

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

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Abstract

A series of statewide on-farm summer field meetings were held for dairy producers to 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.

Background 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 state's 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 than 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.

Adult learning research indicates producers are more likely to adopt targeted new practices when the educational design promotes small groups, open discussion, and experiential hands-on learning on the farm (Kolb 1984, Koontz et al. 1994, Richardson 1994, Rogers 1983). Having the IPM dairy field meetings on a local producer's farm and inviting the local dairy farmers creates a trusting atmosphere. Producers are more inclined to adopt new methods of pest control when they can see and do it on their own farm. A series of field meetings were held across NY and one in New Hampshire to extend dairy cattle IPM information to better manage common nuisance and biting flies attacking animals on dairy pasture and in confinement areas.

Objectives:

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.
2. 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.

Procedures:

Pasture and confinement dairy fly IPM meetings were designed to provide participants with an overview of Dairy Cattle IPM principles and practical approaches to managing common fly pests affecting animals on pasture or while in confinement. These presentations were followed by an in situ demonstration/hands-on experience. By actively engaging individuals through seeing and

doing producers are more willing to adopt many of the new procedures and practices being taught. We teamed with extension educators that have direct connection with producers in several areas of NY and New England. Typical meeting agendas are in Appendices 1 and 2.

The NE IPM Partnership proposal reviewers recommended that this project that growers in the Northeast should have access to the meetings (not just NY growers). Their expectation was that trainings be conducted in several states. To comply with this request, attempts were made to offer IPM field meetings in areas accessible by stakeholders from New York and adjacent states. In addition to training and interacting with producers, these meetings also provided opportunities to collaborate and train extension personnel in Dairy IPM practices and to learn from them fly management needs, issues of concern or areas of opportunity for additional outreach and/or research.

Extension educator host collaborators were invited to select the dairy fly IPM topic that best met the current needs of their local clientele either: flies in and around confinement areas or flies affecting animals on pasture.

Advertising Dairy Cattle IPM events

New York:

Cornell Cooperative extension personnel with dairy and field crop responsibilities were contacted to seek partners to host local field meetings. Extension educators in counties adjacent or close to state borders were particularly targeted. Once local meeting arrangements had been made, meetings were advertised locally through extension newsletters, Country Folks magazine, local newspapers and other outlets including the Northeastern IPM Center's list serve. NY Department of Environmental Conservation offered 2 Pesticide Applicator Training recertification credits (category 1b, 10 and 31) for the session.

New England:

University of Vermont extension and SARE personnel were contacted initially to test interest and availability for hosting an IPM meeting. Unfortunately, these efforts did not pan out. Overtures to New Hampshire proved more successful. Dr. Alan Eaton, State IPM Coordinator and his extension colleagues agreed to host a field meeting in Grafton County in northwest New Hampshire close to the Vermont state line and Maine. The New Hampshire meeting was advertised widely through UNH Cooperative Extension, various NH federal, state and locally based agencies, Northeast Organic Farmer Association (NOFA) –NH, NOFA-VT, NE IPM and SARE list-servers as well as various print media. NH Department of Agriculture offered 2 Pesticide Applicator Training recertification credits for the session.

Results and Discussion:

A total of nine dairy IPM meetings were held in New York and New Hampshire. Meeting locations were selected for potential participation by interested producers from Vermont, Maine, Massachusetts, Connecticut, and Pennsylvania.

New York:

A total of eight on-farm dairy IPM meetings were held in New York during 2011. Eastern NY meetings were held in: Greenwich (Washington County), West Chazy (Clinton County), Port

Henry (Essex County), Valatie (Columbia County), Millbrook (Dutchess County) and Chester (Sullivan County). Western NY meetings were held in Pavilion (Genesee County) and Newark (Wayne County). The meetings in were strategically located for proximity to other bordering states including Vermont, Massachusetts, Connecticut and Pennsylvania. All NY meetings except the Newark (Wayne County) meeting were on flies affecting animals on pasture. The Newark, NY meeting focused on fly management in dairy confinement facilities. A total of 9 extension educators were directly involved in this outreach effort.

New England/New Hampshire:

The New Hampshire confinement fly IPM meeting, hosted by Dr. Michael Lunak, UNH cooperative extension educator and Dr. Alan Eaton UNH IPM Coordinator, was held at the Grafton County cooperative extension dairy farm in North Haverhill, NH. This location provided access to producers from New Hampshire, Vermont and Maine. This meeting also provided a train-the-trainer opportunity to visit with UNH extension educators and discuss livestock fly management issues and approaches. A total of 5 extension educators, including the state IPM Coordinator, plus 1 NRCS Conservation Agronomist were directly involved in this outreach effort.

Meeting participation information is presented in Table 1.

Table 1: Meetings conducted by date, location, audience and number of people attending.

Date	Topic	Location	Audience (growers, school staff, etc.)	Number of participants
June 23	Pasture Fly IPM	Washington County, Greenwich	Producers, Veterinarians	13
July 11	Pasture Fly IPM	Essex County, Port Henry, NY	Producers	7
June 12	Pasture Fly IPM	Sullivan County, Chester, NY	Producers	28
July 12	Pasture Fly IPM	Clinton County, West Chazy, NY	Producers	8
July 12	Pasture Fly IPM	Genesee County, Pavilion, NY	Producers, Dairy Industry, Extension	60
July 28	Confinement Fly IPM	Wayne County, Newark, NY	Producers, Dairy Industry, Extension	20
Aug. 16	Pasture Fly IPM	Columbia County, Valatie, NY	Producers	10
Aug. 17	Pasture Fly IPM	Dutchess County, Millbrook, NY	Producers	10
Aug. 24	Confinement Fly IPM	N. Haverhill, NH	Extension Educators/Producers	22
			TOTAL	178

Participants completed program evaluations in eastern NY and New Hampshire. The results of these evaluations follow. The actual questionnaire can be found in Appendix 3.

Eastern New York Dairy IPM Meetings

All 6 meetings offered in eastern NY presented pasture dairy fly IPM information. Most producers attending were from NY with additional participants from Massachusetts (2), Wyoming (1), Oklahoma (1) and Delaware (1). While the focus of the meetings was on dairy

cattle IPM, several beef cattle producers and a few participants who raised horse, sheep, goats and llamas also attended.

Figure 1 indicates the majority of participants raised either dairy or beef cattle with some horses, sheep, hogs and llamas also held on pasture. The majority of participants were livestock producers with a few veterinarians also attending the meetings.

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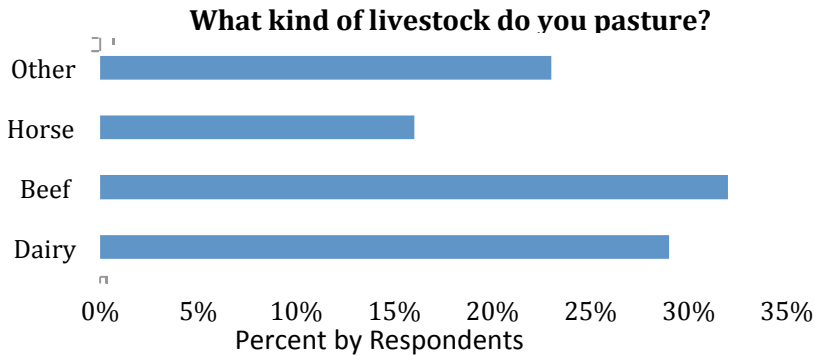


Figure 1: Percentage of respondents (n=31) on what the type of animals they pasture?

Horn, stable and face flies were the predominant fly species participants observed on pastured livestock (Table 2). Participants indicated they felt face, stable and horn flies were responsible for causing economic losses to their animals (Table 2).

Table 2: Percent responses to survey statements of flies on cattle	Horn fly	Stable fly	Face fly	Deer fly	Horse fly	Other
What insect pest appears to be most common on your pastured animals?	26%	24%	33%	2%	10%	5%
What insect pests do you feel cause economic loss to your animals?	32%	29%	39%	0%	0%	0%

All participants responding to the meeting evaluation questionnaire either highly agreed or moderately (100%) agreed that the meeting helped them better understand management of fly pests on pasture.

Prior to the dairy cattle IPM meeting, 82% of participants reported they did not use IPM thresholds in making fly management decisions. Following the meeting 100% of participants indicated they would use IPM thresholds in their fly management (Table 3.).

Table 3: The percent of participants that use of IPM thresholds

	Used IPM Thresholds	Did not use IPM Thresholds
Before Meeting	18%	82%
After Meeting	100%	0%

Table 4 indicates what management practices participants used before the meeting and what they might change after the training. During the pasture fly IPM meetings we demonstrated three commercially available traps effective against biting pasture fly pests: the Epps Biting Fly Trap, Horse Pal Biting Fly Trap, and the Alsynite Biting Fly Trap (see below for photos of the traps). Many producers indicated they did not use traps as a means to manage pasture fly pests on pasture prior to the meeting. Only twenty-three percent of producers reported using the alsynite trap for stable flies prior to the meeting and no one reported using either the EPPs or Horse Pal biting fly traps. The demonstration proved effective with both conventional and certified organic producers. Seventy-five percent of the producers indicating an interest in using a fly trap to enhance pasture fly management. We also discussed the use of the walk through trap to control horn and face flies. None of the producers had ever used them but at the completion of the meetings 55% of the producers stated they would consider their use. Organically certified repellents were used by 81% of the producers before the meeting. They stated that the repellents did seem to keep flies off the cattle.

Table 4: Percent of respondents (n=31) indicating specific fly management practices used prior to attending the dairy fly IPM meeting and what they will use (or consider using) after meeting participation.

IPM Tactic	Before		After	
	Yes	No	Yes	No
Epps Trap (non-toxic)	0%	100%	75%	25%
Horse Pal Trap (non-toxic)	8%	92%	75%	25%
Alsynite Trap (non-toxic)	23%	77%	75%	25%
Walk Through Trap (non-toxic)	0%	100%	55%	45%
Repellents (non-toxic)	81%	19%	93%	7%
Back rubbers (Pesticides)	27%	73%	25%	75%
Pour-on (Pesticides)	60%	40%	60%	40%
Feed Through (Pesticides)	0%	100%	20%	80%
Ear Tag (Pesticides)	20%	80%	0%	100%

Examples of commercially available traps for common flies affecting dairy cattle on pasture.

	
<p>Alsynite Biting Fly Trap - stable fly management</p>	<p>Horse Pal Biting Fly Trap (horse and other Tabanids)</p>
	
<p>Epps Biting Fly Trap</p>	<p>Walk-Through Fly Trap</p>

As a result of the dairy fly IPM meetings 83% of the participants stated that they gained knowledge that would help them reduce the use of insecticides on cattle.

Table 5: Comments made by participants responding to: “Please indicate how this meeting might have improved you pasture fly management practices?”

Gave some great ideas of things to try
Thinking more for biological and natural controls
Helped to better understand flies and their impact they have.
Promote dung beetle use
Watch for insecticide resistance
I will know what to look for better
More awareness of the different species of flies
More time in the field with ID
By employing new traps not chemicals
Great
Learned about fly traps
Knowing the specific behaviors for the different flies and which traps are effective for each.
How to properly use pesticides and sprays
Learned about different fly species and control methods for pasture flies
I will pay more attention to flies
Better comprehension of the fly cycle will help us reduce population and their potential

Table 6: Comments made by participants responding to: “What did you like most about this meeting?”

The pasture walk	Entire meeting
Hands-on	The people and dung beetle talk
Great Setting	Knowledge we learned
Going to the field	General information
Checking out the manure	New Ideas
Going into the field and looking at the flies	The pasture walk
Small group format	

New Hampshire Confinement Dairy Fly IPM Training

The New Hampshire meeting was held at the Grafton County extension dairy farm in North Haverhill, NH. The location was selected to help draw producers and agricultural industry personnel from other New England states. The meeting also provided a train the trainer opportunity to work with UNH extension educators to discuss and train them in dairy IPM. Fourteen producers, 5 extension educators and 1 NRCS Conservation Agronomist attended the training.

When asked, 45% of the participants indicated that the workshop exceeded expectations and 55 % stated that it “Met” expectations (n=11). No one indicated that the workshop was below their expectations. The following are comments on what participants hoped to learn are presented in Table 7.

Table 7: Comments made by participants to: “What did you hope to learn?”

Pest management on farm and control	Fly management
New ideas on management	Pest control options for flies

Participant comments on the usefulness of the workshop are presented in Table 8.

Table 8: Comments made by participants to: “Most useful element of the workshop/farm visit.”

-The different fly biology’s
-Pasture fly management
-Monitoring/natural enemies video/parasitoids
-Biology of fly species/Resources available
-Five points, examples of management options
-Ability to see how things worked
-Impressive on how many maggots develop in a small spot
-Parasitic wasps use to control house flies
-Fly biology/sheets & other references/tour & practical demonstration

Participant comments what could be done to improve the workshop are presented in Table 9.

Table 9: Comments to: “What could be done to improve the workshop?”

Better attendance	Did you have a list of places to look for the traps?
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Every participant in the meeting stated that they would recommend the workshop to other colleagues.

There was a lot of interest in having a more expanded workshop including other topics relative to pasture fly IPM (Table 10). There were also a few suggestions to have meetings at other locations in New Hampshire (Table 11).

Table 10: Comments made by participants to: “Do you have suggestions for other topics?”

-Pasture Fly IPM	-Pasture pest
-Insecticides/repellants etc. for NH	-Internal pest
-Dairy goats	

Table 11: Comments made by participants to: “Do you have suggestions for other locations for a workshop?”

Manchester, NH	NH CT river valley has a lot of dairy
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Summary

Dairy fly IPM meetings were held in Clinton, Essex, Washington, Sullivan, Dutchess, Columbia, Genesee, and Wayne counties in New York and in North Haverhill, New Hampshire. These events were successful in sharing dairy cattle IPM information with 178 participants, helping participants learn dairy biting and nuisance fly IPM principles and applied practices. The meetings were held on farms and employed an experiential learning approach with hands-on opportunities. Farmers responded very favorably to the on-farm classroom environment and were very willing to interact. Producer responses indicated they greatly appreciated the interactive and participatory learning approach of these meetings personalized to their specific farming environment. Participants expressed a better understanding of the importance of scouting, monitoring methods and evaluation. Participants stated they were going to use economic thresholds to better manage flies on animals as a result of knowledge gained from attending these meetings. They also stated that they would consider using pasture fly traps to potentially reduce insecticide use on the farm. Producers and extension personnel expressed enthusiasm and interest in having more meetings in dairy fly IPM and learning IPM approaches to manage arthropod pests affecting several other livestock species in the future. A total of 14 extension personnel from 2 states participated in these meetings as collaborators and potential amplifiers in outreach of dairy cattle IPM information.

Dairy IPM Outreach has been greatly enhanced as a direct and indirect result of this project. At least in part from the awareness created by this regional project, members of Cornell University’s NYS Livestock IPM Program were invited to make two dairy cattle IPM presentations for eOrganic’s national audience. These presentations are archived and available for viewing: Fly Management in the Organic Dairy Pasture, July 6, 2011 {<http://www.youtube.com/watch?v=xETp4ioAczA>} (633 views as of 10.29.12) and Fly Management on Your Organic Dairy Workshop, April 19, 2012

{<http://www.extension.org/pages/63269/broadcast-of-fly-management-on-your-organic-dairy-workshop-april-19-2012>} (216 views as of 10.29.12).

The encouraging results from this NE IPM Partnership funded project were also successfully used to leverage funding through the NYS IPM Program for a summer 2012 dairy cattle IPM training effort in New York: “Dairy and Beef Biting and Nuisance Flies IPM Meeting Series”. A total of 110 dairy and beef producers and several veterinarians attended the twelve meetings offered in eastern NY.

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Key Words: Stable fly, house fly, face fly, horn fly, deer fly, horse fly, dairy, cattle, IPM, integrated pest management, on-farm education.

Appendix 1: Flies Affecting Animals on Pasture Meeting Agenda

(Hour 1)

- Conduct a fun “Pasture Fly Quiz” with Participant

Importance aspect of Pasture Fly IPM:

- Animal Health,
- Economic Impacts
- Population Growth
- Pesticide Resistance
- Food Quality and Protection Act
- On / Off Site fly emigration and other effects

Identification and Biology of Horn Flies, Face Flies and Stable Flies.

- Similarities and Differences
- Management lies within the Biology for the flies
- All flies are not created equal - other potential pests

Integrated Management

- Monitoring Techniques & Threshold Guides
- Fly Trapping Technology (What can they do?)
- Natural Enemies are They Effective?
- Chemical Control, back-rubbers, sprays, ear tags
 - Insecticide Resistance Management
- Organic repellent Sprays-Do they Work?

Pasture Walk (1 Hour)

- Bio-security Issues
- Overview of Farm / Animal Production operation -host farmer or CCE personnel
- Pasture walk with eyes on fly managements issues, challenges, opportunities, how-to's, where's, whys, hands-on demonstration(s), other FAQ's
- Discussion
- Review answers to Pasture Fly Quiz

Appendix 2. Confinement Fly IPM Meeting Agenda

Introduction to Livestock IPM Confinement Area House and Stable Fly Pests (1 Hour)

-Barn Fly Quiz

-Importance aspect of Pasture Fly IPM:

- Animal Health,
- Economic Impacts
- Population Growth
- Pesticide Resistance
- Food Quality and Protection Act
- On / Off Site fly emigration and other effects

-Identification and Biology of House Flies and Stable Flies.

- Similarities and Differences
- Management lies within the Biology for the flies
- All flies are not created equal - other potential pests

-Integrated Management

- Sanitation, Sanitation, Sanitation
- Monitoring Techniques & Threshold Guides
- Baits, Sticky Ribbons / Tapes, Traps
- Natural Enemies, Augmenting natural enemy populations
- Chemical Control
 - Insecticide Resistance Management
- Organic Management

Barn and Facilities Walk (1 Hour)

- Bio-security Issues
- Overview of Farm / Animal Production operation -host farmer or CCE personnel
- Pasture walk with eyes on fly managements issues, challenges, opportunities, how-to's, where's, whys, hands-on demonstration(s), other FAQ's
- Discussion
- Review answers to Barn Fly Quiz

Appendix 3 – Blank Questionnaire

NYS IPM Pastured Cattle –Fly Management Evaluation

1. What type of animals do you pasture?
 ___ Dairy Cattle, ___ Beef Cattle, ___ Horses, _____ Other

2. What is the size of your herd? _____ How many acres do you pasture _____?

3. What insect pest appears to be most common on your pastured animals?
 Horn Fly ____, Stable Fly ____, Face Fly ____, Deer Fly ____, Horse Fly____ Other (name) _____

4. What insect pests do you feel cause economic loss to your animals?
 Horn Fly ____, Stable Fly ____, Face Fly ____, Deer Fly ____, Horse Fly____ Other (name) _____

5. Do you use action thresholds to determine if flies on you animals need to be managed?

<u>Before this meeting</u>	<u>After this meeting</u>
Yes ____, No ____	Yes ____, No ____

6. What fly management practices did you use prior to this meeting and what will you use (or consider using) after this meeting for pastured animals:

	<u>Before the meeting</u>	<u>After the meeting</u>
	check only 1 per column	
a. Epps Trap	Yes ____ No ____	Yes ____ No ____
b. Horse Pal Trap	Yes ____ No ____	Yes ____ No ____
c. <i>Alsynite Trap</i>	Yes ____ No ____	Yes ____ No ____
d. Walk Through Trap	Yes ____ No ____	Yes ____ No ____
e. Repellents	Yes ____ No ____	Yes ____ No ____
f. Back rubbers	Yes ____ No ____	Yes ____ No ____
g. Pour-on	Yes ____ No ____	Yes ____ No ____
h. Feed through	Yes ____ No ____	Yes ____ No ____
i. Ear tags	Yes ____ No ____	Yes ____ No ____

7. Will you reduce the use of insecticides because of this meeting?
 Yes ____ No ____

8. This meeting helped me better understand the fly management issues of cattle on pasture.
Highly agree Moderately agree Not Sure Moderately Disagree Strongly Disagree

9. Please indicate how this meeting might have improved you pasture fly management practices?

10. What did you like most about this meeting?

11. Where can we improve on research-based information to better meet your needs as a producer?

12. What state do you farm in? _____