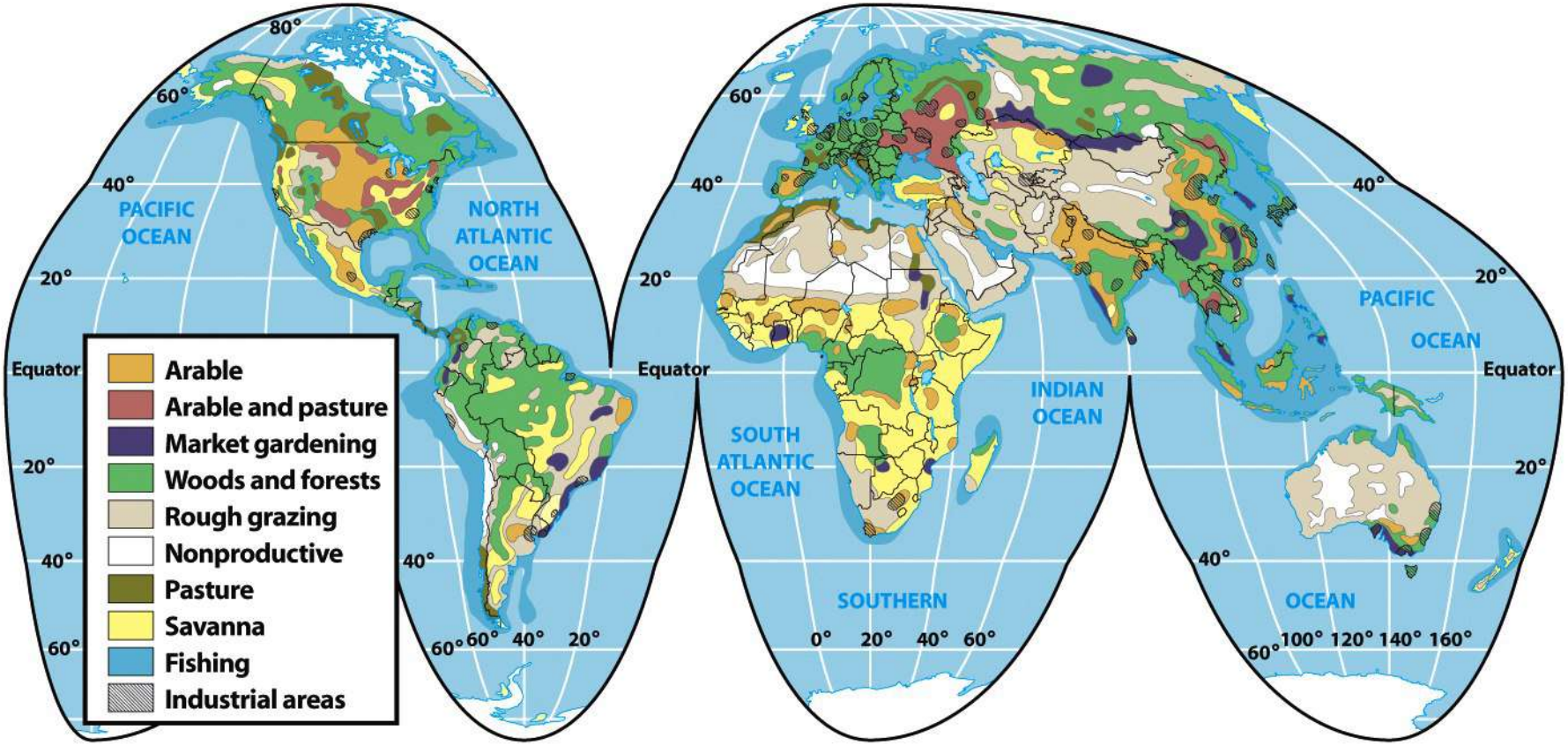
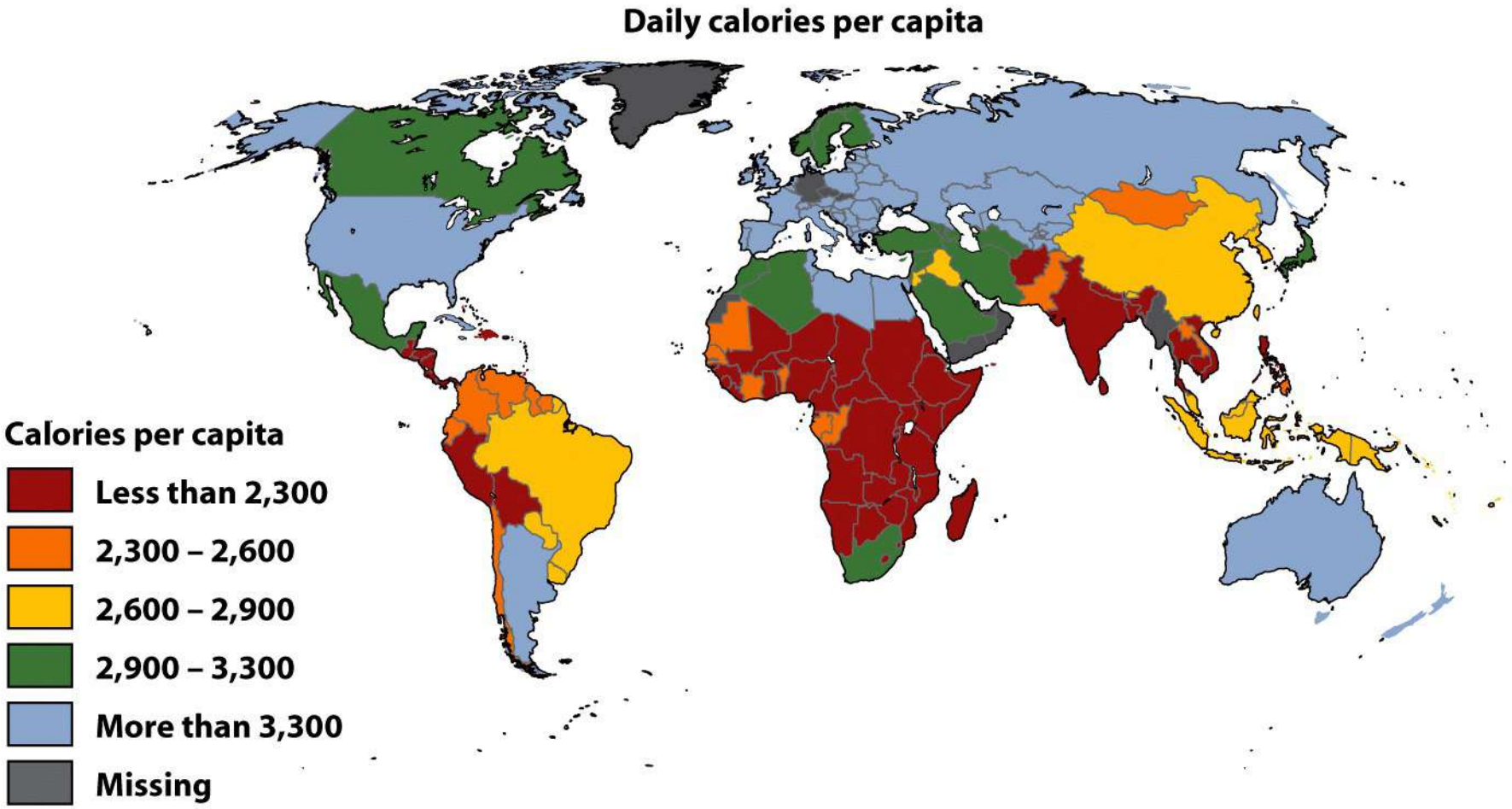
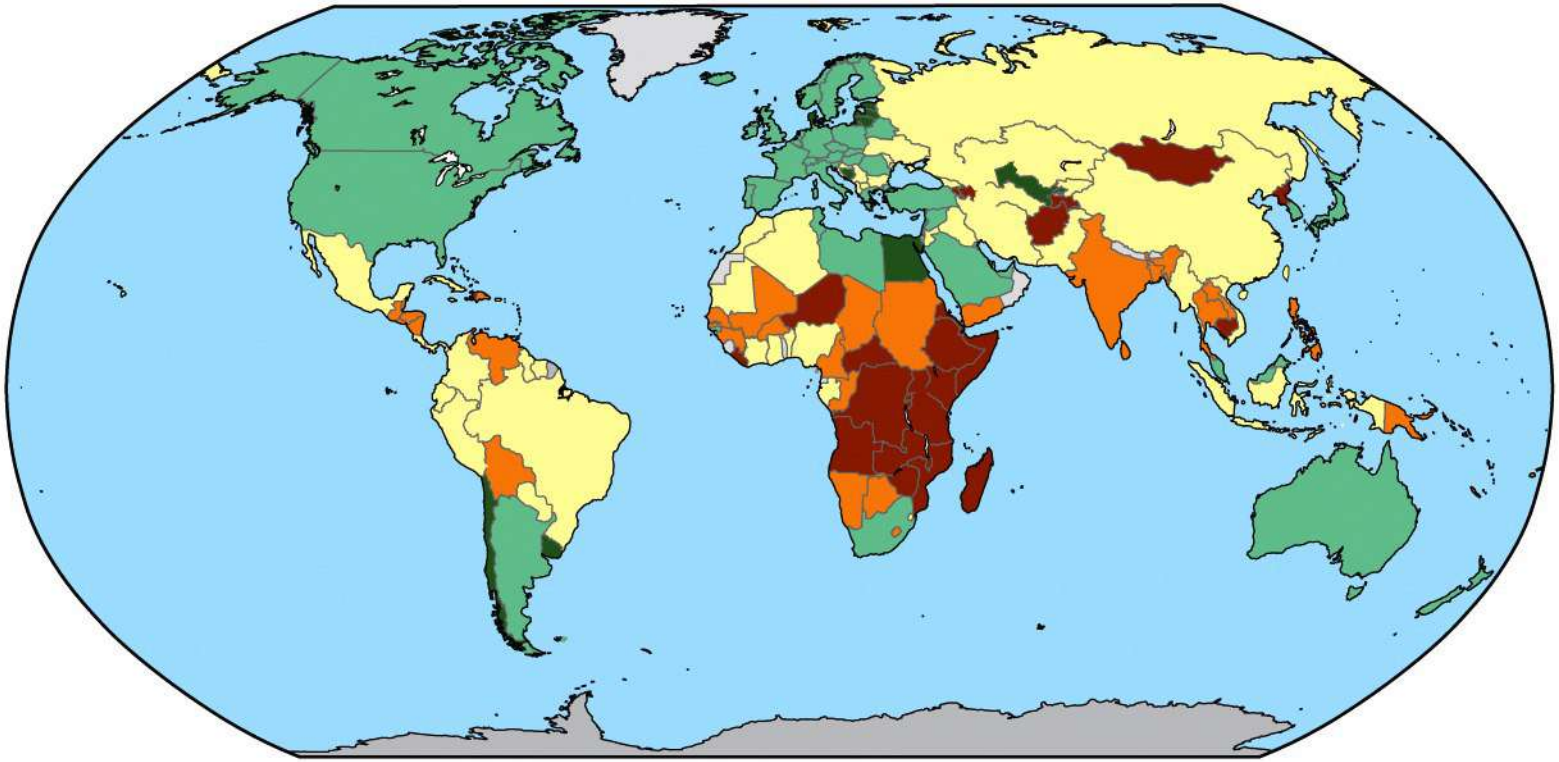
Chapter 11

Producing Enough Food for the World


Arable
Arable and pasture
Market gardening
Woods and forests
Rough grazing
Nonproductive
Pasture
Savanna
Fishing
Industrial areas
PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
PACIFIC OCEAN
SOUTHERN OCEAN
Equator
80°
60°
40°
20°
0°
100°
120°
140°
160°


Daily calories per capita
Calories per capita
Less than 2,300
2,300 – 2,600
2,600 – 2,900
2,900 – 3,300
More than 3,300
Missing

Percentage of population undernourished (1997–1999)



Category	Percent
1	< 2.5
2	2.5 – 5
3	5 – 20
4	20 – 35
5	> 35

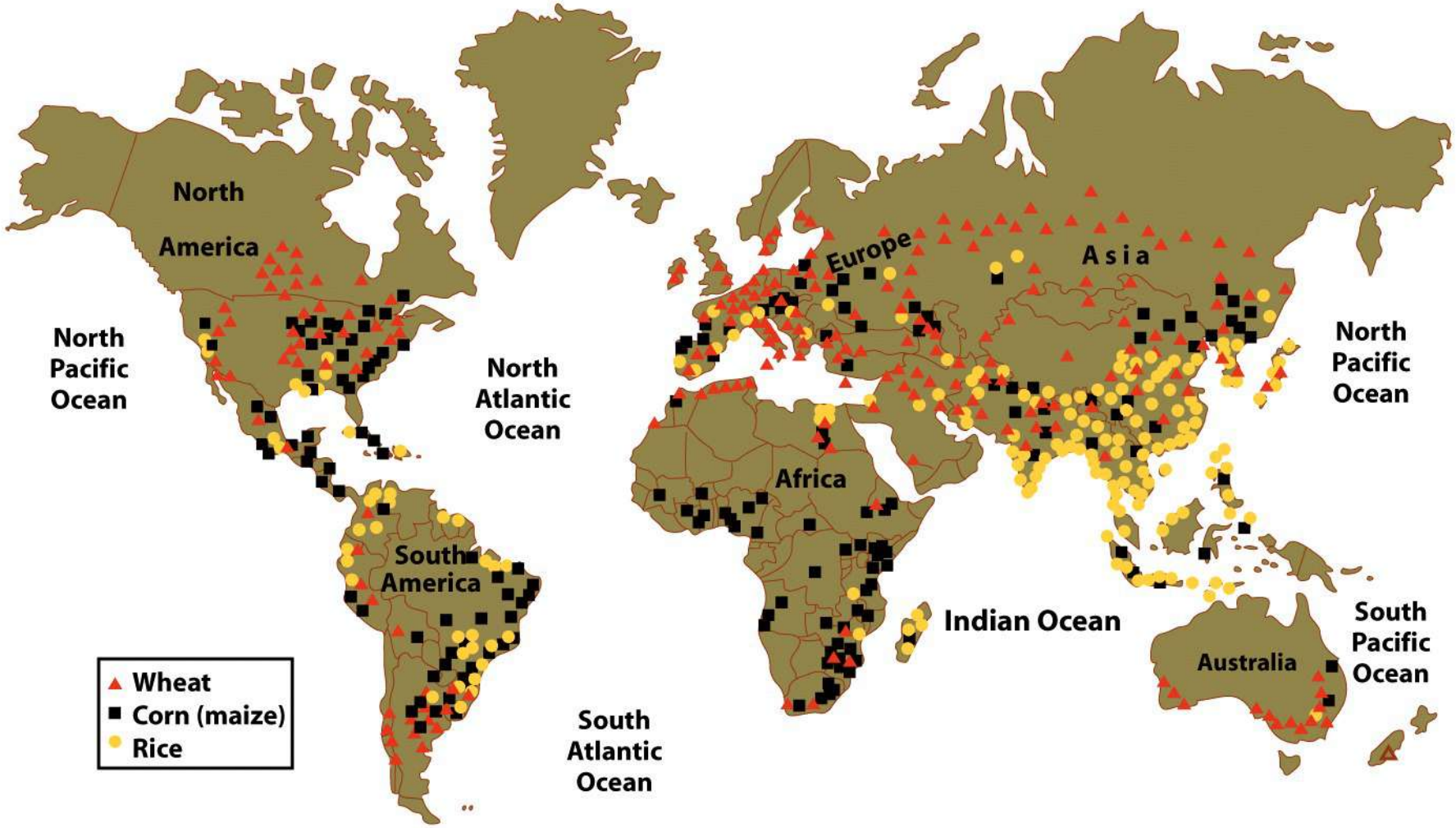
Crops

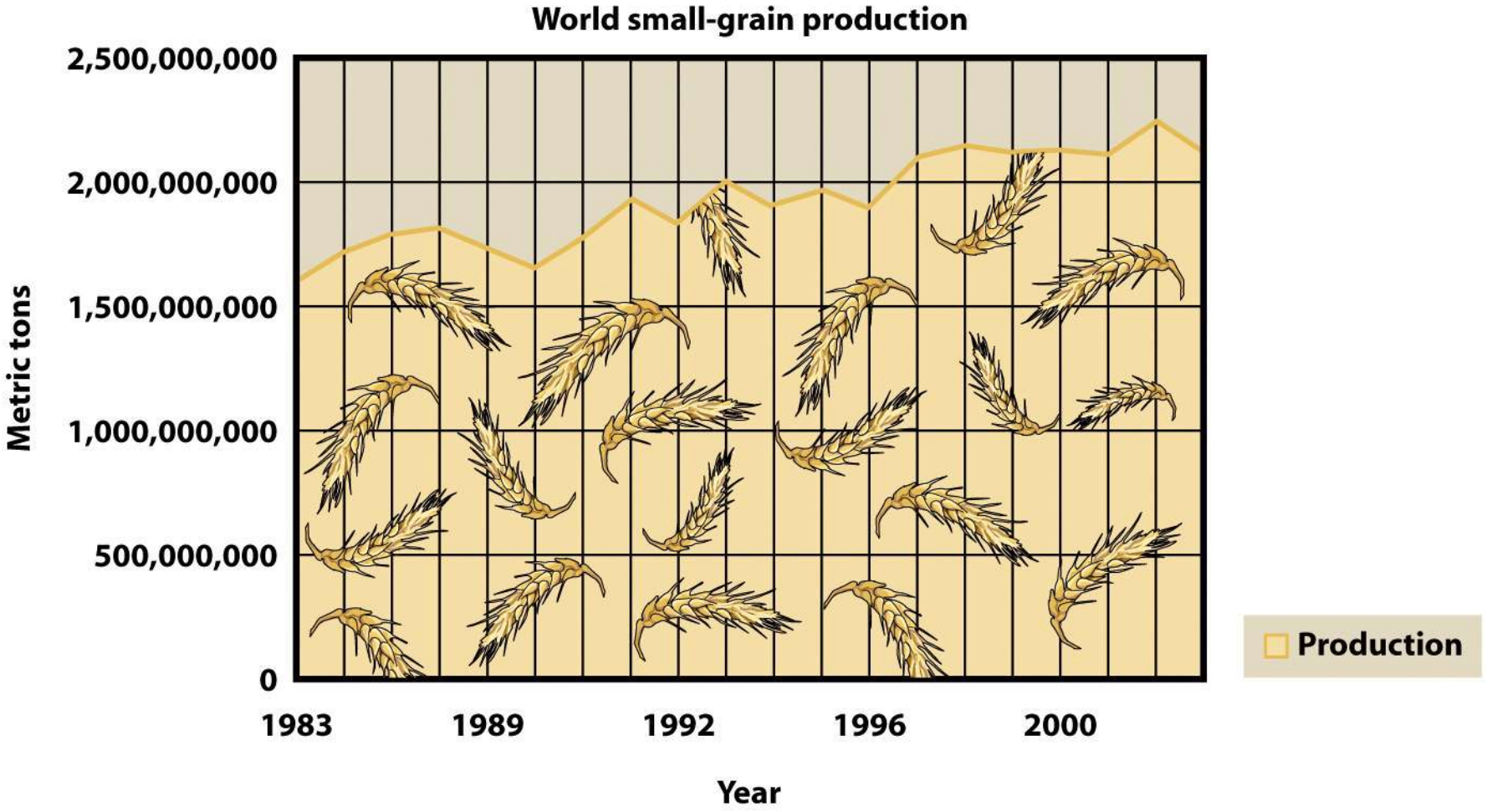
Rangeland:

Provides food for grazing and browsing animals without plowing and planting

Pasture:

Plowed, planted and harvested to provide forage for animals


North America
North Pacific Ocean
North Atlantic Ocean
South America
Europe
Asia
Africa
Indian Ocean
North Pacific Ocean
South Pacific Ocean
Australia
South Atlantic Ocean
Wheat
Corn (maize)
Rice

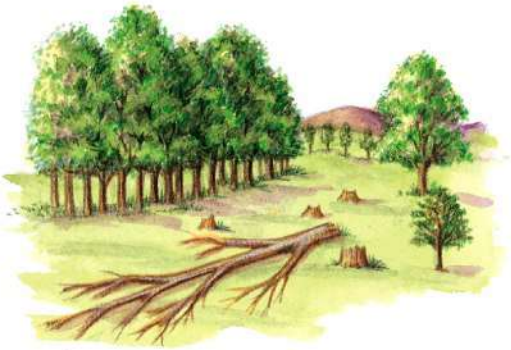

World small-grain production
2,500,000,000
2,000,000,000
1,500,000,000
1,000,000,000
500,000,000
0
Metric tons
1983
1989
1992
1996
2000
Year
Production

Aquaculture

- Aquaculture
  - The farming of food in aquatic habitats
- Mariculture
  - The farming of ocean fish

Six Ways Agroecosystems Differ from Natural Ecosystems

- Try to stop ecological succession and keep the agroecosystem in an early successional state
- Monoculture: Large areas planted with a single species
- Crops are planted in neat rows
- Farming greatly simplifies biological diversity
- Plowing is unlike any natural soil disturbance
- Genetic modification of crops.



Pre-agricultural ecosystem

Agroecosystem

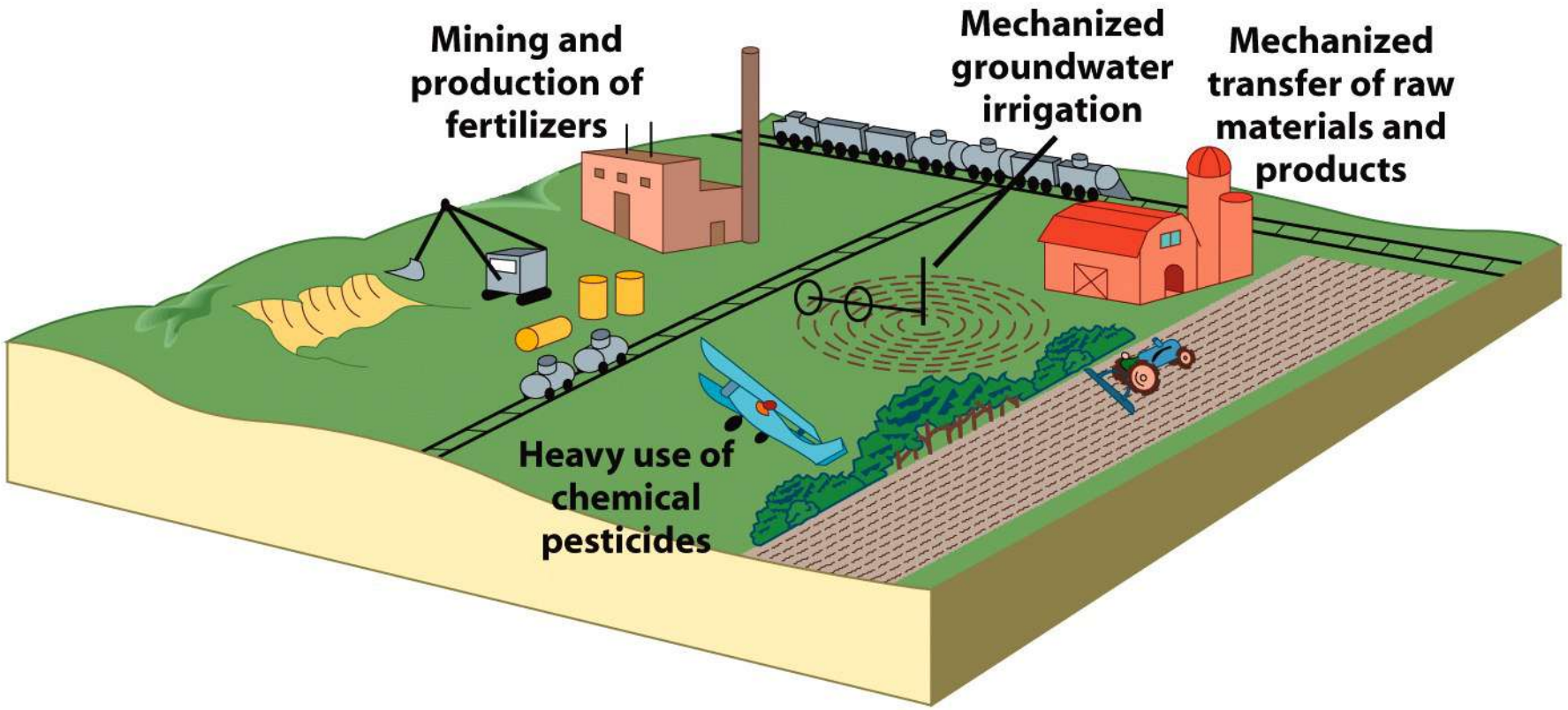
Limiting Factors

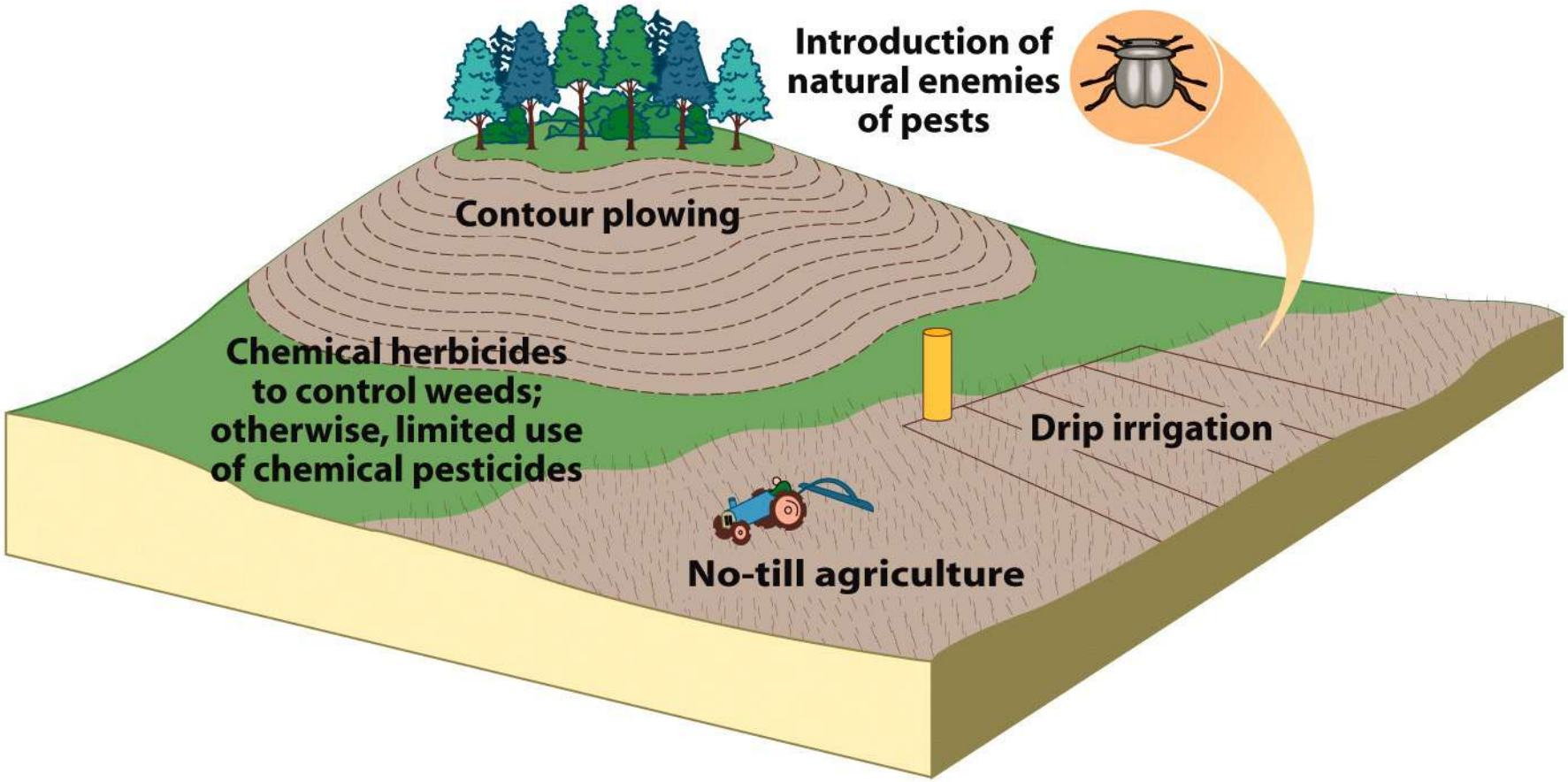
- **Limiting Factor:** The single requirement for growth available in the least supply in comparison to the need of an organism

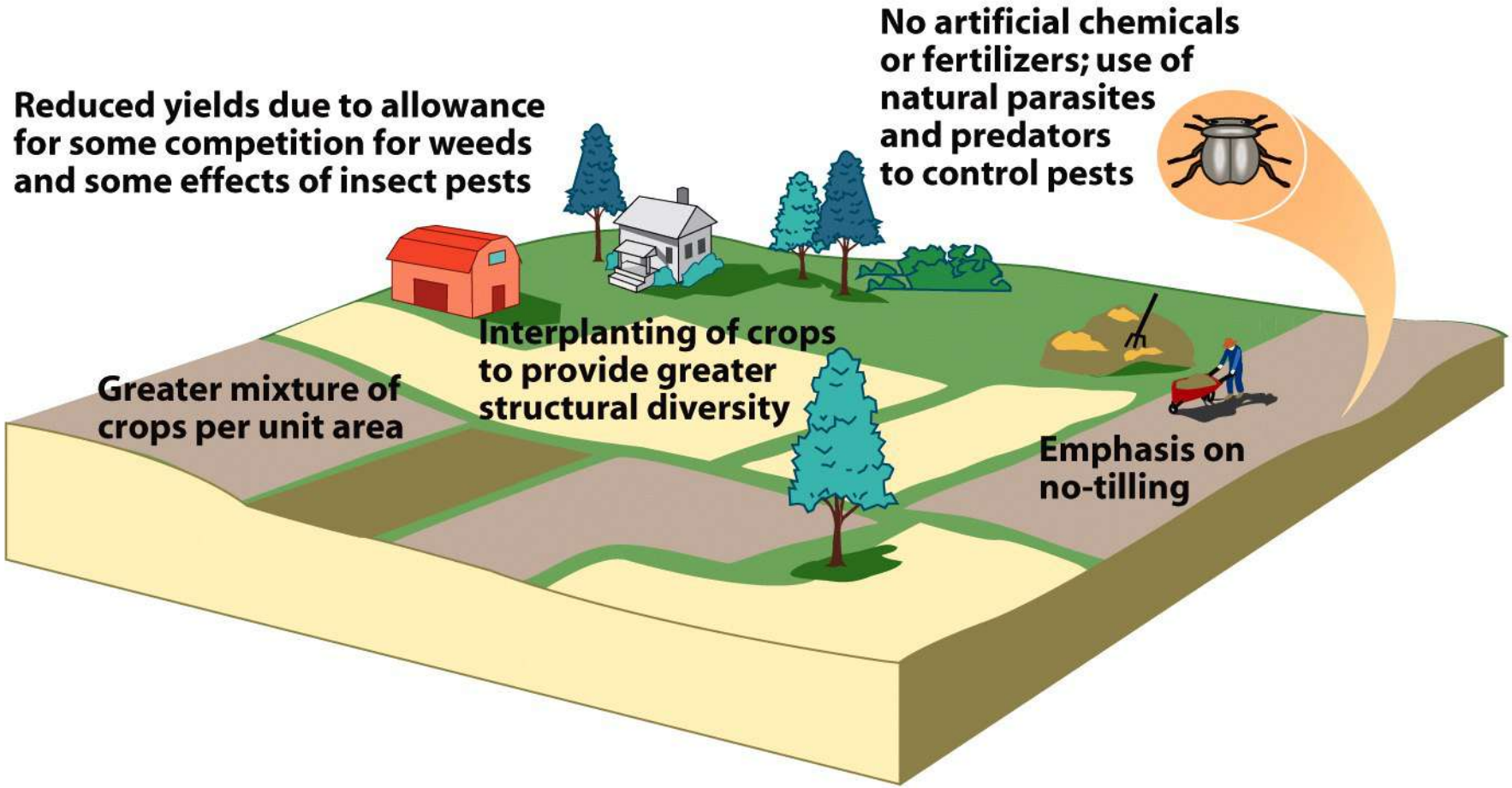
2 Types of Life-Important Chemicals

1. Macronutirents
2. Micronutirents

Synergistic Effects: a change in availability of one resource affects the response of an organism to some other resource


Mining and production of fertilizers
Mechanized groundwater irrigation
Mechanized transfer of raw materials and products
Heavy use of chemical pesticides


Introduction of natural enemies of pests
Contour plowing
Chemical herbicides to control weeds; otherwise, limited use of chemical pesticides
Drip irrigation
No-till agriculture


Reduced yields due to allowance for some competition for weeds and some effects of insect pests
No artificial chemicals or fertilizers; use of natural parasites and predators to control pests
Interplanting of crops to provide greater structural diversity
Greater mixture of crops per unit area
Emphasis on no-tilling

Increasing the Yield per Acre

1. The Green Revolution

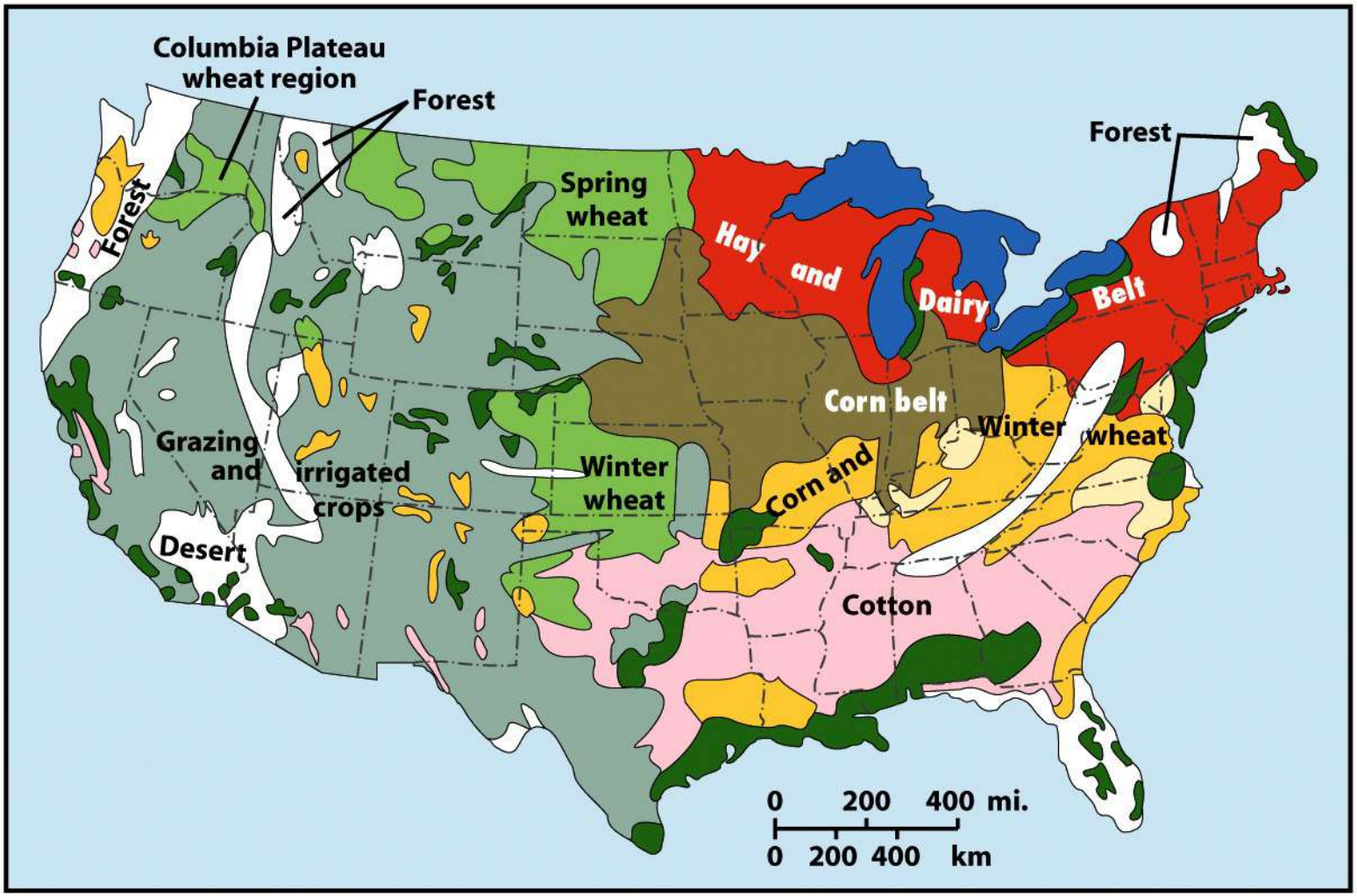
- Programs that have led to the development of new strains of crops with higher yields, better resistance to disease or better ability to grow under poor conditions

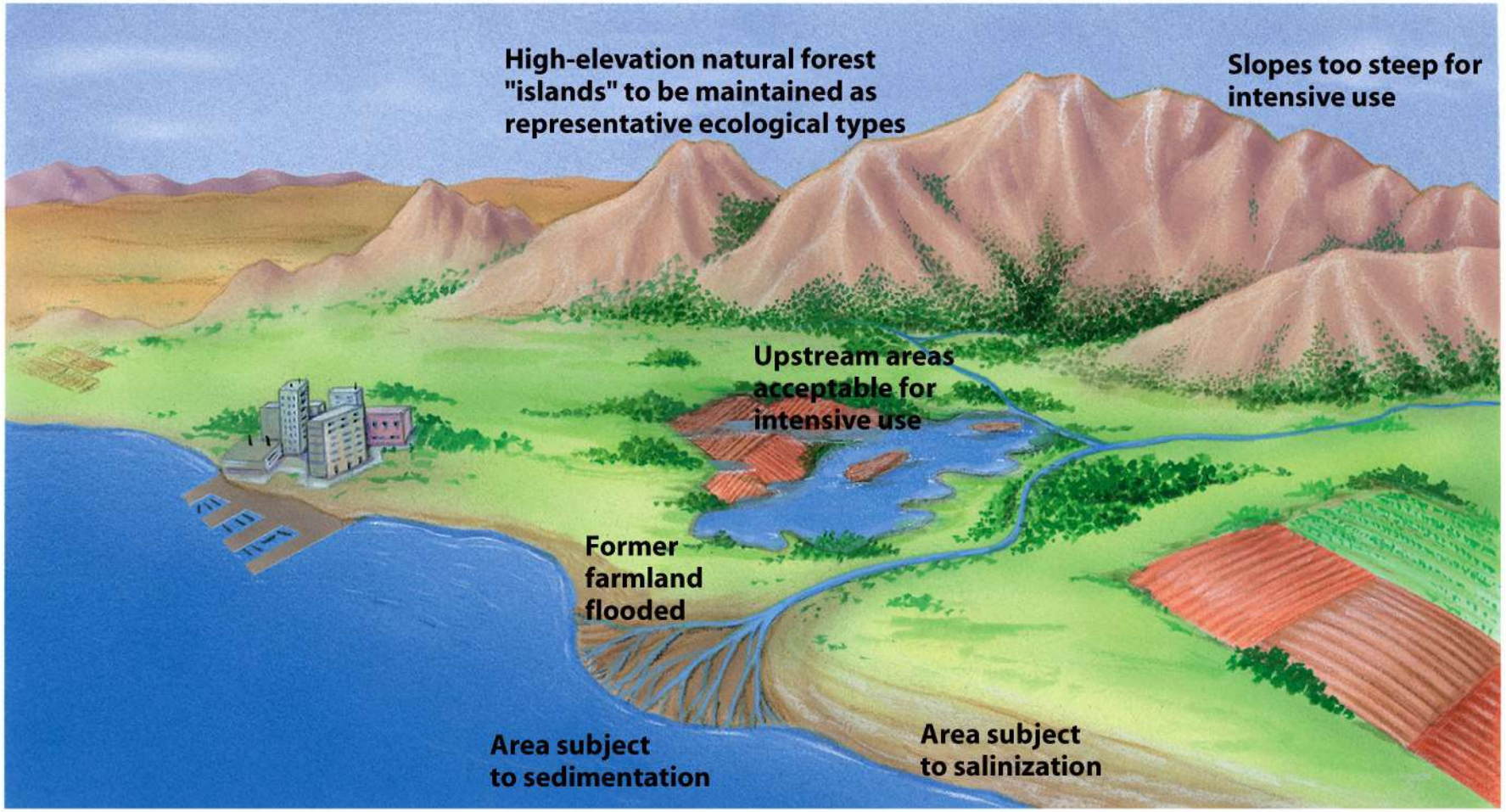
2. Improved Irrigation

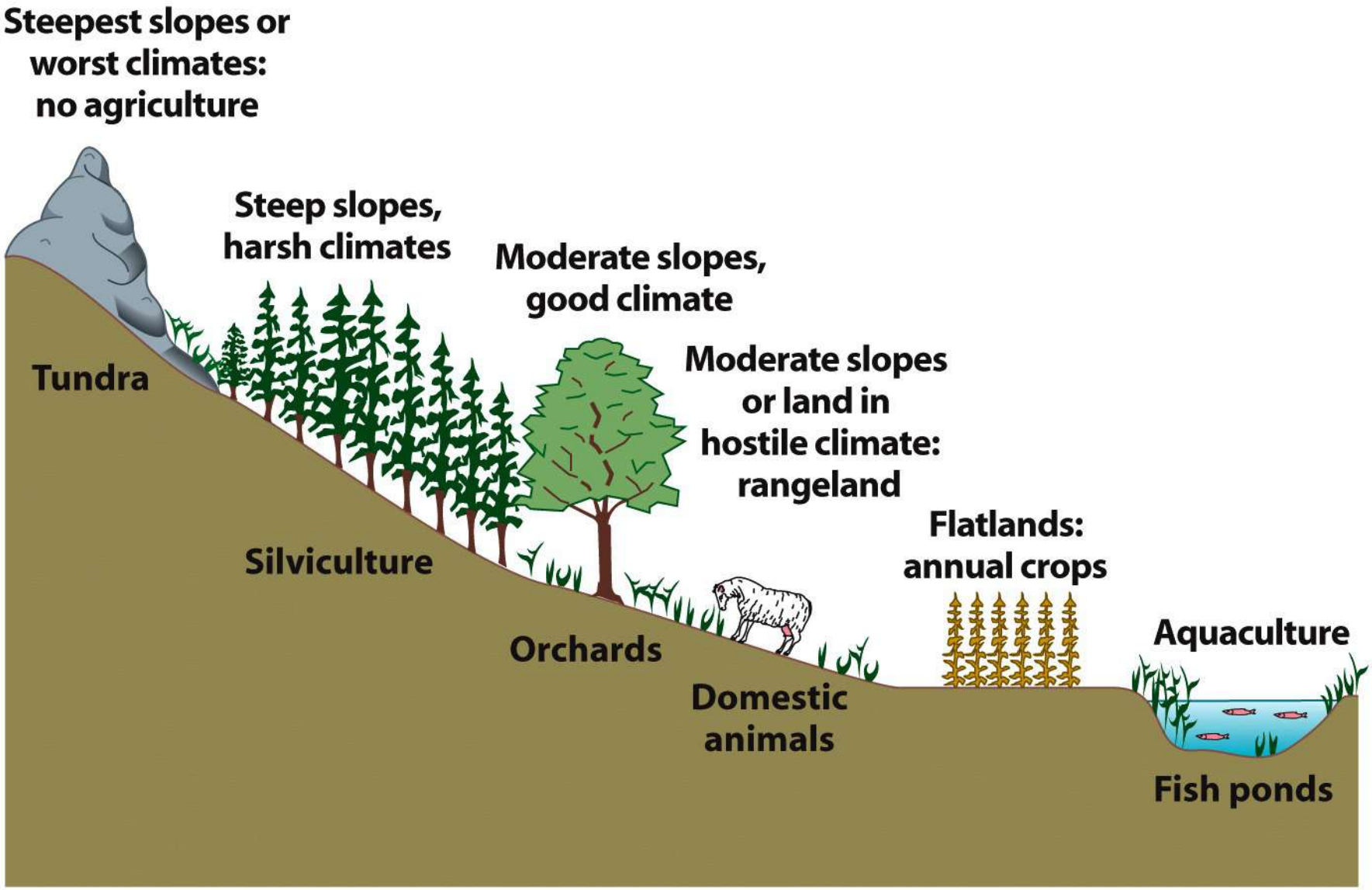
Organic Farming

3 Qualities

- It is more like natural ecosystems than monocultures
- It minimizes negative environmental impacts
- The food that results from it does not contain artificial compounds


Columbia Plateau wheat region
Forest
Forest
Forest
Spring wheat
Hay and Dairy Belt
Corn belt
Winter wheat
Corn and
Winter wheat
Grazing and
irrigated crops
Desert
Cotton
0 200 400 mi.
0 200 400 km
Fruit, truck, and special crops
Wheat and small grains
Dairy
Feed grains and livestock (corn belt)
Tobacco and general farming
Range livestock
General farming
Cotton
Nonfarming


High-elevation natural forest "islands" to be maintained as representative ecological types
Slopes too steep for intensive use
Upstream areas acceptable for intensive use
Former farmland flooded
Area subject to sedimentation
Area subject to salinization


Steepest slopes or worst climates: no agriculture
Steep slopes, harsh climates
Moderate slopes, good climate
Tundra
Moderate slopes or land in hostile climate: rangeland
Flatlands: annual crops
Silviculture
Aquaculture
Orchards
Domestic animals
Fish ponds

Genetically Modified Food

- Genetically Modified Crops are modified by genetic engineers to produce higher crop yields and increase resistance to drought, cold, heat, toxins, plant pests and disease.