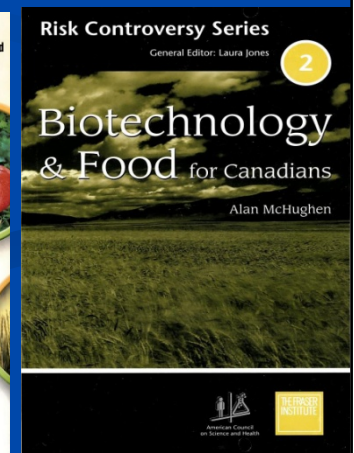
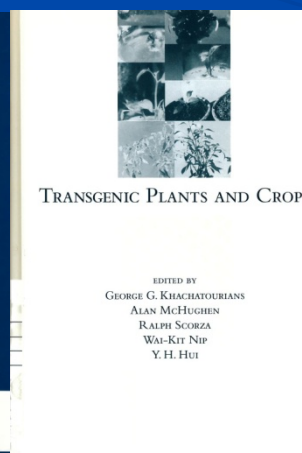
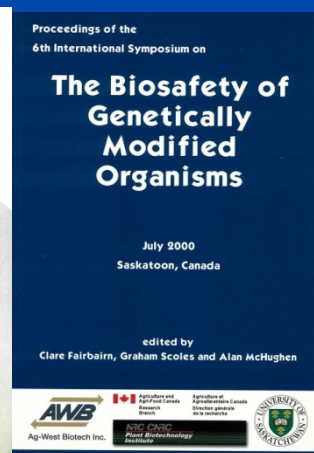
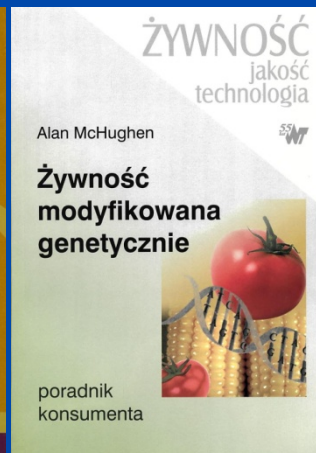
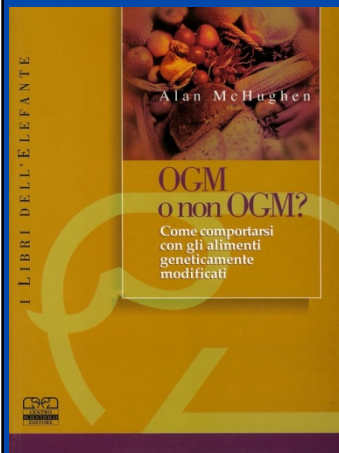
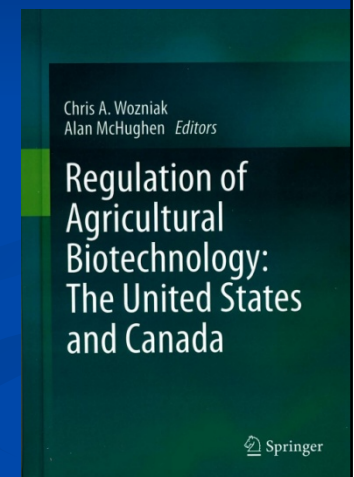
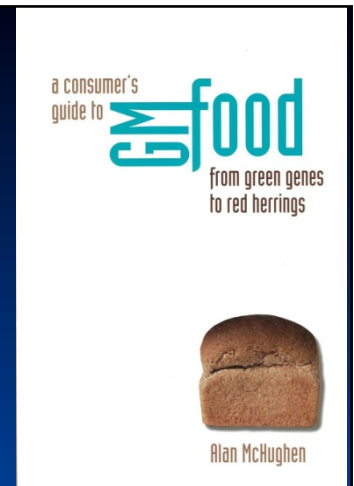


# GMOs and Public Policy

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# *Greenpeace* on Golden Rice

- “Golden Rice won’t solve the VAD problem
- Requires consumption of 9 kilos (*ca.* 20lbs) of cooked rice/day
- Supplements/food fortification works better
- GR causes baldness and impotence in men
- Golden Rice = Fool’s Gold!
- Untested, unproven technology, poses significant risks to health, the environment
- Poses a very real threat to traditional rice varieties
- GR is “poison”, so destruction of Philippine GR trial is justified”

<http://www.greenpeace.org/seasia/ph/News/greenpeace-philippine-blog/no-room-on-our-plates-for-golden-rice/blog/42640/>; <http://www.agbioworld.org/biotech-info/topics/goldenrice/criticism.html>; [http://www.slate.com/blogs/future\\_tense/2013/08/26/golden\\_rice\\_attack\\_in\\_philippines\\_anti\\_gmo\\_activists\\_lie\\_about\\_protest\\_and.html](http://www.slate.com/blogs/future_tense/2013/08/26/golden_rice_attack_in_philippines_anti_gmo_activists_lie_about_protest_and.html)

# And the politics...

Greenpeace's Crime Against Humanity

8 Million Children Dead

**GOLDEN  
RICE NOW**

[AllowGoldenRiceNow.org](http://AllowGoldenRiceNow.org)

**GOLDEN  
RICE NOW**

Thank you, **GREENPEACE** for  
ripping up Golden Rice fields.



Now, I'll never have to see a  
single baby seal being clubbed.

<http://www.skepticfriends.org> - <https://www.facebook.com/groups/GMOLOL/>

*THANK YOU, GREENPEACE*



*FOR SAVING US FROM GOLDEN RICE*

## Clicker question

- Farmers in 1900 comprised what % of US labor force?
  - A)  $<2\%$
  - B)  $2 - 17\%$
  - C)  $17 - 37\%$
  - D)  $37 - 47\%$

# Clicker question

- Farmers in 2000 comprised what % of US labor force?
  - A)  $<2\%$
  - B)  $2 - 17\%$
  - C)  $17 - 37\%$
  - D)  $37 - 47\%$

Most people have romantic notions  
of farming and food production



# Modern agriculture is actually...



- Intense but Sustainable Production Oriented

## US Agriculture

- Increased productivity since 1948 = 170%
- 1900 US agriculture workforce = 41%
- 2000 US agriculture workforce = <2%

[http://www.ers.usda.gov/media/259572/eib3\\_1\\_.pdf](http://www.ers.usda.gov/media/259572/eib3_1_.pdf)

<http://www.ers.usda.gov/data-products/agricultural-productivity-in-the-us.aspx>

# Status of GM Crops

## ■ USA

- Corn > 90%
- Cotton > 90%
- Soybean > 90%

■ Argentina: Soybean > 90%

■ Canada: Canola > 90%

■ India: Cotton > 90%

# Assurance of Safety

- Scientific studies overwhelmingly show the safety of GM foods and crops
  - Over 1,700 technical, peer reviewed studies in the literature, covering every aspect of GMO safety
  - Nicolia et al., 2013. Crit Rev Biotechnol. 1-12
  - <http://www.biofortified.org/genera/>
- The few studies purporting to show hazard have ALL been rejected on scientific grounds by the scientific and medical community
- **“No adverse health effects attributed to GE have been documented...”** *NAS 2004.*

# Scientific Consensus on Safety?

## ■ Generally positive

- \* US National Academies
- \* US Institute of Medicine
- \* American Medical Association
- \* British Royal Society
- \* Royal Society of Medicine
- \* EFSA
- \* EU Economic Commission
- \* World Health Organization
- \* AAAS
- \* American Dietetic Association
- \* International Seed Foundation
- Etc, etc...

## ■ Generally negative



## *Some Popular Misconceptions*

- GMOs are untested and unregulated
- GE violates Mother Nature's "species barrier"
- GMOs are all Patented by big companies
- GE foods cause tumors in test animals
- GE crops cause an increase in pesticide use
- Organic farmers may get GE contamination
- rDNA is 'fundamentally different' from traditional crossing, and so they must be more hazardous
- GMO crops and foods are banned in Europe.

# Variety release requirements: genetically engineered crops

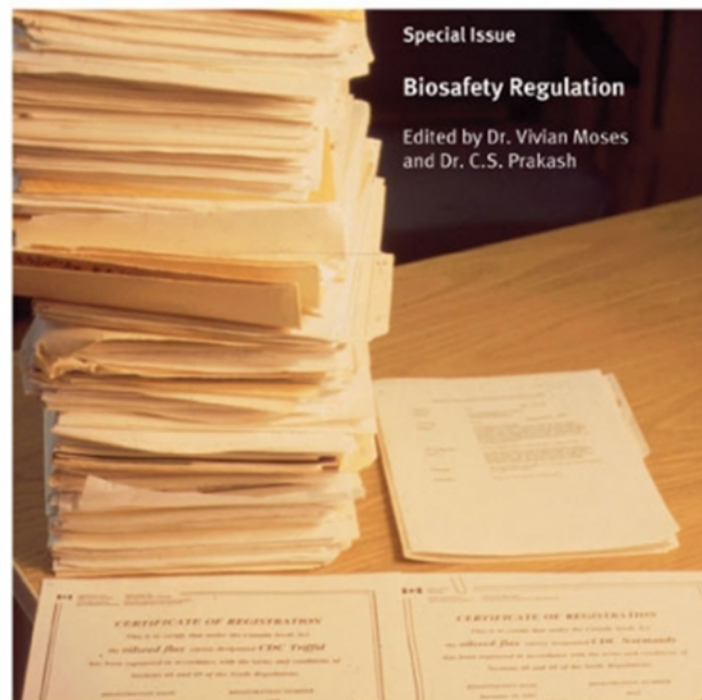
- USDA (APHIS) - environmental issues
- HHS (FDA)- food and feed safety
- EPA- pesticide usage issues



# GM CROPS & FOOD

*Biotechnology in agriculture and the food chain*

Volume 3 • Issue 1 • January/February 2012



Comparison of the 1997 documentation required for the approval in Canada of GM-silenced flax (on the left) versus its 'conventional' counterpart (right). Reproduced by courtesy of Professor Alan McHughen.

## Special Issue

### Biosafety Regulation

Edited by Dr. Vivian Moses  
and Dr. C.S. Prakash

## Editors-in-Chief

Dr. Naglaa A. Abdallah  
*Cairo University*  
Dr. C.S. Prakash  
*Tuskegee University*

## Co-Editor

Dr. Vivian Moses  
*King's College London*

## In this issue:

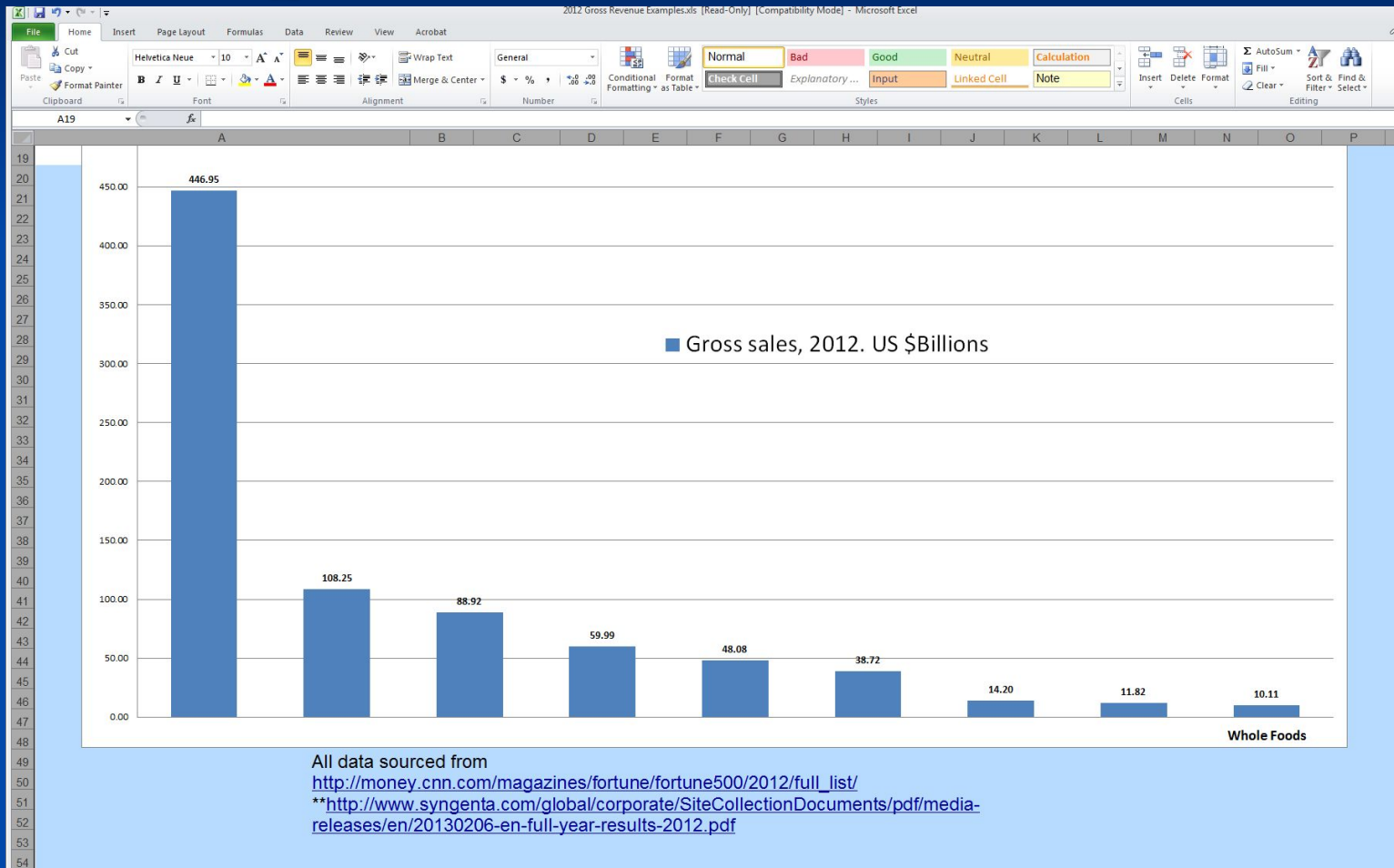
- Introduction by Alan McHughen
- Objectives and barriers to commercializing GM crops under EU regulations, Alan Raybould and Guy M. Poppy
- Gene technology regulation in Australia, David Tribe
- GM food regulation in the UK, Derek Burke
- European attitudes to biotechnology regulation, Mark Cantley
- Regulation of GM crops in Argentina, Moises Burachik
- The costs of compliance with biosafety regulations in developing countries, Jose Falck-Zepeda et al.
- Regulation and litigation in North America, Thomas Redick
- Biosafety regulation and biotech development in Africa, David Wafula et al.
- The emerging international regulatory framework for biotechnology, John Komen



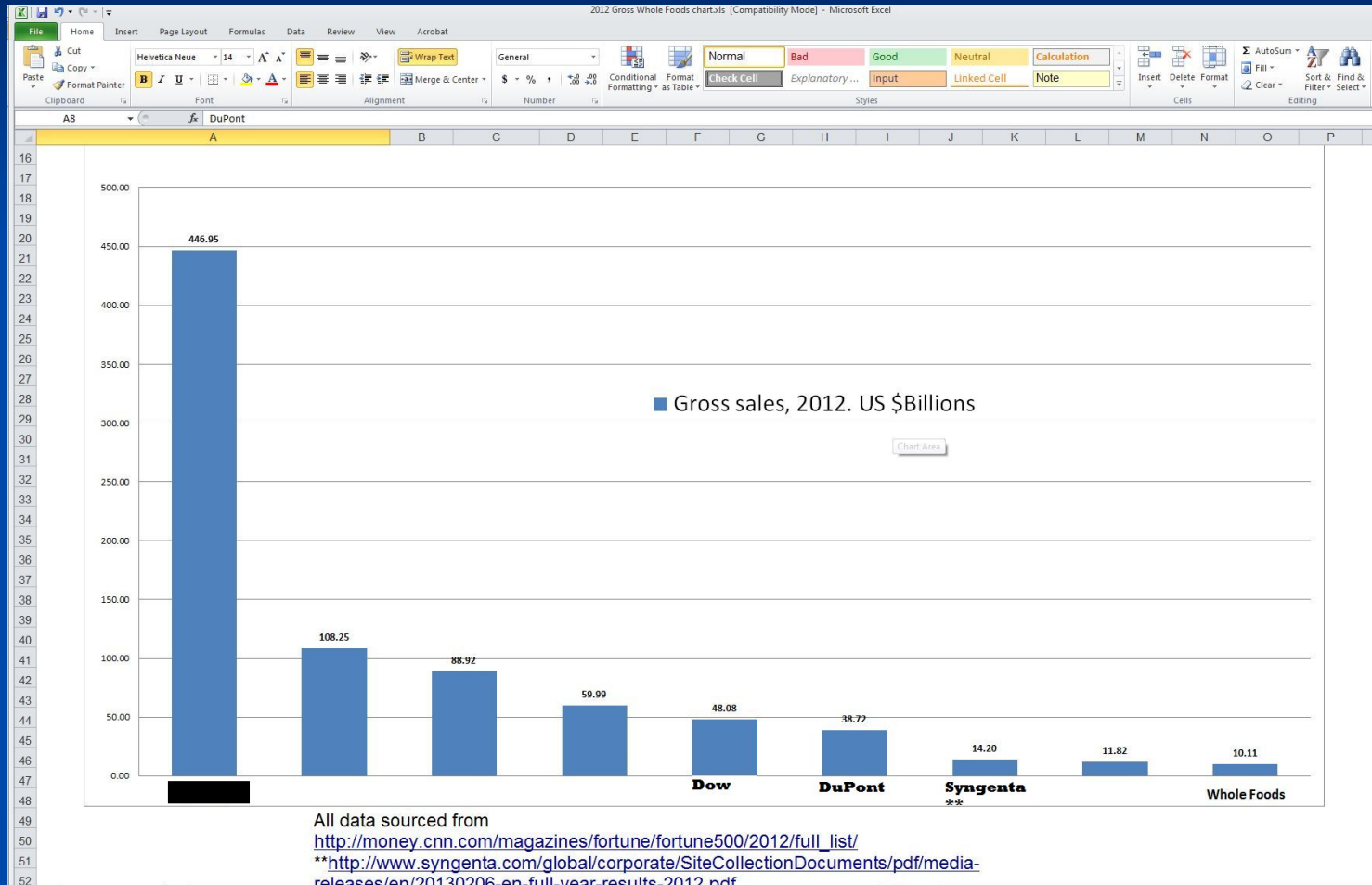
# Common Complaint

- “GMOs are designed only to make even more money for Monsanto, already a huge corporation with so much money they can corrupt politicians, academic scientists and even voters. People should support organic farmers and smaller companies like Whole Foods”.

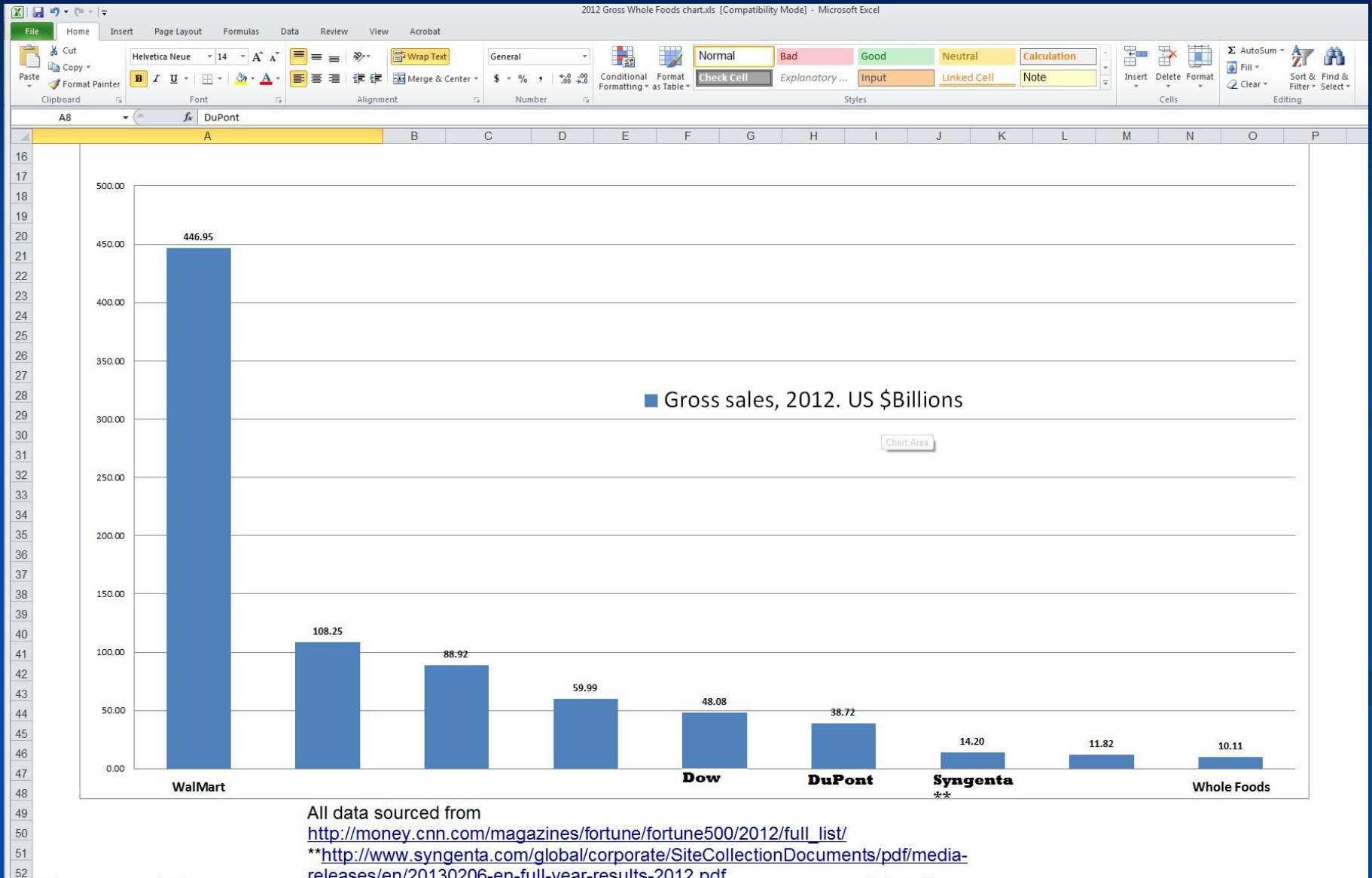
# Comparison of some big companies, Gross sales 2012



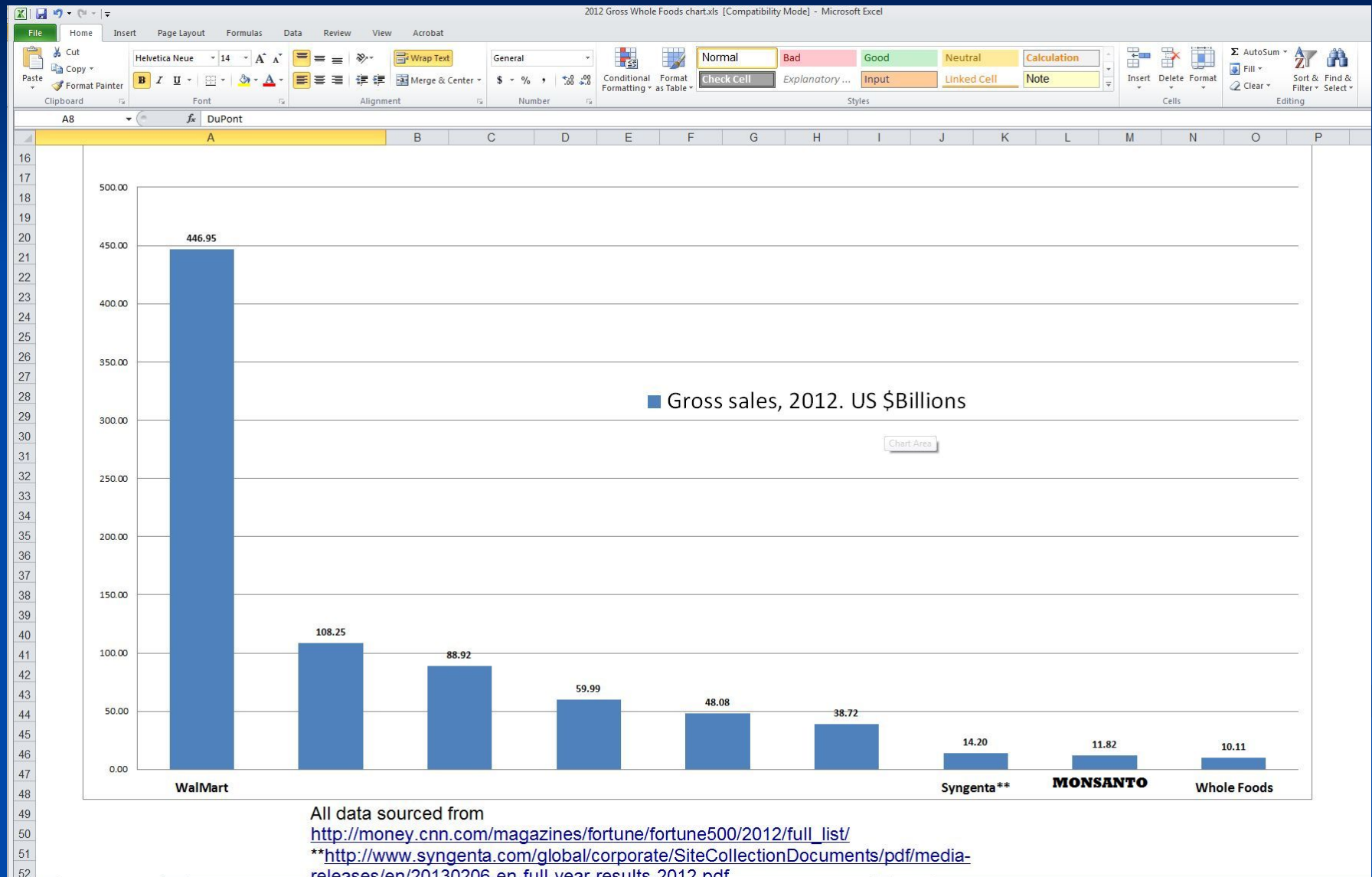
# Adding some GMO companies...



# And the reveal...



# And where's Monsanto?



# Organic Misconceptions

- Certified US Organic acreage (2007 figures)
  - 2,285,643ac out of total ac 406,424,909
  - < 1% of US farmland is certified organic
- Certified Organic US Farms (2007)
  - 11,367 farmers out of total 2,200,000
  - <1% of US farmers are certified organic
- Globally, Organic food is ~2% of sales, but costs *ca.* 20-30% more than conventional food
- Organic food serves a specialty niche market.

# Organic: Feeding the 1%

- Not safer
- Not pesticide free
- Not better nutrition
- Not better for environment
- Not as productive per unit area (acre, hectare, etc)
- Can feed only 3-4 Billion humans worldwide
- IS more expensive!

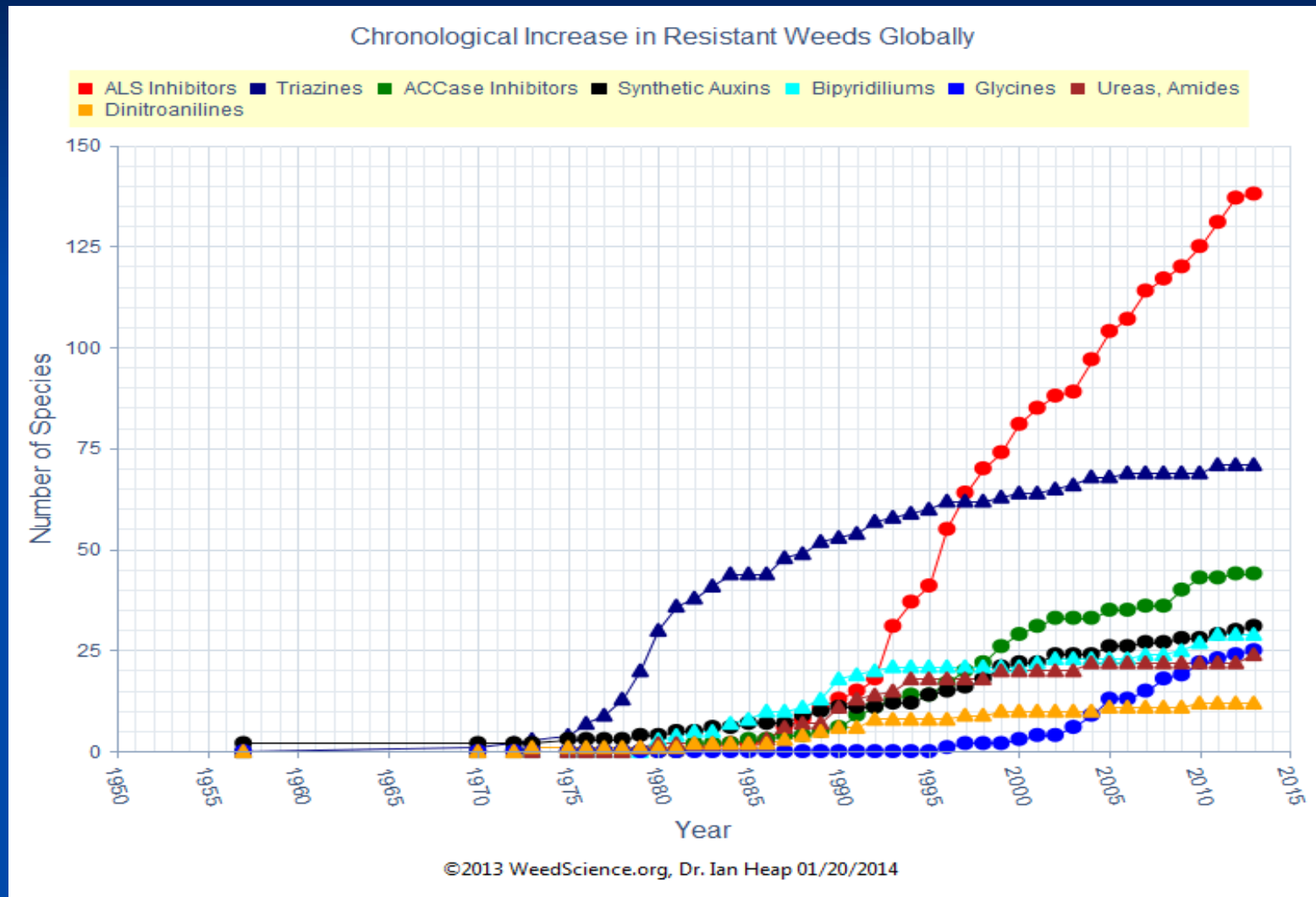
# Hunger = Poverty

- No rich person goes hungry (involuntarily)
- The ‘redistribution’ myth
  - *“The world has plenty of food, but it’s not distributed evenly”*
  - *“The world has plenty of wealth, but it’s not distributed evenly”*
- The solution is NOT redistribution
- The solution is to increase either wealth or food
  - As supply of food increases, demand/cost goes down
  - As food costs drop, more poor people can eat better
  - Reducing the cost of food increases wealth everywhere.

## *Another popular misconception*

- “GM Crops lead to herbicide resistant Superweeds!”
- “Roundup Ready crops allow the farmers to douse the crops with massive quantities of glyphosate...
- Weeds evolve resistance to the herbicides, forcing the farmer into a vicious cycle of ever-increasing herbicide applications...
- Until the weeds cannot be controlled at all, as has happened in the US with RR pigweed.”

# Herbicide resistant weeds



# Misconceptions lead to policies that are humorous or symbolic

- Mendocino County, California bans GE crops
  - and reclassifies DNA as protein
- GMO foods cause sterility in 350K couples in Serbia ([http://english.ruvr.ru/2012\\_12\\_27/Are-GMOs-sterilizing-Serbia/](http://english.ruvr.ru/2012_12_27/Are-GMOs-sterilizing-Serbia/))
- Philippine judge rules Bt Corn responsible for marriage breakdown and grants divorce
  - Because the husband walked through a Bt cornfield
  - And turned gay.

## Or Tragic

- Zambia 2002 GM food: “poison”
- Terminator gene in Indian Bt Brinjal
- B-Carotene enhanced “Golden” rice.

# Do people have a 'Right to Know' what's in their food?

A. Yes

B. No

# If YES, what about...

- Recipe for Coca-cola™?
- Ingredients in Kentucky Fried Chicken ?
- Why not mandatory labels on Organic foods?
- Why not pesticides, induced mutagenesis, etc.?
- Why not biological contaminants, like *E. coli* ?
- There is **no** codified “Right to Know”
- Instead, people have a right to safe food and product/compositional/safety info labels
- And the right NOT to buy a given product.

# Mandatory Food Labels

- Current US policy
  - Labels must be truthful and not misleading
  - Labels for content, not process
  - Nutritional information, + allergens and toxicants
  - Changes from standard/traditional versions
  - Independently verifiable
- Most GM foods have no detectable GE DNA
- Those with composition changes must have labels.

# Mandatory Process Based Labeling: Economics

- Process based labeling shifts the entire label policy from \*Product\* to \*Process\*
- But Process cannot (always) be verified
  - Foods with no physical GM components (oil, sugar)
  - Imported foods cannot be included
- Once one process (GM) is labeled, no basis for denying others (e.g. Organic, Union, Left-handed)
- Cost of process-based labels is substantial
- Who bears the cost?

# Refined sugar in the USA

- Cane sugar: ca. 50%
- Sugar beet: ca. 50%
- In both cases, refined sugar is sucrose:  $C_{12}H_{22}O_{11}$
- No GE sugar cane on the US market
- 95% sugar beet GE; so almost half sugar eaten is GE
- No current label to specify cane vs beet source
- Cannot verify GE sugar in foods; **Label is useless**
- **Also true for vast majority of 'GE' foods (oil, etc.).**

# Biotech beef tomatoes? from Holland?



# Sodium free?



# Diet Water?

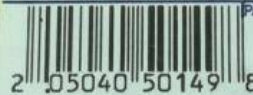


# “Truthful and not misleading”?





WATERMELON



PACKED ON | SELL BY | WT./LBS

1.49

1.00

1.49

08/21

PRICE PER LB.

TOTAL \$ PRICE

COMPARE FOODS  
1883 MADISON STREET QNS

# GE perspectives

- By 2050, when 9+ Billion people inhabit Earth, we need 70% more food than is produced today.
  - This means using *every* available tool, including GE
- Wherever farmers have been allowed to grow GE crops, they have been successful
- There are NO verified incidents of any harm, to either health or environment, due to GE crops and foods.

# The GMO Train...

hop aboard or get run over...?



## Clicker question

- Worldwide, how many people died of hunger while I was speaking today?
  - A)  $\sim 200$
  - B)  $200 - 700$
  - C)  $700 - 1000$
  - D)  $< 1,000$

# GMOs and Public Policy

- Scientific fact is not subject to democracy or the fleeting whim of popular fashion
- Leadership in a free democracy does NOT mean:
  - Giving people the policies they say they **want**,
  - Or referenda, majority vote, popularity, etc.
- Instead, Leadership means
  - Giving people policies they **need**, based on
  - Critical analysis of valid science and evidence
  - **Especially when the policy is unpopular!**

**Should people ignorant of issues  
be allowed to vote?**

A. Yes

B. No