our Apple IPM Program to help growers increase their level of IPM adoption and establish an IPM certification program . Participating growers will receive scouting assistance and training in the use of tree fruit IPM strategies with off-season grower meetings, in-season scouting assistance and training on using the Pesticide Risk Mitigation Engine (PRiME). Growers who meet advanced IPM criteria established through the use of the Red Tomato Eco Apple Protocol will also have the opportunity to be certified under the TruEarth Certified program through Wescott Agri Products.

Sysco Sustainable Agriculture/IPM Initiative – We continue to work with Sysco to facilitate adoption of IPM and other sustainable practices among their fruit and vegetable producers. We assisted in creating an annual report compiling environmental indicator data submitted by 59 suppliers involved in the program, representing 89% of the total supplier base. Throughout late 2010, we worked with Sysco staff to coordinate the Sysco Sustainable Ag/IPM Conference, held in January of 2011. We continue to evaluate suppliers’ Sustainability/IPM programs and provide recommendations for improvement.

Seventh International IPM Symposium, March 27-29, 2012 – The 7th International IPM Symposium will be held in Memphis, Tennessee, focusing on "IPM on the World Stage." Still early in the planning stage, several Symposium committees have formed and outreach begun. Margaret Appleby, Ontario Ministry of Agriculture, Food and Rural Affairs; Jill Schroeder,

weed scientist with New Mexico State University; Rubella Govindasamy with North Dakota State University and T. Green are co-chairs.

McDonald's Potato IPM Project – We worked with McDonald's staff and major potato suppliers to implement an online survey for growers to report their pesticide use and best practice adoption. The survey was tested among suppliers and growers, and we are currently working with McDonald's and others to refine and clarify survey questions based on 2010 results and user feedback.

BMP CHALLENGE Performance Guarantee Program (www.bmpchallenge.org) – Operated by Agflex in collaboration with American Farmland Trust (AFT), the IPM Institute and others, the BMP CHALLENGE offers a risk free yield guarantee to corn producers in 18 states. The program works with farmers to reduce nutrient and sediment outputs to local waterways while offering a financial safety net in case of profit loss. In 2010, Agflex continued to develop the California program and to increase participation in other enrolled states through the \$930,000 Conservation Innovation Grant (CIG) awarded in 2009. Additionally, Agflex consulted for the Minnesota River Board, receiving \$67,750 to recruit acres within watersheds at risk for erosion and nutrient loss, and to incorporate sweet corn acres. AFT launched a BMP CHALLENGE project in Illinois with \$2,000,000 in funding from the Walton Family Foundation, Mississippi River Basin Health Watersheds Initiative (MRBI) Cooperative Conservation Partnership Initiative (CCPI), MRBI CIG, and McKnight Foundation. Overall, there were almost 3000 acres of corn enrolled under the conservation tillage and nutrient management guarantees in 2010. Efforts to expand the program within NRCS's existing programs have not been successful, with a lack of support by NRCS program staff including objections to recognizing that nutrient management can result in net income losses and an unwillingness to fit administrative costs within existing payment structures.

Wisconsin NRCS Environmental Quality Incentives Program 595 TSP Services— In 2010 we participated in an increased role in reviewing and submitting USDA NRCS Environmental Quality Incentives Program (EQIP) 595 plans for orchards in Wisconsin. We provided assistance to John Aue of Threshold IPM Services to complete and submit contracted plans and reports for twelve growers on 315.2 acres. In addition we worked with county Extension in Bayfield County to complete and submit contracted plans and reports for four growers on 47.6 acres.

OTHER ACTIVITIES

We continue to respond to unsolicited inquiries per week from pest management professionals, parents, school administrators and media about IPM and pest-related issues. We keep our website content current with IPM-related news, job listings and resource links. Currently hits to the website average nearly 2200 per day.

In addition, we:

- Participated on the US EPA Pesticide Policy Dialogue Committee, a formal stakeholder body managed by the Office of Pesticide Programs to provide input to EPA on plans and progress on pesticide issues. This committee meets twice annually for two days each.

- Served on the twelve-member planning group for IPM Voice, a new organization with a mission of advocating for advanced IPM. This organization held a formation meeting in Phoenix in December with participation by 36 professionals and anticipates a public membership drive in 2010. One of the primary objectives of this group will be to increase public appreciation and resources for advanced IPM.
- Served on the board of directors for the Entomological Foundation, which seeks to engage and sustain interest of school-aged children in science and insects. The Foundation seeks to establish an Educational Fund to distribute grants which help fund new programs, projects and services, as well as to expand the reach of the Foundation's programs and services. <http://entfdn.org>
- Participated on the board of the National Foundation for IPM Education as a Director. This non-profit lost its primary activity when its cooperative agreement with US EPA ended in 2005. The Foundation has been dormant since then, but potential for revitalization this fall to assist with work on a new IPM Foundation group. <http://www.epa.gov/pesp/publications/2005report/nfipme.htm>
- Reviewed and updated our employees loaded labor rates for charging staff time to grant and contract-funded projects. This rate allows us to recover all direct costs of having an individual perform tasks including salary, benefits, equipment and administrative support.
- Renewed health insurance benefits for our staff, providing for 60% of the cost of individual coverage. Employees pay for the other 40% and 100% of costs for coverage of other family members.

2. 2010 PRESENTATIONS

Pesticide Risk Mitigation Engine; Opportunities in Urban IPM. Entomological Society of America Annual Meeting. San Diego, CA. T. Green.

Changing our Approach to Conservation: Sandusky River Watershed Project Overview. Increasing Conservation on Priority Acres in the Sandusky. Tiffin, OH. T. Green

City of Boulder IPM Program Evaluation. Public Meeting. Boulder, CO. T. Green

Improving BMP Adoption and Ag Economics with Water Quality Credit Trading and the BMP CHALLENGE. Eighteenth National Non-Point Source Monitoring Workshop. Milwaukee, WI. T. Green

IPM in Schools: Ensuring All of our Children are Above Average. Wisconsin Facilities Masters Conference. Wisconsin Dells, WI. T. Green

IPM Voice: Proposal for Governance. IPM Voice Steering Committee Meeting. Alexandria, VA. T. Green, L.Presley

NRCS and IPM Working Group: Grower Incentives for IPM; North Central School IPM Working Group; PRiME Update. North Central IPM Center Stakeholder Panel Meeting. Chicago, IL. T. Green

IPM Opportunities and Challenges. Urban Pesticide Summit, US EPA. NY, NY. T. Green

Pesticide Risk Mitigation Engine. Mid-Atlantic Crop Management School. Ocean City, MD. T. Green

Pesticide Risk Mitigation Engine. Dow Agrosiences. Indianapolis, IN. T. Green

Colorado Indian Tribes Environmental Protection Office Pesticide Training. Pesticide Risk Mitigation Engine. Parker, AZ. T. Green, W. Pronschinske

USDA NRCS Eastern Region Technical Center. IPM: Let's Get Specific. Webinar. T. Green

Soil and Water Conservation Society Annual Meeting. (1) BMP CHALLENGE Across the Corn Belt and Rapid Adoption of Conservation Tillage in California. (2) Grower Incentives for IPM: Using IPM to Protect Our Natural Resources. (3) Eco Apples: Economic Benefits for Northeast Apple Growers Who Protect Soil and Water Resources. (4) PRiME Pesticide Risk Mitigation Engine: A New Online Pesticide Evaluation Tool for Agriculture. St. Louis, MO. T. Green

US EPA Tools for Schools. IPM in Schools. Webinar. T. Green

Heartland Water Quality Conference. BMP CHALLENGE: Compensating Farmers for Implementing BMPs. Nebraska City, NE. T. Green

CleanMed. Healthier Hospitals, People and Plant through Integrated Pest Management: It Takes a Team! Baltimore, MD. T. Green

Cannon River Watershed Summit. BMP CHALLENGE: Effective, Verified Non-Point Source Reduction. Faribault, MN. T. Green

Applied IPM Ecologists Annual Meeting. (1) PRiME Pesticide Risk Mitigation Engine, (2) Landscape IPM and the Sustainable Marketplace: Who Needs What from You? Napa, CA. T. Green

Facilities Masters Conference. (1) IPM in Schools: Ensuring All of our Children are Above Average, (2) Preventive Pest Management. Laconia, NH. T. Green

Mid-Atlantic Fruit and Vegetable Growers Conference. Pesticide Risk Mitigation Engine. Hershey, PA. T. Green

Association of Applied Insect Ecologists, Annual Meeting. Pesticide Risk Mitigation Engine, and Landscape IPM and the Sustainable Marketplace. Napa, CA. T. Green

Wisconsin Fresh Fruit and Vegetable Conference. Pesticide Risk Mitigation Engine. Wisconsin Dells, WI. T. Green

Minnesota Apple Growers Association Winter Meeting. NRCS and IPM Working Group Minnesota Apple Growers. LaCrosse, WI. P. Werts

Minnesota NRCS State Office Meeting. Expanding EQIP for Minnesota Specialty Crops. St. Paul, MN. P. Werts

NRCS Central Region Agronomist Teleconference. IPM Elements and Guidelines for the North Central Region. Webinar. P. Werts

3. 2010 PUBLICATIONS

Green, T.A. November 2010. *Going Buggy? School Planning and Management and College Planning and Management.*

Green, T. A. and Z. Bruns. September 2010. A snapshot from School IPM 2015. In US EPA *PESPWire*. <http://www.epa.gov/pestwise/publications/pep/pepwire-2010-009.pdf>

Green, T. and Z. Bruns. June 2010. In Session: A PMP's perspective about IPM in NYC schools. In *Pest Management Professional Magazine*.

4. 2010 FUNDING OBTAINED

Grants

US EPA Strategic Agriculture Initiative, \$42,275 to increase Tree Fruit grower adoption of IPM through the use of prevention, avoidance, monitoring & suppression (PAMS) strategies that emphasize bio-intensive IPM, in collaboration with American Farmland Trust, John Aue and University of Wisconsin- Madison Center for Integrated Agricultural Systems (UW CIAS).

US EPA Region X, \$6,120 to support development and beta testing of the Pesticide Risk Mitigation Engine (PRiME) tool for Region X major crops, in collaboration with American Farmland Trust, BCS Ecologic and Oregon State University.

Environmental Protection Agency, \$250,000 in support of expanding partnerships (coalitions) to reduce risks due to pests and pesticide use to improve asthma outcomes and to further environmental justice, in collaboration with the Regional School IPM Working Groups.

Great Lakes Protection Fund, \$622,000 to build on and use tools developed as part of a larger effort to reduce nutrient and sediment losses from US corn acres including projects targeting the Mississippi River Basin and Chesapeake Bay Watersheds.

North Central IPM Center, \$30,000 renewal funding to increase collaboration among NRCS and IPM professionals in the North Central region through the regional working group, in collaboration with Michigan State University.

North Central IPM Center, \$30,000 to increase adoption of IPM in schools in the North Central region through the regional working group, in collaboration with Iowa State University.

USDA NIFA IPM PIPE, \$1,000,000 to develop the Pesticide Risk Mitigation Engine for an IPM PIPE for specialty crops in western states, in collaboration with Oregon State University.

USDA NRCS Conservation Innovation Grant Program, \$524,970, and USDA Mississippi River Basin Initiative Grant, \$586,124, to support water quality improvements in the Upper Salt Fork Watershed in Champaign County, IL. In collaboration with American Farmland Trust.

Contracts

Agflex, Inc. Contract for \$3,400 for bookkeeping and grants management services provided by Kelly Adams for the corn producer guarantee project.

Beyond Pesticides. Ongoing contract for evaluating health care facilities for use of IPM.

City of Boulder. Contract for \$49,000 to evaluate and revise the City of Boulder's Integrated Pest Management Program.

McDonald's. Ongoing contract to assist with potato IPM program.

Sysco. Ongoing contract to assist with implementation of Sysco Sustainable Agriculture/IPM initiative with supplier base. Currently assisting in a new initiative focused on establishing an industry-leading position for Sysco in water quality improvements.

United States Army. Contract for \$30,000 for IPM STAR evaluation and certification of Child Development Center facilities.

Apple IPM Program. \$29,000 in contracts with Wisconsin and Minnesota apple orchards for pest scouting services.

Red Tomato. Contract for \$15,260.00 to provide technical assistance for the Northeast Eco Apple Certification program.

Unsuccessful Proposals

USDA NRCS CIG Grant, submitted by the IPM Institute with American Society of Agronomy, American Farmland Trust, Environment Canada, BCS Ecologic, Oregon State University, Growmark Inc. and University of Illinois to address barriers to adoption of conservation

practices specifically with the US Corn crop sector through outreach, training and improved infrastructure.

USDA NRCS CIG, submitted by the IPM Institute for further development of PRiME.

USDA NRCS CIG, submitted by the Food Alliance for further development of PRiME.

Agriculture and Agrifood Canada Innovative Programs Approach submitted by the University of Manitoba, Faculty of Agricultural and Food Sciences to develop a Canadian version of PRiME.

Wisconsin Specialty Crop Block Program, submitted by the IPM Institute for further development of PRiME.

USDA NIFA Organic Agricultural Research Initiative (OREI) for further development of PRiME.

USDA Specialty Crop Block Grant Program, submitted by IPM Institute to develop PRiME for key Wisconsin specialty crops including cranberries, sweet corn and beans.

EPA Region IX SAI Grant, submitted by the IPM Institute with Lodi Winegrape Commission, SureHarvest, UC IPM, Oregon State University, Pesticide Research Institute, Unilever for further development of PRiME.

EPA Region IV SAI Grant, submitted by the IPM Institute with Glades Crop Care and BCS Ecologic for further development of PRiME.

Oregon Department of Agriculture's Specialty Crop Grant Program, submitted by the IPM Institute with Oregon State University and Del Monte for further development of PRiME.

PRIA-2 Partnership Grant, submitted by Saint John's County Cooperative Extension Service, FL with IPM Institute, St. Johns River Water Management District, Northeast Florida Growers Exchange, RiverKeeper, Protected Harvest, Florida IPM program and Pesticide Research Institute for further development of PRiME.

Kellogg Foundation Grant, submitted by IPM Institute for a School and Community IPM project targeting asthma.

Appendix C. Nitrogen Management Performance Guarantee Feasibility Report

Executive Summary

By many measures, the Chesapeake Bay is falling short of its potential to provide vital ecological services, food production and recreational uses. Nitrogen (N) pollution represents the most critical impairment because it accelerates algal growth and reduces the oxygen levels required by aquatic organisms. Agriculture is both the leading source of nutrients and a major contributor to the progress in reducing nutrient loading to date. Pennsylvania farmers alone have been responsible for 41% of all the N reductions from agriculture in the entire watershed. This report summarizes the results of a pilot project that demonstrates how a \$6 million one-time investment can cover and deliver nearly 20% of Pennsylvania's commitment to N-load reductions on a sustained basis.

From 1985 to 2009, Pennsylvania achieved 28% of the N reductions required to meet its annual goal. The Commonwealth also established the largest Conservation Resource Enhancement Program in the nation, exceeding its 2010 goal for forest buffers along waterways and permanently preserving more than three million acres of land.

Pennsylvania has committed to an additional 29.5 million lbs. (lbs.) of N-load reductions annually by 2025. While Best Management Practices (BMPs) have potential to meet and exceed agriculture's contribution to this commitment, they are not universally adopted in large part because farmers need more information, technical support and less economic risk to implement them. This unmet potential is critical as our nation asks agriculture to continue to help meet soaring food and energy needs for an additional five million people in the Chesapeake Bay region and 2.4 billion people worldwide during the next 40 years, as well meet as landscape and ecological diversity goals,.

N management is particularly challenging for corn farmers who must determine how much to apply without advance knowledge of key determinants of crop need including weather. Pennsylvania State University (PSU) advises producers to apply N as close to crop need as possible, with 50% to 90% of the nutrient applied after corn is ten to 20 inches tall, typically in late spring. At that point, soil or leaf-chlorophyll tests may be used to more accurately predict N need, particularly in fields with a recent history of manure application or legume production. Adoption of testing and application in the late spring is thought to be low, although accurate and recent data specific to Pennsylvania farm practices are not available. Based on 2005-2007 data from the USDA's Natural Resources Conservation Service (NRCS), less than one-half of corn fields in the Chesapeake Bay region benefit from late spring applications, and many fewer from tests to refine application amounts. NRCS's Conservation Effects Assessment Project (CEAP) report for the Chesapeake Bay found that approximately 22% of cropped acres have a low level of nitrogen management meaning some or all crops in rotation exceed criteria for rate and either timing or method.

The BMP CHALLENGE™ system is an adaptive management approach to implementing BMPs that provides technical support, a net income guarantee, and verification of practices and net

returns for farmers so that farmers can learn how new practices perform on their farms. The approach has been used to support adoption of nutrient management and conservation tillage in corn and has enrolled more than 16,000 acres across 12 states. Participants have reduced N applications by nearly 425,000 lbs. and prevented loss of more than 3400 tons of sediment and 4600 lbs. of phosphorus on enrolled acres.

The BMP CHALLENGE supports participants who follow Land Grant University (LGU) recommendations for fertilizer application rates and who implement tillage systems that maintain at least 30% residue. These programs do not provide a farmer cost share and are intended for short-term participation, typically on one or two fields, until the farmer becomes comfortable with the BMP or learns how to adapt and manage the BMP on his/her farm. Most participants adopt the BMP in full or in part, and across most of their acreage, after just one year of participation.

In Pennsylvania, the guarantee system has been used primarily for Planned N Reduction (PNR), also historically referred to as enhanced nutrient management or yield reserve. PNR is an approach for achieving water quality objectives whereby farmers apply N at levels below the LGU-recommended rates. The method is also designed for potential ongoing farmer participation in watersheds where nutrient impairments would remain, even if all farmers followed LGU recommendations. In PNR, unlike the BMP CHALLENGE, farmers have been provided with a cost-share payment in addition to the net income guarantee. In contrast to the BMP CHALLENGE, PNR incurs ongoing costs to maintain N use, loss and load reductions.

Findings, Conclusions and Recommendations¹

Based on the feasibility study data collection and analysis of field experience in Pennsylvania and the eleven other states where the conservation yield guarantee BMP CHALLENGE has been implemented, we have five main findings along with conclusions and recommendations. These address the most pertinent project objectives and queries from our project partners, as well as layout potential next steps in achieving the ultimate goal of reducing nutrient loading by accelerating adoption of conservation practices.

- 1) **Planned Nitrogen Reduction (PNR) BMP CHALLENGE**—reducing nitrogen loading by applying nitrogen fertilizer at rates *below* the land grant university recommendations.

Findings

- a) **PNR reduced nitrogen use and nitrogen loadings:** PNR participants reduced N applications by 15% on average, about 27 pounds below LGU recommendations. Between 2005 and 2010 they reduced N use by over 244,000 pounds (i.e., in-field pounds of N fertilizer applications). These application reductions translate to 7.8 pounds per acre or 70,800 pounds of nitrogen reduced in the Chesapeake Bay (i.e., N-load reductions delivered to the Bay), using an average efficiency conversion rate of 29%.
- b) **But PNR also on average reduced yields and caused negative net returns:** Along with the N reductions, participants experienced a 7.3% yield loss translating to 11.9 bu. per acre on average. Despite the savings in fertilizer costs, farmers experienced a \$35.29 loss per acre in net returns for those acres.

¹ Note that additional recommendations are found in Section 6, Recommendations, p. 53

- c) **In addition, utilizing advanced nutrient management techniques and targeting critical acres are likely to reduce yield impacts of PNR:** Numerous tools that improve nutrient use efficiency through management changes to the rate, timing, placement and product have been recommended to farmers for some time and continue to be developed. Analysis of the PNR data set for instance showed that producers who applied commercial N in more than one application (e.g., at or prior to planting, and a second application in late spring) experienced greater yields (and net returns) than for producers who made a single application. Use of additional and more sophisticated techniques hold the promise reducing negative returns even further.
- d) **Moreover, farmers could cover net income losses and even generate net income with a robust water quality credit trading:** based on the project's experience with generating nitrogen credits, a water quality trading market could provide revenue to defray the cost of the N-loss reductions experienced using PNR. Trading could even become revenue positive under the right market conditions. Assuming an average reduction of 7.8 pounds nitrogen per acre delivered to the Bay and the current corn price of \$6 per bushel, the price per pound of N would need to be approximately \$15 per pound to cover full PNR program costs or \$4.52 to cover the farmer's net loss of \$35.29 per acre. While early credits have traded well below these levels, even as recently as 2010, many experts including the World Resources Institute project credit prices to rise to levels in the range of \$20 per pound of nitrogen, which would generate net revenue for farmers.
- e) **PNR yield losses indicate LGU recommendations do not have significant excess built into them:** a view voiced at the outset of this project (and echoed by some water quality advocates) asserted that LGU recommendations are above the optimum N use efficiency rate. This led to the assumption that there were "easy" N reductions to be achieved simply by having farmers cut back the N applications. The PNR results indicate that a 10-15% level of reduction across the board on all fields would have a negative yield impact.
- f) **Scaling up of PNR could add to regional corn deficit:** Given the yield impact, widespread adoption of the PNR would add to the region's corn deficit. Replacement of corn not produced using the PNR would entail an additional acre of corn for every 12.6 acres of PNR corn, assuming 150.5 bu. per acre as average production at LGU-recommended N rates.

Recommendation

Data suggest that the conditions that would consistently result in positive net returns from PNR (e.g., dramatic increases in nitrogen costs, steeply falling corn prices, or nutrient trading markets with nitrogen credit prices significantly exceeding \$15) are unlikely to occur in the foreseeable future. In addition, for a number of reasons, including significant and consistent yield losses, the agricultural community is not ready to accept PNR as a practice to recommend on a routine basis. Despite this fact, PNR appears a cost-effective nitrogen load

reduction strategy on a substantial number of high loading acres in comparison to other options.

PNR should be considered as a viable option for implementation on the acres most at risk of N loss in watersheds where other nitrogen reduction practices may not be sufficient to meet load caps. In addition, farmers will be more interested in further experimentation with PNR when nitrogen trading markets are sufficiently robust and credit prices rise. .

A far more effective and palatable approach for farmers is to promote aggressively the adoption of nutrient use efficiency using numerous tools from the very basic (splitting application of nitrogen, crediting manure) to high tech advances such as variable rate applications. It is important to separate the Performance Guarantee System of the BMPC from the specific practice of planned nitrogen reduction that was the main effort of the last several years.

- 2) **Nutrient Management BMP Challenge (Nutrient BMP CHALLENGE)**—reducing nitrogen loading by applying fertilizer at rates equal to the land grant university recommendations.

Findings:

- a) **Nutrient BMP CHALLENGE reduced nitrogen use and nitrogen loadings:**

Participants in Nutrient BMP CHALLENGE in demonstrations across the country reduced N application rates by an average rate of 20%, averaging 37.4 pounds per acre, to get to Land Grant University-recommended rates. This translates to a total of 180,400 pounds nitrogen use reductions and; if all of the acres were within the Bay watershed, total N-load reductions delivered to the Chesapeake Bay of 52,300 pounds.

- b) **But farmers on average saw reduced yields and negative net returns:** These reductions resulted in an overall average loss of 4% equaling 6.7 bushels (bu.) per acre, which translates to an average loss of \$4.86 per acre based on the net return to nitrogen calculation used based on yield, corn price and nitrogen price.

- c) **However, over 60% of farmers broke even or had positive net returns:** While the average experience per acre was negative, the net returns varied considerably between fields and across the years: Of the 99 fields enrolled in the Nutrient BMP CHALLENGE through 2010, 61 showed no losses and 42 experienced positive net returns. Experience on fields where producers split their applications of nitrogen or implemented greater precision in rate, timing and placement of nutrients indicate that more positive results are achievable.

- d) **Nutrient BMP CHALLENGE is cost effective compared with other conservation practices:** Even using the average negative net returns, when comparing the cost of reducing nitrogen losses, the Nutrient BMP CHALLENGE is highly competitive with other practices. Cover crops, a popular practice being promoted in the Chesapeake Bay region to achieve nutrient reductions, cost \$7.34 per pound based on state and federal

cost-share payments. This compares to \$4.14 per pound in the Nutrient BMP CHALLENGE, a 43% difference. Unlike cover crops that may require additional annual investment by the farmer for seed and planting costs, most Nutrient BMP CHALLENGE farmers reported a reduction of N application rates on a majority of their acres after one year of participation without additional assistance. Eighty-eight percent of respondents to a 2011 survey said they were continuing or planning to continue the new practice (or modified form of the practice) after their experience. Participants also indicated that they intended to implement the practice on an average of 50% of their acreage after a single year of participation

- e) **LGU recommendations close to optimum economic returns to N:** Given the uncertainty inherent in determining optimum N rates, the LGU recommendations followed by BMP Challenge participating farmers were surprisingly close to generating optimum economic returns to N. Many farmers suggested that the negative impact on yields could be due to university recommendation possibly not keeping pace with the new improved plant genetics requiring additional N.

Recommendation

Based on these experiences, Nutrient BMP CHALLENGE represents an opportunity to significantly reduce N loadings into the Bay in a proven, cost effective way that allows farmers to gain experience with nutrient management and then apply it to additional acreage. Assuming Pennsylvania producers apply nitrogen at similar rates and experience similar results to those found nationally, it is possible that a one-time investment of \$6 million in scaling up the Nutrient BMP CHALLENGE to address 104,000 acres (25% of the 417,000 Pennsylvania corn acres that are at highest risk for N losses) would result in a direct reduction of 1.13 million pounds of N load to the Chesapeake Bay. In addition, assuming the farmers expand the practice to additional acres similar to those reported on survey results, reductions of 2.67 million pounds, or 15.4% of Pennsylvania's Watershed Implementation Plan goal, could be achieved in subsequent years for the nominal cost of updating nutrient management plans on an annual basis.

To realize this potential, a new effort is needed to apply the Nutrient BMP CHALLENGE to increase the adoption of Pennsylvania State University's recommendations in key corn-producing regions that are most at risk of N losses. This effort should focus on accelerating the adoption of the range of practices that Penn State is recommending to increase nitrogen use efficiency and that can facilitate producers coming into compliance with state requirements under the Clean Stream and other laws. On one hand, they include basic practices such as split N applications, with the second application applied as sidedress, using PSNT or chlorophyll meter readings and full crediting of manure N values. On the other hand they include new technology, such as active sensors with the potential to more accurately distribute sidedress N based on need within specific areas of the field. All such practices could be supported by the BMP CHALLENGE. If long-term adoption rates are consistent with those experienced to date, an up-front investment of less than \$6 million could deliver nearly 20% of Pennsylvania's commitment to N-load reductions on a sustained basis at no additional cost. These advanced technologies are likely to improve efficiencies in contrast to

those experienced to date by further reducing yield and nutrient losses and thus, costs per acre and per pound of N-load reductions. This investment could be made over several years. Support from partners to the Growing Greener grant activities, including the Chesapeake Bay Congressional Delegation and departments of Agriculture and Environmental Protection, needs to be encouraged to help advance the guarantee system approach. Support for specific language in the next Farm Bill, or other vehicles, could direct the NRCS to offer the BMP CHALLENGE as an option for farmers. The Farm Bill programs administered by NRCS are the largest near-term source of funding available for the guarantee system. Thus, the Nutrient BMP CHALLENGE is an ideal adoption support tool consistent with NRCS EQIP limited-term contracts.

3. **Achieving cost reductions for BMP CHALLENGE**—the BMP CHALLENGE program and the conservation practices have the potential to achieve meaningful cost reductions as suggested by the Project Advisory committee.

Findings:

- a) **Scaling up will reduce costs:** The current project data involved demonstrations on fairly small acreages (12-150 ac). A scaled up effort that covered more acres on a farm would help improve cost effectiveness. Field size impacts costs per acre and costs per pound of N-loss reduction in cases where consultants are paid a flat fee per field. (This arrangement has been the case in the Mid Atlantic BMPC demonstrations. In other states, and in NRCS programs, payments are made on a per acre basis.) Most consultant costs, e.g., time, travel, and setting up the comparison strips are independent of field size. If consultants are paid an average of \$1200 per field, costs of N-loss reduction for PNR differ by \$4.74 between a 25 and a 100 acre field, a difference of 23%. For Nutrient BMP CHALLENGE, the difference is \$2.96, a difference of 41%.

In Maryland in the last three years, more than one practice demonstration was implemented on the same farm, further reducing cost given the fixed costs associated with travel and travel time to the farm.

- b) **Increased use of advanced nutrient management techniques will reduce costs:** Greater precision in achieving nitrogen reductions has the greatest potential to reduce costs of the BMP CHALLENGE since over all reductions in N-loss can be achieved while maintaining, or even increasing yields and thus decreasing pay outs.
 - i) Producers who applied commercial N in more than one application (e.g., at or prior to planting, and a second application in late spring) experienced greater yields (and net returns) than for producers who made a single application.
 - ii) Demonstrations with vertical tillage incorporation of dairy and poultry manure (that reduces N volatilization) in Maryland had higher yields than comparison plots where the manure was surface applied.

- c) **Corn prices most important cost factor:** Fluctuations in corn prices were the most important factor affecting costs and ranged from a low of \$2.20 per bushel in 2006 to a high of \$4.75 in 2008, in contrast to the price of \$6.01 in early 2011. For the PNR fields, each dollar increase in corn price increase overall program costs by approximately \$16 per acre and \$1 per lb. of N-loss reduction. This impact dwarfs other cost efficiency measures tried during the project such as reducing cost share rates.

Recommendations

There is considerable room to increase the cost efficiency of operating the BMP CHALLENGE both through refining program elements such as field size, consultant compensation and targeting practices that focus on nutrient use efficiency. The optimal situation for this program is to identify producers whose fear of potential yield impact is holding them back from adopting a practice that has a strong track record of effectiveness (e.g., split applications, in season testing, different tillage methods). Using the guarantee tool to offer a risk-free trial of a low-risk practice is likely to achieve a high level of adoption at a minimal cost. However, changes in corn price will continue to have the significant impacts on overall program costs.

As stated above, BMP CHALLENGE should target to aggressively promote the adoption of nutrient use efficiency practice to achieve optimum cost effectiveness. In addition two approaches that show additional potential for lowering costs should be given greater attention in the future are:

- Targeting fields with high levels of residual nitrogen on the assumption that such fields would show less response to the reductions, and
- Targeting fields with droughty/sandy soils where the lack of moisture likely affected yields more frequently than nutrient levels, could generate equivalent economic returns with less fertilizer.

4. Program Mechanics of BMP CHALLENGE—effectiveness of the BMPC program design

Findings:

- a) **Single check strip protocol cost effective and consistent with others:** The yield results collected from the BMP Challenge program, which uses a single check strip protocol, are consistent with those from the concurrent Iowa On-Farm Network® and Minnesota Nutrient Management Initiatives, which used multiple rather than single-check strips. The multiple check strips are more costly and are not required in order to get representative and repeatable results, or to increase farmer adoption of better practices. In a survey of 37 BMPC participants from 2003-2010, all but one reported being “satisfied that the method used to determine net returns and calculate guarantee payments was accurate and fair.”

- b) **Farmers like the BMP CHALLENGE:** According to the surveys of past nutrient management and conservation tillage participants completed in 2011, 89% of respondents were satisfied with the income protection provided under these programs.
- c) **Added benefits include technical assistance and adaptive management:** In addition to providing an effective tool to address risk concerns of producers to adopt new practices, the BMP CHALLENGE addresses the critical needs for 1) technical assistance to producers and 2) participation in an adaptive management process, by building in the participation of a certified crop consultant as part and parcel of the delivery system. Annual and past participant surveys indicate that “educational value” has been “very important.” The PA Conservation Commission’s Nutrient management program director has indicated that the inclusion of technical assistance as part of the program design is highly valuable in getting farmers to work through their nutrient management plans with assistance from a qualified professional.
- d) **Program delivery and administration works well:** The administrative and program delivery mechanism that Agflex, AFT and field partners have developed compares favorably to systems that USDA (NRCS) and crop insurance providers use to offer their products. Agflex targets payments to farmers with opportunities for improving practices, verifies implementation, documents outcomes, including impacts on yields, net income and natural resources, and compensates only those farmers who suffer net economic losses and only for the amount of actual loss.

Recommendation

BMP CHALLENGE mechanics are attractive to producers and crop advisors, result in high conversion rates to new practices, provide critical technical support and verification, and are delivered cost effectively. So the basics of BMP CHALLENGE mechanics should be maintained moving forward with minor modifications. These should be maintained with ongoing R&D for continuous improvement and addition of new practices. Additional improvements should include upgrading data collection to include site-specific rainfall amounts, timing and intensity; yield history; soil type and slope; and topographic and location factors needed to allow more extensive data analysis and more precise calculation of N-load reductions. Surveys of past participants should also be improved to increase sample size and accuracy.

Additional investments should be made to identify cost-effective practices that still suffer low adoption due to lack of technical support and income protection, including livestock nutrition management and cover crops, and to support continuous improvement of the system developed in this pilot, including lower-cost yield and net income assessment systems. Further investment is also needed to collect baseline data on farmer adoption of BMPs in Pennsylvania.

Appendix D. 2011 Publication, Putting P In Its Place, *Ohio Farmer*

