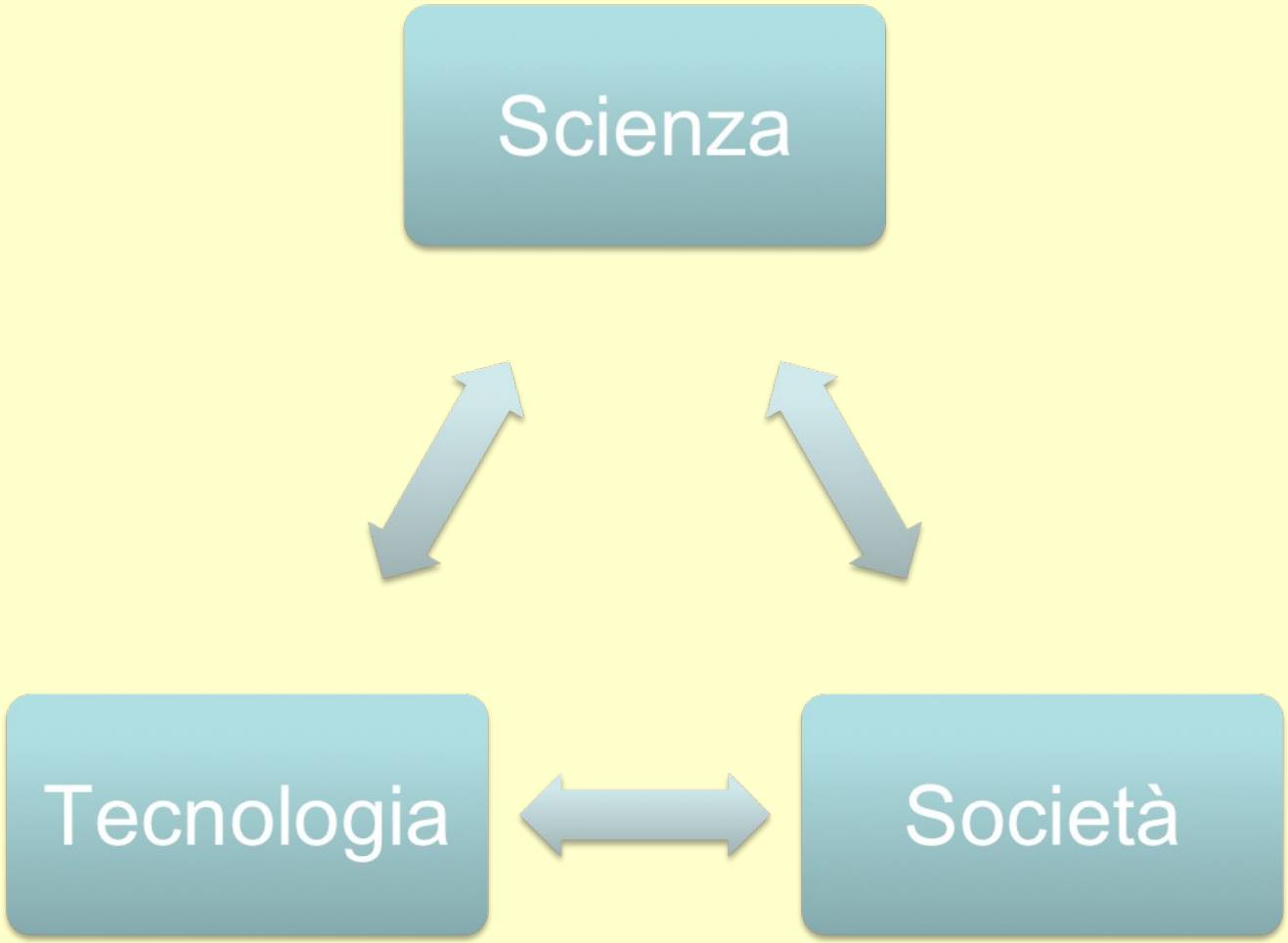
Tra scienza, tecnologia e società: come analizzare l'impatto socio-economico degli OGM?

Gianluca Brunori

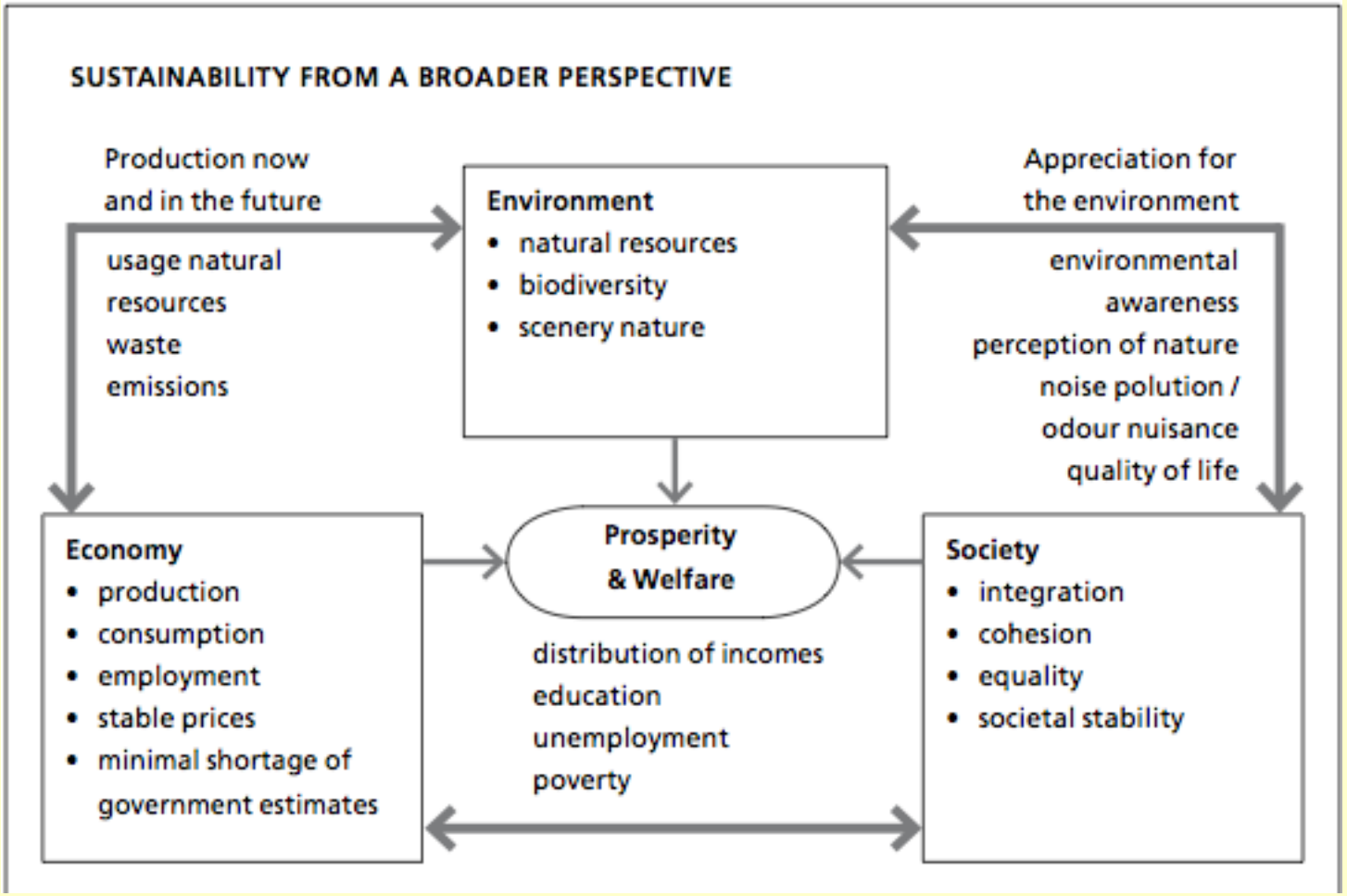
Le domande che ci dobbiamo porre

- In che modo la nuova tecnologia migliora o peggiora la situazione ambientale e socio-economica esistente?
- Quali nuovi rischi e opportunità introduce?
- In che misura la nuova tecnologia contribuisce allo sviluppo sostenibile?

Premessa



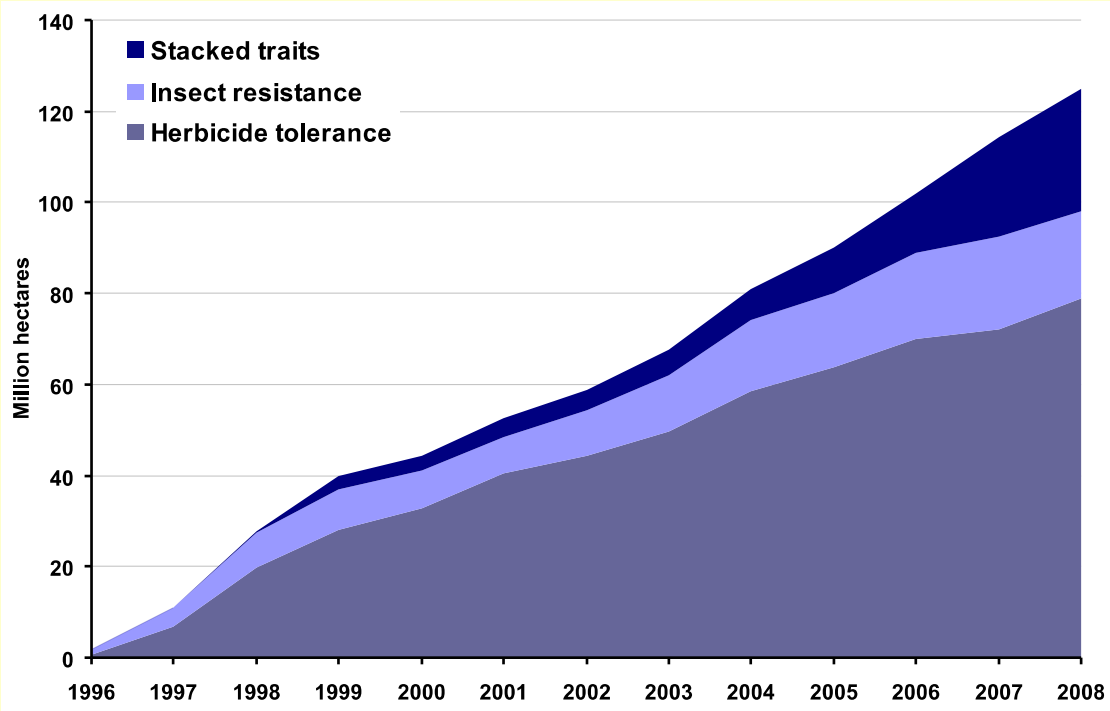
Un quadro degli impatti



L’analisi degli effetti

- Effetti di breve / di lungo periodo
- Effetti diretti / indiretti / sistemici
- Confronto con possibili alternative

Figure 4: Global area cultivated with the main GM traits



Source: Based on data from James (2008 & previous years).

Effetti a breve

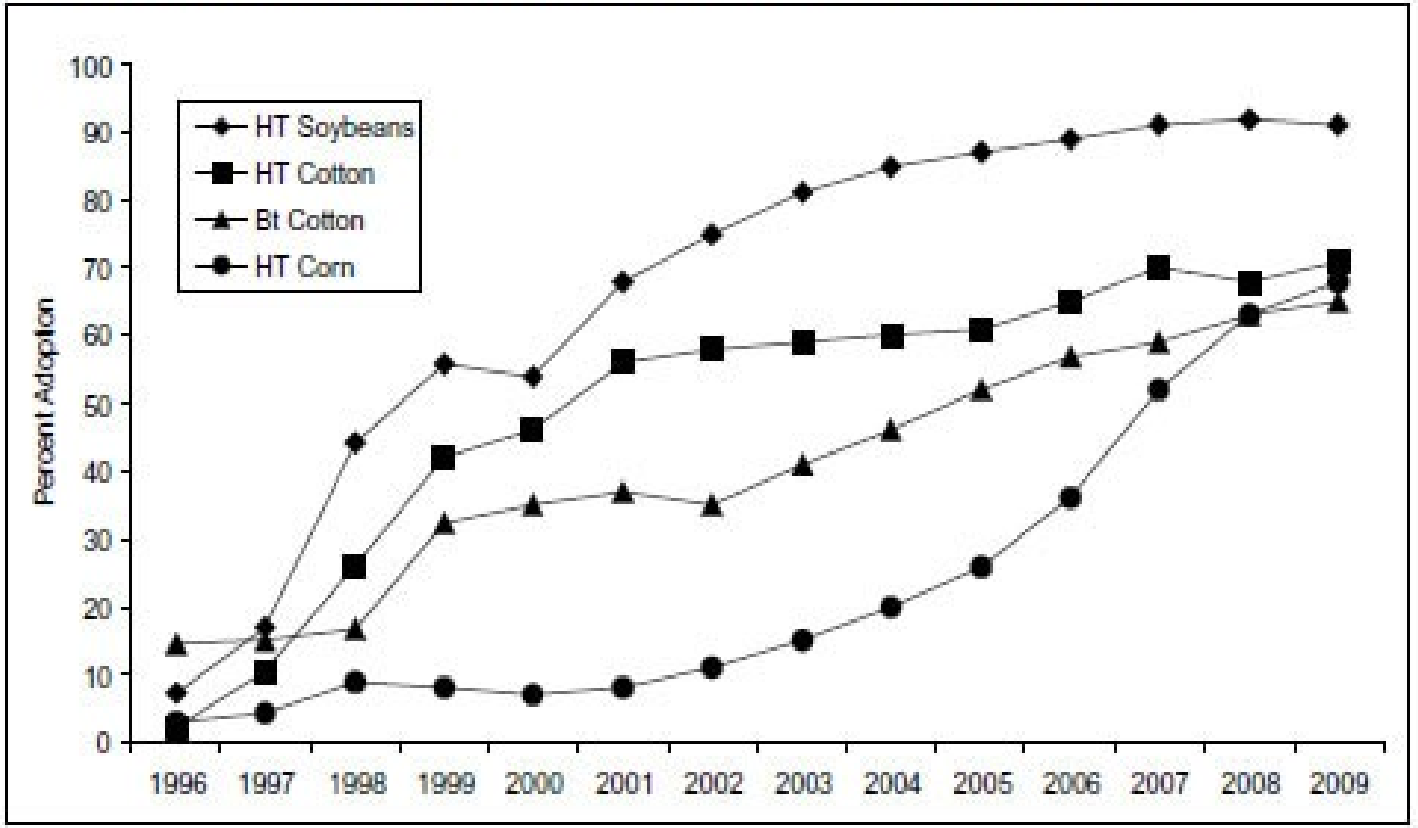
Impatto	Rilevanza	note
Aumento delle rese	?	
Diminuzione dei costi	si	Economie di scala, minor numero di lavorazioni
Aumento dei costi	si	Il seme costa di più e va comprato ogni anno
Diminuzione dei prodotti chimici	no	
Contaminazione genetica	si	Danno per i prodotti non ogm

Effetti di lungo periodo

- Biodiversità agricola
- Fenomeni di resistenza, sviluppo di insetti minori
- Rapporto piccoli produttori /grandi produttori
- Vulnerabilità dei sistemi agricoli e alimentari

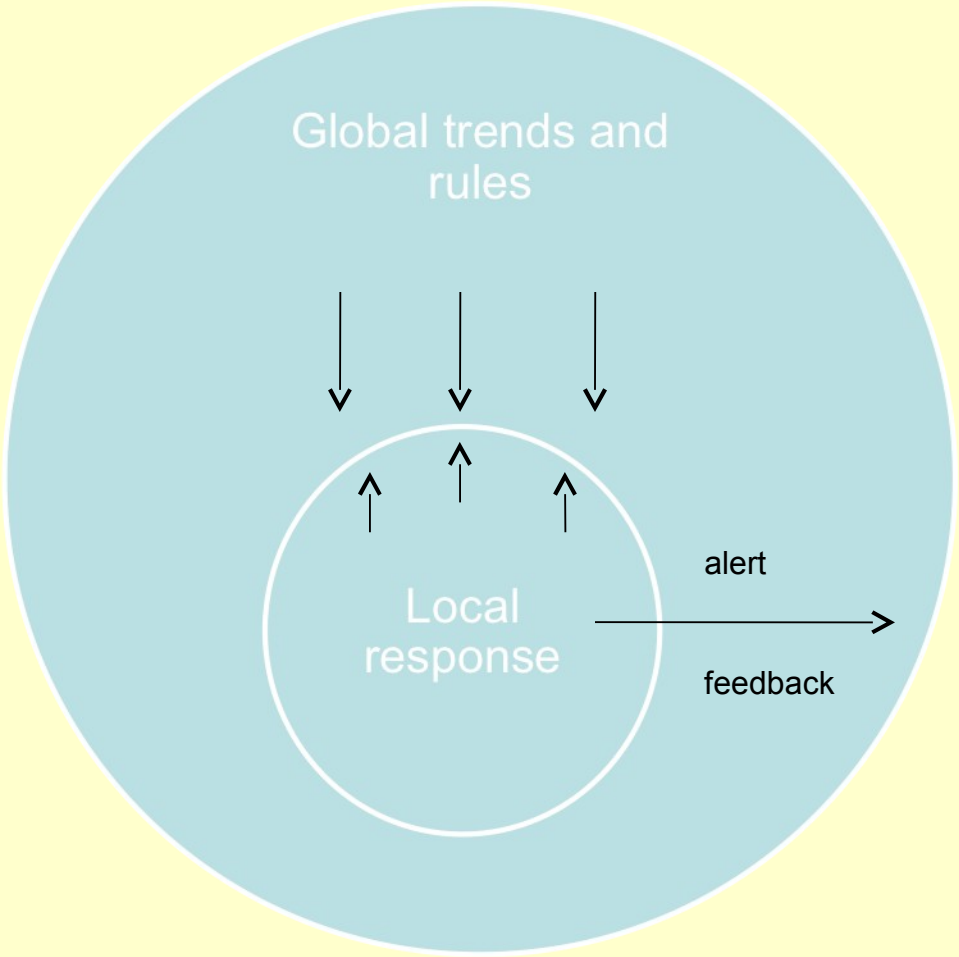
Biodiversità

Figure 2. Percent Adoption of Biotech Crops in the USA, 1996 to 2009.

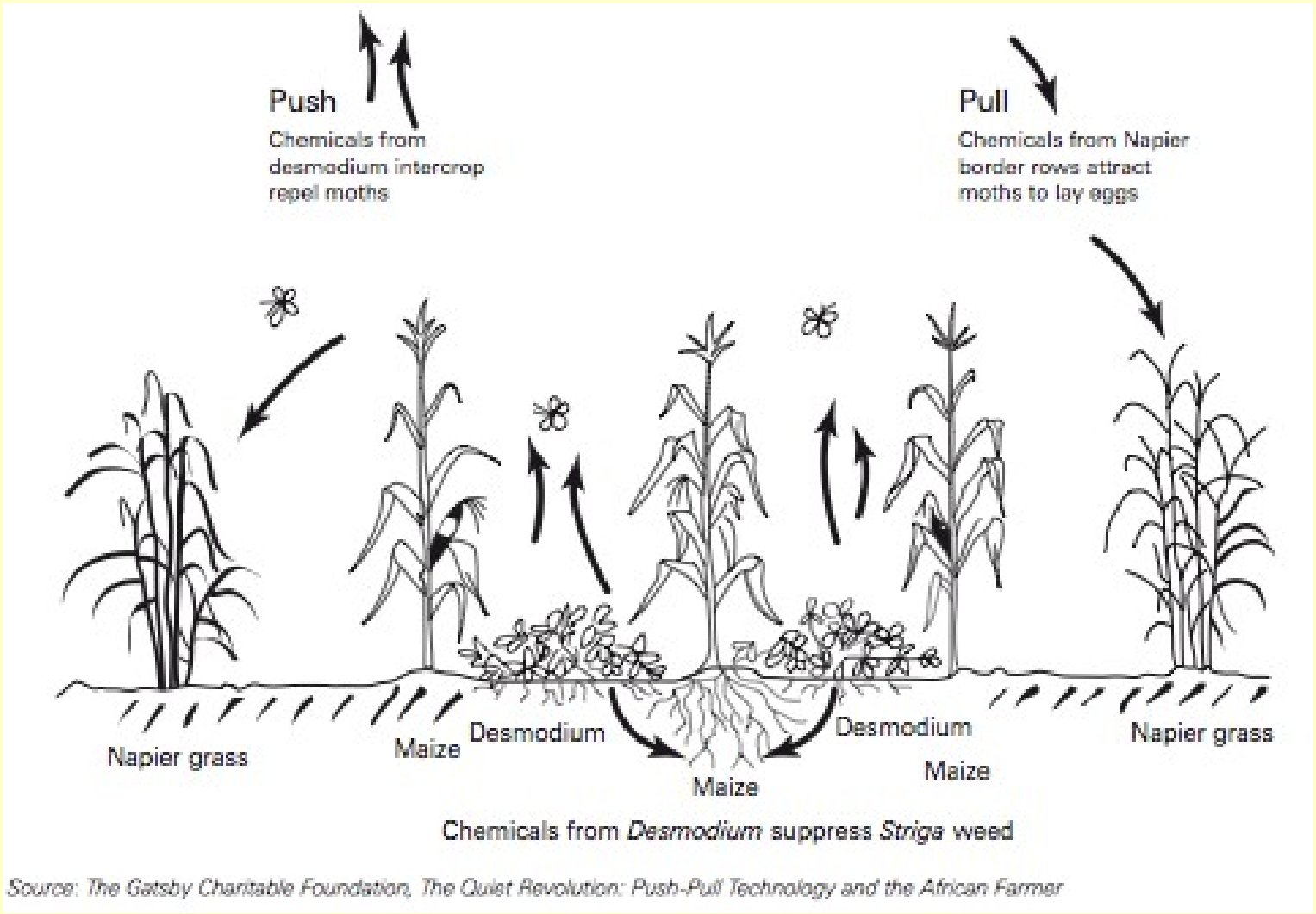


Source: USDA's National Agricultural Statistics Service (NASS), 2009a.

I sistemi locali



Alternative possibili



Source: The Gatsby Charitable Foundation, The Quiet Revolution: Push-Pull Technology and the African Farmer

Gli Ogm e la ricerca pubblica

- I ricercatori hanno scarsa conoscenza delle regole sulla proprietà intellettuale
- Non esiste una chiara distinzione tra benefici privati e benefici pubblici
- L'agenda di ricerca è spesso guidata dai privati
- I metodi brevettuali riducono la possibilità per i ricercatori di operare
- I dati disponibili per l'autorizzazione e il monitoraggio sono largamente insufficienti

From the August 2009 Scientific American Magazine | 26 comments

Do Seed Companies Control GM Crop Research?

Scientists must ask corporations for permission before publishing independent research on genetically modified crops. That restriction must end

By The Editors

MATT COLLINS

Advances in agricultural technology—including, but not limited to, the genetic modification of food crops—have made fields more productive than ever. Farmers grow more crops and feed more people using less land. They are able to use fewer pesticides and to reduce the amount of tilling that leads to erosion. And within the next two years, agritech companies plan to introduce advanced crops that are designed to survive heat waves and droughts, resilient characteristics that will become increasingly important in a world marked by a changing climate.

Unfortunately, it is impossible to verify that genetically modified crops perform as advertised.

NATURE|Vol 461|3 September 2009

BATTLEFIELD

Papers suggesting that biotech crops might harm the environment attract a hail of abuse from other scientists. **Emily Waltz** asks if the critics fight fair.

NEWS FEATURE

VOLUME 27 NUMBER 10 OCTOBER 2009 NATURE BIOTECHNOLOGY

Under wraps

Are the crop industry's strong-arm tactics and close-fisted attitude to sharing seeds holding back independent research and undermining public acceptance of transgenic crops? Emily Waltz investigates.

Sono possibili configurazioni alternative?

Situazione attuale	Configurazioni alternative
IPR rigidi	IPR open source
Miglioramento privato centralizzato	Miglioramento partecipativo
Filiere globali specializzate	Pluralità di configurazioni
Mancanza di ricerca indipendente sugli impatti	Sostegno alla ricerca indipendente
Restrizione dei diritti degli agricoltori	Estensione dei diritti agli agricoltori

La ricerca nei prossimi 20 anni

- Soldi pubblici per finalità pubbliche
- Piena libertà di ricerca e stimolo al dibattito pubblico
- Pluralità di paradigmi e pluralità di tecnologie come fonti di diversità

Grazie per l’attenzione!

New challenges for european agricultural research in the next 20 years: the role of GMOs

Gianluca Brunori

SCAR 2° foresight key questions

- How to deal with vulnerability of food and rural systems at different scales?
- What links between public policies and public goods?
- What arrangements between state, civil society and market?

How to deal with vulnerability?

- Sustained **diversity** → more options
- **Localized** interactions → learning processes and common endeavors
- **Autonomous** selective processes → adapting to specific environments

Green revolution I

- Deliberated reduction of diversity
- Increasing dependence from the outside: knowledge, inputs, markets
- From local control to external control: daily observation, breeding
- Initially strong state intervention, progressively reduced

GMO positions

Pros

- Potential yield increases
- Sustainability through reductions in pesticide applications
- Use in no-till agriculture
- Wider crop adaptability
- Improved nutrition

Cons

- Environmental risks
- Widening social, technological and economic disparities
- Gene flow beyond the crop
- Reduction in crop diversity
- Herbicide resistance transgenes

GMOs in the present regulatory context

- Accelerates separation between knowledge producers / owners and knowledge users
- Creates concentration in the input sector
- Favours large scale agriculture
- Restricts farmers' and breeders' rights (double protection)
- Raises uncertainty, increasing (public) costs of monitoring and control

GMOs and public research

- Researchers largely unaware of IPRs
- No clear distinction between public and private goals and benefits
- Research agendas often driven by corporations
- Patented methods and technologies restrict researchers' freedom of operate
- Data available for authorization and monitoring are largely insufficient

Configurations and performance of technologies

- Who authorizes, control, support
- How many alternatives are available
- How much information circulates about them and about alternatives

What are the drivers for the next future?

- Costs of biotechnology equipment
- Prices of energy and primary resources
- Consumers' concerns
- Increasing attention to effectiveness of public expenditure
- Intellectual Property Rights
- Information and communication technologies

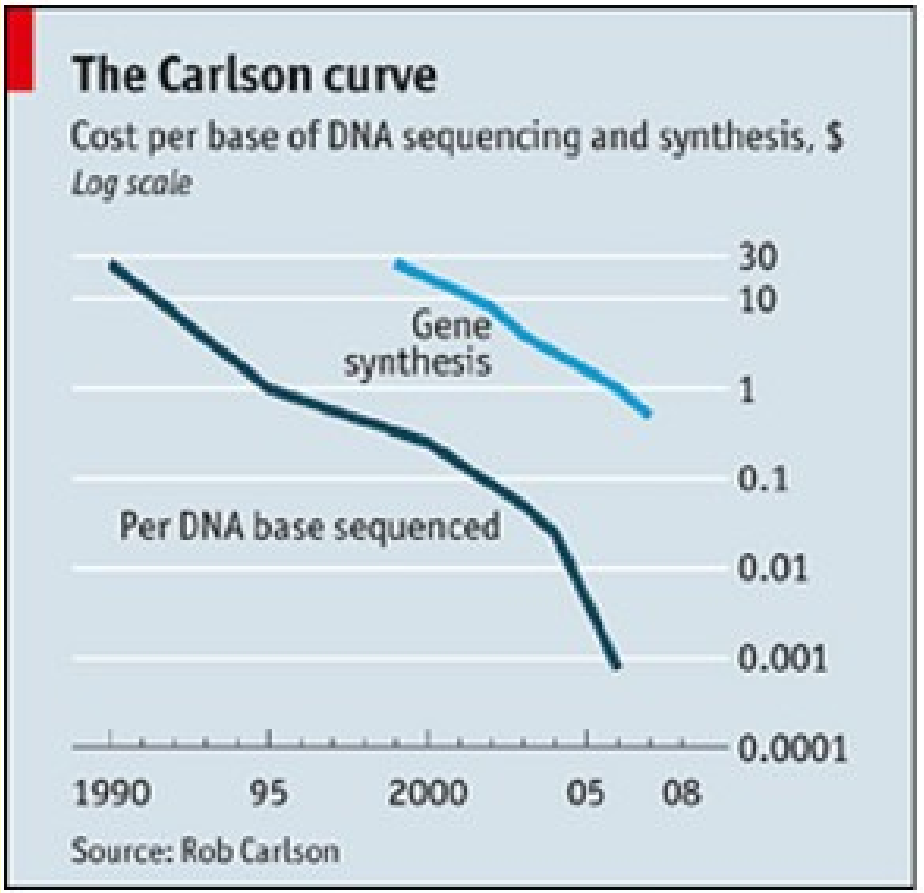
Aren’t there alternatives to GMOs?

- Agroecology
- Functional biodiversity
- Soil biology
- Participatory breeding
- Participatory research

Aren’t there alternative institutional configurations?

Present	Alternative
1. Restrictive IPRs	1. Open source IPRs
2. Centralized private breeding	2. Participatory breeding
3. Centralized use of genomics	3. Distributed use of genomics
4. Specialized global chains	4. Plurality of configurations, including local food systems
5. Lack of independent research on impacts	5. Encouragement of independent research on impacts
6. Restriction of breeders and farmers’ rights	6. Extension of breeders and farmers’ rights

Falling costs of biotechnologies



Aren’t there possible alternative configurations?

Present situation	Alternative configurations
Restrictive IPRs	Open source IPRs
Centralized private breeding	Participatory breeding
Specialized global chains	Plurality of configurations, including local food systems
Lack of independent research on impacts	Encouragement of independent research on impacts
Restriction of breeders and farmers’ rights	Extension of breeders and farmers’ rights

Research in the next 20 years and GMOs

- GMOs as a panacea?
- Public money for public goals
- Full research freedom and public debate
- Plurality of paradigms and plurality of technologies as sources of diversity

Thank you for your attention!

Grazie per l’attenzione!

Impacts	Degree of agreement on the facts	Degree of agreement on the impact	Arguments
Superweeds[1]	High	Low	Pro GMO: not quantitatively relevant events Con GMO: clear sign of future harms
Development of resistant insects[2]	High	Low	Pro GMO: it is sufficient to follow agronomic rules Con GMO: spread of GMO can create a treadmill similar to the pesticides' one
Harm to biodiversity	Moderate	Low	Pro GMOs: GMOs don't make any difference, or even improve, respect to conventional agriculture Con GMOs: GMOs perpetuate the errors of conventional agriculture
Emergence and development of former minor pests	Moderate – High	Low - moderate	Pro GMOs: the phenomena is still quantitatively small, benefits much higher than costs Con GMO: clear sign of future harms
Incentive to monoculture and industrial agriculture	High	High	Pro GMOs: it is an advancement respect to conventional agriculture Con GMOs: GMOs perpetuate and even accentuate the errors of conventional agriculture
Contamination of wild species (es. wild rice)	Moderate	Low	Pro GMOs: lack of scientific evidence
Resistance to antibiotics (via markers)	High	Low	Pro GMOs: the technique of markets is obsolete and being replaced by other techniques Con GMOs: a lot of seeds with the marker still circulate and will circulate in the next years
Increasing concentration of the seed sector	High	Low	Pro GMOs: these technologies are costly, there are natural monopolies Con GMOs: concentration make economies vulnerable and create uneven distribution of power
Clear advantage for large scale, monocoltural, specialized farms: cost reduction, especially labour	Moderate – high	Very low	Pro GMOs: only some traits (HT) harness scale economies, many small farmers and resource poor farmers adopt GMOs Con GMOs: Displacement and vulnerability of small farmers
Present GM don't give benefits to consumers (someone say that the products are cheaper)	Moderate	Low	Pro GMOs: Consumers can benefit from lower product prices. Fortified varieties (eg golden rice) will solve nutritional problems Con GMOs: Nutriceuticals will worsen rather than improving vulnerability, many other alternatives available
Increasing resource-poor farm vulnerability	Low	Very low	Pro GMOs: costs of seeds are compensated by reduction of costs Con GMOs: higher level of dependency on external inputs, indebtedness.
Higher yields	Low	Very low	Pro GMOs: resistance to pests increases 'operational yields'. Con GMOs: no clear evidence and in any case mostly reported from non independent
Ecological efficiency	Low	Very low	Pro GMOs: reduction of pesticides, GMOs in the pipeline will create resistance to stress and more photosintetical efficiency Con GMOs: Low empirical evidence of the benefits (products still in the pipeline) in real contexts
Contamination of GMO free, high value crops	Moderate to high	low	Pro GMOs: GMOs are equivalent to non GMOs. There is a problem of education of consumers
Release of toxins in the soil	Moderate to high	low	Pro GMO: no evidence of negative impact Con GMOs: toxins accumulated into soil alter soil biology, decreasing fertility of the soil.

[1] International survey of herbicide tolerance http://www.weedscience.org/In.asp
[2] Qiu (2008)