

# **NEW YORK FARM VIABILITY INSTITUTE**

## ***Small Grants Program to Enhance Specialty Crop Production Businesses***

### **2004-2005 Final Project Report Form**

**Title of project.**

“Clean Corn” for organic and no-spray sweet corn growers

**Project leader(s) and contact information.**

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**Partner organizations (on *this* project).**

South Central NY Fruit and Vegetable Program  
Cornell Vegetable Extension Program

**Background situation.**

Management of the three lepidopterous insect pests of sweet corn (European corn borer, corn earworm, and fall armyworm) is a challenge for organic growers, growers marketing “no spray” sweet corn, and those small-acreage growers who cannot justify the cost of the expensive, specialized spray equipment needed for sweet corn.

European corn borer (ECB) is the primary pest of sweet corn, overwintering in our area, emerging in mid-May and, depending on the area and strains of moths present, may be flying and laying eggs all season. The corn earworm (CEW) and fall armyworm (FAW) are migrants that arrive in the area between mid-July and late August, depending on the season. All three insects cause damage to sweet corn by feeding in the ear, rendering it unsaleable in most markets. Often the customers of all three types of growers are willing to tolerate some level of damage and contamination from the worm pests, but in some seasons, infestation levels of European corn borer and/or corn earworm can approach 100%, which pushes the limits of even the most tolerant consumer. All three types of growers need pest management strategies that meet the expectations of their market, their certification program in the case of organic growers, or their equipment constraints.

## **Expected outcomes of project.**

Five farmers will learn skills to improve their sweet corn quality.

We will collect and disseminate information about the efficacy of the demonstrated practices.

## **Project activities.**

We worked in 20 plantings, totaling just over 36 acres, on five farms. Plantings ranged in size between 0.3 and 8.6 acres. Moths of the three worm pests were monitored using pheromone traps on each farm. Three releases of *Trichogramma ostrinae* were made to manage European corn borer (ECB). The first releases were initiated with the beginning of the first generation flight in early June in any fields that had reached the 6-8 leaf stage. A second release was made in each field one week later. As subsequent plantings reached the 6-8 leaf stage we repeated this procedure. We released 30,000 wasps per acre for the first two releases. When fields reached the late whorl to tassel emergence stage we made a third release of 60,000 wasps per acre. We scouted fields each week to determine if they would be over threshold for an insecticide application (to estimate how many sprays would be saved by growers who spray) and to estimate parasitism of egg masses. Corn earworm (CEW) and fall armyworm (FAW) did not arrive in the area until late August. Four fields were treated for CEW; three of the fields received one application of Entrust applied with a backpack or handheld sprayer, and one was treated with a mixture of soybean oil and Bt applied to the silks with the Zealater applicator.

On three farms we examined 100-200 ears from each field at harvest to determine the level of worm infestation. In addition, 100 customer satisfaction survey postcards were distributed to each farmer to give to their customers. The postcards asked how often they purchased corn from the grower, how many ears they purchased, how many were infested, and whether they found the quality acceptable. On the two farms marketing through a community supported agriculture (CSA) arrangement, we estimated worm infestation levels at harvest only through the information returned on the postcards.

## **Results and Farmer/business-level impacts.**

### **THE GROWING SEASON**

The 2005 growing season started out cool and wet, with some mid-season plantings delayed or never planted because of the weather. July and August were hot and dry, which resulted in erratic ECB egg laying and very fast corn development, making wasp release timing a challenge. ECB flights were substantial at three farms (Henderson, Mandeville, Thorpe) and lower and more erratic at Peacework and Sabol farms. The CEW flight started in late August and increased sharply in early September on all farms. Fall armyworm was not a serious problem at any of the cooperating farms this season.

## SWEET CORN QUALITY

### Scouting results

Four of the twenty fields we worked in were over threshold for ECB at tassel emergence. In the other sixteen fields, growers with the ability to spray would not have needed to apply a tassel emergence application for ECB.

### Harvest evaluation

Worm infestation levels at harvest ranged from 0-22% in fields before the CEW flight arrived, and from 0-100% in fields harvested after the CEW flight arrived (Table 1). Most unharvested plantings were past the green silk stage most attractive to CEW when the moth flight arrived, but fields (or part of fields) at Henderson's, Mandeville's, Sabol's and Thorpe's were treated for CEW. The growers were offered a choice between the two CEW control techniques (foliar application of Entrust or oil/Bt mixture applied with the Zealater) and were, in general, quite resistant to the idea of using the Zealater, which requires approximately eight hours per acre application time. Mandeville's, Sabol's and Henderson's elected to use one application of Entrust with a backpack or trailer mounted handheld sprayer. Fields treated with a backpack sprayer had higher levels of control than that treated with the trailer-mounted sprayer. At Henderson's part of the 3<sup>rd</sup> planting was treated and part was not, so we had a direct estimate of control. Infestation levels in the treated area were about 20% lower than those in the untreated area. At Sabol Farms, no worms were found during the main harvest in the field (5&6) treated with Entrust, but 100% of ears harvested later were infested with CEW. At Mandeville Farm, fields 7 and 8 were at the green silk stage when the CEW flight increased sharply. Field 7 was treated with Entrust and had 10% infested ears at harvest. Field 8 was left untreated and had 92% infested ears at harvest. At Thorpe Farm, half of a planting of popcorn was treated with the oil and Bt mixture applied with the Zealater. No formal harvest evaluation was conducted, but Gayle reports that damage levels were low in ears from the treated area and much higher in the untreated area.

Table 1. Worm infestation levels at harvest

Farm	Planting	Reach Threshold for ECB?	Percent Ears Infested at Harvest
Henderson	1		3.5
	2		2.0
	3 (Entrust)		66
	3 (untreated)		84
Mandeville	1		9.0
	2	√	6.0
	3	√	10.0
	4		14.0
	5	√	16.0
	6	√	9.0
	7		10.0
	8		92.0
Peacework	1&2		8.0
Sabol	1		6.0
	2		4.0
	3		8.0
	4		22.0
	5&6		0
	Late cleanup		100
Thorpe	2&3		6.0

#### Customer satisfaction

Customer satisfaction was generally high, and an analysis of satisfaction levels and frequency of purchase is interesting (Table 2). Given that customers were purchasing from the same “pool” of corn, it appears that in a couple of cases a higher percentage of customers who report more frequent purchases are satisfied with the quality of the corn than those who purchase less frequently. The level of control we achieved in this trial would not be acceptable for a wholesale market, but proved generally acceptable in a direct market situation, especially for customers who have developed a closer relationship with the farmers through frequent purchases. Information from Henderson’s customers is missing because we got the post cards to them after their first two plantings were done, and the third planting suffered from the drought and had little corn to harvest.

Table 2. Customer satisfaction at different purchase frequencies

Farm	Purchase Frequency	Quality Rating	Percent Response	Average % Infestation
Mandeville	Seldom (6)	Acceptable	100	0
		Not Acceptable	0	
	Occasionally (13)	Acceptable	100	9.5
		Not Acceptable	0	
	Often (33)	Acceptable	97	11.7
		Not Acceptable	3	50.0
Peacework*	Often (62)	Acceptable	90	4.2
		Not Acceptable	10	34.0
Sabol	Seldom (11)	Acceptable	82	8.3
		Not Acceptable	18	41.7
	Occasionally (13)	Acceptable	92	8.5
		Not Acceptable	8	83.0
	Often (8)	Acceptable	100	7.1
		Not Acceptable	0	
Thorpe**	Seldom (6)	Acceptable	67	6.3
		Not Acceptable	33	29.0
	Occasionally (14)	Acceptable	86	2.4
		Not Acceptable	14	11.8
	Often (33)	Acceptable	100	5.4
		Not Acceptable	0	

\* Marketed exclusively through CSA

\*\* Marketed through CSA and roadside stand

Some customer quotes:

- ❖ Great job! Although it never bothered me to see an occasional worm when I knew we weren't eating toxic chemicals. So, this is an awesome bonus!
- ❖ There used to be frequent pests in the corn. Now it was the best!
- ❖ Quality much better than last year
- ❖ Last year there were 1-2 worms in almost every ear of corn. This is great! Thanks.
- ❖ Fantastic! And I feel great about giving it to my children with no chemicals on it.
- ❖ This corn is so much better than in past years because of the lack of worms.
- ❖ Corn was much less infested with worms compared to last year's crop
- ❖ This year's worms were less (much) than last year!
- ❖ We appreciate the absence of chemical pesticides. Thanks for your work in this area.
- ❖ This is much preferred to chemical pesticides
- ❖ Great corn; glad not to have pesticides! I don't mind worms, only half worms.
- ❖ We appreciate what you are trying to do and glad that you can grow corn without chemicals. Yummy!
- ❖ I wondered why there were fewer worms this year!

## Cost

### ECB management

The wasps are not yet commercially available, but we estimate that 30,000 will cost between ten and fifteen dollars. At the release rates we used this season, the cost for the wasps would be \$40-\$60 per acre for the three releases. It takes about 10 minutes per acre to put the wasps out in the field, which adds less than \$2.00 to the cost even if higher wage employees are doing the job. Shipping for the wasps also need to be factored into the costs but are more difficult to estimate. Shipping for small acreages of sweet corn would add a substantial cost per acre, but that cost would decrease with a larger number of acres.

### CEW Management

It takes about eight hours per acre to apply an oil and Bt mixture to silks with the Zealater. The application does not require a high level of skill, so if an employee making \$6-\$7 per acre were assigned to the job, the cost for labor would be \$48-\$56 per acre. Approximately two gallons of oil and 1/2 lb. of Bt are needed to treat an acre of corn. We used Golden Pest Spray Oil, a soybean oil that contains an emulsifier, needed to evenly suspend the Bt in the oil. The cost for the oil is approximately \$60 per acre. The cost of the Bt adds about \$10 per acre. The total cost for the CEW treatment using the Zealater is \$120-\$130 per acre. If a foliar application of Entrust is used for CEW management, one application at the 2 oz per acre rate costs approximately \$60 for materials, plus application costs. Two or three applications may be needed for good control in some years.

Compare these costs with potential losses. If we assume a yield of 1000 dozen per acre and a price of \$3.00 per dozen, the loss if 25% of the ears are unmarketable would be \$750 per acre. At 50% unmarketable ears the loss would be \$1500. per acre, and if 75% are unmarketable, the loss would be \$2250 per acre.

### **Producer participation.**

Five producers were involved in the project. All agreed to cooperate at the grant-writing stage but none were involved in the planning. On two farms, employees were hired to work on the demonstrations. All farmers participated in the customer satisfaction survey. When CEW control became necessary, farmers participated in the decision about which technique to use.

Elizabeth Henderson, Newark, NY. 315-331-9029 (organic)

Janet and KC Mandeville, Spencer, NY. 607-589-4399 (no-spray)

Richard and Susan Sabol, Lodi, NY. 607-869-5896 (organic)

Cheryl and Dave Henderson, Penn Yan, NY. 315-536-8848 (no sprayer)

Gayle and Mike Thorpe, East Aurora, NY. 716-655-4486 (organic)

### **Other participants.**

List any non-farm participants involved in the project and their affiliations

Molly Shaw, SCNY Fruit and Vegetable Program

Jen Allen, Yates Co. Cooperative Extension

Genesee Valley CSA members  
Thorpe Farm CSA members

### **Outreach & media.**

The project was the focus of a twilight meeting on one of the cooperating farms. We developed a poster about the project, which was displayed at the Ithaca Farmer's market one afternoon, at the organic Program Work Team meeting, and at the Western New York Vegetable Program Winter Meeting,

### **Producer evaluation.**

All of the producers were happy with the level of worm infestation at harvest and four of the five gauged it lower than previous years. Thorpe Farms said it was the most worm-free corn they've ever had, and Dave Henderson said the control they had was better than when they have used insecticides. One farm had only been growing sweet corn for three years and did not have a sense of how high their infestation levels had been in previous years.

Four of the growers said they would use *Trichogramma* again in the future. At one farm, half the farm couple voiced skepticism about whether releasing the wasps would be worth the investment every season as some seasons they had low worm infestation levels without releases. The fact that the wasps need to be used as a preventive measure and not in response to scouting and using an economic threshold was seen as a shortcoming. The other half of the farm couple was interested in using the wasps in the future.

The price of the wasps was an issue for some of the farmers, but all felt that the projected costs were reasonable. Monitoring moth flights using pheromone traps will be an additional expense, whether the farms purchases and maintains its own set of traps or subscribes to a weekly pest update through the local extension program.

### **Your evaluation.**

Overall, I'm happy with the quality of the harvested corn, although infestation levels in some plantings were higher than I would like. We are gaining evidence that parasitism levels are reduced in weedy fields, and the farms with higher infestation levels did have weedier fields. Release timing was difficult this season because the corn developed so quickly for part of the season, so poorly for other parts of the season, and because ECB egg-laying tends to be sporadic under drought conditions. However, weedy fields, dry seasons, and late releases are the real world, and one thing for sure is that conditions will rarely be perfect. Control with *T. ostriniae* will be more variable than that achieved with insecticides, but will satisfy customers in specific markets most of the time.

While I was disappointed that growers were resistant to using the Zealater oil applicator for CEW management, we were able to demonstrate to them that the time and expense invested are more than offset by the potential loss of marketable yield. Although we did pretty well with one Entrust application on two of the farms, when CEW flights are high, multiple insecticide applications may be needed for good control. By the time you've

added up the time for the multiple applications, especially if using a backpack sprayer, you have almost as much invested as you would if you used the Zealater, which only needs to be used once.

I also learned valuable information about what the education and support growers will need to be able to use *Trichogramma* successfully on their own. This information will inform future projects aimed at helping growers make the transition to using the wasps on their own.

**Follow-up activities, spin-off effects.**

I have submitted a proposal to the NYS IPM grants program to provide growers with wasps and regular consultations to help them learn to use *Trichogramma* on their own.