Project Director(s): Keith Waldron and Kenneth Wise: Cornell University/NYS Program

Project Title: **Expanding Livestock Integrated Pest Management: IPM Training Opportunities for Northeast US Dairy Producers**

Project Type: IPM Issues

**Project Summary:**
Dairy production is an integral component of many rural communities in the northeastern US, helping to sustain the economic viability of our region. There are 5,700 dairy producers in New York milking 626,000 cows New York State (NYS NASS, 2010). In 1997, northeast U.S dairy and beef cattle associated revenues totaled $4.4 billion (USDA Census of Agriculture, 1997). Many of these dairy producers use monthly applications of insecticides to control nuisance and biting flies in the barn and on pasture without regard to action thresholds, environmental concerns or human health issues. We propose two approaches to educate producers on Integrated Pest Management (IPM) strategies to control nuisance and biting flies of dairy cattle. The first approach will pilot a new dairy fly IPM educational program modeled from the highly successful field crop Tactical Agriculture (TAg) program initiated in 1990 by the NYS IPM Livestock and Field Crops program. TAg is a proven educational model that presents objective, proven, land-grant based IPM information in an experiential, intensive, hands-on training to small groups of producers on their own farms. The proposed program will teach dairy producers to better manage dairy fly issues, protect the environment and reduce health risks. Participants will be actively integrated into a season-long program, which builds on an understanding of pest fly identification and biology to develop an effective fly management program. The dairy Fly IPM TAg effort has the potential to successfully encourage participants to adopt IPM strategies. Impacts of the program will be measured by pre- and post-testing of subject matter and an exit survey to determine the percentage of adoption of IPM practices taught to producers.

The second approach is a series of statewide traditional summer producer field meetings to reach a large audience of dairy producers and increase awareness of issues and IPM approaches to manage nuisance and biting flies on dairy cattle in and around confinement areas and for animals on pasture.

**Problem and Justification:**
Dairy production is an integral component of many rural communities in the northeastern US, helping to sustain the economic viability of our region. In New York, 5,700 dairy farms were in production in 2010 contributing nearly $1.6 billion in dairy products to the states economy (NY NASS, 2010). In 1997, northeast U.S dairy and beef cattle associated revenues totaled $4.4 billion (USDA Census of Agriculture, 1997). Additionally, the value of these commodities in the eastern US, where the results of this project are most applicable, total $15.4 billion.

Biting and nuisance flies, and external parasites adversely affect animal health, productivity and reduce farm profitability. A complex of pests is usually involved, which can differ in the intensity of direct and indirect host effects. Damage from infestations of summer and winter active arthropod pests of dairy and beef cattle in the U.S. have been estimated to exceed $2.26 billion in losses annually (Byford et al. 1992).
In a 1997 survey of New York dairy farmers, twenty-eight percent of respondents indicated flies in and around barn areas were most difficult to control and 43% indicated animal confinement area flies were the most likely to cause economic loss (Harrington et al. 1998). Flies in and around the barn were treated with an insecticide an average of once a week. Most respondents (80-90%) employed cultural practices such as manure removal, while less that 5% of respondents released beneficial insects to manage barn flies. In this same survey, 52% of respondents selected flies on pastured cattle as being the most difficult pest to control and 56% indicated pasture flies were the most likely to cause economic loss (Harrington et al. 1998). Additionally, dairy farmers reported using insecticides two to three times per month to manage flies on pastured cattle.

Several challenges currently face those seeking to effectively manage livestock pests today. Implementation of the 1996 federally mandated Food Quality Protection Act (FQPA) resulted in the removal of a number of commonly used livestock insecticide materials, such as dimethoate, naled and chlorpyrifos. In the last decade, relatively few new insecticides have been registered for use on livestock. Efforts by the Cornell University Veterinary Entomology research group have documented widespread insecticide resistance in house flies, a primary pest on livestock operations (Kaufman, et al. 2001). In some cases, 100% of house flies treated with specific insecticides survived when treated with the legal application rate of insecticides. The combination of fewer insecticides available and an increased presence of insecticide resistance heighten the potential for effective pest management options.

To complicate matters, as suburban areas encroach on rural agricultural landscapes, emigration of pest flies to off-site locations can act as a community lightning rod creating a new set of challenges for those involved in animal agriculture. This results from potential public health concerns and nuisance complaints from neighboring communities.

Individuals relying upon a largely insecticide-based pest management strategy will find this tactic an inadequate approach to controlling these pests. With fewer insecticides available, prospects for new materials limited, insecticide resistance more prevalent, and urbanization of once rural areas becoming more common place, livestock producers will continue to face increased challenges with fly management in the future.

These issues highlight the need for producers to have the best information available to manage dairy cattle pests and to utilize a broad integrated approach that includes a variety of cultural, biological, physical and chemical tactics.

On February 26, 2003 the Northeastern IPM Center for Livestock Commodity Working Group set priorities for livestock IPM research and extension. The working group’s second highest priority was to:

1. Enhance outreach and training in livestock IPM for growers, practitioners, vets, and others in the industry
2. Develop a strategy to ascertain the best method to share information with growers and producers

March, 2009 the North Central IPM Center identified IPM research and education needs (NCERA 201). The center set high priorities in Livestock IPM. These are as follows:
1. Educational resources on topics where regional expertise is limited, e.g. mycotoxins in animal feed, livestock IPM, stored grain IPM

The NY Organic Dairy Task Force on 4/25/2006 identified barriers to organic dairy production
1. Dairy fly management was one of their main priorities.

We also have letters of support for this project from: Northeast Organic Farming Association of New York and the NY Organic Dairy Initiative. These goals are compatible and provide rationale to address livestock pest management issues. We propose two educational outreach activities to provide dairy producers and other professionals with skills and knowledge to use of proven, effective, integrated pest management techniques to minimize, avoid and mitigate common dairy livestock arthropod pest problems. We propose increasing the number of producers utilizing livestock IPM by increasing the opportunities for Livestock IPM education designed to awareness and IPM skill level of commodity extension educators and other dairy outreach multipliers in the northeast.

Two approaches will be offered: The first is a pilot effort to utilize the proven Tactical Agriculture (TAg) training model and apply it to managing dairy fly pests. The second is a series of traditional field meetings. The methods we present are applicable for conventional and organic producers.

Livestock IPM information can, unfortunately, be difficult to obtain when needed most, due to a limited number of veterinary entomologists actively engaged in research and extension activities. Fortunately, the Veterinary Entomology program at Cornell University (New York) has had a long history of research and extension efforts to develop IPM strategies for managing pests associated with animal production. Currently, livestock IPM support is extremely limited from the other northeastern state land grant institutions. Technical support from University based veterinary entomologists will likely become more scarce as faculty retirements go into effect.

The Cornell University veterinary entomology program, working in collaboration with the New York State IPM program, has developed extremely successful confined dairy fly management and poultry programs. As a result, many northeastern dairy producers are successfully employing the IPM approach in and around animal facilities and for animals on pasture. Extension efforts are on-going to improve the amount and accessibility of this information.

Our previously developed house fly IPM strategies for confined dairy and poultry have met with substantial success and adoption. Pasture fly IPM is at a different level of development however we have had success sharing the state-of-the-art pest management strategies for this unique pest complex. As presented earlier, we have the framework and expertise in place to incorporate these results into our extension programs. Although the primary focus of our fly IPM educational outreach will be common fly pests of dairy cattle, much of the information will also have application for IPM efforts for beef cattle and horses.

Adult learning research indicates producers more readily adopt targeted farming practices when the educational design promotes small groups, open discussion, experiential hands-on learning on the farm, and is reinforced several times. (Richardson 1994; Wuest et al. 1995). The
educational model used to design this pilot dairy IPM education project will be modeled after the NY field crop Tactical Agriculture (TAg) design. The Tactical Agriculture program is a proven experiential, hands-on educational program for small groups of producers for IPM training on their own farms. See the following website for more information and impacts of the TAg program: http://nysipm.cornell.edu/fieldcrops/tag/tag_intro.asp. Exit surveys from producers who have participated in our alfalfa, field corn or soybean field crop TAg programs have documented 80 to 90% adoption of the IPM practices taught. The dairy fly IPM educational model we propose will utilize a similar approach to train participants on what is needed to more effectively manage important summer active dairy fly pests. Using a proven model gives us confidence that dairy fly IPM TAg participants would be expected to show similar improvements in their fly management skills and enhance their long term adoption of IPM practices for these pests. By increasing the rate of adoption of IPM we protect the environment, reduce public health risks, and enhance the economic status of farms. The TAg educational design has three important components. The pilot educational program will be conducted (1) on the participant’s farms, (2) in small learning groups (3) with hands-on learning over the course of a one summer. Conducting the meetings on participant farms encourages producer interest and involvement and increases the likelihood that they will use the information being taught. Wuest et al. (1995) indicate that conducting education on the farm increases the rate of adoption of specific practices of interest and discussion. The dairy fly IPM pilot program will also promote small group participation and hands-on learning for dairy producers. Blackburn (1984) and Rogers (1983) suggest that the fewer people in a group will increase producers’ learning potential and the willingness to use new farming practices. Richardson (1994) found that extension clientele preferred to learn by doing through a combination of several teaching methods, including demonstrations, visual depictions, handouts, discussion and lecture. The pilot program will be an intensive educational program that promotes exactly this type of learning, bringing Cooperative Extension educators, dairy producers, industry and agribusiness personnel together to teach, learn, and implement dairy fly IPM. Annual end-of-season participant surveys have been useful in evaluating the TAg program which this model is based on. Exit surveys of field crop TAg participants have consistently shown an enthusiastic response towards the local small group learning structure an extremely effective means to convey IPM philosophies and techniques (Waldron et al. 2002). Some typical results follow. (1) 100% of respondents indicated that the learning groups helped them to better understand their IPM role, (2) 86% indicated that they are now more aware of pest events in a season, (3) 100% indicated they would continue routine pest monitoring on their farms, (4) 88% indicated that TAg helped them realize the need for better timing and selection of their management practices, (5) 75% would “very strongly” recommend involvement in TAg to others, the remainder would make the same recommendation “moderately”. 

Teamwork is the key to having a successful dairy IPM fly educational program. The Cornell NYS IPM Program (Keith Waldron Cornell University/NYS IPM Livestock and Field Crops Coordinator, Kenneth Wise: Cornell University/NYS IPM, Eastern New York Area IPM Educator- Livestock and Field Crops) will coordinate the implementation and provide technical assistance for the pilot program. We will work very closely with an experienced Cornell Dairy Extension Educator to Design a program that best fits the local producers’ needs. The County Extension Educator will be responsible for organizing and identifying groups of producers in a local area to be in a “dairy IPM fly team”. An ideal team will consist of 4 to 6 producers in a local area. Participants will observe real barn and pasture fly problems and will employ integrated solutions. Each team participant comes to meetings with their own experience and
expertise that can enrich discussion and contribute to the overall learning process of the group. Dairy fly IPM TAg efforts will concentrate on managing summer active house and stable flies affecting dairy animals in confinement areas such as: barns, calf coveralls and hutches and face, horn and stable flies affecting dairy cattle on pasture. Each TAg participant will identify areas meeting these criteria to serve as a classroom for dairy IPM fly team meetings.

On-farm education has been shown to increase participation and rates of adoption (Wuest et al. 1995). Producers want to see how an IPM method or new technology might work on their own farm. The small group educational design promotes learning and effective communication for both the dairy participants and the Extension Educator. Participants learn from each other what dairy IPM methods might work in their type of local farming system. The program will be uniquely designed to meet local needs increasing the potential to dramatically increase the rate of adoption of IPM practices.

Another aspect of our educational implementation efforts is to reach more growers than an intensive training dairy IPM pilot program. We proposed to offer several one-time meetings for any dairy producer that wants to learn about the basics of barn and pasture dairy fly IPM. Due to the inherent differences in fly species biology and management we propose two confinement fly and two pasture fly IPM meetings. The one-time field meetings have in the past been an effective means to identify producers that want to learn more about IPM, potentially lead to increased educational opportunities and can be the genesis for developing a quorum for a future local Fly IPM TAg program.

\[d. \text{Objectives and Anticipated Impacts}\]

1. To increase the number of producers utilizing livestock IPM by increasing the number, awareness and IPM skill level of dairy producers and other agriculture professionals in the northeast.
   a) Implement 1 pilot summer-long intensive hands-on dairy fly IPM educational program
   b) Conduct 2 one-time on-farm barn fly and 2 one-time pasture fly field meetings in different locations in the NE

2. Develop educational curriculum for pasture dairy fly IPM

3. Measure the level of adoption of dairy fly IPM practices by participants in the educational programs.

Anticipated impacts: Objective 1. Producers directly engaged in the livestock IPM training effort will gain knowledge and skills related to managing common summer active livestock fly pests, will recognize opportunities and implement timely action to reduce number and impact of these fly pests on animal health and performance, will improve pesticide use decisions safeguarding human and animal health, reducing risk for development of pesticide resistance and impacts on non-target organisms and the environment.

Objective 2. Educator access to pre-developed livestock IPM curricula including background, suggestions for meeting approach, implementation, resources and evaluation will enhance the ability of local educators to provide Livestock IPM training. Widespread availability of these
“lesson-plans” via the internet will increase the number of producers receiving this education, potentially increasing those receiving the benefits described above in objective 1.

Objective 3. Evaluation of producer adoption will provide indications on the effectiveness of current educational efforts and identify strengths, weaknesses and opportunities to improve on training approach, impact, and producer use of IPM methods.

Approach and Procedures

Objective 1a. The pilot dairy fly IPM program will be held in Sullivan County, NY. Each producer/participant will enroll one barn and one pasture that will be used as the sites to conduct hands-on intensive educational sessions throughout the summer. The new program will allow for regular monitoring of flies in barns/calf greenhouses/calf hutches and pasture on animals. The dairy IPM fly team will meet once a month at one of the participant’s farms to learn the subject being delivered. Teaching responsibilities will be conducted by either the NYS IPM Livestock and Field Crops Coordinator or the Eastern NYS Area IPM Educator for Livestock and Field Crops. Other Cornell faculty experts will be invited to teach and discuss certain topics at the on-farm meetings when appropriate.

The fly data collected for the farms will also be shared statewide as newsletter articles to dairy producers in our weekly summer pest report (http://nysipm.cornell.edu/fieldcrops/tag/pestrpt/default.asp) that is distributed electronically through email and our NY IPM Program webpage. The weekly summer pest report reaches over 10,000 producers, field consultants and extension personnel each summer. The weekly summer pest report will be distributed on Cornell Cooperative Extension New York Field Crops and the Pro-Dairy e-mailing list serves. Such educational materials will aid in county field crop newsletters, radio pest alerts, educational flyers, grower meetings, field days and regional field crop meetings.

Objective 2. There is also the need to develop educational curriculum to fit the new dairy fly IPM on-farm educational program. A series of TAg program support teaching resources has been developed to assist Extension educators in delivering effective single topic training lessons. These TAg IPM teaching modules are IPM lesson plans with support materials, resources and tools to assist extension educators to conduct an effective hands-on, discussion-oriented in the field program on the concepts and methods of IPM. Modules typically have a flexible format so presenters can mix and match components to best fit local needs and opportunities. These modules typically include information on IPM concepts, reinforcing activities and pertinent supplementary resource materials. TAg modules are available at: (http://www.northeastipm.org/saremod/index.html). A confinement dairy IPM fly teaching module is currently available. We propose to develop a complementary dairy pasture fly IPM module. The flies affecting dairy cattle on pasture are horn flies, face flies, stable flies, horse and deer flies. We plan on developing creative and innovative teaching modules around the suppression of these insect pests. We also plan to develop supporting materials to use with meetings like pocket sized ID flash cards and threshold information; creative educational games to use in meetings like pasture fly pest jeopardy, etc. Developing teaching materials will allow us to train extension personnel so they can conduct their own IPM dairy fly educational program in the future thus, reaching more dairy producers with more extension educational professionals.
The potential TAg meeting calendar would sequentially address the critical fly pest management needs and opportunities that occur over the summer. The new program will teach a decision-making process. We will teach each dairy producer how to assess the fly pest levels and what IPM options that is available. Then we will encourage the dairy producers to consider and use non-pesticide options but to also include judicious use of chemical control tactics only when appropriate. The meeting subject matter topics include:

**June Meeting**
1. Conduct Pretest of knowledge to better design the program around producers needs, 2. Basics on confinement fly management, 3. Walk the barn and look for management issues, 4. Set up monitoring program for each producer, 5. Set up certain demonstration fly traps in the barn and pasture, 5. Develop a protocol for summer assistants to report pest information to the producer, extension educator and IPM educators.

**July Meeting**

**August Meeting**
1. Reinforce fly IPM lessons from the previous meeting, 2. Walk barn and pasture to evaluation management practices in place, 3. Share fly weekly infestation populations with dairy producers, 4. Discuss concerns of what seems to work and not work under the confines of each farms design, 5. Conduct the post-test of knowledge and an exit survey on adoption of IPM practices.

**Objective 1b.** Another aspect of our educational implementation efforts is to reach more growers than an intensive training dairy IPM pilot program. We will offer 4 one-time meetings for any dairy producer that wants to learn about the basics of barn and pasture dairy fly IPM. There will be two meetings devoted to management of dairy confinement fly pests and two meetings on fly pests attacking dairy cattle on pastures. These meetings will be conducted in locations across the state to increase opportunities for grower participation. To optimize local producer participation, field meetings would be held in cooperation with local Cornell Cooperative extension, Cornell Organic Dairy / Small Farms Initiative and NY the Northeast Organic Farming Association of New York. The one-time meetings have also been an avenue to identify producers that want to learn more about IPM and enroll in the more intensive program the following year.

**Objective 3. Evaluation Plans**

**Evaluation of the Summer-Long Program**
Measuring behavior change by participants in the program is a vital component of the educational model. Program impacts will be measured through pre and post-testing participants to determine changes in their knowledge and use of IPM practices on their farming operations. The team approach has the potential to dramatically increase knowledge and the rate of adoption of IPM practices. After the participants have enrolled in the program they will be required to complete a pre-test covering the information that will be presented over the course of the summer. An assessment will be conducted to determine fly pest management knowledge and practices that participant’s use before the program begins. After the completion of the program
participants will take a post-examination and an exit survey to measure changes in knowledge and the level of adoption of IPM practices on their farms. Program evaluation will include documentation of changes in knowledge of IPM, future monitoring activities, changes in pesticide usage, changes fly trapping technology that reduce fly populations on the farm. On completion of the program the producers will have the opportunity, knowledge, and skills to implement IPM practices into their farming operations. Results of the program will be published and presented in an array of venues in NYS. The report of the project results will be published on the NYS IPM/Cornell Website and will be presented at Cornell Cooperative Extension in-service training. The results will also be available for various Cornell Cooperative Extension newsletters that are sent to dairy producers.

Evaluation of the One-Time Educational Meetings
To evaluate the impact of the proposed on-time on-farm meetings that are not associated with the summer-long program producers who attend will be asked to complete a very brief survey/questionnaire. We plan to include questions on subject matter as well as on the value of the meeting. One question will be designed to determine interest in a more intensive educational program, such as a TAg team, in the future.

Literature Cited