



# Are GM crops fit for purpose? If not, then what?

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# Systemic Risk in food & farming: can it be avoided?

The IAASTD Assessment

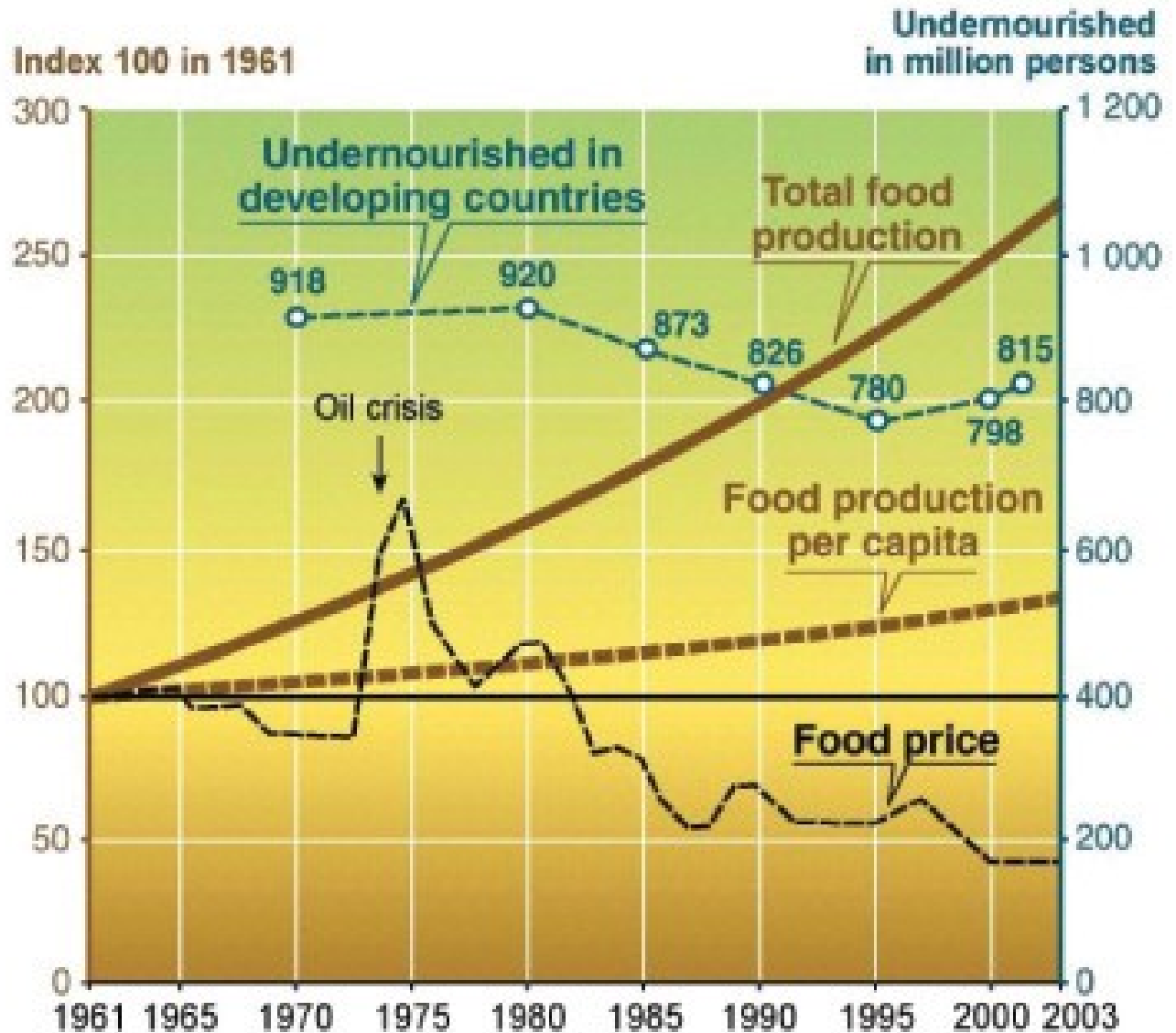
London, 12 November 2008

Janice Jiggins, Communication & Innovation Studies,  
WUR, The Netherlands

# Perception: food security ‘not at risk’; agriculture ‘just another industry’

- At turn of millennium, dietary energy supply for the global population was 2803 kcals per person per day on average, comfortably within the range of average energy intake considered adequate for healthy living.
- Existing range of yields from conventional & ‘agro-ecological’ technologies estimated as sufficient to continue to feed global populations well into 2030s

Dramatic & so far sufficient increases in yields based on improving productivity per ha



Sources: FAOSTATS, SOFI, Millennium Ecosystem Assessment

# IAASTD - Business as usual is not an option

- Uneven distribution of profits in the world's largest industry
  - little profit finds its way back to small holders, women & rural labourers ie the majority of those who depend on farming for their livelihood, & where the greatest gains in productivity can be made
- Poverty is mainly rural; rural poverty not 'solved' by trickle down from economic growth
  - With current patterns of growth, it would take about US\$166 of global income growth to generate an extra \$1 for those living on below \$1/day; a shift to \$3/day, would need another 15 planets' worth of biocapacity

# Business as usual not an option

- Unbalanced dietary outcomes
  - approx. 1bn with insufficient food; additional 1bn unable to buy an adequate & healthy diet; additional 1 bn obese; - & over a third of the world's people suffer moderate to severe health problems because of micronutrient deficiencies
- Impacts on the natural world already unsustainable
  - water, soils, biodiversity: degraded, over-used
  - agri-ecosystems: losing resilience, facing tipping points
  - contribution to climate change emissions: significant, increasing
  - fossil-fuel use: high & dependent

## Ecologically Literate Legislation



**But Australian inland river  
landscapes are often like this...**





# Institutional failures increase systemic risk

2. Unbalanced markets in AKST  
e.g. Corporate sector not interested in proven integrated solutions from which they cannot make profit
3. Risks estimated as single products, technologies or processes, lifted out of context of use & combinatorial effects
4. Unbalanced economic institutions  
e.g. concentrated corporate control in commodity trading, commercial seed supply, fertilisers, pesticides & other agri-chemicals, in biotech patents, in food retail
5. Food security highly coupled to financial market instability

# 1. Significant under-investment & imbalance in AKST

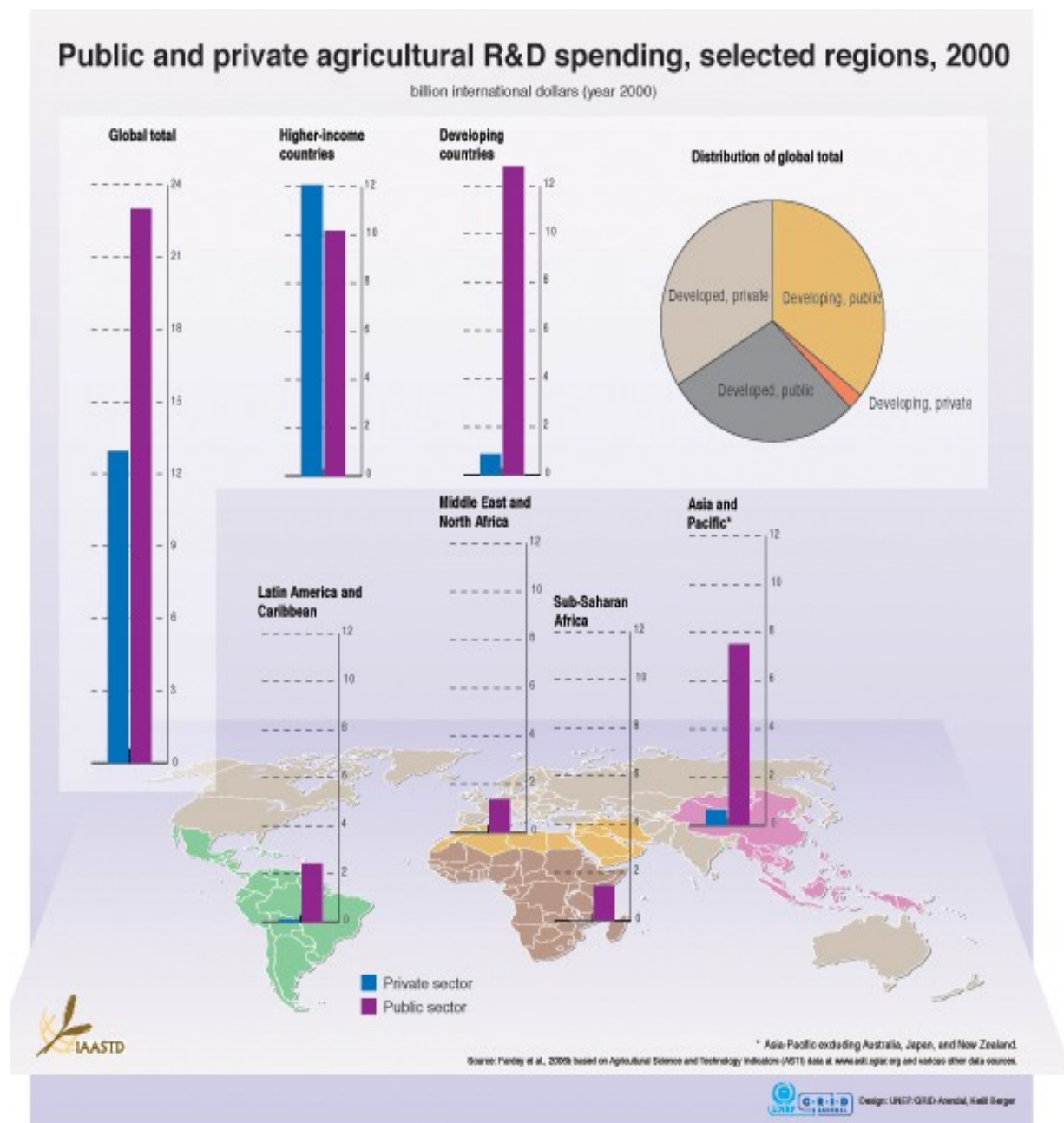
- in some regions, especially sub-saharan Africa
- in small-holder farm systems and agri-enterprises
- for global public goods, including mitigation & adaptation to climate change
- for locally important crops, & domestication
- in agri-ecological approaches to natural resource management and ecological service provision

Investment in AKST is unbalanced, between regions and between public & private R&D.

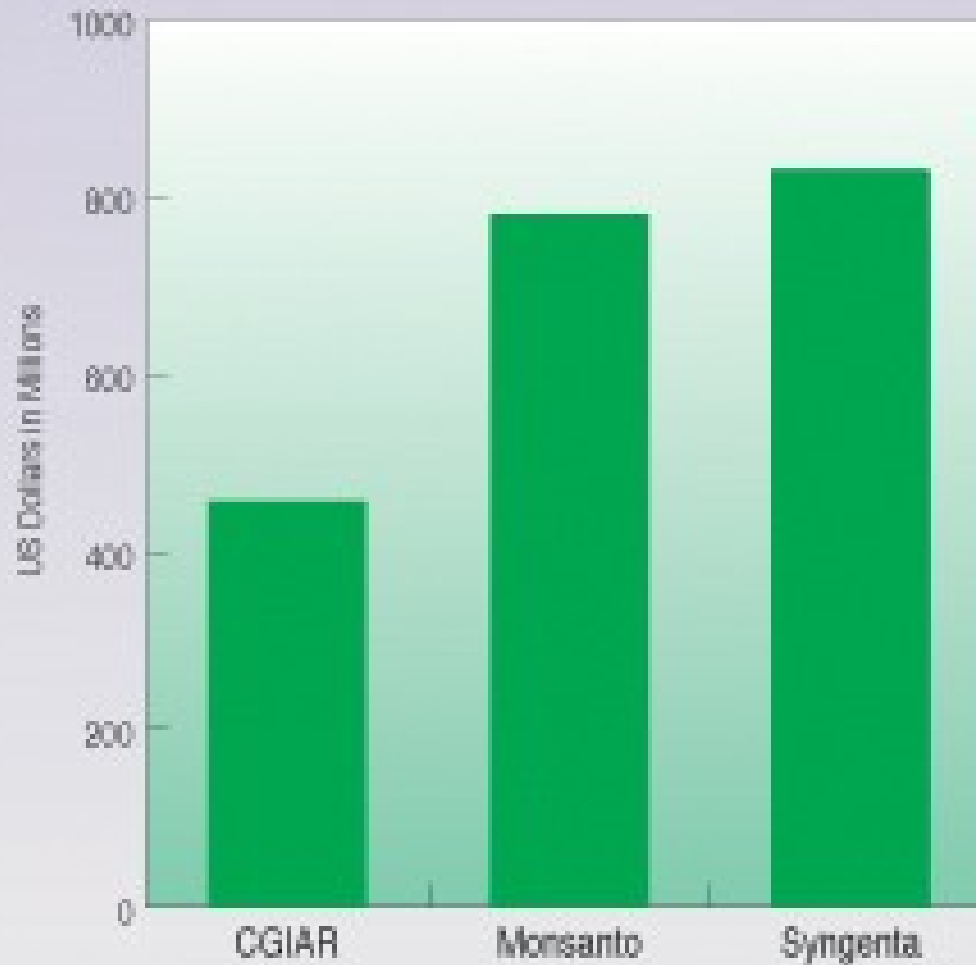
Current ODA: 1bn pa

Current climate change adaptation costs: estimates vary but median range

>50bn\$US pa



## Research Budgets of the CGIAR International Agriculture Research Centers, Monsanto Corporation and Syngenta



SOURCE: CGIAR Annual Report, 2007; [www.monsanto.com](http://www.monsanto.com); [www.syngenta.com](http://www.syngenta.com)

BRASITO, Design: I&M/C&P/Aranda, Kofel Berger

## 2. The illusion of the 'global anywhere'

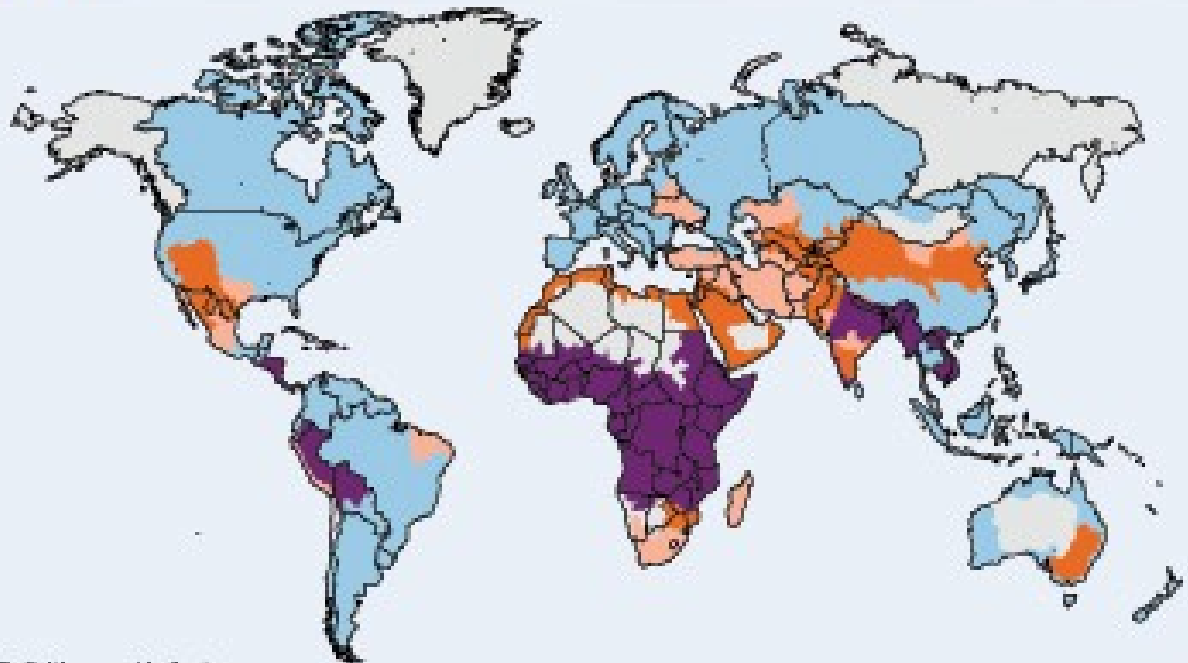
The global farming and food industries are a heavy component of the human environmental footprint (the average per person resource demand)

Sweden's 'food footprint': one third of the production area needed for food consumed in Sweden lies outside its national borders, its natural resource claim is x 2-4 its own agricultural land area;, its embedded energy claim is x 40

The invisible hand of the market allows consumers to distance themselves from the resource claims and impacts of production in far away places.

## 2. Inter-dependent but unevenly distributed costs

- *Every food importing country is imposing comparable but competing claims on the 'global anywhere'. The better off are fed but the costs are borne by those least able to cope, in areas far from view*
- 1.9 bn ha (2.6 bn people) are affected by significant levels of land degradation. Some 70% of freshwater withdrawal globally (2.45% of rainfall) is attributable to irrigated agriculture. Approx 1.6 bn people live in water-scarce basins.



#### Definitions and indicators

- **Little or no water scarcity:** Abundant water resources relative to use, with less than 25% of water from rivers withdrawn for human purposes.
- **Physical water scarcity** (water resources development is approaching or has exceeded sustainable limits). More than 75% of river flows are withdrawn for agriculture, industry, and domestic purposes (accounting for recycling of return flows). This definition—relating water availability to water demand—implies that dry areas are not necessarily water scarce.
- **Approaching physical water scarcity:** More than 60% of river flows are withdrawn. These basins will experience physical water scarcity in the near future.
- **Economic water scarcity** (human, institutional, and financial capital limit access to water even though water in nature is available locally to meet human demands). Water resources are abundant relative to water use, with less than 25% of water from rivers withdrawn for human purposes, but malnutrition exists.

Source: International Water Management Institute analysis done for the Comprehensive Assessment of Water Management in Agriculture using the Waters in model: chapter 2.

## 2. And then there's Climate Change

- Agriculture contributes about 60% of anthropogenic emissions of methane and about 50 % of nitrous oxide (*IPCC 4<sup>th</sup> Report*)
  - For every 1° C rise in temperature, rain fed farmers may lose annual net revenues of:
    - Africa: \$28/ha
    - China: \$95/ha
    - India: 9%/ha
- (Brookings Institute, forthcoming 2008)*
- Production in many areas will become more vulnerable to physical & economic water stress, & to more extreme and variable rainfall and temperatures



# 3. Current IPRs drive innovation along the wrong path

- Concentrates power over food & farming
  - creates proprietary control over biological materials & processes
  - the rewards of innovation are exclusionary
- Restricts
  - registration & release for sale of Participatory Plant Breeding outputs
  - intellectual freedom of universities; public good research
  - exchange of information & materials
  - public regulation & over-sight
- Appropriates
  - local & traditional Knowledge, Science & Technology (KST)
  - does not provide protection for local & indigenous KST & biological materials
- No strong evidence that IPR increase rates of innovation
  - crowds out options of no interest to corporate actors
  - reduces the innovation space

# Enthusiasts' claims: GM technology can solve all these complex problems

- Prof. David King
  - GM crops are *essential* to feed Africa, deal with salinity in water, yield in rice crops, drought resistance: "We have the technology to feed the population of the planet, the question is do we have the ability to understand what we have and to deliver" (09.8.08 BA Science Festival)-
  - "The problem is, " he said, "the Western world's move towards organic farming – a life style choice – and against agricultural technology and GM in particular, has been adopted across Africa...with devastating consequences." (*Observer*, 05.10.08: 28-29)
- IAASTD is "an attempt to blind world leaders to any potential positive contribution from GM crops" (*Nature Biotechnology* 26:3, 247; 499-501)

The IAASTD's actual position

Advanced biotechnology offers far more than only GM crops, and specifically far more than transgenic techniques

GM technology is NOT rejected in principle

But the evidence assessed has a  
robust conclusion

Current GM crops are found on  
the evidence to be appropriate  
in some contexts, unpromising  
in others, and unproven in many  
more

# The evidence

- After 30 years' promotion, 2 traits in 4 GM crops in 6 countries account for 95% of sown area
- Conflicting evidence whether the absolute amounts of herbicide have increased either because of or since introduction of GM herbicide-tolerant (glyphosate tolerant) crops
- Compelling research that links the pattern of use of glyphosate on GM crops and emergence of weed resistance; this pattern is unique to GM crops

# The evidence (continued)

- Robust evidence that yield outcomes have been mixed (for crops, years, locations)
- Robust evidence that GM constructs have not been chosen for optimal agronomic performance nor matched to mosaics of production environments

# The evidence (continued)

- Robust evidence of resurgence of non-target & secondary pests
- Mixed evidence for reduction in synthetic insecticide use (dependent on cropping system)
- Robust evidence that Integrated Pest Management achieves steeper reductions in synthetic pesticides

# The evidence (continued)

- Unclear evidence on health-related risks and the micronutrient contribution to diets
- Mixed evidence on income benefits to farmers (highly dependent on context of use)
- Robust evidence of regulatory failures: escapes, contamination, false labels, weak/no enforcement, data gaps



# The evidence (continued)

- No conclusive evidence that GM crops
  - are necessary to maintain food output above population growth
  - can offer solutions to the broader socio-economic dilemmas and institutional failures impacting food security & equitable development
  - are necessary for addressing complex natural resource, climate change & ecological challenges

# Headlines

- Advanced biotech has an essential but not sufficient role - conventional AKST, indigenous & local knowledge & practices, and new sciences are all needed
- Agri-ecological approaches can help deliver combined sustainability & development
- Increased AKST investments for public good goals are essential

# Systemic risks can be managed

- Improve designs for biodiverse agri-ecologies
- Develop full accounting of costs to allow accurate assessment of competing technology claims, trade-offs & risks
- Increase investments in global public goods and securing public value
- Ensure independence of research & of regulatory and advisory services
- Increase role of multi-stakeholder governance of AKST

# Policy options to consider

- Target AKST to small holders; secure small holders' natural resource rights
- Use public funds & public procurement to redirect AKST toward agri-ecological approaches
- Focus on regional and local trade
- Develop territorial approaches to manage natural resources, restore landscape & food diversity, assist adaptation to climate change

More resources  
available at the website  
[www.feedingtheworldconference.org](http://www.feedingtheworldconference.org)



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