

FINAL REPORT 2009

Soybean IPM Education Programs: On-Farms in NYS

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Abstract:

In 2009, 20 participants representing 18 farms in 3 counties in New York State participated in on-farm soybean Tactical Agriculture (TA) team Integrated Pest Management (IPM) programs. Participants were actively engaged in a growing-season-long educational program discussing critical pest and crop management topics arising during the growing season. Multiple educational meetings were held in farmer fields enhancing opportunities to reinforce use of IPM concepts and techniques. Participating producers benefited from the timely collection of data from their fields throughout the growing season. The pest information gathered from scouting these soybean fields during the growing season was used in other extension educational efforts across New York State. Soybean aphid was over threshold in all TA producers fields this last year. There was a potential yield loss of 5 to 8 bushels/acre which is \$50 to \$80 per acre. As a whole the growers that participated in TA avoided losses of \$431,750 to \$690,800.

In addition to the traditional soybean TA efforts, one-time IPM and Integrated Crop Management (ICM) soybean meetings were held in Cortland, Chenango, Otsego, Oswego, Tompkins counties. These field meetings extended the reach of soybean IPM and ICM on-farm education beyond the more intensive TA groups to target soybean producers in areas where soybean acreage is expanding. Seventy producers attended these meetings.

Background and Justification:

Sound crop and pest management is critical to economical and efficient field crop production in New York State. The diverse landscape of New York State provides a variety of environmental conditions that can present unique crop production and pest management challenges while providing opportunities for locally based and locally adapted Integrated Pest Management (IPM) and Integrated Crop Management (ICM) training. Many agricultural producers have indicated they would like to learn more about Integrated Crop and Pest Management as a way to increase profits while protecting the environment. The Tactical Agriculture program (TA) was initiated in the early 1990s to help field corn and alfalfa producers learn how to improve their crop and pest management. TA is an intensive, on-farm, growing-season-long, educational program that brings together Cooperative Extension educators, field crop producers, and agribusiness personnel to teach, learn, and implement IPM and ICM practices. An experiential, hands-on educational philosophy is the foundation of the TA program approach. TA builds on the philosophy that a participant learning a new IPM or ICM tactic by hearing, demonstrating,

discussing, and practicing new concepts will more likely retain the information and adopt the practice, especially when the information is reinforced throughout the growing season.

A soybean TAG team typically consists of 4 to 8 producers and agribusiness personnel from a local area. TAG groups are comprised of farming neighbors who meet at a participant's farm to learn, discuss, demonstrate and practice the IPM and ICM methods. Meetings are scheduled approximately once a month to capitalize on the educational and management opportunities of the growing season. Participants are encouraged to be proactive and learn the IPM decision-making process. Many IPM options are presented, and participants are taught how to assess pest levels, and how to evaluate need, timing, and effectiveness of various management interventions. Thus, they can more effectively manage situations in real time during the growing season when the pest or crop issues are occurring. Producers are encouraged to consider and use non-pesticide options but to also include judicious use of chemical control tactics when appropriate. Each TAG participant brings his or her own experience and expertise, which enriches discussion and contribute to the groups' overall learning process. TAG participants enroll 1 field of soybeans which serve as classrooms for TAG meetings.

On-farm education has been shown to increase participation and rates of adoption of new concepts and technologies (Wuest et al. 1995; Flora 1991). On-farm TAG meetings provide an ideal opportunity for producers to directly observe disease, insect, and weed issues. The on-farm setting fulfills a producer's desire to see how an IPM and ICM method or new technology might work on his or her own farm. The small group educational design promotes learning and effective communication among TAG participants and Extension facilitators. Participants learn from each other what agronomic methods might work on their farm given their unique crops, soils, equipment, management, and other individual farm strengths and constraints. Trust is gained among farmer, extension, and agribusiness participants. In addition to presenting a core set of IPM and ICM topics, the flexible nature of TAG programs allows facilitators to address unique situations or local concerns. Adapting TAG programs to meet local needs has great potential to dramatically increase the rate of adoption of IPM and ICM practices. For more information on this approach, please visit the following section of the NYS IPM website: <http://nysipm.cornell.edu/fieldcrops/tag/default.asp>

Needs of agricultural producers constantly change. For many producers, soybeans fit well with their field crop rotations, provide a useful homegrown source of livestock feed, and offer a valuable cash crop option. In New York State, soybean acreage has increased 10-fold plus since 1986. The USDA National Agriculture Statistics Service estimated in November of 2009 that 252,000 acres of soybeans would be harvested in 2009 in NY, the largest acreage on record. From 2007 to 2009 there was an increase of 20% in the number of soybean acres harvested in New York State. The trend in soybean acreage expansion is expected to continue as local markets are enhanced by availability of commercial roasters and oil processing plants, favorable yield potential and commodity prices, and a continued increase in interest in production and marketing of soy biodiesel. As soybean acreage has increased, so have producer questions regarding crop protection.

Until recently, soybean pest concerns have been minimal in the northeast, generally restricted to weeds, and minor insect, disease and vertebrate pests affecting emergence, vegetative and

reproductive phases of crop development. Given our Northeastern pest spectrum, many pest impacts have largely been minimized or avoided through an integrated approach based on selecting varieties for maturity group, disease resistance, and commercial commodity attributes and the timely implementation of sound agronomic practices including crop rotation. Regular field monitoring for pests and crop condition is encouraged to alert producers of potential problems.

With the detection of soybean rust in the southeastern US in November of 2004, many experts speculated that rust could have a substantial impact on soybean pest management in the future. In response, producers anticipated a need to be proactive in learning how to manage the problem should rust appear in New York. A season-long on-farm soybean education program is playing a major role in effectively communicating with farmers about Asian soybean rust identification and management, and the associated surge in interest and awareness of other foliar diseases. In addition, soybean aphid, a pest that was first documented in New York in 2001, has also dramatically increased the need for sound IPM education for soybean producers.

Weed management in soybeans will continue to be an important area for educating producers. While initially intended to be used occasionally to clean up weeds from problem fields, estimates from field crop extension educators indicate as much as 90 % of soybeans planted are glyphosphate herbicide resistant (Roundup Ready) varieties. This management technique appears to work adequately in most cases, but it is essential for IPM educators to be proactive in keeping soybean farmers alert about the potential risk of developing herbicide resistance, importance in correct timing of application, shifts in weed species occurrence, and the role that other glyphosphate-resistant crops (field corn and alfalfa) play in the use of this technology. Common lambsquarter that appears to tolerate normal rates of glyphosphate if not applied at the correct growth stage are becoming a larger concern to soybean farmers across NY. With two new exotic pests, numerous other occasionally severe pests, as well as increasing weed management challenges, it is crucial to use an educational delivery method that Cooperative Extension and other personnel can easily use in IPM outreach in soybean production systems.

Soybean producers in Seneca, Wayne and Jefferson counties were targeted for participation in intensive Soybean TAg training programs this season. In addition to these traditional TAg efforts, one-time IPM and Integrated Crop Management (ICM) soybean grower meetings were held in Cortland, Chenango, Otsego, Oswego, Tompkins counties.

Objectives:

- 1) Conduct on-farm “traditional” TAg season-long integrated pest management (IPM) and integrated crop management (ICM) education programs for soybean producers across New York State. Discuss key agronomic and economic aspects of soybean production in New York State, with an emphasis on the identification, biology, and management of critical pests, including Asian soybean rust and soybean aphid.
- 2) Extend the reach of soybean IPM and ICM on-farm education beyond the season-long groups to more effectively target farmers in areas to which soybean production is expanding, by offering soybean producer “one time” meetings group field meetings.

3) Evaluate the impact of the education programs by measuring the level of adoption of IPM and ICM practices by participating soybean farmers.

Procedures:

Traditional TAg Educational Design:

Soybean on-farm TAg education programs were implemented in 3 counties in 2009. Each county identified key IPM and ICM educational needs based on initial meetings with the farmers who chose to participate. Local educators organized and held timely meetings to address the identified topics. Meetings were scheduled relative to the pest-related needs and opportunities identified. Meetings were held to provide relevant teaching in critical educational moments during the growing season. Mike Stanyard established two soybean TAg teams in Seneca and Wayne Counties. Mike Hunter coordinated a soybean TAg team in Jefferson County. Table 1 summarizes the number of farms, coordinating Cornell Cooperative Extension Educators, and acres targeted. Table 2 presents the range of topics offered during 2009 for the traditional locally-adapted soybean TAg meetings.

Table 1. Description of TAg Teams in 2009. Number of farms and soybean acreage impacted by participating county programs

County	Local CCE TAg Team Coordinator	Number of Farms	Number of Team Members	Approximate number of Soybean Acres Targeted
Seneca	Michael Stanyard	6	7	2310
Wayne	Michael Stanyard	7	8	4075
Jefferson	Mike Hunter	5	5	2250
Totals:		18	20	8635

Table 2. Soybean TAg Topics. Overview of topics covered at Soybean TAg meetings.

Meeting Time	Topics Taught
June	Soybean stages of growth, plant population assessment - stand counts, seed corn maggot, slugs, early season disease pests: seedling rots and blights, soybean aphids, weed identification and management
July	Soybean stages of growth, soybean aphid identification and management, progress of on-farm demonstrations, soybean rust and other foliar diseases (Septoria brown spot, downy mildew), white mold, considerations regarding fungicide-use decisions
August	Soybean stages of growth, defoliating insects, soybean rust update, weed identification and management, white mold, farm-by-farm season-long pest management review, progress of on-farm demonstrations
September	Management of pests of stored soybeans, soybean harvest issues, planning for next year's crop: crop rotation, variety selection and seed treatment options; summary of on-farm demonstration observations so far

Field Scouting: Extension summer assistants monitored the enrolled soybean fields weekly on each

participating farms. Obtaining field observations at regular intervals helped reinforce the value of timely scouting and the application of this approach to all soybean acreage in production. Field scouting documented crop growth and condition and pest status. Scouting reports were shared with producers weekly, and collected field data was used as a basis for discussion at each TAG team meeting. Experience has shown an “educational moment” value when producers analyze *real* pest and crop management data collected on their *own* farm. The analysis of timely field information more fully engages participants in the learning and decision making process. This approach is ultimately more convincing and effective at promoting behavioral changes than using hypothetical examples. As a result producers learn more and are more likely to adopt IPM and ICM practices.

Soybean producer “one time” group field meetings.

This season we again offered a series of complementary “one-time” soybean educational meetings to provide soybean IPM training opportunities for growers not enrolled in Traditional Soybean TAG programs. Local extension educators coordinated several one-time field meetings to educate soybean producers in IPM and ICM concepts. Although these meetings did not have the advantage of a full season TAG training, the format was very similar to a typical TAG team agenda.

Each meeting was held in the field and featured training in how to identify, monitor and evaluate common pest and crop problems. Fields were evaluated for crop growth and development and examined for presence of diseases, weeds, and insects. Suggested field monitoring and record keeping forms and other resources were shared with participants. These trainings prepared soybean producers with information and enhanced skills to conduct their own scouting. These meetings were offered in Cortland, Chenango, Otsego, Oswego, and Tompkins counties. Seventy growers participated. See table 2 for an overview of topics taught at particular times during the growing season.

Evaluation of the Program:

TAG participants were asked to complete a pre-test and a post-test to document a baseline of participant’s IPM / ICM knowledge and skill level prior to program participation, to assess changes resulting from involvement with the TAG program, and to identify subject areas requiring special attention. A post-season survey was also conducted to determine how many IPM or ICM practices participants planned to continue doing, on how many acres, and participants’ suggestions for improving IPM and ICM education efforts in their county.

Results and Discussion:

Two types of soybean educational programs were conducted this season in NY: the traditional soybean TAG program and one-time soybean producer field meetings.

Traditional Soybean Tactical Agriculture teams (TAG).

The Tactical Agriculture (TAG) program has been a model for IPM and ICM information transfer in New York State for over 19 years. Three soybean TAG team programs were successfully implemented in 2009. Participants learned how to correctly identify, sample, assess, and apply different management tools on potential soybean pests including insects, weeds and diseases. They also gained the self-confidence needed to make environmentally and economically sound pest management decisions on their own.

2009 season overview. New York soybean producers faced many challenges this season. Wet conditions delayed planting for many growers and weather was cool and wet for much of this season. In many places where soybeans are produced the growing degree days lagged behind by from historical norms by 1 to 2 weeks. Lack of heat and delayed planting were responsible for many fields having delayed growth and development for much of the season. Initial TAg meetings addressed variety selection, soil pH, seeding rate, and fertility. During the mid June meetings, we conducted stand counts, provided an update on soybean rust development in the Southeast, practiced soybean aphid scouting (including monitoring for natural enemies), and conducted a weed assessment. This season, soybean aphid populations provided an excellent example of the advantage offered by regular field monitoring. By the time July meetings started the field scouts had discovered soybean aphids (SBA) were going to be a problem in 2009. In many areas of central, western and northern NY SBA infestation levels reached very high numbers early with many fields over threshold and requiring an insecticide treatment. Soybean fields in the Wayne, Seneca and Jefferson counties TAg teams all went over threshold for SBA. In some cases there were a 1000+ aphids on each plant in the field, more than 4 times the 250 per plant threshold guideline. These fields received insecticide treatments for SBA. It is speculated that fields left untreated growers would have lost 5 to 8 bu/acre. A few fields that were sprayed needed a second treatment about a week later. Reports from across New York indicate SBA populations remained high much of the growing season. If soybeans were left untreated with an insecticide for SBA there was the potential for \$50 to \$80 per losses acre. As a whole the growers that participated in TAg avoided estimated losses of \$431,750 to \$690,800 for SBA damages.



(“I became a better manager of my soybeans because of the hands-on experience on what to look for, when to look for it and when to treat,” TAg participant quote 2009)

During July and August meetings, we discussed and observed foliar diseases of soybean, giving special attention to distinguishing each disease from soybean rust. At every meeting we emphasized the importance of understanding plant growth stages and vulnerable stages in plant growth and development, and to correctly time management actions, if management was necessary.

The wet season favored development of a number of soybean diseases this season. The more frequently observed diseases were white mold, downy mildew, bacterial blight, brown spot and bacterial pustule. TAg participants learned to identify these diseases and discussed conditions that favor development. Management actions were also discussed including resistant variety

selection, crop rotation, and application of fungicides. No TAg fields had issues that warranted fungicide application this season. September meetings focused on pests of soybeans in on-farm storage, as well as crop rotation, variety selection, and seed treatment decisions for 2010.

New York State participated in the 2009 National Soybean IPM PIPE Sentinel plot network under the guidance of Gary Bergstrom (Cornell Department of Plant Pathology), Mary McKellar (Northeast Plant Diagnostic Center), and Keith Waldron (NYS IPM Program). The sentinel plot network, designed to provide an early warning to the arrival of soybean rust, has had the added benefit of providing field information that has greatly improving our understanding of the occurrence of other important diseases including several diseases which were never before detected in NY. The network also documents the status of soybean aphid populations. Three of the 6 sentinel plots in NY were located on the farms of soybean TAg team participants. If soybean rust had been present in NY in 2009, TAg team members and other soybean farmers would have been kept informed of status and management options through Cornell Cooperative Extension and the Cornell Plant Pathology Soybean Rust information site (<http://www.ppath.cornell.edu/soybeanrustny/>). See the website <http://sbrusa.net/> for more information on the national soybean rust and soybean aphid efforts.

Pest and crop observations gathered from monitoring TAg fields were shared at every meeting. The weekly scouting visits and the data they provided encouraged members to begin their own sampling programs and become more familiar with their crops. The pest information gathered from scouting the soybean TAg was also used to supplement information available in other extension educational efforts across New York State, including the NYS IPM Weekly Field Crops Pest Report (<http://nysipm.cornell.edu/fieldcrops/tag/pestrpt/default.asp>). This report was distributed to field crop educators, crop consultants, and other agri-business personnel throughout NY. Information was also posted on county and regional program websites and included in Extension newsletters. TAg updates were also discussed with statewide field crop extension personnel during Cooperative Extension weekly conference calls. The resulting “multiplier effect” greatly increased the reach of the on-farm education programs well beyond the 20 participants on TAg teams.

Knowledge and Adoption of IPM and ICM:

Results of the pre and post-testing indicated that TAg participants all increased their knowledge of IPM and ICM. Scores on soybean pre-tests averaged 56%. At the completion of the program, participants’ scores greatly increased to an average of 76%. Mean scores on pre and post tests are presented by team in Table 3.

Table 3. Pre and Post Test Scores. Mean scores on pre and post tests by county program

County	Mean Pre-test Score (%)	Mean Post-test Score (%)	Percent Improvement
Seneca Co.	64	86	22%
Wayne Co.	65	82	17%
Jefferson Co.	40	60	20%
Overall	56	76	20%

IMPACTS:

The soybean TAg program provided valuable information and served as a forum for discussion of a wide range of soybean production and protection issues. Particular emphasis was placed on educating producers about two new invasive pests of soybeans. Soybean aphids have been present in NY for several years, and had severe infestations causing yield losses to many non-TAg growers in 2009. Many producers in New York do not make management decisions based on field observations and economic thresholds. Soybean aphid identification, scouting, and management were major topics covered during soybean TAg meetings. Every soybean field on participating farms were over threshold for soybean aphid in 2009. Some of these infestations had over a 1000 aphids/plant (threshold is 250 aphids/plant). There was a potential yield loss of 5 to 8 bushels/acre which is \$50 to \$80 per acre. As a whole the growers that participated in TAg avoided potential losses of \$431,750 to \$690,800. Although Asian soybean rust has fortunately still not yet been detected in NY, producers were concerned about the possible occurrence of this disease and the occurrence of diseases that have similar symptoms.

In our TAg program evaluation, we emphasized these two pest problems with the following questions: Because of TAg, 1) Do you feel more knowledgeable about Asian soybean rust?; 2) Do you have an improved ability to scout for soybean diseases and to distinguish common diseases from rust?; 3) Are you more knowledgeable about whom to contact in case of the appearance of rust?; and 4) Are you more knowledgeable about soybean aphid life cycle, damage, and thresholds? All participants answered *yes* to all four questions.

While knowledge of IPM and ICM is important, the long-term implementation of these practices is a more critical measure of program impact. After the completion of the TAg program, participants completed an exit survey or participated in interviews to indicate what IPM and ICM practices that they plan to implement.



(“I can be more profitable because TAg enables us to take an IPM approach and take action when necessary as opposed to being strictly preventative or late to react. The use of thresholds, correct planting rates, timing of herbicides, etc.” TAg participant quote)

Impacts of the one-time soybean pest and crop management meetings

Participants in the one-time soybean meetings were asked to complete an evaluation providing feedback on meeting content and suggestions for future topics. Information from these educational events has proven positive. When participants were asked to assess their pre- and post-meeting knowledge (1 = low, 5 = high) on various soybean topics their responses indicated noticeable improvement (See table 4).

Table 4: Pre/Post survey feedback from soybean educational event.

Topic	BEFORE: Mean Response	AFTER: Mean Response
Soybean aphid	2.5	4.3
Diseases of Soybean/Fungicide use decision-making	2.6	4.1
Soybean growth stages	2.6	4.4
Weed Management	3.8	3.9

One-time meetings had an additional benefit of stimulating local interest in more in depth soybean IPM training. As a result, Soybean TAg education programs are being planned for implementation in Chenango and Otsego Counties in 2010.



(“I really enjoyed the fact that we were able to developed critical thinking skills and apply a working knowledge of what we learned to management and recommendations,” TAg participant quote 2009)

Summary: The soybean TAg programs in Seneca, Wayne and Jefferson Counties in 2009 were successful at helping 20 participants representing 18 farms to learn and to implement IPM and ICM philosophy and practices on the 8635 acres of soybeans that they manage in their farming operations. Growers greatly appreciate the interactive and participatory learning approach of this educational program that is personalized to their specific farming environment. Year after year growers indicate their receptiveness to the on-farm season-long TAg approach to soybean IPM education. They have implemented many of the IPM and ICM practices taught in the TAg programs. This has resulted in an increase in knowledge and awareness of good soybean management practices implemented on the farm. They understand the importance of scouting fields and evaluating thresholds on certain pests of soybeans. Producers in NYS continue to express interest joining a TAg team or attend meetings on soybean IPM and ICM. Continuation of the soybean on-farm education programs will enhance soybean IPM implementation efforts in NY and will improve the exchange of information between producers and extension personnel.

It should be duly noted that the successes gained through implementation of the soybean TAg efforts greatly reflect the active participation, dedication and hard work of the local cooperative extension educator facilitator(s) and their summer assistants.

Funding:

This project was supported by generous and continued funding from the Northeast Soybean Promotion Board.

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