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Economic Implications of IPM

By James VanKirk

Overview

Concept	Activity	Handouts and Materials
Using a decision grid will help participants understand the rest of this module.	#1: Using a Decision Grid	A. *Coin Toss Decision Grid*
Crop value, severity of pest damage, and pest control costs are factors that influence pest management decisions.	#2. "Real-Life" Scenario	B. *Corn Rootworm Decision Grid* *Corn Rootworm Decision Grid: Crib Sheet* C. *Averages Worksheet* *Crop /Pest Economic Scenarios* D *Average Net Return: Economics of CRW Management in NYS* (or similar figures for your state)
Pesticides may preserve—but not increase—a crop's yield potential or net profit.		
Scouting data help make economically viable pest management decisions.		

Resources:	Related Topics:
Penn State Field Crop IPM pp. 43-45	Each module in the series.

Here s what you ll do:

Beforehand:

- Instructor prep time is important in this module. You won't pull it off if you don't understand it. So—run through the module, working through the math with figures for a couple of different pests and crops.
- We've included figures for potato leafhopper and corn rootworm. Alternatively, you may use your own figures… or figures supplied by the class. Tell participants beforehand what figures you want if you decide to go this route.
- Photocopy handouts and prepare overheads.

Today, on site:

- explore the costs involved in treating or not treating for a pest;
- see how scouting costs factor into the equation;
- find out how scouting pays for itself and sometimes returns savings that translate into profits.

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ACTIVITY #1: Using a Decision Grid

Setting	Time Required	Materials	Handouts
Indoors: classroom or someone s home with a big table and a place to set up the overhead projector.	*10 minutes*	*A quarter, pencils, overhead projector or flip pad.*	*A. C*oin Toss Decision Grid

Q:	Pose a series of questions:	A:
There are many good reasons to use IPM. But which reason is closest to your pocket?	To make or save money.	
*Place one blank copy of the C*oin Toss Decision Grid *on the overhead (or quickly draw one on the flip pad); pass out copies to the group.* *Tell participants that this is a warm-up exercise that will help the next activity go more smoothly.* *Flip the quarter, with one participant at a time calling heads or tails.* *Fill in the grid: one tally mark in each box depending on the call vs. the results.* *Continue until each box contains at least one tally mark.*		
What is the probability that the coin will be either heads or tails? What factors influence this probability?	Probability: 50 / 50— or 50%. Factors: Coin is unweighted. *(Or maybe you call it right, and the coin doesn't listen!)*	
When you make a call, how many options are there for where your call will be tallied on the grid?	Your call will fall into one of two boxes on the grid.	

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ACTIVITY #2: Real-Life Scenarios

Setting	Time Required	Materials	Handouts
Indoors: classroom or someone s home with a place to set up the overhead projector.	*Up to an hour*	*A quarter, pencils, clipboards, overhead projector* Corn Rootworm Decision Grid:- Crib Sheet *(instructor s copy)* Pest/Crop Economic Scenarios *(for use with decision grids includes figures for several other pests)*	*B.* Corn Rootworm Decision Grid *C.* Averages Worksheet *D.* Average Net Return: Economics of CRW Management in NYS *(or similar table for your state)*

Q:	Pose a series of questions:	A:
*Divide group into three teams. Place one BLANK copy of the C*orn Rootworm Decision Grid *on the overhead and pass out copies to each group.* ♦ *Tell Team 1 members that they are the ones who **always** treat with a soil insecticide, regardless of the situation.* ♦ *Tell Team 2 members that they are the ones who **never** treat with a soil insecticide, regardless of the situation.* ♦ *Tell Team 3 to hang loose.* *Using the crib sheet, fill in the overhead.* ***Note that all the figures in the grid are hypothetical. You may use your own figures for rootworms or any other pest but work it out ahead of time!***		
Will the potential crop value be the same or different for each of our options?		The same. This is the gross dollar value we can get per acre before we subtract our costs.
Fill in the potential crop values ($432) in each quadrant. (It's on your crib sheet.)		
What about control costs? Will they be the same, or different? Which ones do we know without even looking?		Different. And the costs in the "Don't Treat" column are pretty clear—they've got to be ZERO.
Fill in the control costs ($10/acre for "Treat," $0/acre for "Don't Treat."		
Check out the "Pest Under Threshold" boxes. What's our loss here?		Zero in both columns.
What about the "Pest Over Threshold" boxes? Which result do we know without looking?		Well, since we're able to control the rootworms in the "Treat" column, we won't have any net loss there.

Q:	Continue your series of questions:	A:
Fill in the pest damage loss in each quadrant. In the lower left quadrant, put in the same estimated cost as for "Pest Over Threshold/Don't Treat" but CROSS IT OUT because the treatment works.		
What does the crossed-out figure in "Pest Over Threshold / Treat" represent?	It represents our CROP VALUE PRESERVED.	
Which team uses the lowest-risk strategy? Will they ever get the highest net?	Team 1. They go for guaranteed returns. They avoid big losses but never get the biggest gain.	
Which team uses the highest risk strategy? What sort of net can they end up with?	Team 2. They can get the highest net return, but also risk the greatest losses and the lowest net.	
Where do we find the greatest net result?	"Pest Under Threshold / Don't Treat."	
In what important ways (besides product cost) is this exercise NOT like real life?	The degree to which pests are or aren't over threshold will vary greatly depending on cultural practices, where you are in rotation, the weather, the season, etc.	
Hand out the Averages Worksheet.		

Q:	Averages Worksheet discussion:	A:
Ask the first two teams to find the average Under Threshold/Over Threshold net result for their strategy. Tell them to assume a 50/50 probability of pests being either under or over threshold. *Plug their figures into the* Averages Worksheet. *If anyone seems uncertain about how to proceed, work it through on the overhead.*		
Under conditions of absolute parity (which you never find in real life), which strategy, followed blindly, will tend to give us the best results year after year?		The "Always Treat" strategy. It returns $418 / acre versus the "Never Treat" average of $405.50 / acre.
Team 3, it's your turn for a strategy— but you get to pick it. You can choose any two boxes in either row or column. What'll it be?		Why, the "Pest Under Threshold / Don't Treat"and "Pest Over Threshold / Treat" quadrants, of course! (At least, let's hope this is what they say!)
Figure the average "Under Threshold / Over Threshold" net results for your strategy. Reckon in a $2 / acre scouting cost. *(This will vary.)* What have you got? Do you like your strategy even better now?		$423 / acre. Not bad. Looks like the way to go.
Team 3, how would you know which of these strategies to use in the field?		Through scouting, how else?
If we were flipping quarters, our probability for any of these results would always be 50%. But this is the real world. What's the average net for each of these three strategies if there's a 70% probability that pests will be over threshold? What if the situation were reversed?		*(Work this through with each of the groups.)*
How do we know what the probability actually is?		Through scouting, of course!
Does an increased chance that you'll be over—or under—threshold affect your decision to scout? Why or why not?		*Lots of possible answers to these questions.*

Q:	Remaining Discussion Points	A:
Routine pesticide treatment is often misperceived as "good insurance." But if you live on a hill, do you buy flood insurance?		No.
How can "good insurance" turn into "costly insurance"?		A pest becomes resistant to a chemical… Some years, the weather takes care of an insect… you spray, but it's not even there.
Not all control options and costs involve sprays. What about rotating out of corn—how would you figure your costs and benefits? Ditto with early harvest of alfalfa? Cultivating for weeds?		Answers will vary. *Refer to Module 3: What Is a Threshold?*
As you discuss the following section, refer to figures from Pest/Crop Economic Scenarios.		
And what about controlling alfalfa weevils—the recommended treatment is early harvest. What other factors are involved, and how might we figure the cost? Can we, always?		Spraying tracks down the crop. Early harvest can conflict with corn planting… but who cuts hay when they ideally should, anyway? Maybe this just gets it done on time! And the value of more nutritious hay may balance the possible loss of corn maturity.
How might the "Potato Leafhopper on Alfalfa" decision grid work out differently than the "CRW" or "Alfalfa Weevil" grids?		Looks like "Never Treat" tends to have an economic edge over "Always Treat" for this pest. But "Scout , then Treat" is still the way to go.
Hand out copies of Average Net Return: Economics of CRW Management in NYS *(or similar tables for your state)*		
Our decision grid shows a 50/50 likelihood of a pest being over or under threshold. Of course, real life is much more variable. Between what percentage points (risk of CRW over threshold) is "Never Treat" the best option? What about "Always Treat"? "Scout, Then Decide"?		Never Treat: under 5%. Always Treat: over 85%. Scout, then Treat: between 5 and 85% *(These are NY figures which presumably are applicable to other areas and other conditions. Discuss how they may or may not be similar.)*
We've talked about the obvious costs and results for several different scenarios. Now—let's list the ones we haven't mentioned yet.. The ones that are harder to put a dollar value on, but which sometimes have tremendous costs.		Pesticide resistance… soil compaction… ground water and stream pollution… health hazards. *(If you have to fish for responses, ask: anyone ever had pests become resistant to an inexpensive insecticide and have to go to a pricier one? Etc.)*
What's the most cost-effective "insurance policy" for managing your farm?		Using integrated pest management principles.
Now for the dramatic flourish: *Flip your coin at the table in front of Team 3. Wait till it settles, leaving it uncovered. Then ask members of the team to call it.* *What s the analogy?* ***Don t make the call till you know the score.***		

A. *Coin Toss Decision Grid*

Worksheet for Activity 1

Use this page to make a transparency, or draw a grid on a flip chart.

		Your Call	
		Heads	Tails
Result			
	Tails		
	Heads		

B. *Corn Rootworm Decision Grid*

Worksheet for Activity 2

	Your Decision	
	Treat	**Don't treat**
Reality		
Pest under threshold	***Potential Value:*** yield x value ____ x ____ = $___ / a Control Costs = -$___ / a Monitoring Costs = -$___ / a Pest Damage Loss = -$___ / a Net Result = $___ / a	***Potential Value:*** yield x value ____ x ____ = $___ / a Control Costs = -$___ / a Monitoring Costs = -$___ / a Pest Damage Loss = -$___ / a Net Result = $___ / a
Pest over threshold	***Potential Value:*** yield x value ____ x ____ = $___ / a Control Costs = -$___ / a Monitoring Costs = -$___ / a Pest Damage Loss = -$___ / a Net Result = $___ / a	***Potential Value:*** yield x value ____ x ____ = $___ / a Control Costs = -$___ / a Monitoring Costs = -$___ / a Pest Damage Loss = -$___ / a Net Result = $___ / a

Corn Rootworm Decision Grid: Crib Sheet

Crib Sheet for Activity 2

	Your Decision	
	Treat	**Don't treat**
Reality	***Potential Value:***	***Potential Value:***
Pest under threshold	18 tons/a @ $24 / ton = $432 / a Control Costs = -$14 / a Monitoring Costs = -$ 0 / a Pest Damage Loss =-$ 0 / a net result = $418 / a	18 tons/a @ $24 / ton = $432 / a Control Costs = -$0 / a Monitoring Costs = -$ 2 / a Pest Damage Loss =-$ 0 / a net result = $432 / a
Pest over threshold	***Potential Value:***	***Potential Value:***
	18 tons/a @ $24 / ton = $432 / a Control Costs = -$14/ a Monitoring Costs = -$ 2 / a Pest Damage Loss =~~-$53~~ / a Net result = $418 / a	18 tons/a @ $24 / ton = $432 / a Control Costs = -$ 0 / a Monitoring Costs = -$ 0 / a Pest Damage Loss =-$53 / a net result = $379 / a

C. *Averages Worksheet*

Worksheet for Activity 2

Refer to chart below for time spent scouting per 10 and 50 acre field...

Find your net saving per acre. (Assume 50/50 probability of pest over/under threshold)

Always Treat team	*Never Treat Team*	*Scout, Then Decide Team*
Add:	Add:	Add:
pest under threshold $	pest under threshold $	pest under threshold $ .....
+ pest over threshold $	+ pest over threshold $	+ pest over threshold $ .....
= $	= $	= $ .....
Divide:	Divide:	Divide:
/ 2 = $ _____	/ 2 = $ _____	/ 2 = $ _____

How much could you potentially make per hour if you re on Team 3?

10-acre field	*50-acre field*
I. Multiply:	*I. Multiply:*
♦ *net/acre $*	♦ *net/acre $*
♦ *x # acres 10*	♦ *x # acres 10*
♦ = $	♦ = $
II. Divide:	*II. Divide:*
♦ *Figure from 3rd bullet, above, by:*	♦ *Figure from 3rd bullet, above, by:*
♦ *Scouting time*/10 acres (from chart below) minutes*	♦ *Scouting time*/10 acres (from chart below) minutes*
♦ *Result = $ /min.*	♦ *Result = $ /min.*
♦ *x 60 = $ /hr.*	♦ *x 60 = $ /hr.*
Looks good but no one scouts a field just once. You may scout 3 times or 6 times or 9 times in a field, depending on the season and the crop; you may find no pests or several different pests calling for a variety of management decisions.	Looks good but no one scouts a field just once. You may scout3 times or 6 times or 9 times in a field, depending on the season and the crop; you may find no pests or several different pests calling for a variety of management decisions.
So presuming you go to this field 6 times in the season and you need no control, determine your best case scenario of profit for an hour spent scouting:*	So presuming you go to this field 6 times in the season and you need no control, determine your best case scenario of profit for an hour spent scouting:*
III. Divide:	*III. Divide:*
♦ *Figure from 4th bullet, above, by 6 (six times in the field) or any other # of times that seems reasonable to the group!*	♦ *Figure from 4th bullet, above, by 6 (six times in the field) or any other # of times that seems reasonable to the group!*
♦ *$ /hr / by scouting trips*	♦ *$ /hr / by scouting trips*
♦ *Result = $ /hr.*	♦ *Result = $ /hr.*

** Doesn t include time spent driving between fields.*

Average time in minutes spent scouting, per visit, per field size…(round up or down in the exercise)				
5 ac. or less: 13.5	5 .1– 10 ac.: 17.1	10.1 – 15 ac.: 16.9	15.1 – 20 ac.: 17.3	20 ac. or more: 20.9

Crop/Pest Economic Scenarios

Instructor materials for Activity 2

For use with decision grids

Unless otherwise noted, all figures are per acre

Corn Rootworm complex on silage corn

Control method: Soil insecticide at planting
(rotation is another option)

Yield: 18 ton
Value: $24/ton
Value/a: $432/a

Control cost:	$5
Pest damage loss:	$-53
Prob. pest over threshold:	0.5
Net results for quadrants:	
tl (pest under, you treat):	$418
bl (pest over, you treat):	$418
tr (pest under, don't treat):	$432
br (pest over, don't treat):	$379
Avg. of always treat column:	$418
Avg. of never treat column:	$405.50
Avg. of scout then decide diagonal:	$425

Seed corn maggot and damping off on silage corn

(assume early planted, heavily manured field)

Control method: Seed treatment

Yield: 18 ton
Value: $24/ton
Value/a: $432/a

Control cost:	$1
Pest damage loss (10%?):	$-43.20
Prob. pest over threshold:	0.9
Net results for quadrants:	
tl (pest under, you treat):	$431
bl (pest over, you treat):	$431
tr (pest under, don't treat):	$432
br (pest over, don't treat):	$388.80
Avg. of always treat column:	$431
Avg. of never treat column:	$393.12
Avg. of scout then decide diagonal:	
Don't have a sampling routine. Assuming we DID, so could predict accurately	$431.10

Potato Leafhopper on alfalfa

Control method: Insecticide application
(early harvest is another option)

Yield: 1 ton/a/cutting
Value: $88/ton
Value/a/cut: $88/a/cut

Control cost:	$10
Pest damage loss:	$-13.20
Prob. pest over threshold:	0.25
Net results for quadrants:	
tl (pest under, you treat):	$78
bl (pest over, you treat):	$78
tr (pest under, don't treat):	$88
br (pest over, don't treat):	$74.70
Avg. of always treat column:	$78
IF you happen to time it right. If not so lucky, you lose tmt. cost ($10) *and* suffer damage ($-13.20) in 25% of fields	$74.70
Avg. of never treat column:	$84.68
Avg. of scout then decide diagonal:	$85.50

Alfalfa weevil on alfalfa

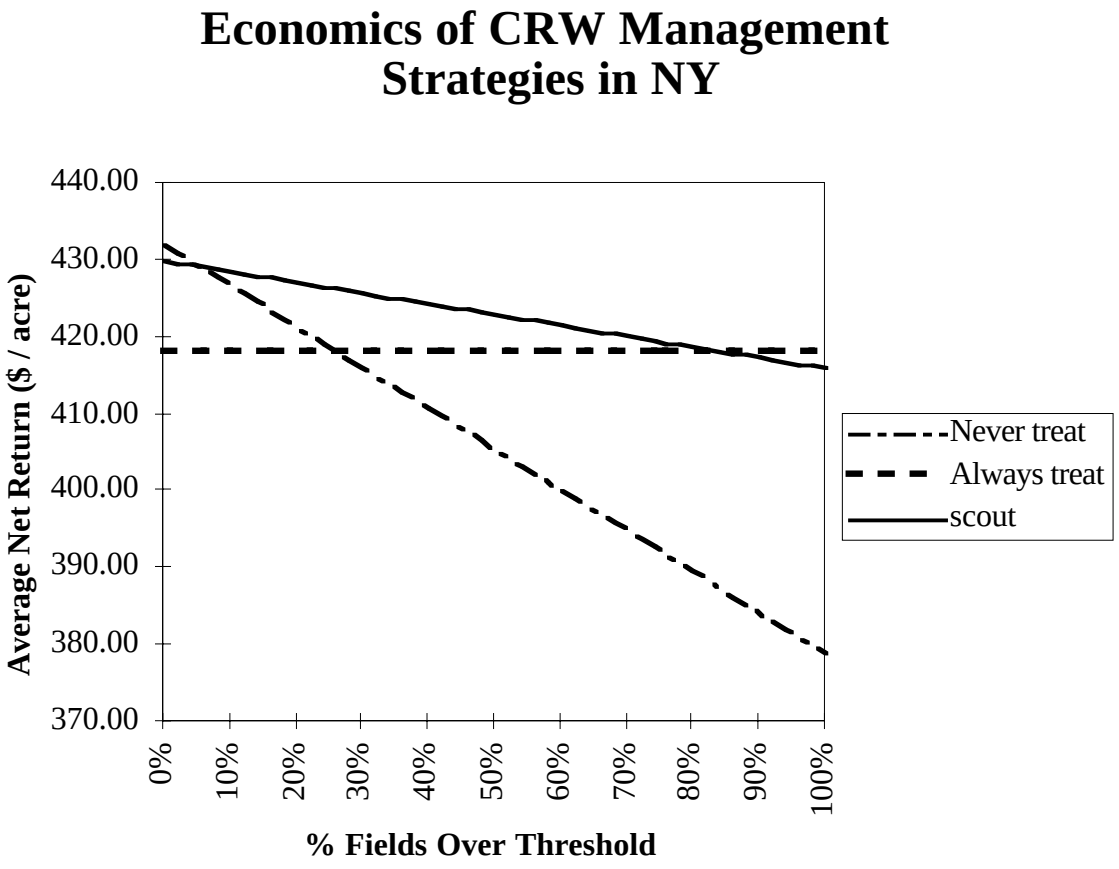
Control method: Early harvest

Yield: 1 ton / a (first cut only)
Value: $88/ton
Value/a: $88/a

Control cost: Guess 5% yield loss	$-4.40
Pest damage loss:	$-22
Prob. pest over threshold:	0.3
Net results for quadrants:	
tl (pest under, you treat):	$83.60
bl (pest over, you treat):	$83.60
tr (pest under, don't treat):	$88
br (pest over, don't treat):	$66
Avg. of always treat column:	$83.60
Avg. of never treat column:	$81.40
Avg. of scout then decide diagonal:	$86.60

D. *Average Net Return: Economics of CRW Management in NYS*

Handout for Activity 2



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Module Feedback

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Adapt the questions as needed.

Tell us a little about yourself:

I m a	*My commodity area is:*
♦ Farmer _____	♦ Dairy and field crops _____
♦ Crop advisor _____	♦ Vegetables _____
♦ Industry rep _____	♦ Fruits and berries _____
♦ Extension educator _____	♦ Greenhouse and nursery stock _____
♦ Other _____	♦ Other _____

Let us know what you think:

What part of the workshop was most interesting for you?
What part of the workshop was most valuable to you?
What two new ideas would you like to try on your farm or in your business?
Do you feel you understand IPM—and how to use it—better now?
What other information should be included in this module?
What other topics would you like us to cover in future modules?

Teachers, please fill out an evaluation as well. Photocopy and send all informative evaluations to:

NE-IPM Modules, NYS IPM Program, Box 28 Kennedy Hall, Cornell University, Ithaca NY 14853