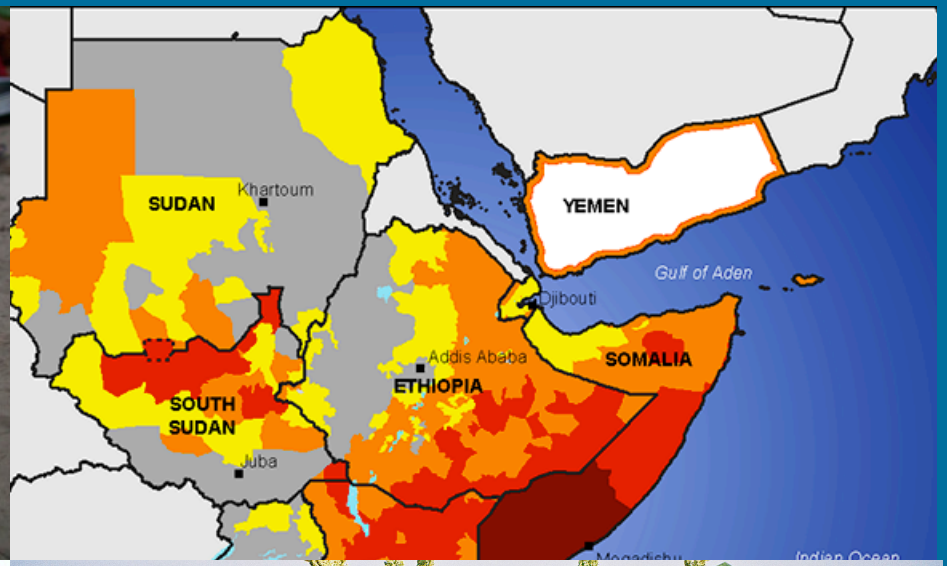
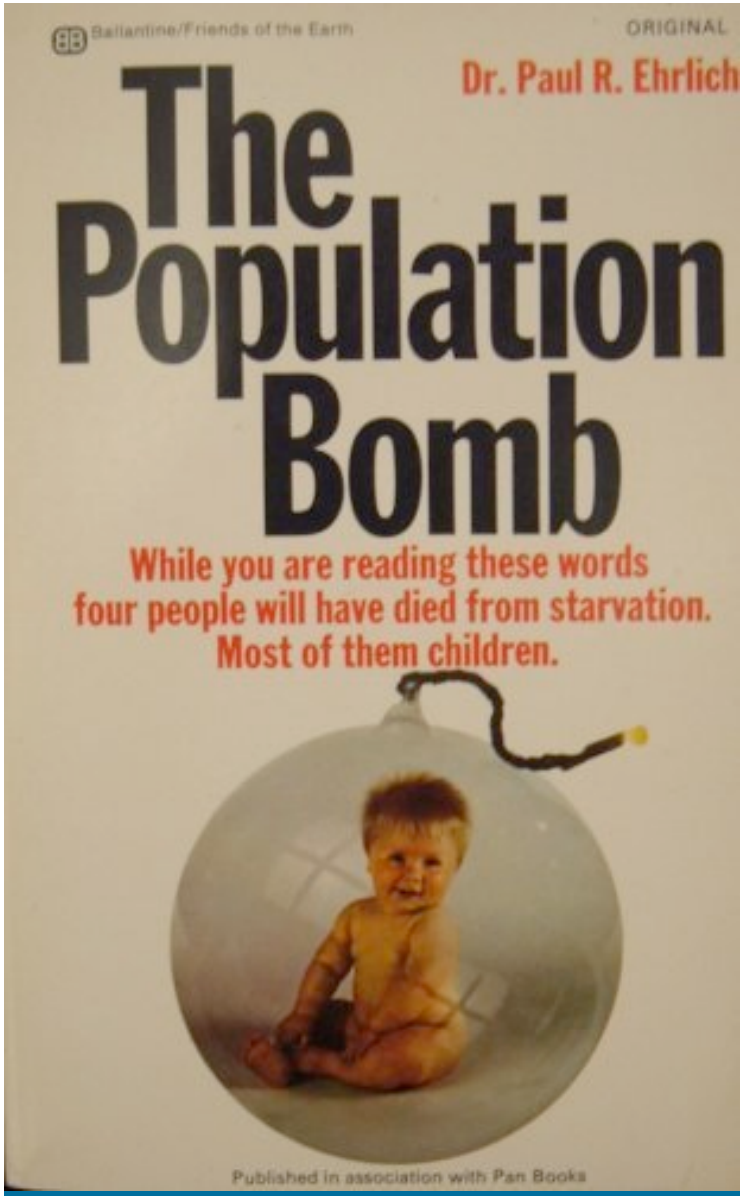
Mission 2019:
Global Food Security in the 21st century



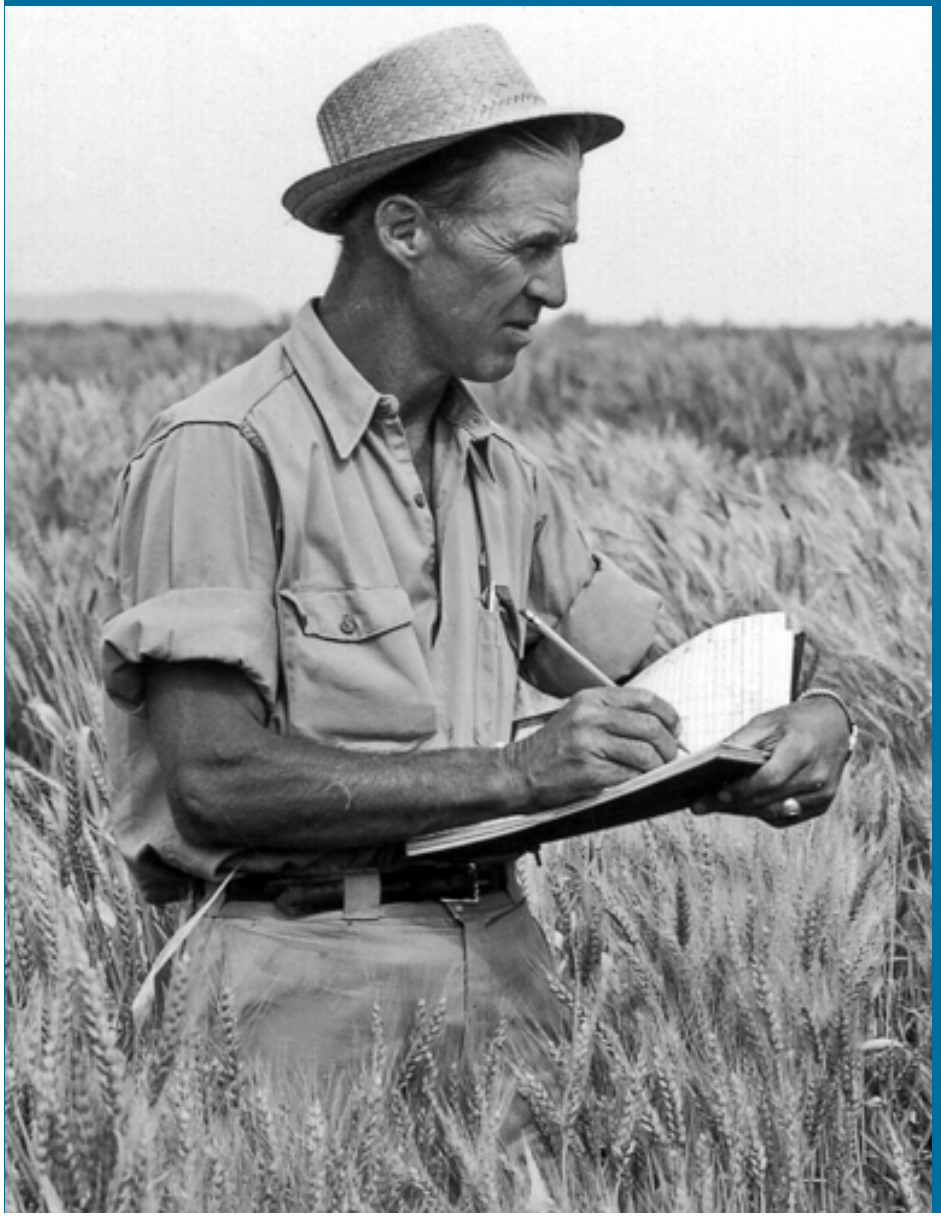


Published 1968

PROLOGUE

The battle to feed all of humanity is over. In the 1970s and 1980s hundreds of millions of people will starve to death in spite of any crash programs embarked upon now. At this late date nothing can prevent a substantial increase in the world death rate, although many lives could be saved through dramatic programs to "stretch" the carrying capacity of the earth by increasing food production and providing for more equitable distribution of whatever food is available. But these programs will only provide a stay of execution unless they are accompanied by determined and successful efforts at population control. Population control is the conscious regulation of the numbers of human beings to meet the needs not just of individual families, but of society as a whole.

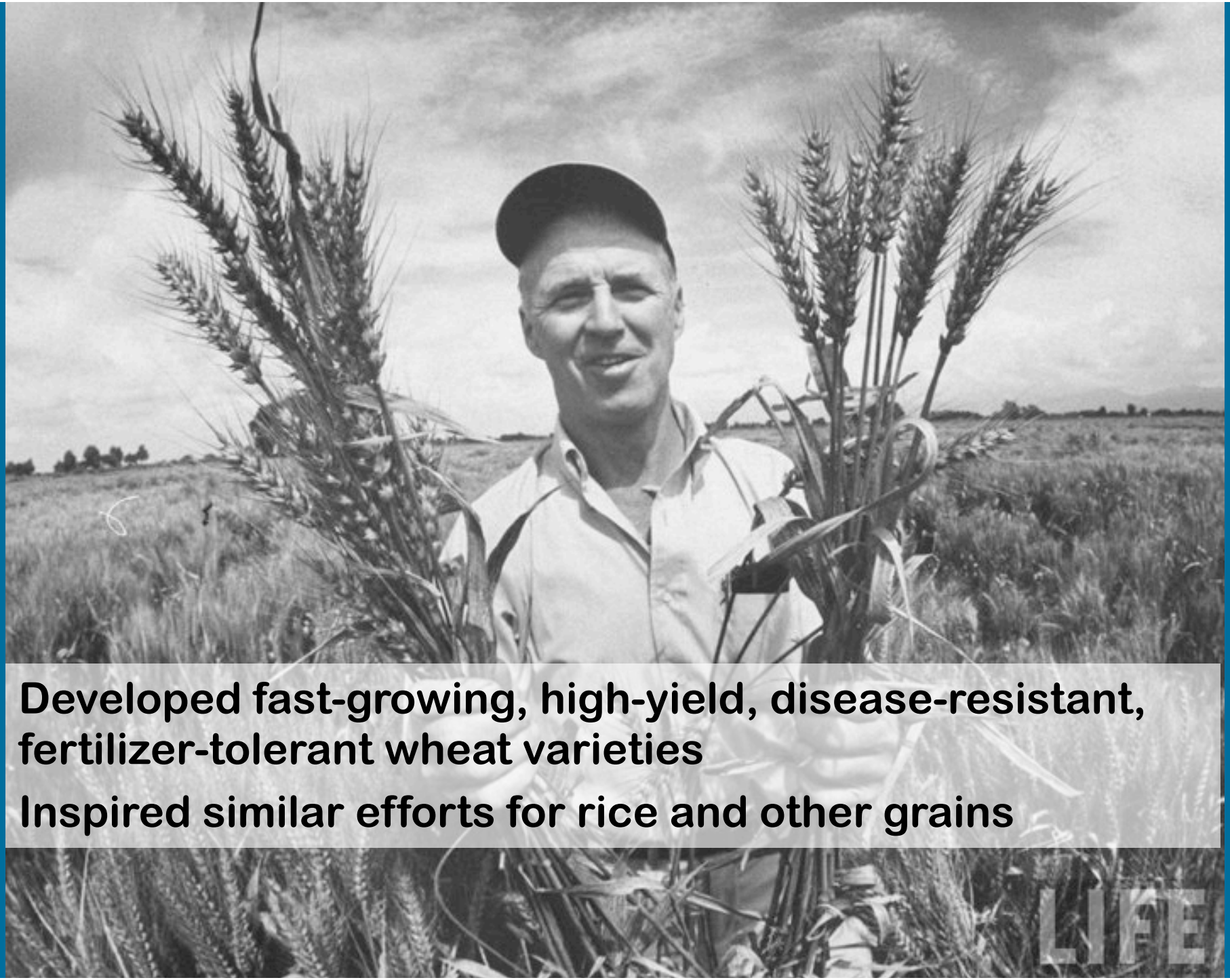
The "Green Revolution"



Norman Borlaug (1914-2009):

Wheat breeder and 1970 Nobel Peace Prize winner

"The Man Who Saved a Billion Lives"



Developed fast-growing, high-yield, disease-resistant, fertilizer-tolerant wheat varieties

Inspired similar efforts for rice and other grains

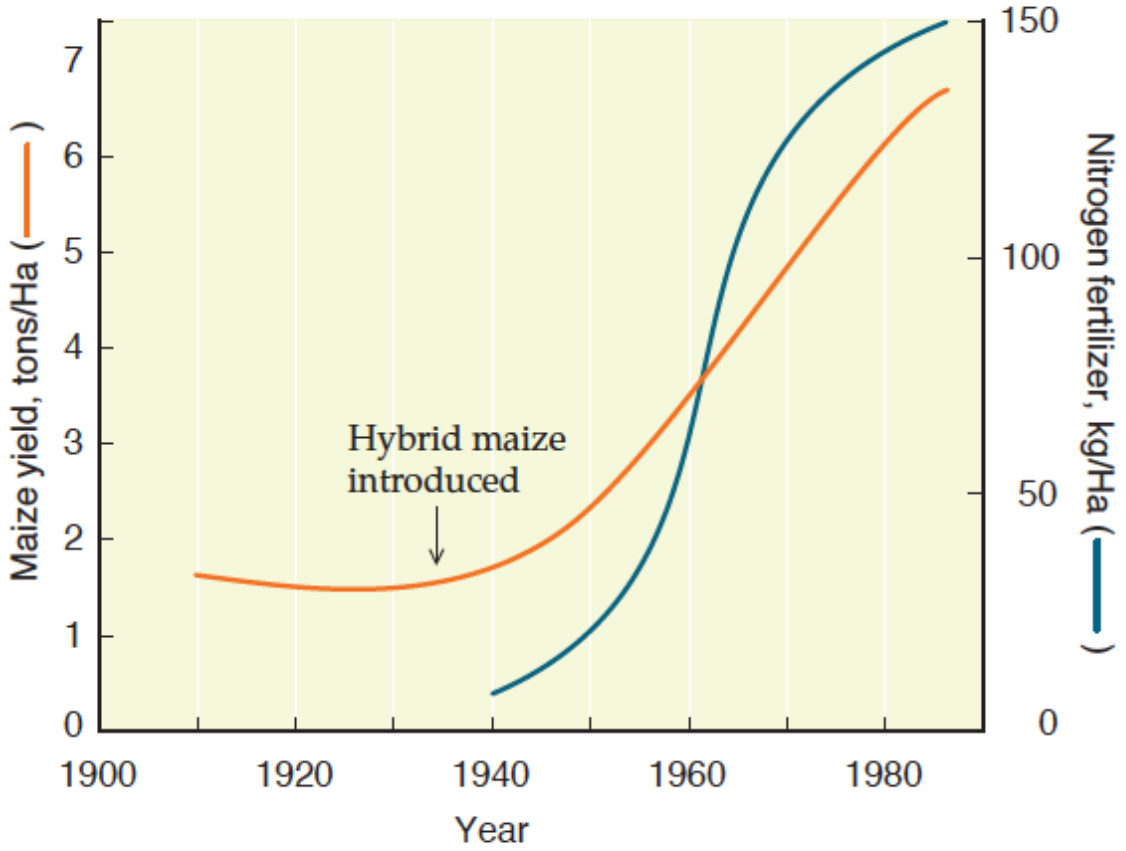
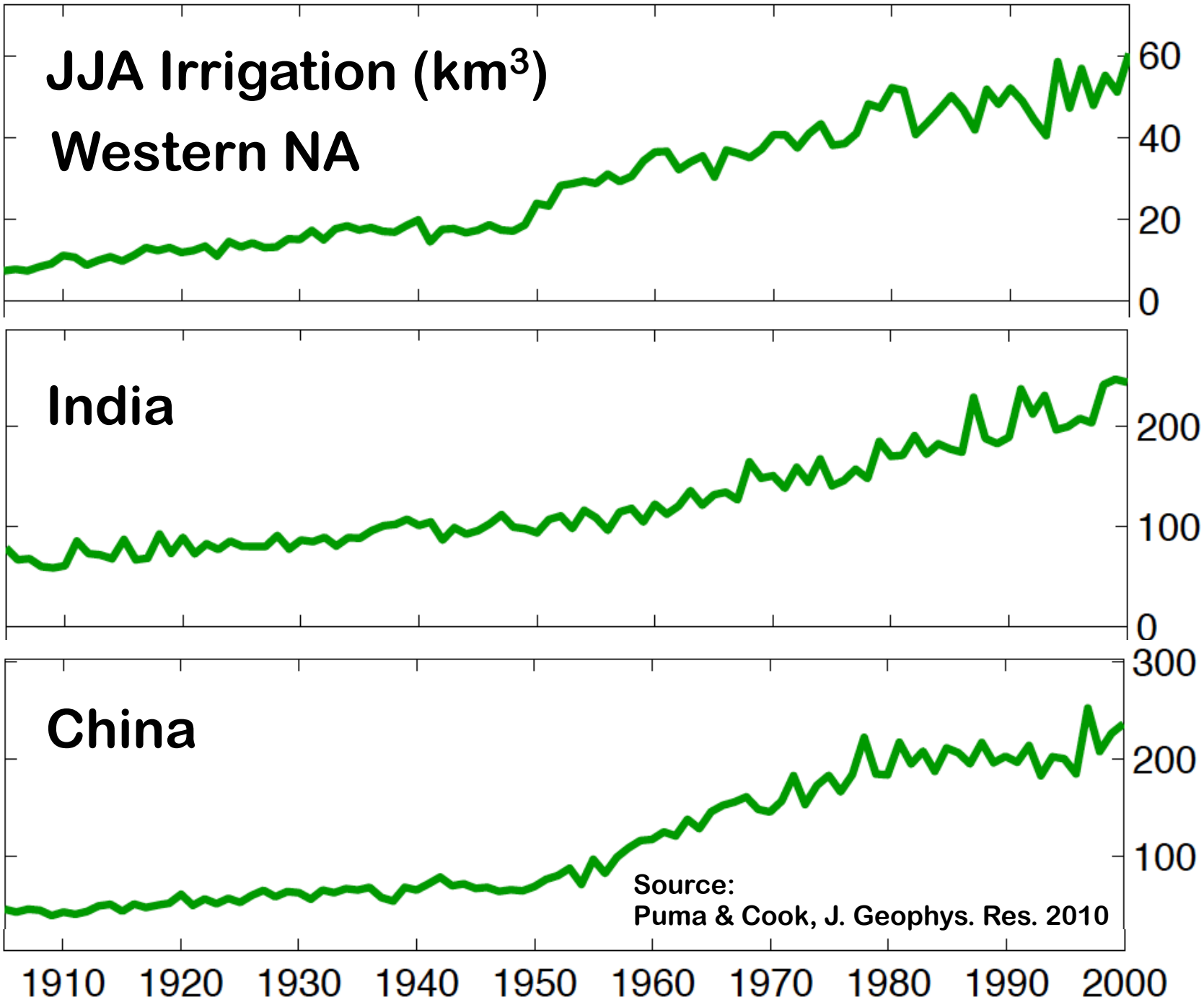


Figure 3.5 Interaction of inputs in crop production: Maize yields and the use of nitrogen fertilizers in the United States. The arrow points to the introduction of hybrid maize. By the time the planting of hybrid maize was complete (1950–1955), yields had increased significantly. The big yield increase parallels the use of nitrogen fertilizers and is caused by breeding strains that respond to nitrogen fertilizers. *Source:* Data from U.S. Department of Agriculture.


JJA Irrigation (km³)
Western NA
60
40
20
0
India
200
100
0
China
300
200
100
Source:
Puma & Cook, J. Geophys. Res. 2010
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

The "Green Revolution"

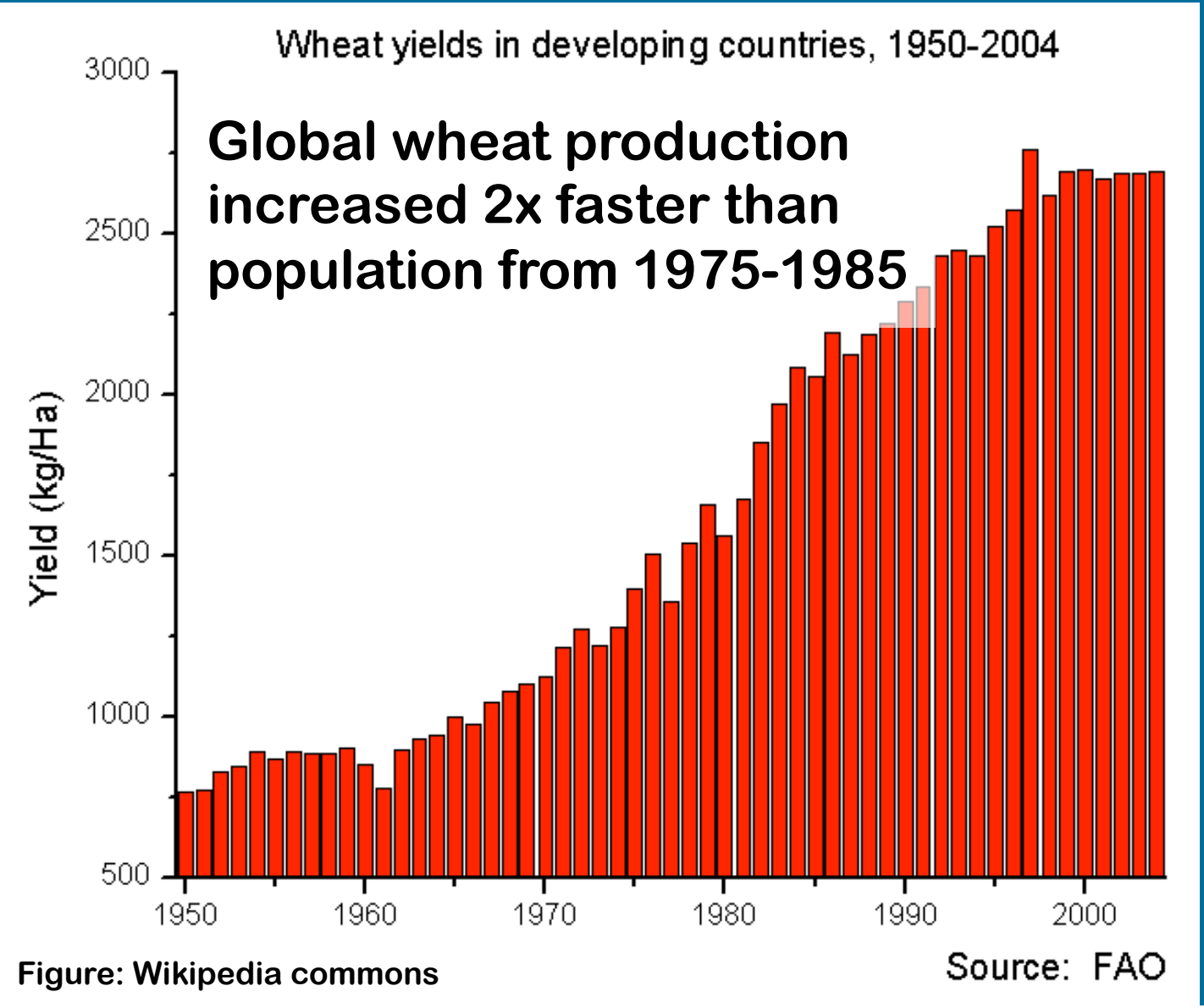


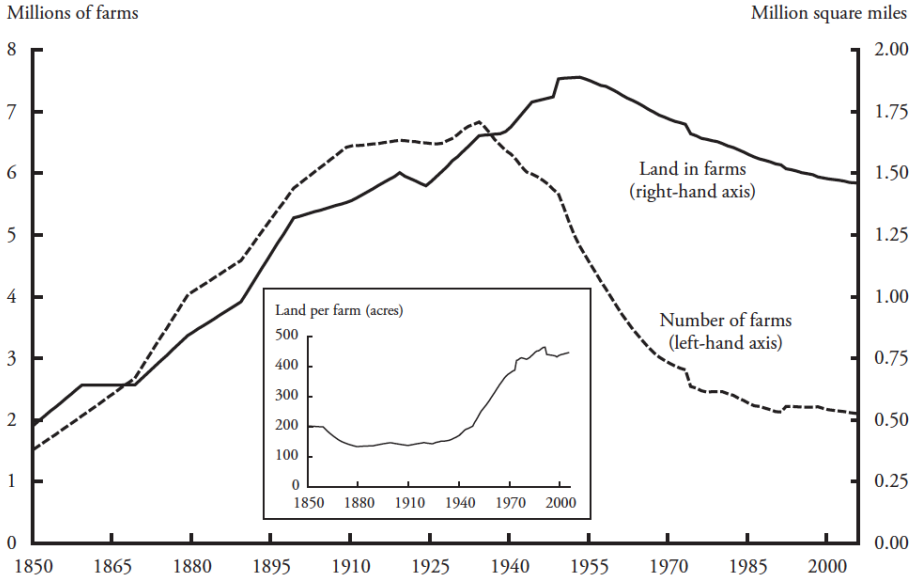
Figure: Wikipedia commons

US: Increases in total production despite decline in land farmed

Production = yield x area

Yield = f(technical developments, inputs)

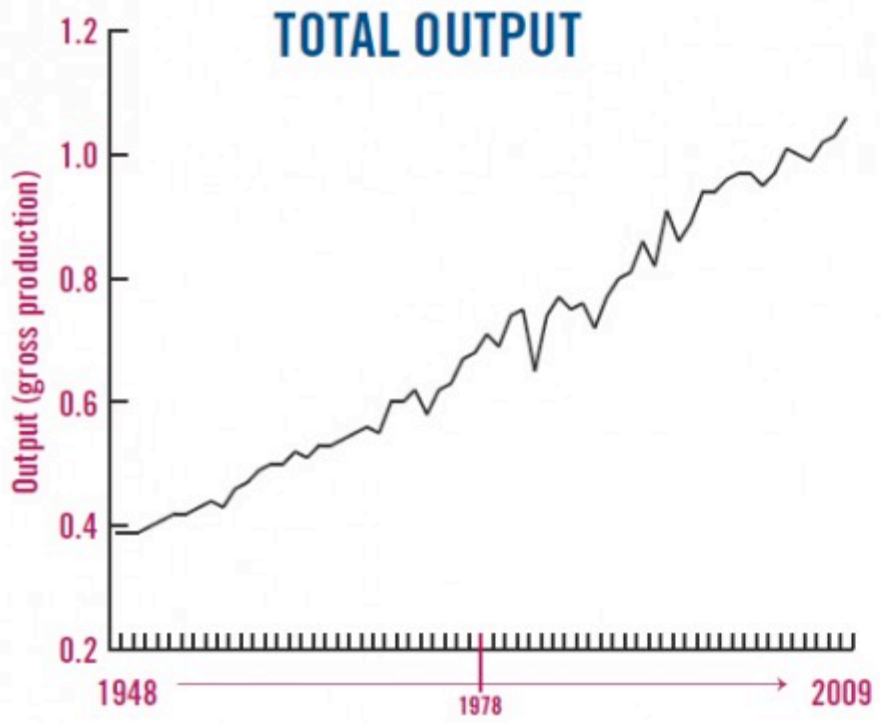
Figure 2-5 U.S. Farm Acres, Farm Numbers and Average Farm Size, 1850–2006



Sources: Number of farms (1910–1999) and Land in farms (1911–1999) are from Olmstead and Rhode (2006, series Da 4 and Da 5, respectively). For both variables, values for 2000–2006 are from USDA ERS (2007); 1900 and 1890 values for farm numbers are from the U.S. Bureau of the Census (1975, series K-4 and K-5); 1910, 1900, and 1890 values for land in farms are from series K-5 of the same resource.

Notes: For farm numbers, intercensal values were estimated using a linear interpolation wherever no value was provided.

http://www.ers.usda.gov



SOURCE: http://www.ers.usda.gov/data-products/agricultural-productivity-in-the-us.aspx#28247 TABLE 1

Table 3.4 The technological basis of modern agriculture (inputs per hectare of corn in the United States)

Input	Hand Produced	1910	1980
Labor (hr)	1,200	120	12
Machinery (kg)	1	15	55
Animal use (hr)	0	120	0
Fuel (L)	0	0	125
Manure (kg)	0	4,000	1,000
NPK fertilizer (kg)	0	0	316
Lime (kg)	0	10	426
Seeds (kg)	11	11	21
Insecticides (kg)	0	0	2
Herbicides (kg)	0	0	2
Irrigation (%)	0	0	17
Drying (kg)	0	0	3,200
Electricity (10^3 kcal)	0	0	100
Transport (kg)	0	25	326
Yield (kg)	1,880	1,880	6,500

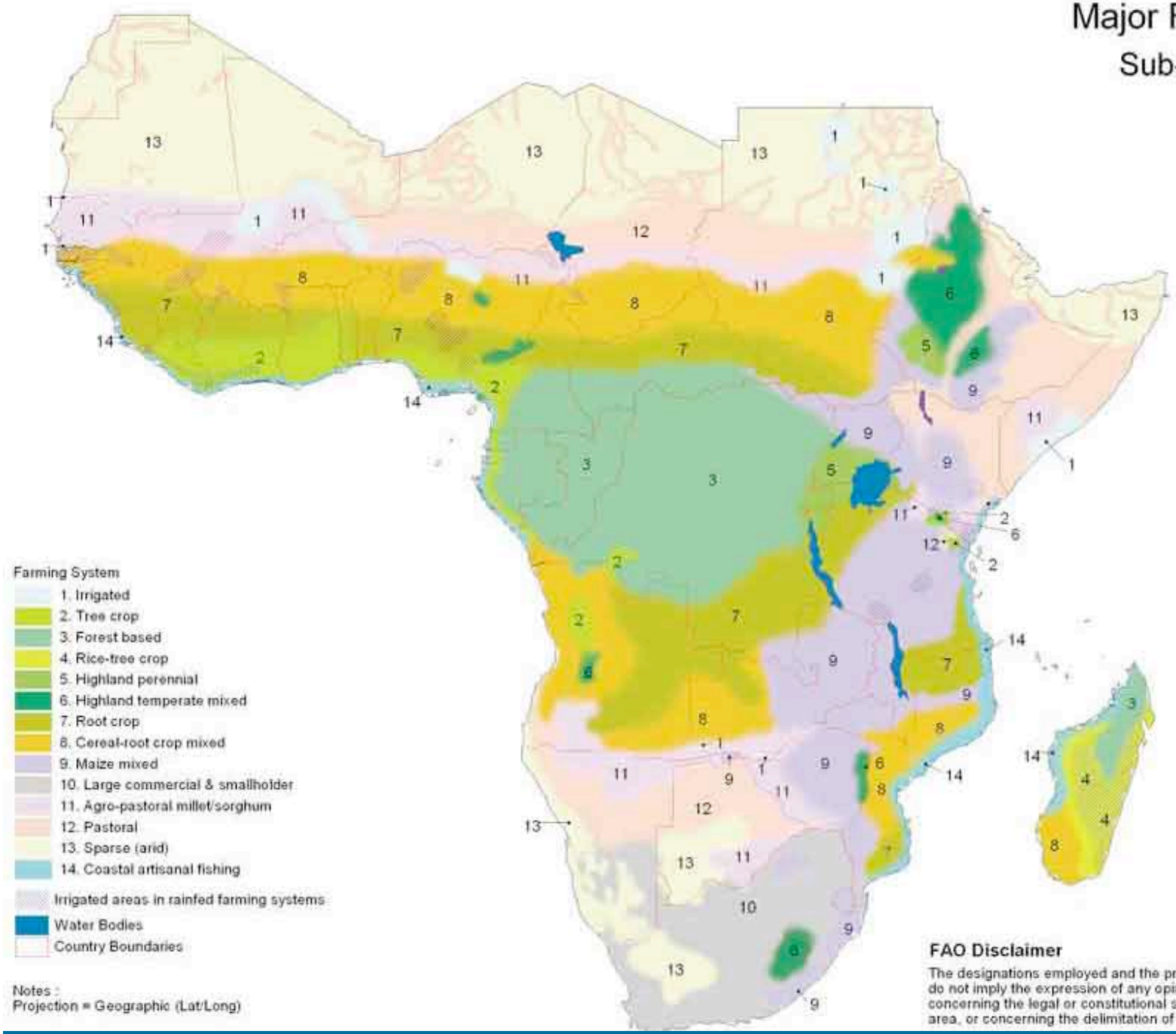
Source: Data summarized by D. Pimentel, from USDA and estimates, in D. Pimentel, ed. (1989), *Food and Natural Resources* (New York: Academic Press).

The “Green Revolution”: Key elements

- High-yield varieties (HYVs) of key crops created by traditional cross-breeding techniques
- Irrigation development
- Increased fertilizer use
- Increased pesticide use
- Substantial public investment in
  - infrastructure for irrigation and transport
  - credit for purchasing inputs
  - price guarantees.

Major Farming Systems

Sub-Saharan Africa
Map 1



Notes :
Projection = Geographic (Lat/Long)

FAO Disclaimer

The designations employed and the presentation of the material in the maps do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal or constitutional status of any country, territory or sea area, or concerning the delimitation of frontiers.

Mini-project 1

- Produce an oral report for the rest of the class on the Green Revolution in one of the following countries:
  - Mexico
  - Philippines
  - Malawi
  - India
  - Brazil
  - Kenya
  - United States

Mini-project 1

- Your report should answer the following questions:
  - How has agriculture in your country changed since 1950?
  - What have been the benefits of these changes?
  - What are the negative outcomes of these changes?
  - Does the history of the last 65 years provide any lessons for the future?

Mini-project 1

- Your report should be 5-6 minutes long (i.e., 5-6 content slides).
- Be prepared to present your report in class on Monday, September 21.
- Upload your report (pptx or pdf) under “Mini-project 1” in Stellar by 12 pm on Monday, Sept. 21. It should be Mac-compatible.
- Include references

Unsolicited advice

- It will be impossible to tell the whole story of 65 years of a country's agricultural history in 6 minutes! Choose the points you think are most important for the rest of the class to understand.

- Think about the design of your slides to most effectively communicate your content.

The coming week

- Wednesday: Room ____. Librarian Chris Sherratt will give a short presentation about library resources. Rest of the class is for group work.
- Friday: Up to your group! 3-270 and E25-117 are available for your use.
- Please have your group email me and Mike Eddy a progress report or draft of your presentation by Friday afternoon at 5 pm; this progress report/draft will be shared with mentors.
- A brief journal entry will be due by Wednesday, Sept. 23.