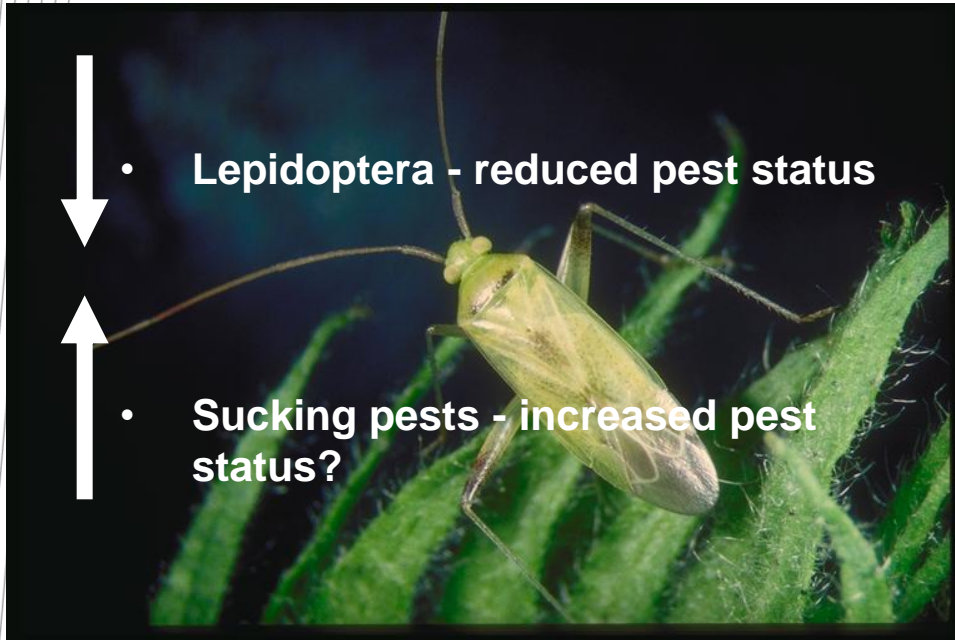


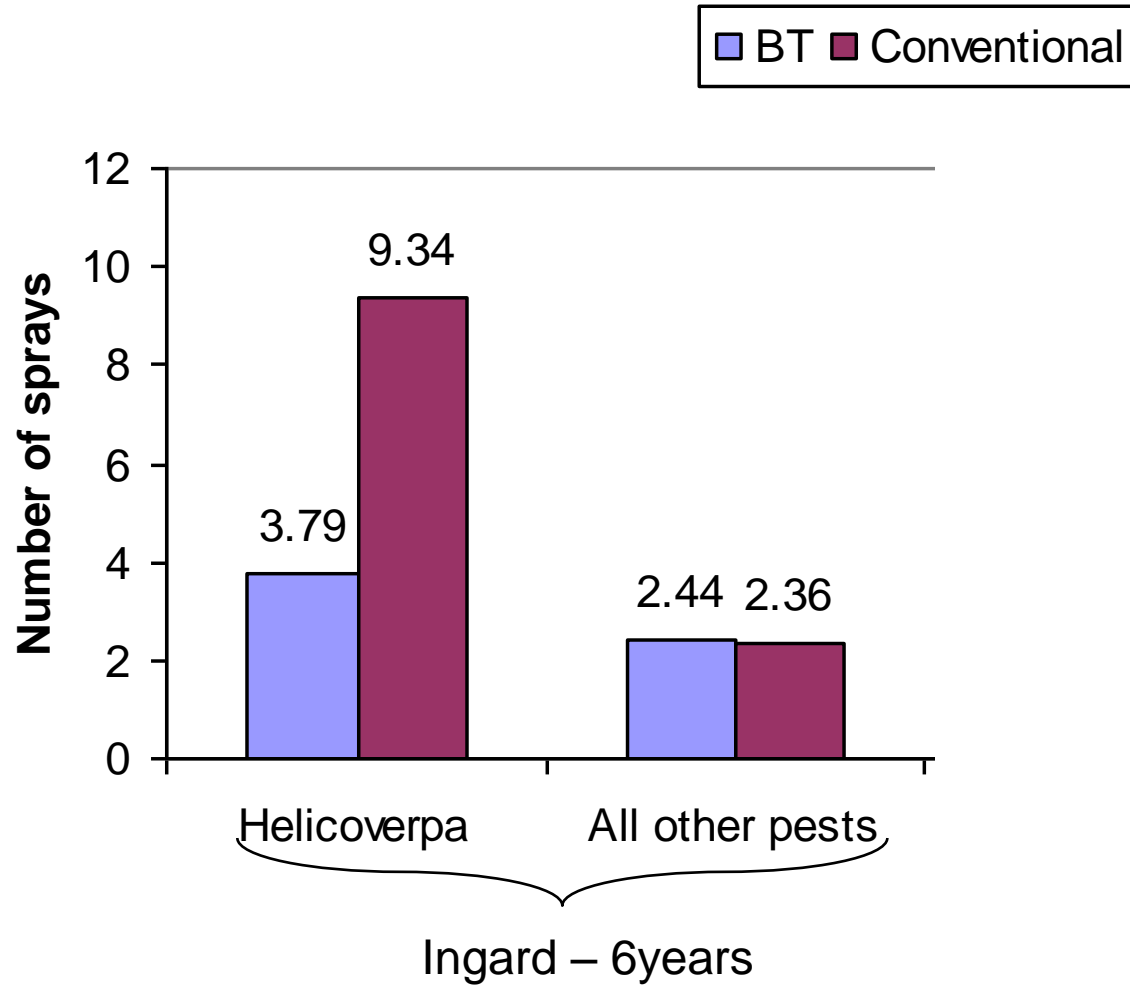
# Changing Pest Status ....



What has happened?



# Pesticide sprays...

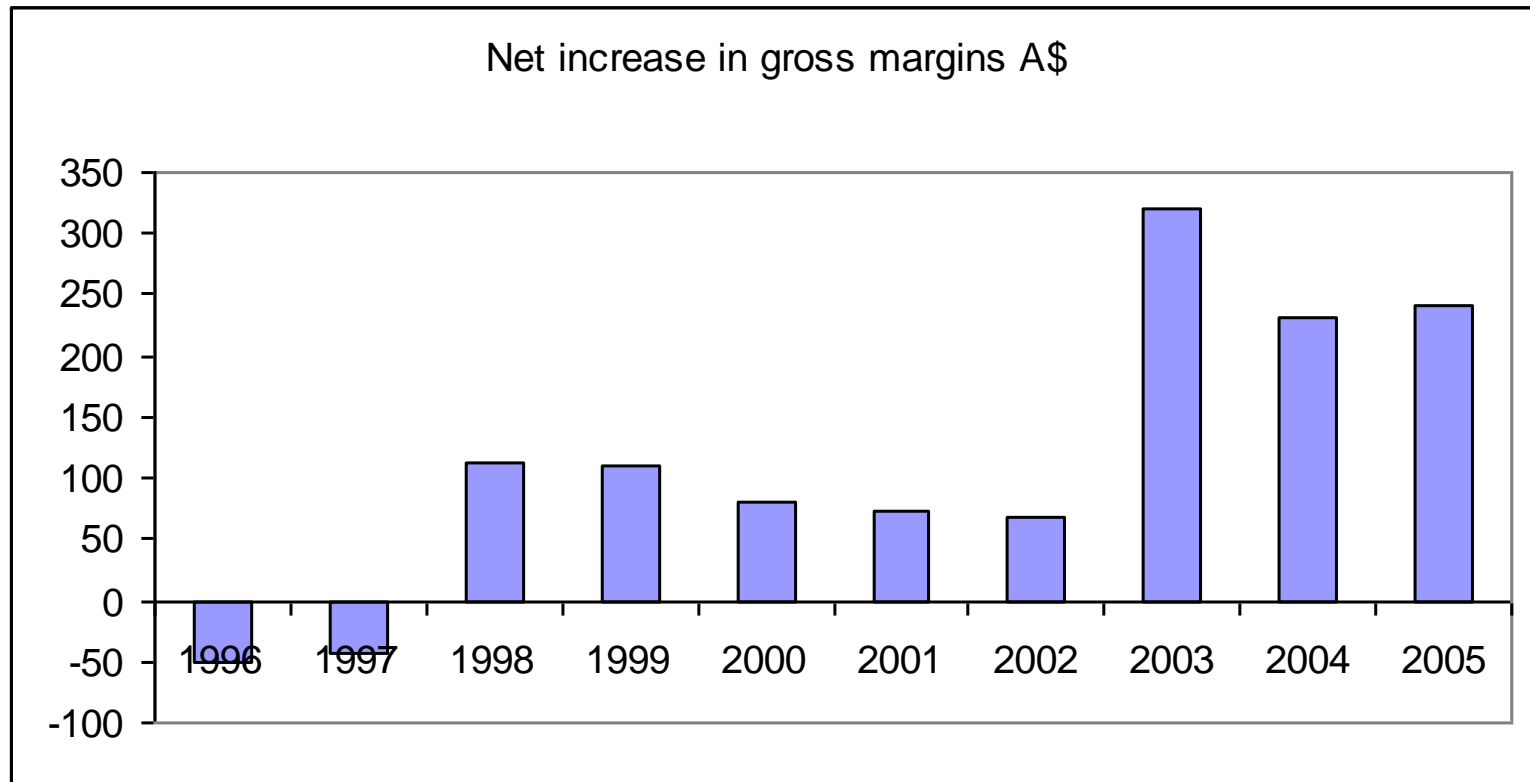




# 3. Economic benefits



# Economic benefits



***Brookes and Barfoot 2006 – “GM Crops: The First Ten Years - Global Socio-Economic and Environmental Impacts” ISAAA Briefs 36 96pp.***



## 4. Bt cotton Underpinning adoption of IPM



# Bt cotton Supporting IPM



**Plant Compensation for Damage**

**Explicit Manipulation and use of Beneficials**

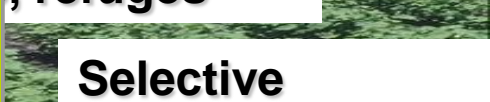


**Enhanced on-farm diversity - trap crops, refuges**



**Agronomic management**

**Bt Cotton builds the confidence in growers to adopt IPM**



**Selective pesticides, biologicals, semiochemicals**



**Cultural Controls  
Stubble management**



**Conventional Host Plant resistance**



**Pre-emptive Resistance Management**



**Sustainable IPM based on transgenic varieties**



# 5.Environmental benefits



# Environmental benefits

- increased abundance of beneficial insects
- elimination of endosulfan residues in cattle from cotton areas – no cases since 2000
- elimination of endosulfan residues in the Namoi and Gwydir rivers
- 95% reduction in total complaints to environmental regulators about “cotton” (98/99 – 03/04)





# 6. Resistance Risks



# Resistance results – Australia



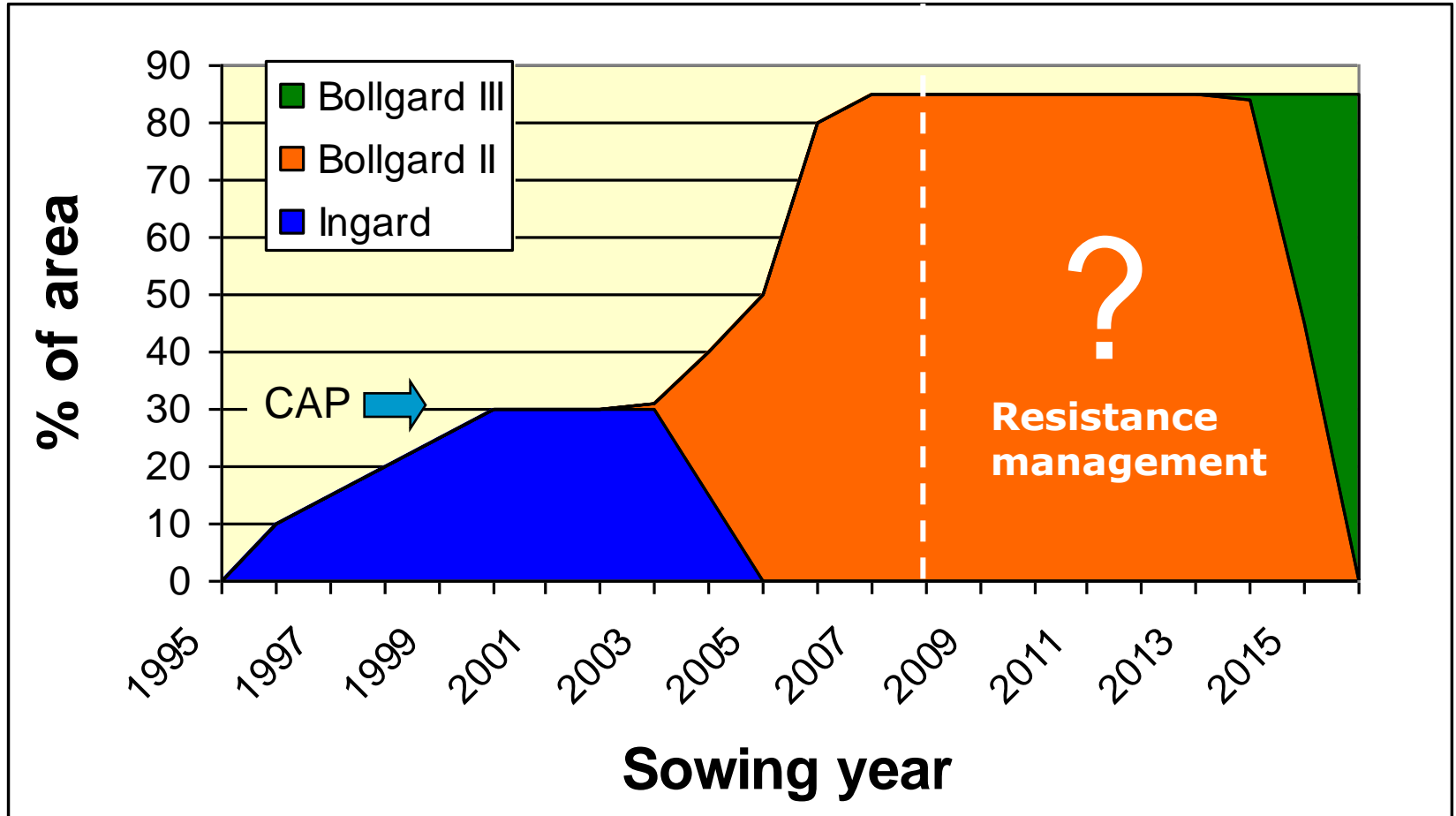
- Cry1Ac
  - Frequency <**0.0003** [2 alleles / 8268 tested]
  - No evidence of change in survival of discriminating dose or allele frequency after 12 years of Bt cotton
  - Resistance Strategy working



- Cry2Ab
  - Surprisingly high background frequency – 0.005
  - Significant increase in both Helicoverpa species in last few years
  - Now at 0.03 – 0.04
  - Resistance Strategy tightening

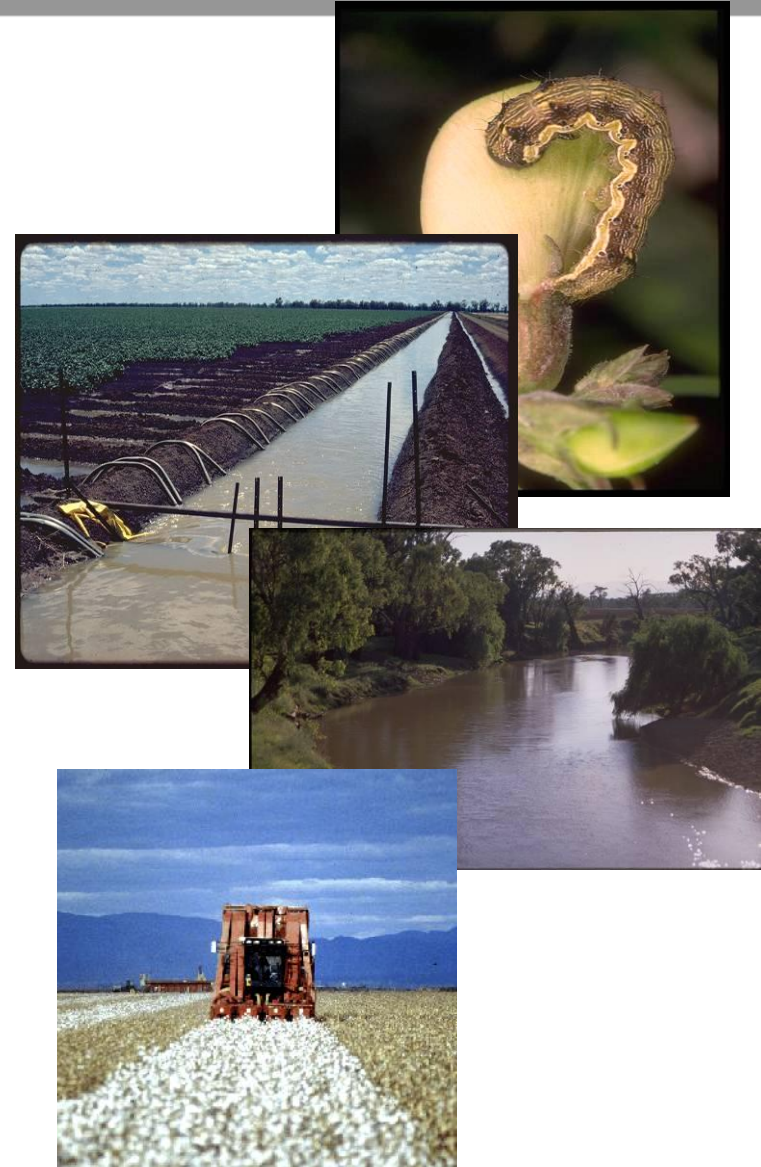
# Looking ahead...BGIII

What do we do to get through?



# After 12 years of Bt cotton ...

- Spectacular reduction in pesticide use – catchment scale environmental benefits
- Significant enhancement of on-farm biodiversity
- Foundation for broader IPM approach – management of secondary pests
- Involvement of industry was crucial for deployment
- Rigorous pre-release evaluation
- Resistance management is key



# Biotech crops.... a challenge

- Not silver bullet solutions
- Biotech crops require sound supporting management systems
- Challenge to maintain research investment in management strategies and enabling systems science in an era of growing biotech investment



**Fitt, G.P.** (2008) Have *Bt* Crops Led To Changes In Insecticide Use Patterns and Impacted IPM? in *Integration of insect-resistant GM crops within IPM Programs*. J. Romeis, A.M. Shelton and G.G. Kennedy (Editors). Springer.

**Fitt G.P,** Wilson L., Kelly D., Mensah R. (2009) Advances with integrated pest management as a component of sustainable agriculture: the case of the Australian cotton industry. In *Dissemination of Integrated Pest Management Technology: Theory and Practice*. R. Peshin (Ed). Springer

Thank you

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