

## Feedstocks for the KBBE

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Knowledge Based Bio-Economy towards 2020

*Turning Challenges into Opportunities*



Food,  
Agriculture and Fisheries,  
and Biotechnology  
Knowledge-Based Bio-Economy (KBBE)

# KBBE 2010+: an EXTRAORDINARY time of great concerns but also opportunities



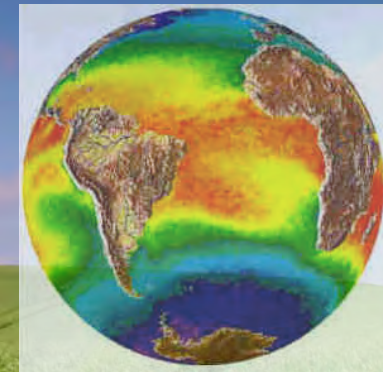
- **Global food security**
  - Enhanced productivity + nutrition
  - Increased yield
  - Sustainable production



- **Water availability**
  - Drought-tolerant crops
  - Crops with improved water use efficiency



- **Bioenergy**
  - Biomass production to help meet demand for fuel should not compete with food production



- **Climate change**
  - Reduce CO<sub>2</sub> footprint
  - Increase fertilizer use efficiency

**A Bio-Based Economy must be part of the solution!**

# KBBE 2010+: Challenges that need to be turned into opportunities

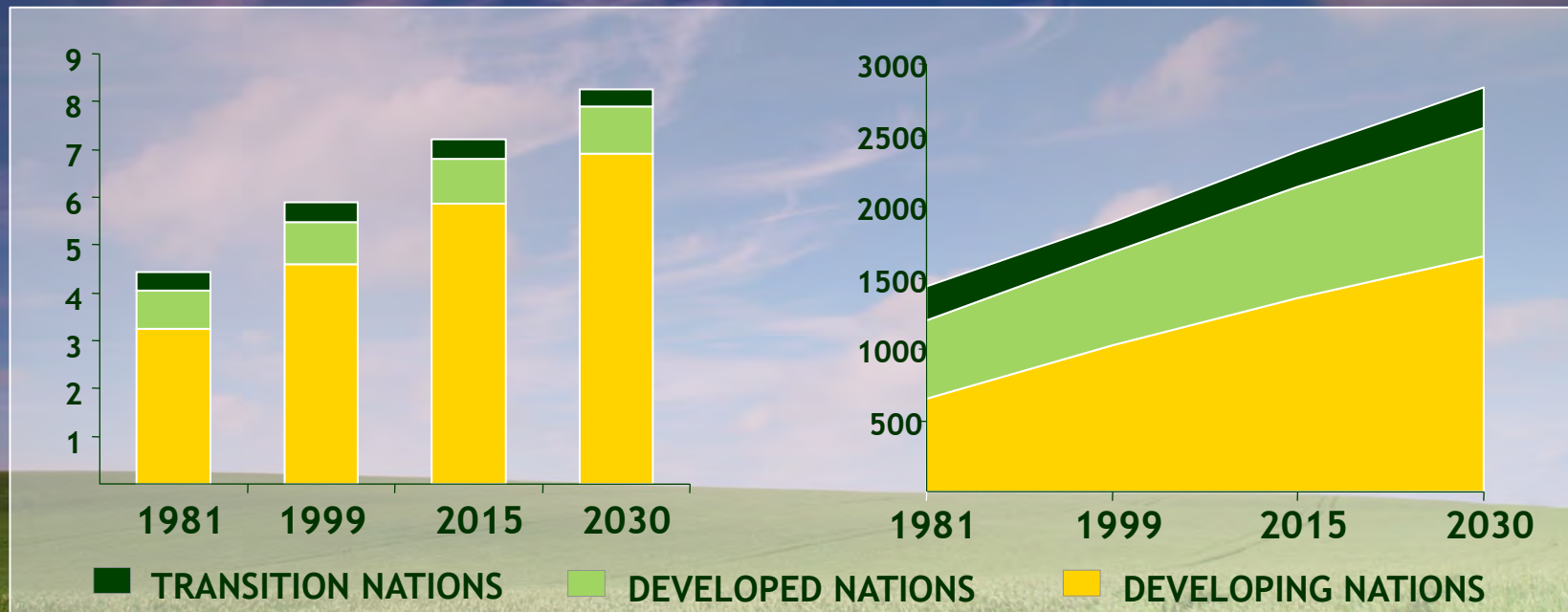
- Low stocks of staples
- Reduced funding for plant breeding and training for several decades
- Declines in world food prices over previous decades and now sharp increases
- Higher standards of living in China and India
- More people and higher urbanization
- Higher energy prices and demand for biofuel feedstocks
- Climate change
- GMO crisis in Europe

**A Bio-based Economy must urgently address these issues!**

# In the next 50 years we have to produce more food and feedstocks than ever before in the history of humankind

**GROWING WORLD POPULATION (B)**

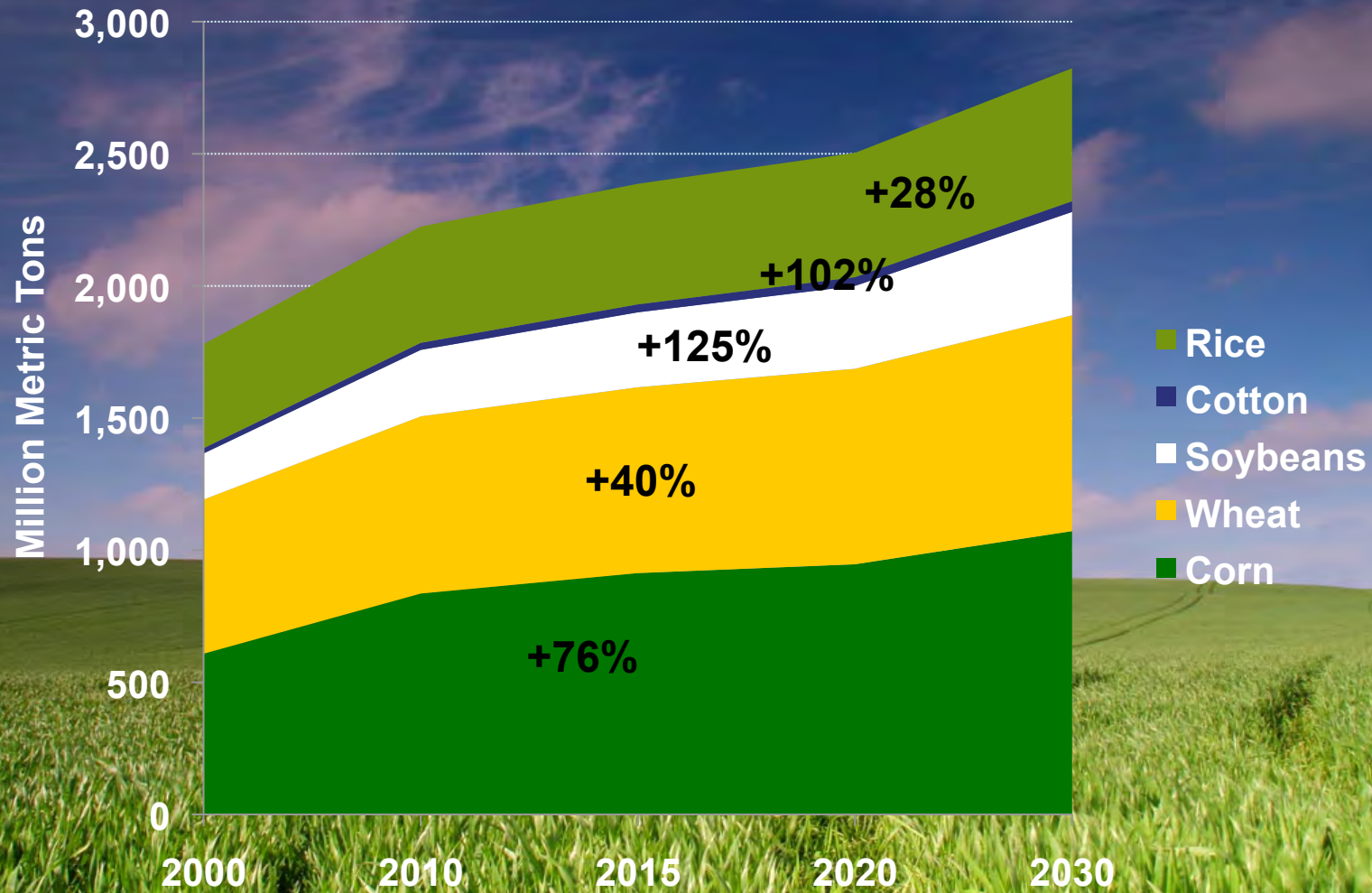
**RISING CEREAL DEMAND (MMT)**



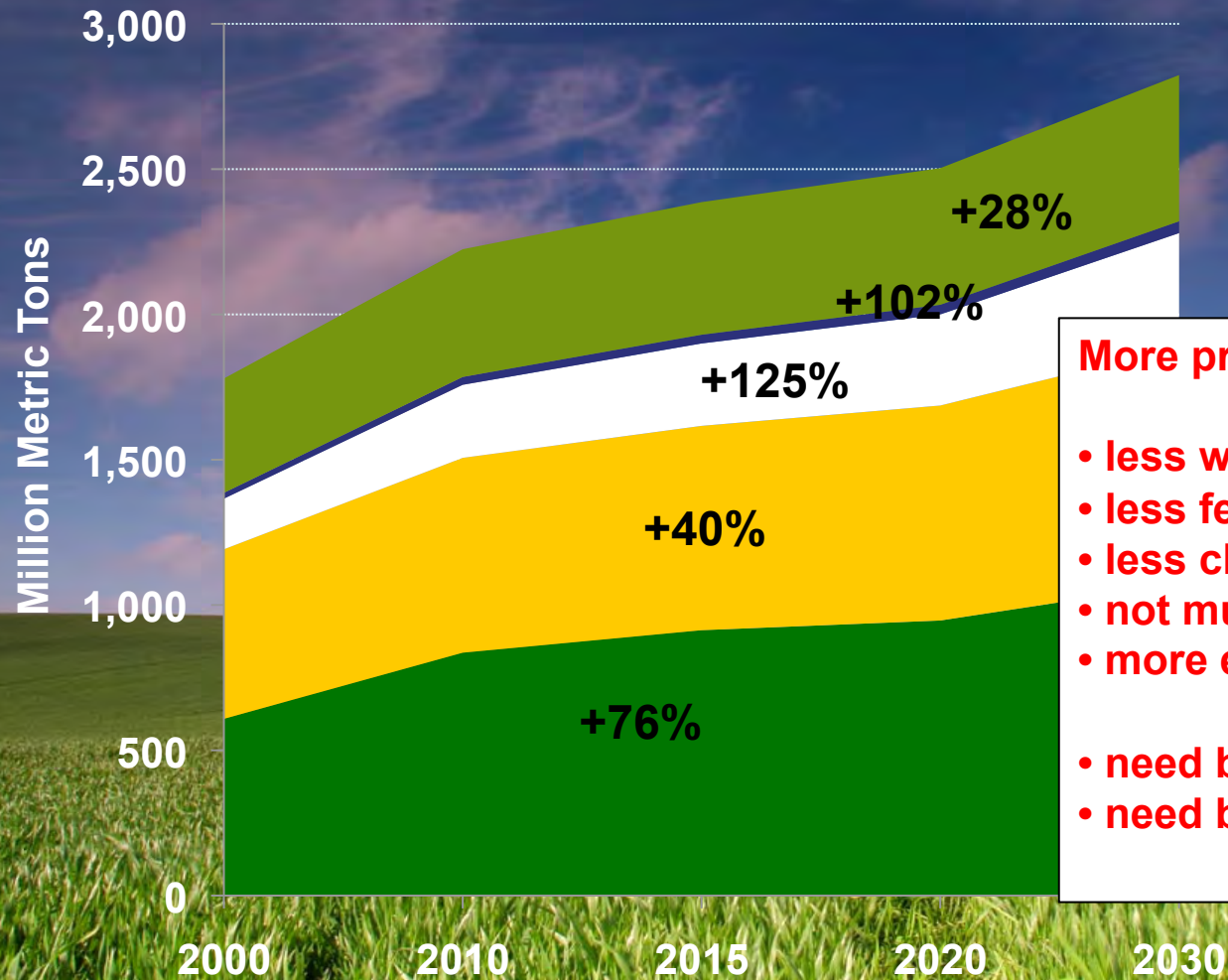
- World population continues to increase
- Per capita food consumption continues to rise
- Consumers continue to demand better food, nutrition and energy

Source: FAO, WHO

# Unprecedented demand growth for agricultural commodities



# Unprecedented demand growth meets unprecedented challenges



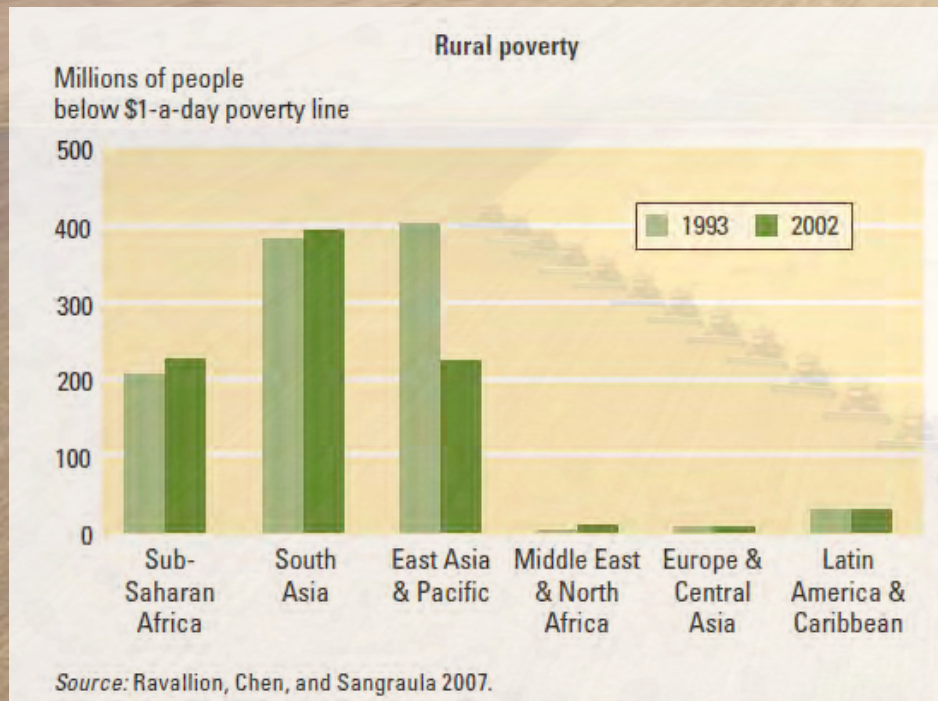
**More production with:**

- less water
- less fertilizer
- less chemicals
- not much more land
- more extreme weather

- need better varieties
- need better agronomy

# KBBE 2010+: What has not changed ...



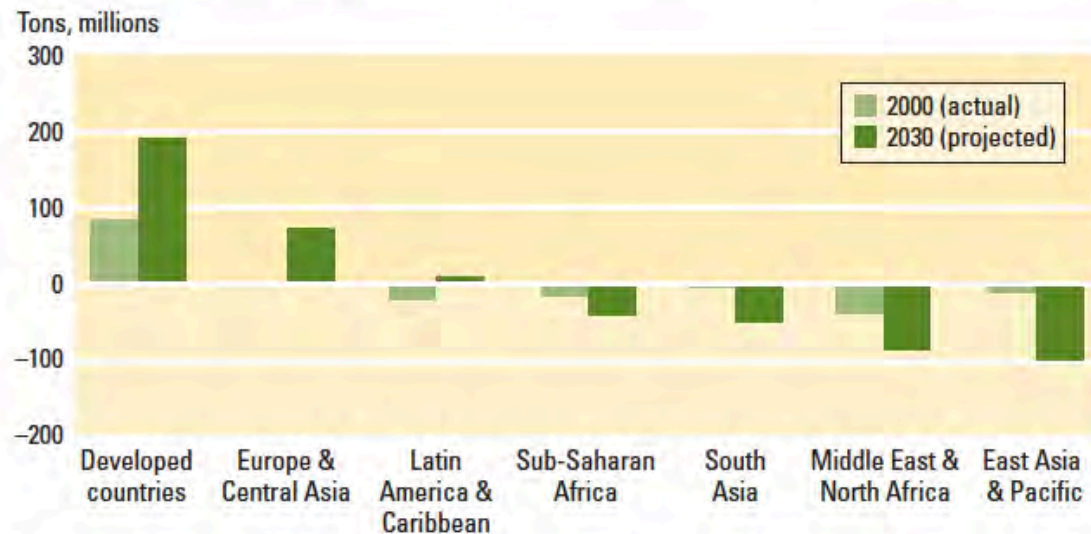
- **2009: World's hungry reach more than 1 billion!**
- **Increasing poverty in Africa, South Asia and CWANA**
- **75% of the poor live in rural areas**

Paulo Whitaker/Reuters

# Challenge to the KBBE: while world cereal markets are expanding, yield growth and agricultural R&D are stagnating

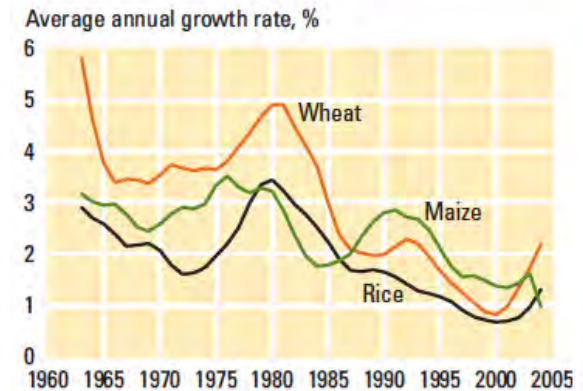
## World Development Report 2008

**Figure 2.9** Developing countries will become even bigger markets for cereals exported largely by developed countries

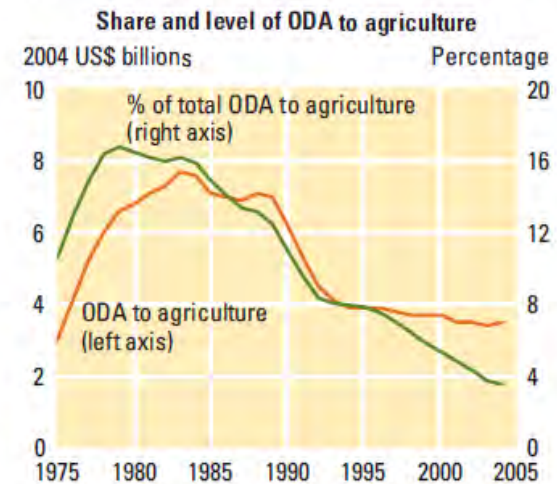


Source: Rosegrant and others 2006b.  
Notes: Negative values indicate net cereal imports, and positive values indicate net cereal exports.

**Figure 2.12** Growth rates of yields for major cereals are slowing in developing countries



Source: FAO 2006a.  
Note: Data smoothed by locally weighted regressions.



Source: OECD 2006a.  
Note: Data smoothed by locally weighted regressions.



# Agriculture in a **Bio-Based Economy**— The Fast-Lane Forward

## Bringing the first products to market

- Agronomic practices and logistics
- Collaborations
- Field trialing
- Seed production

## Rapid improvement with advanced plant breeding

- Sequencing and marker maps
- Marker-assisted breeding
- Hybrids
- Propagation techniques

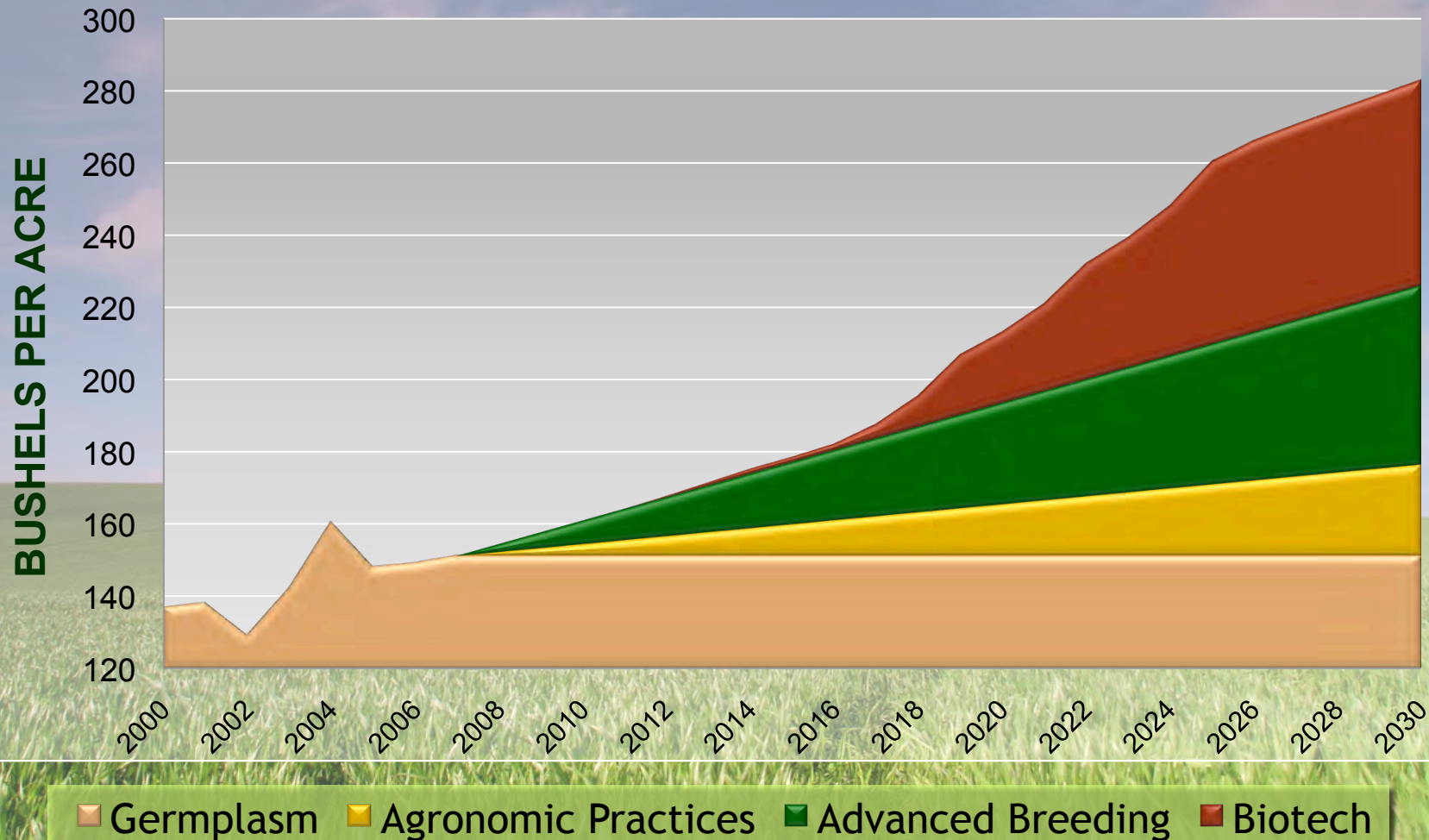
## Sustainable growth with biotech traits

### Broad portfolio of traits

- Biomass
- Improved nutrition
- Drought tolerance
- Nitrogen use efficiency
- Disease resistance
- Etc.

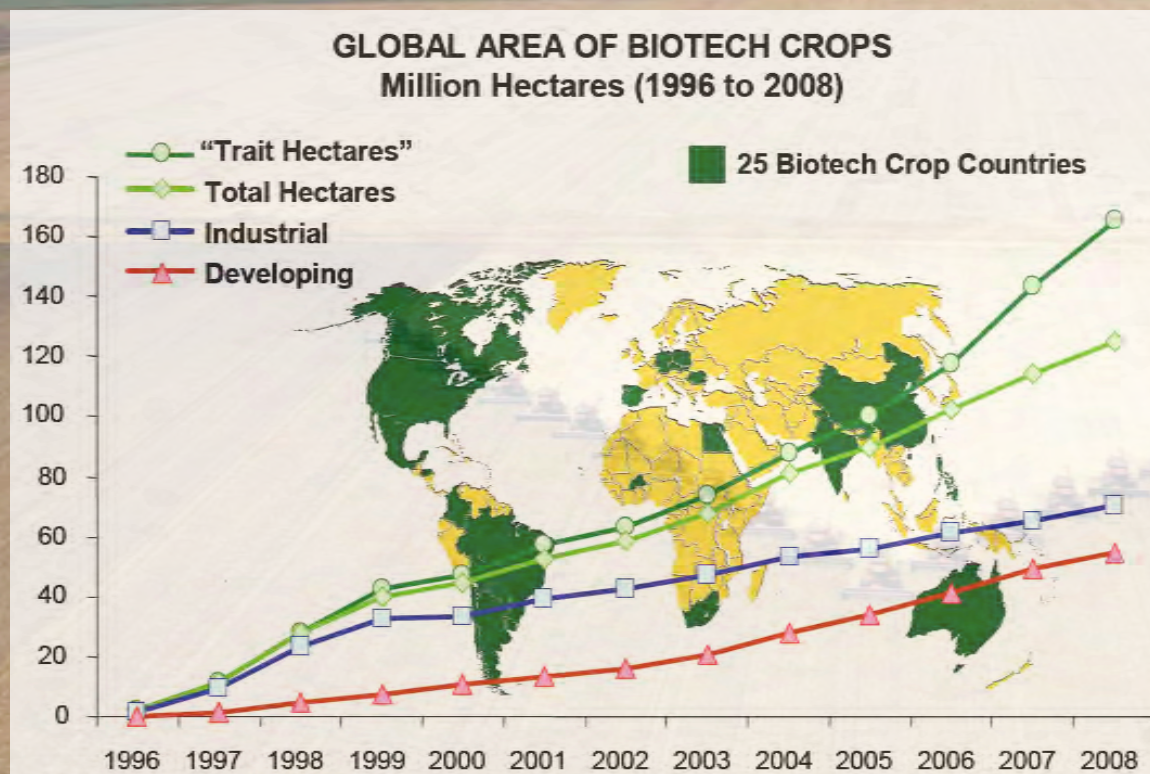
# The combination of breeding, agronomic practice improvements and biotechnology can maximize yield gains

## CORN YIELD POTENTIAL TO 2030 IN THE UNITED STATES



# Biotech crops are major drivers of production increases, however...

- ... there are currently only four crops that contribute to the GMO increase
- ... all developed and deregulated by the private sector in the U.S.
- ... subsequently adopted by developing countries  
(cotton, maize, soybean, canola with herbicide-tolerance and insect-resistance)

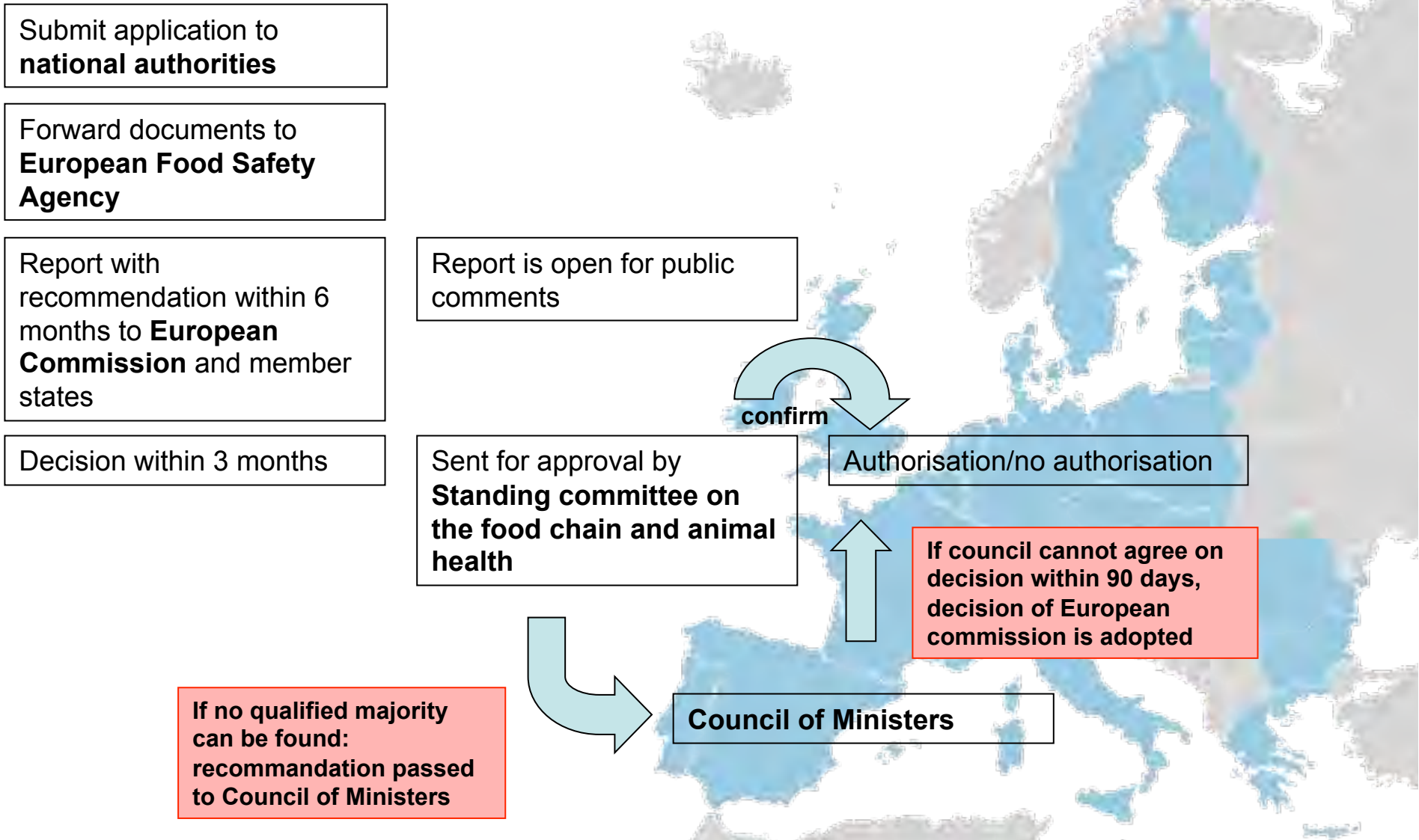


International Service for the Acquisition  
of Agri-biotech Applications

Paulo Whitaker/Reuters

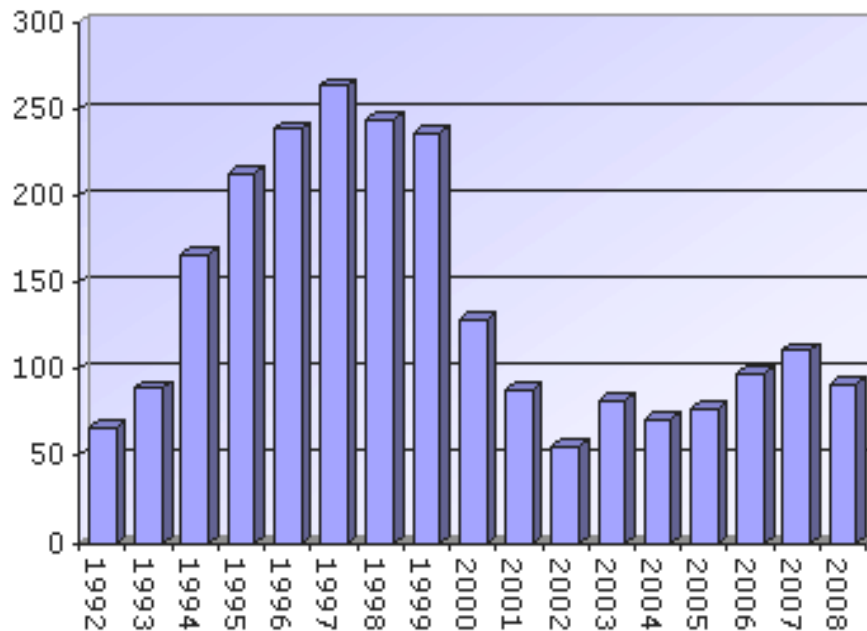
**Novel traits from the public domain have little chance to contribute to this optimistic scenario in the near future, if present regulation is maintained.**

# Can the European KBBE be successful with a complex GM regulatory process?

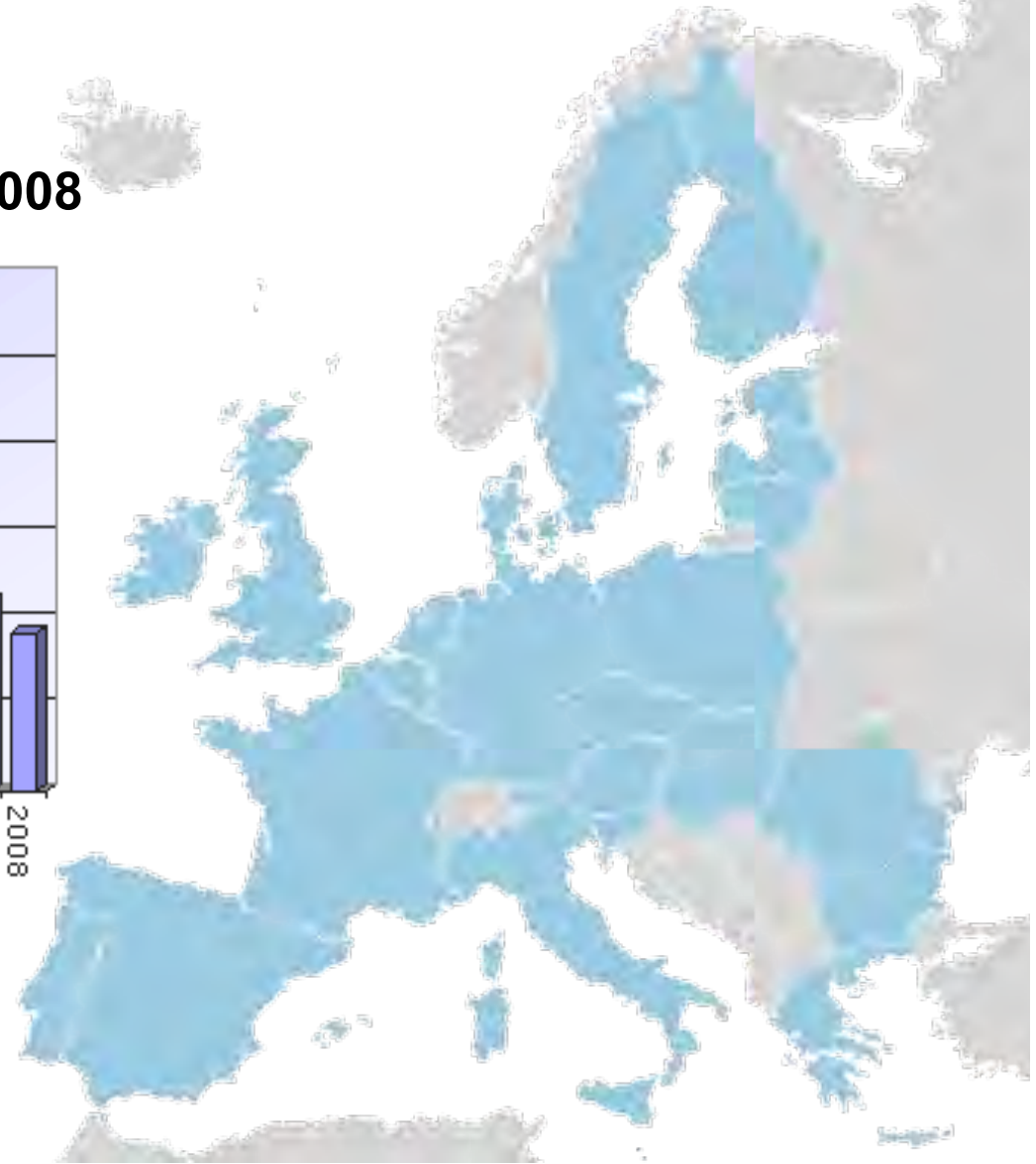


# A Threat to the European KBBE innovation: The number of GM field trials in the EU has drastically decreased

## European GM field trails 1992 - 2008



Source: GMO Compass



# The Fast-Lane-Forward: key messages for the **European KBBE**

- Urgency of addressing **European and world needs**
  - food, feed, feedstocks and energy
- **Facilitate what have we learned** from past and current breeding programs
  - Integration, synthesis, scale, co-ordination, innovation
- Achieving sustainable food security and feedstock production requires **public trust** in novel traits
- Urgent R+D investments to **develop new crops** for food and **facilitate biomass production**

**Time is short!**

## The panelists:

- **Diana Bowles**, Univ. of York, Chair, Centre for Novel Agricultural Products
- **Johan Cardon**, CEO of CropDesign (BASF)
- **Michael Carus**, Managing Director, nova-Institute for Ecology and Innovation
- **Ivan Ingelbrecht**, Program Manager, International Industrial Biotechnology Network (UNIDO)
- **Paul Temple**, Chairman, COPACogeca, Founder, Farmers Biotech Forum
- **Heikka Timo**, Director, Regulations & Feedstocks, Stora Enso

# Demand for maize will double by 2050

- **Maize production increases 2001 – 2006 : 3.7% annually**
- **Maize consumption increases > 3.7% annually driven by**
  - **Economic growth (2004-06 per annum)**
    - **9% in Asia**
    - **6% in Africa**
    - **2% in industrialized countries**
  - **Livestock revolution: meat & dairy**
  - **Population growth**
  - **Use of maize for biofuel**

India: 2000 – 2025

- **Meat: +176%**
- **Milk and vegetables +70%**

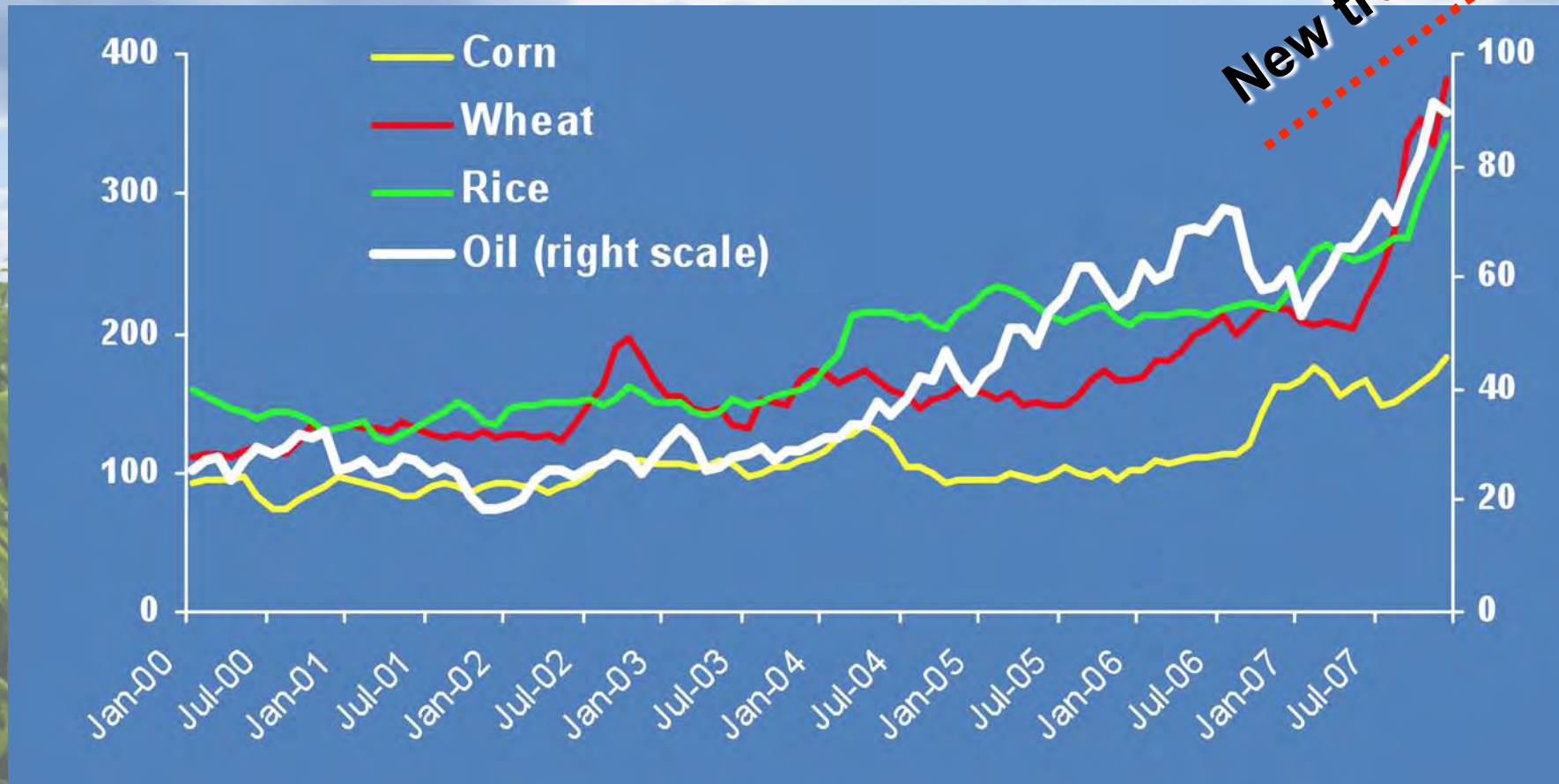
Source: IFPRI 2008





# Challenges to the Bioeconomy: surge in cereal and oil Prices

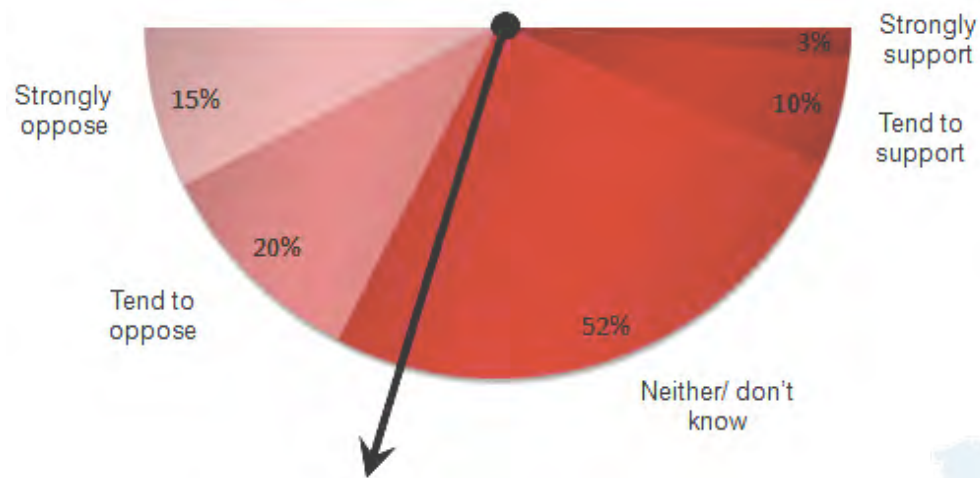
**Commodity prices US\$ / ton**



Source: Von Braun, 2008

# Can the European KBBE afford to continue opposition to GM technology?

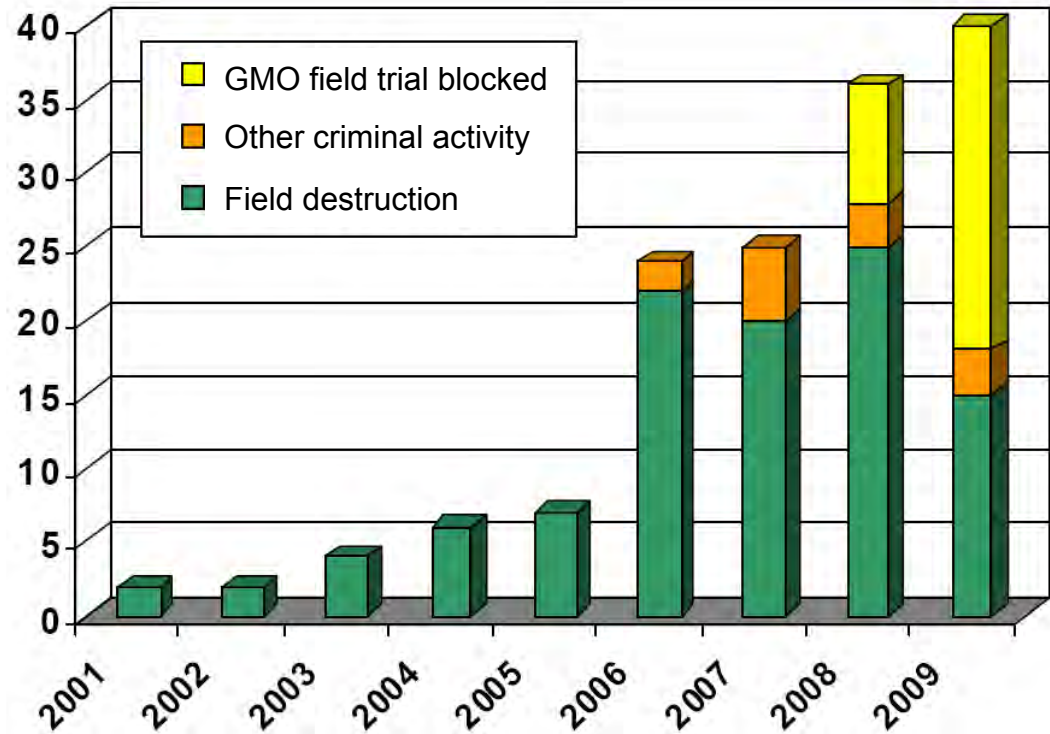
**How strongly, if at all, would you say that you support or oppose GM food?**



Source: IGD Consumer Unit 2008. Base: All adults



# Can the European KBBE afford destruction of scientific progress?



**ETH**

Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich

# Greenpeace protest against our transgenic wheat field experiments

March 31, 2008



September 14, 2010

W. Gruissem / European Bioeconomy / wgruissem@ethz.ch

# Destruction of our transgenic wheat field experiment

**Vandalism on June 13 2008 by 35 persons**



01: Versuchsfeld

13.06.2008 07:33:28.394

# A wake-up call for the European Bio-economy

If GM technology had not been available in 2008, maintaining global productions levels would have required additional plantings of millions of hectares of conventional soybeans, corn, cotton and canola. This total area would have been equivalent to about 6% of the arable land in the US.



Soybean  
**+ 4.6 million ha**



Corn  
**+ 3.5 million ha**



Cotton  
**+ 2.2 million ha**



Canola  
**+ 0.3 million ha**

GM crops: global socio-economic and environmental impacts 1996-2008, PG Economics