Small Holder Farmer Experience with Biotechnology cotton in SA

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Background of SA

- Population of 52.9 million (11 official languages,9 Provinces)
- Area 1 221 912 square km (25th largest country in the world)
- GDP of $371,2 billion (33rd biggest economy in the world)
- 10% of the area is arable land
- Many Agricultural practices are taking place: Three GMO crops; cotton, maize and soyabeans

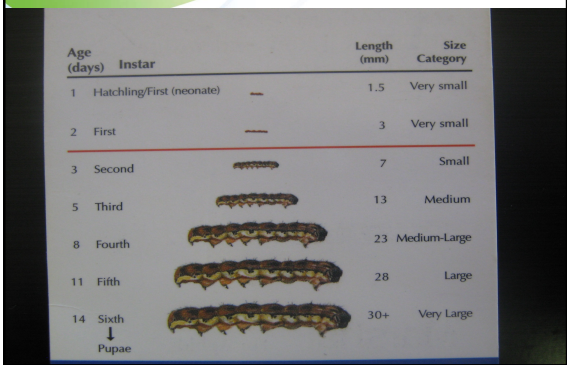
Bt cotton…

- What is Bt?
  - Soil bacterium called *Bacillus thuringiensis (Bt)*
  - Thuringia is region in Germany where it was first isolated.
  - Many subspecies of Bt are found in soils
  - *Bt* strains produce three types of insecticidal protiens(h.specific);
    - crystal(Cry), cytolic(Cyt) and vegetatively expressed insecticidal protein
  - The gene was transferred into cotton using (*Agrobacterium tumefasciens*)which develops into a full GM plant, – gene splicing technique
- Bt-cotton is genetically modified (GM)cotton that expresses one or more proteins whose genes have been derived from soil bacterium (Bt)
- Produces a protein that paralyses the larvae of the cotton bollworm moth

…Bt cotton continues…

- Infestation by bollworms has a devastating effects on the crop
- Organic farmers have been using *Bt* as insecticide (liquefied and granules)-Permitted standard
- *Bt* gene is incorporated into the genome of plant as a built-in mechanism of protection.
  - Plants are protected through-out the entire stages
- When ingested by the larvae, its activated in the guts alkaline condition and punctures the mid-gut leaving the insects starving to death (72 hrs)

…Bt cotton continues…



Damage by *Heliothis armigera*

…Bt cotton continues.

- Safety of Bt technology
- Cotton bollworm have receptor-mediated guts where the Bt protein binds, hence the targets.
- Humans, animals and most beneficial insects lack receptors – no harmful effects ever reported.
- It has no adverse effects to the environment.
- The insecticidal proteins breaks down immediately when plant dies.

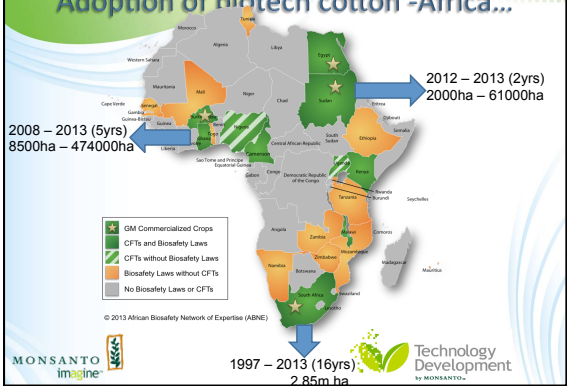
African bollworm (*Helicoverpa armigera*)

Red bollworm (*Diporapsis castinea*)

Spiny bollworm (*Earias species*)

Adoption of Biotech Cotton

Adoption of biotech cotton -Africa…



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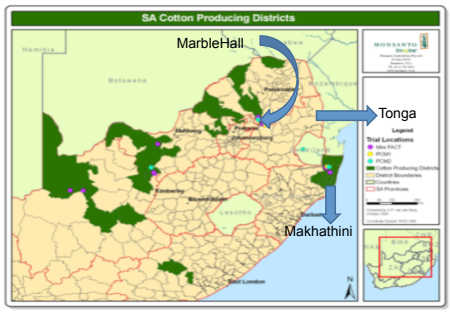
Cotton production areas



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…Adoption of biotech - continues…

- 1st commercial cotton grown in SA, 1997
- In late 90s, Bt cotton was introduced to small holder farmers in Makhathini region.
- Three generation of biotech cotton since:
  - Bollgard cotton
  - Stackgene(Bt/Ht)
  - Bollgard II RRF

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…Adoption of biotech - continues…

- Bt gene cry1Ac – develop 1st Bollgard I
- Offers bollworm control
- But – manual weeding
- Pesticide reduction

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…Adoption of biotech - continues…

Stack gene/BGII (cry1Ac & cry2Ab2 – Ht) (4th L. stage)

Roundup Ready Flex (BGIIRF)

genuity™
Roundup Ready Flex | Bollgard II

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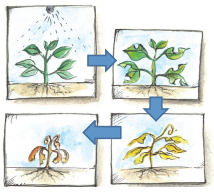
Roundup Ready PowerMax Herbicide (glyphosate)

- Spray Nozzle – Flat Fan

- Broad spectrum
- Systemic
- Non-residual



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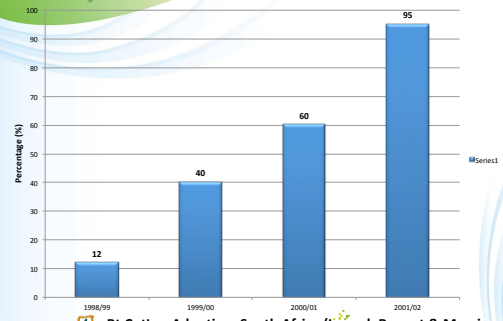
…Adoption of biotech.

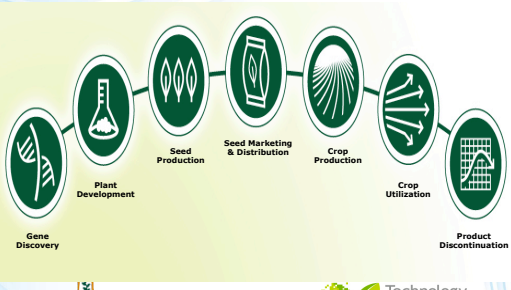


Bt Cotton Adoption: South Africa (Ismael, Bennet & Morsi, 2002)

Stewardship

Refuge area

Stewardship

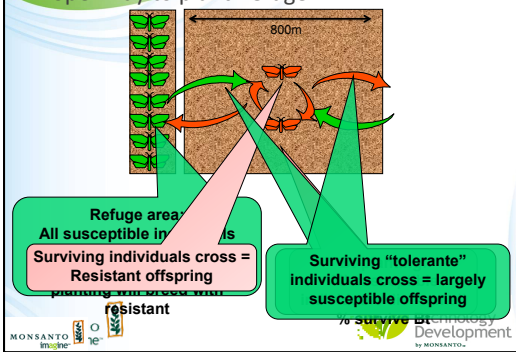


Refugia – Bollgard II

- Planting a portion of each field with non-Bt to allow for interbreeding between bollworms which may have developed resistance (from Bt) and insects that are still susceptible to Bt.
- MINIMUM 5% REFUGE AREA – (Do not spray)
- 95% BOLLGARD COTTON
- PEST DON'T BECOME RESISTANT

Insect resistant Management(IRM)

- Proper way to plant Refuge



Stewardship

- Stewardship - the **responsible management** of a product from its inception through to its ultimate use and discontinuation
- Everybody responsibilty

Training-Tonga Farmers (chairmen)

Testimonies

Mr Khoza – Tonga, MP

"I plant my cotton on 5ha piece of land. Roundup Ready cotton is easy to manage, so I don't spend all the time on my field"

Mr Malela - Matlerekeng,LP

"I started planting Bollgard cotton in 2000 on 6 ha. After realising better profit I gradually increased my field to 70 ha..... I will not use any other seed without the technology"

- **Mr Mhlongo, KZN** "With Biotech cotton, pesticide application has drastically dropped from 6+ sprays to two per season saving water and the health of our people"

Conclusion

- Support structures
  - Agricultural Research Council (ICC)
  - Cotton SA
  - Government/Extension services
  - Cotton ginners
- Commitment to provide farmer with **knowledge** and access to **innovative** farming methods and **technologies**. From **biotech** plants that boost **yields** and **profit**, to **herbicides** that replace strenuous labour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THANK YOU
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