Update on Objective 4: Managing the Economic Consequences of BMSB Damage

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Specialty Crop Research Initiative

Collaborating Institutions

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Objectives & Expected Outcomes

- Assess the economic potential of biological control as a long-term strategy for managing BMSB populations (Objective 2)
- Develop estimates of the cost and benefits of specific management practices for BMSB (Objective 3)
- Assist with development of program evaluation tools (Objective 5)

Economic analyses help encourage adoption of both landscape scale management strategies and farm-level management practices for the BMSB

Project #1:
Management Survey, including assessment of the economic potential of biological control of BMSB

- Develop a survey gauging economic impact of BMSB and the management practices used by commercial producers
- Assess the economic value of biological control. This is a complicated undertaking, especially for a pest that attacks a wide range of crops over a broad geographic area

Gauging the value of biological control

Successful biological control would lower pest management costs, increase yields, and improve quality for farmers and grower

- Assess potential acceptance and value:
  - Contingent valuation method
    - Commonly used to value public goods (parks), externalities (pollution), and existence values (endangered species or unique landmarks)
  - For BMSB, the survey will be used to determine the perceived value and potential acceptance of biological control by affected farmers and growers
  - Generate a benefit-cost ratio that expresses value of biological control to effected population stemming from public investment in biological control tactics

Management Survey, including Biological Control Willingness to Pay

- Management survey developed in late winter/early spring 2017
- CVM questions included to try to gauge individual willingness to pay (w/Dr. John Lee, Purdue)
- IRB process was a nightmare…took 5 iterations…approval only obtained in mid-September 2017

Q18. Biological control is the use of natural enemies to manage an insect population. It is a management tactic that can provide effective control that is also safe, environmentally-friendly, and economical.Because BMSB originally came from Asia, naturally occurring predators of the BMSB don't currently exist in large enough numbers to effectively control them in the United States.One of the most promising natural enemies of the BMSB is *Trissolcus japonicus*, a tiny parasitic wasp (less than 1/8 inch long) from Asia that attacks BMSB eggs.Effective biological control would require the widespread establishment of these wasps in areas affected by the BMSB (including the possibility of an initial mass releases).Once the wasp is widely established, additional releases would not be required unless an individual producer is interested in releasing extra wasps on their own farm to try to boost the level of control.Release of these wasps requires the approval of regulatory agencies.Researchers are preparing a petition to USDA that if granted would allow field release of *Trissolcus japonicus*.

If/when a biological control for BMSB is approved for use, would you:

	Yes	No
Want to see it released in your area?	○	○
Be willing to have it released on your operation?	○	○
Have concerns on how they may affect other insects?	○	○

Q19. How much would you be willing to spend, *per acre*, on a **ONE-TIME BASIS** for biological control of BMSB if it was:

100% effective in eliminating all crop damage from BMSB?	
90% effective in reducing crop damage from BMSB?	
75% effective in reducing crop damage from BMSB?	
50% effective in reducing crop damage from BMSB?	

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Q20. What level of control, *in percent*, would you need from a biological control program (or a combination of biological control and other pesticide-free options) for you to consider eliminating insecticide applications for BMSB?

Q21. If/when a biological control for BMSB is approved for release, who do you think should pay for the program?

- ○ Agricultural producers pay for release on their own operation and adjoining lands
- ○ All landowners in an affected area pay an assessment to cover program costs
- ○ Agricultural producers and government share the cost of the program
- ○ Affected growers pay through a commodity check off program
- ○ Would rather use other tactics to manage BMSB on my operation
- ○ Other

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Management Survey Rollout

- Survey available on-line beginning in March 2018
  - Formatting issues to address
  - Will need help advertising survey through Extension outlets
- After first year, survey will be used to track actual management response and assess the benefit of biological control on specific crops/production systems

Project #2:
Fine-tune/expand management tool that helps farmers and growers select insecticides that fit their BMSB management program at the lowest cost

Earlier similar efforts:

- **corn and soybean herbicide selection tool for Pennsylvania back in the late 1990's**
- **apple insecticide selection tool for NY State (2013-2017)**

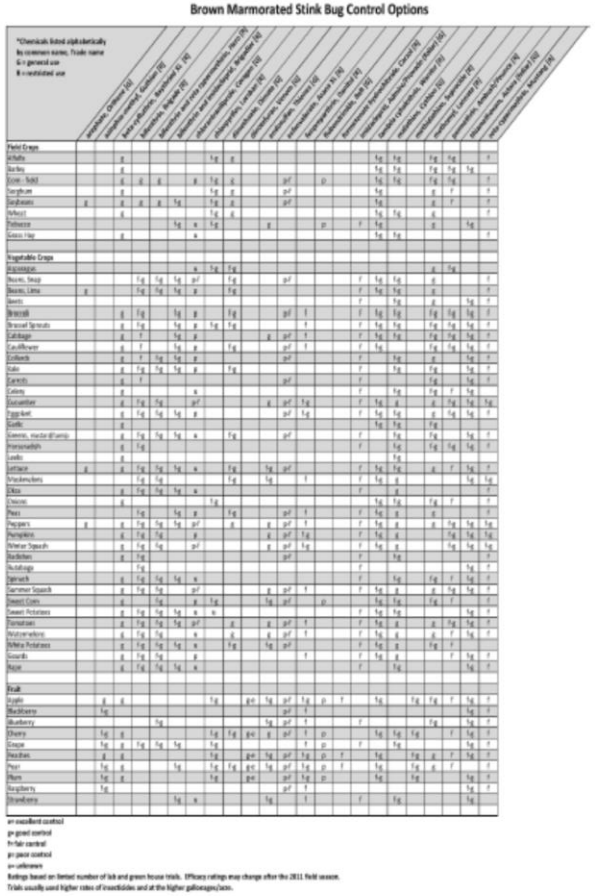
For BMSB, the selection tool is programmed within Microsoft Excel (began in 2015)

Subroutines written in Visual Basic for Applications (VBA) perform the necessary calculations and execute various sorts

Cost of BMSB Spray Options

- **Idea started with publications by Welty (2012) and Lewis, et al. (2011)**
  - **Insecticide PHI by crop**
  - **Insecticide efficacy by crop**

Ohio State handout
(Welty, 2012)



University of Maryland publication
(Lewis, Dively, Hooks, and Brust, 2011)

Structure of Selection Tool:

- Selection tool estimates the cost of BMSB spray options by crop (field crops, vegetables, fruit, and tree nuts)
- User Input:
  - Application rate (low, mid, high)
  - Insecticide price (default price list can adjusted by user)
  - PHI
- Generates:
  - least cost option
  - highest efficacy, least cost option
  - least cost option with different IRAC mode of action

CALCULATE RESULTS

BMSB Insecticide Selection Tool

Click boxes:

Instructions

CALCULATE RESULTS

BMSB management scenarios evaluated:

1) Least expensive option for PHI
2) Least expensive option for PHI with a different IRAC
3) Least expensive option for PHI with highest efficacy level

Application Rate:

- ○ Low
- ○ Mid
- ◉ High

Pre-harvest interval: 14

Trade Name	Active ingredient	unit	Default Price per unit	Your price per unit	Price to use for per unit
Actara	thiamethoxam	oz.	$3.36	$0.00	**$3.36**
Admire Pro	imidacloprid	oz.	$1.37	$0.00	**$1.37**
Agri-Mek 1.5	abamectin	oz.	$2.44	$0.00	**$2.44**
Ambush	permethrin	oz	$12.32	$0.00	**$12.32**
Asana XL	esfenvalerate	oz.	$0.44	$0.00	**$0.44**
Assail	acetamiprid	oz.	$5.07	$0.00	**$5.07**
Avaunt	indoxacarb	oz.	$6.31	$0.00	**$6.31**
Aza-Direct	azadirachtin	oz.	$1.74	$0.00	**$1.74**
Baythroid	beta-cyflutrin	oz.	$1.09	$0.00	**$1.09**
Belay	clothianidin	oz.	$2.00	$0.00	**$2.00**
Beleaf	flonicamid	oz.	$8.71	$0.00	**$8.71**
Brigade	bifenthrin	oz.	$0.62	$0.00	**$0.62**
Brigadier	bifenthrin + imidacloprid	oz.	$1.24	$0.00	**$1.24**
Carzol	formetenate hydrochloride	lb.	$3.55	$0.00	**$3.55**
Cobalt Advanced	chlorpyrifos + lambda chhalothrin	oz.	$0.39	$0.00	**$0.39**
Danitol	fenproparthrin	oz.	$1.31	$0.00	**$1.31**
Diazinon	diazinon	lb.	$9.00	$0.00	**$9.00**
Dimethoate	dimate	oz.	$0.37	$0.00	**$0.37**
Endigo	thiamrthoxam + lambda-cyhalothri	oz.	$1.59	$0.00	**$1.59**
Fastac	alpha-cypermethrin	oz.	$1.17	$0.00	**$1.17**
Hero	bifenthrin+ zeta cypermethirin	oz.	$1.09	$0.00	**$1.09**
Justice	acetamiprid + bifenthrin	oz.	$5.07	$0.00	**$5.07**
Lannate SP	methomyl	lb.	$31.52	$0.00	**$31.52**

34 insecticides listed…

Highest label rate, 30 day PHI	Least expensive option						Least expensive option, different IRAC					Least expensive option, highest efficacy					
Crop	Insecticide	Cost/A	PHI	Efficacy	IRAC	IRAC 2	Insecticide	Cost/A	PHI	Efficacy	IRAC	IRAC 2	Insecticide	Cost/A	PHI	Efficacy	IRAC	IRAC2
alfalfa	Baythroid	$3.05	7	2	3	--	Dimethoate	$5.92	3	2	1	--	Cobalt Advanced	$14.82	21	1	1	3
barley	Baythroid	$2.62	30	2	3	--	Malathion 5EC	$8.00	7	3	1	--	Endigo	$7.16	30	1	3	4
corn	Baythroid	$3.05	21	2	3	--	Dimethoate	$5.92	28	2	1	--	Brigade	$3.97	30	1	3	--
cotton	Brigade	$3.97	14	1	3	--	--	--	--	--	--	--	Brigade	$3.97	14	1	3	--
grass hay	Baythroid	$3.05	0	2	3	--	Malathion 5EC	$8.00	0	3	1	--	Brigade	$3.97	30	1	3	--
peanuts	Brigade	$3.97	14	1	3	--	--	--	--	--	--	--	Brigade	$3.97	14	1	3	--
sorghum, grain	Baythroid	$3.05	14	2	3	--	Dimethoate	$5.92	28	2	1	--	Cobalt Advanced	$14.82	30	1	1	3
soybeans	Admire Pro	$1.78	21	2	4	--	Baythroid	$3.05	15	2	3	--	Brigade	$3.97	18	1	3	--
tobacco	Admire Pro	$1.92	14	2	4	--	Brigade	$3.97	14	1	3	--	Brigade	$3.97	14	1	3	--
wheat	Baythroid	$3.05	30	2	3	--	Malathion 5EC	$6.00	7	3	1	--	Baythroid	$3.05	30	2	3	--
artichokes	Brigade	$3.97	5	1	3	--	--	--	--	--	--	--	Brigade	$3.97	5	1	3	--
asparagus	Malathion 5EC	$8.00	1	3	1	--	Assail	$26.87	1	2	4	--	Lorsban Advanced	$8.64	1	2	1	--
beans, lima	Admire Pro	$1.64	7	2	4	--	Baythroid	$3.49	7	2	3	--	Brigade	$3.97	3	1	3	--
beans, snap	Admire Pro	$1.64	7	2	4	--	Brigade	$3.97	3	1	3	--	Brigade	$3.97	3	1	3	--
beets	Admire Pro	$1.64	7	2	4	--	Brigade	$3.97	1	1	3	--	Brigade	$3.97	1	1	3	--
broccoli	Admire Pro	$1.78	7	2	4	--	Baythroid	$2.62	0	2	3	--	Brigade	$3.97	7	1	3	--
brussel sprouts	Admire Pro	$1.78	7	2	4	--	Baythroid	$2.62	0	2	3	--	Brigade	$3.97	7	1	3	--
cabbage	Admire Pro	$1.78	7	2	4	--	Baythroid	$2.62	0	2	3	--	Brigade	$3.97	7	1	3	--
carrots	Admire Pro	$1.64	7	2	4	--	Baythroid	$3.05	0	2	3	--	Brigade	$3.97	21	1	3	--
cauliflower	Admire Pro	$1.78	7	2	4	--	Baythroid	$2.62	0	2	3	--	Brigade	$3.97	7	1	3	--
celery	Baythroid	$3.49	0	2	3	--	Dimethoate	$5.92	10	2	1	--	Brigade	$3.97	7	1	3	--
cilantro	Brigade	$3.97	3	1	3	--	--	--	--	--	--	--	Brigade	$3.97	3	1	3	--
collards	Admire Pro	$1.78	7	2	4	--	Dimethoate	$2.96	14	2	1	--	Brigade	$3.97		1	3	--
cucumber	Baythroid	$3.05	0	2	3	--	Belay	$8.00	7	2	4	--	Brigade	$3.97	3	1	3	--
eggplant	Admire Pro	$3.01	0	2	4	--	Baythroid	$3.05	0	2	3	--	Brigade	$3.97	7	1	3	--
garlic	Warrior II	$4.07	14	2	3	--	Malathion 5EC	$10.00	3	3	1	--	Venom	$29.12	1	1	4	--

… output for 61 crops

Changes and what's next for BMSB Insecticide Selection Tool

- Changes since Version 1 (2015)
  - updated efficacy ratings
  - removed all pesticides that have a poor efficacy rating
  - removed Calypso, Closer, Seeker, Supracide, Thionex, and methyl parathion from options
  - updated default insecticide prices
  - adjusted sort routines
  - updated PHI data
  - added 6 crops
- What still needs to be done (next 2 months)
  - Double check insecticide rates and PHI information
  - Improve output screen
  - Upload to StopBMSB.org website

Future efforts: Develop estimates of the cost and benefits of specific management practices for BMSB

Some potential evaluations:

- estimating the cost of lures, traps, and labor inputs associated with monitoring BMSB populations to make threshold based management decisions.
- comparing the cost of crop damage in threshold-based IPM programs versus conventionally managed systems that require multiple insecticide sprays.
- determining the cost and benefits of using sustainable management tools like trap crops, insectary strips, border sprays, and attract-and-kill strategies for various specialty crops.
- evaluating the cost of reduced risk options to replace broad spectrum pyrethroid and neonicotinoid insecticides