



Growing Energy

BIOMASS 2009

National Harbor, Maryland

**Richard Hamilton
President & CEO**



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Arm-Chair Farming



“Farming looks mighty easy when your plow is a pencil, and you are a thousand miles from the corn field.”



Dwight Eisenhower



The Real “Crime Against Humanity”?

Corn Yield Trends (Bushel Per Acre)			
	1990	2000	2005
World Average	59	70	75
USA	113	137	149
Argentina	60	93	109
China	74	78	80
Brazil	33	47	54
India	23	29	31
Sub-Saharan Africa	22	24	25



Indirect Land Use Conversion (ILUC)

Are U.S. Farmers...

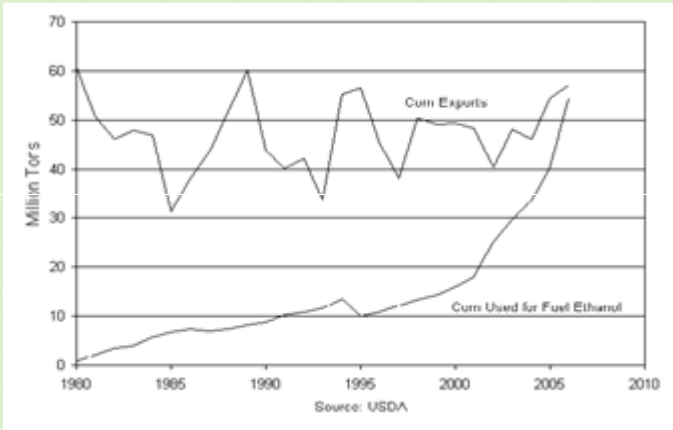


**...Responsible
for Tropical Deforestation?**

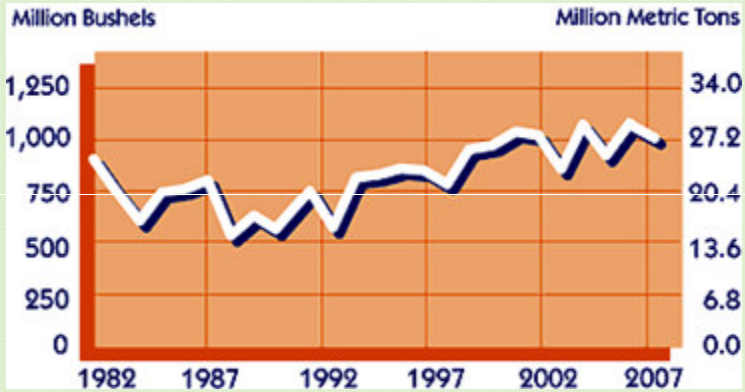


Indirect Land Conversion?

U.S. Corn for Ethanol and for Exports



U.S. Soybean Exports

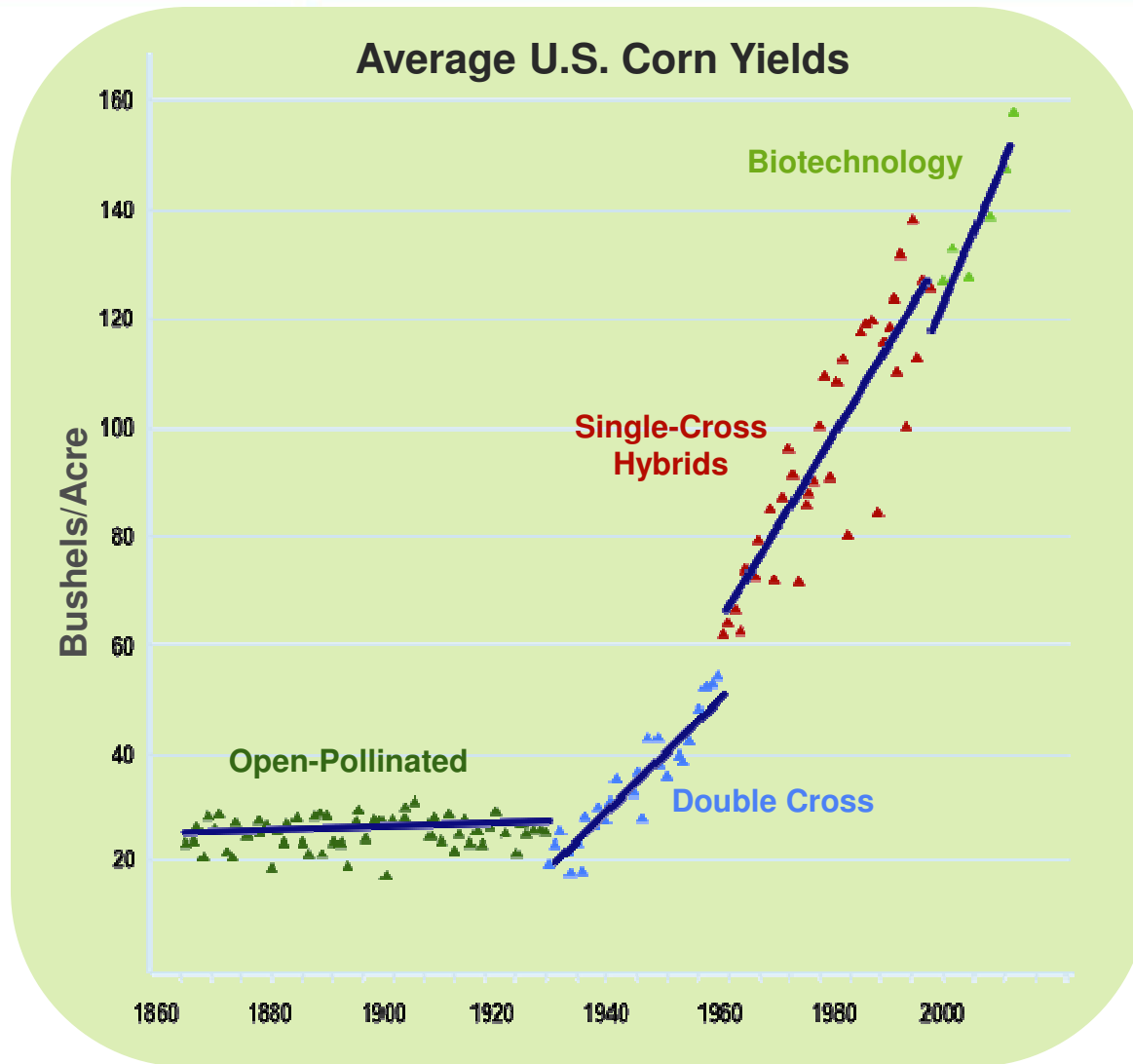


Is U.S. biofuel production leading to a decrease in corn or soybean exports?



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Can ILUC Models Predict Innovation?



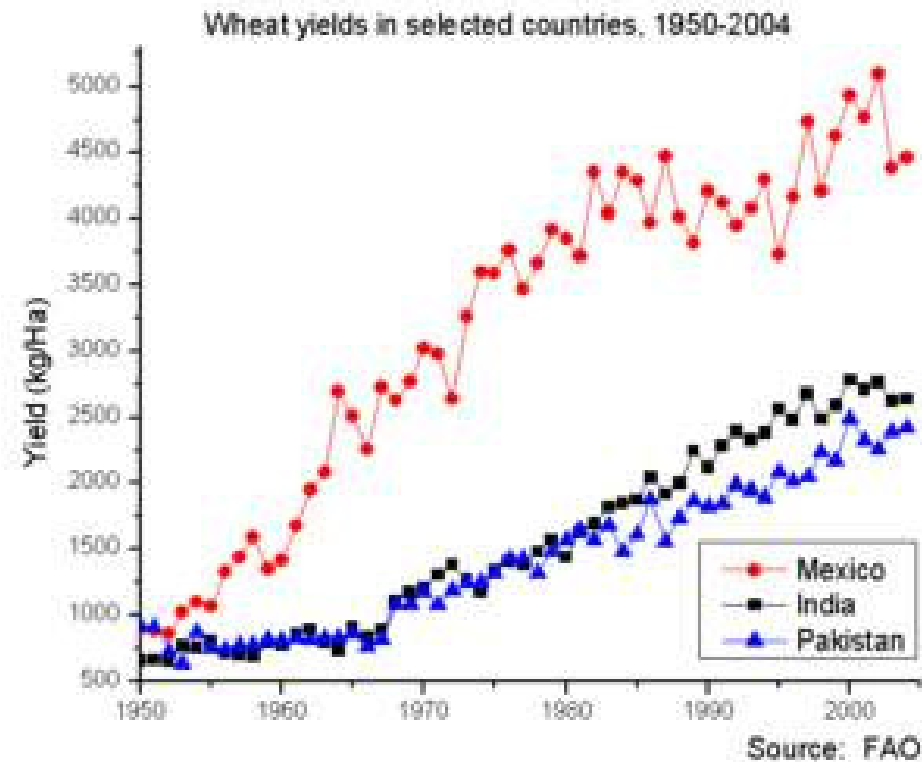
Hybrid genetics & biotechnology have driven a **five-fold increase** in average U.S. corn yields since 1940.



Or a 300% Increase in Global Wheat Yields?



Nobel Laureate Dr. Norman Borlaug

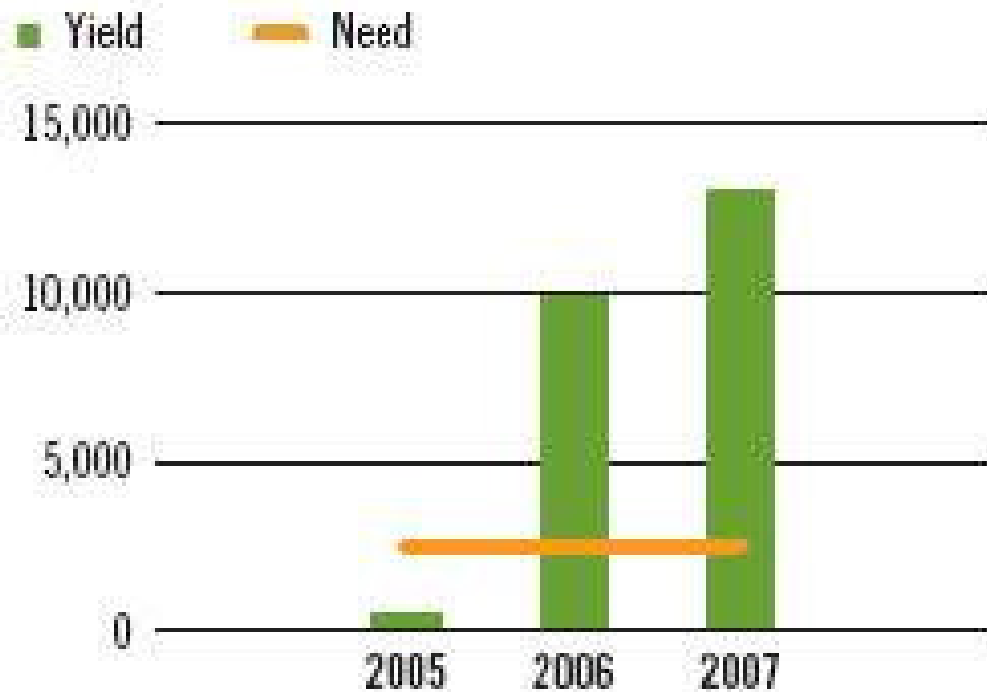




Or Adoption of Technology?...

Mary Katsonya's Harvest, 2005-2007

(in kilograms maize)



2005 – Non-hybrid varieties from saved seed

2006 - \$70 of hybrid seed and fertilizer

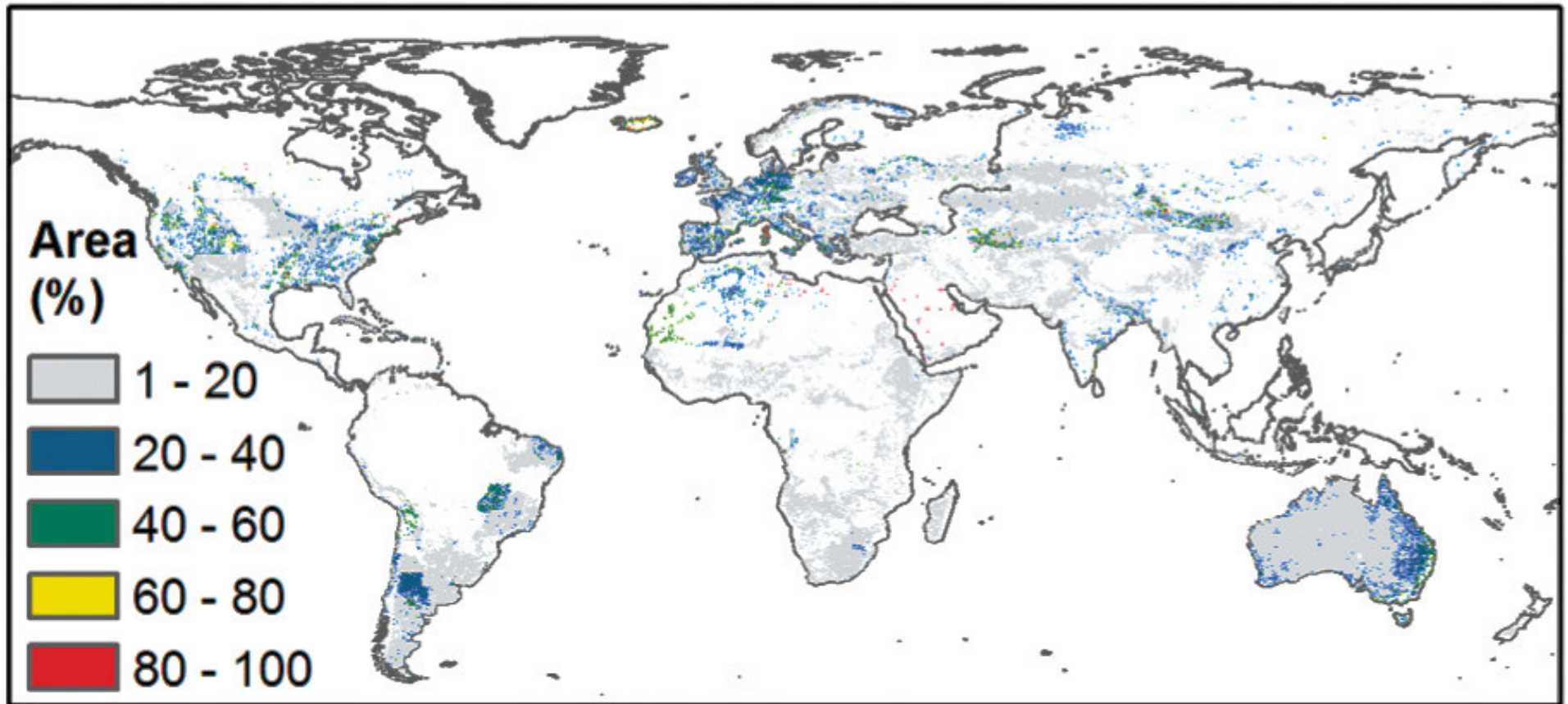
2007 – Chose hybrids, not saved seed

Source: Monsanto

FAO STAT: Malawi maize yields average 1,200 kg/hectare vs. over 8,000 for USA



Or Bringing >1 Billion Acres Of Abandoned Agricultural Land Back Into Production?



Campbell et al., *Env. Sci. Technol.* (2008) **ASAP Article**, 10.1021/es800052w



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Innovation: Increased Biomass Yield



Public Variety

Ceres Cultivar



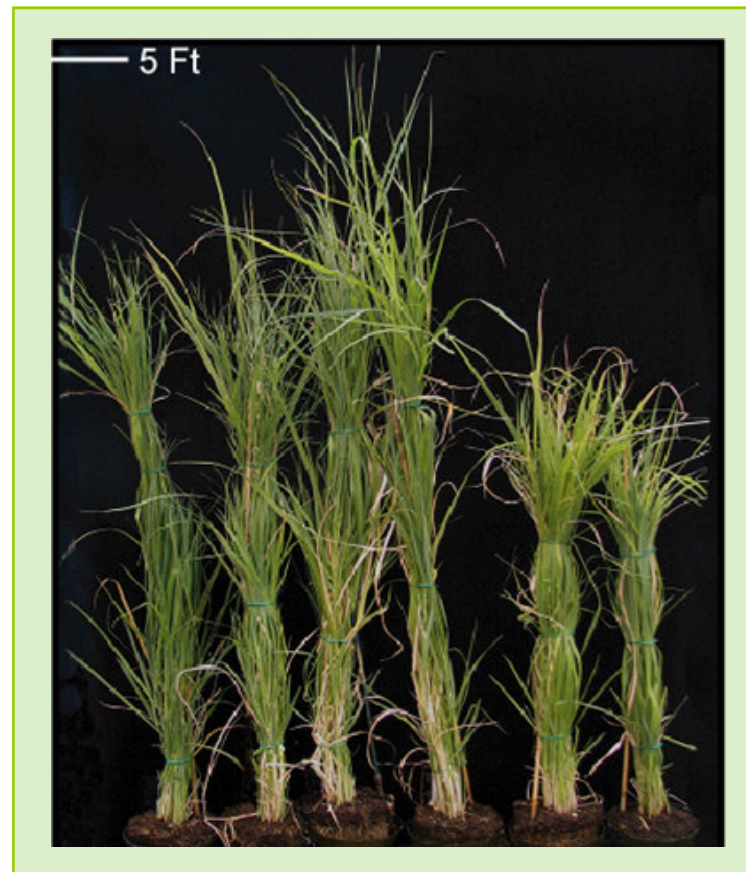
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Innovation: Low Nitrogen

Reduces fertilizer requirements in crops

Minimizes use as yields increase

Lower N_2O – a greenhouse gas



New Trait

Control



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Innovation: Drought-Tolerance



***Securing
high yields
on
marginal
land***

Time-Lapse Photography Over Two Days



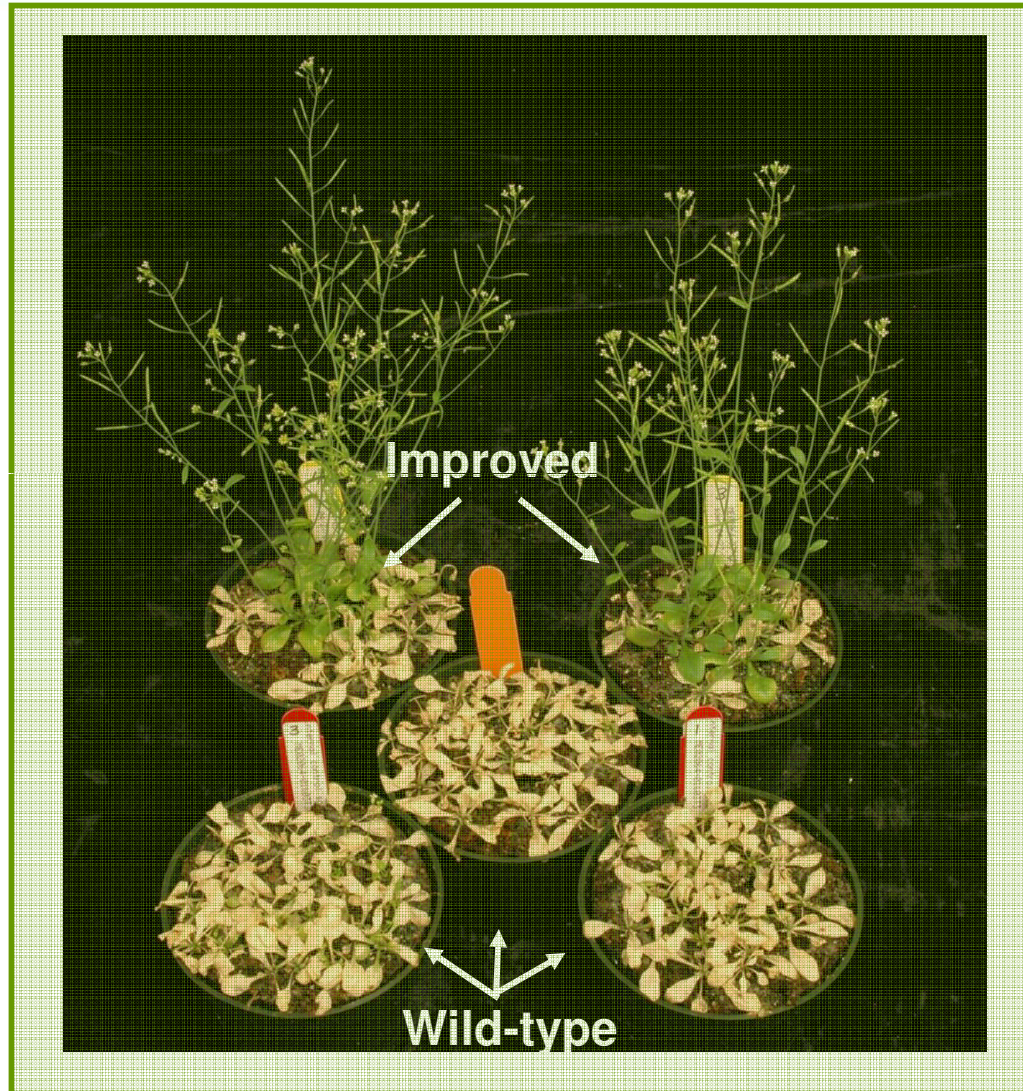
Control

Drought-Tolerance Trait

the energy crop company™



Salt Tolerance... (75% sea water)





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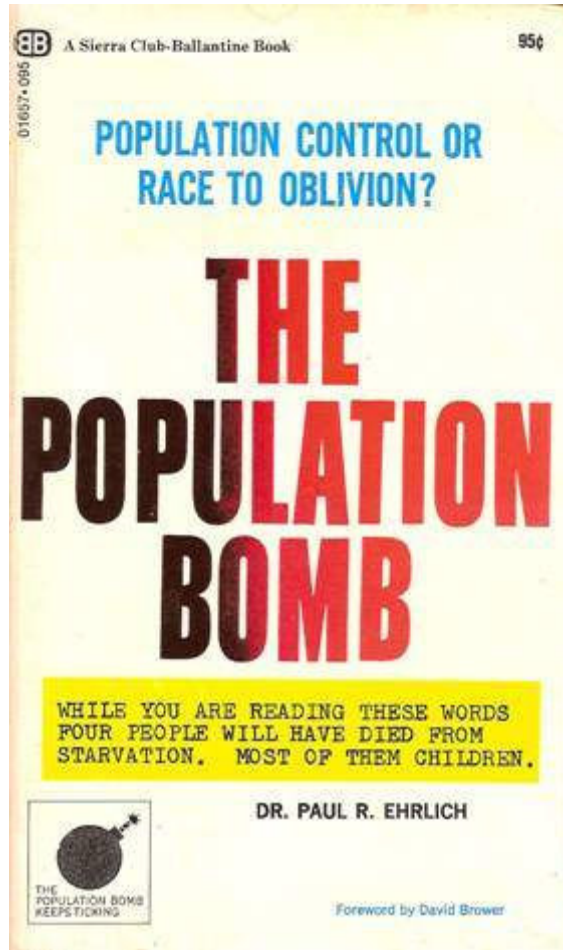
Some “Recent” Innovations...

the energy crop company™



- **1900** - Rediscovery of Mendel's Laws
- **1935** - Hybrid genetics
- **1953** - Structure of DNA
- **1983** - Biotechnology in plants
- **1995** - Marker-assisted breeding
- **2001** - First plant genome sequenced

What will the next 66 years bring?



- "the battle to feed all of humanity is over"
- "In the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now."
- "India couldn't possibly feed two hundred million more people by 1980,"
- "I have yet to meet anyone familiar with the situation who thinks that India will be self-sufficient in food by 1971."

Beware of Malthusian Myths...



John F. Kennedy

“ For the **great enemy of the truth** is very often not the lie – deliberate, contrived and dishonest – but the myth, persistent, persuasive, unrealistic. We enjoy the comfort of opinion without the discomfort of thought. ”



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