



# GMO Feeds: Facts and Fiction. What does the science say?



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<http://animalscience.ucdavis.edu/animalbiotech>

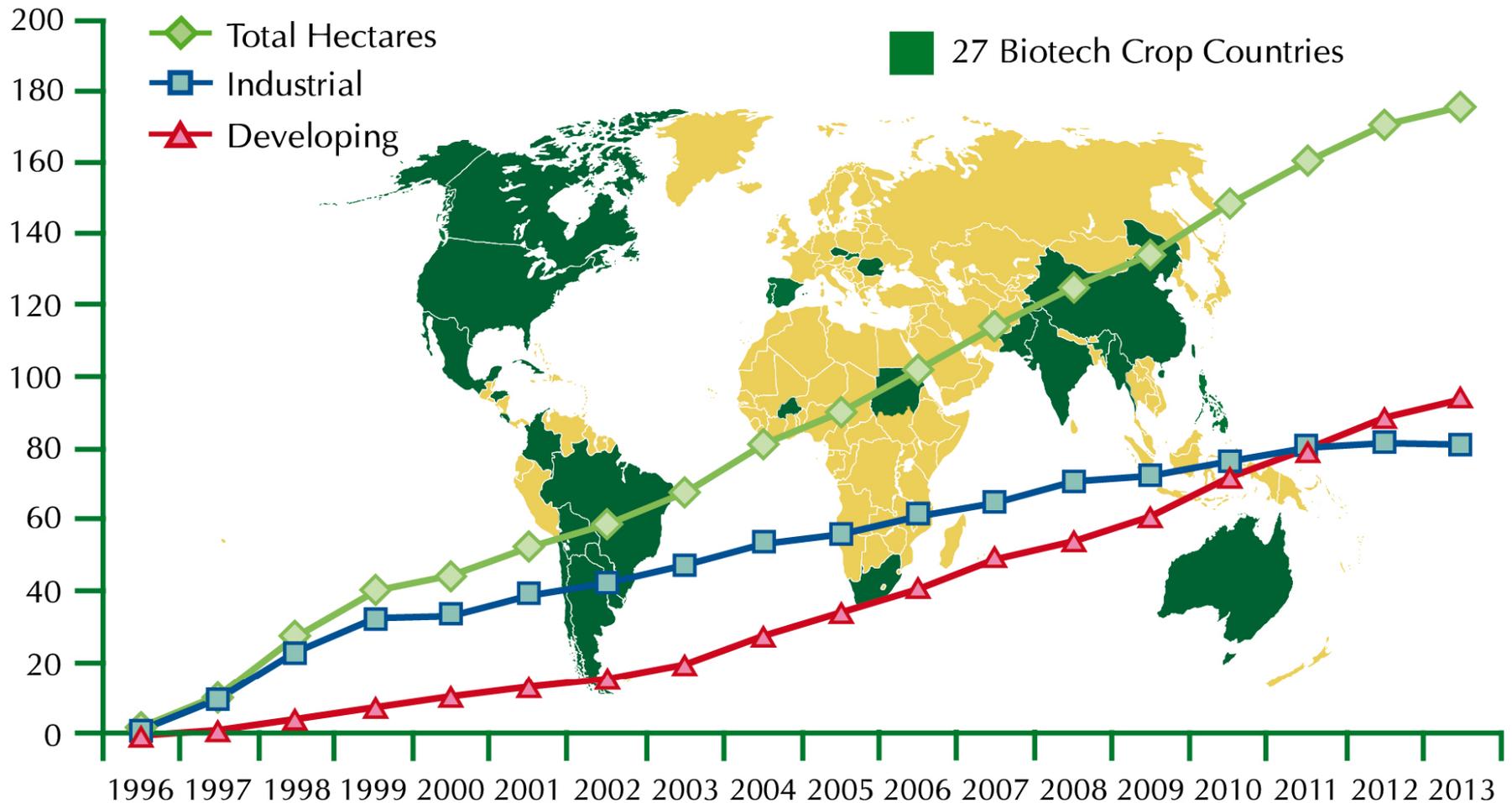


# What is genetic engineering?

- The USDA's current definition of genetic engineering is “manipulation of an organism’s genes by introducing, eliminating or rearranging specific genes using the methods of modern molecular biology, particularly those techniques referred to as recombinant DNA (rDNA) techniques.”
- Also known as genetically modified, GM, GMO, transgenic, bioengineered, biotech, made with modern biotechnology, Frankenfood



# Global Area of Genetically Engineered (GE) crops Million hectares (1996-2013)



*A record 18 million farmers, in 27 countries, planted 175.2 million hectares (433 million acres) in 2013, a sustained increase of 3% or 5 million hectares (12 million acres) over 2012.*



# What crops are GE in US?



- ✓ 90% of all **corn** planted in U.S. was GE in 2013
- ✓ 90% of all **cotton** planted in U.S. was GE in 2013
- ✓ 93% of all **soybeans** planted in U.S. was GE in 2013
- ✓ 95% of all **sugar beet** planted in U.S. was GE in 2013
- ✓ 90% of all **alfalfa** seeds sold in US were GE in 2013
- ✓ Also canola, papaya, some squash, melons and sweetcorn

## NON-GE FEEDSTUFFS CURRENTLY INCLUDE

- Wheat
- Sorghum
- Oats
- Rice
- Millett
- Barley



# Top Ten Myths about GE food and feeding GM crops to livestock

1. There is scientific uncertainty/lack of consensus about safety of GE





# There is scientific consensus

## 600+ published safety assessments

An estimated 2 trillion meals containing GM ingredients have been eaten around the world over the last 16 years without a single substantiated case of ill-health.



### Some summary statements of leading science organizations include:

- “No effects on human health have been shown as a result of the consumption of such foods by the general population in the countries where they have been approved.” (World Health Organization)
- “No adverse health effects attributed to genetic engineering have been documented in the human population.” (National Academy of Sciences)
- “The science is quite clear: crop improvement by the modern molecular techniques of biotechnology is safe.” (American Association for the Advancement of Science)
- “There is no scientific justification for special labeling of bioengineered foods. Bioengineered foods have been consumed for close to 20 years, and during that time, no overt consequences on human health have been reported and/or substantiated in the peer-reviewed literature.” (American Medical Association)
- “No scientific evidence associating GMOs with higher risks for the environment or for food and feed safety than conventional plants and organisms.” (European Commission)



# There is a scientific consensus: Professional Scientific and/or Medical bodies with an opinion on safety of GE

## Generally Positive

- ✓ The U.S. National Research Council (NRC)
- ✓ U.S. National Academy of Sciences (NAS)
- ✓ The American Medical Association, (AMA)
- ✓ U.S. Department of Agriculture (USDA)
- ✓ U.S. Environmental Protection Agency (EPA)
- ✓ U.S. Food and Drug Administration (FDA)
- ✓ European Food Safety authority (EFSA)
- ✓ American Society for Plant Biology (ASPB)
- ✓ Federation of Animal Science Societies (FASS)
- ✓ World Health Organization (WHO)
- ✓ Food and Agriculture Organization (FAO)
- ✓ Royal Society (London)
- ✓ Brazil National Academy of Science,
- ✓ Chinese National Academy of Science
- ✓ Indian National Academy of Science
- ✓ Mexican Academy of Science
- ✓ Third World Academy of Sciences

## Generally Negative

x The American Academy of Environmental Medicine

*“For over 50 years, the American Academy of Environmental Medicine (AAEM) has been studying and treating the effects of the environment on human health. In the last 20 years, our physicians began seeing patients who reported that electric power lines, televisions and other electrical devices caused a wide variety of symptoms..... diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.*



# Top Ten Myths about GE food and feeding GM crops to livestock



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been no independent safety studies on GE crops





# Global livestock populations are the major consumers of GE crops



70-90% of harvested GE biomass is fed to food producing animals





# There have been hundreds of animal feeding studies using GE crops

Animal species/ category	Number of experiments	Nutritional assessment
Ruminants		No unintended effects in composition (except lower mycotoxin concentration in Bt-plants)
Dairy cattle	23	
Beef cattle	14	
Others	10	
Pigs	21	No significant differences in digestibility and poultry health as well as no biological relevant unintended effects on performances of animals and composition of food of poultry origin
Poultry		
Broilers	48	
Laying hens	12	
Other poultry	1	
Others (fish, rabbits etc.)	8	



. Flachowsky G, Schafft H, Meyer U: **Animal feeding studies for nutritional and safety assessments of feeds from genetically modified plants: a review.** *Journal für Verbraucherschutz und Lebensmittelsicherheit (Journal of Consumer Protection and Food Safety)* 2012, **7**:179–194.

Van Eenennaam WHM 2014



# Top Ten Myths about GE food and feeding GM crops to livestock



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been no independent safety studies on GE crops
3. There have been no long term studies on the effects of GE crops



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Contents lists available at SciVerse ScienceDirect

## Food and Chemical Toxicology

journal homepage: [www.elsevier.com/locate/foodchemtox](http://www.elsevier.com/locate/foodchemtox)

## Review

## Assessment of the health impact of GM plant diets in long-term and multigenerational animal feeding trials: A literature review

Chelsea Snell<sup>a</sup>, Aude Bernheim<sup>b</sup>, Jean-Baptiste Bergé<sup>c</sup>, Marcel Kuntz<sup>d</sup>, Gérard Pascal<sup>e</sup>, Alain Paris<sup>f</sup>, Agnès E. Ricroch<sup>b,\*</sup><sup>a</sup> University of Nottingham, School of Biosciences, Sutton Bonington Campus, Loughborough, Leicestershire LE12 5RD, United Kingdom<sup>b</sup> AgroParisTech, 16, rue Claude Bernard, 75231, Paris, Cedex 05, France<sup>c</sup> Anthala, 239, chemin de Saint Claude, 06600 Antibes, France<sup>d</sup> Laboratoire Physiologie Cellulaire Végétale, CNRS – Université Joseph Fourier – INRA, Institut de Recherches en Technologies et Sciences pour le Vivant, 38054 Grenoble, Cedex 9, France<sup>e</sup> Le Breuil, 63220 Saint Alyre d'Arlanc, France<sup>f</sup> INRA – Met@risk, AgroParisTech, 16, rue Claude Bernard, 75231 Paris, Cedex 05, France

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Systematic review

## ABSTRACT

The aim of this systematic review was to collect data concerning the effects of diets containing GM maize, potato, soybean, rice, or triticale on animal health. We examined 12 long-term studies (of more than 90 days, up to 2 years in duration) and 12 multigenerational studies (from 2 to 5 generations). We referenced the 90-day studies on GM feed for which long-term or multigenerational study data were available. Many parameters have been examined using biochemical analyses, histological examination of specific organs, hematology and the detection of transgenic DNA. The statistical findings and methods have been considered from each study. Results from all the 24 studies do not suggest any health hazards and, in general, there were no statistically significant differences within parameters observed. However, some small differences were observed, though these fell within the normal variation range of the considered parameter and thus had no biological or toxicological significance. If required, a 90-day feeding study performed in rodents, according to the OECD Test Guideline, is generally considered sufficient in order to evaluate the health effects of GM feed. The studies reviewed present evidence to show that GM plants are nutritionally equivalent to their non-GM counterparts and can be safely used in food and feed.

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# Meta-analysis of long-term and multigenerational animal feeding trials



- Published long-term feeding studies using a GE-based diet ranged from 110-728 days
- The longest multigenerational study involved 10 generations.
- The authors concluded that none of the long-term or multigenerational studies they evaluated revealed any new effect that had not been found in the 90-d rodent toxicology study

*"The studies reviewed present evidence to show that GM plants are nutritionally equivalent to their non-GM counterparts and can be safely used in food and feed."*

Snell C, Bernheim A, Berge JB, Kuntz M, Pascal G, Paris A, Ricroch AE. 2012. **Assessment of the health impact of GM plant diets in long-term and multigenerational animal feeding trials: a literature review.** *Food Chem Toxicol* **50**:1134–1148.



# Review of data from 60 high-throughput '-omics' comparisons between GE and non-GE crop lines and 17 recent long-term animal feeding studies, and 16 multigenerational studies on animals

- The '-omics' comparisons revealed that the genetic modification has less impact on plant gene expression and composition than that of conventional plant breeding. Moreover, environmental factors (such as field location, sampling time, or agricultural practices) have a greater impact than transgenesis.

*"None of these -omics profiling studies has raised new safety concerns about GE varieties; neither did the long-term and multigenerational studies on animals"*

Ricroch AE: **Assessment of GE food safety using '-omics' techniques and long-term animal feeding studies.** *N Biotechnol* 2012, **30**: 349-354.





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Howard Vlieger claims *"We started witnessing problems in livestock in 1998, when we first started feeding genetically engineered crops to animals," Vlieger said. "First, we noticed conception problems." Also in 1998, "we noticed different digestive issues and immune system problems." Beyond the ample anecdotal evidence that Vlieger and his farming colleagues had amassed, the June 2013 study provided "solid statistical, scientific findings" that pigs overall had "a 260 percent increase in the number of them who had severe inflammation in their stomachs, severe stomach erosion," including ulcers, after consuming GMO soy and corn.....*



# The majority of the more than 100 billion food animals raised in the US between 2000-2011 consumed varying levels of GE feed.



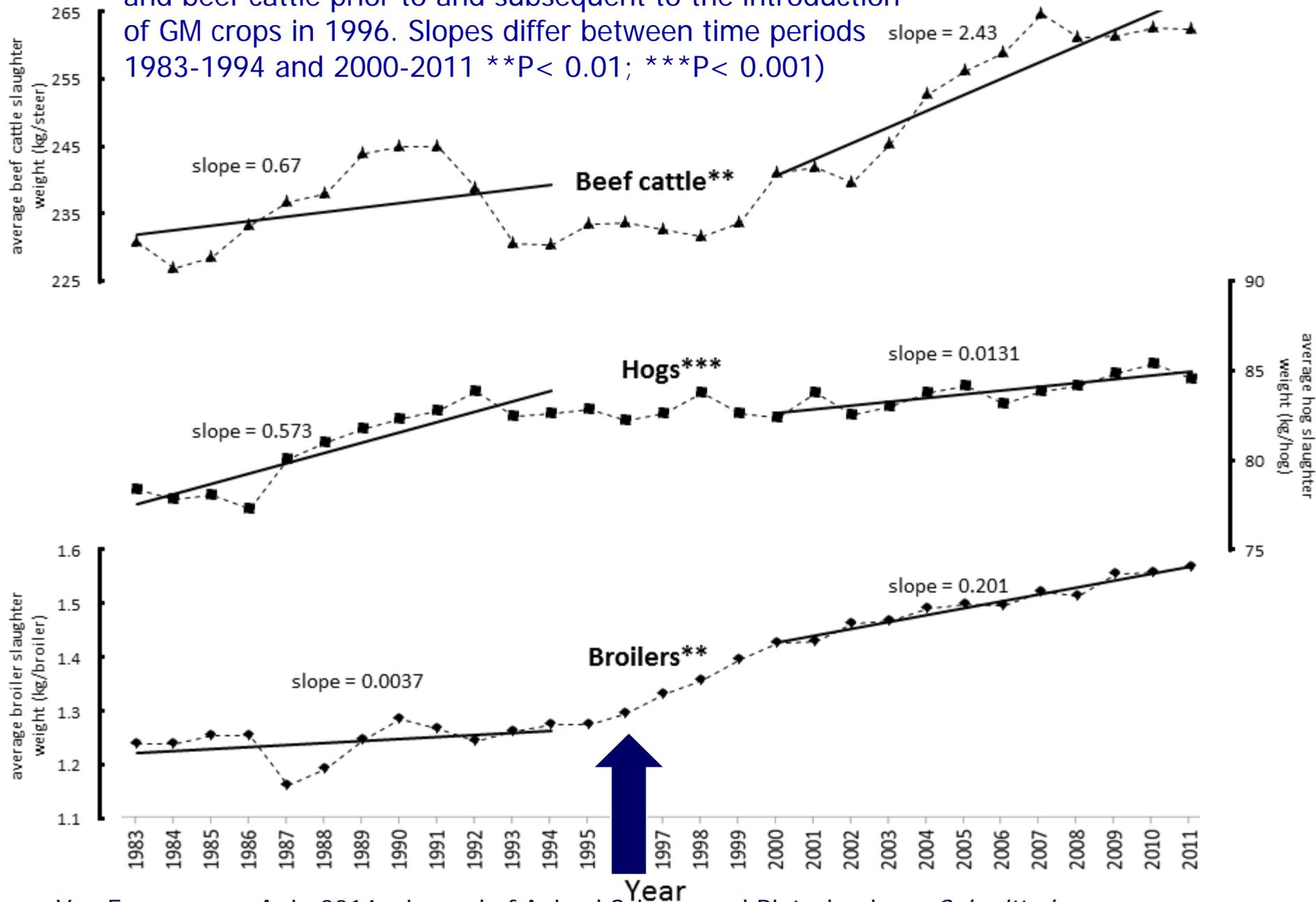
Industry <sup>a</sup>	U.S. <sup>b</sup>
Broiler	105,426,000,000
Beef cattle	410,000,000
Dairy Cows	35,000,000
Hogs	105,000,000
<b>Total</b>	<b>105,976,000,000</b>

<sup>a</sup> Numbers for broilers, hogs (barrows and gilts) and beef cattle (steers) are for slaughtered animals during calendar year. Dairy animals are number of dairy cows in a calendar year divided by three to account for three lactations per animal.

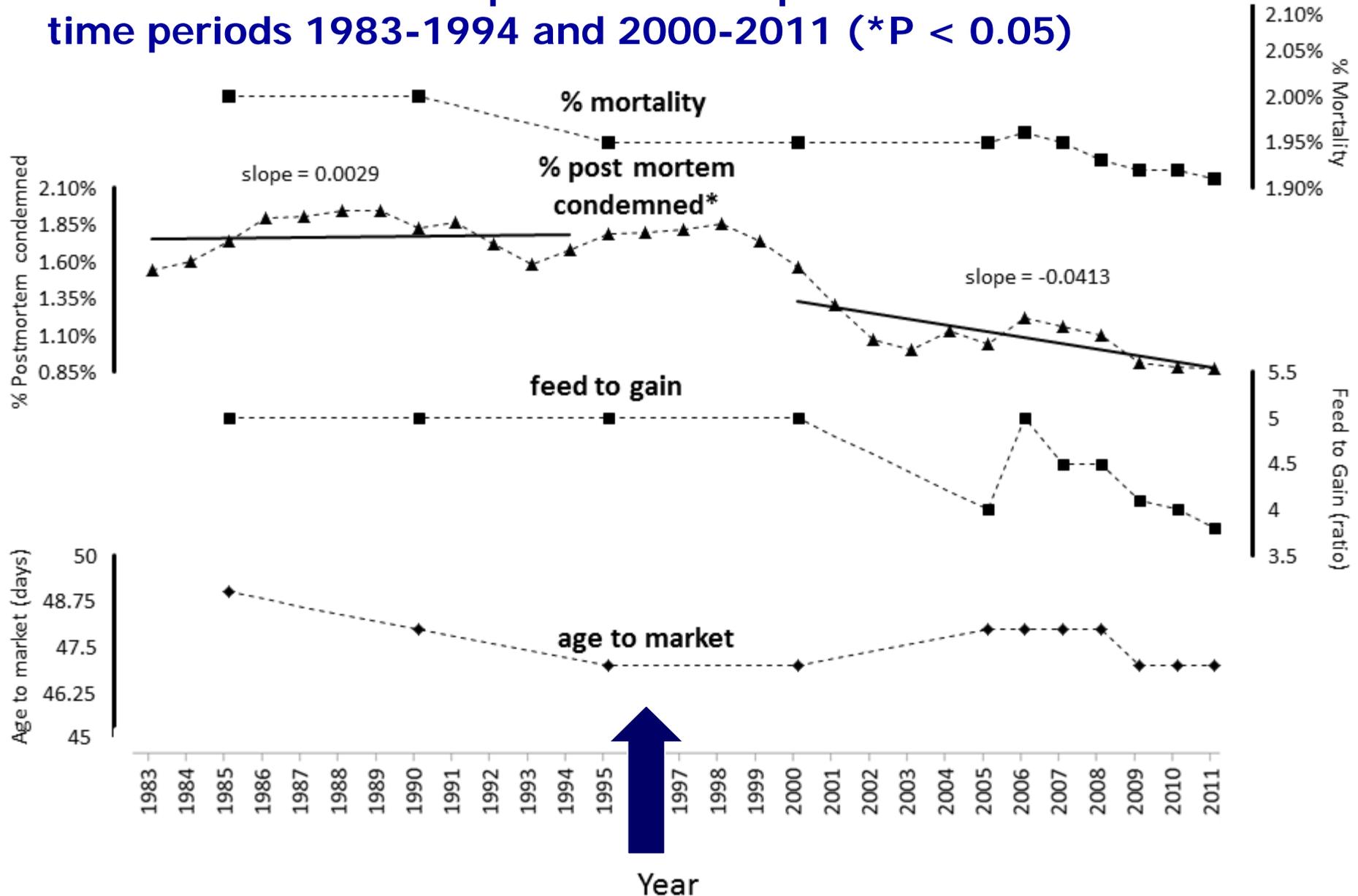
<sup>b</sup> USDA: The USDA Economics, Statistics and Market Information System (ESMIS). 2013  
<http://usda.mannlib.cornell.edu/MannUsda/homepage.do>.

Van Eenennaam, A. L. 2014 . Journal of Animal Science and Biotechnology. *Submitted*

US meat animal slaughter weight statistics for broilers, hogs and beef cattle prior to and subsequent to the introduction of GM crops in 1996. Slopes differ between time periods 1983-1994 and 2000-2011 (\*\*P < 0.01; \*\*\*P < 0.001)



# US broiler statistics prior to and subsequent to the introduction of GM crops in 1996. Slope differs between time periods 1983-1994 and 2000-2011 (\*P < 0.05)





# FASS maintains a list of animal feeding studies with GE crops; and transgenic DNA and protein in livestock products



FASS Federation of Animal Science Societies

FEDERATION OF ANIMAL SCIENCE SOCIETIES®  
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### Scientific References

FASS is committed to assisting in the dissemination of scientific information to accomplish our goal for the pursuit of scientific and educational good of animal agriculture. To support this effort, we have assembled the following list of references. We hope that you find value in this list of scientific articles, organized by topic and species when planning your research.

[References - Feeding Transgenic Crops to Livestock](#)  
 PDF Available  
 Updated May 2012

[References Pertaining to Transgenic DNA and Protein and Livestock Products \(Meat, Milk, Eggs\)](#)  
 PDF Available  
 Updated April 2012



However poorly-designed, sensational studies on small numbers of animals get all the media attention with no mention of the hundreds of other independent studies finding no effect of GE feed (e.g. Seralini *et. al.* 2012 *Food Chem Toxicol* 50:4221–4231)



Control image downloaded from <http://www.ratfanclub.org/mamtumpics.html>  
Approx. 70% of female Sprague–Dawley rats get mammary tumors by 2 years of age



**This study that was retracted by the journal was given a lot of coverage by popular media, including the Dr. Oz Show**





# Highly-publicized yet poorly-designed animal feeding studies have real world consequences



“Within hours, the news had been blogged and tweeted more than 1.5 million times. Lurid photos of tumor-ridden rats appeared on websites and in newspapers around the world, while larger-than-life images of the rats were broadcast across the USA on the popular television show Dr. Oz.

Activists destroyed a GM soybean consignment at the port of Lorient, France, in order to denounce the presence in the food chain of a product they considered to be toxic. The Russian Federation and Kazakhstan banned imports of the maize variety used in the study, Peru imposed a 10-year moratorium on GM crops and Kenya banned all imports of GM food.”

Arjó G, Portero M, Piñol C, Viñas J, Matias-Guiu X, Capell T, Bartholomaeus A, Parrott W, Christou P. 2013. **Plurality of opinion, scientific discourse and pseudoscience: an in depth analysis of the Séralini et al. study claiming that Roundup™ Ready corn or the herbicide Roundup™ cause cancer in rats.** Transgenic Res. 22:255-67.



# Top Ten Myths about GE food and feeding GM crops to livestock



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been no independent safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. **Meat, milk and eggs from animals that have eaten GE crops is unsafe/different**
  - No GE rDNA or the proteins encoded have ever been found to be present in the milk, meat, or eggs from animals that have eaten GE feed
  - It is not possible to distinguish any differences in the nutritional profile of animal products following consumption of GE feed
  - **Labeling of such animal products is not currently required in either US or Europe.**



# Freely available publication from Council for Agricultural Science and Technology (<http://www.cast-science.org>)

## CAST<sup>®</sup> Issue Paper

Number 34  
July 2006

### Safety of Meat, Milk, and Eggs from Animals Fed Crops Derived from Modern Biotechnology *Animal Agriculture's Future through Biotechnology, Part 5*

#### SUMMARY

As the global land area of biotechnology-derived crops modified for agronomic input traits such as herbicide tolerance and/or insect resistance continues to increase, these crops have become an increasingly important source of feed-stuffs for farm animals, and it is important to review the safety of meat, milk, and eggs derived from animals fed these crops. Once the safety of the newly expressed protein has been established, then nutritional equivalence between





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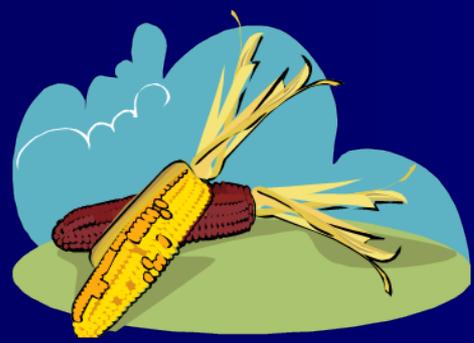
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6. There is a need to label food from animals that have eaten GE feed and this will have no impact the price of these products



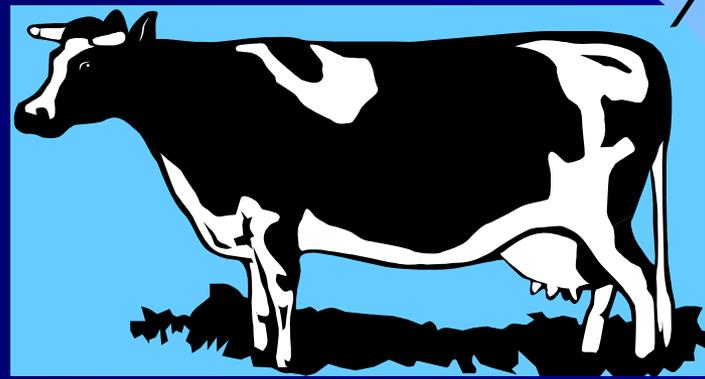
# Where is GE used in Animal Agriculture?

GE products are used in animal feed, vaccines (chickens, pigs, horses, dogs, cats), pharmaceuticals, food processing aids, and food

GMO feed

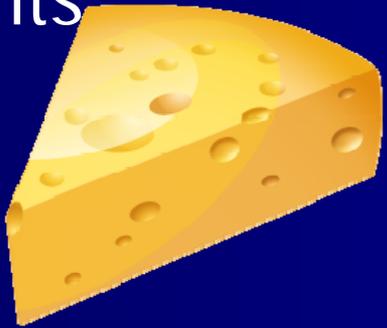


rDNA vaccines  
rBST



Currently no GM animals in market

GMO food & ingredients



GE rennet, and other food processing aids





# What is being proposed for labeling? Implication if food made with GE ingredients are labeled

Food containing ingredients derived from GE plants will have to be labeled unless....

## EXEMPTIONS

- Animals fed GE feed or treated with GE drug (e.g. rBst)
- Any processed food made with GE processing aids
- Certified Organic food
- Until July 1, 2019, tolerance threshold of up to 0.9% GE content of the processed food; the tolerance after that time is unclear

Washington Initiative. 2012. I 2570, [http://sos.wa.gov/assets/elections/initiatives/FinalText\\_285.pdf](http://sos.wa.gov/assets/elections/initiatives/FinalText_285.pdf)





**In 2013 six states (MA, MO, NM, OR, TN, and WV) considered bills without the GMO feed consumption exemption; and some retailers (e.g. Whole Foods) plan to label animal products from GE-fed animals; or to use only non-GE fed animals (e.g. Chipotle)**

**Broiler and livestock production in U.S. during 2011 reported for organic and conventional production.**

Type	Number of organic farms	Organic <sup>1</sup>	Total <sup>2</sup>	Organic as a Percent of Total
Broiler	153	19,654,307	8,683,067,000	0.2%
Beef cows	488	35,367	31,400,000	0.1%
Dairy cows	1,848	213,376	9,200,000	2.3%
Hogs	97	12,125	110,860,000	<0.1%

<sup>1</sup>USDA. 2011 Certified Organic Production Survey.

<http://usda01.library.cornell.edu/usda/current/OrganicProduction/OrganicProduction-10-04-2012.pdf>

<sup>2</sup>USDA. 2011. The USDA Economics, Statistics and Market Information System (ESMIS).

<http://usda.mannlib.cornell.edu/MannUsda/homepage.do>.





# Background in costs of organic (non-GE) feed



- Only about two-thirds of organic beef is grain-fed because of the high costs of organic feeds compared with conventionally grown
- Premiums for organic feeds were 57 percent above conventional feeds. In some years, organic grains may only carry premiums of 25% or so, although premiums are generally much higher, sometimes more than 100 % higher.
- Assuming enough demand producers would respond by growing more non-GE feed – which would be more expensive

Non-GE crops

- Wheat
- Sorghum
- Millett
- Barley
- Rice
- Oats

Alternative Beef Production Systems: Issues and Implications by Kenneth Mathews and Rachel Johnson Outlook No. (LDPM-21801) 34 pp, April 2013

<http://www.ers.usda.gov/ersDownloadHandler.ashx?file=/media/1071057/ldpm-218-01.pdf>



# Non-GE will cost more

## Shoppers Unwilling to Pay More for Non-GMO Products

Posted Tue, 2014-02-18 10:59 by [BMM](#)

CHICAGO — The labeling of genetically modified (GMO) food is at the center of debate across the country, but the decision to buy or not buy non-GMO food often is based on price. A recent NPD food market research study on GMO awareness and concern among consumers finds that 67 percent of all primary grocery shoppers are not willing to pay a higher price for non-GMO food.

Over half of U.S. consumers express some level of concern about genetically modified organisms, but when asked to describe GMOs, many primary grocery shoppers are unclear. The NPD study, **Gauging GMO Awareness and Impact**, thinks that is likely a factor in the unwillingness of shoppers to pay a higher price for non-GMO food. Also unclear to consumers is the prevalence of GMO versus non-GMO items at the grocers. Four out of ten primary grocery shoppers feel that they mostly buy non-GMOs while the same ratio of consumers says they are not sure.



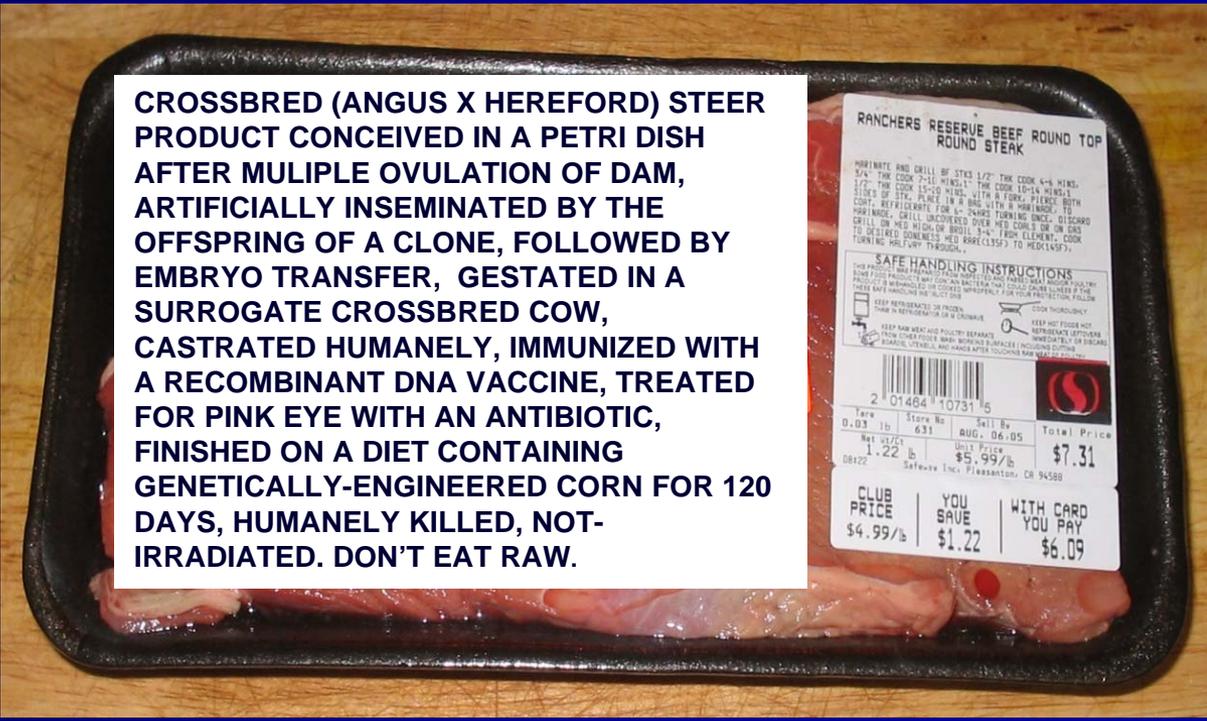
GMO corn field on the island of Oahu, Hawaii. Photo by BMM





# Mandatory process-based labeling singles out GE process in absence of difference in product – there are many processes used in food production

What would be the cost of mandatory consumer “right to know” process-based labeling about all aspects of the food production process?





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4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. There is a need to label food from animals that have eaten GE feed and this will have no impact the price of these products
7. **GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides**



# When are the benefits that have been derived from adoption of GE crops?



- "From 1996 to 2012, biotech crops contributed to Food Security, Sustainability and the Environment/Climate Change by: increasing crop production valued at US\$116.9 billion; providing a better environment, by saving 497 million kg a.i. of pesticides; in 2012 alone reducing CO<sub>2</sub> emissions by 26.7 billion kg, equivalent to taking 11.8 million cars off the road for one year; conserving biodiversity by saving 123 million hectares of land from 1996-2012; and helped alleviate poverty for >16.5 million small farmers and their families totalling >65 million people, who are some of the poorest people in the world.
- Biotech crops are essential but are not a panacea and adherence to good farming practices such as rotations and resistance management, are a must for biotech crops as they are for conventional crops. "

International Service for the Acquisition of Agri-Biotech Applications [www.isaaa.org/](http://www.isaaa.org/);  
Carpenter J.E. (2013). "The socio-economic impacts of currently commercialised genetically engineered crops,"  
*International Journal of Biotechnology*, 12 (4) 249. DOI: [10.1504/IJBT.2013.059248](https://doi.org/10.1504/IJBT.2013.059248)



# When are the benefits that have been derived from adoption of GE crops in the US?



Since GM seeds were introduced in the mid-1990s, farmers have opted for these products. A recent report from the National Research Council of the **U.S. National Academy of Sciences**, "The Impact of Genetically Engineered Crops on Farm Sustainability in the United States," offers an insight as to why. The report concludes that U.S. farmers growing biotech crops "..are realizing substantial economic and environmental benefits — such as lower production costs, fewer pest problems, reduced use of pesticides, and better yields — compared with conventional crops."

National Research Council. Impact of Genetically Engineered Crops on Farm Sustainability in the United States . Washington, DC: The National Academies Press, 2010



# GE insect-resistant (*B.t.*) crops: summary of active ingredient usage and associated percent decrease in amount of active ingredient used 1996–2011



**Table 5.** GM IR maize: summary of active ingredient usage and associated EIQ changes 1996–2011

Country	Change in active ingredient use (million kg)	Percent change in amount of active ingredient used
USA	-40.7	-41.9
Canada	-0.5	-93.8
Spain	-0.4	-34.3
South Africa	-1.1	-56.2
Brazil	-7.2	-75.6
Colombia	-0.1	-33.0
<b>Aggregate impact: all countries</b>	<b>-50.0</b>	<b>-45.2</b>

**Table 6.** GM IR cotton: summary of active ingredient usage and associated EIQ changes 1996–2011

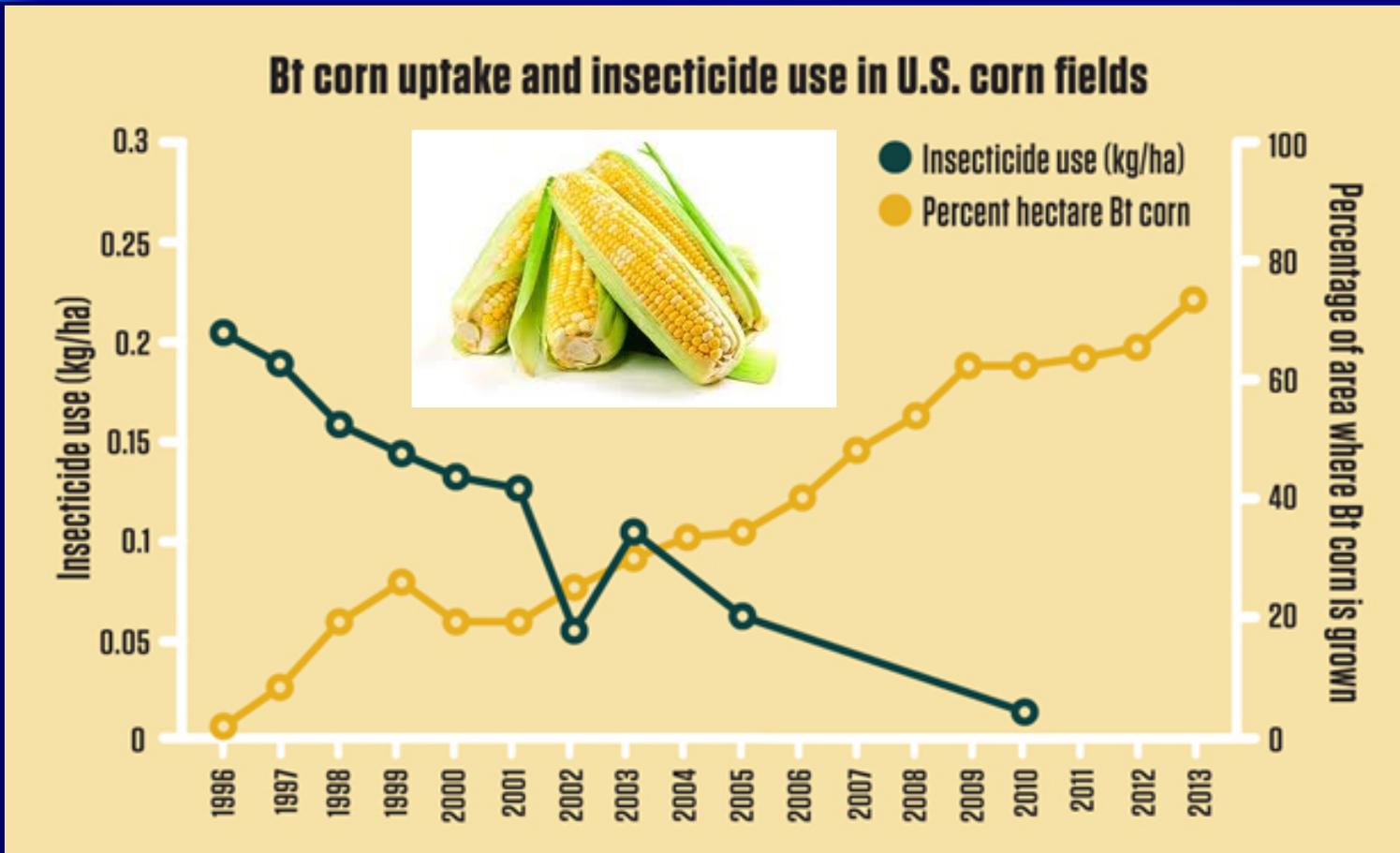


Country	Change in active ingredient use (million kg)	Percent change in amount of active ingredient used
USA	-11.0	-16.7
China	-108.7	-30.3
Australia	-16.8	-32.4
India	-49.8	-19.1
Mexico	-1.1	-9.5
Argentina	-0.8	-16.2
Brazil	-0.5	-8.9
<b>Aggregate impact: all countries</b>	<b>-188.7</b>	<b>-24.8</b>





# Overall insecticide use in the United States has declined 0.6% per year



<http://www.washingtonpost.com/blogs/wonkblog/files/2013/08/bt-corn.png>



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6. There is a need to label food from animals that have eaten GE feed and this will have no impact the price of these products
7. GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides
8. **The world does not need GE feed for its livestock populations**



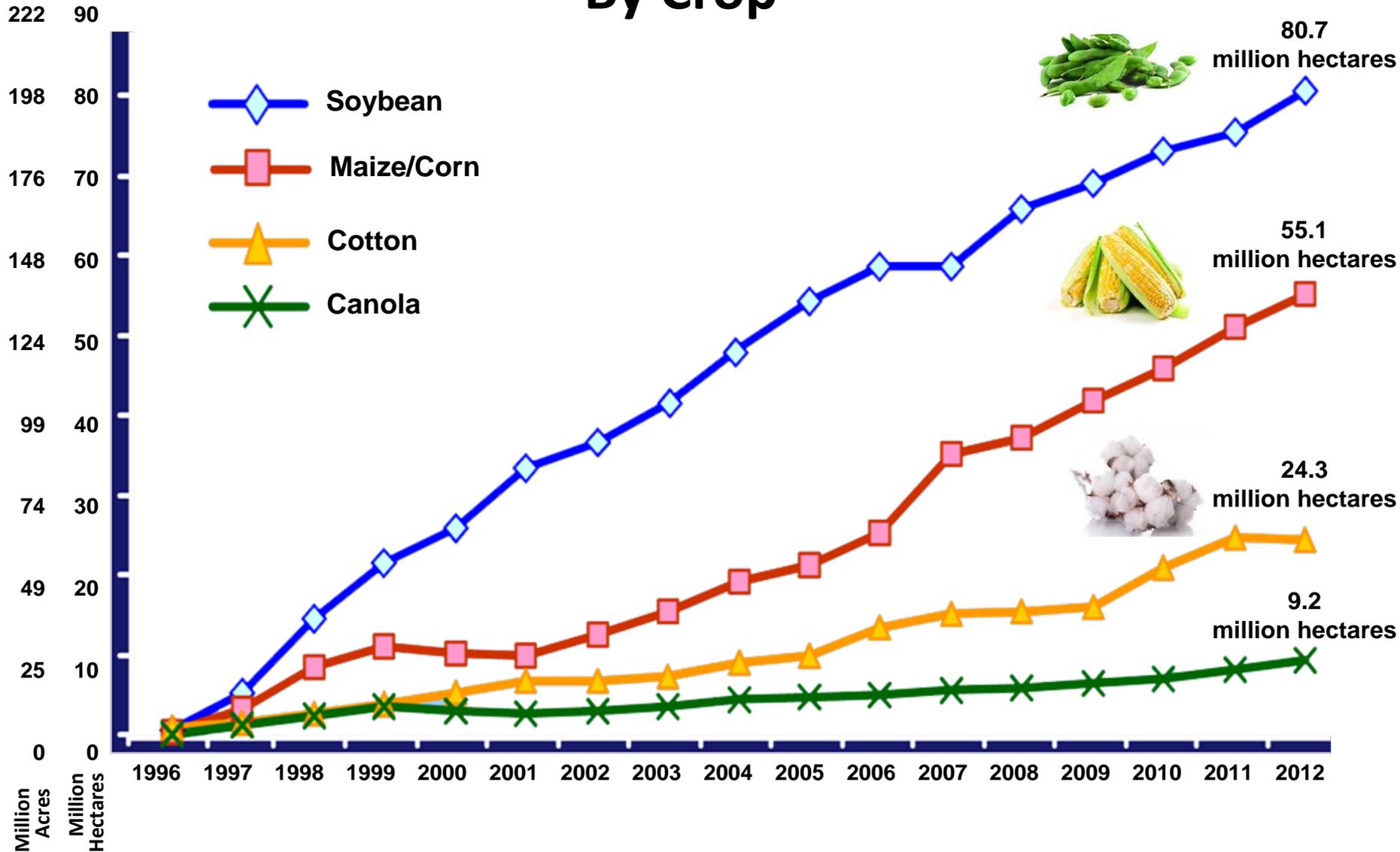
# The livestock revolution



- **Demand for livestock products is expected to continue growing strongly through the middle of this century**
- Unlike the supply-led Green Revolution, the “Livestock Revolution” is driven by demand resulting from population growth, rising affluence in developing countries and urbanization
- For more than a decade, the strongest increases in animal protein production have been in the developing world
- From the early 1970s to the mid-1990s, the volume of meat consumed in developing countries grew almost three times as much as it did in the developed countries
- Since 1995 developing countries produce more meat and dairy products than are produced in developed countries

Delgado, C. L. 2003. Rising consumption of meat and milk in developing countries has created a new food revolution. *Journal of Nutrition* 133:3907S-3910S

# Global Area of Genetically Engineered (GE) Crops 1996 – 2012 By Crop





# When are the yield benefits that have been derived from adoption of GE crops?

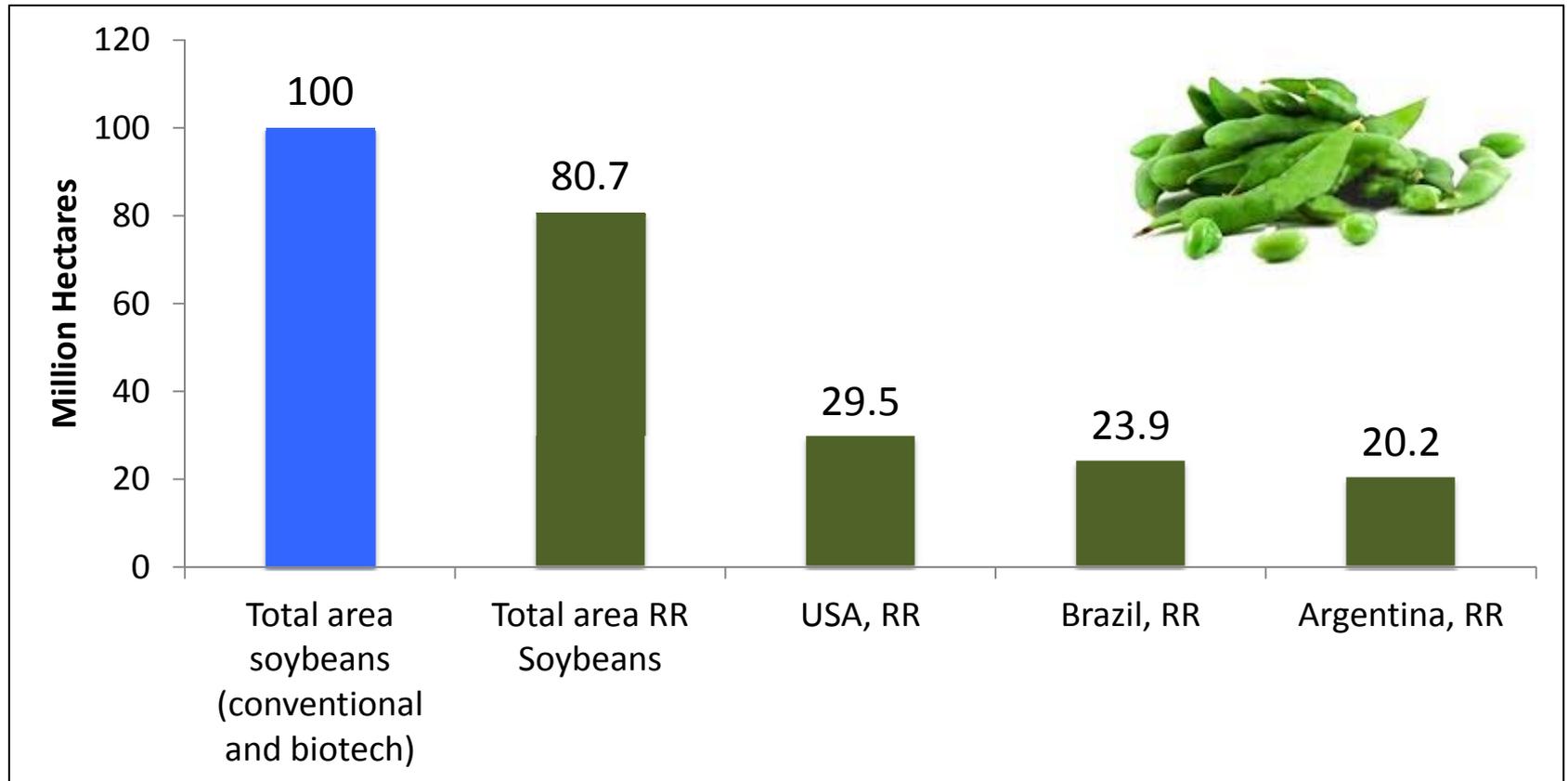
- GE technology has added 110 million tonnes of soybeans and 195 million tonnes of corn to global production of these crops since the introduction of GE crops in the mid-1990s.

Brookes G, Barfoot P: **The global income and production effects of genetically modified (GM) crops 1996–2011.** *GM Crops and Food: Biotechnology in Agriculture and the Food Chain* 2013, **4**:74–83.



# Soybeans, 2012

- In 2012, GE soybeans accounted for 47% of all GE crop area
- 81% of all soybeans grown were GE
- 11 countries grew “RoundUp-Ready” (RR) GE Soybeans





# Share of global crop trade accounted for by GE crops 2011/12 (million tonnes)

	Soybeans	Corn	Cotton	Canola
<b>Global production</b>	238	883.5	27.0	61.6
<b>Global trade (exports)</b>	90.4	103.4	10.0	13.0
<b>Share of global trade from GE producers</b>	88.6 (98%)	70.0 (67.7%)	7.15 (71.5%)	9.9 (76%)
<b>Share of global trade that may be GE</b>	96.7%	67.7%	71.5%	76%

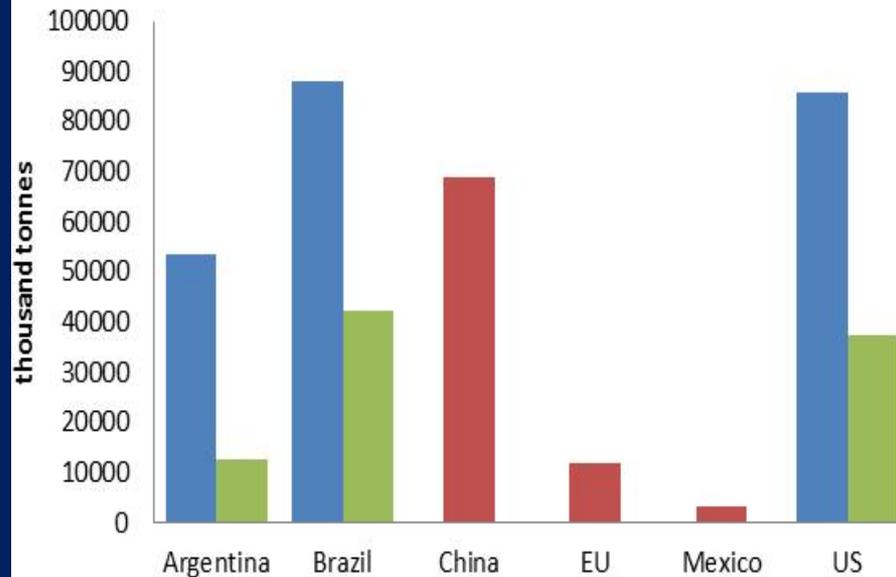
Brookes G, Barfoot P: 2013 **GM crops: global socio-economic and environmental impacts 1996–2011**. PG Economics Ltd: UK; [www.pgeconomicscouk/pdf/2013globalimpactstudyfinalreportpdf](http://www.pgeconomicscouk/pdf/2013globalimpactstudyfinalreportpdf).

# China and the EU are large importers of GE soybeans

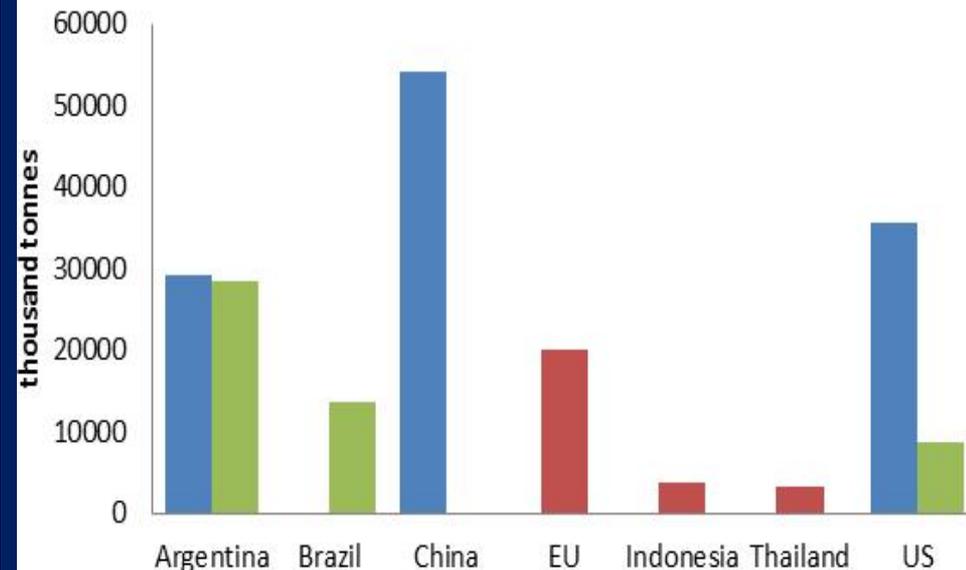
Three top producers, importers and exporters of soybeans and soybean meal (thousand tonnes)

■ Production ■ Imports ■ Exports

### Soybeans - 2013



### Soybean Meal - 2013



Oilseeds world market and trade. September 2013 <http://www.fas.usda.gov/oilseeds/Current>



# The EU imports a lot of GE feed to support its animal agriculture



- For climatic and agronomic reasons, the European Union (EU) is unable to produce most of the oilseed meal and other protein-rich feedstuffs required to feed its livestock
- 80% of all livestock feed in the European Union (EU) is imported
- 98% of EU soybean meal is imported from Brazil, the USA, and Argentina; ~ 80% of this imported soybean meal animal feed is GE
- If the EU were not able to import soybean protein from outside the EU it would only be able to replace 10-20% of imports by high protein substitutes, resulting in a substantial reduction in animal protein production, exports and consumption, and a very significant increase in animal protein imports and cost in the EU\*

\* Directorate-General for Agriculture and Rural Development. 2007. **Economic impact of unapproved GMOs on EU feed imports and livestock production.** [http://ec.europa.eu/agriculture/envir/gmo/economic\\_impactGMOs\\_en.pdf](http://ec.europa.eu/agriculture/envir/gmo/economic_impactGMOs_en.pdf)



# German poultry sector ends avoidance of GMO soy in feed

No Comments Posted Feb. 18th, 2014 by Reuters News Service



HAMBURG, Feb 18 (Reuters) – German poultry producers have given up a promise to consumers to avoid feeding birds with soy containing genetically-modified organisms (GMOs) because of lower supplies of non-GMO soybeans, poultry producers association BBH said on Tuesday.

Brazil, the main bulk supplier of GMO-free soybeans, was likely to cut its supplies of GMO-free soybeans by 50 percent this year partly because of cross-pollination with conventional beans, the association said.

The danger of cross-contamination between GMO and conventional crops during transport has also risen, it said.

“Feeding for chicken and turkey production in Germany without use of genetic technology can no longer be undertaken,” the association said. “Specialist feed factories for production of poultry feed requires a seamless supply chain with impeccable GMO-free soybeans, but supplies can no longer be guaranteed in the required volumes.”

The association said Germany was not alone with such problems and some British and Danish poultry producers had in the past year also given up commitments not to use GMO soybeans. <http://www.producer.com/daily/german-poultry-sector-ends-avoidance-of-gmo-soy-in-feed/>



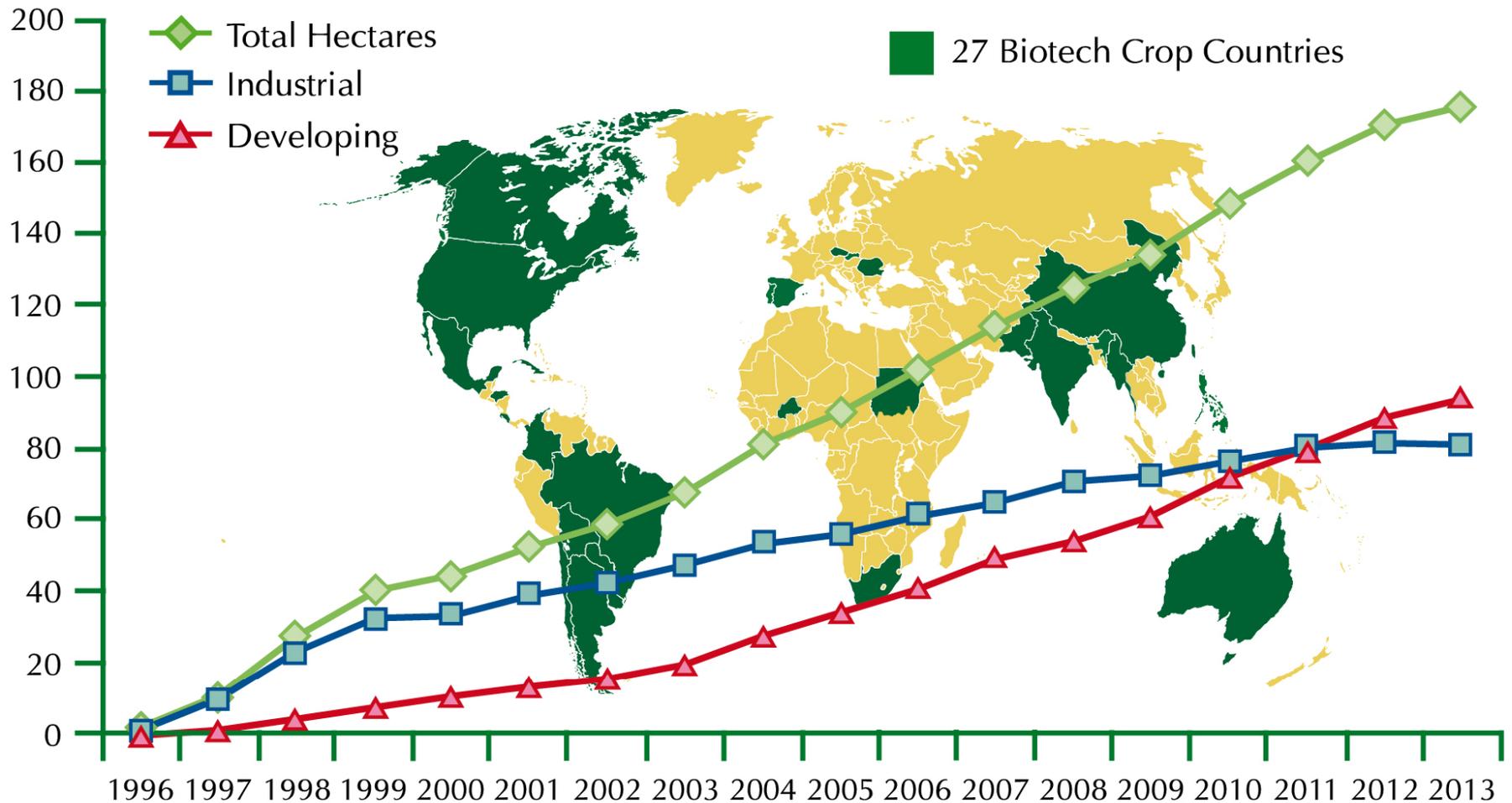


# Top Ten Myths about GE food and feeding GM crops to livestock



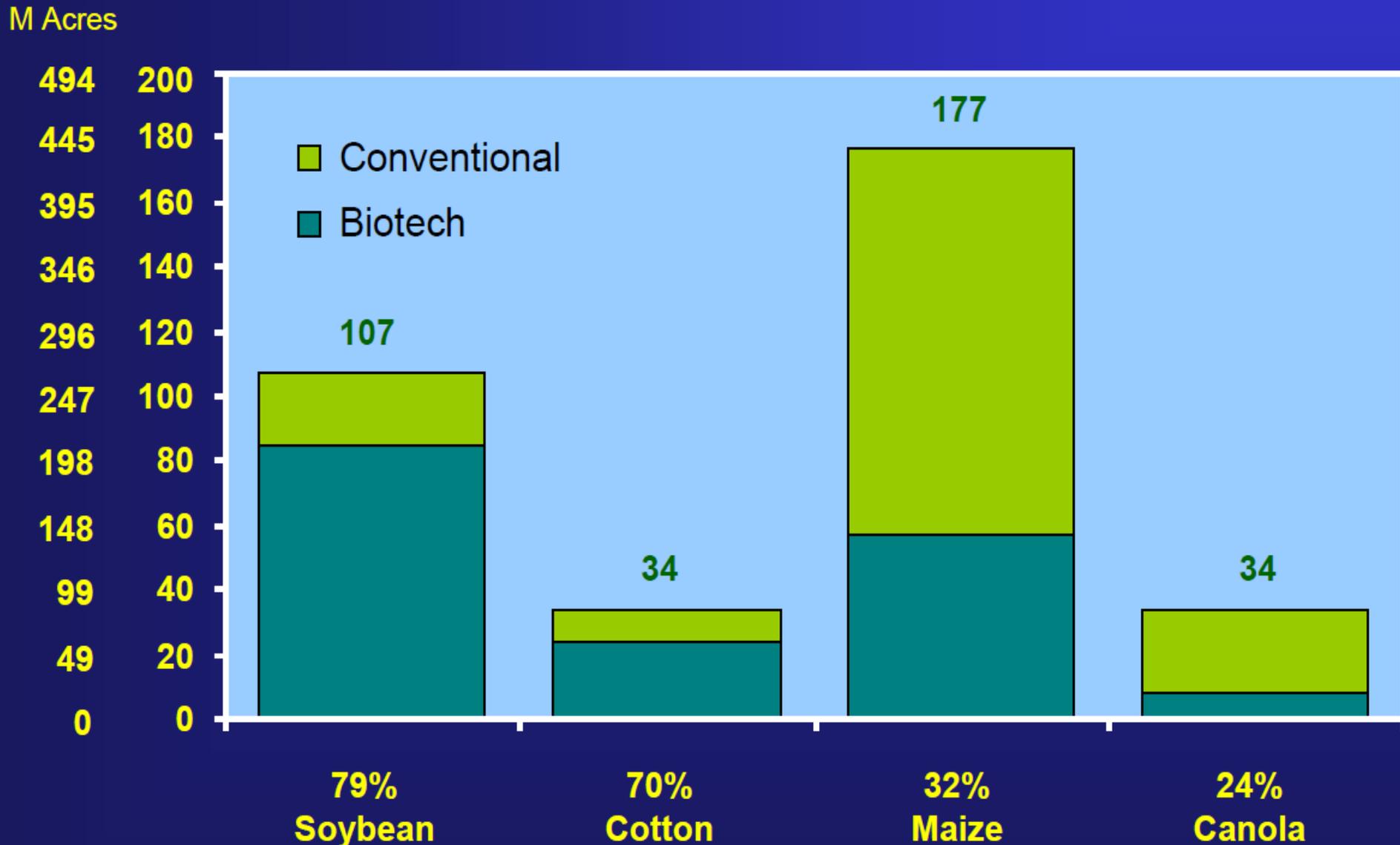
1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been no independent safety studies on GE crops
3. There have been no long term studies on the effects of GE crops
4. GE feed is making livestock populations sick (e.g. pigs with enlarged uteruses, infertility, tumors, mortality)
5. Meat, milk and eggs from animals that have eaten GE crops is unsafe/different
6. There is a need to label food from animals that have eaten GE feed and this will have no impact the price of these products
7. GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides
8. The world does not need GE feed for its livestock populations
9. **Farmers are forced to plant GE crops by multinational companies**

# Global Area of Genetically Engineered (GE) crops Million hectares (1996-2013)



*A record 18 million farmers, in 27 countries, planted 175.2 million hectares (433 million acres) in 2013, a sustained increase of 3% or 5 million hectares (12 million acres) over 2012.*

# Global Adoption Rates (%) for Principal GE Crops, (Million Acres, Million Hectares) 2013





# Top Ten Myths about GE food and feeding GM crops to livestock



1. There is scientific uncertainty/lack of consensus about safety of GE
2. There have been no independent safety studies on GE crops
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7. GE crops have not benefitted farmers or the environment and have resulted in a huge increase in the use of pesticides
8. The world does not need GE feed for its livestock populations
9. Farmers are forced to plant GE crops by multinational companies
10. **Any scientist that presents information about this topic is an industry shill (unless that information is negative)**



**Shill:** an accomplice of a hawker, gambler, or swindler who acts as an enthusiastic customer to entice or encourage others.





# Summary



- Science shows safety of GE feed and food
- No difference in milk, meat, or eggs from animals that have eaten GE feed – and no way to detect it (i.e. no “trace”) if that was the case
- Labeling of food containing ingredients derived from GE crops would not be trivial; but pales in comparison to tracking products from animals that have (or have not) eaten GE feed – how much, how often, never ever?



# Questions

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In terms of the environmental impact associated with "round-up ready" crops - important changes in the profile of herbicides used have occurred.

Environmental Impact Quotient (EIQ) integrates the various environmental impacts of individual pesticides into a single "field value per hectare". The EIQ value is multiplied by the amount of pesticide active ingredient (ai) used per hectare to produce a field EIQ value.

The lower the EIQ/ha the less the environmental impact, this is more informative than kg of active ingredient (ai)/ha as ai have differing toxicities

**GM HT soybean 2011**

Country	Area of trait ('000 ha)	Average ai use GM crop (kg/ha)	Average ai use if conventional (kg/ha)	Average field EIQ/ha GM crop	Average field EIQ/ha if conventional	Aggregate change in ai use ('000 kg)	Aggregate change in field EIQ/ha units (millions)
US	30,052	1.90	2.02	31.4	38.5	-3,358	-198.5
Canada	1,110	1.32	1.43	20.9	34.2	+122	-14.8
Argentina	18,414	3.02	2.78	47.0	48.0	+4,419	-18.4
Brazil	20,531	2.91	2.39	40.7	37.4	+10,676	+69.4
Paraguay	2,619	3.30	3.03	52.7	51.8	+707	+2.3
South Africa	401	1.04	1.28	15.9	24.0	-98	-3.2
Uruguay	867	2.49	2.15	39.6	43.6	+34	-3.5
Bolivia	966	3.30	3.03	52.7	51.8	+260	+0.8
Mexico	15	1.62	1.76	24.8	41.0	-2	-0.2