



## Healthy Soil, Who Cares?





**HEALTHY SOIL = HEALTHY FOOD = HEALTHY PEOPLE**

**- J.I.Rodale**



**“The health of soil, plant, animal and man is one and indivisible.”**

**— Sir Albert Howard**



## It's Not Only About Yields

## It's About the SOIL!



**“To be a successful farmer one must first  
know the nature of the soil.” –**

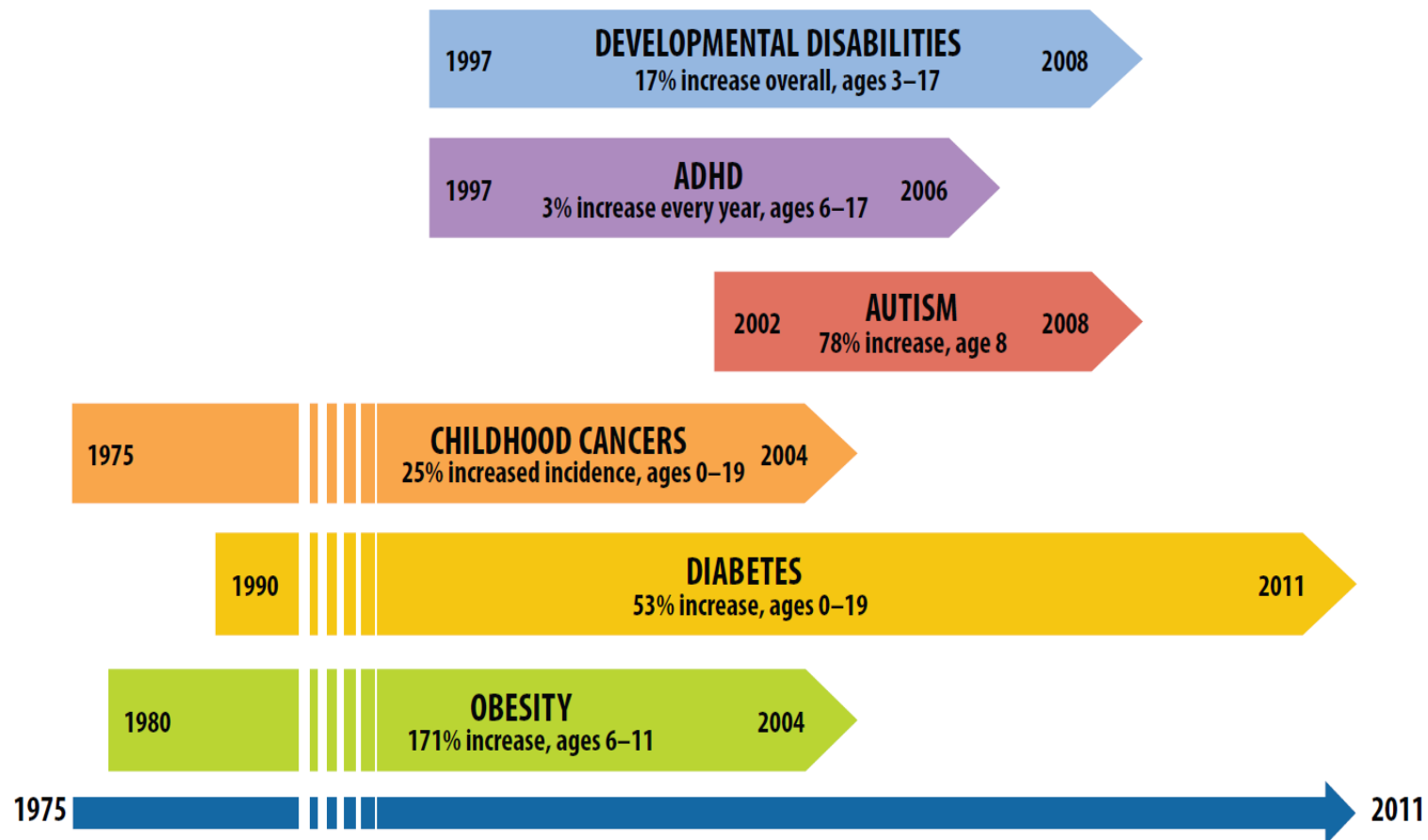
***Xenophon, Oeconomicus, 400 B.C.***

# Farming and human health discussion must start with pesticides

## Health and Nutrition: Improving Human Health and Nutrition

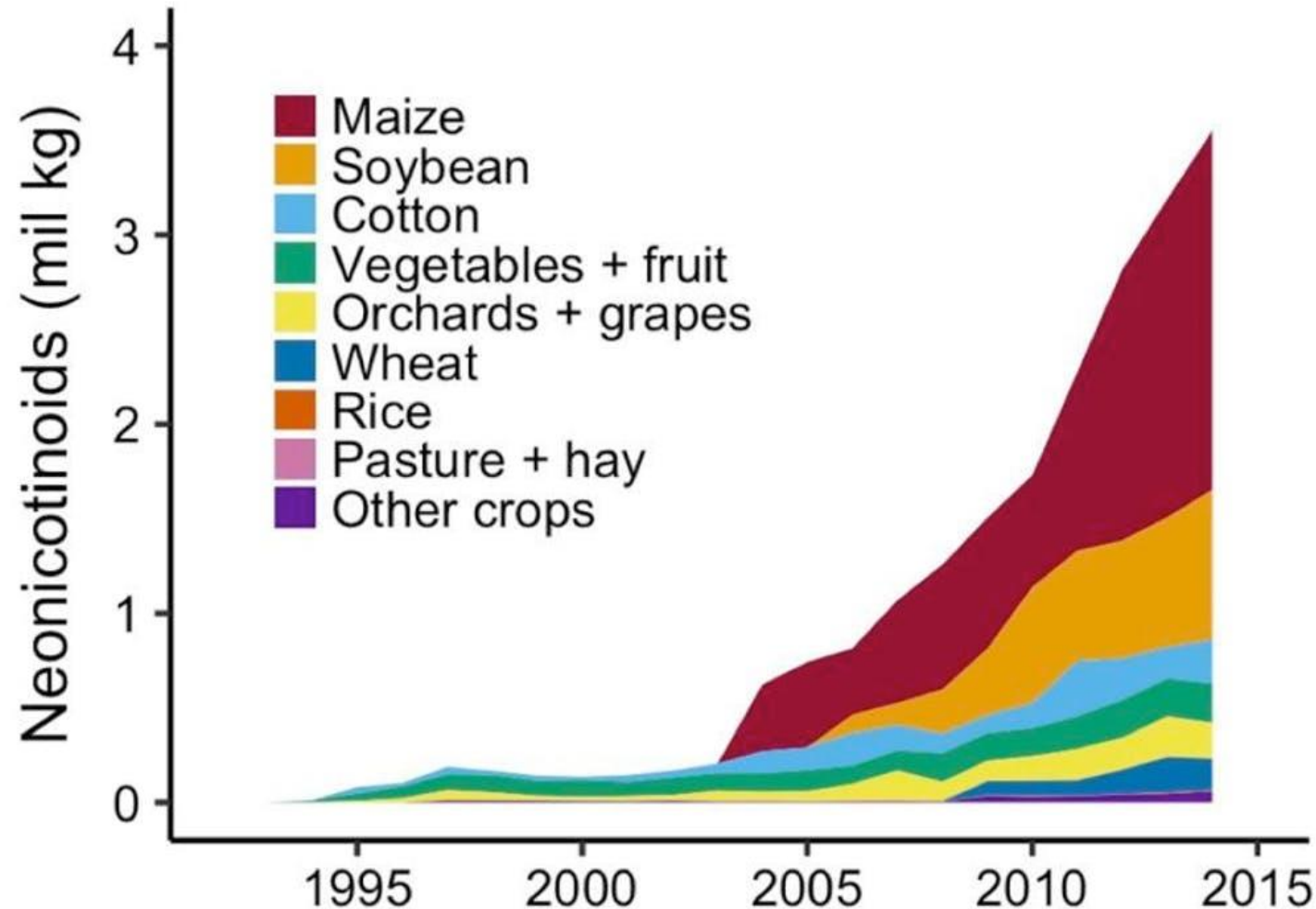


# HEALTH AND NUTRITION





## Recent rise in systemic insecticides – highly water soluble



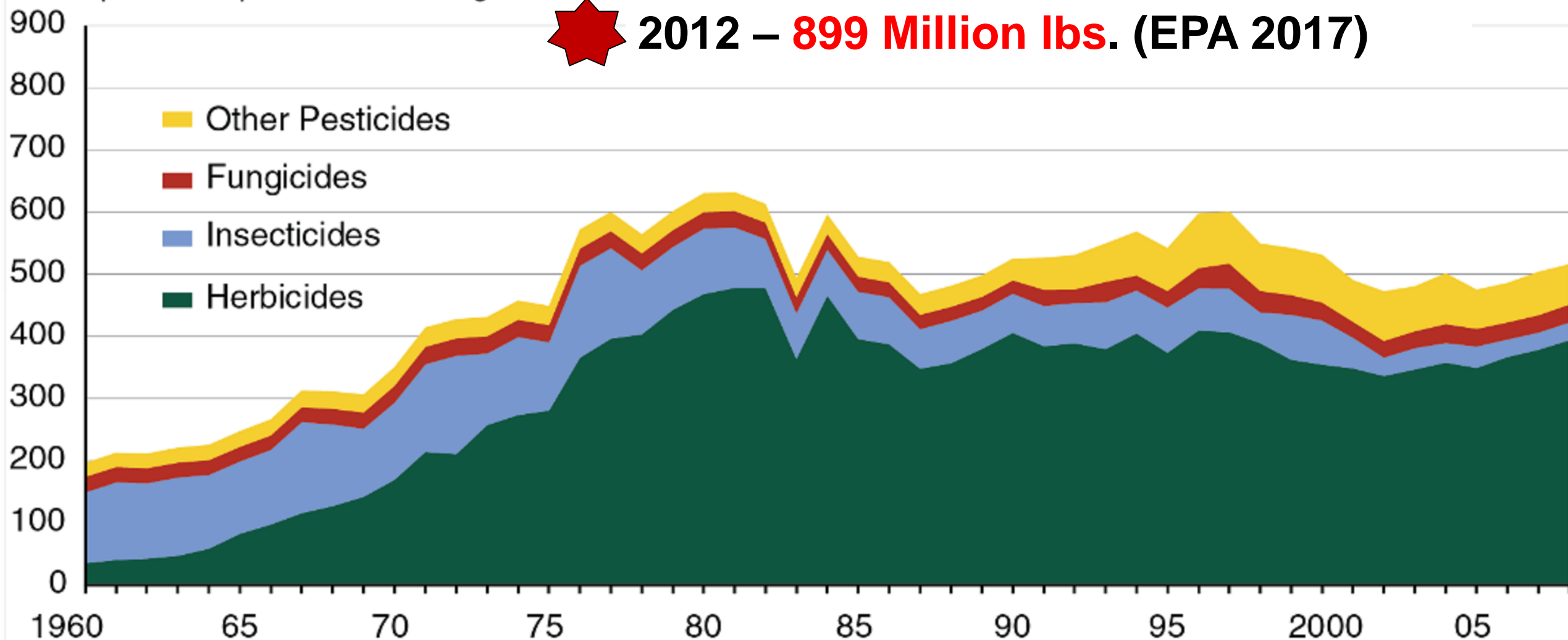
[Tooker, Douglas, Krupke, 2017, doi:10.2134/aer2017.08.0026,](https://doi.org/10.2134/aer2017.08.0026)

- USDA study found no economic benefit \$\$USD in soybeans from systemic seed treatments.
- Tooker et al. 2016 – in Pennsylvania soybeans - seed treatments disrupt natural enemies, increase slugs, and reduce yields.
- No economic benefit, substantial environmental detriment and health risk

Figure 1

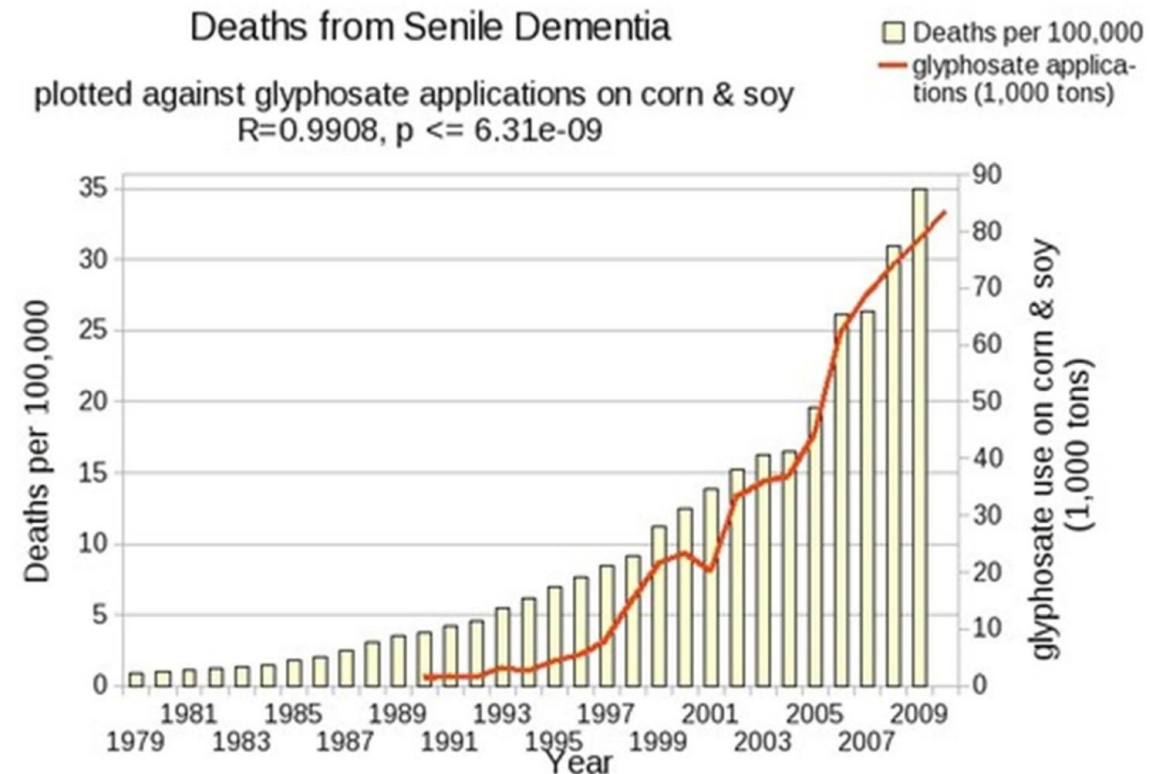
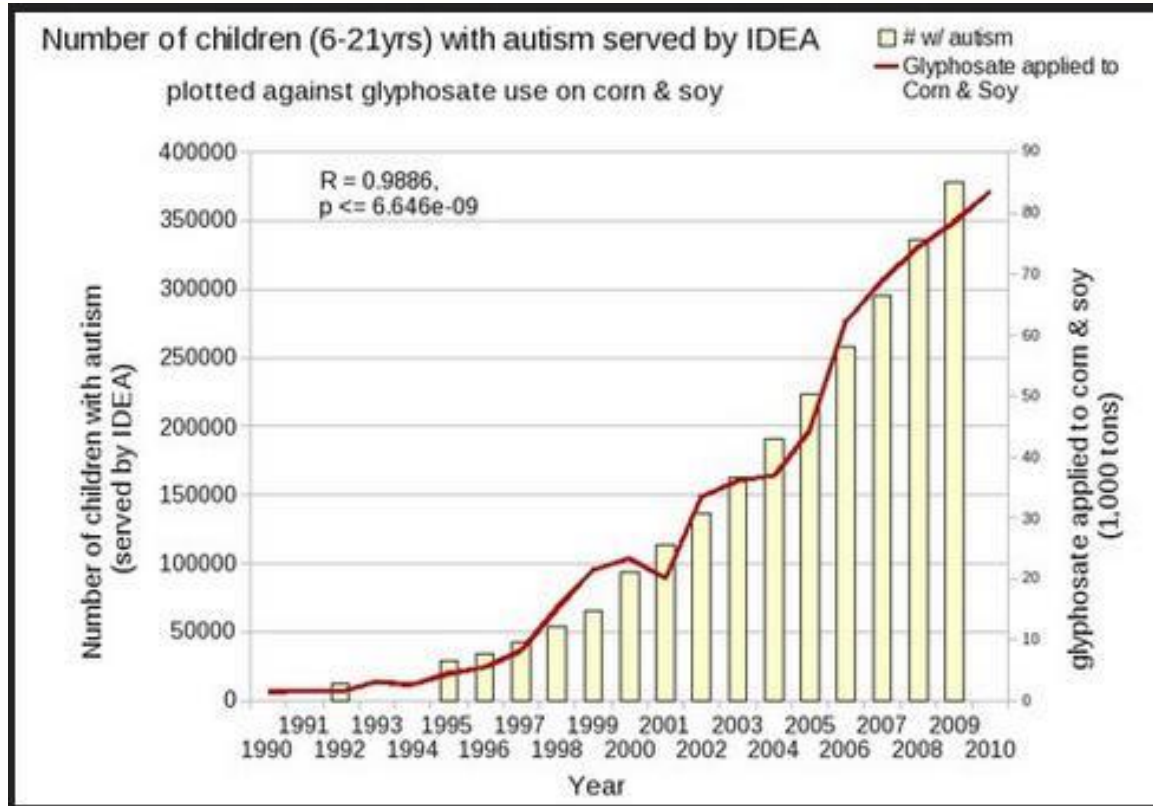
# Pesticide use in U.S. agriculture, 21 selected crops, 1960-2008

Million pounds of pesticide active ingredient



Source: Economic Research Service with USDA and proprietary data. See Appendix 2.

# Neurological Diseases Plotted Against Glyphosate Use





# HEALTH AND NUTRITION

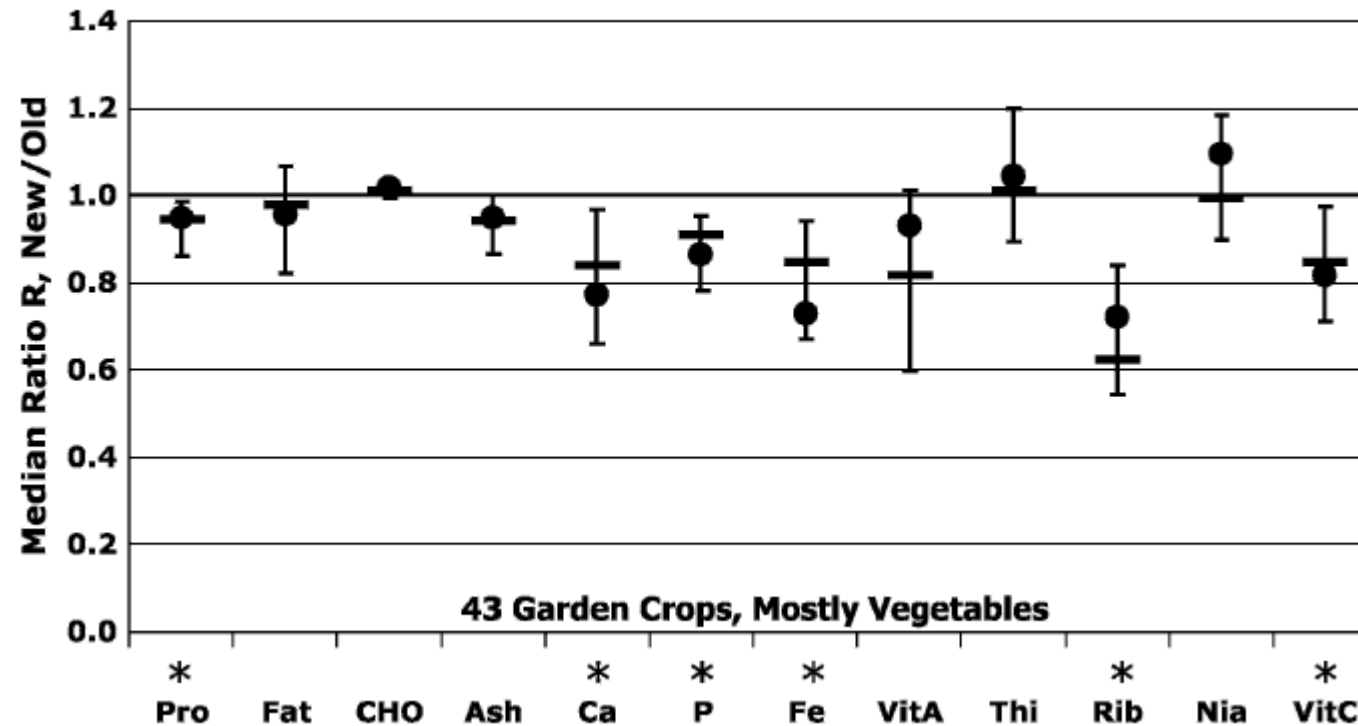
## -Food as Medicine-

### Expenditures (\$USD)

Year	Food	HealthCare
1960	\$74.6 million	\$27.2 million
2017	\$1.5 trillion	\$3.2 trillion

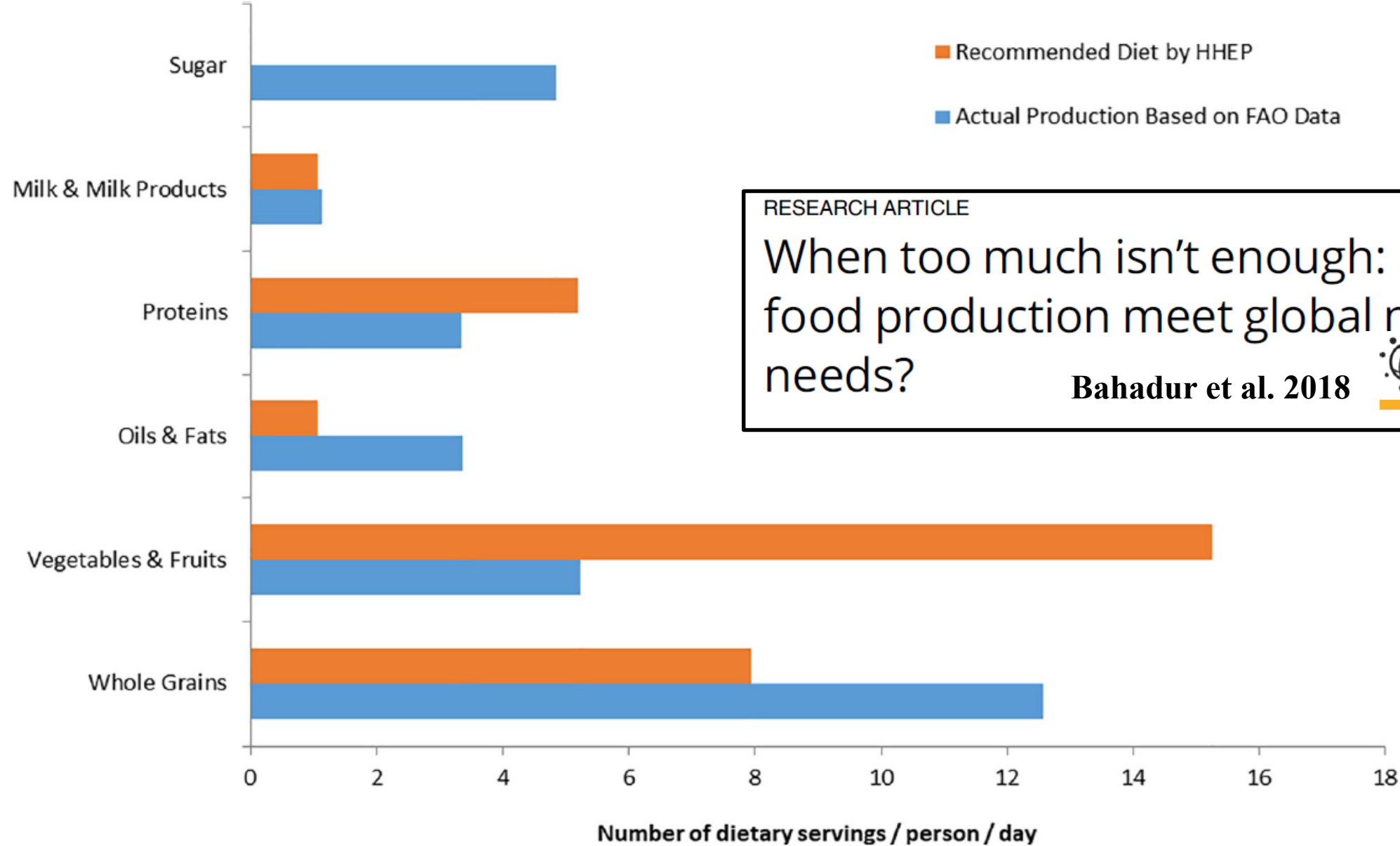
# HEALTH AND NUTRITION

Change in fruit and vegetable nutrient status from tests in 1950 and 1999.



Davis 2009, based on USDA nutritional data

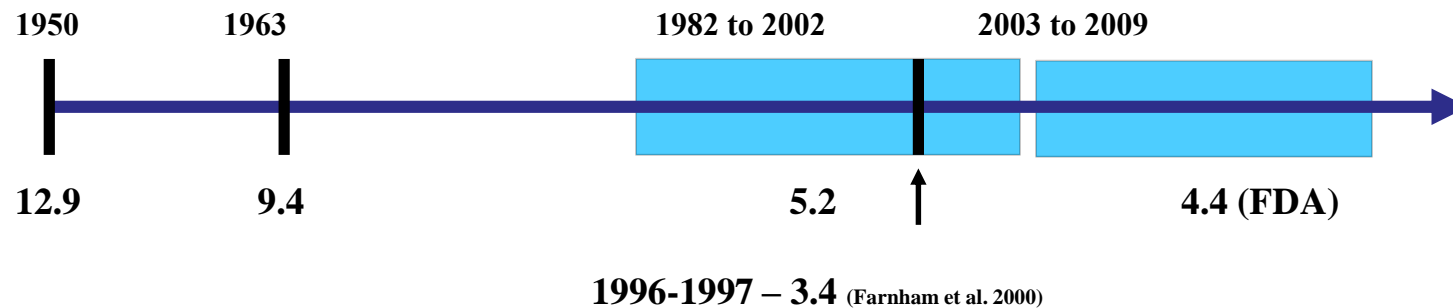




**Fig 1. Global production versus recommended consumption.** Global food production (blue bars) are from FAO (2011) data and nutritional recommendations (orange bars) are based on Harvard University Healthy Eating Plate model. All data are displayed in dietary servings following the CFG [17] and USDA guidelines [23].

# HEALTH AND NUTRITION

## Calcium concentrations in Broccoli (mg/g)



In a study of 27 commercial varieties, there was a significant inverse relationship between Head Weight (Yield) and Magnesium (-1.3) and Calcium (-1.7) concentrations.

Farnham et al. 2000



# HEALTH AND NUTRITION: ORGANIC PRODUCTION

*British Journal of Nutrition* (2014), **112**, 794–811

doi:10.1017/S0007114514001366

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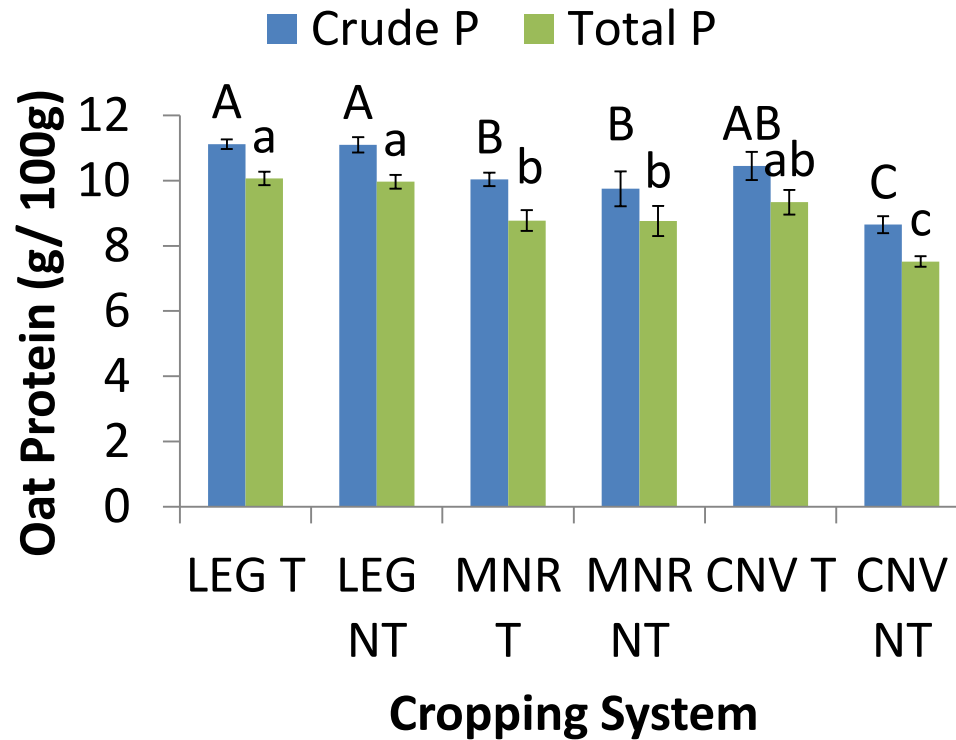
## Higher antioxidant and lower cadmium concentrations and lower incidence of pesticide residues in organically grown crops: a systematic literature review and meta-analyses

Baranski et al. 2014

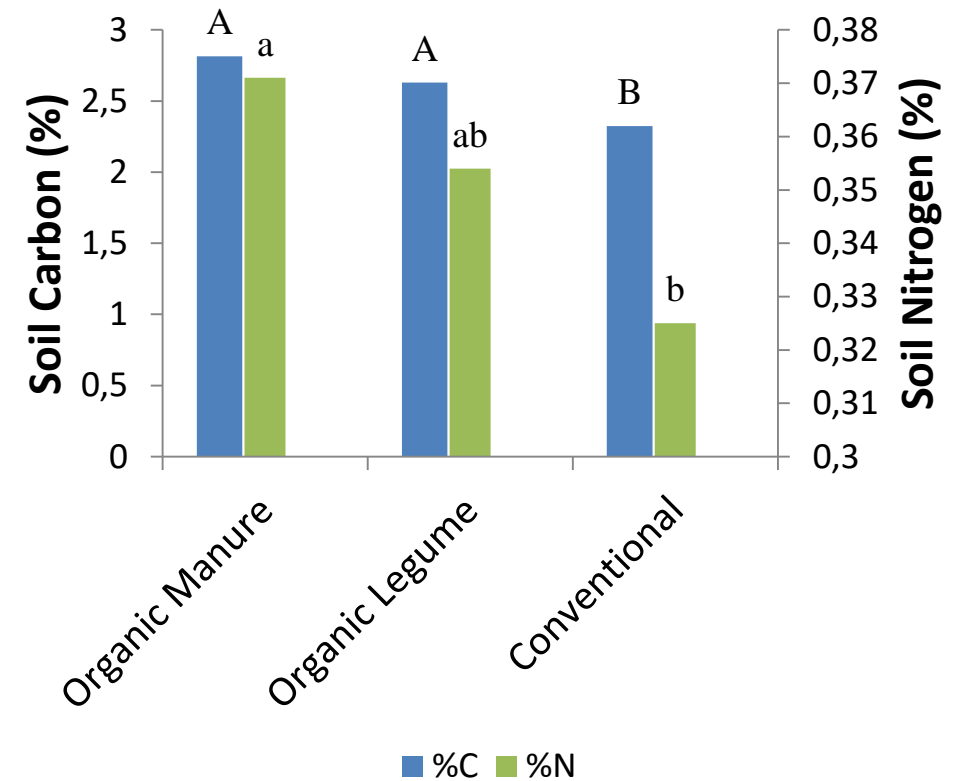
- Higher total antioxidant activity, polyphenols, xanthophylls, ascorbic acid, carotenoids and lutein in organic crops
- Lower protein, amino acid, and fiber in organic cereals.
- Higher cadmium, nitrate, and nitrite in conventional cereals.
- 4x higher pesticide residues in conventional crops.



# HEALTH AND NUTRITION – Farming Systems Trial



CNV – Conventional; MNR – Organic Manure; LEG



- Ergothioneine and Beta-Glucans seem to be impacted by tillage



## HEALTH AND NUTRITION: Test Case

### **Ergothioneine (ERGO):**

- Naturally occurring antioxidant
  - Anti-inflammatory,
  - Accumulates in cells and tissues,
  - potential to mitigate neurodegenerative diseases
- Only synthesized by fungi and fungi-like bacteria
- Unknown how enters and moves within plants.



Ergothioneine highest in mushrooms but exists in many foods.

## HEALTH AND NUTRITION: Test Case

### **Ergothioneine (ERGO):**

- Rodale Institute and Pennsylvania State University currently measuring ERGO levels in oats and wheat grown in FST.
- Simultaneously measuring ERGO levels in the soil. (never been done before)
- Preliminary data suggests:
  - Tillage plays an important role – less is better
  - Broadleaf weeds and not grass weeds may impact crop uptake. Needs well designed, controlled study.



# Linking Soil Health To Cancer

CHECK YOUR SYMPTOMS

FIND A DOCTOR

FIND LOWEST DRUG PRICES

WebMD

HEALTH A-Z

DRUGS & SUPPLEMENTS

LIVING HEALTHY

FAMILY & PREGNANCY

NEWS & EXPERTS

Let us fight for you.


Become a patient

THE UNIVERSITY OF TEXAS MD Anderson Cancer Center Making Cancer History

MENU

Cancer > News >




TRIPLE ACTION RELIEF






## Global Cancer Rates Set to Soar by 2030

Cancer Prevention Steps May Help Stem Rise in Cancer Rates

By Denise Mann

FROM THE WEBMD ARCHIVES

May 31, 2012 -- Worldwide **cancer** rates are set to jump more than 75% by 2030.

And these rates may increase even further -- by 90% -- among less developed countries, according to what one leading New York City **cancer** doctor calls an "eye-opening" new report in the journal *Lancet Oncology*.

If the new predictions hold, 22.2 million new **cancer** cases will be diagnosed in 2030, compared with 12.7 million in 2008.

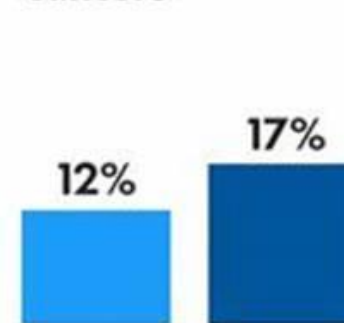


## CANCER RATES RISE IN GEN X AND MILLENNIALS

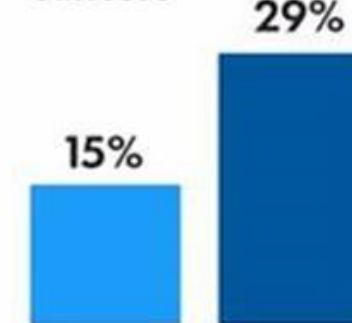
People under age 55 make up an increasing share of colon and rectal cancer cases in the United States:

● 1990 ● 2013

Share of colon cancers



Share of rectal cancers



SOURCE Journal of the National Cancer Institute  
Kari Gelles, USA TODAY

USA TODAY

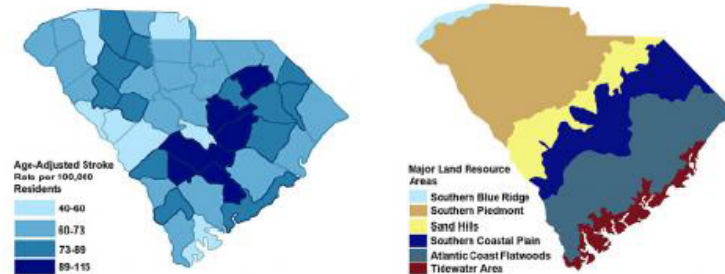
**Purple Majesty – anthocyanin – colon cancer**

Based on this, the researchers hypothesize that Coastal Plain residents might be at higher risk for stroke because of the prevalence—or perhaps lack—of specific microbes in the region's moist, acidic soils.



## USDA study hints at possible links between soil characteristics and stroke risk

23 August 2013, by Ann Perry



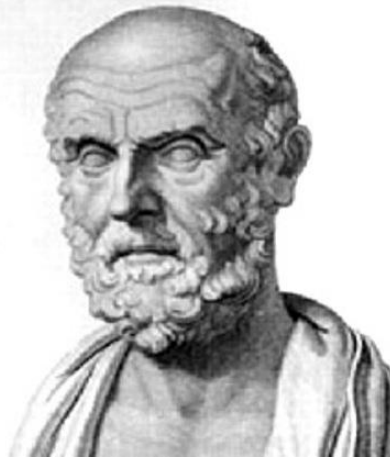
Scientists from ARS and the Medical University of South Carolina compared South Carolina stroke data to soil characteristics. They found links between the counties that have the highest stroke risk (40-60) and the counties that

Belt later. He had identified some very intriguing trends, but he did not fully understand what might be driving those trends.

"Over the past 30 years, I've been involved with research projects focused on racial and geographical disparities in stroke risk," Lackland says. "One of the major objectives of these investigations is to identify factors associated with the high stroke risk in this part of the country. Unhealthy lifestyle and the Southern diet are often proposed as reasons for the disparities. But similar high-fat and high-carbohydrate diets are seen in other parts of the country. So we must study other factors."



# Hippocrates



460 to 370 BC

**“A physician should know something about the soil  
where a patient’s food comes from”**

# Healthy Soil – We All Should Care



## CONTACT

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