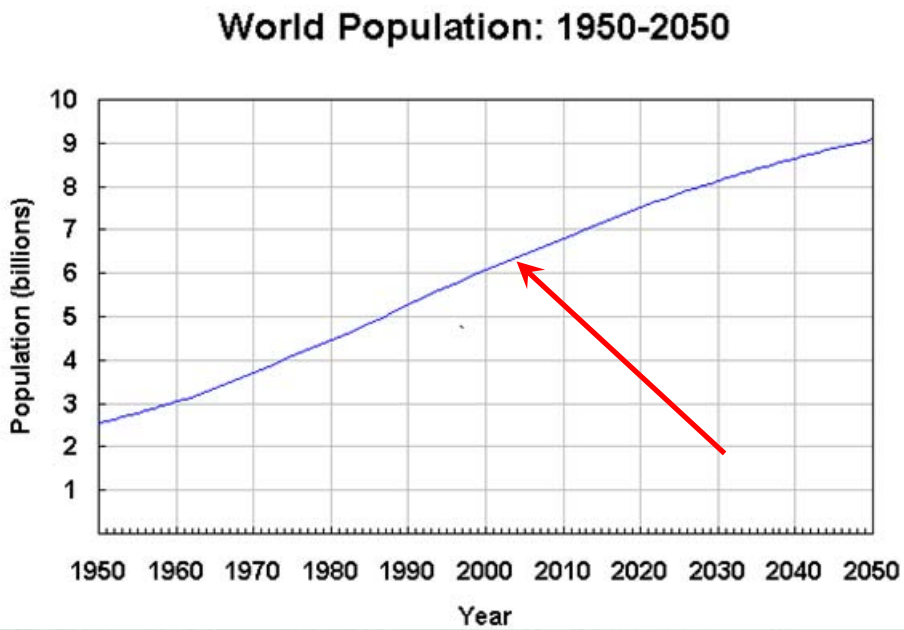
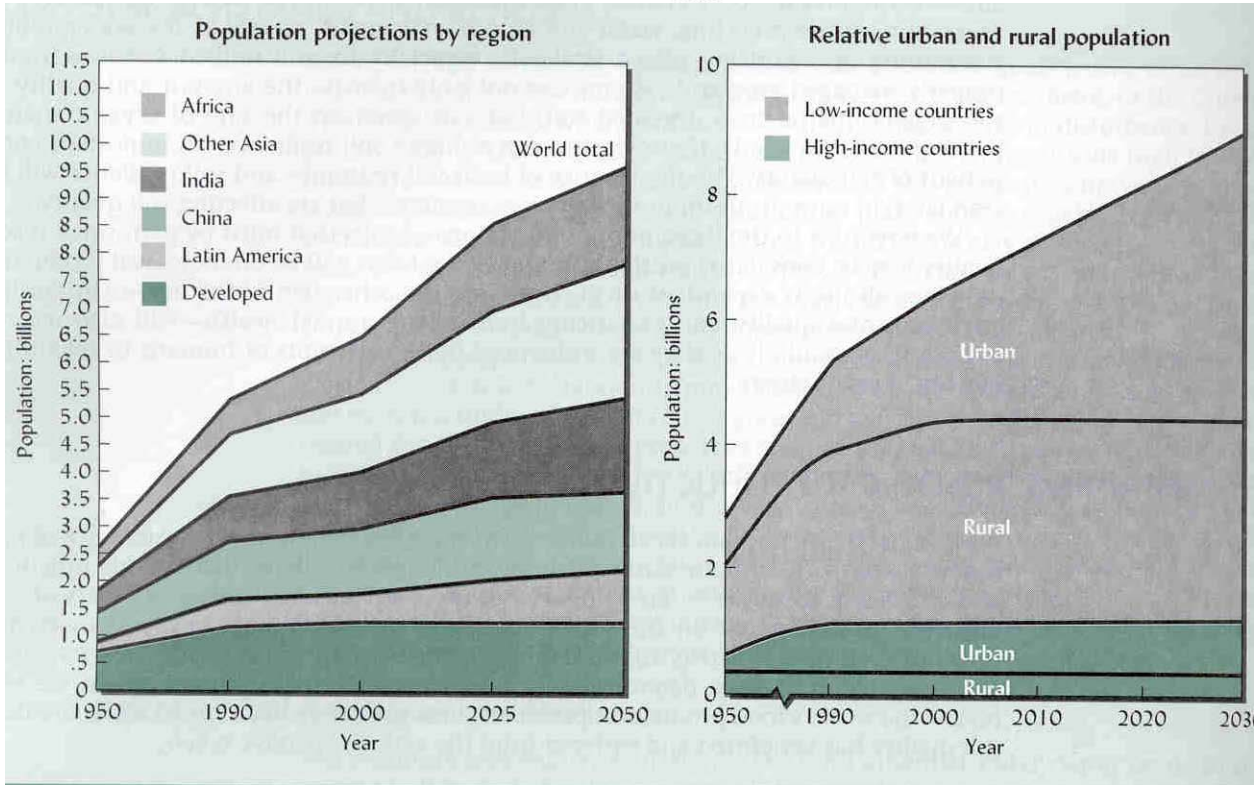
Soil and its implication for World Events

Setting the Stage (1) –

Population…



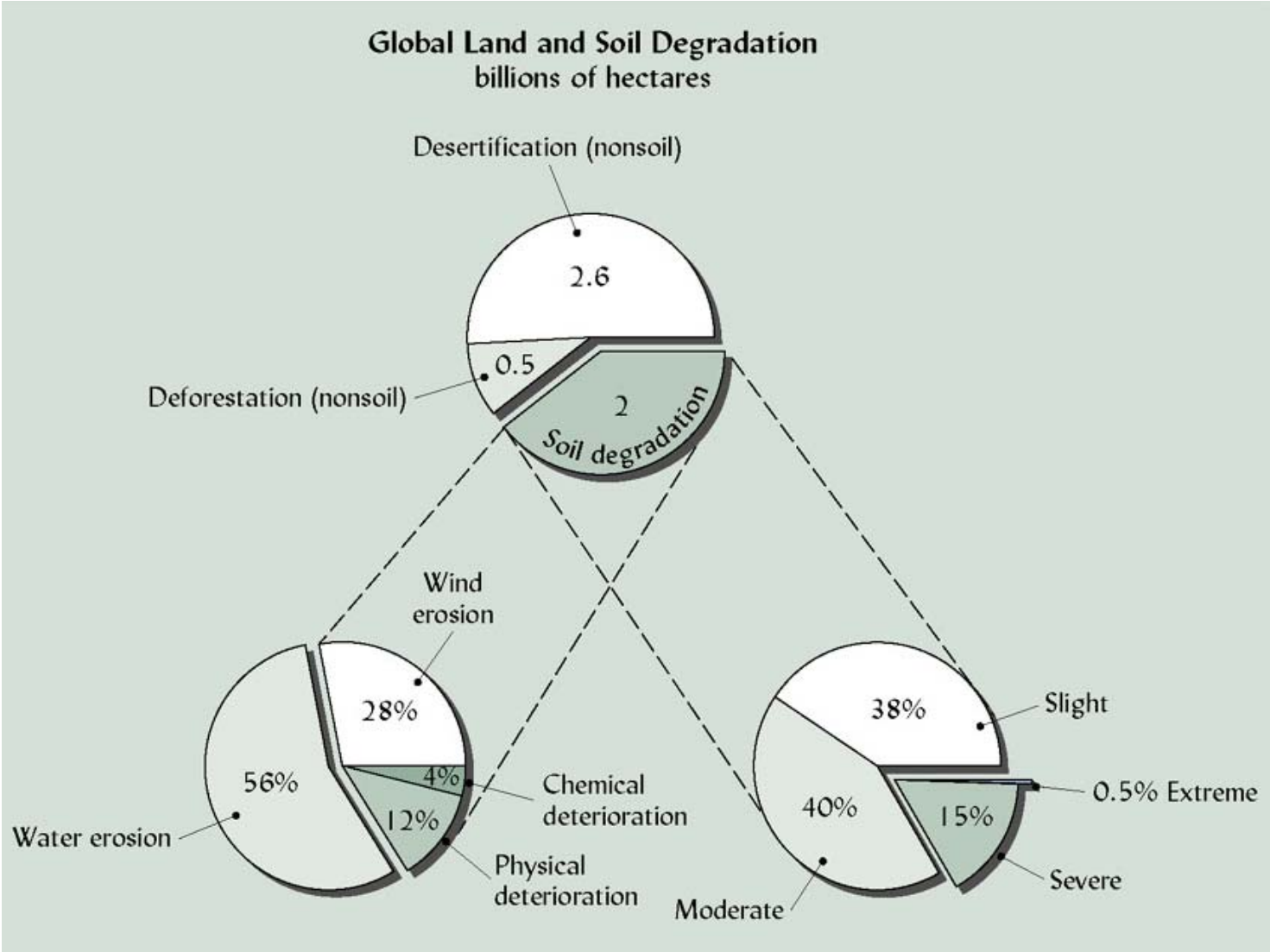


Setting the Stage (2) –

Land Degradation…

Natural Resources…

Soil degradation has diminished productivity of @ 2 billion ha of the 5 billion ha of arable land



Factors affecting World Food Supply

1. The natural resources available – esp. soil and water
2. Technical & knowledge resources – infrastructure and management
3. Appropriate plant / animal varieties and management thereof…
4. Supply of production inputs – fertilizer, pesticides, water, labor, etc.

Things to think about (1) –

If the vast majority of food/fiber production comes from land-based operations

Agricultural land accounts for…

TABLE 19.1
World Land Area in Different Climatic Zones

Climatic zone	*Area (million ha)*			
	Potentially arable	*Grazing*	*Nonarable*	*Total*
Polar and subpolar	0	0	560	560
Cold temperate boreal	50	190	1730	1,970
Cool temperate	910	1000	1000	2,910
Warm temperate subtropical	550	840	1370	2,760
Tropical	1670	1630	1650	4,950
Total	3180	3650	6310	13,150

From The President's Science Advisory Panel on World Food Supply (1967), Vol. II, p. 23.

TABLE 20.6 **Areas of Land in million ha, Used for Agriculture, Permanent Pasture, and Forests or Woodlands, and Estimates of the Percentages of These Lands That Have Suffered Human-Induced Soil Degradation (Reduced Soil Quality)**

Land use	*Africa*	*Asia*	*South America*	*Central America*	*North America*	*Europe*	*Oceania*	*World*
Agricultural land								
Area	187	536	142	38	236	287	49	1475
Percentage degraded	**65**	**38**	**45**	**74**	**26**	**25**	16	**38**
Permanent pasture								
Area	793	978	478	94	274	156	439	3212
Percentage degraded	31	20	**14**	**11**	11	35	19	21
Forest and woodlands								
Area	683	1273	896	66	621	353	156	4048
Percentage degraded	**19**	**27**	13	**38**	**1**	**26**	**8**	**18**
All lands								
Area	1663	2787	1516	198	1131	796	644	8735
Percentage degraded	30	**27**	16	32	**8**	**27**	16	**23**

World Soil Resources and Their Major Limitations for Agriculture

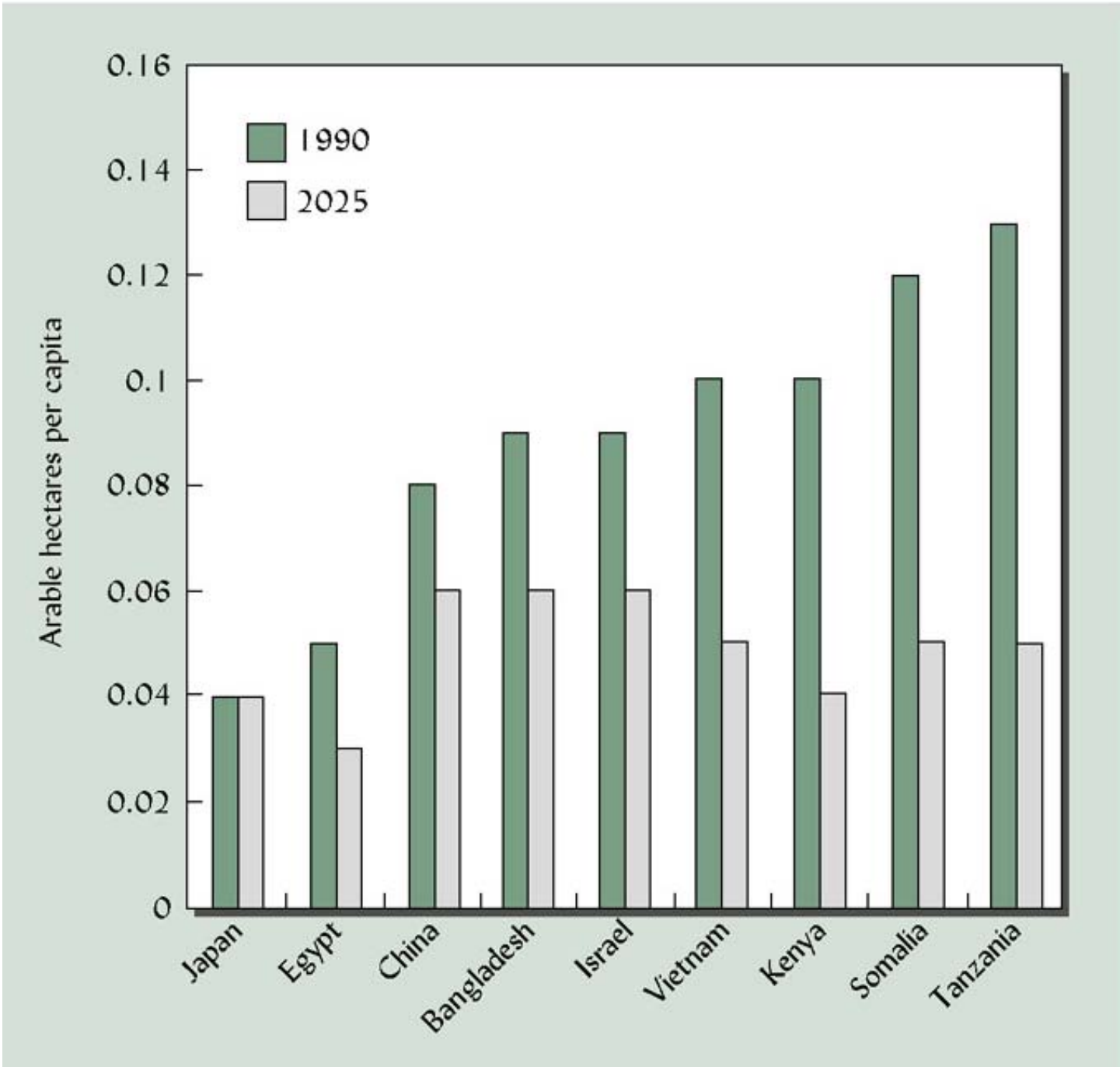
Percent of total land area in each category.

Region	*Limitation*					
	Drought	*Mineral stress*[a]	*Shallow depth*	*Water excess*	*Permafrost*	*No serious limitation*
North America	20	22	10	10	16	22
Central America	32	16	17	10	—	25
South America	17	47	11	10	—	15
Europe	8	33	12	8	3	36
Africa	44	18	13	9	—	16
South Asia	43	5	23	11	—	18
North and Central Asia	17	9	38	13	13	10
Southeast Asia	2	59	6	19	—	14
Australia	55	6	8	16	—	15
World	28	23	22	10	6	11

TABLE 19.2
Population and Cropped Land on Each Continent, Along With Cropland Per Person and Percent of Potentially Arable Land That Was Cropped in 1987

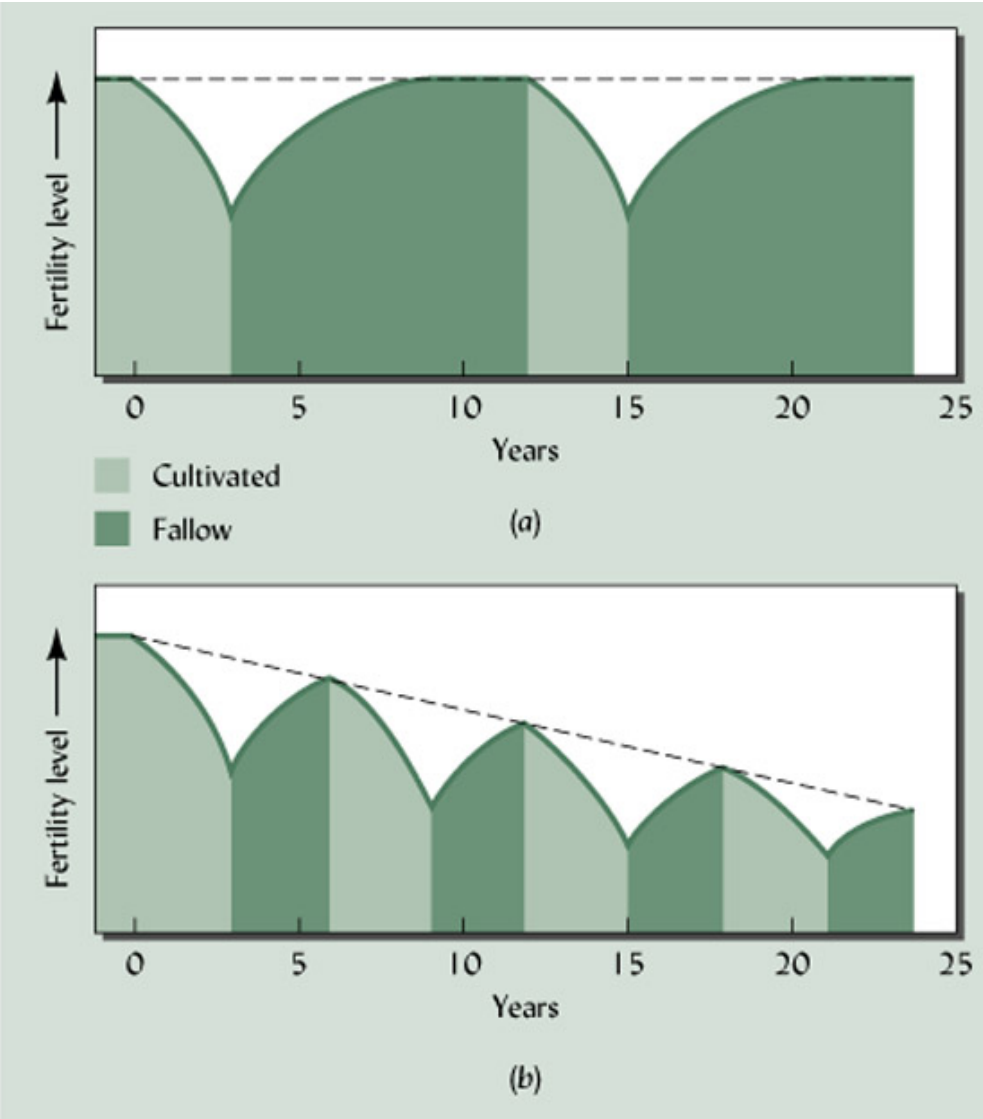
Area	Population in 1987 (millions)	Area (million ha)			Cropland per person (ha)	Arable land cropped (%)
		Total	Potentially arable	1987 cropland		
Africa	589	2966	733	183	0.31	25
Asia	2913	2679	627	455	0.16	73
Europe	495	473	174	140	0.28	80
North America	412	2139	465	274	0.66	59
South America	279	1753	680	139	0.50	20
U.S.S.R.	284	2272	356	232	0.82	65
Oceania	25	843	154	48	1.92	31
Total	4998	13,081	3189	1472	0.29	46

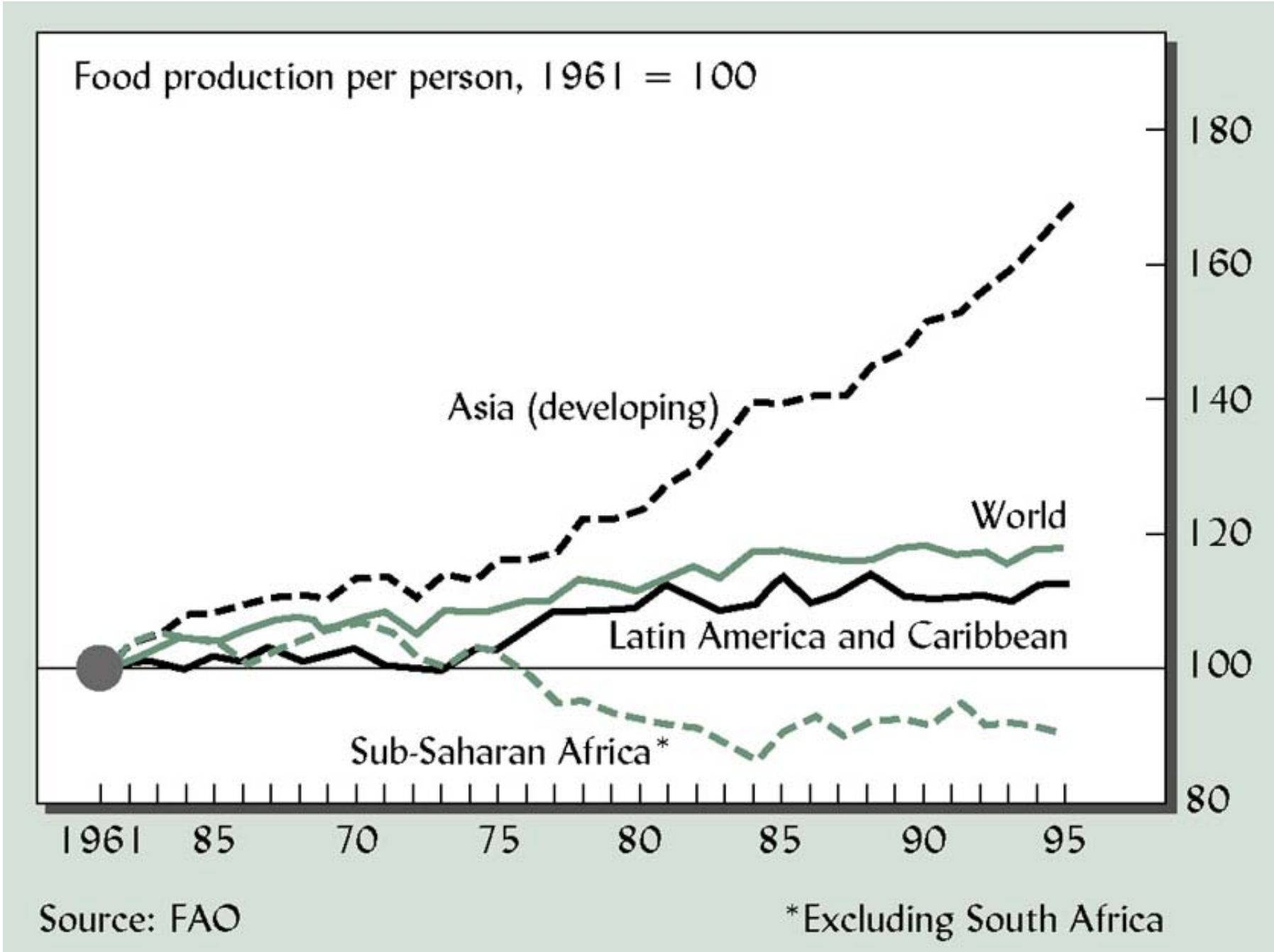
Data for potentially arable land from President's Science Advisory Committee Panel on World Food Supply (1967); all other from *World Resources 1987*.


0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Arable hectares per capita
1990
2025
Japan
Egypt
China
Bangladesh
Israel
Vietnam
Kenya
Somalia
Tanzania

Things to think about (2) –

The majority of agriculture in developing nations is based on traditional agricultural practices




Food production per person, 1961 = 100
180
160
140
120
100
80
Asia (developing)
World
Latin America and Caribbean
Sub-Saharan Africa*
1961
85
70
75
80
85
90
95
Source: FAO
*Excluding South Africa

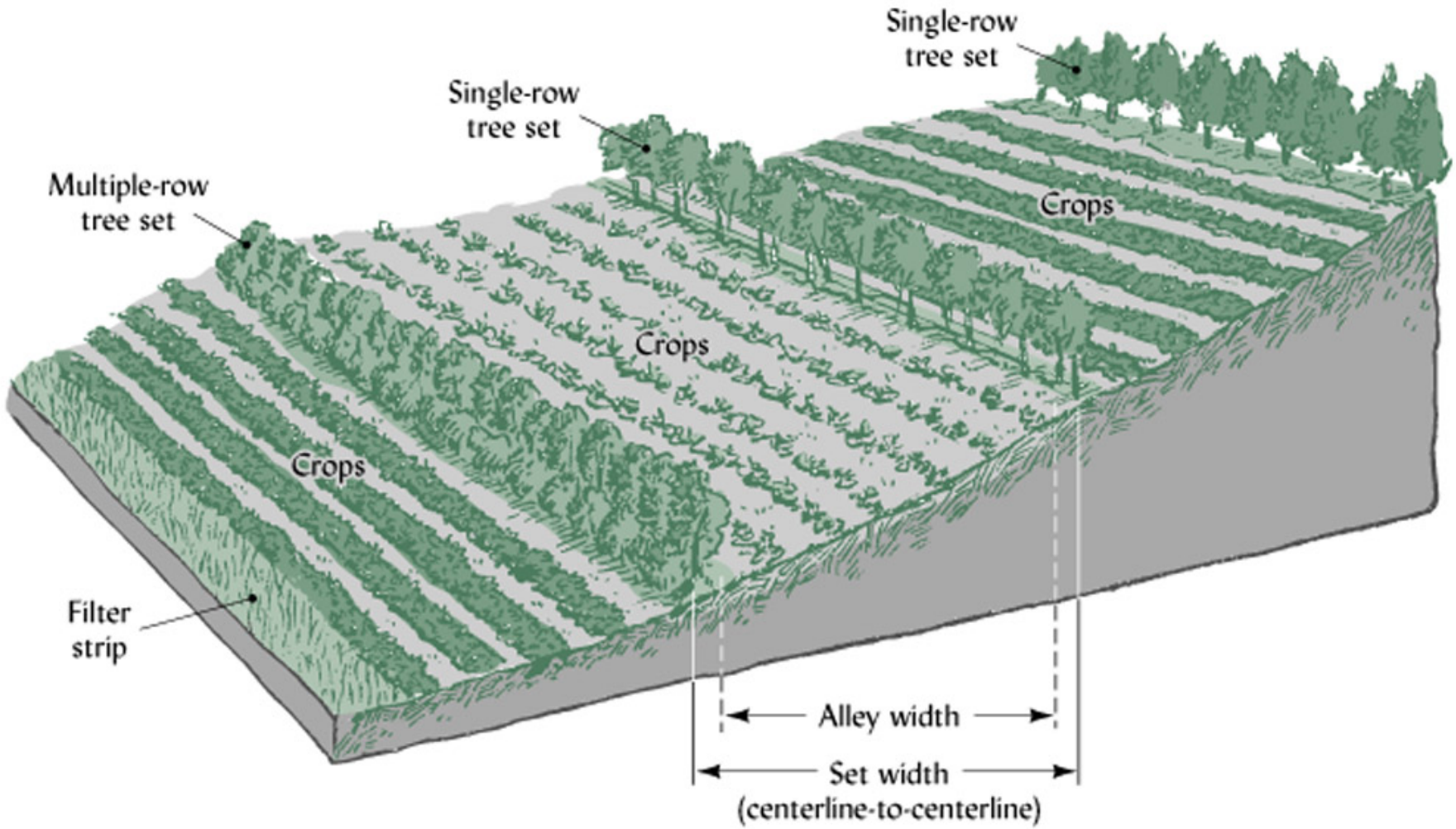
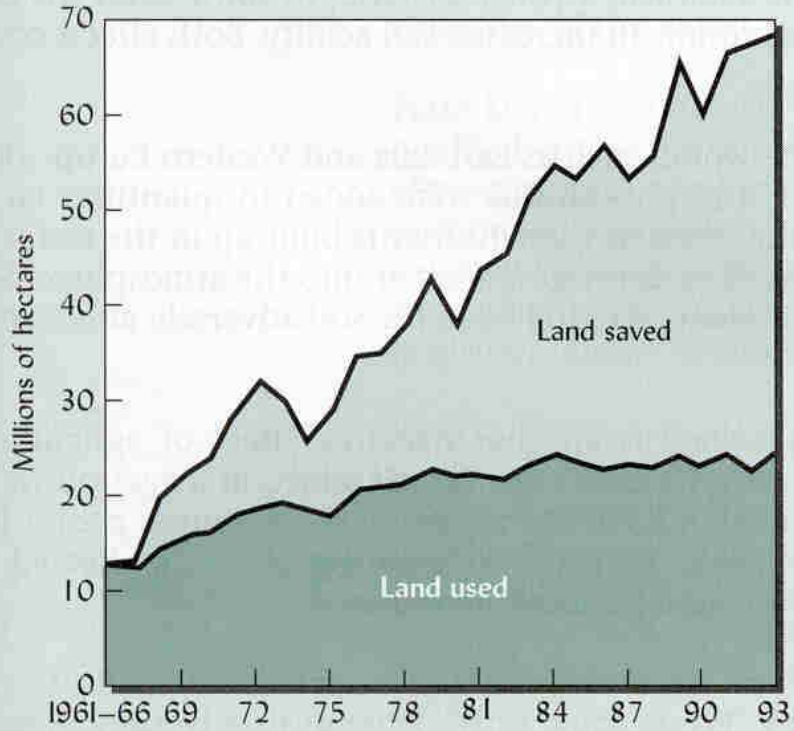

Single-row
tree set
Single-row
tree set
Multiple-row
tree set
Crops
Crops
Crops
Filter
strip
Alley width
Set width
(centerline-to-centerline)

TABLE 20.4 Percent of Increase in Food Production in Different Regions Between 1961 to 1963 and 1989 to 1990 Attributable to Increases in Area Cropped and to Increases in Yields Per Hectare

Region	*Increase attributable to*	
	Increased area, %	*Increased yields,[a] %*
Low-income countries		
Sub-Saharan Africa	47	52
Latin America	30	71
Middle East/North Africa	23	77
South Asia	14	86
East Asia	6	94
High-income countries	2	98
World	8	92

[a] Includes both increasing the number of crops per year and increased yields per hectare.

Data from the Food and Agriculture Organization (FAO).



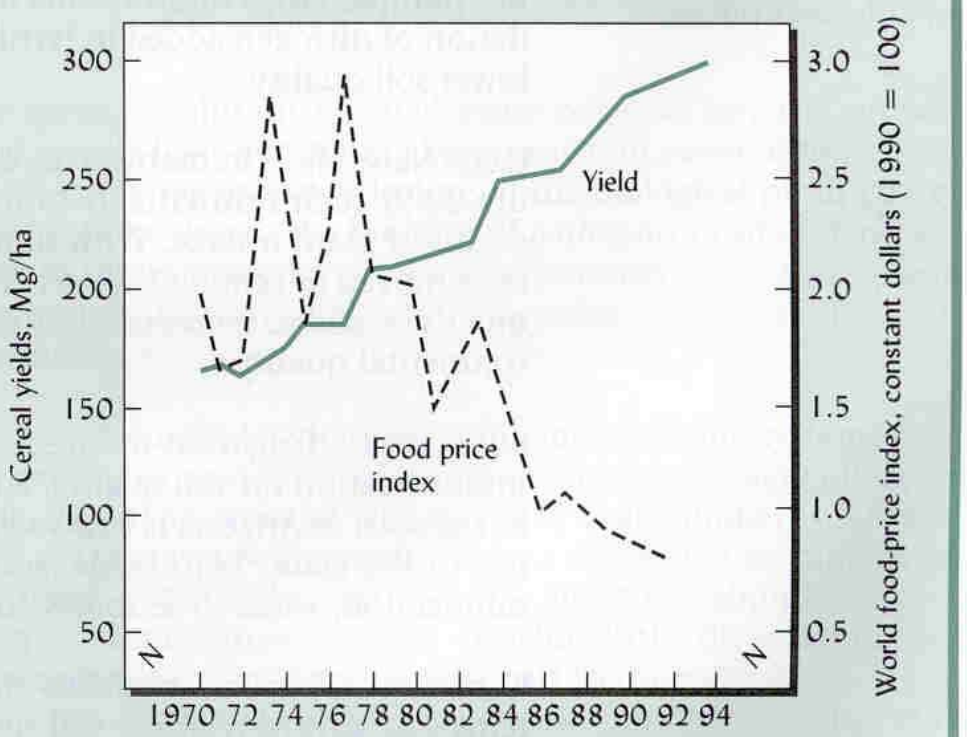


FIGURE 20.7 (*Left*) In the 1990s, if India had been forced to produce its wheat with technologies and varieties of the 1960s, farmers would have needed about 40 million more hectares of farmland. Most of this extra farmland would have to come from easily erodible forestlands that are characterized by steep slopes. (*Right*) The increase in global per-hectare yields of cereal crops (wheat, corn, and rice) from 1970 to 1994 was associated with a reduction in the world food price index for these foods, meaning that consumers paid less for them. The poor people in developing countries (urban as well as rural) were the greatest beneficiaries of these reductions. [Right from CIMMYT (1995); left from *The Economist,* June 10, 1995]