



# The changing climate for entomology

**Peter Gregg<sup>1,3</sup> & Lewis Wilson<sup>2,3</sup>**

**<sup>1</sup> University of New England, Armidale NSW 2351**

**<sup>2</sup> CSIRO Plant Industry, Narrabri, NSW 2390**

**<sup>3</sup> Cotton Catchment Communities CRC, Narrabri NSW 2390**





*Go, Pippa!*



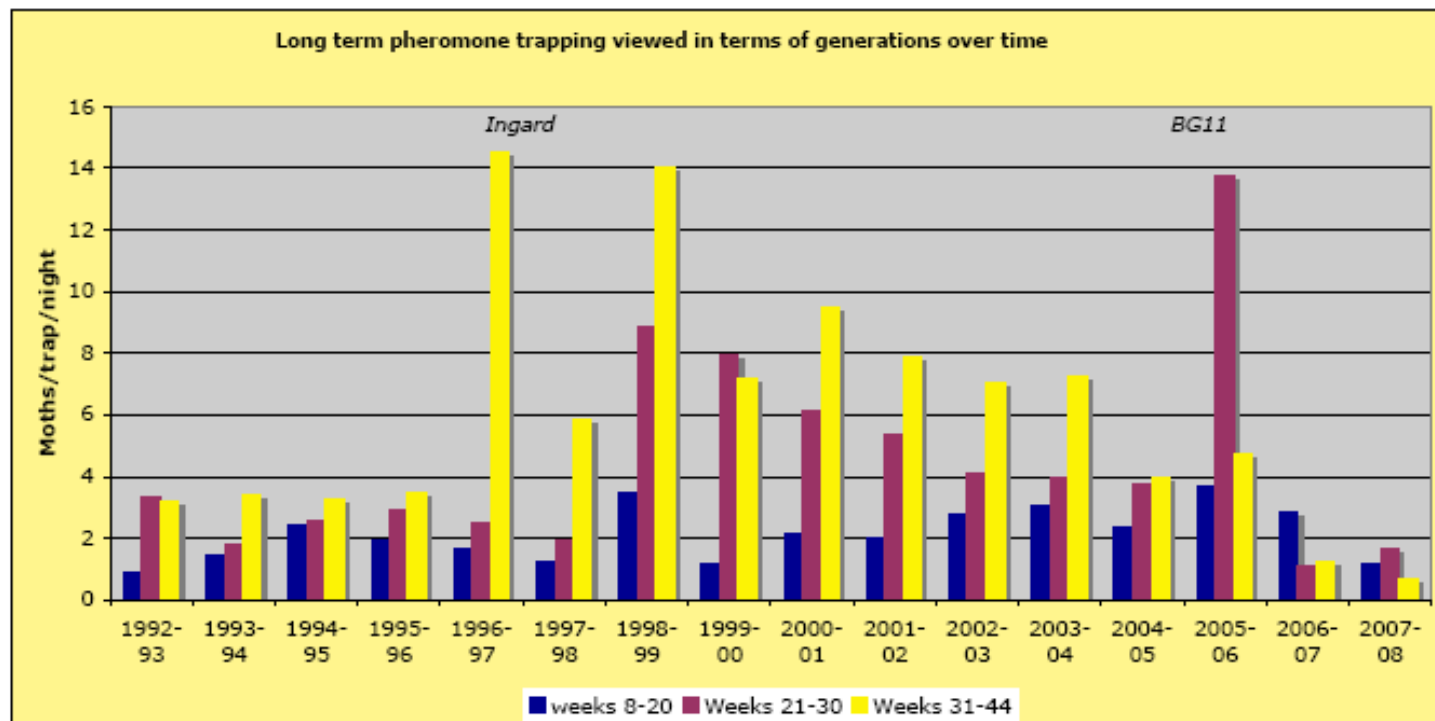
# Outline of the talk

- **What is happening in pest management?**
  - the big picture
- **Mirids**
  - have we gone overboard on them?
- **New tools**
  - what's in the pipeline?
- **Bollgard II® or conventional?**
  - are we too dependent on Bollgard?
- **IPM in the transgenic era**
  - vision or nightmare?
- ***We won't cover Bollgard resistance or climate change***



# What's happening in pest management?

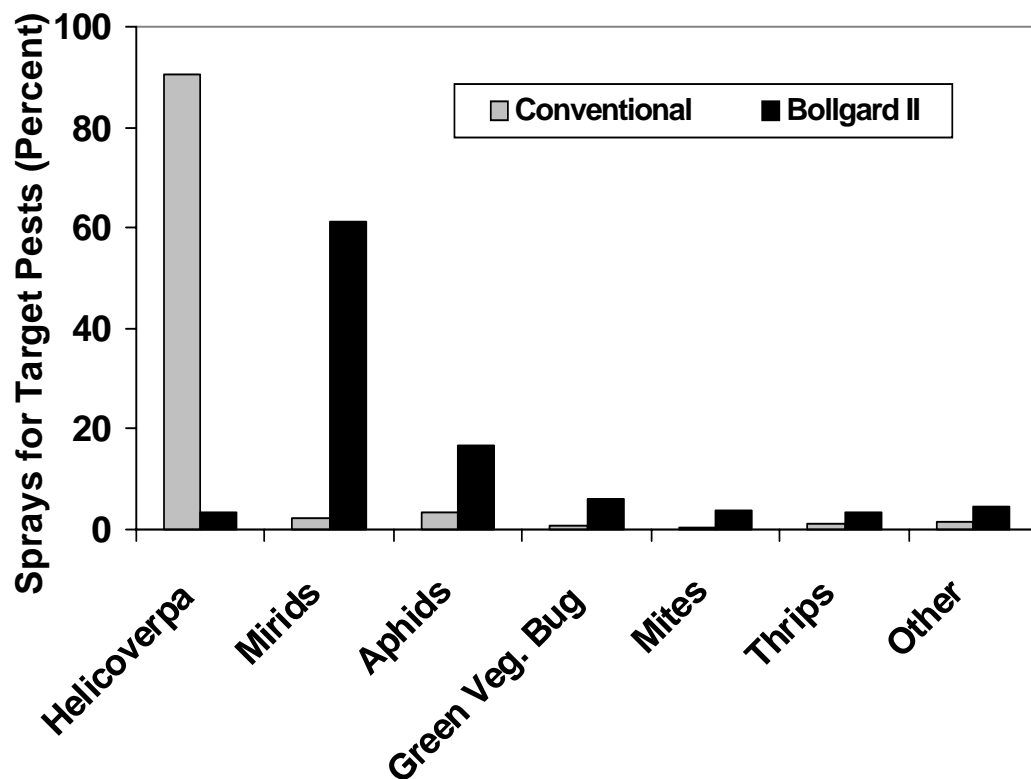
- *Helicoverpa* pressure has been fairly low
- The trend to bigger late season populations has stopped
- But survivors in Bollgard II® are still an occasional problem



Data from Colin Tann

# What's happening in pest management?

- The pests of Bollgard II® are different from those of conventional cotton



.... and the types of chemicals are different

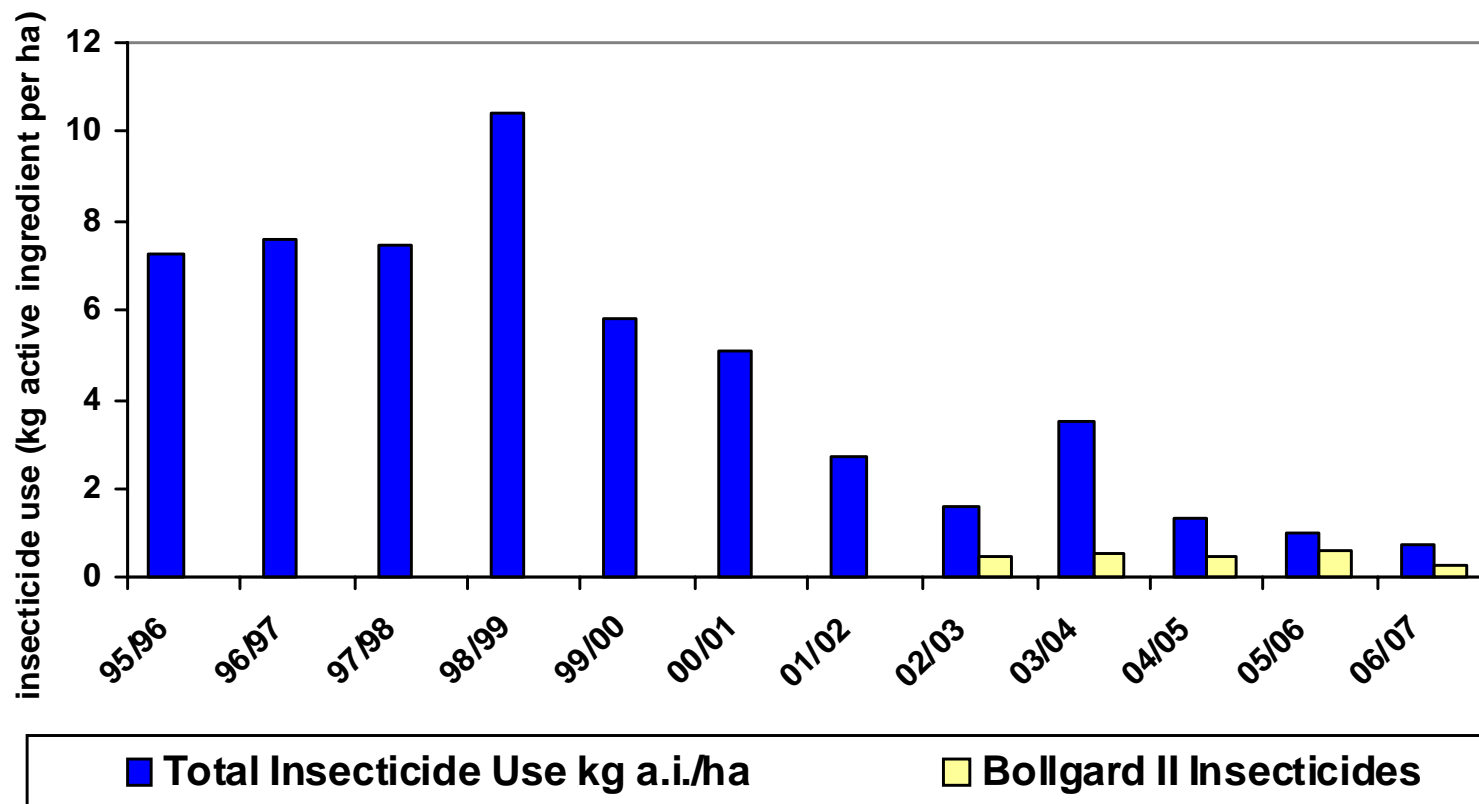
**Bollgard II®** - dimethoate, fipronil and abamectin

**Conventional** – endosulfan, emamectin, profenofos and SP's

Data from Pyke 2008

# What's happening in pest management?

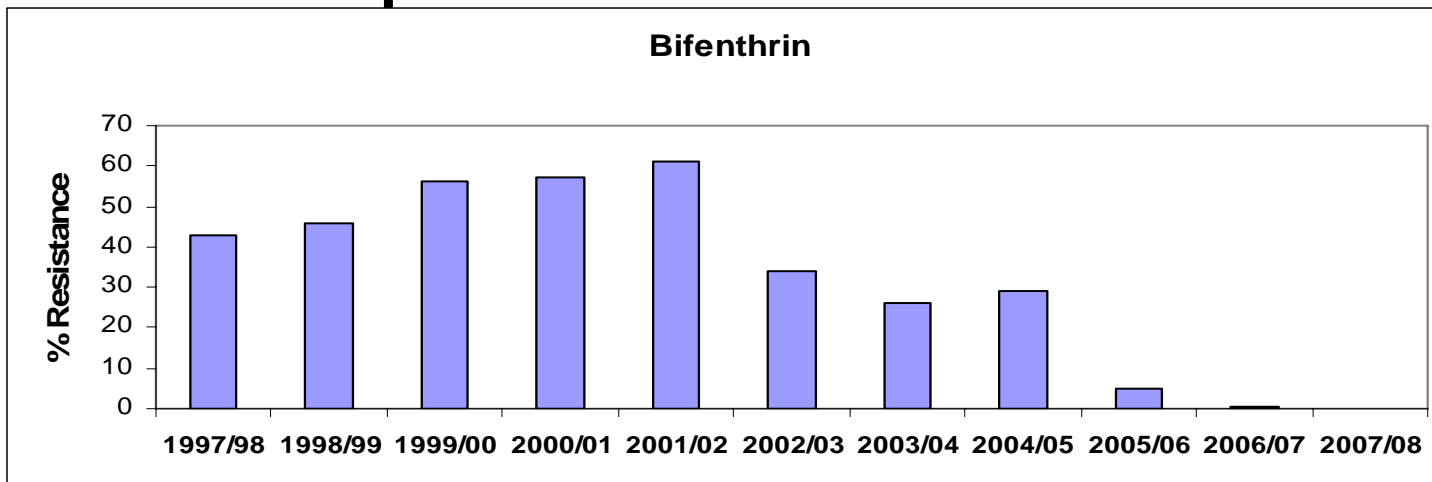
- Total insecticide use remains low in comparison with the 1990's .....



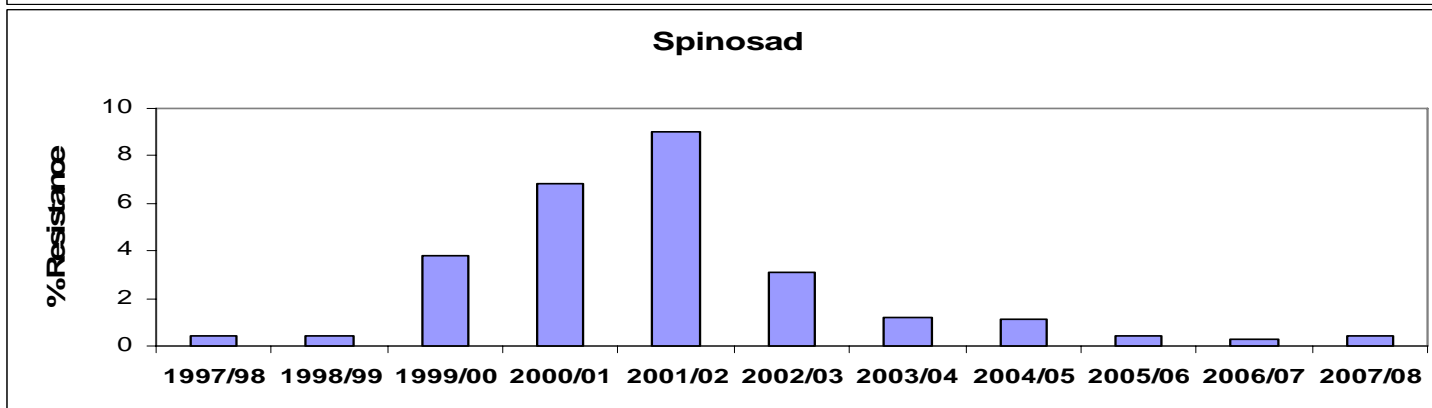
Data from Pyke 2008

# What's happening in pest management?

- Resistance to insecticides is declining as the selection pressure comes off



... but would reappear quickly with renewed selection



Data from Louise Rossiter

# What's happening in pest management?

- Pest of the season



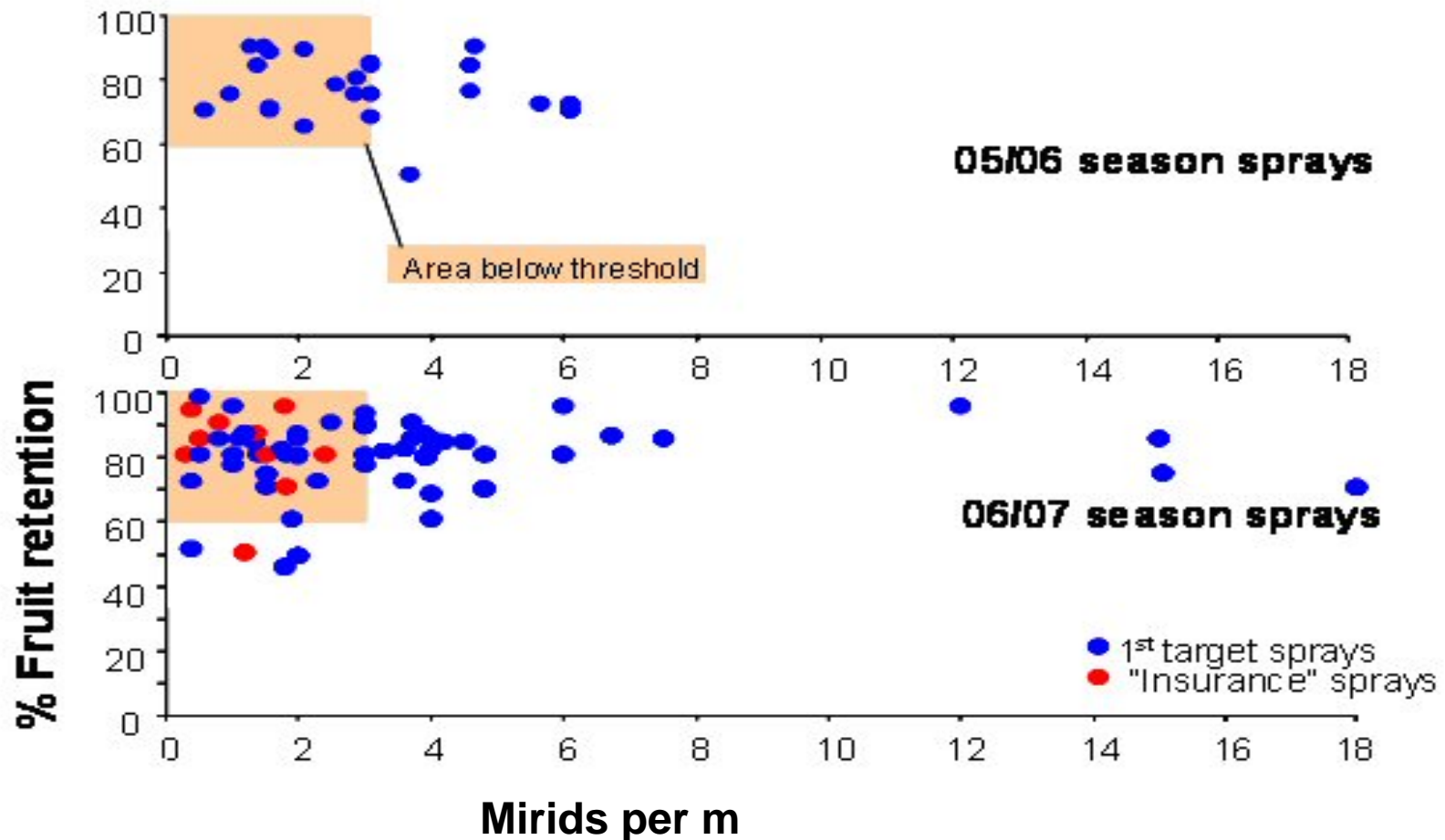
**Pale cotton stainer**  
*Dysdercus sidae*

Photos: Lewis Wilson



# Mirids – have we gone overboard?

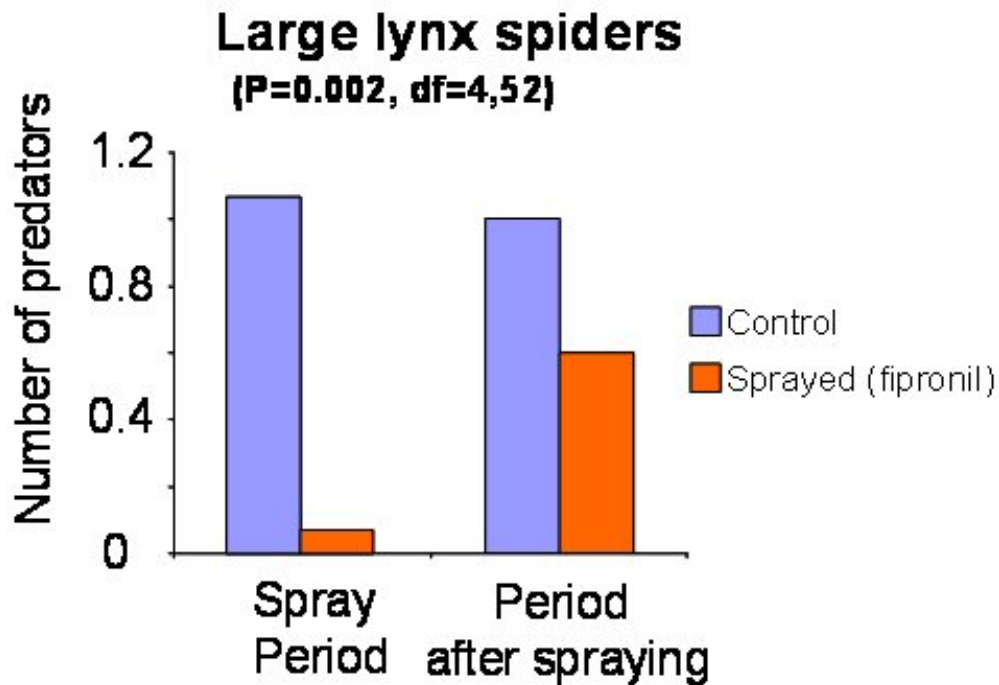
- We are spraying too much for them



Data from Mary Whitehouse

# Mirids – have we gone overboard?

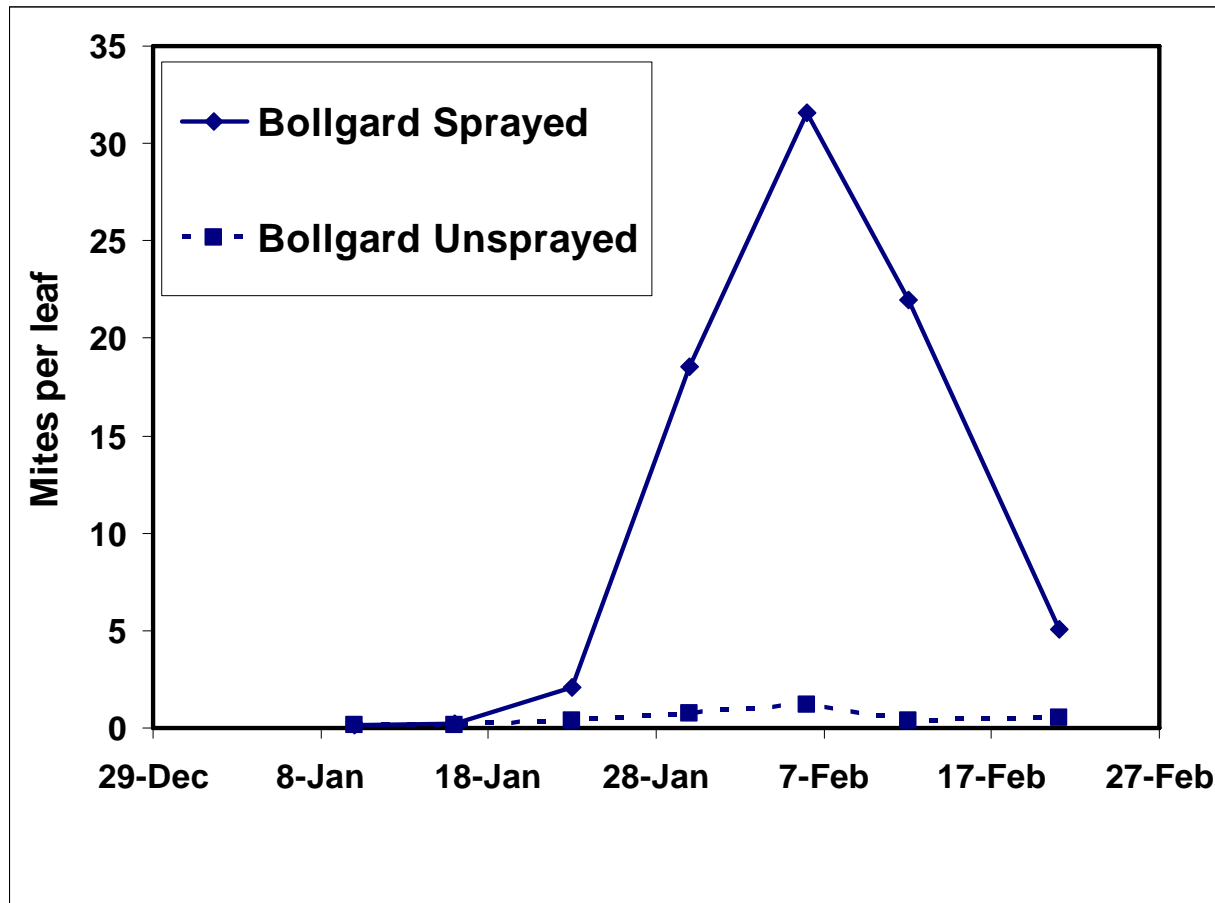
... It isn't helping yields (Whitehouse 2008) and it is damaging natural enemy populations .....



Data from Mary Whitehouse

# Mirids – have we gone overboard?

.... and flaring secondary pests like mites



Data from Lewis Wilson

# Have we forgotten about IPM?



Photo; Lewis Wilson

# New tools

- **New transgenics**
- **New insecticides**
- **Biopesticides**
- **Semiochemicals**
- **Plant extracts**



# New tools

- **New pesticides**

**Altacor® (chlorantraniliprole or rynaxypyr from Dupont)**

- novel mode of action, for lepidopteran pests

**Movento® (spirotetramat from Bayer)**

- lipid biosynthesis inhibitor, systemic for aphids & whiteflies

**Lineout® (flubendiamide/thiacloprid from Bayer)**

- mixture for *Helicoverpa* and mirids/aphids

***But the flow of new chemicals is drying up***



# New tools

- **Biopesticides**

Entomopathogenic fungi: *Beauveria* spp (BC667) and *Metarhizium* spp. (BC639) are being developed against green mirids and aphids



**Healthy green mirid  
adult**



**Adult infested with  
BC639 fungus**



**Nymph Infested with  
BC667 fungus**

Photos: Robert Mensah

# New tools

- **Semiochemicals – Magnet®**



- **Magnet® attract-and-kill technology will be registered this season**
- **For conventional cotton**
- **We are researching applications for Bollgard refuge management**

# New tools

- **Plant extracts**

**Greenfire™**, from a Tasmanian plant, active against mirids and aphids, being developed by Robert Mensah and Native Fire

**Plant X – oviposition deterrent active against *Helicoverpa***, being developed by Robert Mensah and Growth Agriculture

Data and photos: Robert Mensah



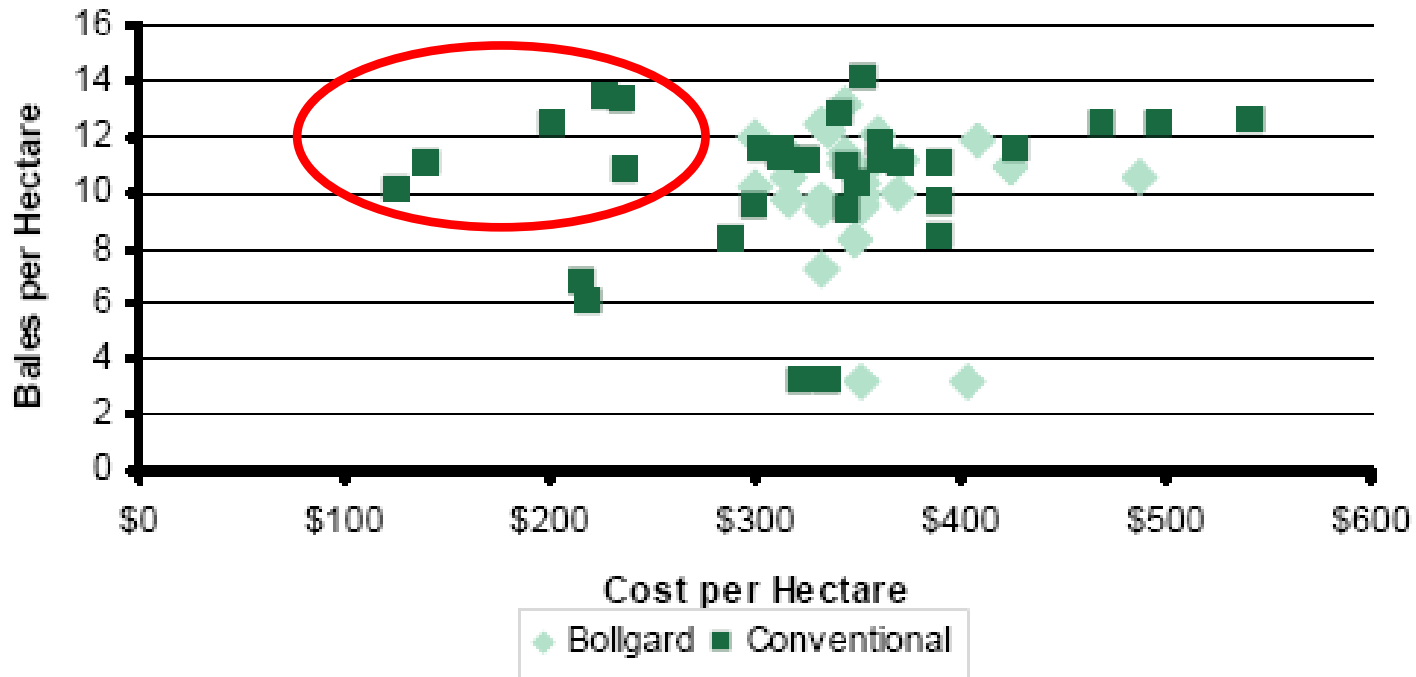
# Bollgard II® or conventional?

- **Are we relying too much on Bollgard II®?**
- **Conventional cotton as a refuge**
- **How easy is it to grow conventional cotton now?**



# Bollgard II® or conventional?

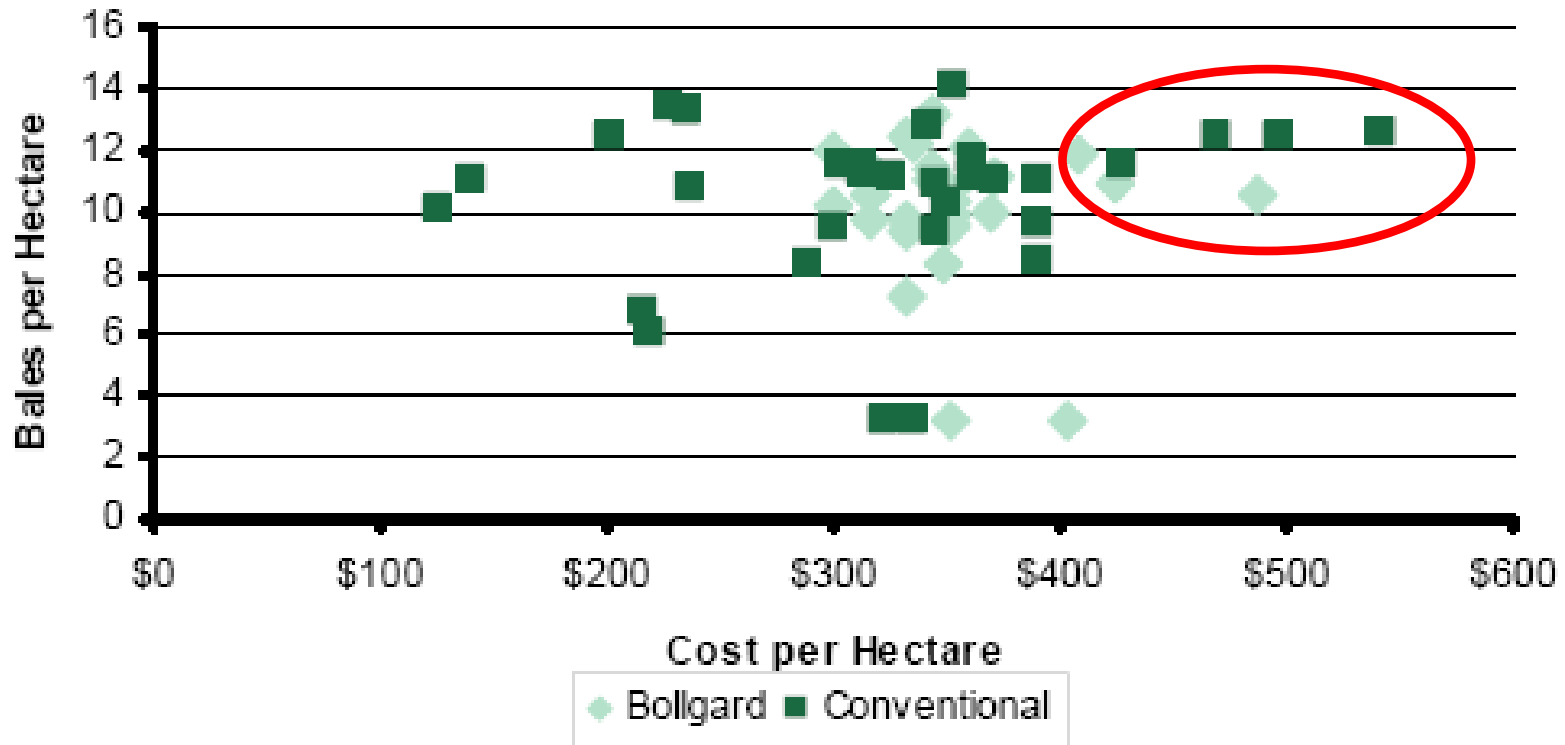
- It's possible to get high yields from conventional cotton without spending a lot of money on crop protection



Data from CCA Survey

# Bollgard II® or conventional?

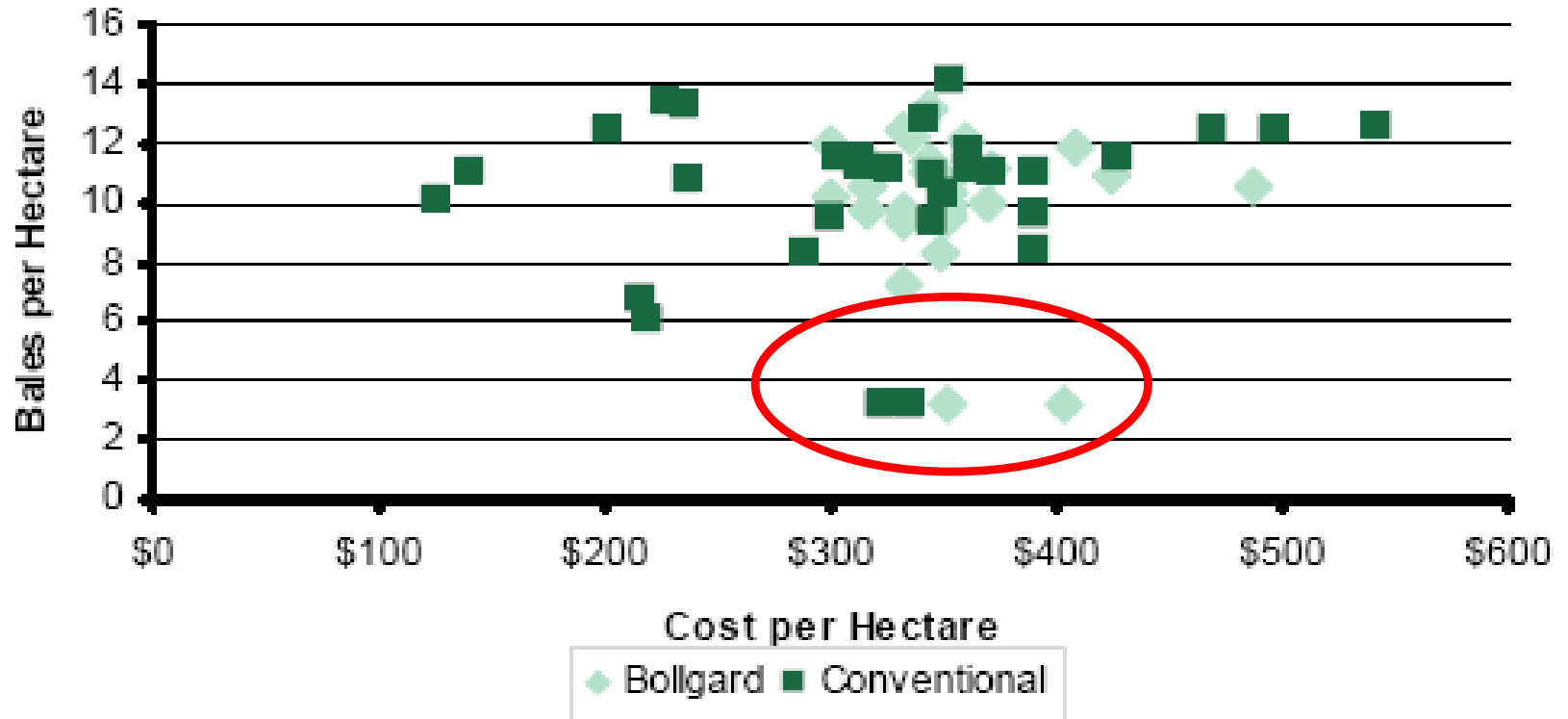
- It's also possible to spend a lot of money on both Bollgard and conventional crops!



Data from CCA  
Survey

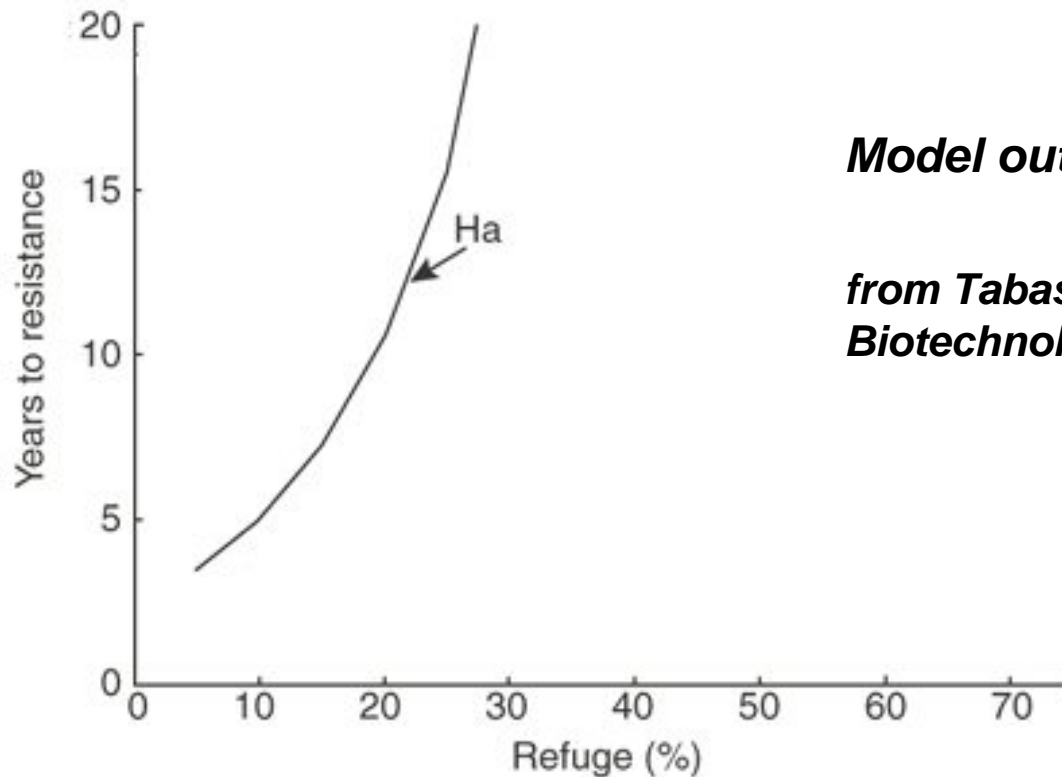
# Bollgard II® or conventional?

... and it's possible to stuff them both up!



Data from CCA  
Survey

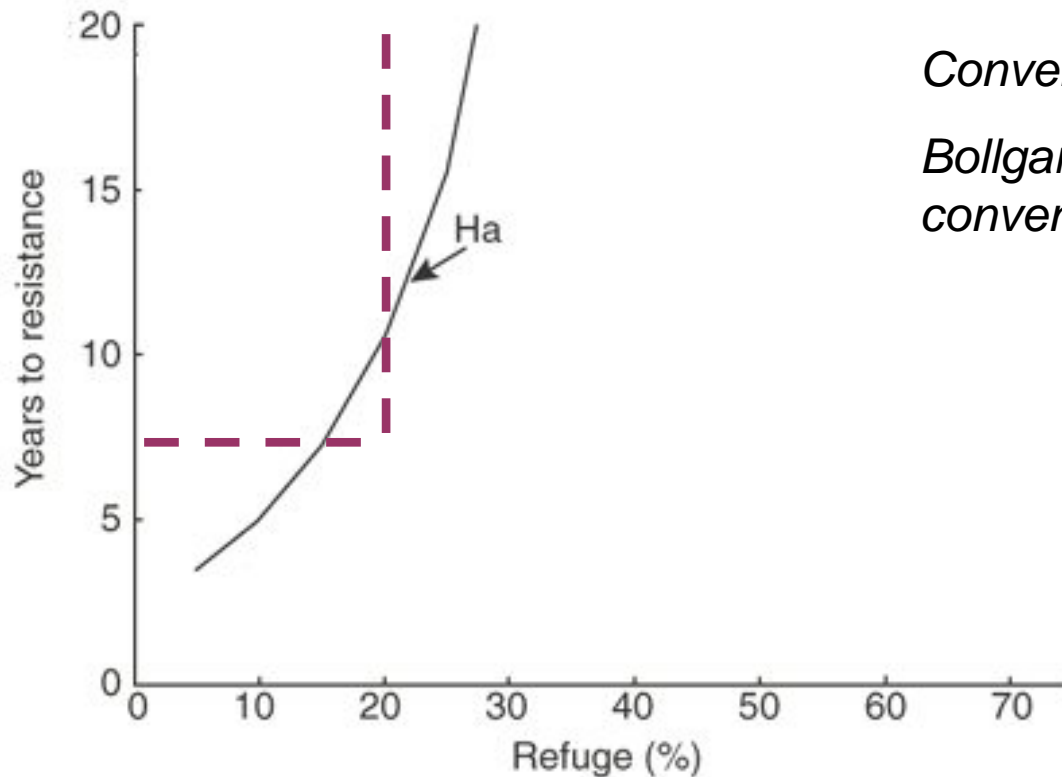
# The more refuge we can have, the better for resistance management



***Model output, for a single Bt gene***

***from Tabashnik et al Nature  
Biotechnology 26, 199 - 202 (2008)***

# The more refuge we can have, the better for resistance management



**So what about a mixed system?**

*Conventional is a refuge for Bollgard*

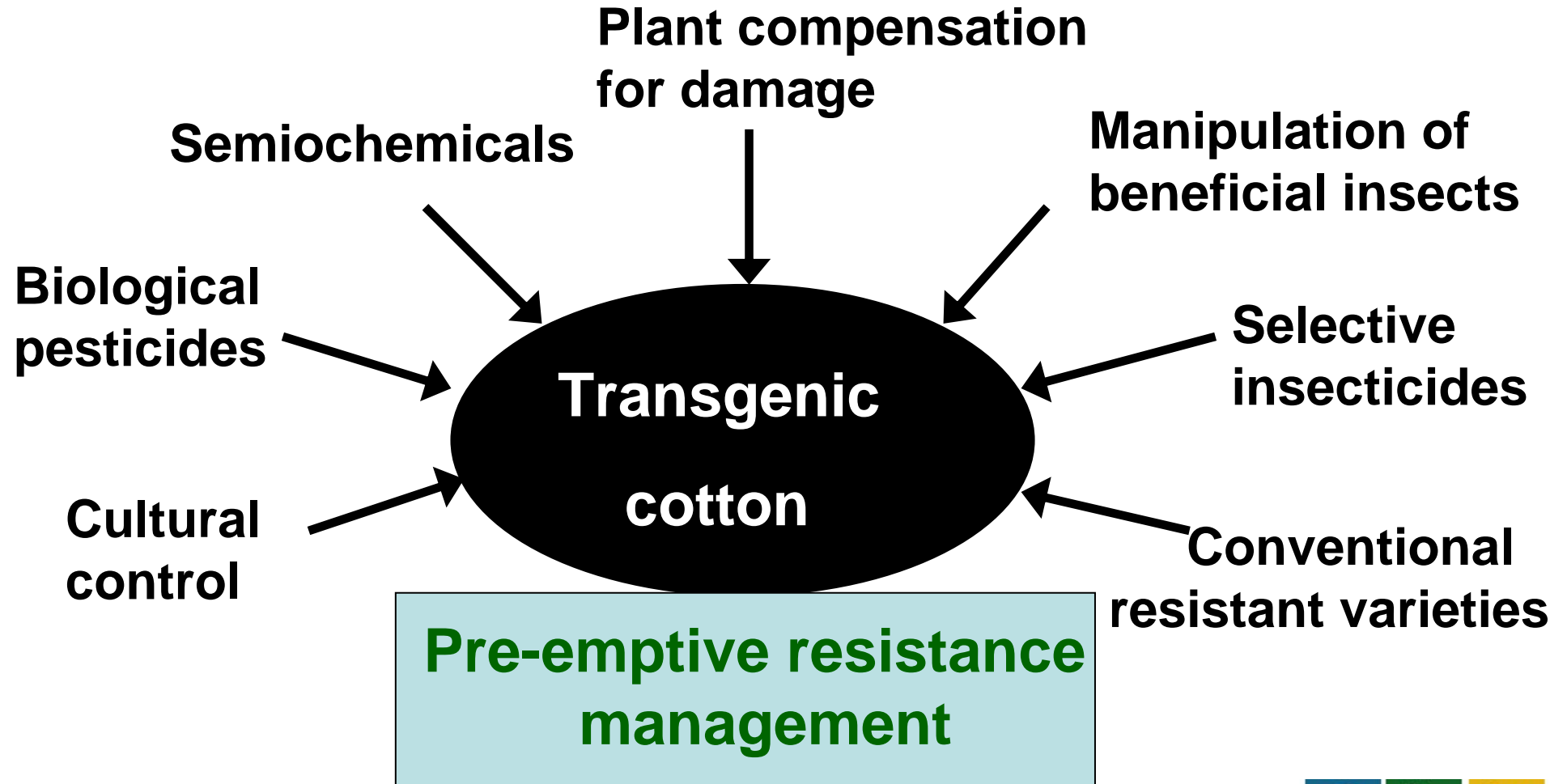
*Bollgard takes pressure off conventional*

# Some thoughts on Bollgard & conventional

- **It's getting easier to manage pests on conventional cotton (lower pressure, less resistance, new tools)**
  - *but how much of the low pressure is due to Bollgard sink?*
- **Need Bollgard/IPM, not Bollgard/sprayed conventional**
  - *a rise in aggregate chemical use would reflect badly on the industry*
  - *renewed selection for resistance, secondary pests*
  - *do we still have the IPM skills?*
- **Would growers compromise lifestyle & peace of mind?**
- **The key is *Helicoverpa* pressure – a flexible system**
  - *we have the technology to forecast*
  - *would growers vary Bollgard % on a *Helicoverpa* forecast?*

# IPM in cotton

After Fitt (2000)



Semio  
chemicals

Plant  
compensation

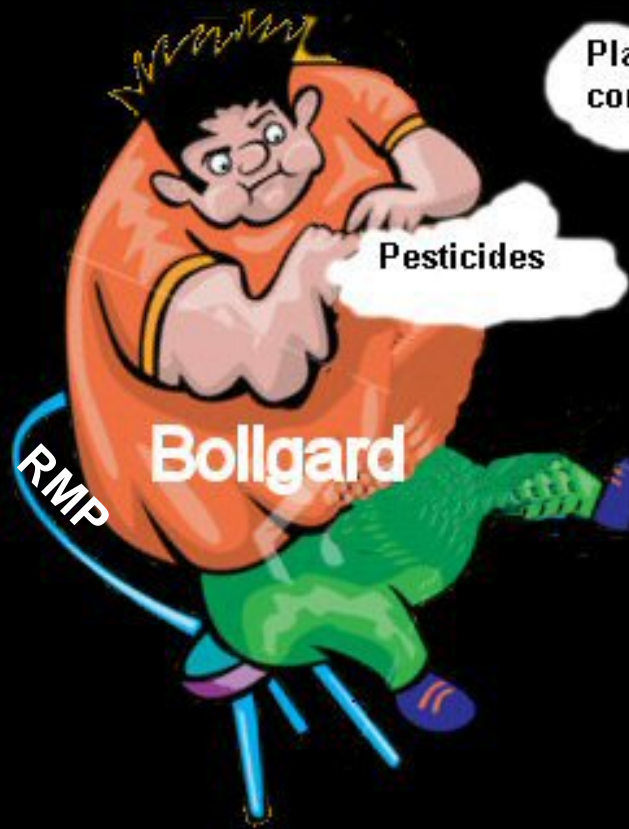
Cultural  
control

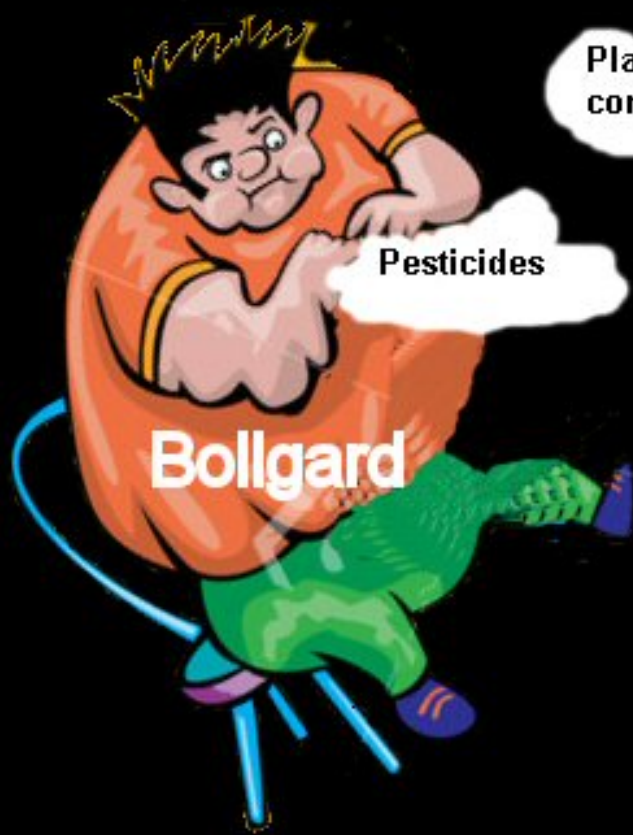
Pesticides

Beneficial  
insects

RMP

Bollgard





**Bollgard**

**Pesticides**

**Plant  
compensation**

**Cultural  
control**

**Beneficial  
insects**

**Semio  
chemicals**



# Acknowledgments

We thank, for discussions and for contributing data and images for this talk:  
Robert Mensah, John Barber, Alice Del Socorro, Greg Constable, Geoff  
Cornwell, Carrmen Quigley, Mary Whitehouse, Paul de Barro, Louise Rossiter,  
Moazzem Khan, Sarah Mansfield, Colin Tann ... and anyone we've forgotten!

