

Science in The Eye of The (Perfect?) Storm

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What Storm?

- Future climate apocalypse
- Future energy apocalypse
- Future food apocalypse
- Future biodiversity apocalypse (“Anthropocene”)
- Future water apocalypse
- Future (other) resources apocalypse
- Future waste apocalypse
- Future pandemic health apocalypse
- Future nuclear (accident) apocalypse
- (Did we forget?) future nuclear weapons holocaust

Heidegger's Question -

- Perhaps the apocalypse has *already* happened?
 - For *some*...
- Maybe our focus on “the” future distracts us from a more searching examination of the present apocalypse(s) which many – billions – are already suffering?
- For example, ~1bn underfed, while ~1bn obese

- In 2008 the FAO estimated that world total production of cereals was approx. 2,285,000 million tonnes
- FAO estimate of world population in 2008, ~6.7 billion.
- On good first approximation, the 2008 average *per capita* food availability was ~340kg/cap/year, or ~1kg/person/day. Even with 9bn, there is enough food
- Production *alone* is a small part of the problem - though important, nevertheless. BUT, key issue: what kind of production?
- Millions starve in India, while millions of tonnes of rice rot in Indian storage. Why? Global export trade!!
- GM, & science, defines issue as production problem only – *and only for global export markets*. Its agenda is industrialised agribusiness global export production only...
- *Modes of production also matter!* They affect distribution, and access, in important ways

III “Enclosure”? - take LAND alone

- About 60% of global food estimated as produced by small farmers, w mainly agroecological methods
- In India for example, 98% of farmers produce food on average less than 3 hectares
- This farming needs continual improvement, and inputs; but most of these are endogenous and sustainable inputs – including intensive knowledge
- The dominant model imposed is totally in conflict with this, eg 1998 Vision 2020, Andhra Pradesh.
Where do the millions of expelled small farmers go?
- No-one asked! (did anyone care?)

Was this model tested, and falsified?

- World Economic Forum, 2012, *A New Vision for Agriculture* – McKinsey report, funded by most of the big global food, agrichemicals, seed, food-retail, corporate interests.

“The New Vision asserts that agriculture is a primary driver of economic growth, the planet’s largest source of potential for greenhouse gas (GHG) emissions abatement

...

It represents a shift from approaching agricultural development with philanthropy to approaching it as a market investment, creating a system where stakeholders have the incentive to innovate, resilience to endure risk and capital to invest in growth” (p.5)

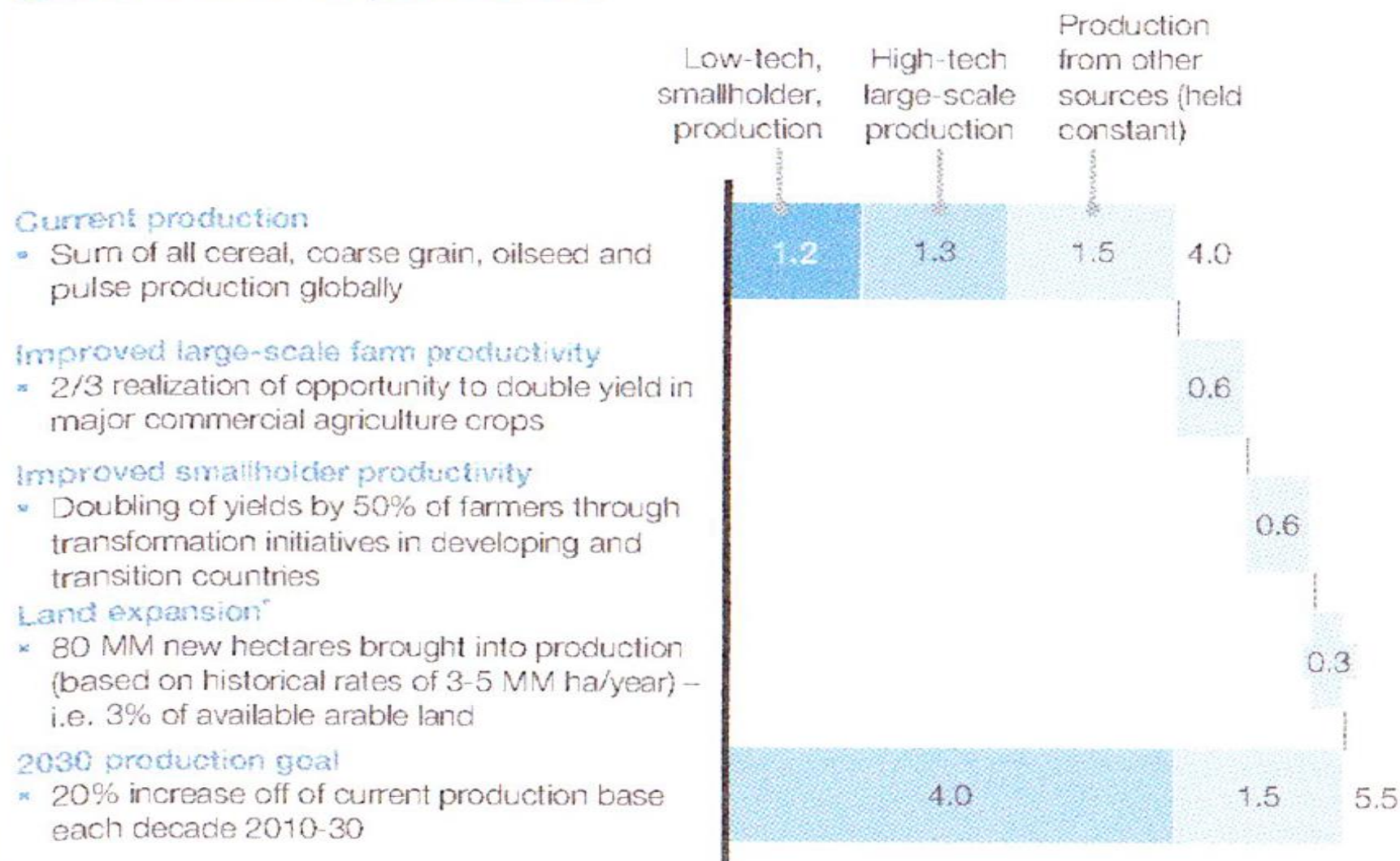
And the stakeholders in this Vision?

“Stakeholders include all actors involved both directly in the food value chain and those impacting the broader food system, including: government, food and beverage companies; storage and processing firms; shipping and transport providers; retailers; IT; inputs companies; banks; and donor organizations” (fn7, p.9)

Notice the missing ones - farmers! And no other multifunctional land-users *at all, either*

Given current projections, it is feasible to achieve 20% production improvement each decade until 2030

Billions of mt of production



McKinsey WEF “*New Vision for Agriculture*” report, 2012: the funders

- “The New Vision for Agriculture initiative is led by 26 global Partner companies that span the full food value chain and beyond, including: AgCo, Archer Daniels Midland, BASF, Bayer CropScience, Bunge, The Coca-Cola Company, Diageo, DuPont, General Mills, Heineken, Kraft Foods, Metro, Monsanto Company, Maersk, Mosaic, Nestlé, PepsiCo, Rabobank International, SABMiller, Swiss Re, Syngenta, Teck Resources, Unilever, Vodafone, Wal-Mart Stores and Yara International. Each of these companies has contributed tremendous leadership and technical expertise...” (*preface*: Archer Daniels Midland and Bunge are two of the global giants in global grain trading)

AgBio Industry Faces Reality – Complexity of Biological Systems

GM Trait Development Facing Complexity of Plant Genomes and the Challenge of Multi-Genic Traits

• Compared to optimistic expectations of potential broad traits, commercialization has been limited by a number of factors:

- Growing recognition of the complexity of plant genomes o
- Current traits (HT/IR) are largely “qualitative traits” – Influenced by a single gene
- Many trait targets – agronomic (drought/stress), complex input (disease), and output traits are largely “quantitative traits” – Influenced by the interaction of multiple genes/ microRNAs and their interaction with the environment

Breeding: Genotype (G) x Environment (E) = Phenotype (P)

• Why is all this important? – Given current knowledge of plant genomes, genetic complexity and biotechnology techniques, the ability to develop many commercial GM multi-genic trait targets are out of reach (based on today’s technologies)

“This requires triggering a wave of transactions by identifying incentives (such as access to land) as well as *conditions for success (such as aggregating smallholders)*. For example, bidding rounds of lots or contracts are transactional approaches to kick-starting and accelerating investment.

Articulating the action plan for addressing this pipeline can align expectations and provide space to set targets for monitoring progress. This could include setting *operational goals to measure success, for instance, the number of entrepreneurs and investments required, the number of smallholders aggregated by the entrepreneurs, and the lift in smallholder income of those who have been aggregated*”. (p.12)

Public sector should . . .

- Create an enabling environment for market-driven economic growth & investment
 - Present attractive investment options to the private sector and donors
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Private Sector Should . . .

- Adapt commercial models to fit the unique needs of developing country contexts
- Demonstrate genuine commitment to a combined commercial & social value to earn trust & credibility (WEF 2012, 20)

Argentina's GM 'liberation'

- “The GM soybean revolution” – began in 1991, with unannounced field-trials of US GM soy
- During and after, Argentinian farmland bought up by the global US grain-feed traders like Cargill, and investment funds, and other private companies
- “small farmers were offered pennies for their lands. When they refused to sell, they were forced off their land by terrorist militia or the state police. Tens of thousands more farmers had to give up their lands when driven to bankruptcy by market flooding of cheap food imports under the free market reforms imposed by the IMF” (Engdahl, 2007, p.184)
- By 2004, 48% of agricultural land down to soybean, 90 to 97% of this, Monsanto Roundup Ready – for export (as animal-feed)
- Argentina became a food-importer for first time, and over 200,000 farmers ‘expelled’ to cities.
- In 1970, 5% of population in official poverty. By 1998, 30%; by 2002, 51%; Malnutrition btw 11% & 17% by 2003

- The exclusive national, and global, governance frame & tool is risk and impacts – biosafety – excluding even benefits questions (benefits for whom? For how long? under what conditions?) RA, with legal presumption in favour, thus burden of proof on ‘harm’, the only hurdle to commercialisation and growth
- This political and epistemic reductionism deletes the bigger political, social, and economic *human* questions from view
- But it is not hard to see that publics sense those concealed issues, behind the “science-only” front of official policy
- Thus public ambivalence-alienation widespread - even in US
- This “Risk-biosafety only” discourse suits the economic and political interests driving GM R&D, innovation & promotion. They are attempting to control the scientific biosafety debate, and claim “the scientific biosafety debate is over”
- GM cannot be accused of *causing* these human impacts on its own. But it is a – **the** - key co-production force
 - **Meanwhile, “sound science-informed” policy sups at the same table....**

AgBiotech Industry Could Have Minimized the Risks it Faces

The Industry Made 3 Strategic Mistakes - From the Beginning:

Minimized consumer benefits to build market acceptance - Focus on GM benefits to farmers/ag industry, without balancing development of GM benefits directly for the consumer

Scientific recognition of what was not known, as well as what was known about plant genetics in the late 1980's-early 1990's,

when the first major GM crops were being developed (RR soybeans, Bt corn, Bt cotton, and RR corn – commercialized in 1996-1997)

o (No) Recognition of what was scientifically not known about plant genetics/molecular biology at the time of development, combined with broadening scientific knowledge. Should have triggered corporate decisions/regulatory actions to undertake re-evaluations to insure no unintended adverse consequences

A lesson from history – Calgene's Flavr Savr tomato (with improved ripening qualities) - First GM food to go through the FDA regulatory process and the first to be commercialized in 1994