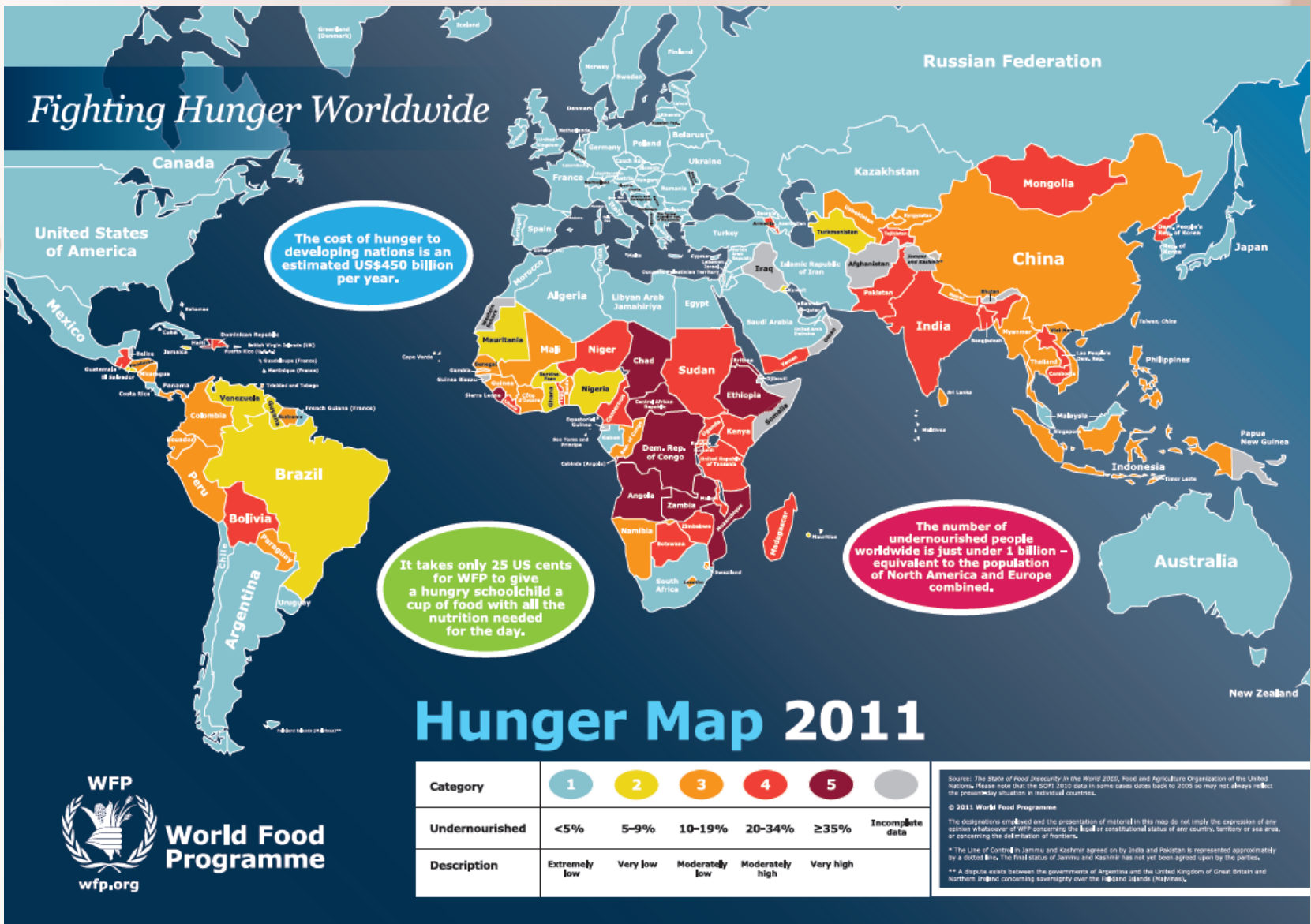
GRAIN SA
GRAAN SA

Farmers' experience with biotech crops in South Africa

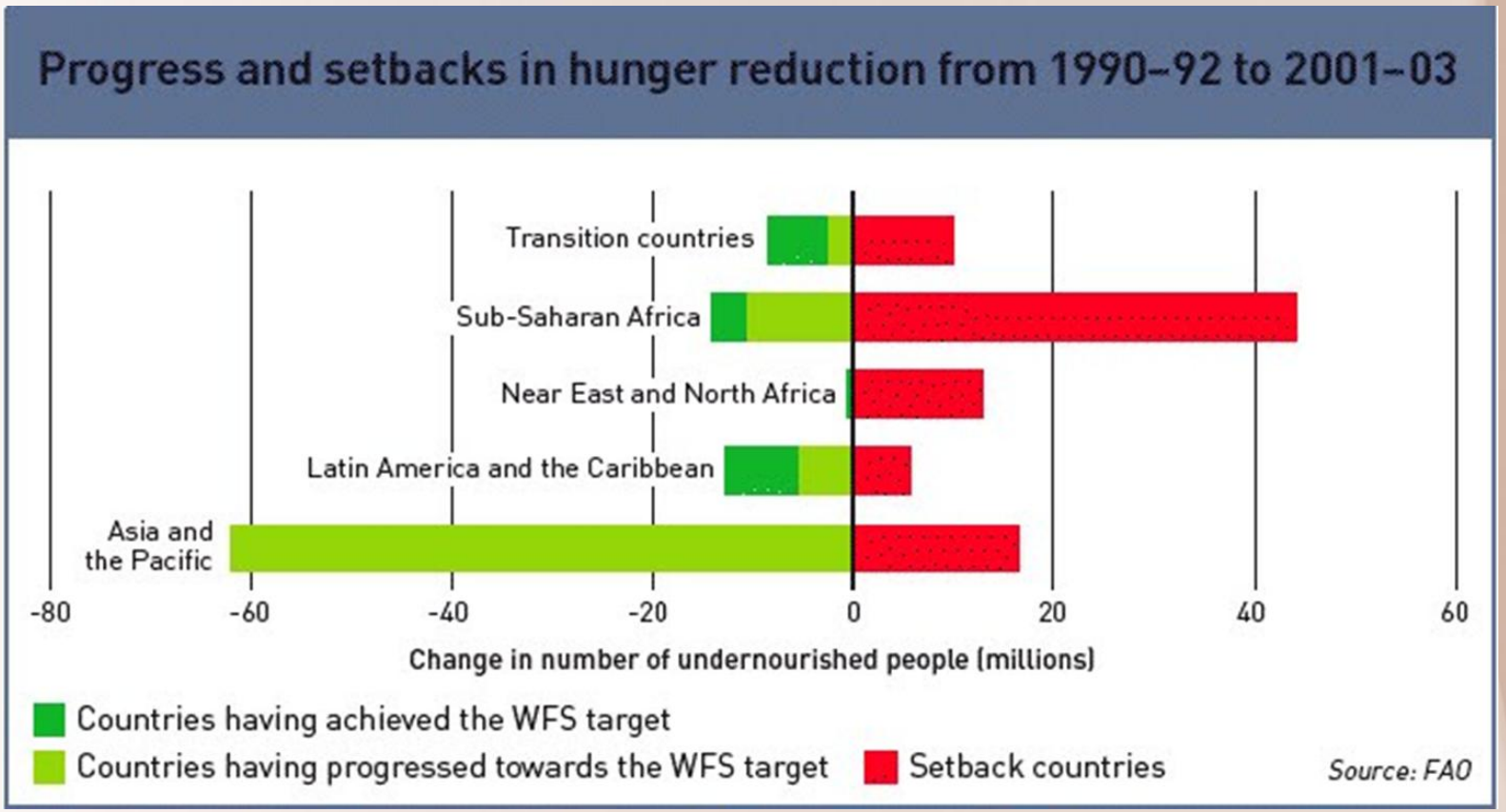
Jaco Minnaar

June 2011

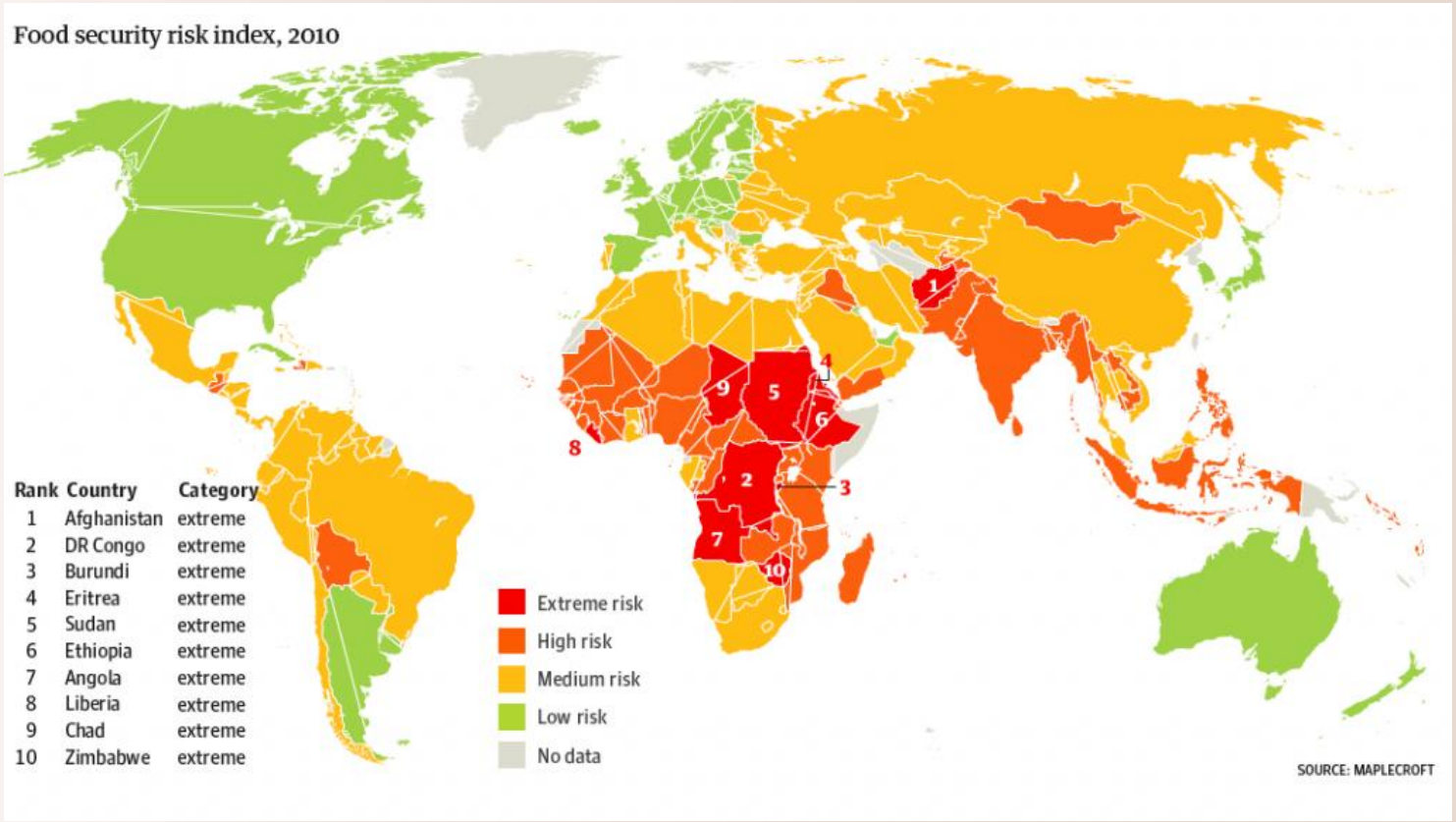
World Hunger



Trend of world hunger

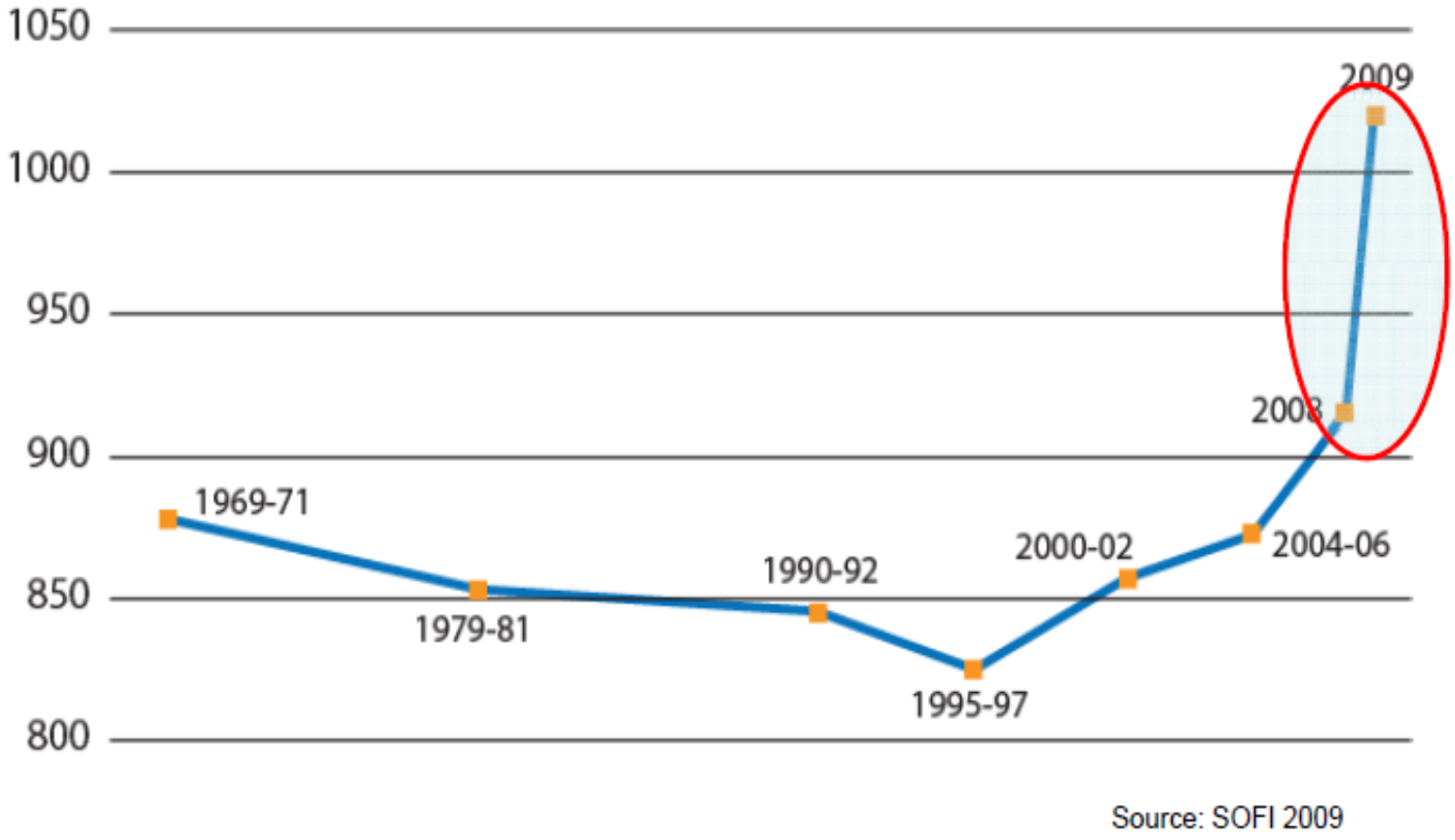


Food Security risk Index 2010



Food for all?

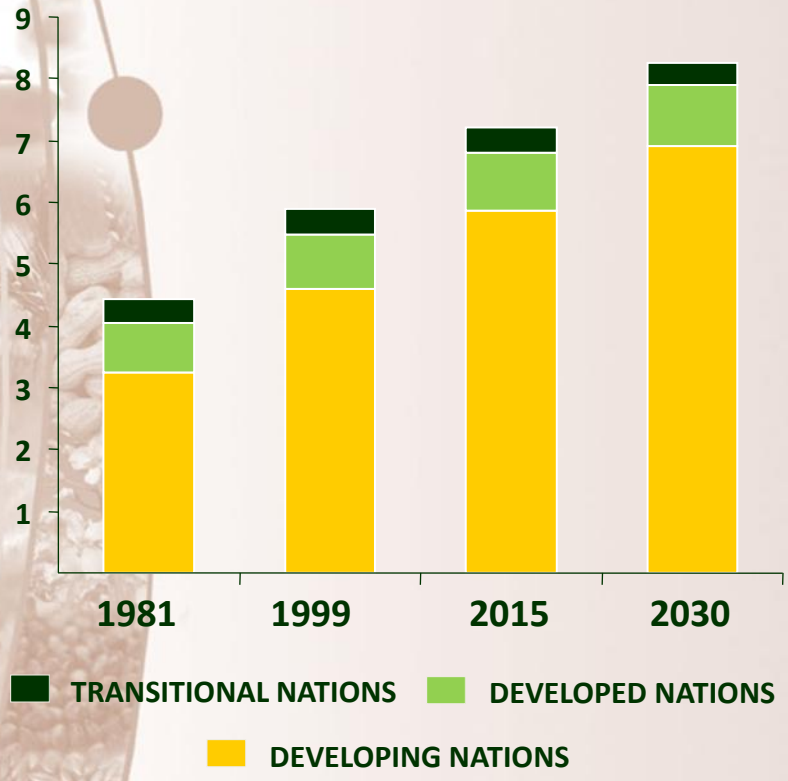
People that are underfed worldwide



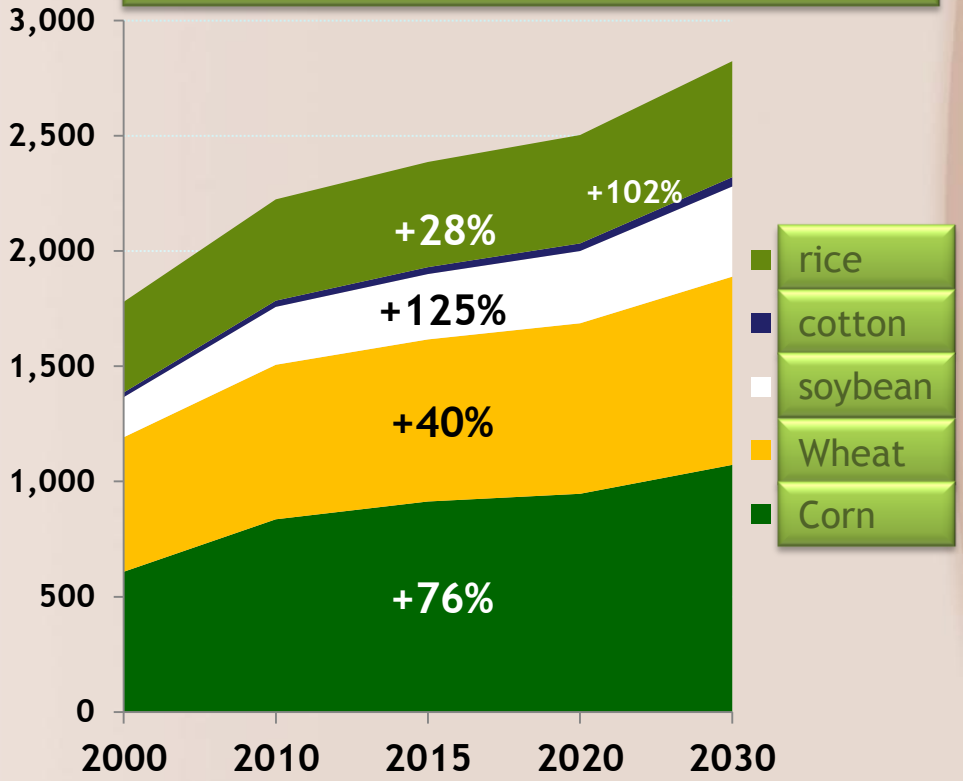
Source: SOFI 2009

Global demand will increase with population growth

Growth world population(b)



Global grain demand (M MT)



Sources: FAO "World Agriculture: towards 2015/2030. Summary Report"; IHS Global Insights , Agriculture Division

Cause - world hunger

1. Political Conditions

   War, Legislation, Governmental Support, etc.

2. Economic Conditions

   Poverty, Debt, Economic decline, Poor terms of trade,

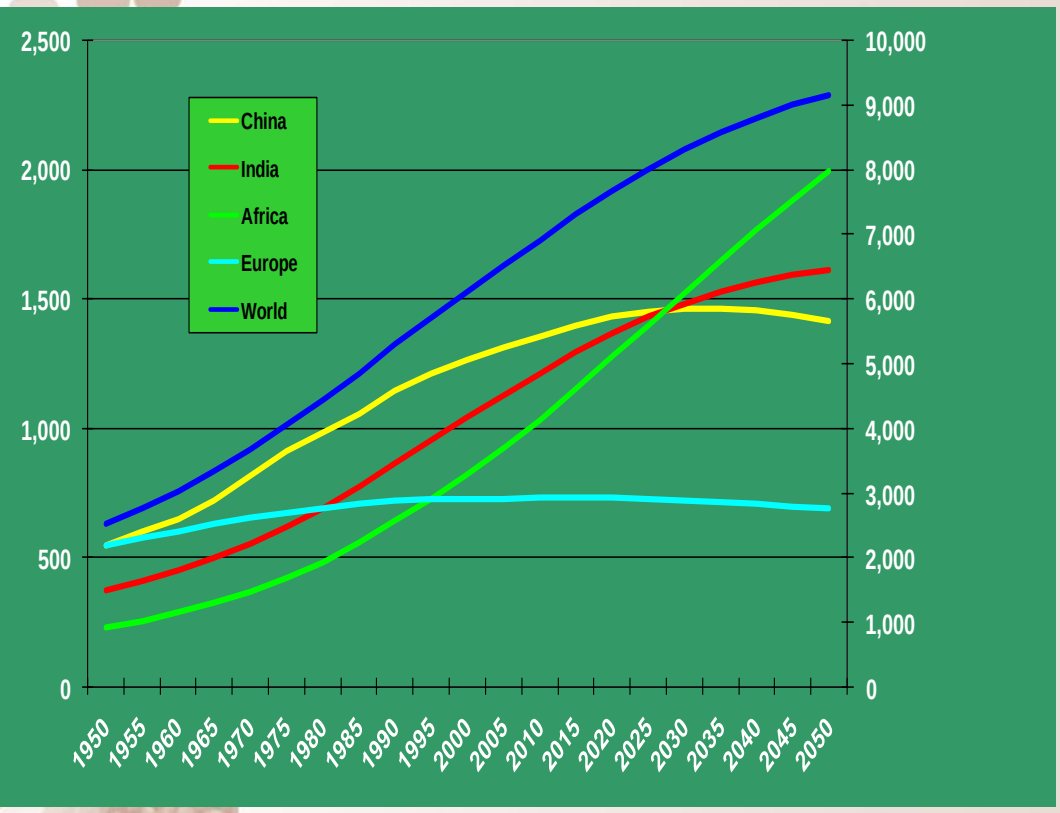
   Fast population growth, etc.

3. Environmental Conditions

   Climate change, Available arable land, etc.

Source: WFP

Why produce more?
UN population stats(2008)



- In 1960 1 acre fed 1 person
- In 2005, it was 1.8 person/acre
- Predictions estimate that in 2050 1 acre should feed between 2.4 and 2.6 persons

- 1 out of 6 doesn't have enough food
- Population growth demands that we need to produce more food in the next 50 years than in the previous 1000.

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision*, http://esa.un.org/unpp, Sunday, April 05, 2009; 3:23:40 PM.

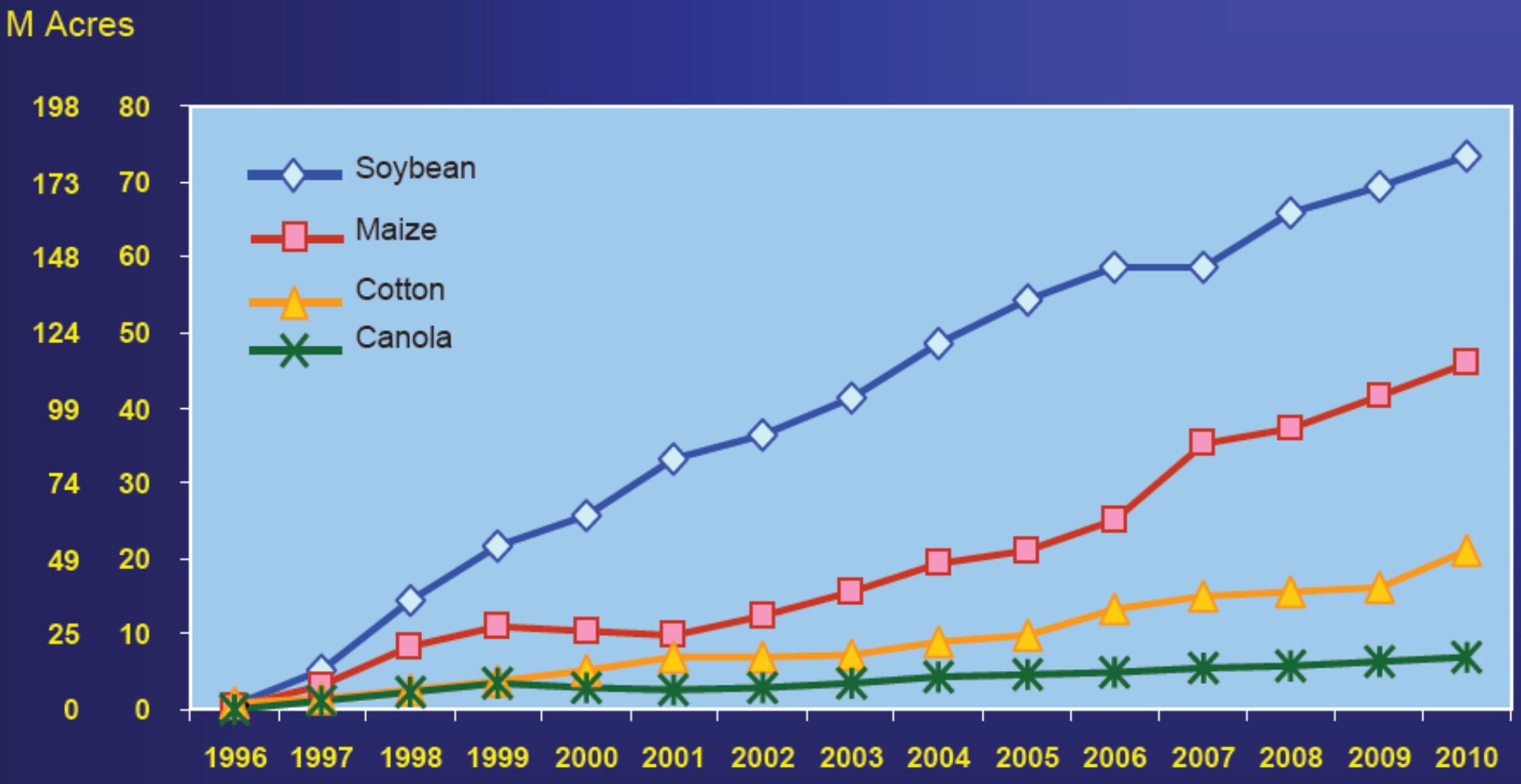
How do we produce more?

1. Plant more hectares
   - Arable land in Africa, Asia, South America
   - Destruction of forests, nature, etc.

2. Produce more per hectare (efficiency)
   - Better production methods, tillage, nutrition, etc.
   - Better genetics

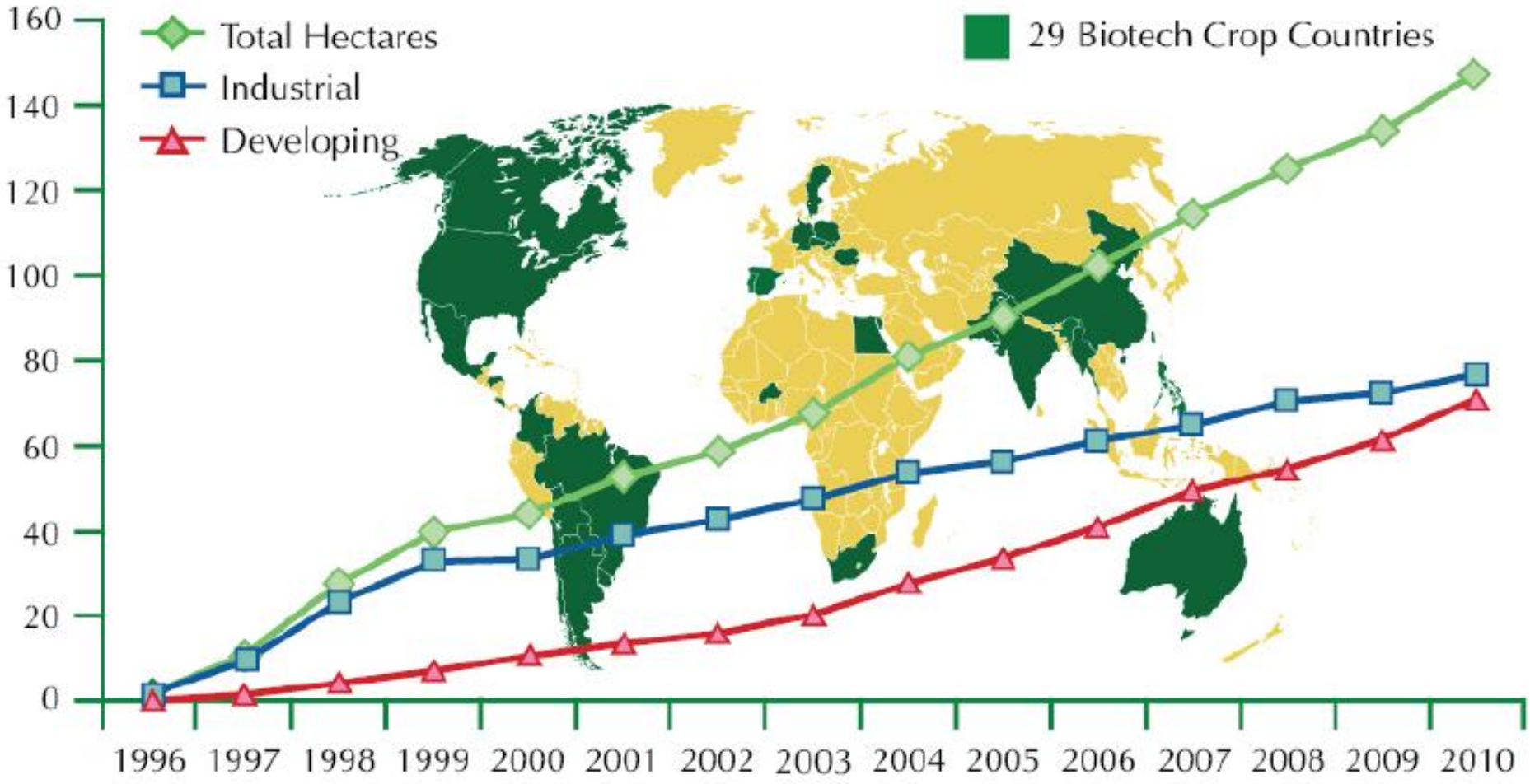
Global Area of Biotech Crops, 1996 to 2010: By Crop (Million Hectares, Million Acres)

ISAAA



Source: Clive James, 2010

GLOBAL AREA OF BIOTECH CROPS
Million Hectares (1996-2010)



A record 15.4 million farmers, in 29 countries, planted 148 million hectares (365 million acres) in 2010, a sustained increase of 10% or 14 million hectares (35 million acres) over 2009.

Source: Clive James, 2010.

Biotech Mega Countries

29 countries which have adopted biotech crops

50,000 hectares (123,553 acres), or more

	Million Hectares	Million Acres
USA	66.8	165.0
*Brazil**	25.4	62.7
*Argentina**	22.9	56.6
*India**	9.4	23.2
Canada	8.8	21.7
*China**	3.5	8.6
*Paraguay**	2.6	6.4
*Pakistan**	2.4	5.9
*South Africa**	2.2	5.4
*Uruguay**	1.1	2.7
*Bolivia**	0.9	2.2
Australia	0.7	1.7
*Philippines**	0.5	1.2
*Myanmar**	0.3	0.7
*Burkina Faso**	0.3	0.7
Spain	0.1	0.2
*Mexico**	0.1	0.2

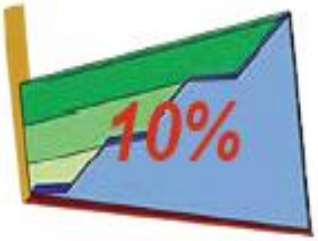
9

Less than 50,000 hectares

*Colombia**	Czech Republic	*Costa Rica**
*Chile**	Poland	Romania
*Honduras**	*Egypt**	Sweden
Portugal	Slovakia	Germany

* *Developing countries*

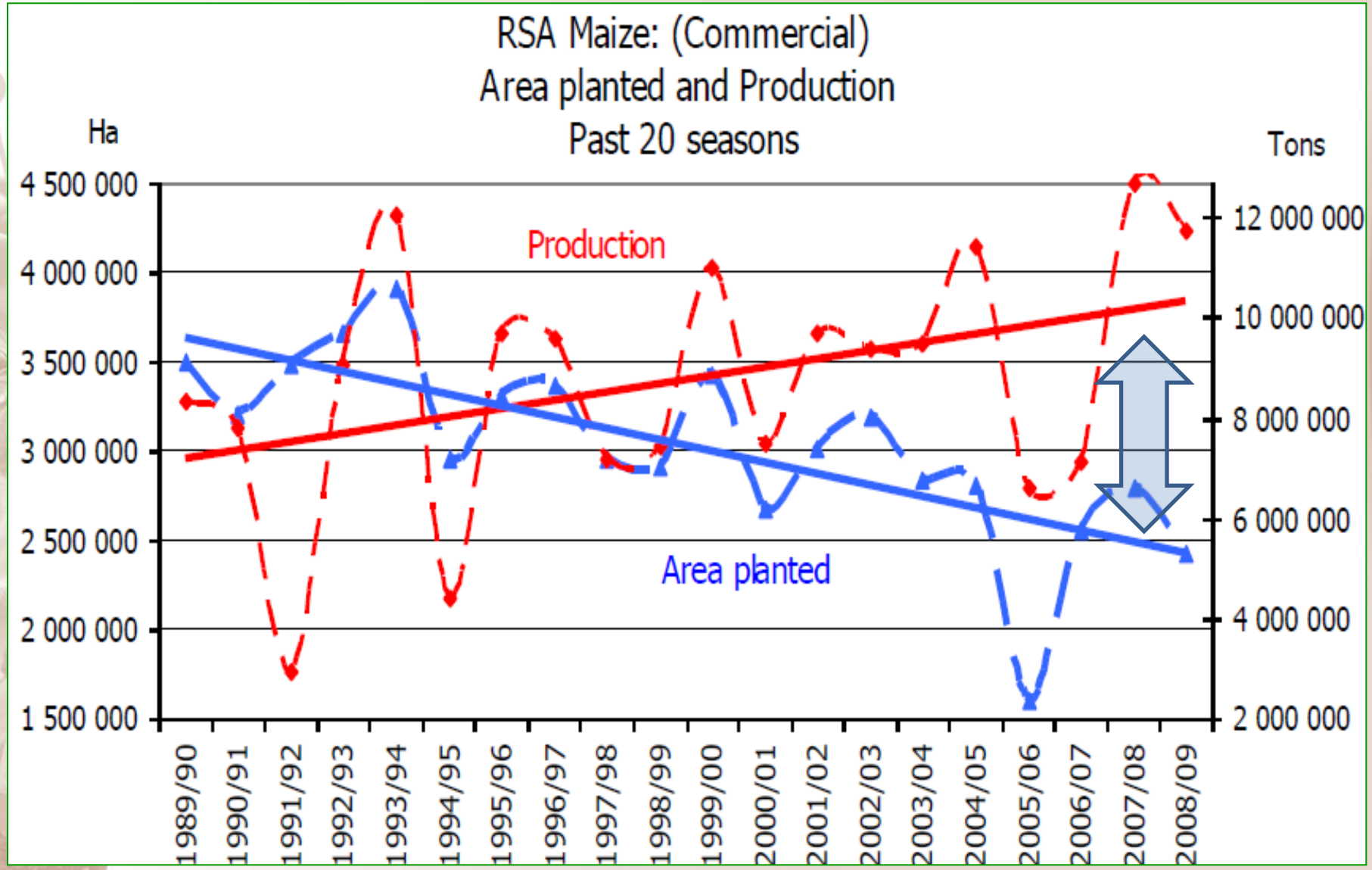
Increase over 2009



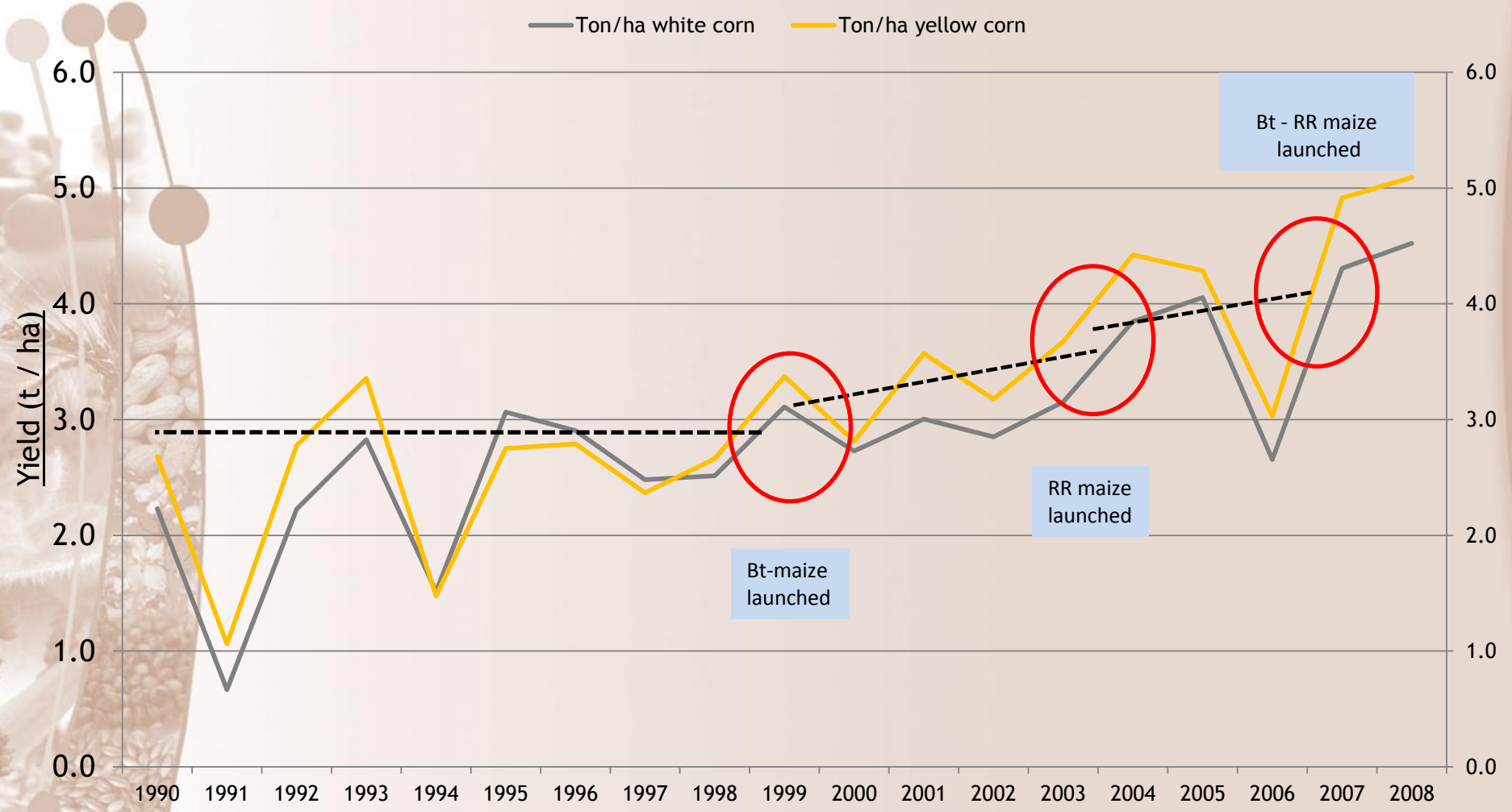
In 2010, global area of biotech crops was 148 million hectares, representing an increase of 10% over 2009, equivalent to 14 million hectares.

Source: Clive James, 2010.

South African Maize Production



Maize Production in South Africa
Biotechnology is contributing....

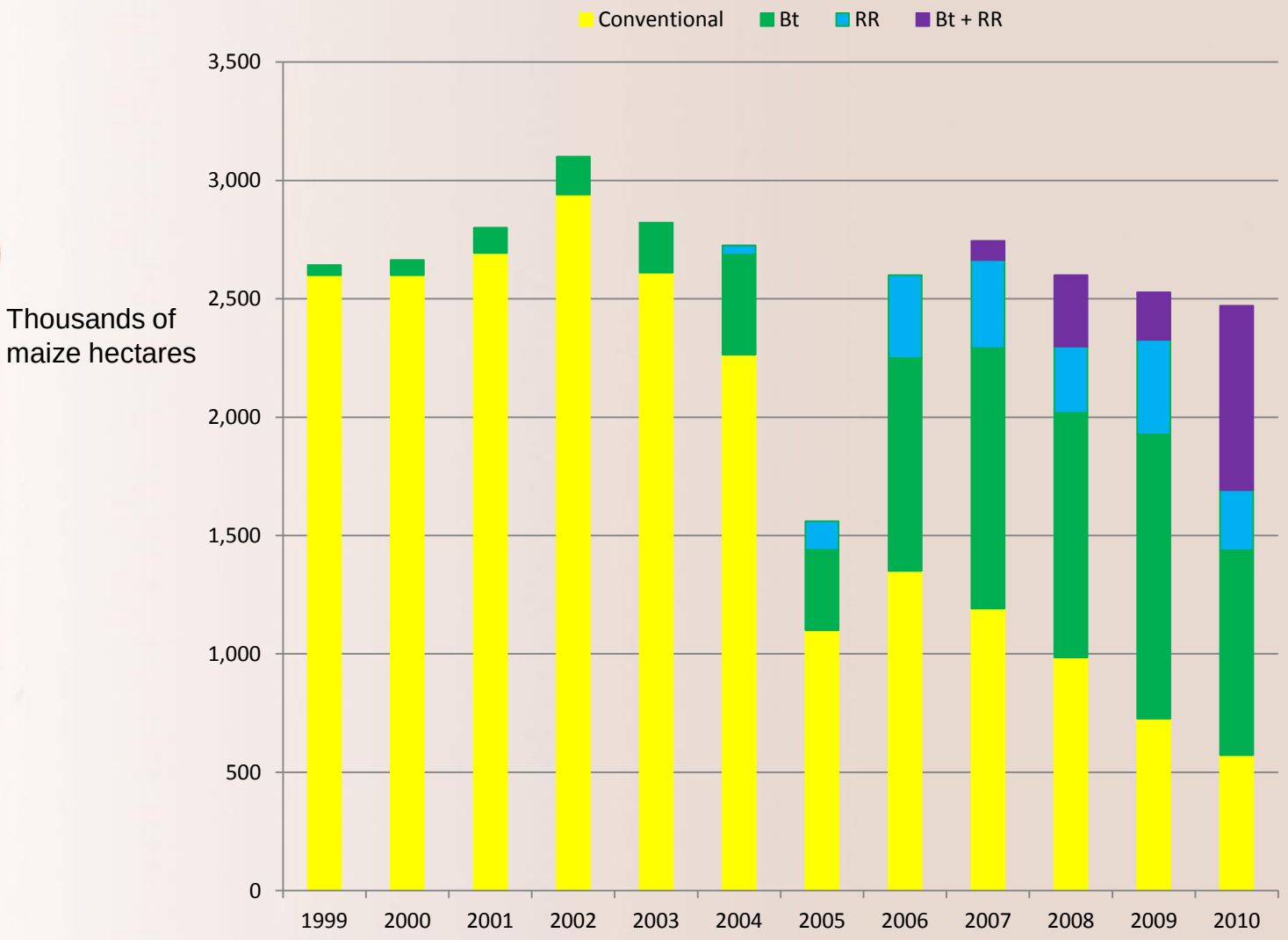


Biotech Status South Africa 2010

- Maize - 76.9% biotech
  - 45% Bt gene
  - 13.4% herbicide tolerant (HT)
  - 41% Stacked gene (Bt + HT)
- Soybeans
  - 85% HT
- Cotton – 100% biotech
  - 95% Stacked gene (Bt + HT)
  - 5% HT in refugia

Situation

Traited / GMO Maize ha in South Africa ‘10



My experience as an Commercial farmer

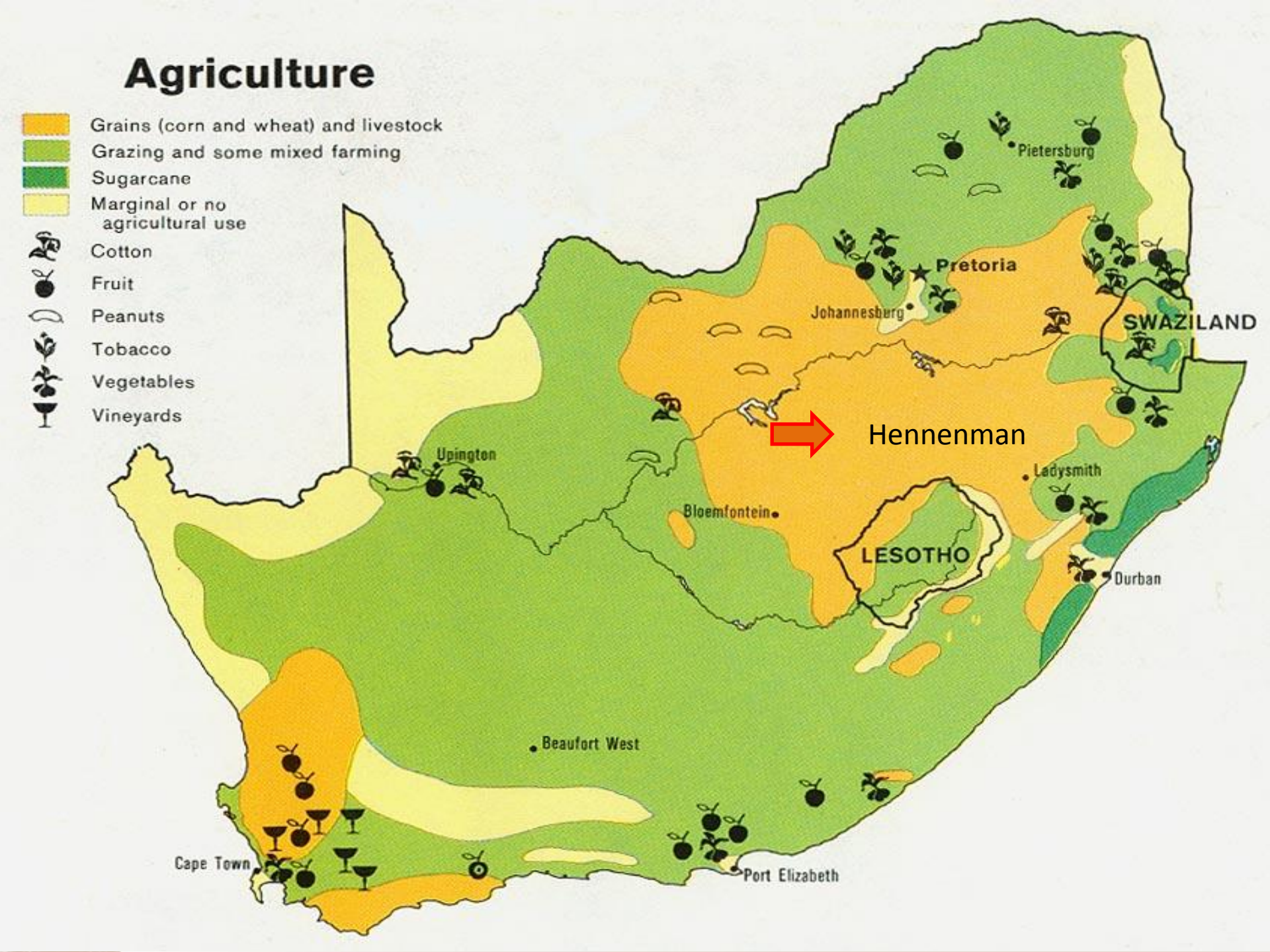
Farming in the Freestate, central South Africa

Farming with Corn, Wheat, Sunflower, Soybeans, Potatoes, Game and Cattle

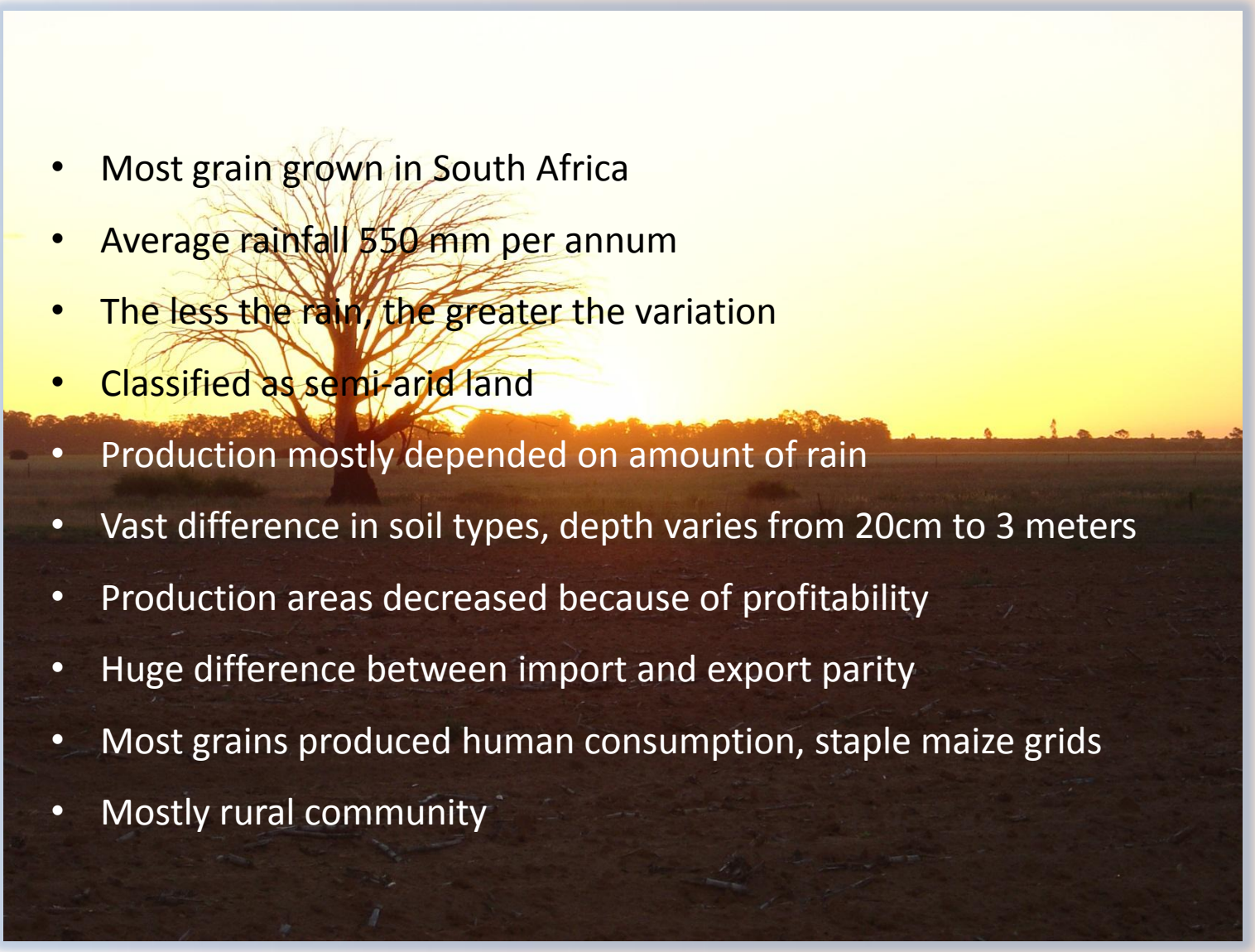
Introduced Precision farming approach since 1998

Planting biotech since 2003

Planting trails for different supplies every year

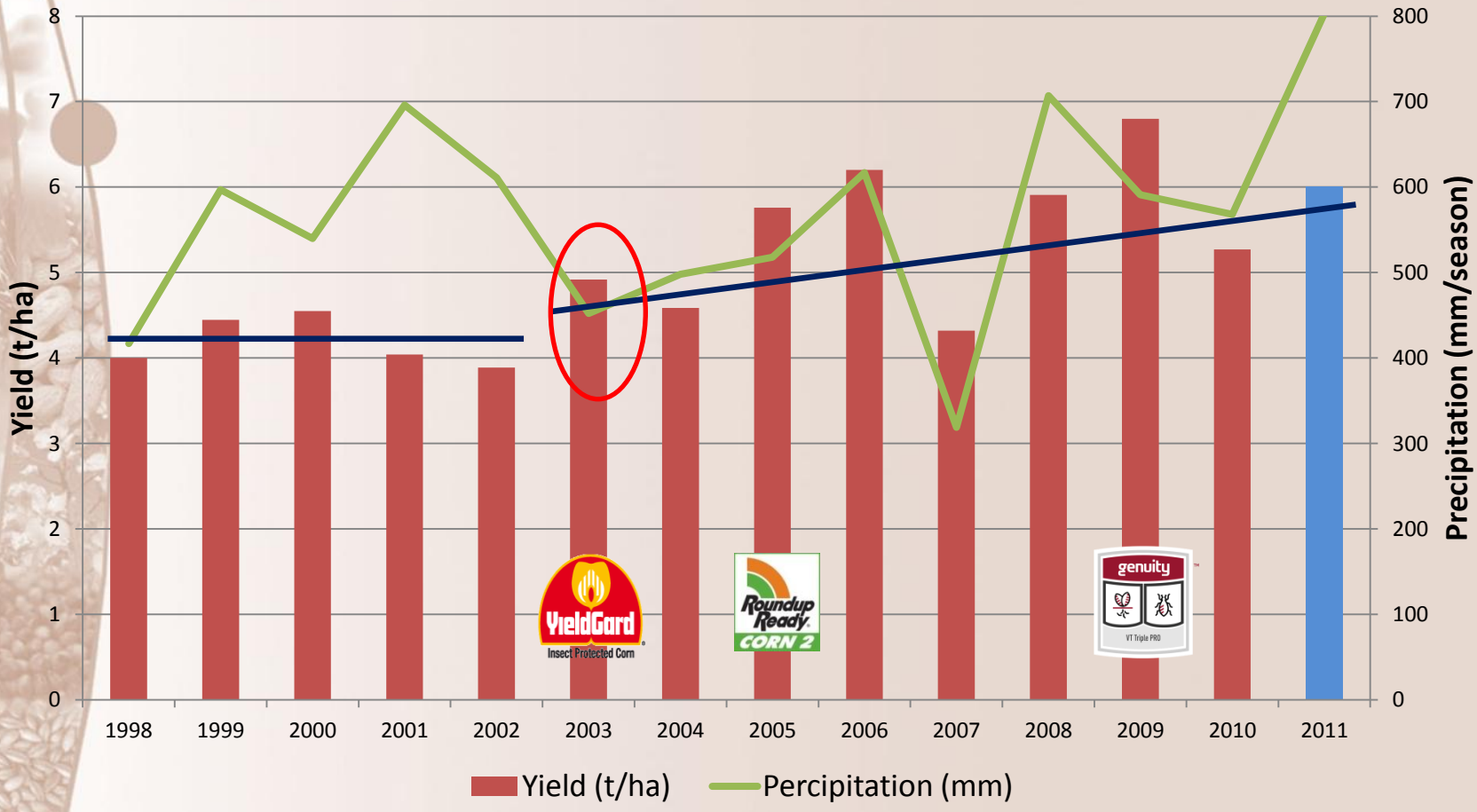

Agriculture
Grains (corn and wheat) and livestock
Grazing and some mixed farming
Sugarcane
Marginal or no agricultural use
Cotton
Fruit
Peanuts
Tobacco
Vegetables
Vineyards
Pietersburg
Pretoria
Johannesburg
SWAZILAND
Hennenman
Upington
Ladysmith
Bloemfontein
LESOTHO
Durban
Beaufort West
Cape Town
Port Elizabeth

More About the Freestate



- Most grain grown in South Africa
- Average rainfall 550 mm per annum
- The less the rain, the greater the variation
- Classified as semi-arid land
- Production mostly depended on amount of rain
- Vast difference in soil types, depth varies from 20cm to 3 meters
- Production areas decreased because of profitability
- Huge difference between import and export parity
- Most grains produced human consumption, staple maize grids
- Mostly rural community

Yield vs rainfall trend



Yield analyses

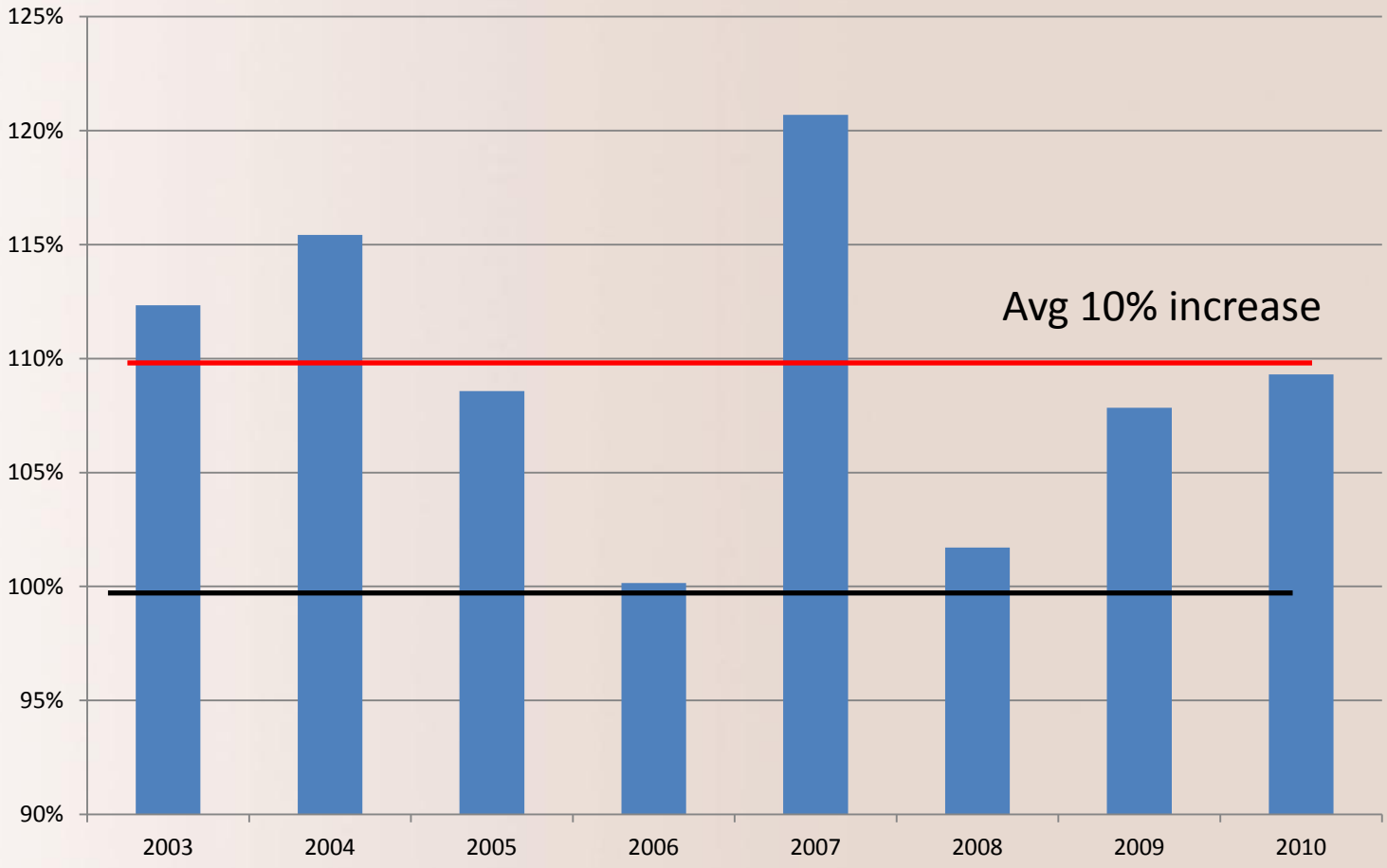
Yield 1998-2002

- Avg rainfall : 572 mm
- Avg Yield : 4.2 t/ha
- Water use efficiency: 7.3 kg/mm

Yield 2003-2010

- Avg rainfall : 533 mm
- Avg Yield : 5.5 t/ha
- Water use efficiency: 10.3 kg/mm

Bt vs non-Bt
Yield index



Cost of production 2010

Rand/€ : R 9.78

	Conventional	Bt	RR	Bt + RR
Seed	R 507	R 629	R 630	R 732
Fertilizer & Lime	R 1,940	R 2,076	R 1,940	R 2,134
Weed Control	R 400	R 400	R 300	R 400
Pest control	R 230	R -	R 230	
Fuel	R 595	R 553	R 276	R 276
Repairs & Parts	R 327	R 304	R 152	R 152
Permanent Labour	R 400	R 400	R 250	R 250
Marketing cost	R 380	R 380	R 380	R 380
Interest on production credit	R 232	R 231	R 207	R 214
Other Cost	R 1,027	R 1,027	R 1,027	R 1,027
Total	**R 6,038**	**R 5,998**	**R 5,393**	**R 5,565**
Savings		**-1%**	**-11%**	**-9%**

What ends up in the farmers back pocket?

Rand/€ : R 9.78

	Conventional	Bt	RR	Bt + RR
Production cost	R 6,038	R 5,998	R 5,393	R 5,565
Yield (t/ha)	4.3	4.8	4.7	4.9
Income	R 6,450	R 7,200	R 7,050	R 7,350
Profit	**R 412**	**R 1,202**	**R 1,657**	**R 1,785**
Margin	**7%**	**20%**	**31%**	**32%**

Actual figures from trails conducted in 2010

What's the cost to the environment?

Resistance

Saving per hectare:

- 1.8 kilograms Triazine
- 1.7 kilograms Acetochlor
- 480 grams Organophosphate
- 37.5 liters of Diesel Fuel
- 100.5 kg CO_2 gas

But why?

- You don’t see stalk borer, but their there!
- Sometime not cost effective to spray, but damages occur
- Bt affect other crop impacting insects as well
- Management easier
- Planting outside of traditional reduced stalk borer periods
- Refuge areas!!!
- Other herbicides may damage crops
- Weed controlled longer, no residual effect
- Less crop protection products
- Adoption of alternate tillage practices
- Increase in productivity, less input, more output

What's the catch?

- Resistant organisms (insects and weeds)
- Cost of technology
- Monopoly in seed/germplasm markets
- Technology goes wrong (non-pollination/sterile seeds)
- Dependent on technology
- Food safety??

What does other farmers say?

"The GM seeds is a little bit higher (in cost), but it does a fantastic, a wonderful job for me. The benefits at the end of the day outweigh the cost of the seed itself"

Samuel Moloi (2010)

"Making use of the new technology lowers total costs and results in better profits that can be ploughed back into the farm to buy new technologies or improve business and marketing skills. It definitely pays to buy new seed technologies"

- Evan Enslyn (2009)

- Source ISAAA Brief 42 (2010)

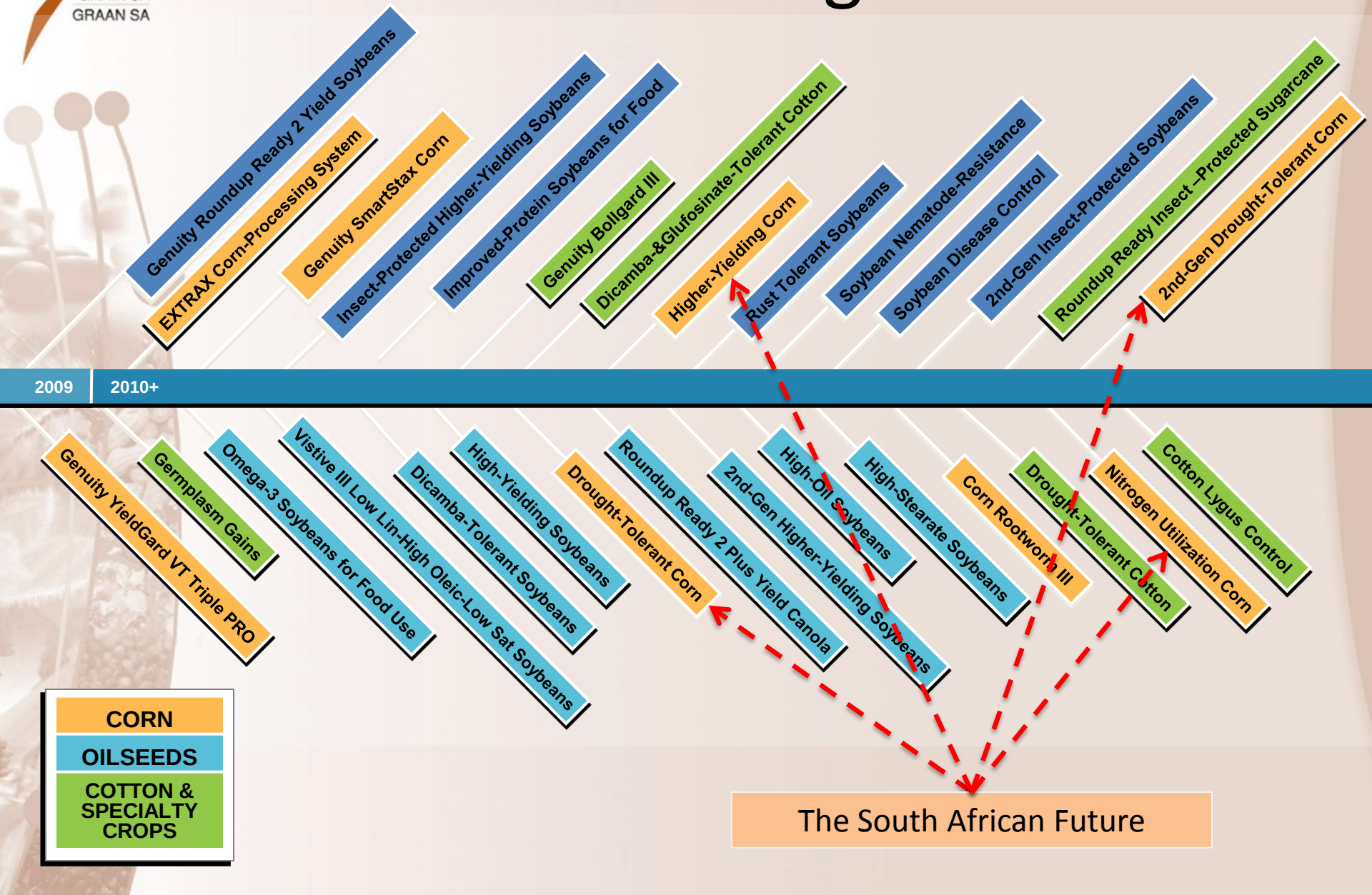
Assume

- South Africa is homogenic
- All farms looks like mine
- All practices are the same

South Africa saved through biotech maize

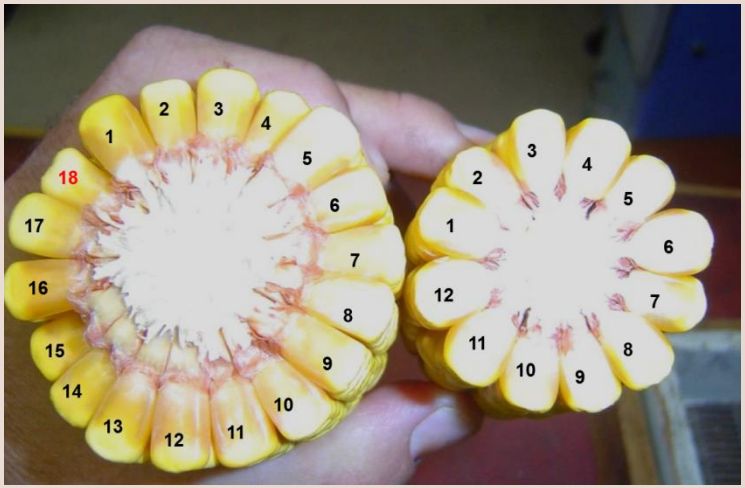
- 1860 ton Triazine
- 1757 ton Acetochlor
- 790 ton Organo-phosfate
- 38.8 M liters of Diesel Fuel
- 104 000 ton CO_2 gas

The Future of grains



The Future – other crops

- Herbicide tolerant wheat
- Golden rice (Bt)
- Biotech Potatoes
  - High quality starch
  - Disease resistance
  - Insect resistance



- Biotech Vegetables – insect resistant
- Improved efficiency an tolerant genes

Choice!

"Biotech crops could save millions from starvation and malnutrition, if they can be freed from excessive regulation" – Ingo Potrykus (2010)

- Europe has enough food, they have Choice!
- Hunger people don't have food, never mind choice

- Choose: Die of hunger now, or of possible GM effects in 30 years?

Food production constraints in Africa

- Political
  - Political will and support
  - Political influence (European regulations in Africa)
  - Political focus – poverty relief through grants, not economic development
- Economic
  - Not enough money for research
  - Infrastructure
- Global
  - Compete with subsidized product
  - Food aid coming from elsewhere, not supporting local production

Final words

- Expedite breeding of better suited hybrids and varieties, traditional or bioengineering
- Share all relevant info
- Promote technology
- Responsible stewardship

Help fight world hunger

Thank You!

Merci!

Jaco Minnaar

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