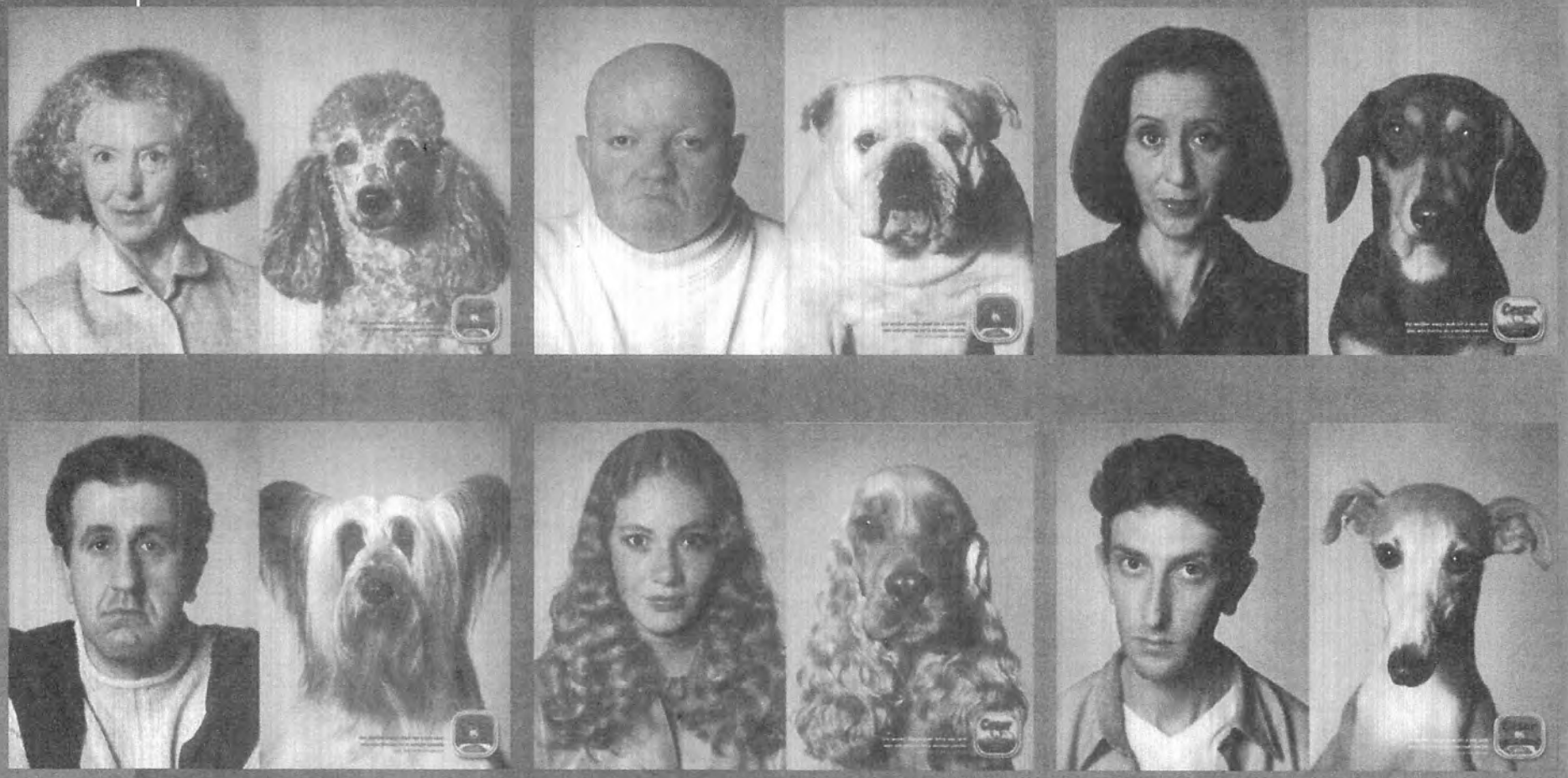
I do not like the term genetically modified or GMO – because it is ambiguous as to what "modified" means

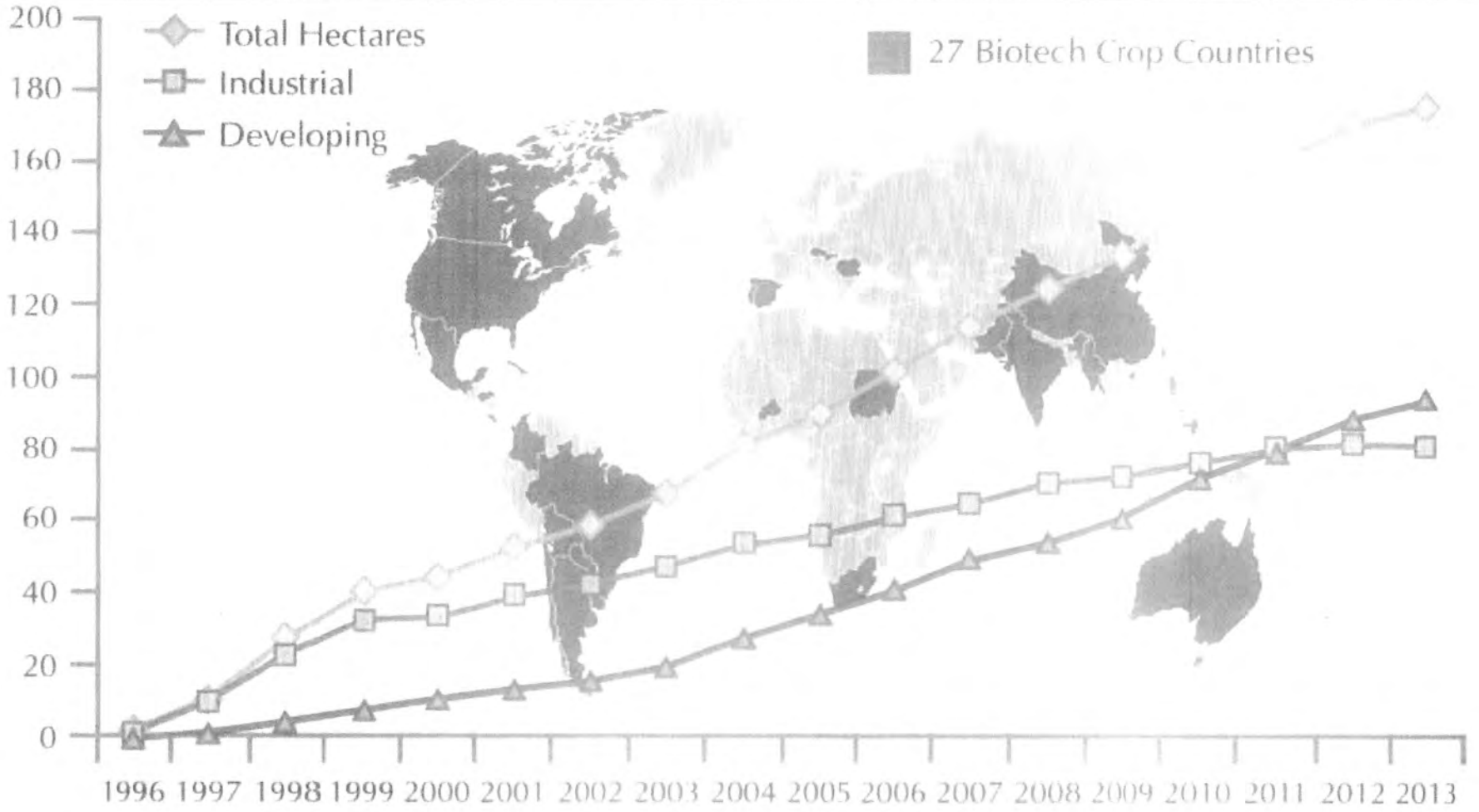


I prefer the term genetic engineering (GE) as it means something specific

- 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.

Source: Clive James, 2013 ISAAA Brief 46-2013

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
- ✓ Also, canola, papaya, some squash, melons, sweetcorn and an increasing acerage of alfalfa

NON-GE FEEDSTUFFS CURRENTLY INCLUDE

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

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.

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

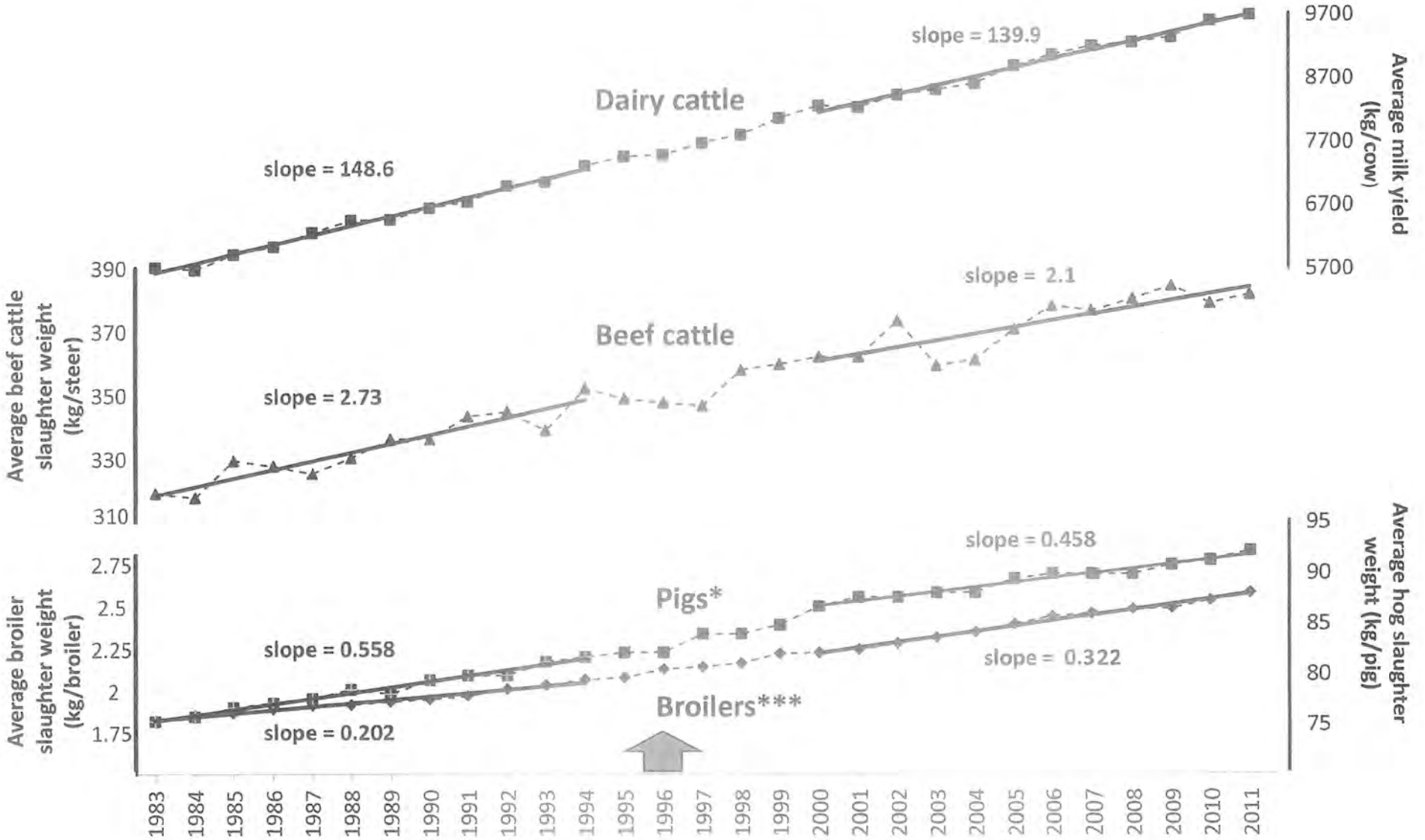
Industry[a]	U.S.[b]
Broiler	105,426,000,000
Beef cattle	410,000,000
Dairy Cows	35,000,000
Hogs	105,000,000
Total	**105,976,000,000**

[a] 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.

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

Van Eenennaam, A. L. and A. E. Young. 2014 . Journal of Animal Science. *92:4255-4278*

Milk, beef, swine, and broiler production trends in US prior to and subsequent to the introduction of GE crops in 1996



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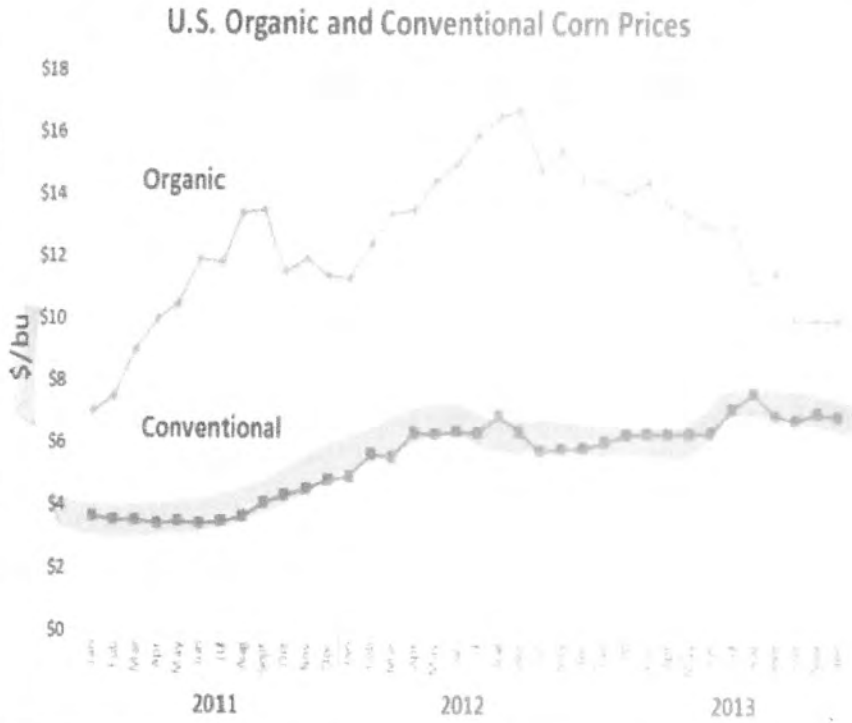
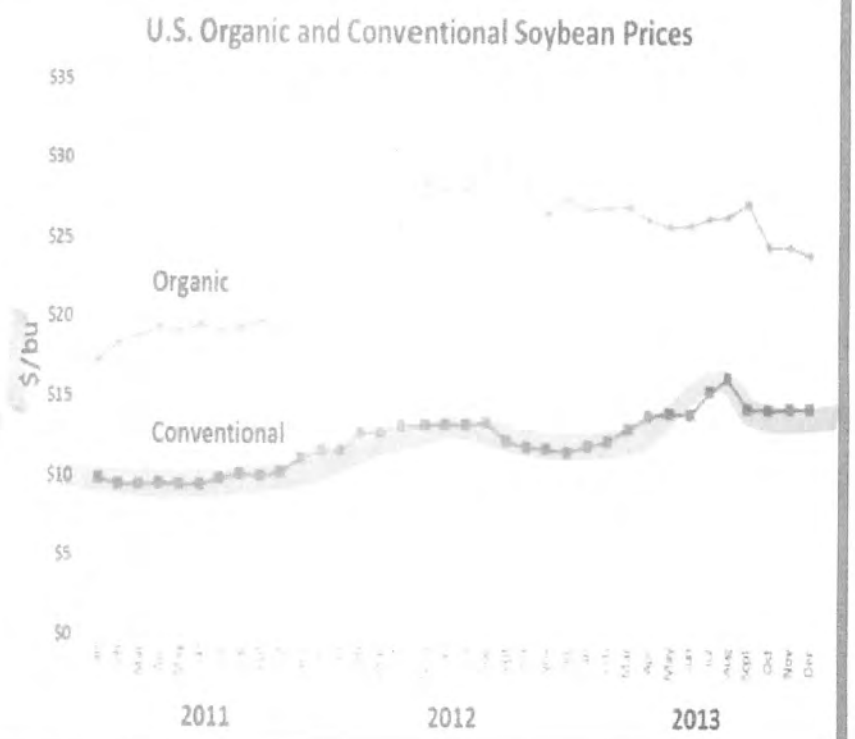
MAKING MORE FOOD W/LESS ANIMALS & LAND EVERY YEAR

PEOPLE WANT FOOD TO BE SAFE, CHEAP, AND ABUNDANT!

Background in costs of organic and non-GE feed





Non-GE crops
- Wheat
- Sorghum
- Millett
- Barley
- Rice
- Oats

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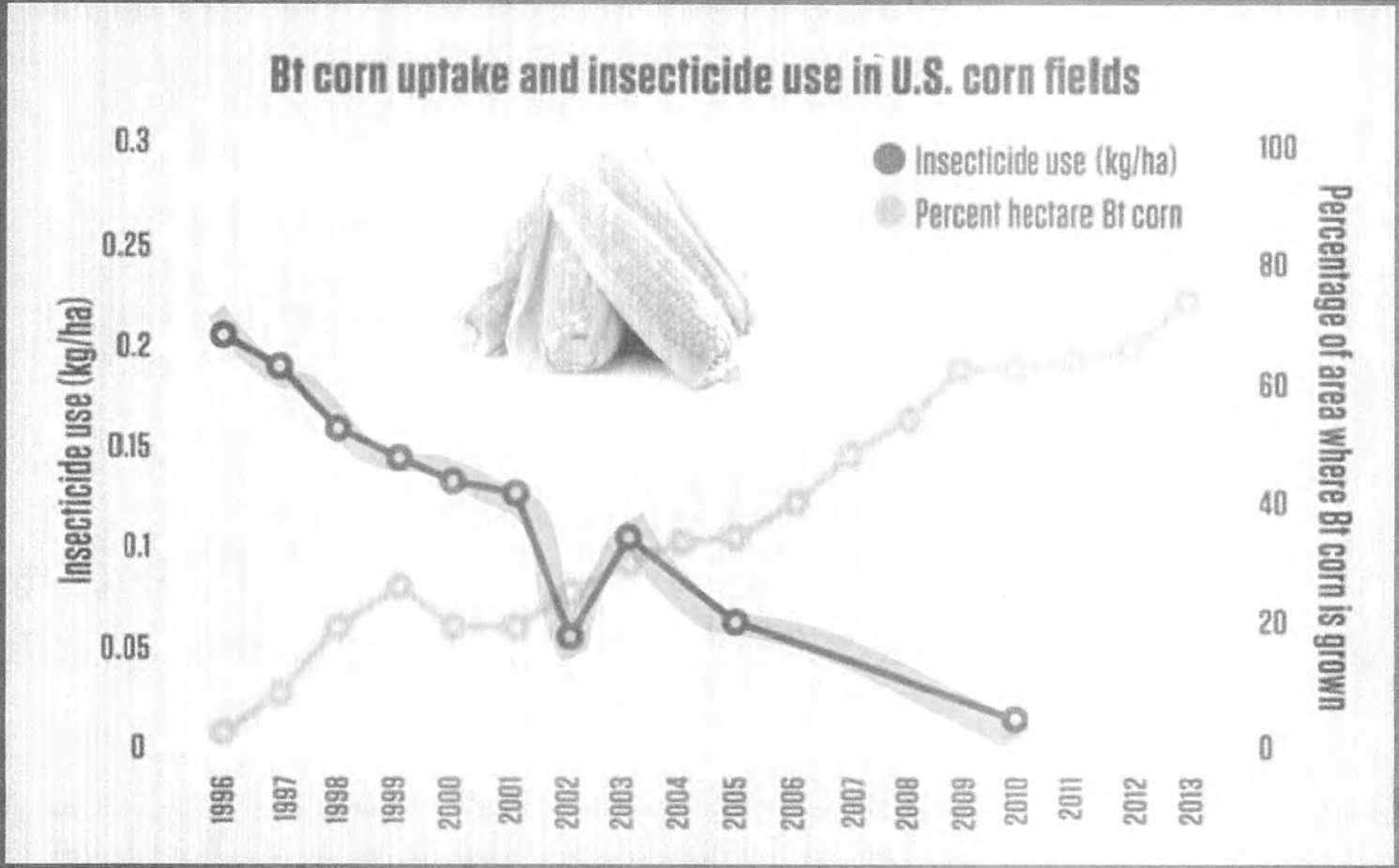
People want cheap food & safe supply of it!

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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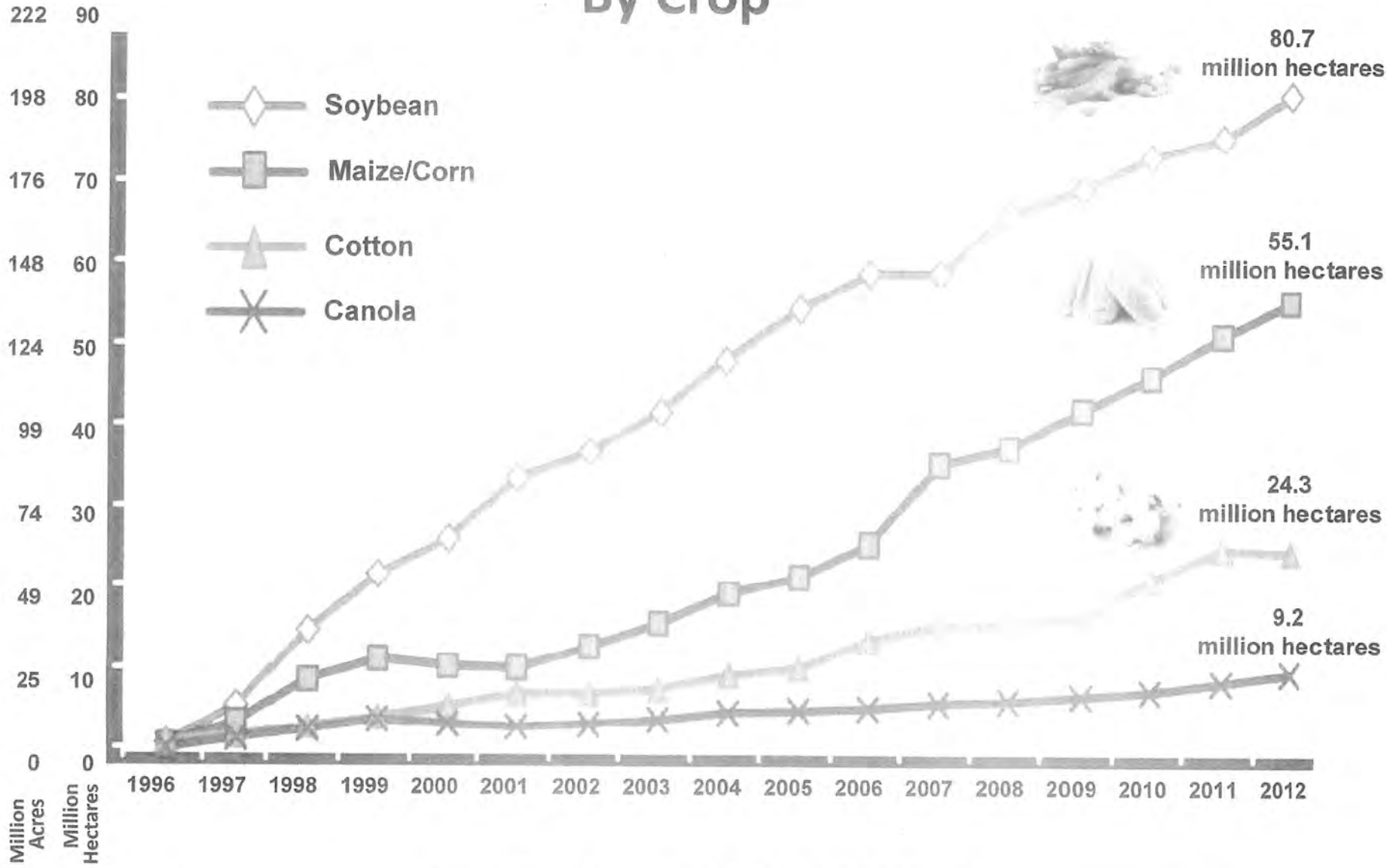
TODAY'S CORN VARIETIES USE LESS WATER, PESTICIDES + FERTILIZE

Globally there are substantial benefits from first generation (input trait) GE crops

"On average, GE technology adoption has reduced chemical pesticide use by 37%, increased crop yields by 22%, and increased farmer profits by 68%. Yield gains and pesticide reductions are larger for insect-resistant crops than for herbicide-tolerant crops. Yield and profit gains are higher in developing countries than in developed countries."

Klümper W, Qaim M (2014) A Meta-Analysis of the Impacts of Genetically Modified Crops. PLoS ONE 9(11): e111629.

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



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Source: Clive James, 2012 ISAAA Brief 44-2012 http://www.isaaa.org