Conservation Tillage and Stress Tolerance: Mitigating and Adapting to Climate Change

UN Climate Change Conference
Poznan, Poland, December 8th, 2008
David Dennis, CEO, Performance Plants Inc.

performance PLANTS

The promise of growth

Demonstrated Value of Modern Agriculture

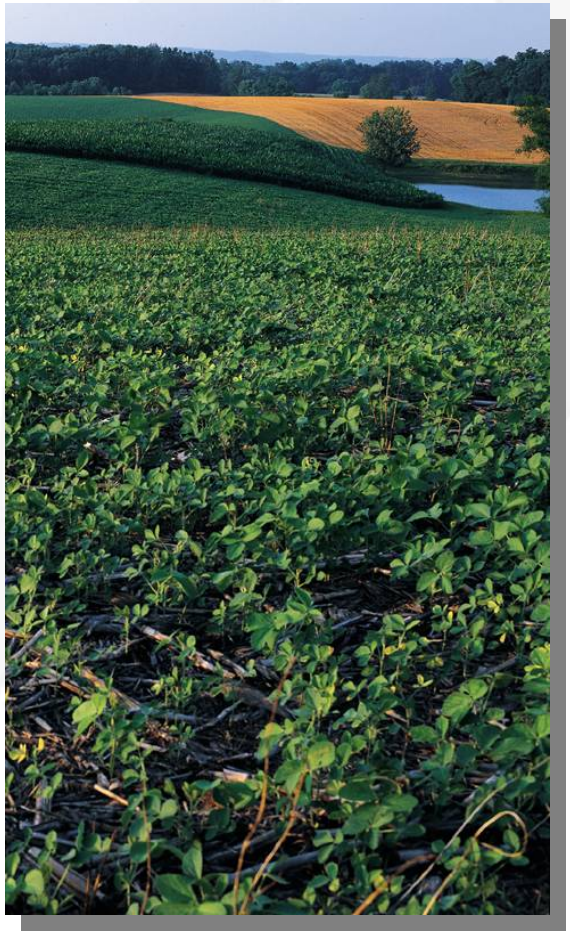
- Role in climate mitigation
- Role in adapting food production to changed environmental conditions

Impact of Agriculture on Climate Change

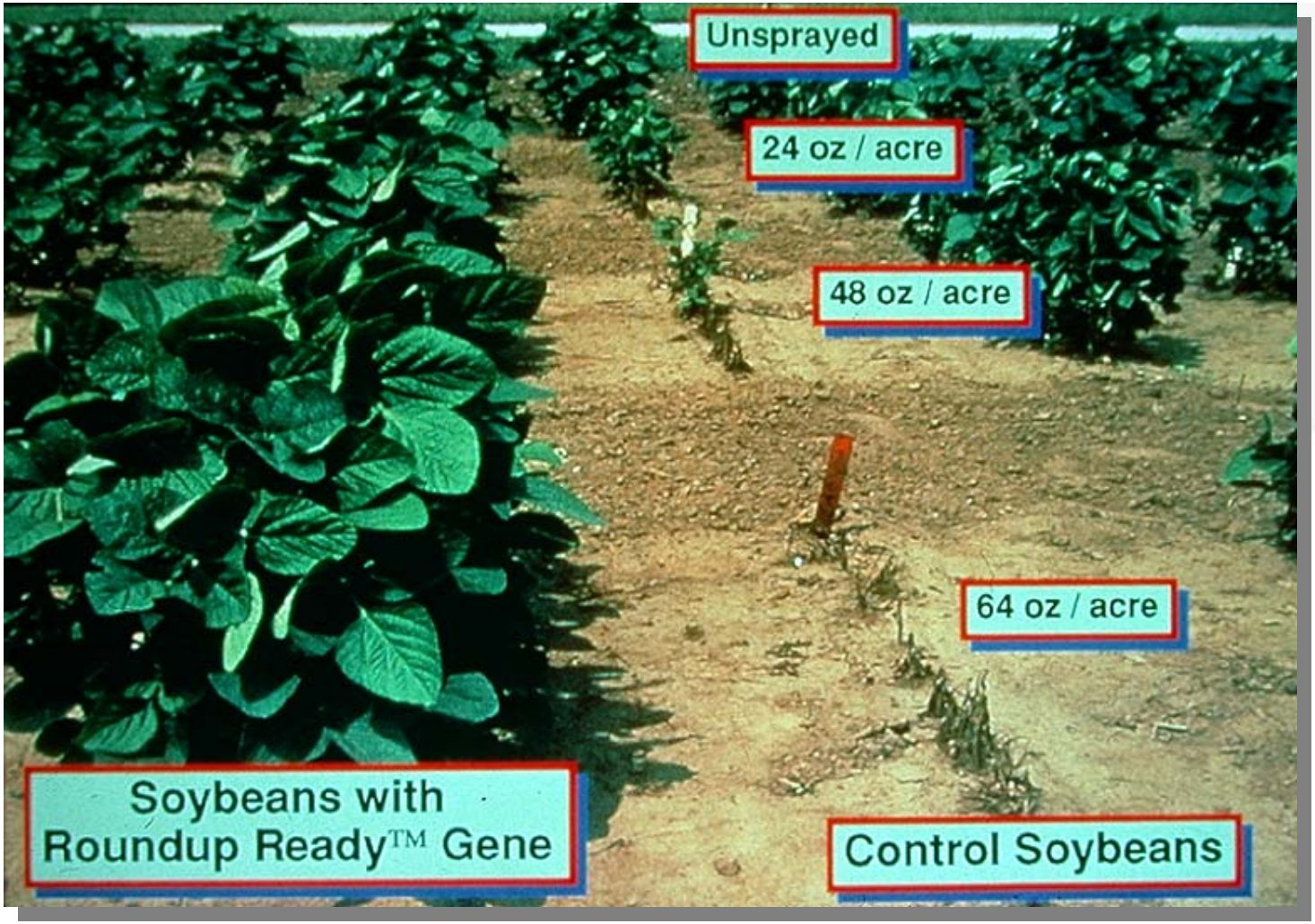
- Soil a major land site for CO_2 storage
- Unplowed Prairie soil has 5% organic matter
- Continuously plowed soil has 1.9%
- Modern agriculture has role to play in reversing this

No-Till Agriculture is an Example

- Huge environmental value
- Requires use of herbicides



Herbicide-Resistant Soybeans



No-Till Farming

Herbicide Resistant Crops

- New crop sowed into residue of last crop
- Weeds destroyed by herbicide not by tilling
- Soil not disturbed
- Huge environmental advantages

Herbicide-Resistant Corn (Roundup-Ready®)

No-Till Farming

Carbon Mitigation by No-till Farming

- Organic matter accumulates in soil
- CO_2 removed from atmosphere
- Greatly decreased use of tractors
- Great increase in earthworms
- Prevents soil erosion
- Reduces the need for fertilizer (nitrogen)

Impact of Non-Till Farming (USA)

- Saved 1,400 million litres per year of tractor fuel
- Organic matter increased in no-till
  - Increased 3.8% in 20 years
- Increased carbon/acre
  - 0.4 tons/year over 20 years

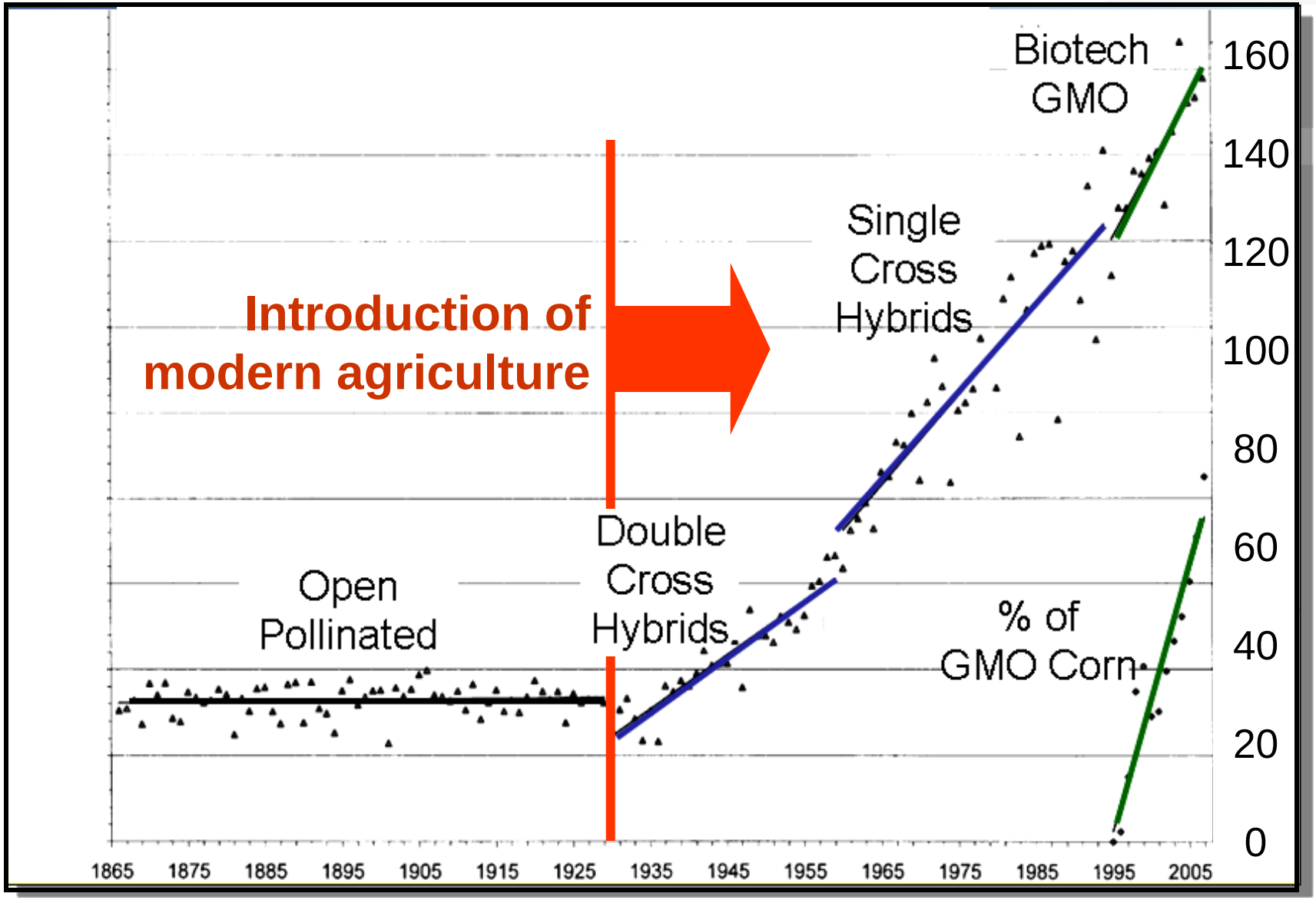
Future Role of Agriculture in Climate Change

The Problems of the 21st Century are Huge

- 9 Billion people by 2050 (6.75 B now)
  - 852 million at present malnourished
- Improved nutrition world-wide

This will double or triple food needs

Modern agriculture will be needed to accomplish this while preserving wild habitat


Introduction of modern agriculture
Open Pollinated
Double Cross Hybrids
Single Cross Hybrids
Biotech GMO
% of GMO Corn
Average Corn Yields / % of GMO Corn
0
20
40
60
80
100
120
140
160
1865
1875
1885
1895
1905
1915
1925
1935
1945
1955
1965
1975
1985
1995
2005

Problems of the 21st Century are Huge

- Climate Change
  - Drought, heat, unstable weather
  - This will strain agricultural productivity
- Need for Renewable Biofuels
  - Replacement for fossil fuels

Modern agriculture is addressing these problems

New Crops Needed Due to Climate Change

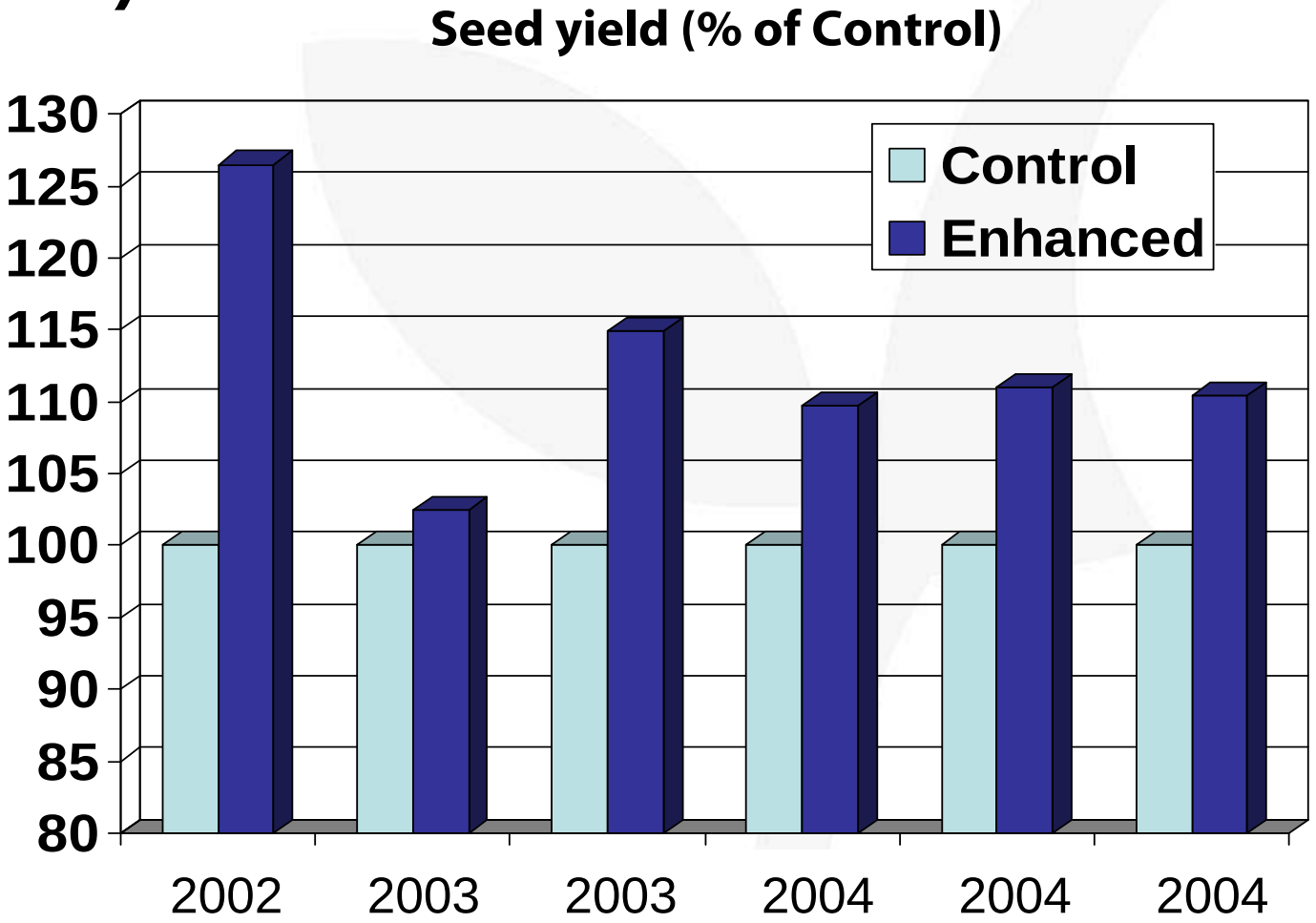
- Increased resistance to drought
- Increased resistance to heat
- Plants that need less irrigation
- Plants that use less fertilizer (nitrogen)
- Increased biomass to replace fossil fuels

Making Plants Drought Tolerant

Plants Made Drought Tolerant

Day 8 of drought stress

Canola with Enhanced Drought Tolerance (in field)

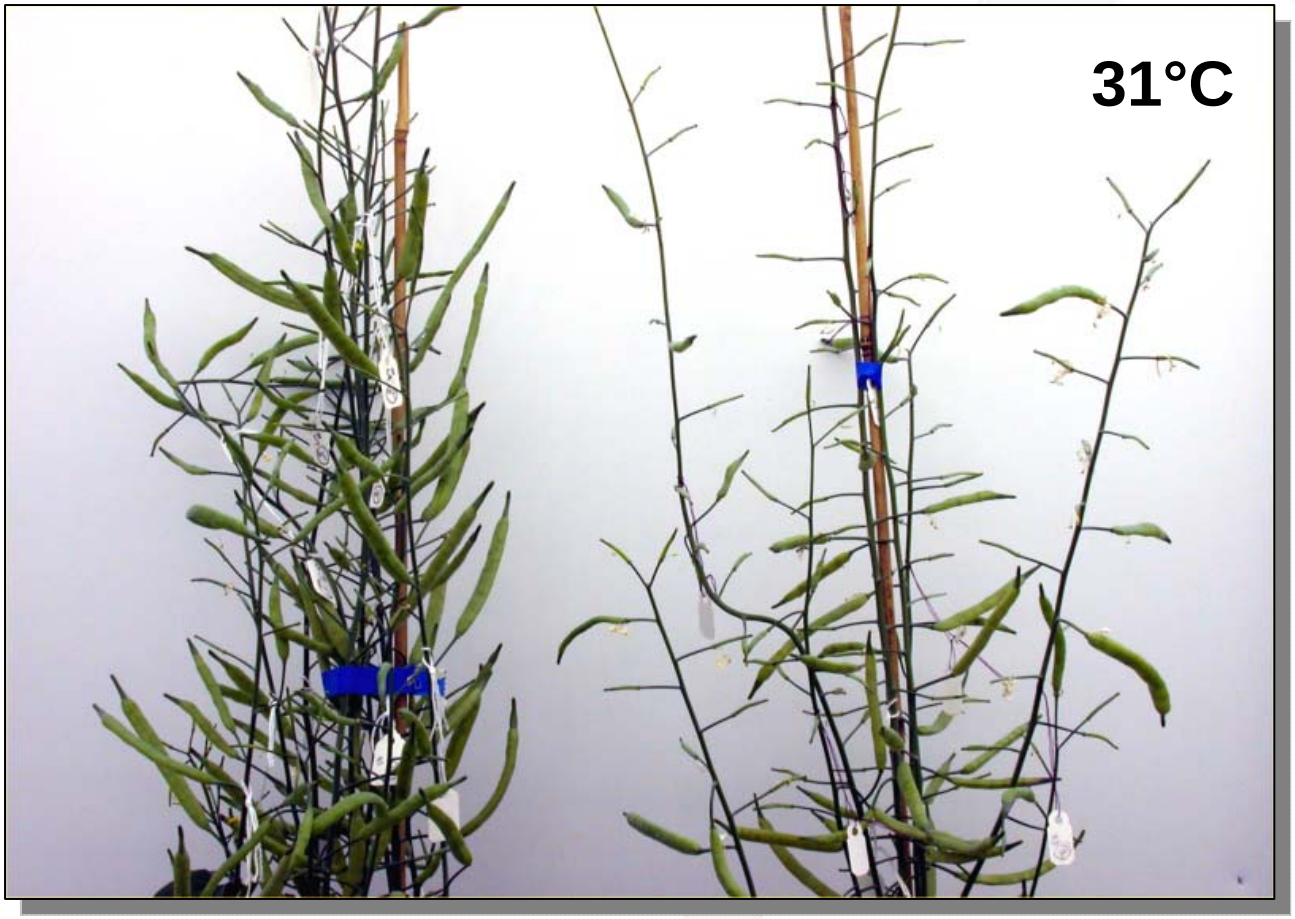


Crops Resistant to Higher Temperatures

High Temperatures Impact Crop Yields

	Threshold	
■ Wheat	26º	Post Flowering
■ Canola	29º	Flowering
■ Rice	34º	Grain Production
■ Corn	38º	Grain Production

Heat Resistant Canola



Plants That Use Less Water

NewScientist

February 25 - March 3, 2006

It takes **2500 gallons** of water to grow a pound of coffee,

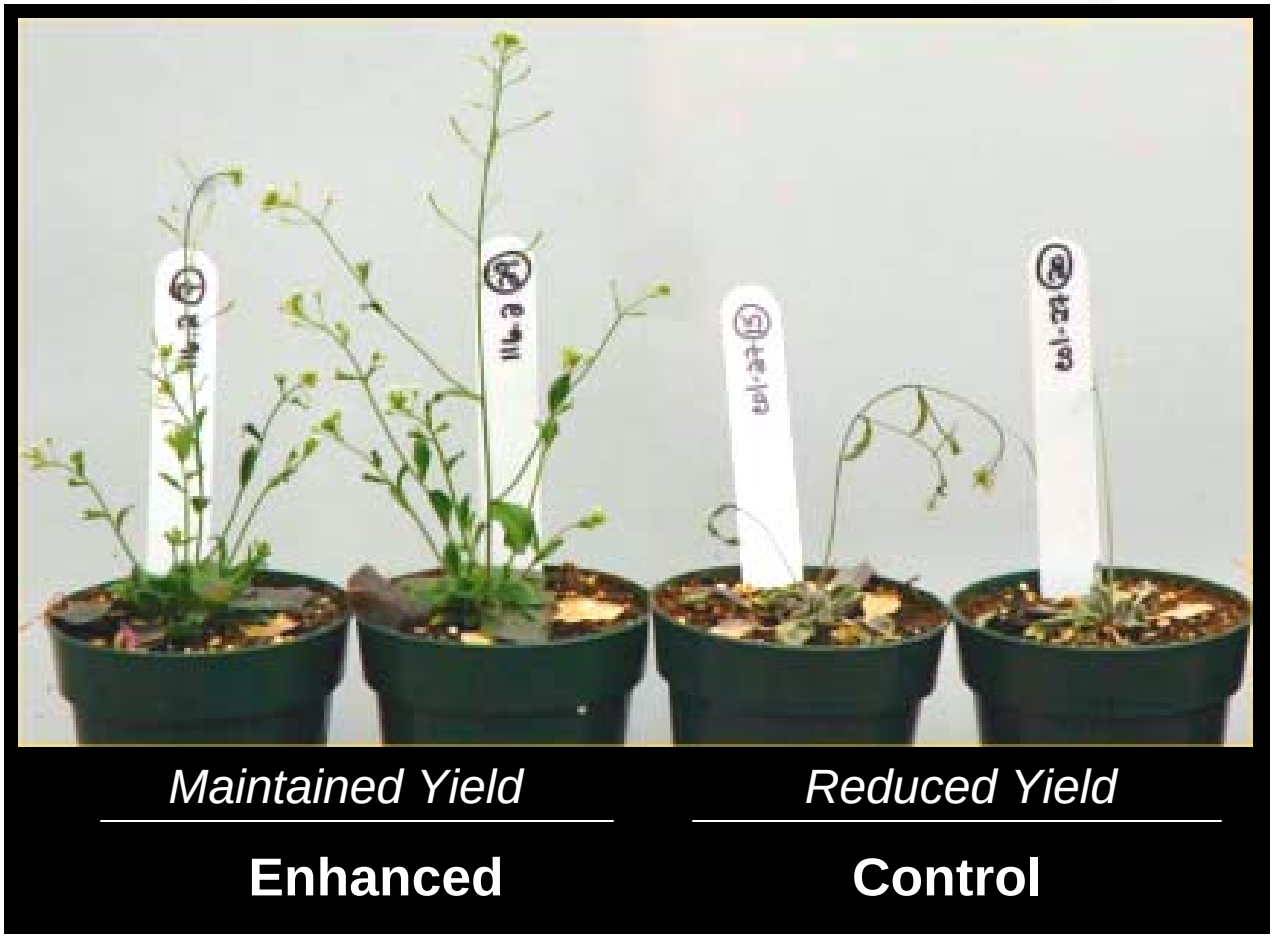
3000 gallons of water to

make a quarter pounder,

and **600 gallons** of water to make a pound of cheese

No wonder the Earth is running dry...

Plants That Use Water More Efficiently



Maintained Yield — **Enhanced**

Reduced Yield — **Control**

Harvesting the Sun

For Energy

Harvesting the Sun's Energy

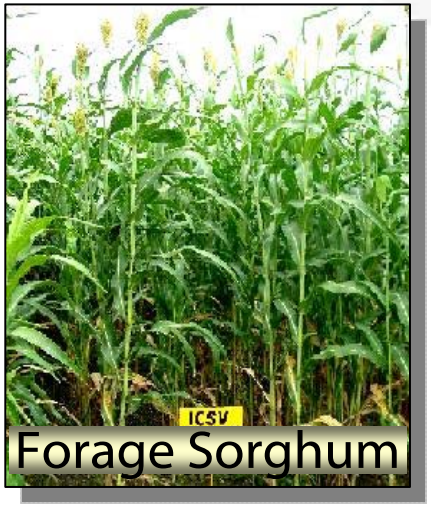
- Windmills and Photovoltaic cells
  - Cannot store the energy
- Plants – Photosynthesis
  - Plants also store the energy as **BIOMASS**

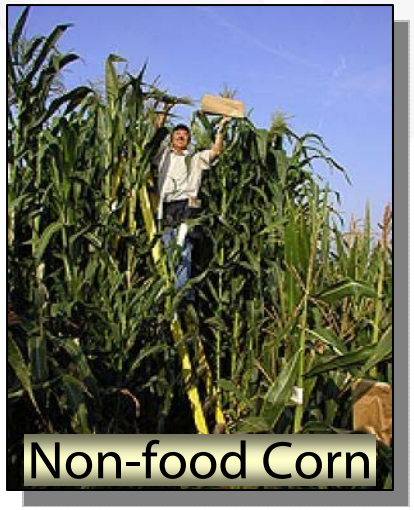
Using Biomass to Make Cement

- A cement works might use 110,000 tons/year of coal
- Can we replace the coal with biomass

Developing Non-Food Biomass Crops

Potential Biomass Crops





The Wild Corn Plant is Mainly Biomass

Modern Hybrid Corn

Greatly Reduced Biomass

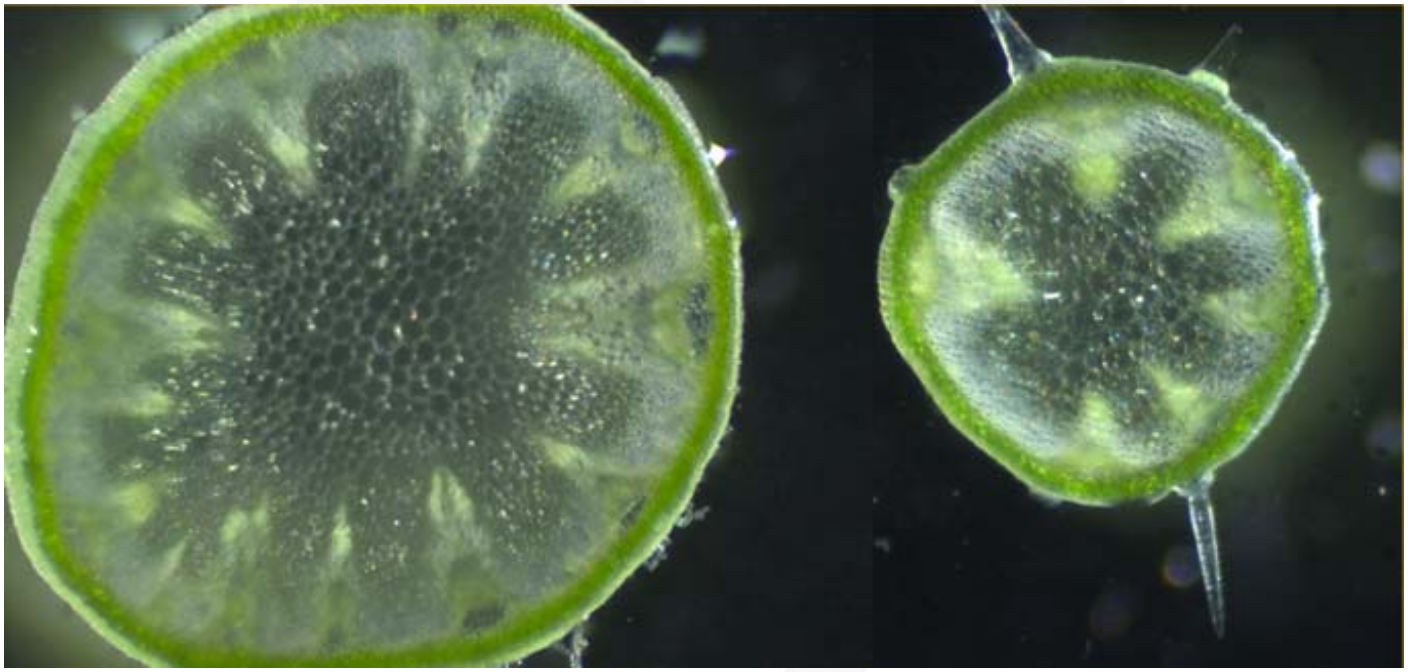
Parent 1 P1 | Hybrid P1xP2 | Hybrid P2xP1 | Parent2 P2

Wild Corn is Modified to Produce Seeds

Figure 2. Modern corn hybrid (right), its wild relative teosinte (left),

Biomass Enhanced Plants

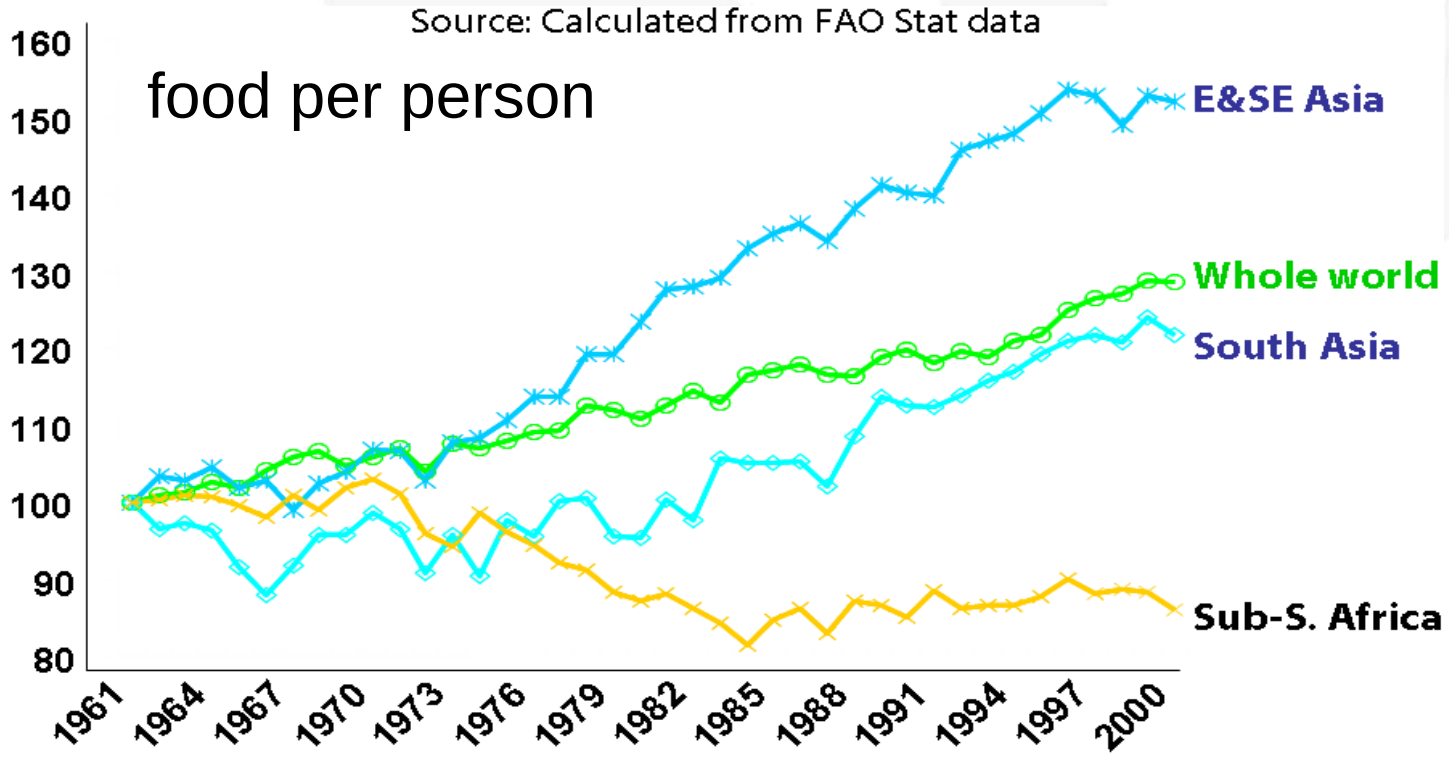
Thicker Stems – More Tonnes Per Hectare



Enhanced Control

Climate Change will Impact Emerging Nations

Sub-Saharan Africa is impacted
by drought and high temperatures



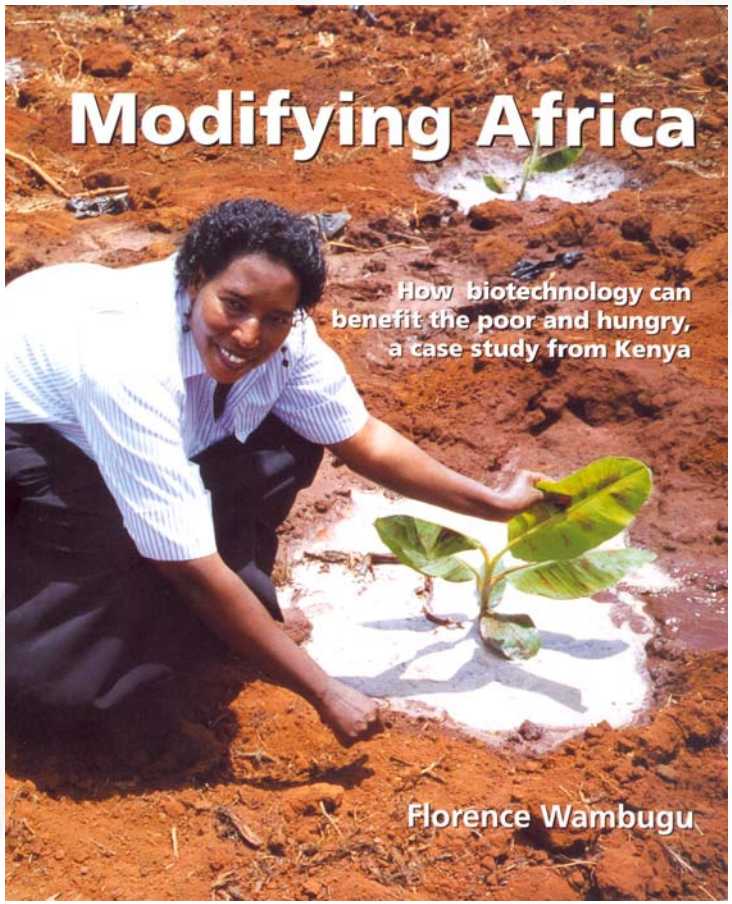
Need to Develop Improved African Crops

Africa Harvest

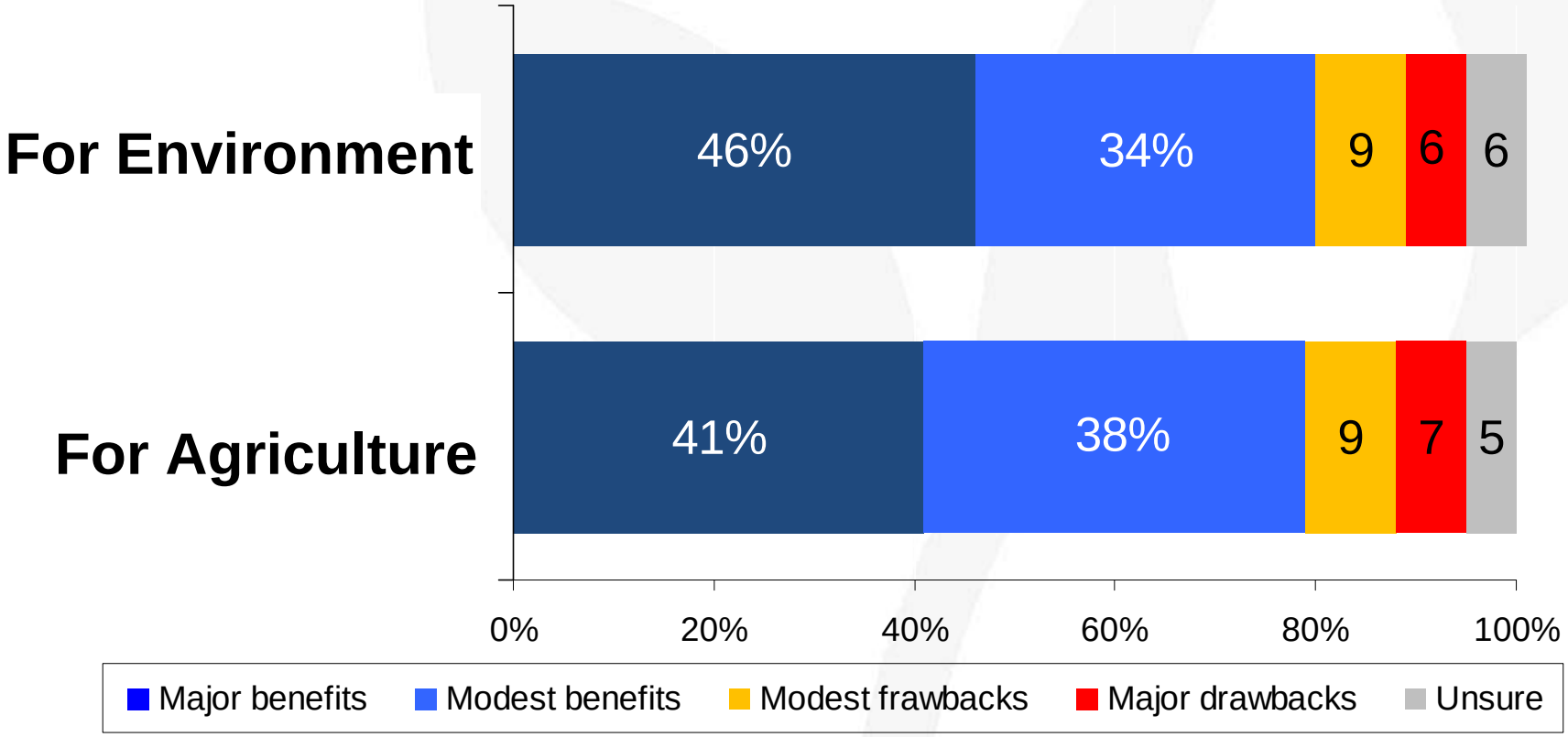
Biotech Foundation

"Africa cannot afford to be excluded from the biotechnology revolution"

Dr. Florence Wambugu



8 of 10 Canadians See Biotechnology Benefits



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