February 1992

A.E. Ext. 92-1

ECONOMICS OF INTEGRATED PEST MANAGEMENT PRACTICES FOR INSECTS IN GRAPE PRODUCTION

New York State, 1991

Darwin P. Snyder
Timothy H. Weigle
Gerald B. White

Department of Agricultural Economics
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, New York 14853

ECONOMICS OF INTEGRATED PEST MANAGEMENT PRACTICES FOR INSECTS IN GRAPE PRODUCTION

New York State, 1991

D. P. Snyder
T. H. Weigle
G. B. White

Introduction -

In recent years, the environmental aspects of agriculture have received increasing attention in New York and elsewhere. Concern over protecting the environment, including ground and surface water, have given rise to programs such as Integrated Pest Management (IPM). This program seeks to encourage farmers to apply a holistic management approach to pest control. This approach utilizes a variety of compatible techniques to best manage a specific pest problem at a given time or, where possible, avoid the pest problem altogether. When pesticides are necessary to maintain crop yields and quality they are judiciously employed in an environmentally responsible manner.

The potential effects of other agricultural inputs and practices on the environment have also been recognized. Thus, practices including soil conservation, inorganic fertilizer use and the use of animal wastes and crop residues have been scrutinized for their effects on environmental quality.

The application of known and developing technologies to protect soil and water resources involves the transfer of knowledge and research results to the producer. Ideally, these production practices would lead to a refinement of strategic crop management plans (long term) and operational crop management plans (short term) and result in an optimum use of available technology to enhance the environment as well as the profitability of agriculture. The emerging perspective of integrated crop management seeks to provide farmers with a cropping strategy that includes all appropriate crop production practices, including the use of IPM, to optimize the profitability and environmental efficiency of crop production.

The authors are, respectively, Research Associate, Department of Agricultural Economics, Grape IPM Specialist, Cornell Cooperative Extension, and Professor, Department of Agricultural Economics, Cornell University, Ithaca, NY.

Background -

The grape IPM program was created in 1989 to provide pest management programming for growers in western New York and the Finger Lakes region. The goal of the grape IPM program is to educate growers in alternative pest management practices, provide growers with the information needed to make informed pest management decisions, and optimize the use of pesticides while maintaining, or increasing, grower profitability.

The Grape Berry Moth Risk Assessment protocol was introduced to a large number of growers during the 1990 and 1991 growing seasons. This program involves periodic scouting and sampling to determine pest pressures. In 1990, insecticide use was eliminated in 53 percent of the participating vineyards and insecticide use was reduced an average of 55 percent for all vineyards in the program.

Another program involved the use of a grape berry moth pheromone product as the primary control. A commercial product, Isomate-GBM, was registered for use in New York State vineyards prior to the 1991 growing season. Twenty six growers participated in a 1991 implementation project involving the pheromone. This program also included scouting and the use of insecticides as needed to control other insects.

The use of these alternative grape berry moth management systems also encourages growers to take a closer look at their disease management strategies.

Traditionally, growers in western New York have applied fungicides in conjunction with insecticide applications or on a calendar basis. The introduction of infection period forecasting models for black rot, powdery mildew, downy mildew and Phomopsis Cane and Leaf Spot, combined with weather equipment, has provided growers with new "tools" to time disease management strategies when they are needed. Implementation projects during the 1990 and 1991 growing seasons show a reduction in fungicide use is possible if these "tools" are used.

The future of the grape IPM program changes with the development of new management protocols for all vineyard pests including insects, diseases, weeds, birds and mammals.

Purpose and Objectives -

The goal in pest management is not necessarily the elimination of the pest but rather its control in such a way as to assure that the quality of the crop meets the buyers' specifications. The management program also must not adversely affect yields or production costs. In short, a successful IPM program will optimize pest control without adversely affecting the grower's profits or the environment in which he operates on a sustained basis and, ideally, improve both.

The Grape Berry Moth (GBM) is the primary insect pest affecting the grape crop in New York State. Therefore, insect pest management

practices are designed toward its control. However, in applying these practices growers must consider the need to manage other pests as well. These other insect pests include the Eastern Grape Leaf Hopper and the Japanese Beetle. This study deals with insect control as an important pest management concern in the production of grapes.

The purpose of this report is to summarize and analyze the economics of the use of three approaches to insect control in grape production in New York State.

Methodology -

Conventional control methods are based on general knowledge of insects and pesticide options and use for the control of the pest. Spray programs are commonly calendar based without close attention to the population levels of the target pests.

Two alternative control methods were field tested. Both are based on specific knowledge of each insect and judgment regarding economic thresholds of crop pest tolerance and pesticide use. Also important is the timely surveillance of the grape crop as it develops throughout the growing season. The Pheromone Treatment Control Program included the use of a pheromone product, Isomate-GBM, plus the use of pesticides as necessary to control insects other than the grape berry moth. It included scouting to monitor the success of the pheromone treatment and to determine if other insects exceeded tolerable thresholds. The other method, the Grape Berry Moth Risk Assessment Control Program, relied on the timely use of pesticides as determined by risk assessment procedures. These protocols used scouting and sampling techniques to determine pest pressures and appropriate control practices, if any.

Eleven farms in Chautauqua County in western New York provided records of their pest management practices as enrollees in a formal grape IPM insect control program. This Extension IPM program included group and individual educational efforts to teach growers specific procedures to follow in determining the optimum use of pesticides in the production of grapes.

Each of the eleven farms participated in the Pheromone Treatment Control Program. Records were kept on test blocks that ranged in size from three to eight acres with five acres as the most common block size. Records included information about insecticides used, if any, in addition to the pheromone ties attached to the trellis throughout the block. Application rates for insecticides as well as the number of applications for each block were recorded.

Eight of the 11 farms also provided records for a test block for which the Grape Berry Moth Risk Assessment procedures were followed to determine appropriate pest control practices. These test blocks ranged in size from four to 17 acres each. Records were provided for insecticides used, application rates and the number of applications.

The costs for insect management for these two programs were compared to costs for a common conventional insect control program as estimated by field personnel in the western New York region.

In addition to the group of growers in Chautauqua County, another group of ten grape growers in the Finger Lakes region provided records of their pesticide use in 1991. Each grower used the Pheromone Treatment Control Program and provided records of insecticides used, if any. Six of these growers also provided records of insecticides used in their conventional spray program on a test block. No records were obtained for the Grape Berry Moth Risk Assessment Control Program in the Finger Lakes region.

Costs for the materials used were calculated using standard unit costs for all blocks. Thus, material costs per acre were affected only by the material and the quantity used. The cost of the pheromone ties was discounted 50 percent by the manufacturer to encourage field testing by the program participants. The pheromone cost includes $3.50 as the cost of one-half hour of labor required to install the recommended 200 ties per acre. Cost per acre for insect control includes a standard charge of $6 per acre to represent an average cost of custom insecticide application.

Scouting and sampling procedures involve time in the vineyard to assess the need for and success of the pest management program. These formal procedures are not part of conventional spray programs and, therefore, will be an additional cost for the alternative management programs.

Scouting is estimated to require an average of one hour of time per block regardless of size. This would cover two visits to a block allowing one-half hour per visit. The value of that time, whether hired or the operator's, would be spread over the entire block. Since scouting costs and block size may vary considerably, those costs have not been included in this study. The cost of scouting, therefore, should be considered as these data are applied to specific vineyard blocks of various sizes.

Results -

Data for the 11 individual grape growers in western New York is shown in Table 1. These data show costs for the Pheromone Treatment Control Program for each individual grower. The test blocks are only a small portion of the total acres of grapes on each farm.

Table 1. Insect Control Costs for Materials and Application on Grapes
Pheromone Treatment Control Program*
Chautauqua County, NY, 1991

Farm no.	Total block acres	Block acres sprayed	Cost per acre sprayed		Total incl application			Avg cost /ac
			Mat'l	Appl	Spray cost	Pheromone cost**	All costs	
			$	$	$	$	$	$
1	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
2	5.0	5.0	9.63	6.00	78.15	117.50	195.65	39.13
4	5.0	1.0	15.81	12.00	27.81	117.50	145.31	29.06
5	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
7	8.0	0.0	0.00	0.00	0.00	188.00	188.00	23.50
8	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
9	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
10	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
11	3.0	3.0	5.50	6.00	34.50	70.50	105.00	35.00
12	5.0	1.0	9.88	6.00	15.88	117.50	133.38	26.68
13	5.0	5.0	11.94	6.00	89.70	117.50	207.20	41.44
Totals	56.0	15.0			246.04	1316.00	1562.04	
Average cost per acre					4.39	23.50	27.89	

* Pheromone ties used on all acres with insecticides applied as necessary.

** The discounted pheromone cost was $20 per acre. Also included was an application cost of $3.50 for one-half hour of labor to apply 200 ties per acre.

Of the 56 acres in these 11 blocks, 15 acres were sprayed with insecticides in addition to the pheromone ties used to control the grape berry moth. Insecticides cost an average of $4.39 per acre for the 56 acres including material and application.

The pheromone ties were applied to all acres in each block at the rate of 200 ties per acre. The cost of the ties was discounted by 50% to $20 per acre. It is estimated that one-half hour of labor is required to install the ties on one acre. Assuming a labor cost of $7.00 per hour, the cost of the pheromone treatment averaged $23.50 per acre.

The total of all costs except for scouting averaged $27.89 per acre for the Pheromone Treatment Control Program. The table shows the average cost for the pheromone treatment ranged from $23.50 to $41.44 per acre for individual farms.

There were eight test blocks from which data were obtained for the Grape Berry Moth Risk Assessment Program in western New York. Acreage in these blocks totalled 61 acres of which 40 acres were sprayed for

insects. Block size ranged from four to 17 acres each. Table 2 shows the cost of this control program for these blocks. The average cost for material and application was $13.03 per acre and ranged from zero to $33.82 per acre for individual blocks.

Table 2. Insect Control Costs for Materials and Application on Grapes
Grape Berry Moth Risk Assessment Control Program*
Chautauqua County, NY, 1991

Farm no.	Total block acres	Block acres sprayed	Cost per acre sprayed		Total incl application	Avg cost /ac
			Mat'l	Appl	Spray cost	
			$	$	$	$
1	5.0	5.0	7.90	6.00	69.50	13.90
2	4.0	4.0	10.76	12.00	91.04	22.76
4	5.0	1.0	5.93	6.00	11.93	2.39
7	17.0	0.0	0.00	0.00	0.00	0.00
9	10.0	10.0	21.82	12.00	338.20	33.82
11	10.0	10.0	5.50	6.00	115.00	11.50
12	5.0	5.0	9.88	6.00	79.40	15.88
13	5.0	5.0	11.94	6.00	89.70	17.94
Totals	61.0	40.0			794.77	
Average cost per acre					13.03	

* Insecticides are applied on recommendations from information based on scouting and sampling techniques.

Table 3 provides a cost comparison of these two insect control programs with the cost of an average conventional insect control program in the Chautauqua County area in western New York State. Conventional programs commonly involve two insect sprays with material costs of $19.76 per acre. Application costs at $6.00 per acre total $12.00 for two sprays. Based on these assumptions, conventional programs cost $31.76 per acre for material and application.

Table 3. Insect Control Costs for Materials and Application on Grapes
Comparison of Three Control Programs, Chautauqua County, NY, 1991

Control program	Mat'l	Appl	Total
	$	$	$
Conventional	19.76	12.00	31.76
Pheromone Treatment			27.89
GBM Risk Assessment			13.03

The conventional insect control program cost $3.87 more per acre than the pheromone program and $18.73 more per acre than the risk assessment program. These averages reflect the cost experience of grape growers in western New York for the 1991 growing season.

In the Finger Lakes region in central New York State, ten grape growers provided data for their insect control costs for test blocks in the Pheromone Treatment Control Program. Six of these growers also provided data for their conventional insect management practices.

The ten pheromone treated blocks, as shown in Table 4, totalled 45 acres of which 12 acres were also sprayed to control insects. Spray costs averaged $3.75 per acre including application for these acres. Pheromone costs, as in western New York, averaged $23.50 per acre including the cost of installing the ties. Total cost of the pheromone treatment was $27.25 per acre not including the cost of scouting activities.

Table 4. Insect Control Costs for Materials and Application on Grapes
Pheromone Treatment Control Program*
Finger Lakes Region, NY, 1991

Farm no.	Total block acres	Block acres sprayed	Cost per acre sprayed		Total incl application			Avg cost /ac
			Mat'l	Appl	Spray cost	Pheromone cost**	All costs	
			$	$	$	$	$	$
22	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
23	3.0	0.0	0.00	0.00	0.00	70.50	70.50	23.50
24	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
25	6.0	1.0	11.94	6.00	17.94	141.00	158.94	26.49
30	3.0	3.0	7.11	6.00	39.33	70.50	109.83	36.61
31	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
33	5.0	4.0	9.88	6.00	63.52	117.50	181.02	36.20
34	5.0	4.0	5.97	6.00	47.88	117.50	165.38	33.08
35	3.0	0.0	0.00	0.00	0.00	70.50	70.50	23.50
36	5.0	0.0	0.00	0.00	0.00	117.50	117.50	23.50
Totals	45.0	12.0			168.67	1057.50	1226.17	
Average cost per acre					3.75	23.50	27.25	

* Pheromone ties used on all acres with insecticides applied as necessary.

** The discounted pheromone cost was $20 per acre. Also included was an application cost of $3.50 for one-half hour of labor to apply 200 ties per acre.

Conventional spray program costs for 40 acres in six blocks of grapes in the Finger Lakes region are shown in Table 5. Five and one-half acres on these blocks were not sprayed. Insect spray costs averaged $15.31 per acre for materials and application. Costs ranged from zero to $32.90 per acre for individual blocks.

Table 5. Insect Control Costs for Materials and Application on Grapes
Conventional Insect Control Program
Finger Lakes Region, NY, 1991

Farm no.	Total block acres	Block acres sprayed	Cost per acre sprayed		Total incl application	Avg cost /ac
			Mat'l	Appl	Spray cost	
			$	$	$	$
22	4.0	4.0	20.90	12.00	131.60	32.90
25	19.0	19.0	9.88	6.00	301.72	15.88
30	5.0	5.0	7.11	6.00	65.55	13.11
31	4.0	4.0	11.94	12.00	95.76	23.94
35	3.0	0.0	0.00	0.00	0.00	0.00
36	5.0	2.5	1.13	6.00	17.83	3.57
Totals	40.0	34.5			612.46	
Average cost per acre					15.31	

Conventional spray program costs for cooperating growers in the western New York region were not obtained because of the likely influence participation in the formal control programs had on their "conventional" practices. Such influence was not considered a factor with the Finger Lakes growers where variety differences may help explain significantly lower conventional insecticide costs per acre.

Conclusions -

Data for 1991 from growers in Chautauqua County in western New York indicate that a formal effort to monitor insect pressures in vineyards can significantly reduce the cost of insect control. Grape growers using the GBM Risk Assessment Control Program had insect control costs averaging $13.03 per acre compared to conventional costs of $31.76 per acre. This cost reduction of $18.73 per acre is likely to be more than adequate to cover the cost of one hour of scouting spread over a block several acres in size.

On the other hand, even though the pheromone treatment cost averaged $3.87 per acre less than the cost of conventional treatment, the reduced cost would have to be spread over a larger number of acres to cover scouting costs. At the present discounted cost of pheromone ties to

growers, pheromone treatment would be economically feasible only on blocks in excess of about five acres depending on the cost of scouting. As the full cost of the pheromone ties and, especially, the actual cost to the grower declines with more use, the cost of pheromone treatment may become more competitive with other insect control programs in western New York.

The cost of the Pheromone Treatment Control Program in the Finger Lakes region, at $27.25 per acre, was very similar to the cost in western New York. Conventional spray program costs on the participating Finger Lakes farms averaged $15.31 per acre. Clearly, these farms did not find the pheromone treatment program competitive with their conventional practices.

If conventional insect control program costs on non-participating farms in the Finger Lakes region are, in fact, higher than these records would indicate, pheromone treatment would be more competitive. It may be that the Finger Lakes participants were using some scouting practices informally in their conventional program, thereby doing a more cost effective job of insect pest management than the average grower.

The scouting and sampling procedures used in the GBM Risk Assessment Control Program are a cost effective way to manage insect pests on grape farms in western New York. The significant reduction in the use of pesticides resulted in lower costs to the growers. In 1991, insecticides were eliminated entirely on 73 percent of the test block acreage in the pheromone program and 34 percent where the risk assessment program was used. Such practices that reduce costs without compromising yield or quality will contribute to improved enterprise profitability while using environmentally responsible management practices.

OTHER AGRICULTURAL ECONOMICS EXTENSION PUBLICATIONS

No. 91-25	The Year 2000: A Food Industry Forecast	David M. Russo Edward W. McLaughlin
No. 91-26	List of Available Agricultural Economics Publications July 1, 1990 - June 30, 1991	Dolores Walker
No. 91-27	Pro-Dairy Financial Data Collection Workbook	Jonas B. Kaufman Stuart F. Smith Linda D. Putnam
No. 91-28	Income Tax Myths, Truths, and Examples Concerning Farm Property Dispositions	Stuart F. Smith
No. 91-29	Farm Income Tax Management and Reporting Reference Manual	George L. Casler Stuart F. Smith
No. 91-30	Considerations in Establishing Retirement Plans for Farm Employees	George Casler Tom Maloney
No. 91-31	Item Pricing in New York State: A Three Phase Study Focusing on Price Systems, Accuracy, Consumer Perception and Related Costs to the Food Industry	Gene A. German Debra J. Perosio
No. 91-32	New York Economic Handbook 1992 Agricultural Situation and Outlook	Extension Staff
No. 91-33	1990 Northeast Beef Farm Business Summary	Caroline Nowak Rasmussen Danny G. Fox Stuart F. Smith Ted C. Perry
No. 91-34	Issues in the Development and Marketing of Reduced Chemical Agricultural Products: A Look at Disease-Resistant Apple Cultivars	Cecile Murphy Lois Schertz Willett