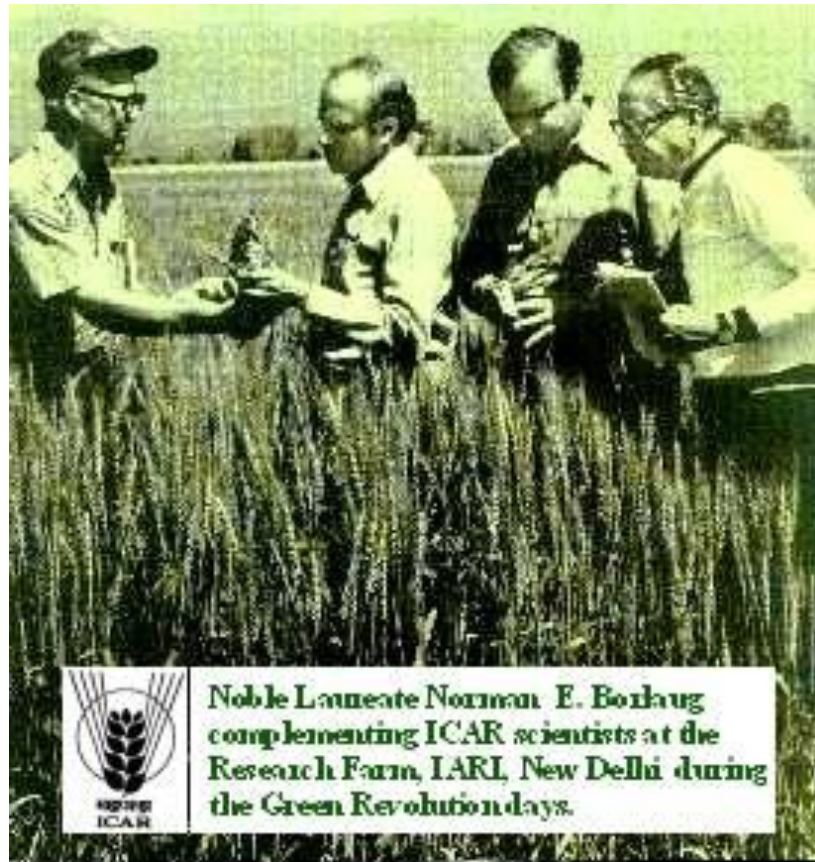
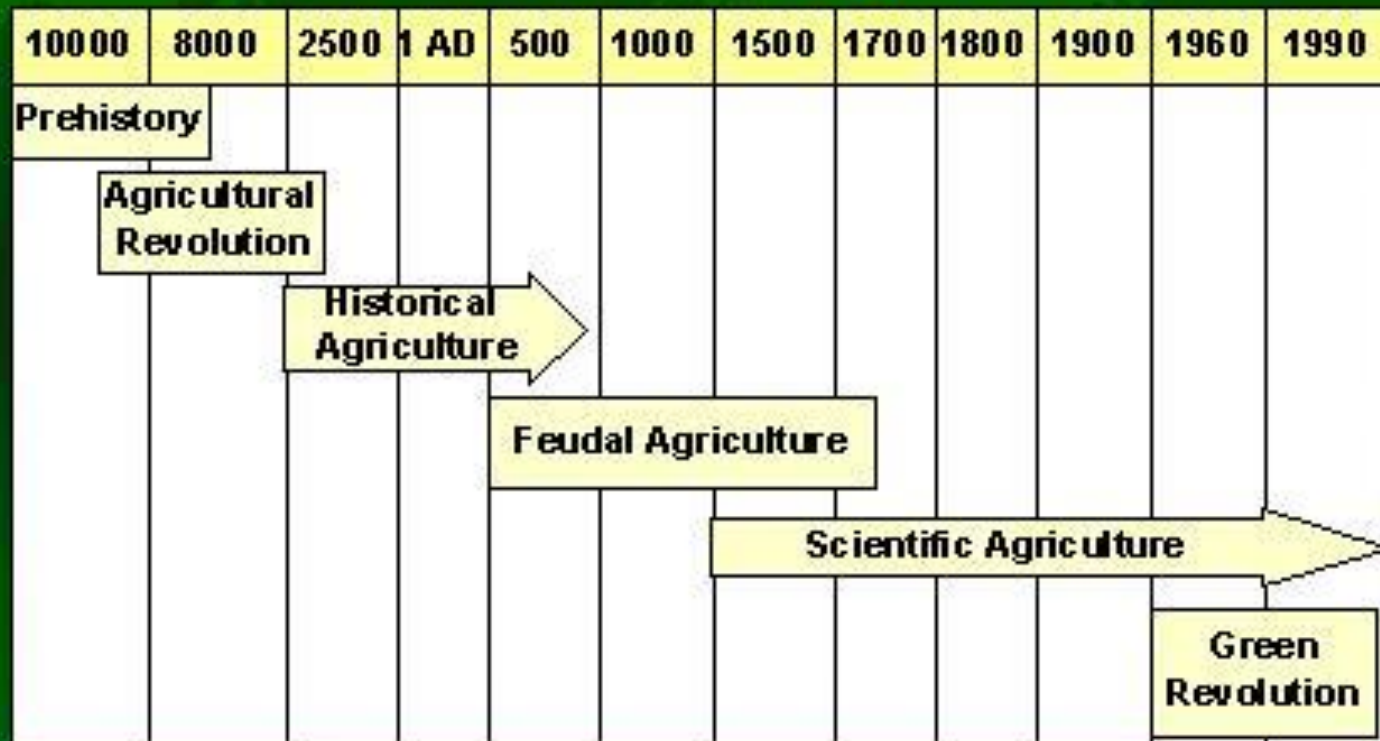


The Green Revolution



“The way we eat has changed more in the last 50 years than in the last 10,000 years”-Michael Pollan, 2009

Evolution of Agriculture



Pre-GR Agriculture





A Word about Seeds

- Open-pollinated – “natural” pollination by insects, etc. Seeds breed “true”, but may contain genetic diversity. (e.g., heirloom tomatoes). Some species may produce seeds with wide variety if open-pollinated (i.e., squash)
- F-1 Hybrid – varieties bred for particular traits; created through selective inbreeding of distinctly different varieties of the same species; seeds do not breed true and exhibit trait variability in next generation (e.g., mule)
- Genetically modified -seeds whose genomes have been altered by inserting genetic material from a different species (e.g., Bt corn)

Green Revolution



By Daniel Pepper / Special to The Chronicle

Green Revolution

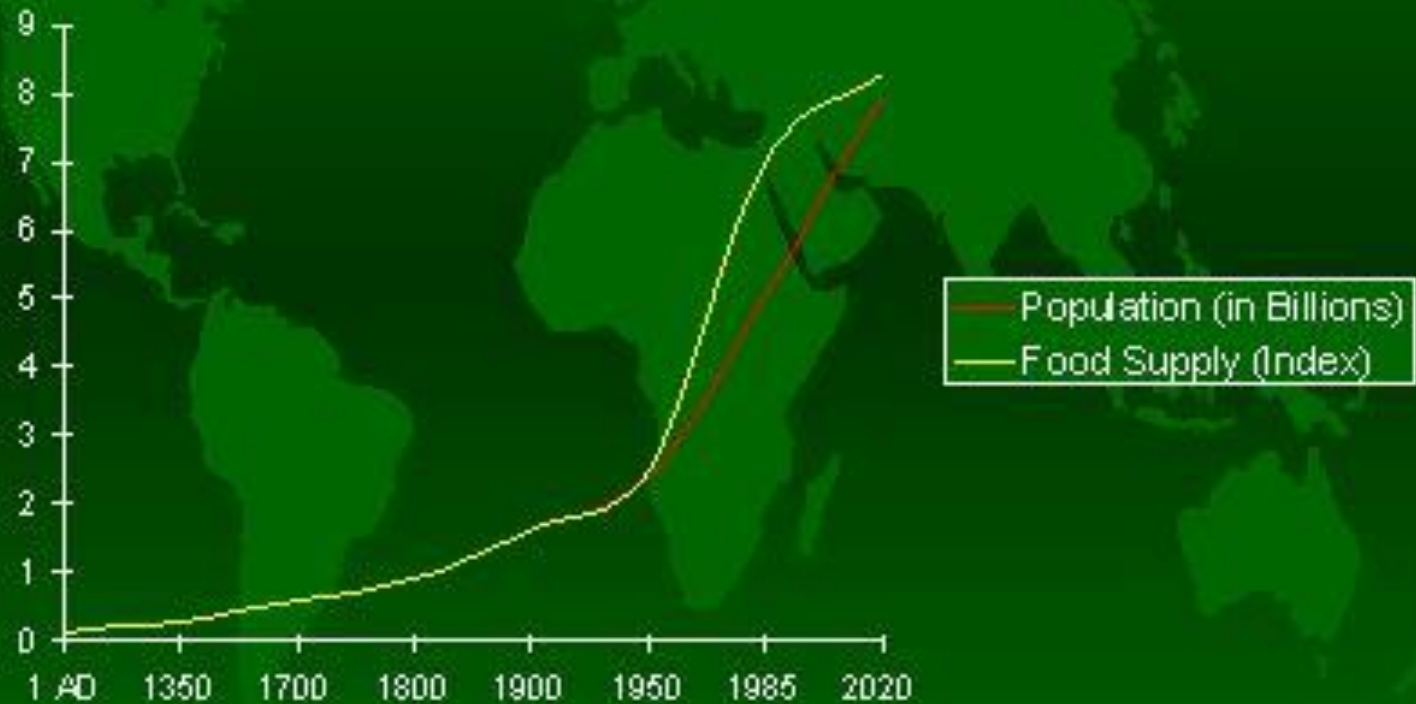
- International effort to improve productivity, starting with corn, wheat and rice, high yield varieties
- Started around 1960 with an effort to breed and distribute enhanced seeds
- High yielding varieties, particularly targeted toward developing countries
- Objectives: Eliminate hunger, increase agricultural yields, increase technological “know-how”

High Yield Varieties

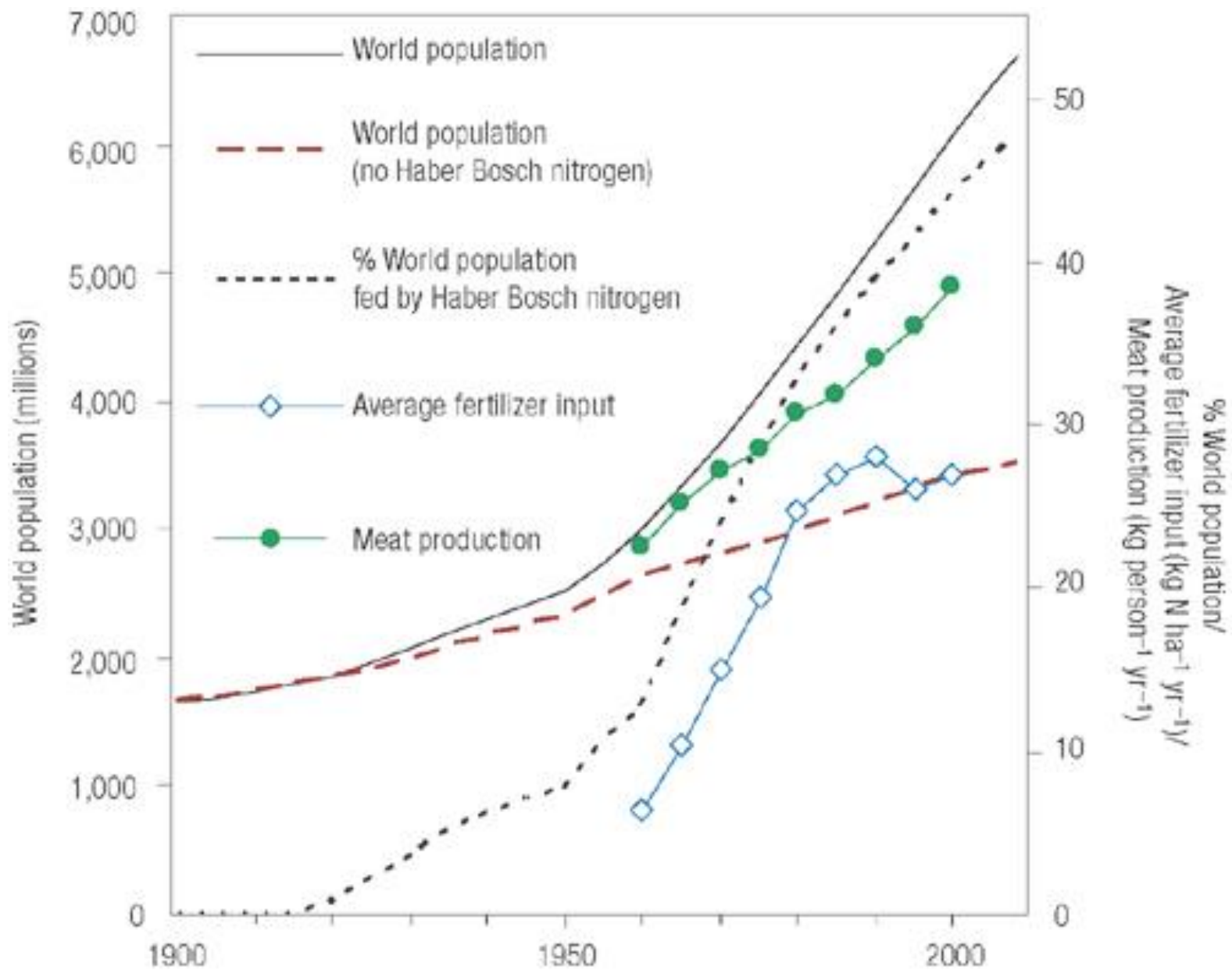
- Semi-dwarf/dwarf
- Uniform
- Early maturing
- Fertilizer dependent
- Required new pesticides and disease control (due to absence of genetic variation)
- New irrigation strategies
 - Tubewells, electric pumps=up to 5X more water



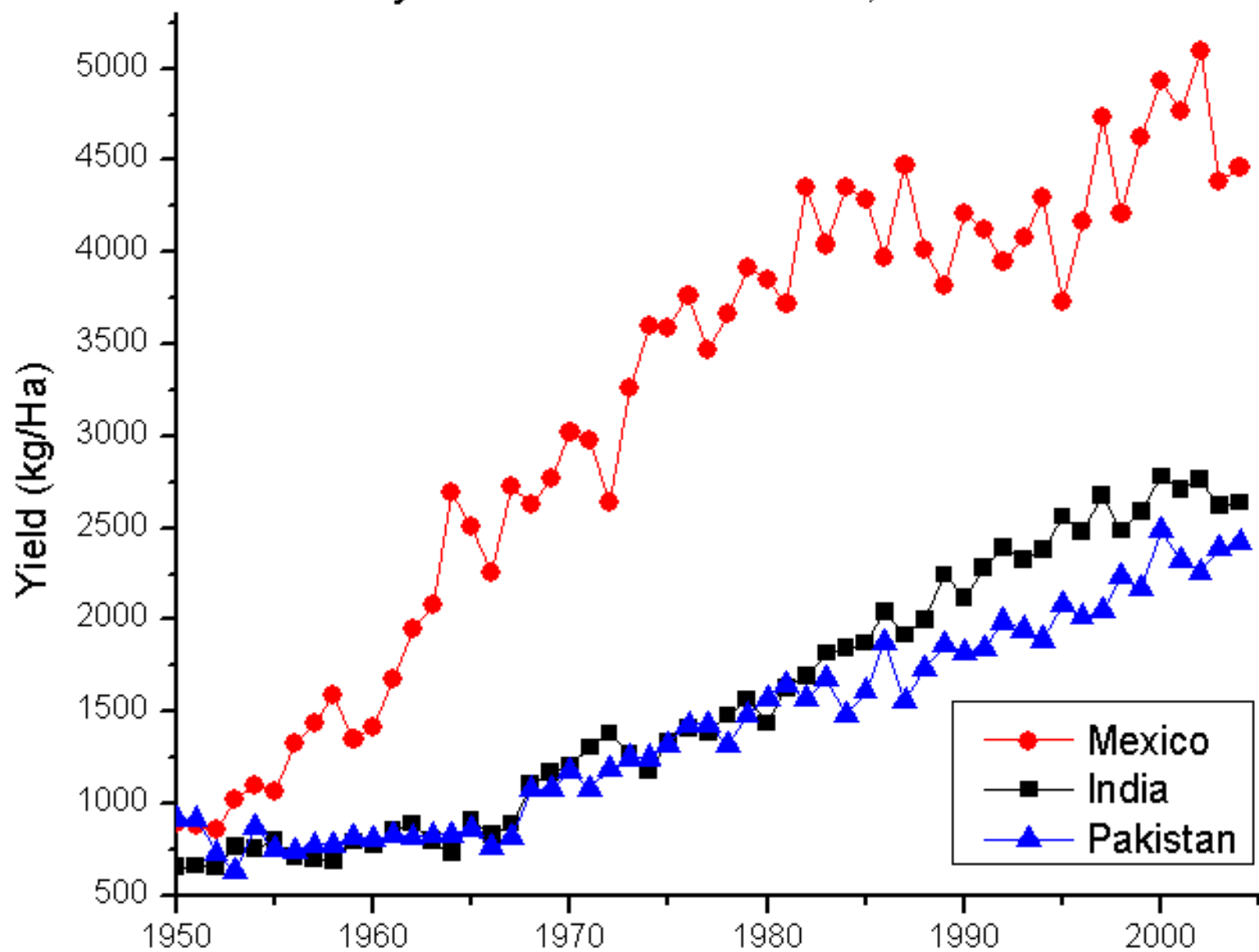
Population & Food



Food & Agriculture Organization (FAO)



Wheat yields in selected countries, 1950-2004



Source: FAO

Actors

- Ford Foundation, U.S.
- Rockefeller Foundation, U.S.
- International Center for Corn and Wheat Improvement (CIMMYT) in Mexico
- International Rice Research Center (IRRI), in the Philippines
- Norman Borlaug, U.S. (Nobel Peace Prize, 1970)
- M.S. Swaminathan, Minister of Agriculture, India

GR-Success or Failure?

- Population is still increasing
- Urbanization
 - Mega cities in developing countries
- Lack of transportation infrastructure causes crop and income losses
- Poverty and food insecurity are still with us
 - In some places in India, as high as 90% of population
- Cost prohibitive production practices for poor farmers
- Loss of arable land from subsistence uses to cash crops
- Chicken and egg question about whether agricultural surpluses create population growth