

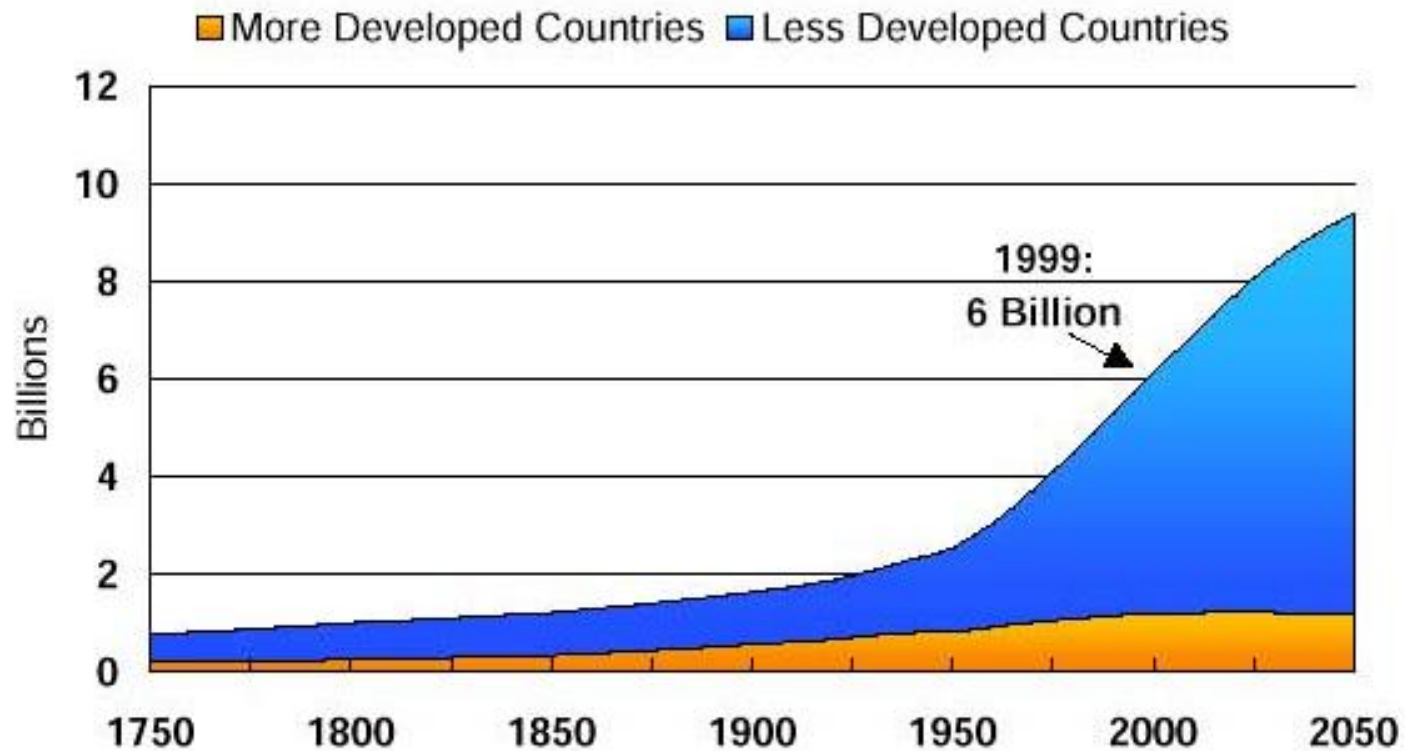
Food for all forever

The challenge of sustainable agriculture

Michael Bomford

More People...

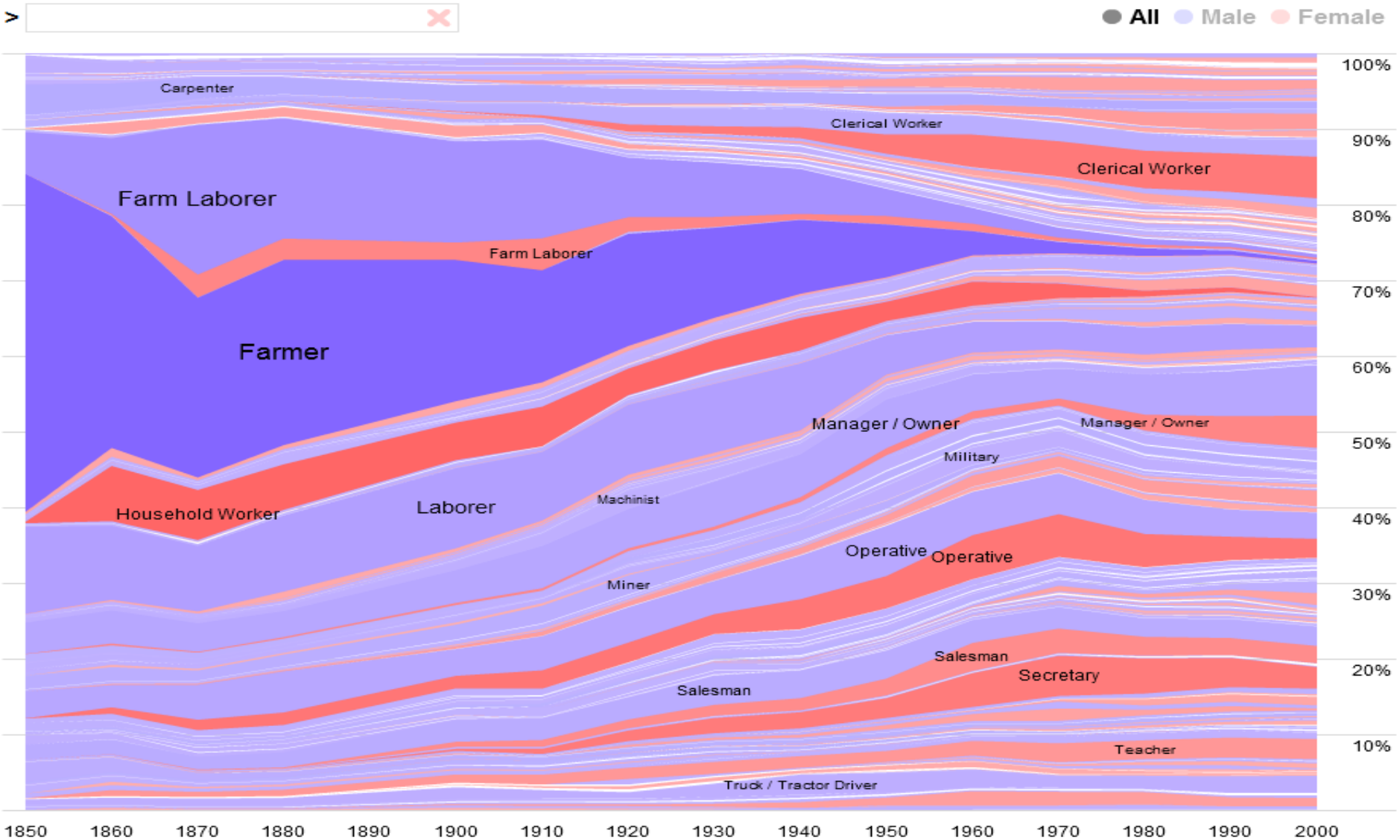
Population growth, 1750-2050



Sources: Before 1950: PRB estimates; 1950-2050: UN, *World Population Projections to 2150*, 1998 (medium scenario).



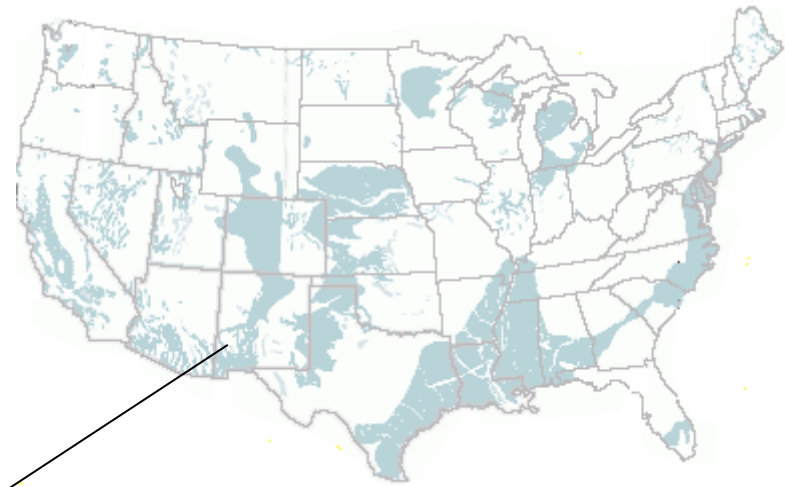
Fewer Farmers...



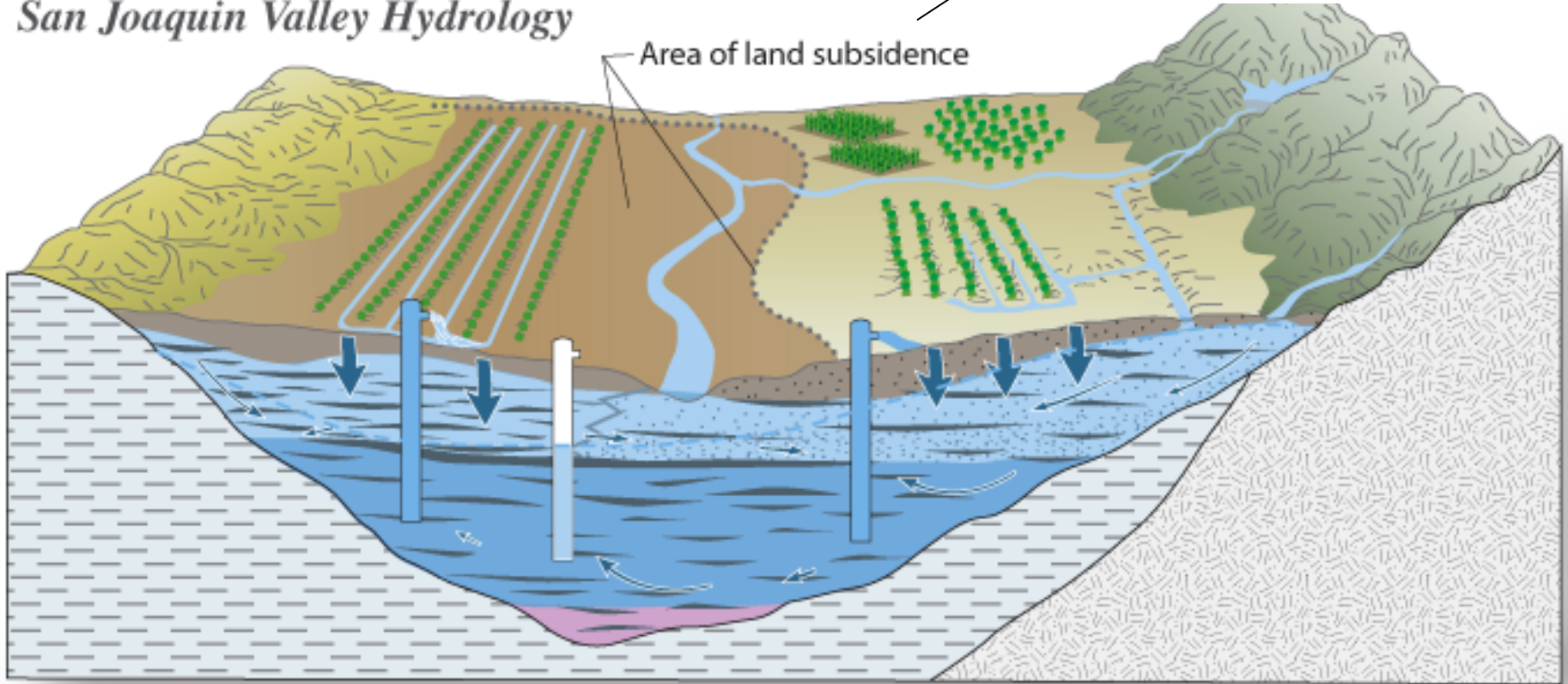
Less Soil...



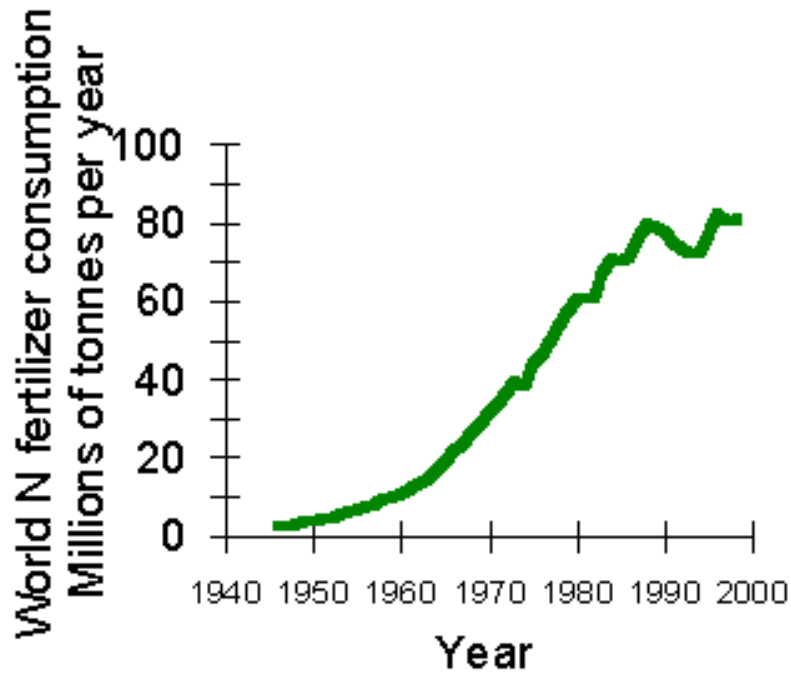
Less Water...



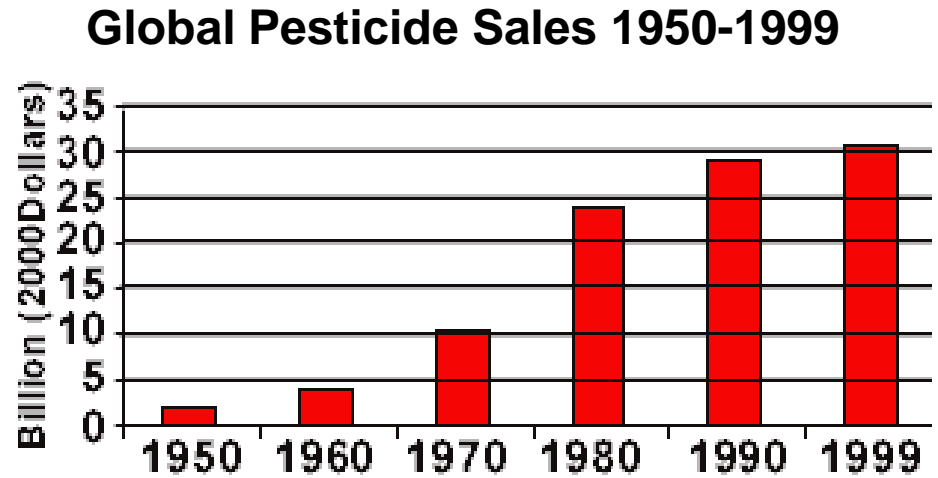
San Joaquin Valley Hydrology



More Fertilizer & Pesticide...

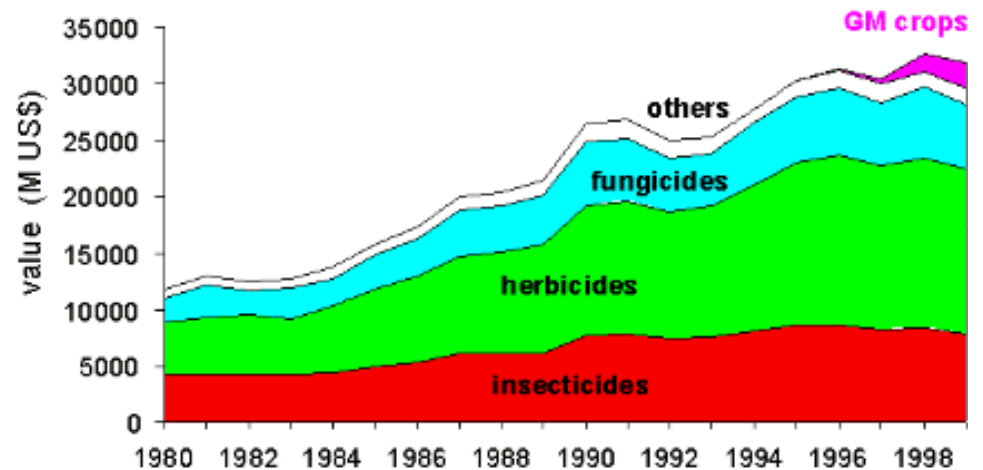


Source: Vaclav Smill



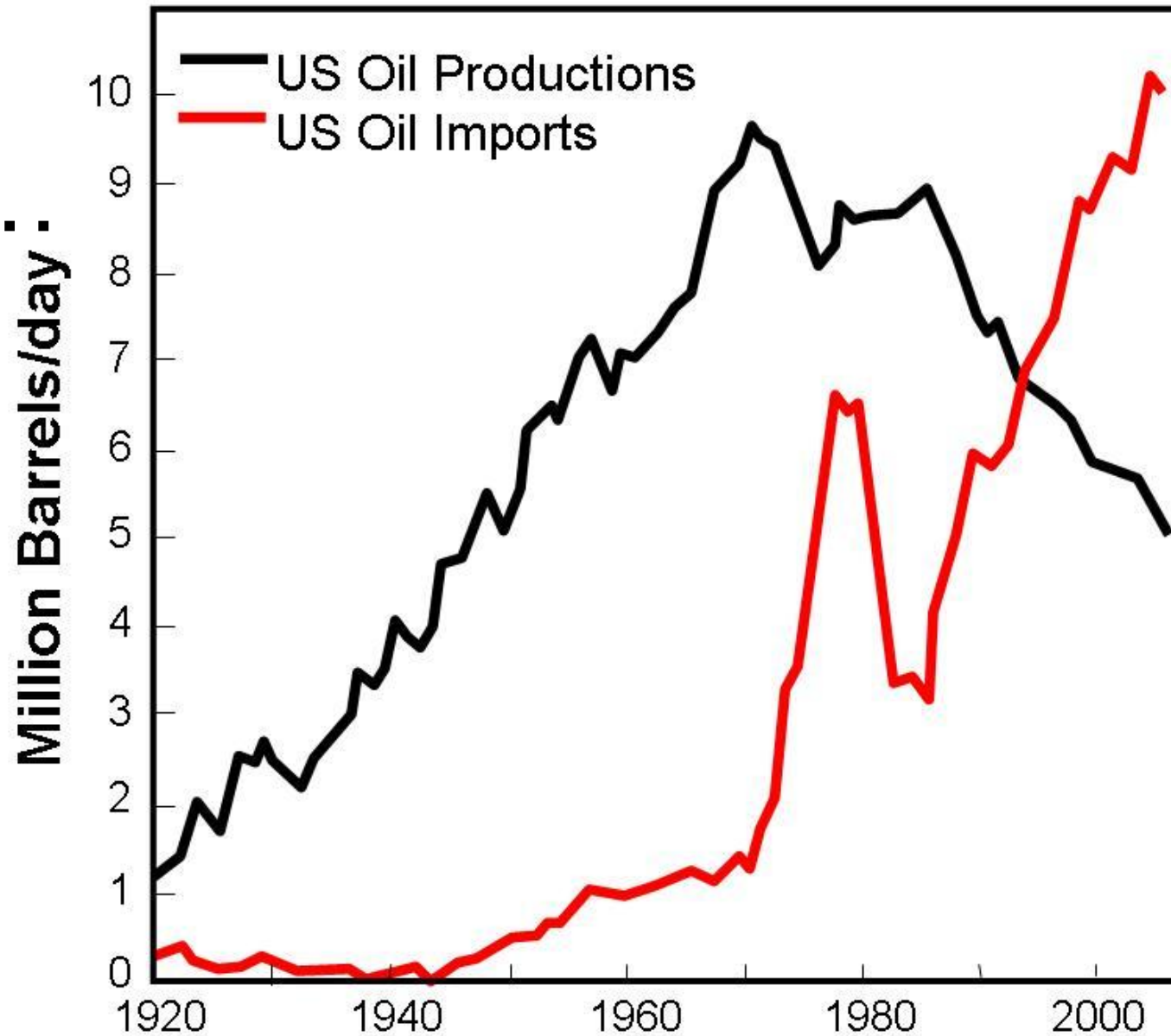
Source: Agronova

Annual World Pesticide Sales 1980 -1999

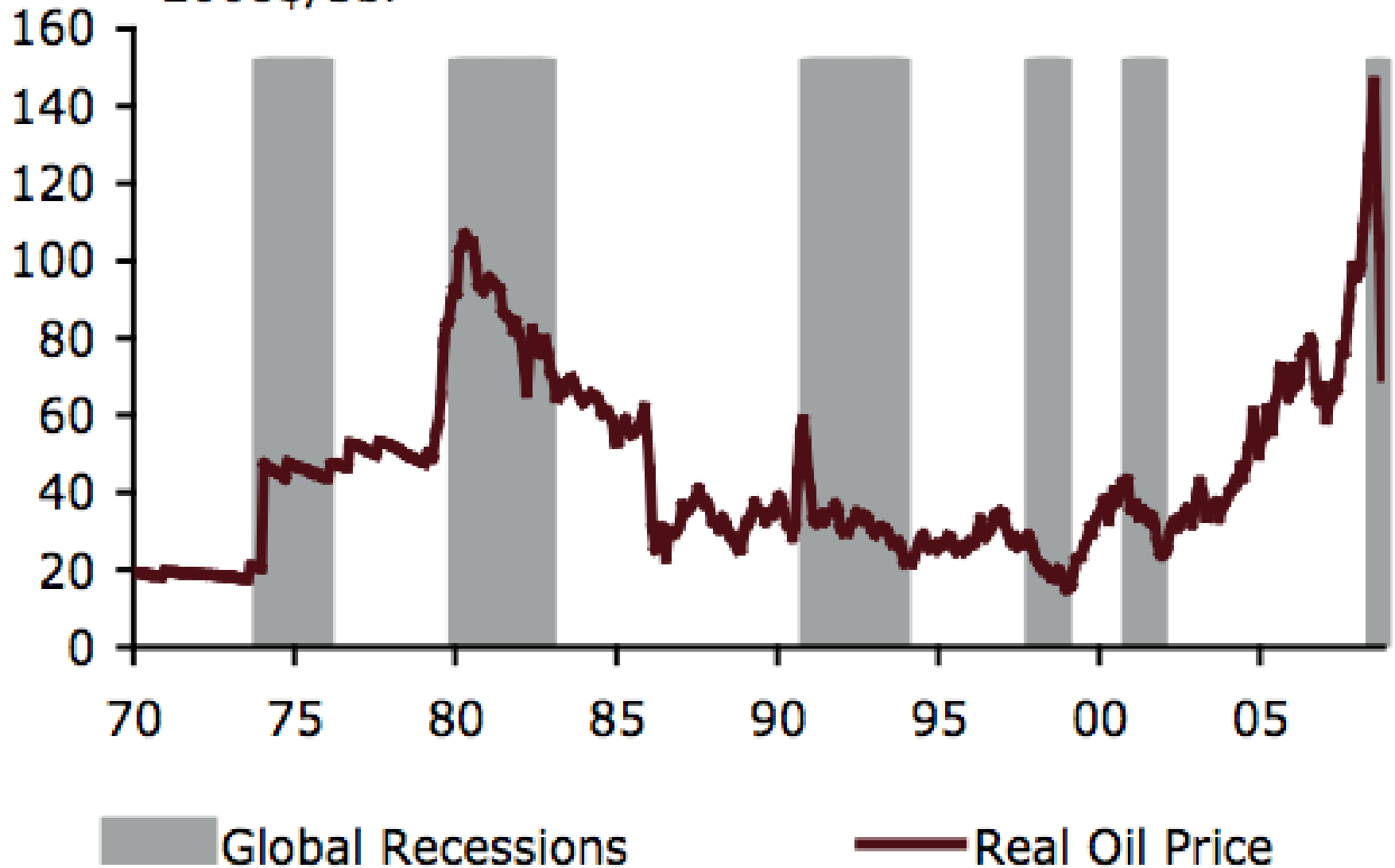


source: British Agrochemical Association Annual Reports

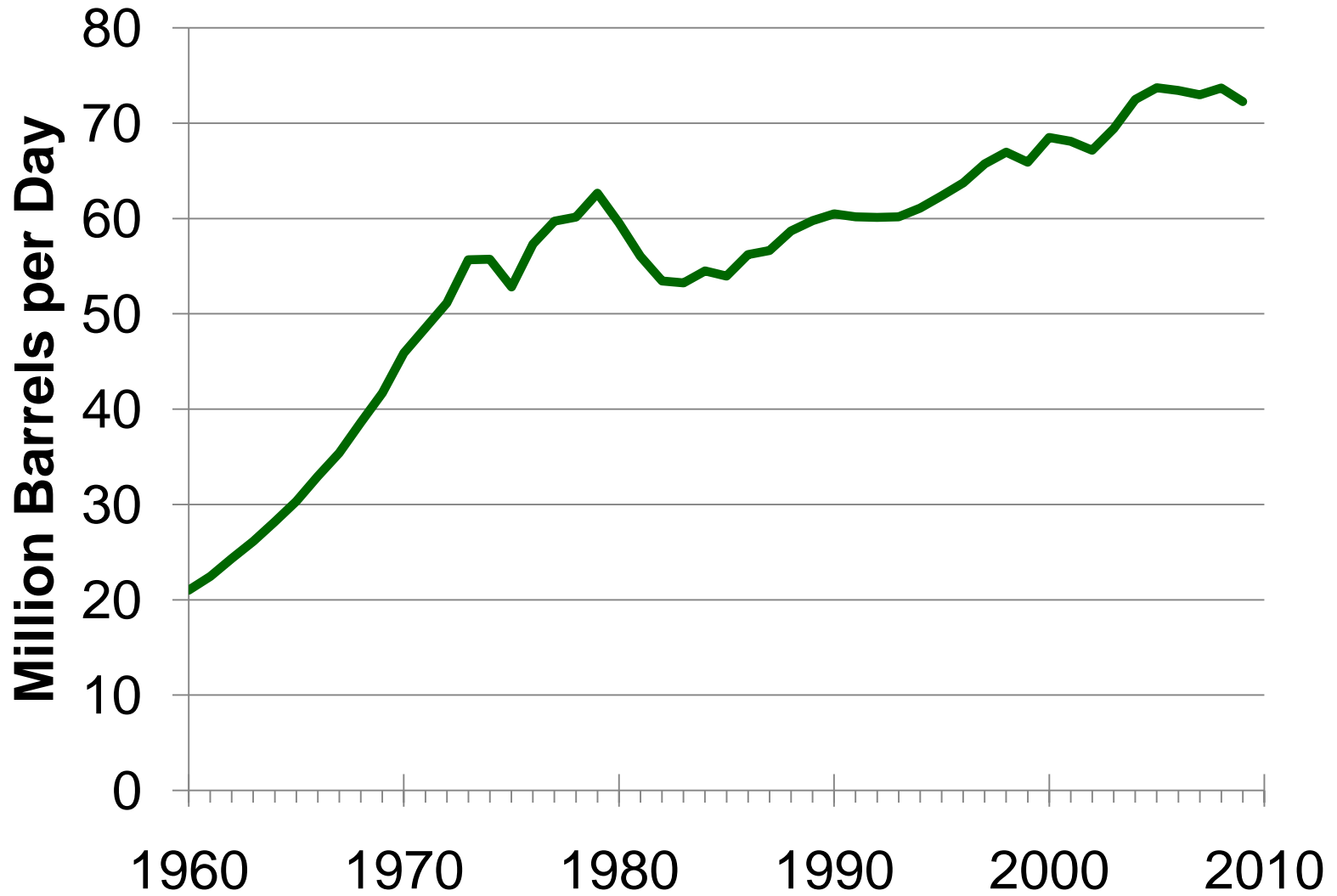
Less Energy...



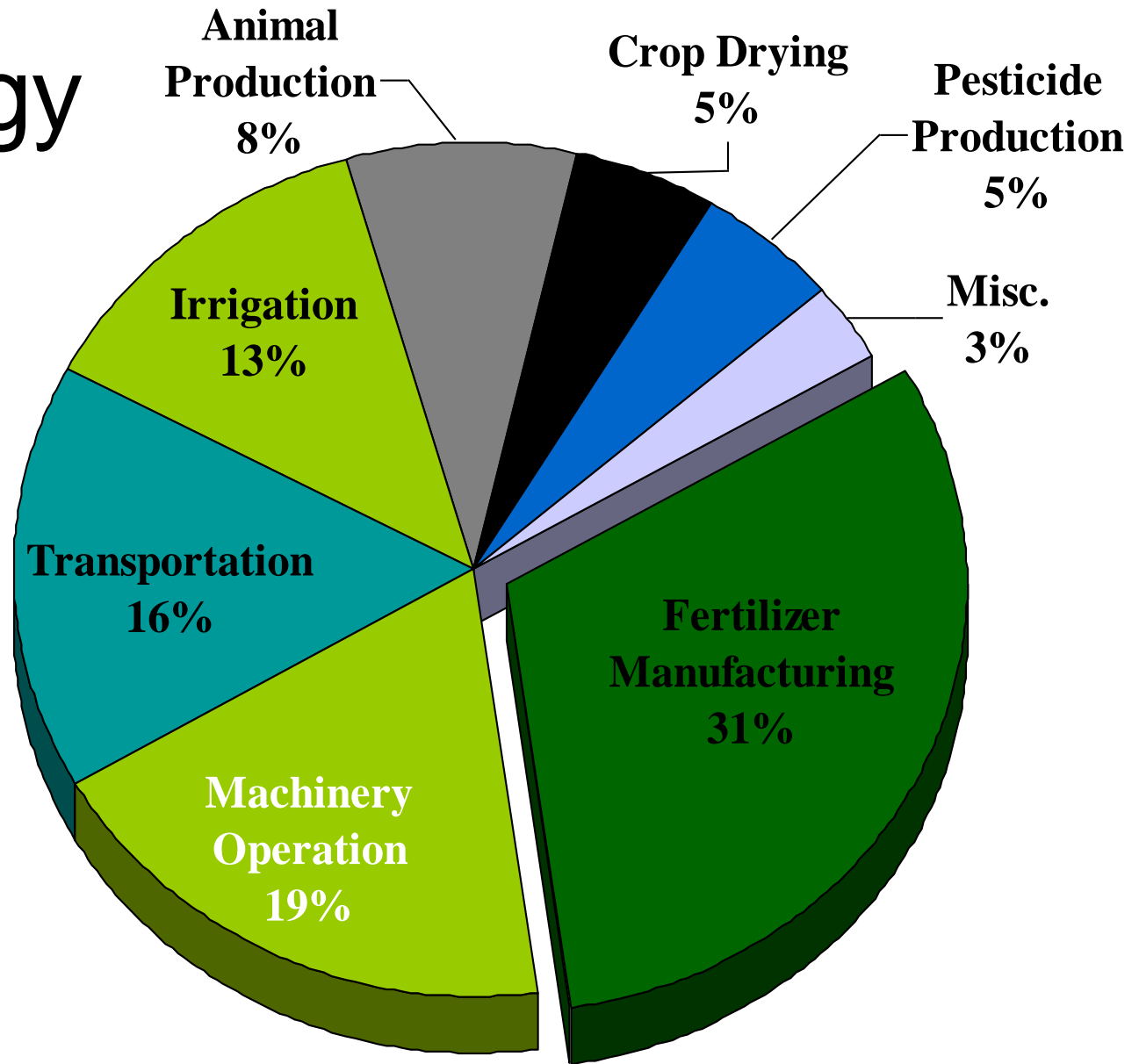
2008\$/bbl



World Oil Production, 1960-2009



Ag Energy Use in North America



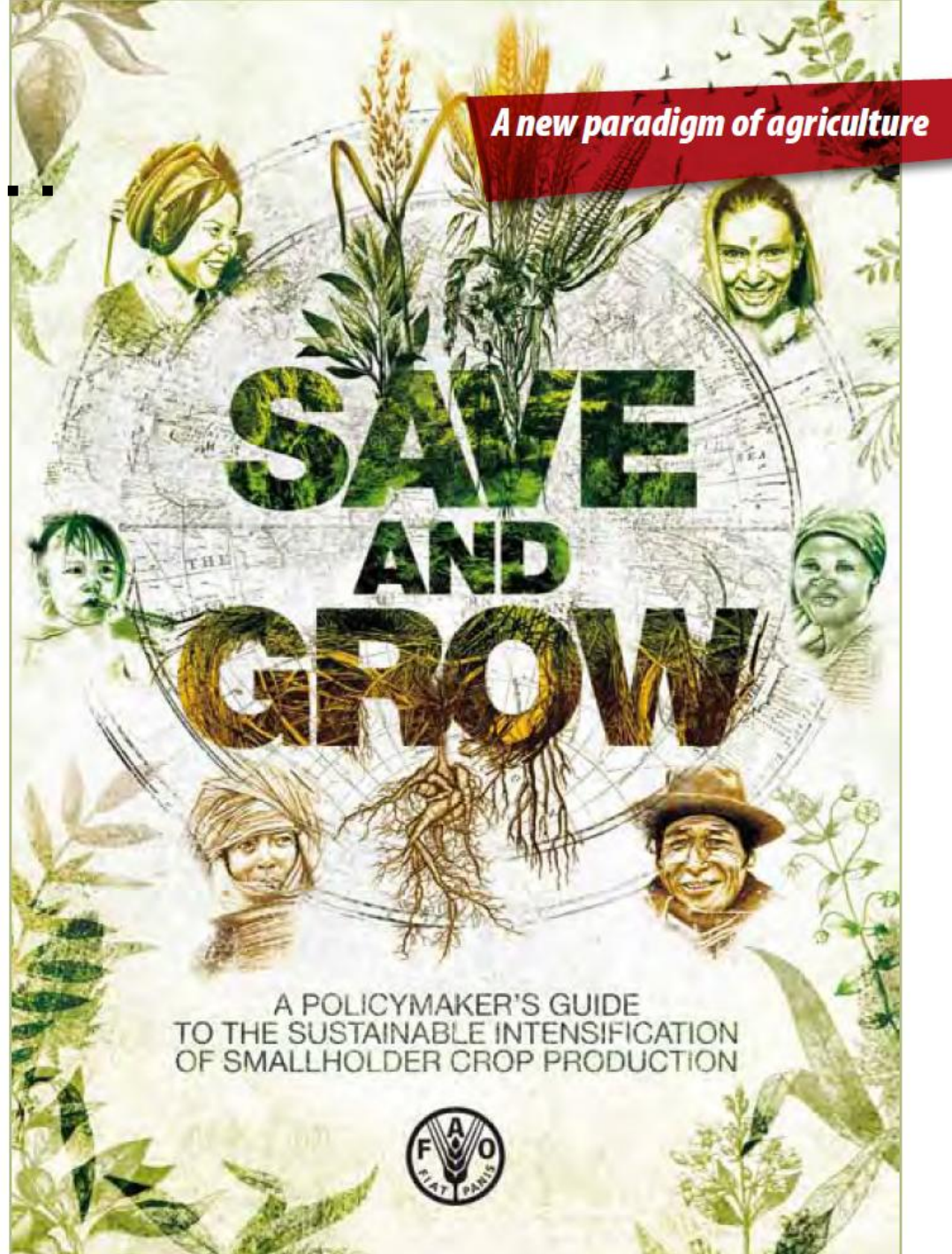
Organic Production Standards

Organic agriculture is “a production system that is managed in accordance with the Act and regulations in this part to respond to **site-specific** conditions by integrating **cultural, biological, and mechanical** practices that foster **cycling of resources**, promote **ecological balance**, and conserve **biodiversity.**”



Old and New...

- Released by UN-FAO, June 2011
 - Small, diverse farms
 - Soil & water conservation
 - Natural pest management



Albert Howard (1873-1947)



- British agricultural scientist.
- 25 years in India.
- Critical of reductionist agricultural science and specialization
- Blamed fall of past civilizations on unsustainable agriculture
- Wrote *An Agricultural Testament* (1940)



Howard on Eastern agriculture

“The small-holdings of China, for example, are still maintaining a steady output and there is no loss of fertility after forty centuries of management.”

- Tiny farms
- Labor intensive
- Integration of crops and livestock
- Lots of legumes
- Little cultivation

Howard on Western agriculture



- Large, growing farms
- Monocultures
- Mechanization
 - Machines consume resources but do not contribute urine/dung
- Synthetic fertilizer dominates
- Food prices too low... farmers forced off land



- U.S. organic food sales have grown between 17 and 21% each year since 1997 (total U.S. food sales over this time have grown in the range of 2-4% a year)
- Organic food sales represent approximately 2% of U.S. food sales.
 - (Organic Trade Association's 2004 Manufacturer Survey)

