Economic Analysis of Control Options for the Western Corn Rootworm Soybean Variant in Southern Wisconsin Paul D. Mitchell Agricultural and Applied Economics University of Wisconsin-Extension Johnstown, WI and Burlington, WI

December 8, 2004

Goal of Analysis

Estimate the \$/ac Net Benefit for a seed treatment, soil insecticide, and YieldGard Rootworm in first year corn

 Convert beetles/trap/day from Soybean Trapping Network into \$/ac Net Benefit
 Costs: use Peg Reedy's work
 Benefits: more difficult—link entomology

field research and economics

Convert beetles/trap/day into expected root rating (1-6 scale) the following year, assuming no rootworm control is used
An estimate of larval pressure next year
Use O'Neal et al. (2001) formula estimated using IL data from 1997-1999

 $RR_{no} = 1.96 + 0.22 \times (beetles/trap/day)$

Estimate expected root rating for each control method based on RR_{no}
 How much less is the RR with control?
 Use field trial data from all around Midwest (1999-2000)
 Add in more recent IL and WI data

 $\begin{aligned} \mathsf{RR}_{\mathsf{SeedTrt}} &= 1 + 0.687 \times (\mathsf{RR}_{\mathsf{no}} - 1) \\ \mathsf{RR}_{\mathsf{SoilIns}} &= 1 + 0.432 \times (\mathsf{RR}_{\mathsf{no}} - 1) \\ \mathsf{RR}_{\mathsf{YldGard}} &= 1 + 0.262 \times (\mathsf{RR}_{\mathsf{no}} - 1) \end{aligned}$

Convert root ratings into % yield loss Based on Mitchell, Gray and Steffey (2004), but updated method and data ■ %YL = $0.063 \times (RR - 1)$ Meaning: each 1 unit increase in the root rating implies 6.3% more yield loss Calculate %YL for No Control, Seed Treatment, Soil Insecticide, and YieldGard Rootworm

Calculate the Net Benefit Benefit: (%YL_{no} - %YL_{treated}) x price x yield Gives \$/ac gained by using the treatment Net Benefit: Subtract the treatment cost Example: 11% yield loss with no control, 6% with a treatment, Benefit = 5% yield gain x \$2/bu x 125 bu/ac = \$12.50/ac Cost is \$10/ac, so Net Benefit is \$2.50/ac

Show results today for a range of assumptions Expected yield: 120, 135, 150 bu/ac

Expected yield: 120, 135, 150 bu/ac
Corn price: \$1.90/bu, \$2.05/bu, \$2.20/bu
Show results for three different densities

2.5 Beetles/Trap/Day (Kenosha County)
3.75 Beetles/Trap/Day (Rock County)
5 Beetles/Trap/Day (Walworth County)

Summary of Soybean Trapping Network Data Sites Avg B/T/D County Columbia 0.35 5 Dane 3 0.53 0.51 3 Green 2.07 **Jefferson** 5 Kenosha 2.51 2 2 1.81 Racine 3.75 Rock 10 Walworth 5.04

Net Benefit (\$/ac) vs No Control											
with different planting densities											
2.5 Beetles/Trap/Day (Kenosha County)											
		See	d Treat	tment	YieldGard RW			Soil Insecticide			
Yield	Price	Low	Med	High	Low	Med	High	\$16/ac	\$18/ac		
120	1.90	-8.21	-9.71	-11.21	-1.99	-3.79	-5.59	-3.68	-5.68		
120	2.05	-7.68	-9.18	-10.68	-0.73	-2.53	-4.33	-2.71	-4.71		
120	2.20	-7.14	-8.64	-10.14	0.53	-1.27	-3.07	-1.74	-3.74		
135	1.90	-7.36	-8.86	-10.36	0.01	-1.79	-3.59	-2.14	-4.14		
135	2.05	-6.76	-8.26	-9.76	1.43	-0.37	-2.17	-1.05	-3.05		
135	2.20	-6.16	-7.66	-9.16	2.85	1.05	-0.75	0.05	-1.95		
150	1.90	-6.51	-8.01	-9.51	2.01	0.21	-1.59	-0.60	-2.60		
150	2.05	-5.84	-7.34	-8.84	3.59	1.79	-0.01	0.62	-1.38		
150	2.20	-5.17	-6.67	-8.17	5.17	3.37	1.57	1.83	-0.17		
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Net Benefit (\$/ac) for Each Control Method vs No Control										
with different planting densities										
3.75 Beetles/Trap/Day (Rock County)										
		See	d Treat	ment	YieldGard RW			Soil Insecticide		
/ield	Price	Low	Med	High	Low	Med	High	\$16/ac	\$18/ac	
120	1.90	-6.97	-8.47	-9.97	0.92	-0.88	-2.68	-1.44	-3.44	
120	2.05	-6.34	-7.84	-9.34	2.42	0.62	-1.18	-0.29	-2.29	
120	2.20	-5.71	-7.21	-8.71	3.91	2.11	0.31	0.86	-1.14	
135	1.90	-5.97	-7.47	-8.97	3.29	1.49	-0.31	0.38	-1.62	
135	2.05	-5.26	-6.76	-8.26	4.97	3.17	1.37	1.68	-0.32	
135	2.20	-4.55	-6.05	-7.55	6.65	4.85	3.05	2.97	0.97	
150	1.90	-4.97	-6.47	-7.97	5.65	3.85	2.05	2.20	0.20	
150	2.05	-4.18	-5.68	-7.18	7.52	5.72	3.92	3.64	1.64	
150	2.20	-3.38	-4.88	-6.38	9.39	7.59	5.79	5.08	3.08	

Net Benefit (\$/ac) for Each Control Method vs No Control											
with different planting densities											
5.0 Beetles/Trap/Day (Walworth County)											
		See	d Treat	ment	YieldGard RW			Soil Insecticide			
<i>ield</i>	Price	Low	Med	High	Low	Med	High	\$16/ac	\$18/ac		
120	1.90	-5.74	-7.24	-8.74	3.84	2.04	0.24	0.81	-1.19		
120	2.05	-5.01	-6.51	-8.01	5.56	3.76	1.96	2.13	0.13		
120	2.20	-4.28	-5.78	-7.28	7.29	5.49	3.69	3.46	1.46		
135	1.90	-4.58	-6.08	-7.58	6.57	4.77	2.97	2.91	0.91		
135	2.05	-3.76	-5.26	-6.76	8.51	6.71	4.91	4.40	2.40		
135	2.20	-2.94	-4.44	-5.94	10.45	8.65	6.85	5.89	3.89		
150	1.90	-3.42	-4.92	-6.42	9.30	7.50	5.70	5.01	3.01		
150	2.05	-2.51	-4.01	-5.51	11.45	9.65	7.85	6.67	4.67		
150	2.20	-1.60	-3.10	-4.60	13.61	11.81	10.01	8.33	6.33 11		

Main Point

On average, seed treatments generally do not seem to create enough benefit to justify their cost Soil insecticide or YieldGard RW generally seem justified in Walworth and eastern/southeastern Rock County, especially for fields with high average yields and/or high price

Caveat: Analysis based on averages

Average RR based on beetles/trap/day • Sometimes high beetles \neq high RR, but on average it does Average RR decrease for each control method Sometimes Soil Insecticide outperforms YieldGard in terms of RR, but on average YieldGard does a little better Average yield loss based on RR Sometimes high RR \neq high loss, but on average it does Average yield and price Data show tremendous variation around averages \$0/ac Net Benefit means you win $\frac{1}{2}$ the time and you lose 1/2 the time

What's missing?

Uncertainty: typically increases beetle/trap/day 1. threshold because risk of wasted money exceeds risk of untreated loss Cost and control benefits for Lodging 2. Cost of Refuge for YieldGard RW 3. Added harvest & drying costs with higher yields 4. Non-financial costs of insecticides and associated 5. benefits of YieldGard RW and seed treatments

Spreadsheet Available

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