AGRICULTURAL REVOLUTIONS

Before Agriculture

- Paleolithic (Old Stone Age)
- Hunter-gatherers--Nomads
  - Simple stone tools & weapons
  - Much space/Few people
  - Men- Hunt and Women- Gather
- Family Groups – About 50 or less
- World Population 9000 BCE 5-10 Million

1st Agricultural Revolution

- **"Neolithic Revolution"**10,000 BCE - subsistence agriculture began developing independently in several crop hearths.
- **Subsistence Agriculture:** farming just enough crops to provide for ones family
- **Domestication** – manipulating genetics of plants and animals to make them useful for humans
  - Pigs, Goats, Sheep, Cattle
  - 8000 BCE (10,000 years ago!)

Domestication

- Dogs were first animals to be domesticated (12,000-15,000 years ago)
- How?

Domestication

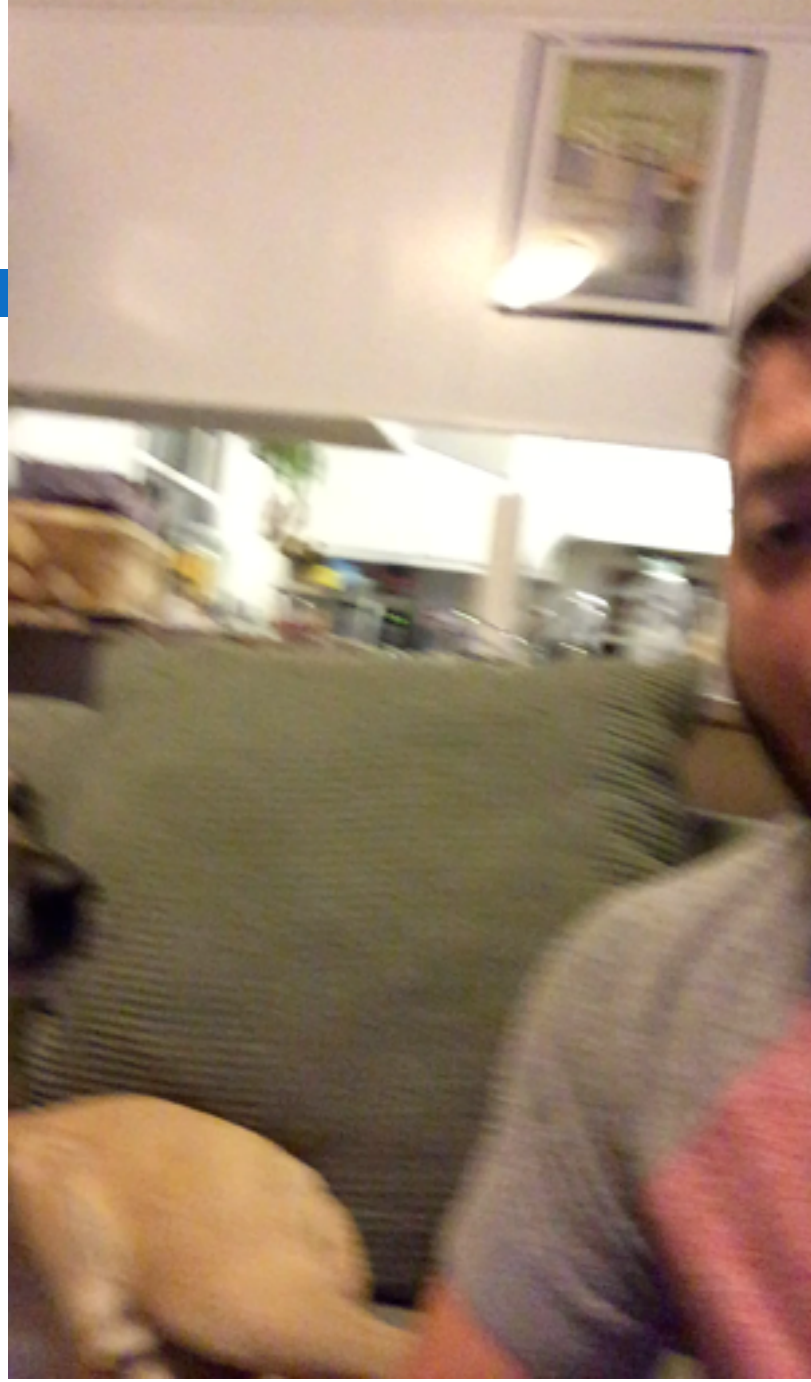
- Dogs ancestors are wolves
- Wolves were around human settlements because food was there
- Some wolves were genetically disposed to being braver and less aggressive

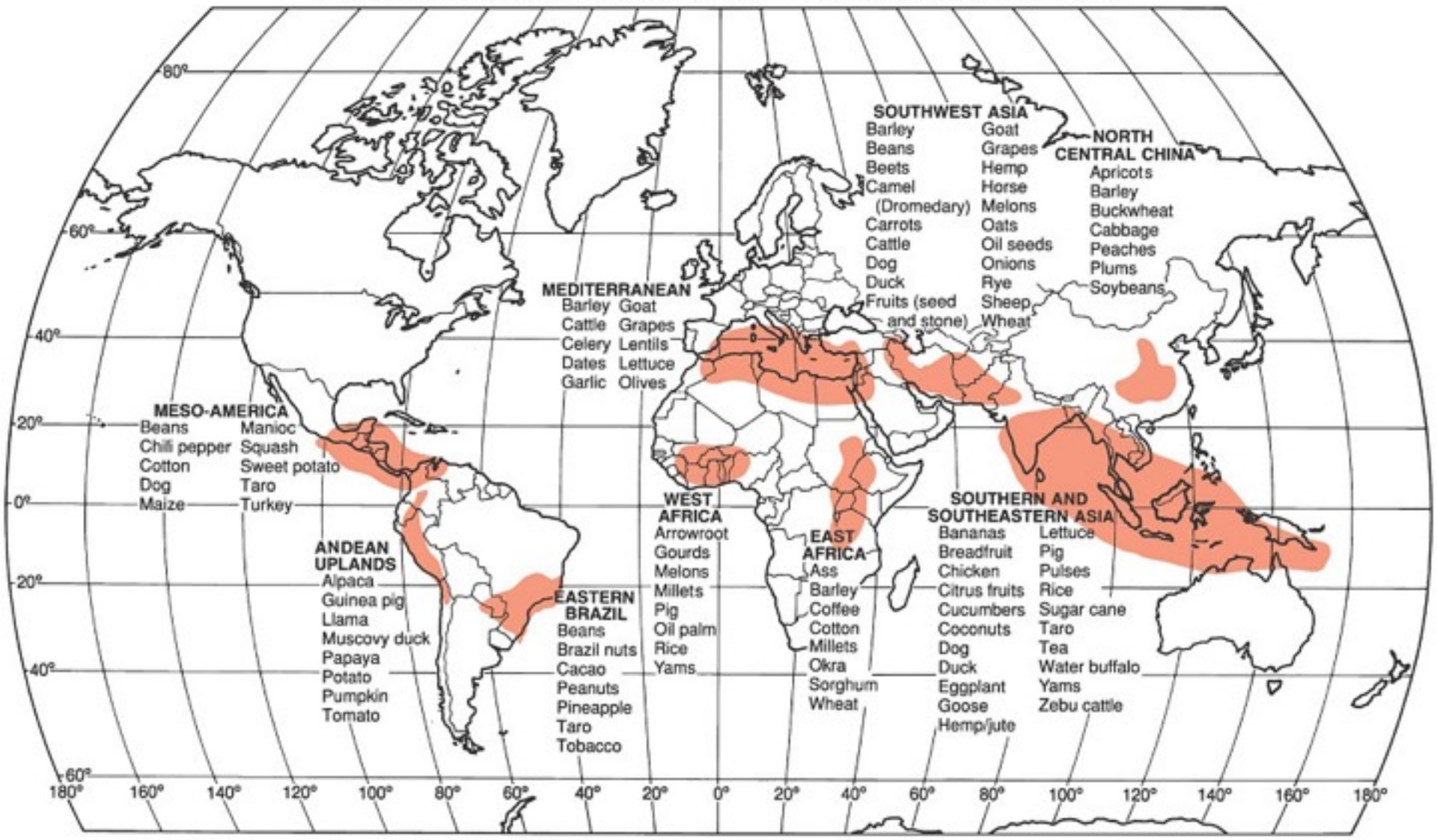
Domestication

- Wolves and humans are both pack animals
- Some wolves began to see humans as food sources, humans saw wolves as means of protection from predators
- Over time, wolves comfortable with humans bred with other wolves comfortable with humans

Domestication

- Over many generations of breeding wolves, many wolf traits (size, aggression) were no longer passed and a new species was created: dogs
- Humans learned to train dogs to hunt and work



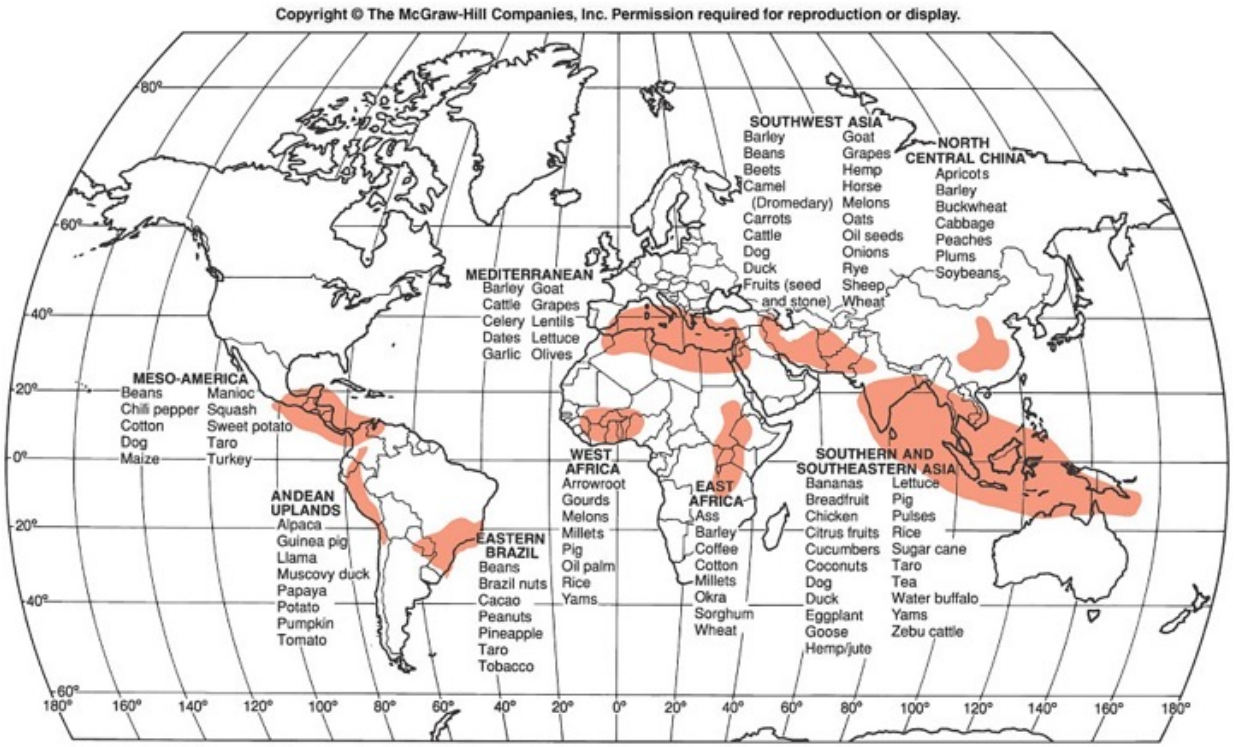


(a)

(b)

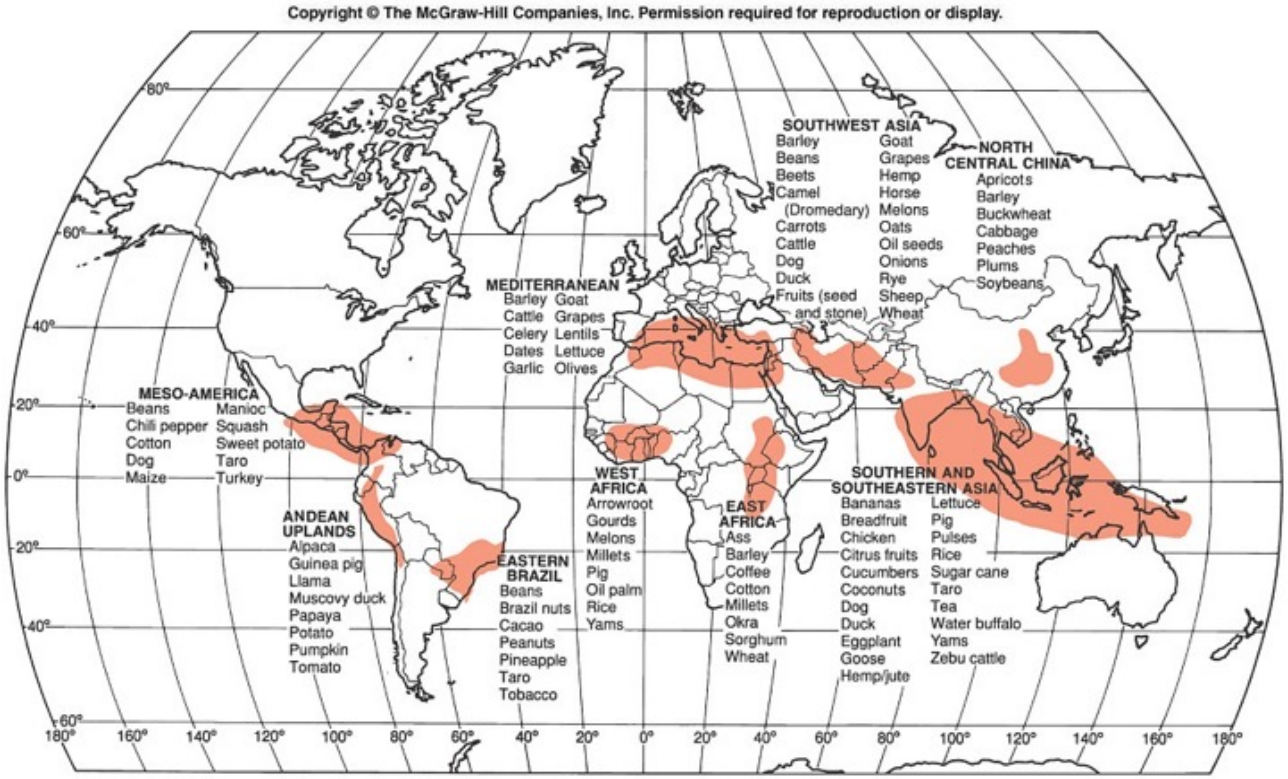
1st Agricultural Revolution

- Southwest Asia (Mesopotamia/ Fertile Crescent)
  - Located between the Tigris and Euphrates Rivers
  - Domesticated Barley and Wheat
  - Pigs, Cattle, Sheep, and Dogs



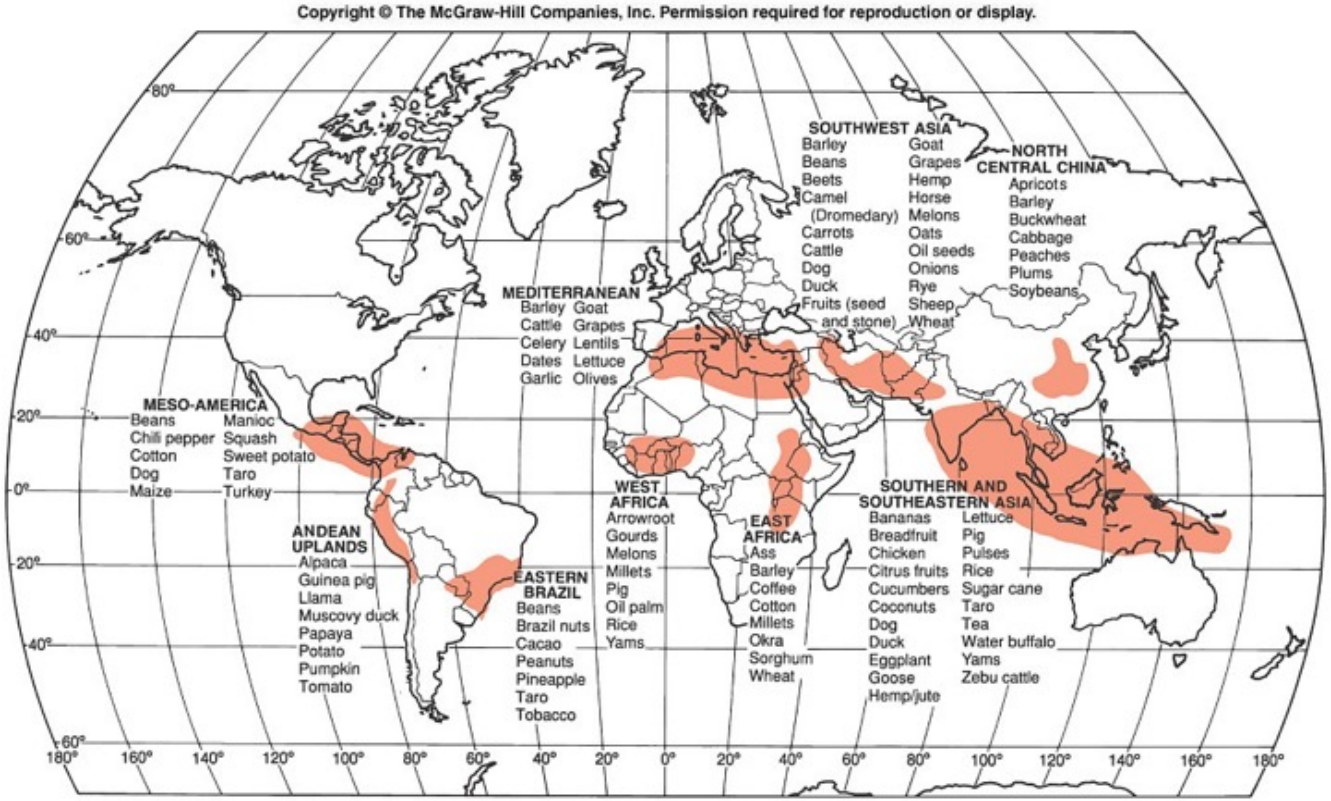
1st Agricultural Revolution

- East Asia (Yellow River Valley)
  - Domesticated Rice and the Chicken



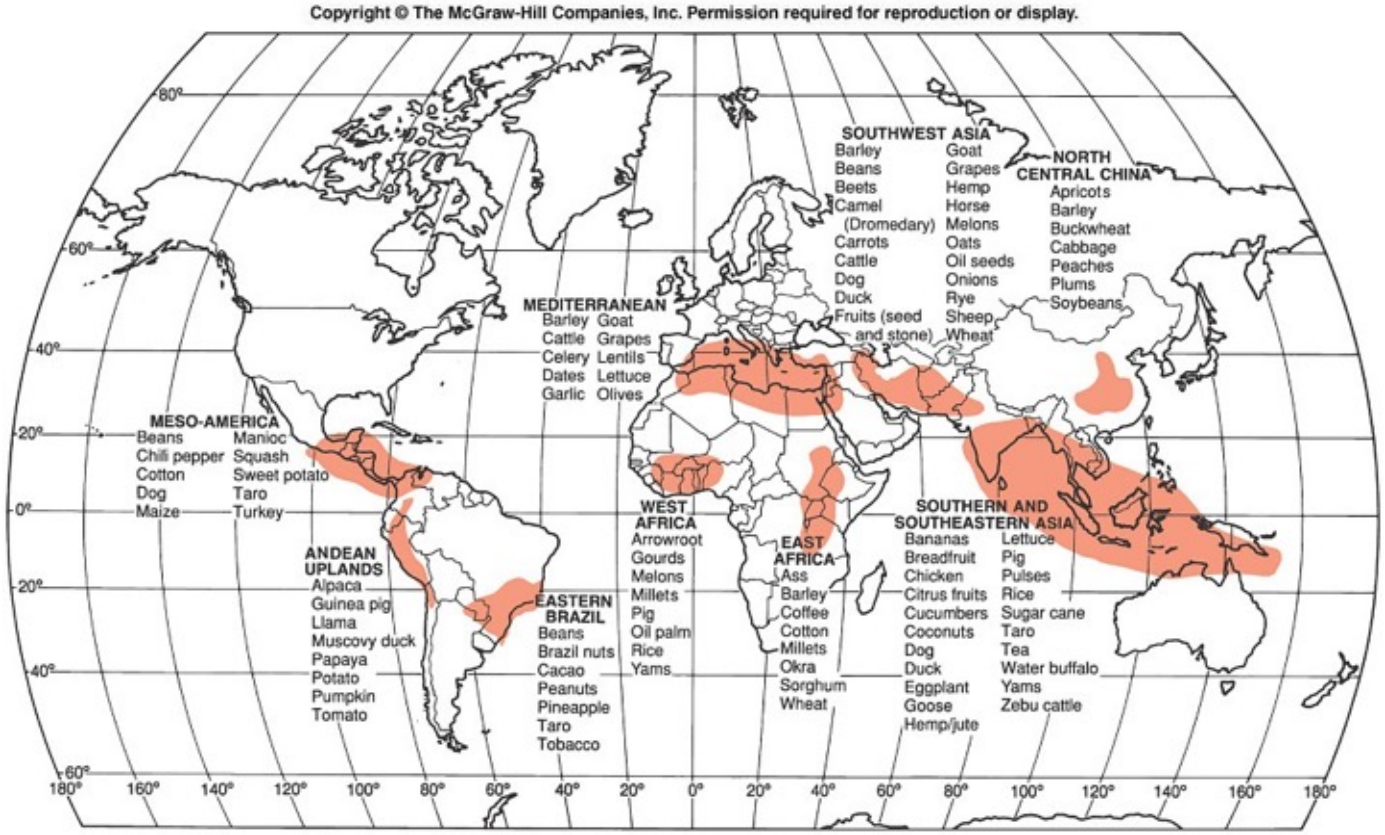
1st Agricultural Revolution

- Latin America (Yucatan Peninsula and Incan)
  - Domesticated Corn, Potatoes, Squash, and Beans
  - Still Staple Crops



1st Agricultural Revolution

- Sub-Saharan Africa (West Africa)
  - Sorghum, Yams, Millet, and Rice were domesticated.

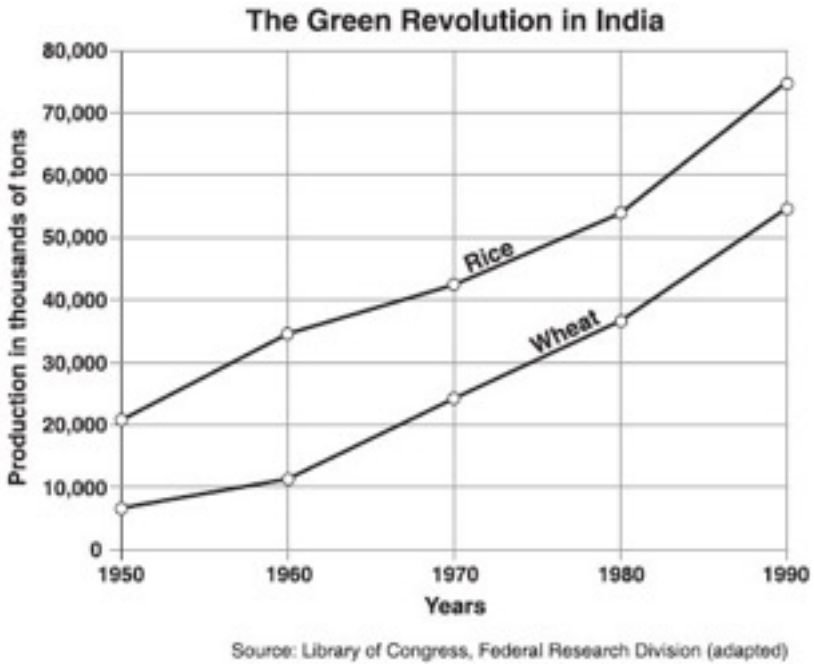


2nd Agricultural Revolution

- Due to technology from Industrial Revolution
- Fields were much larger, but still used the same amount of labor
- Many LDCs are still in the second agricultural revolution.

3rd Agricultural Revolution/ "Green Revolution

- Happens in the latter half of the 20th century
  - Genetically Modified Crops
  - Fertilizers
  - Irrigation Techniques
  - Pesticides



SUBSISTENCE AGRICULTURE

	Commercial Agriculture	Subsistence Agriculture
Purpose		
Labor Force		
Machinery		
Size		
Relationships with Business		

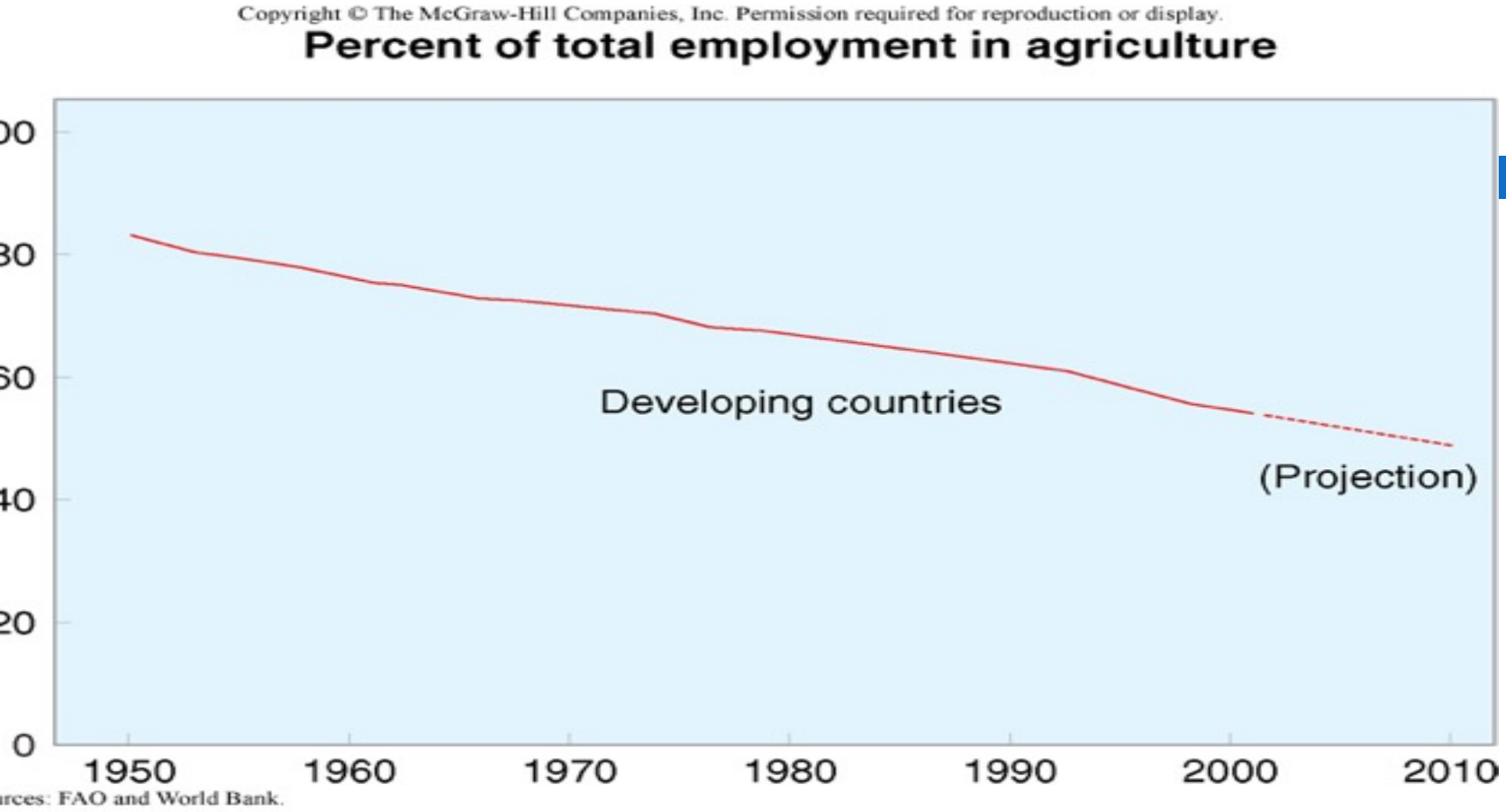
Patterns of access & isolation – white indicates areas within 20 miles of railroads, Motor transport, or water navigation.

Source: Copyright permission: Hammond Inc., Maplewood, N.J. 07040.

Is there a correlation between a country's development level (demographic transition stage) and their spatial patterns of access/isolation?

Subsistence Agriculture

- Producing food needed to survive on a daily basis
- Near total self-sufficiency – predominant occupation of mankind today
- 2 types:
  - Extensive
  - Intensive

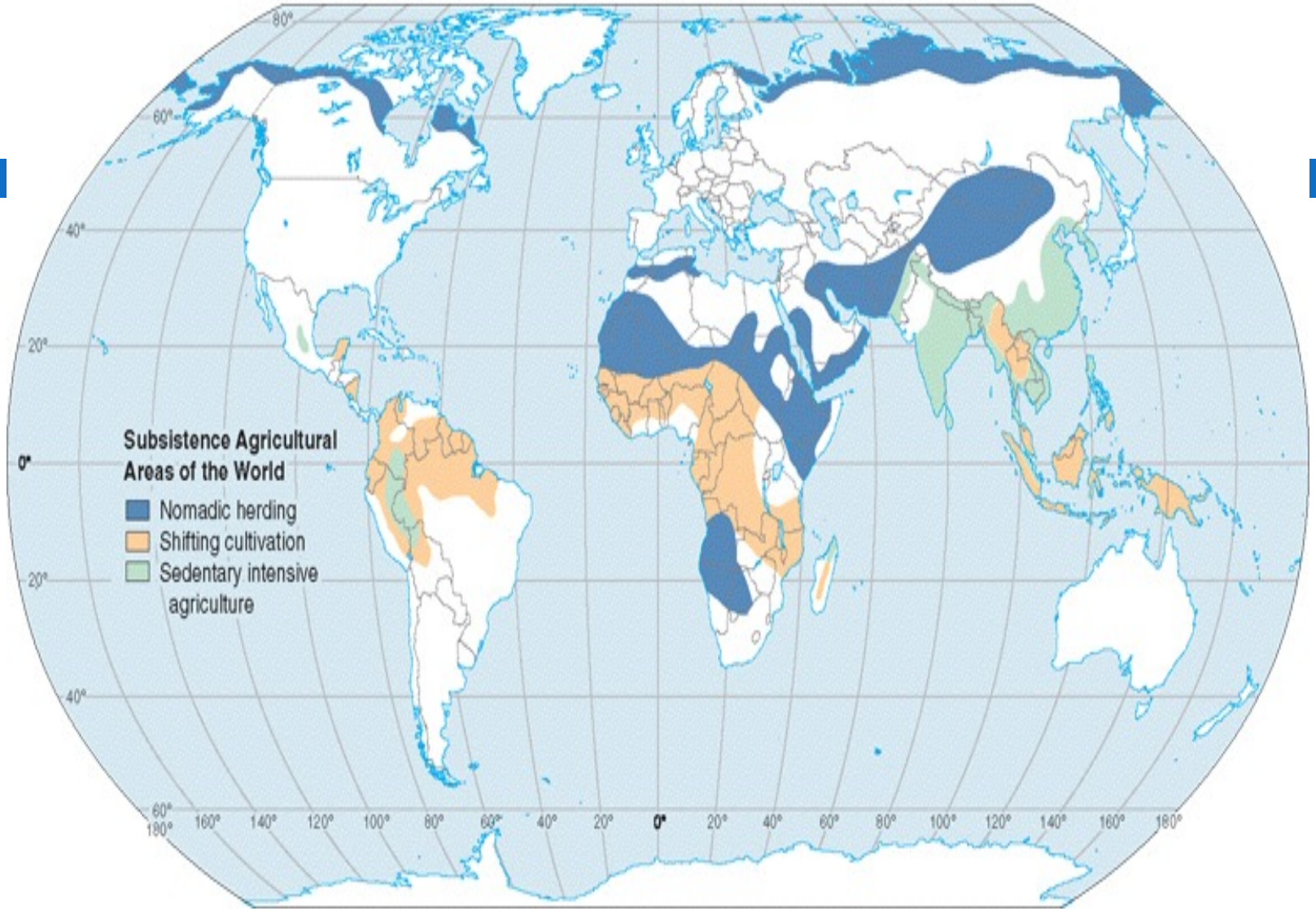


1. What trend is occurring in developing countries regarding percentage of total employment in agriculture?

1. What factors might be contributing to this trend?

Extensive Subsistence Agriculture

- **Defn. –** large amount of land required for large output (uses a large amount of land)
- **Represents a very small % of world population**
- **2 groups:**
  - **Nomadic herding**
  - **Shifting cultivation**



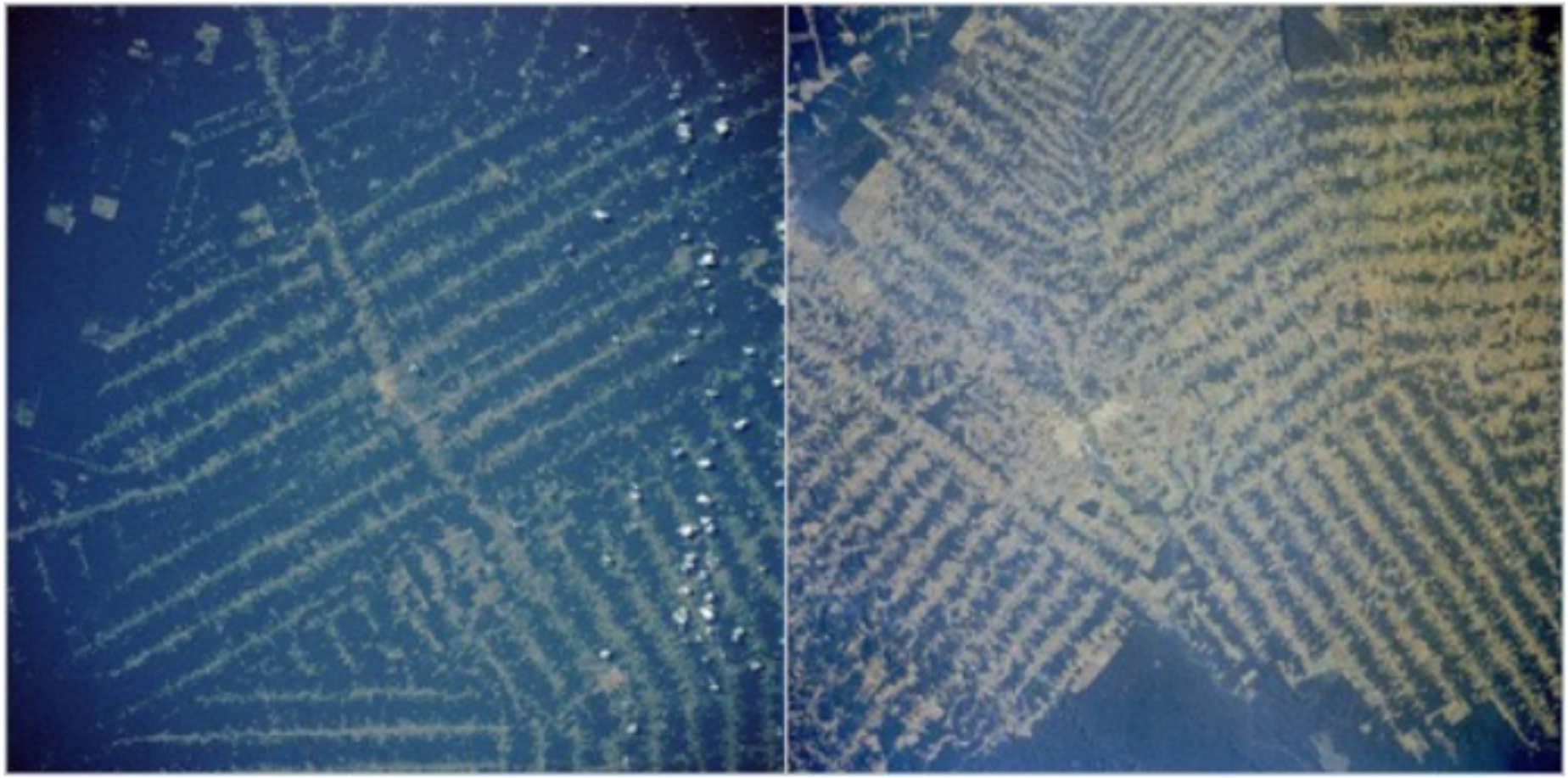
1. What regions do we find nomadic herding?
2. What regions do we find shifting cultivation?

Nomadic Herding

- Also called **pastoral nomadism**
  - Wandering, but controlled movement of livestock
  - Solely dependent upon natural forage
  - Dry & cold regions
  - Requires large expanses of land
  - **Transhumance** – human movement of animals
  - Small % worldwide
  - Prevents Desertification

Shifting Cultivation

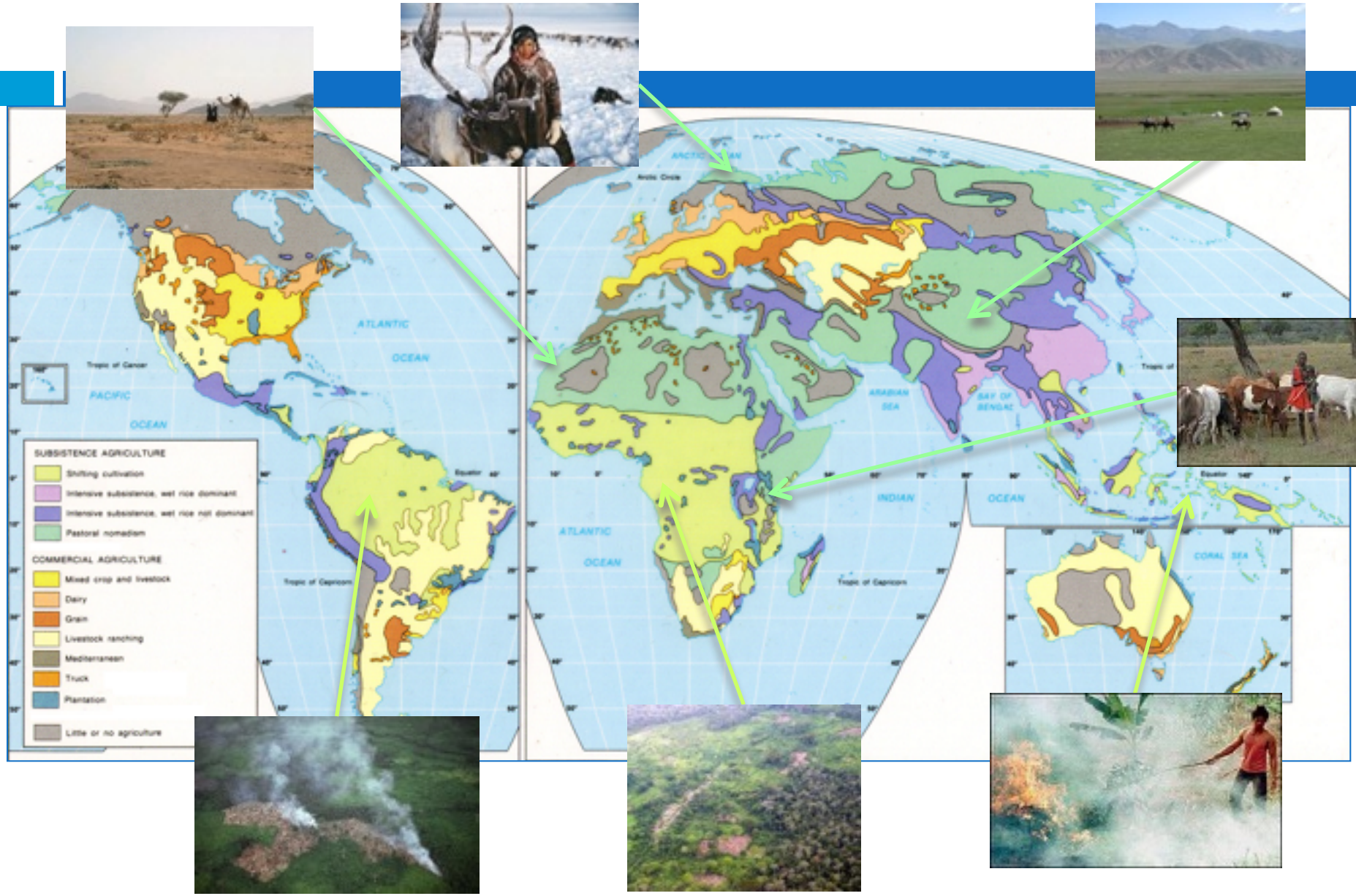
- nomadic farming - slash & burn
- Located in warm, moist, lowlands
- Involves about 5% of world's population
- Renewable strategy if:
- population is low
- Cons?
  - Growing Population
  - Deforestation
  - Green House Gases



1985

1992

Extensive Subsistence Agriculture



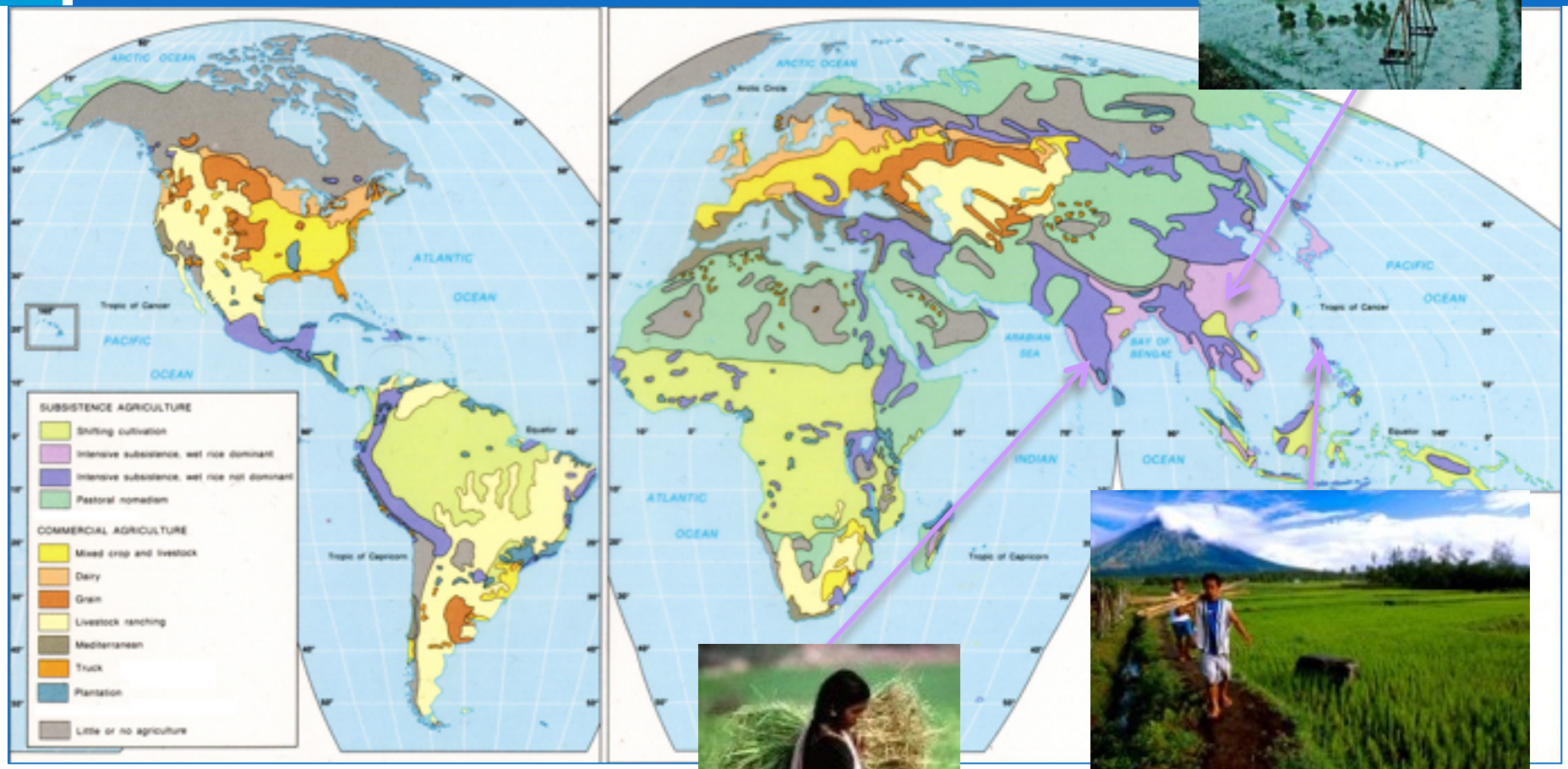
Intensive Subsistence Agriculture

- Defn. - concentrated farming (uses a small amount of land)
- ¾ of people in LDCs feed themselves through this method
- Warm, moist climates (Asia)
- Labor-intensive farming, simple tools, small plots of land,often double cropped
- Most Frequently Rice
- **double cropping** - two crops, same piece of land

Intensive Farming (cont.)

- **<u>Urban</u> subsistence farming /garden plots**
  - Increasing phenomenon worldwide
  - Converts waste products to fertilizers, but can cause spread disease

Intensive Subsistence Agriculture



Subsistence Agriculture (cont.)

- Extensive
- Intensive

Impact of Green Revolution on Subsistence Farming

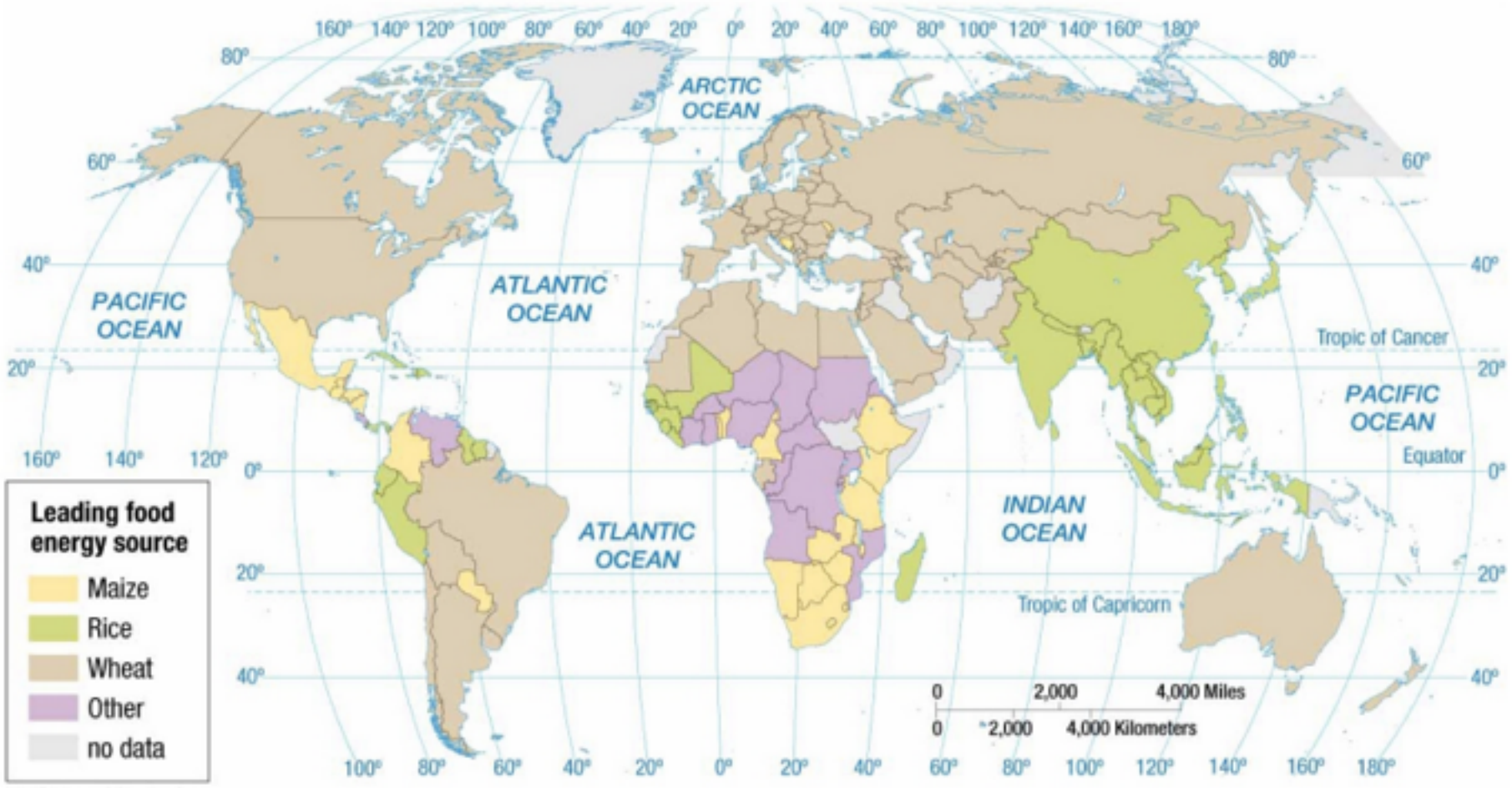
- Irrigation problems - lack of water
- Seed genetics (good: inc. food yields, more resistant to disease… bad: homogeneity, long term health effects)
- Displaced traditional farmers
- Population growth uncontrolled

WHY DO PEOPLE EAT DIFFERENT FOODS?

Why Do People Consume Different Foods?

- Diet
  - *Dietary energy consumption* is the amount of food that an individual consumes.
  - Consumption of food varies around the world, both in total amount and source of nutrients, for two reasons.
    1. Level of development
    2. Physical conditions

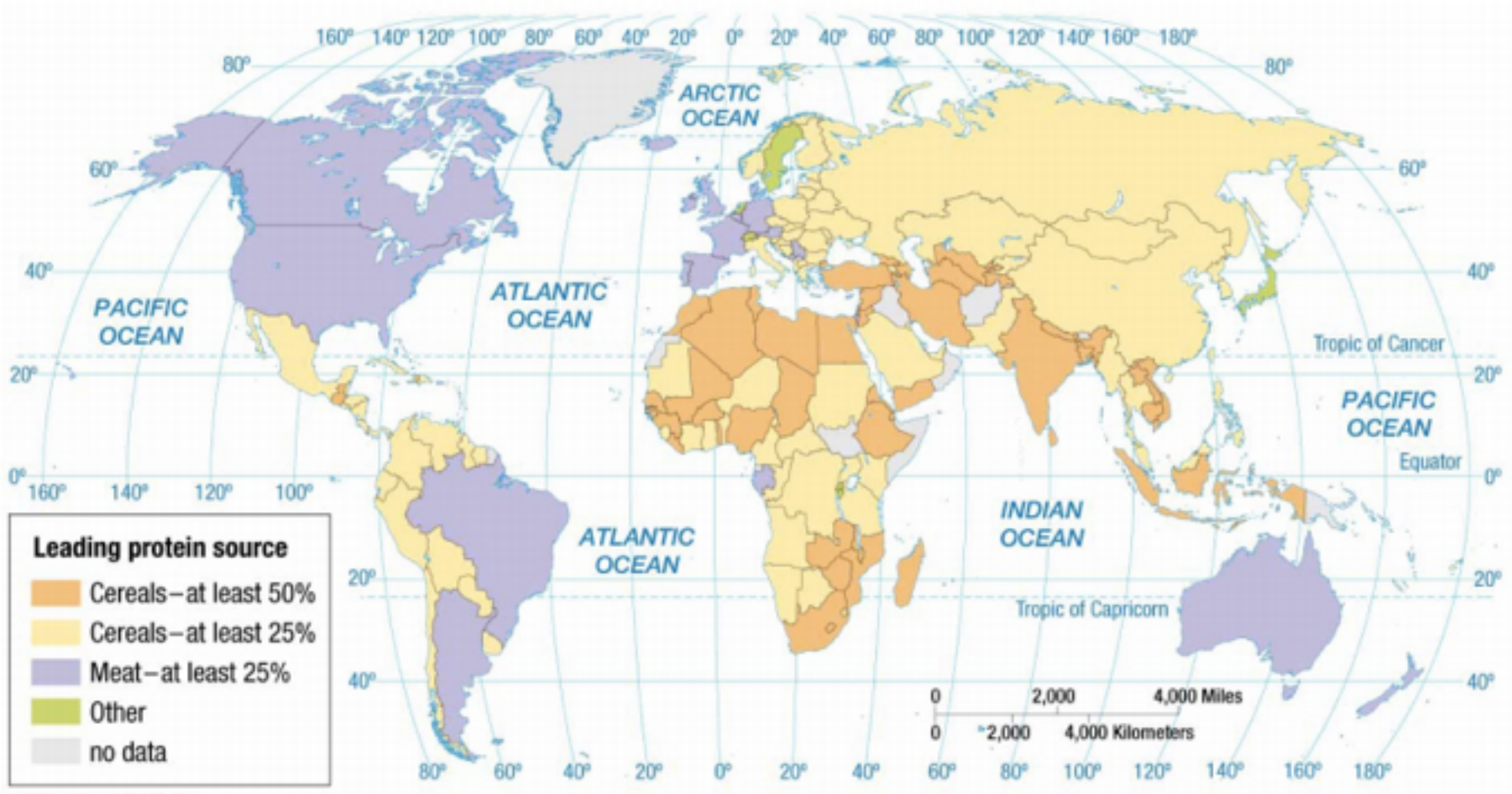
Dietary Energy by Source



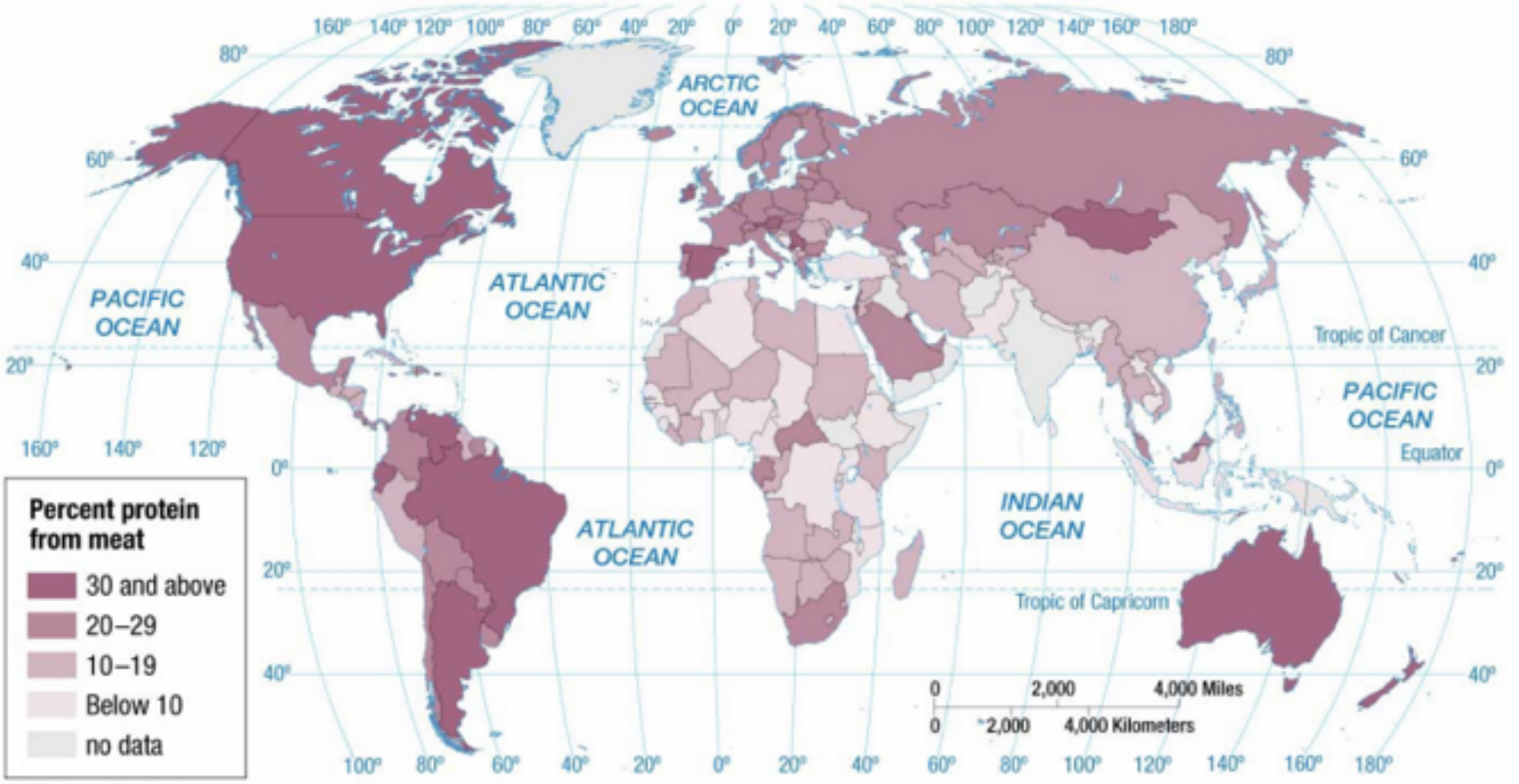
Why Do People Consume Different Foods?

- Source of Nutrients
  - Developed and developing regions typically differ most in their primary sources of protein consumed.
    - Developed Countries
      - Leading source of protein is meat products.
        - » Beef
        - » Pork
        - » Poultry
    - Developing Countries
      - Leading source of protein is cereal grains.

Protein by Source



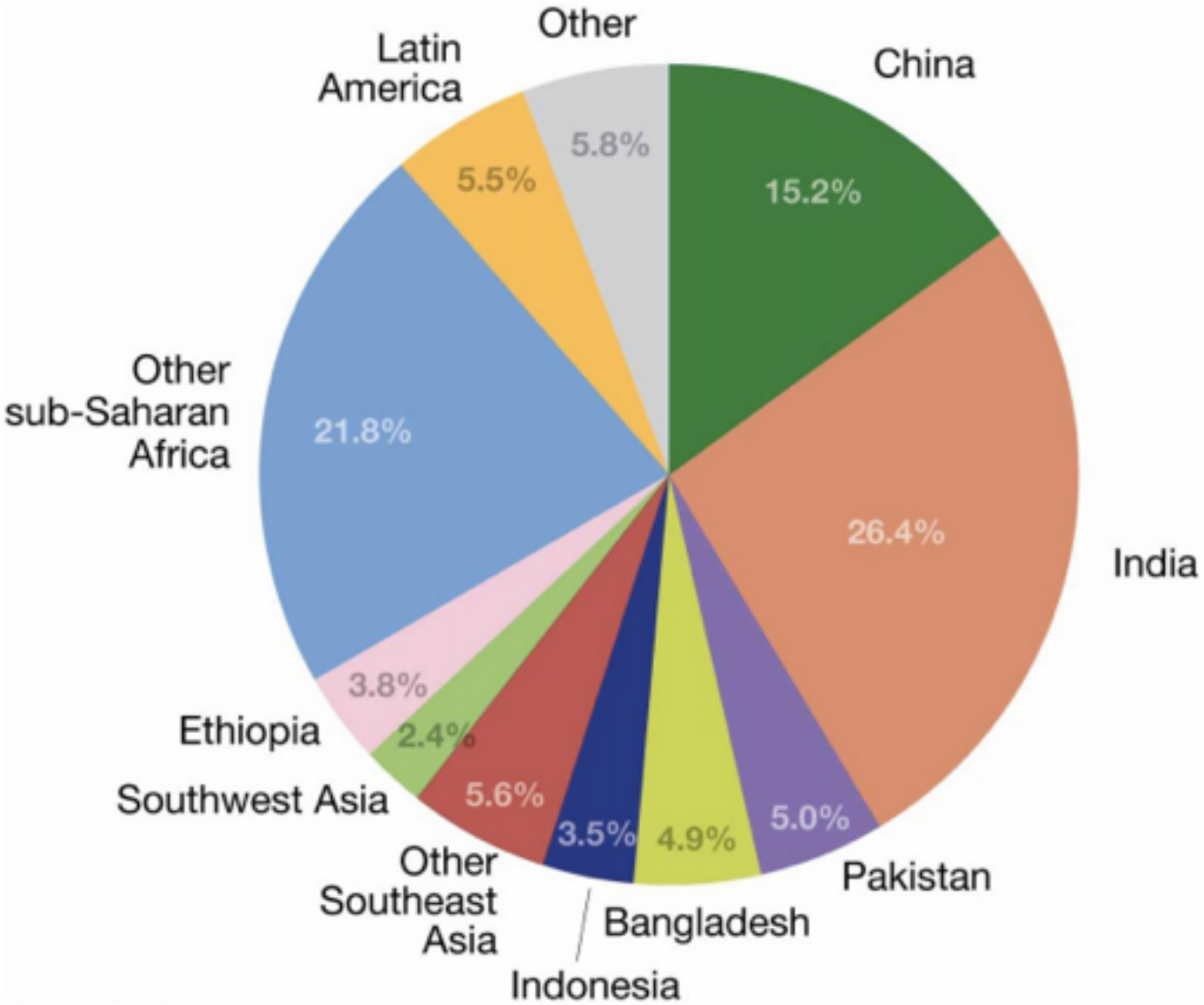
Protein from Meat



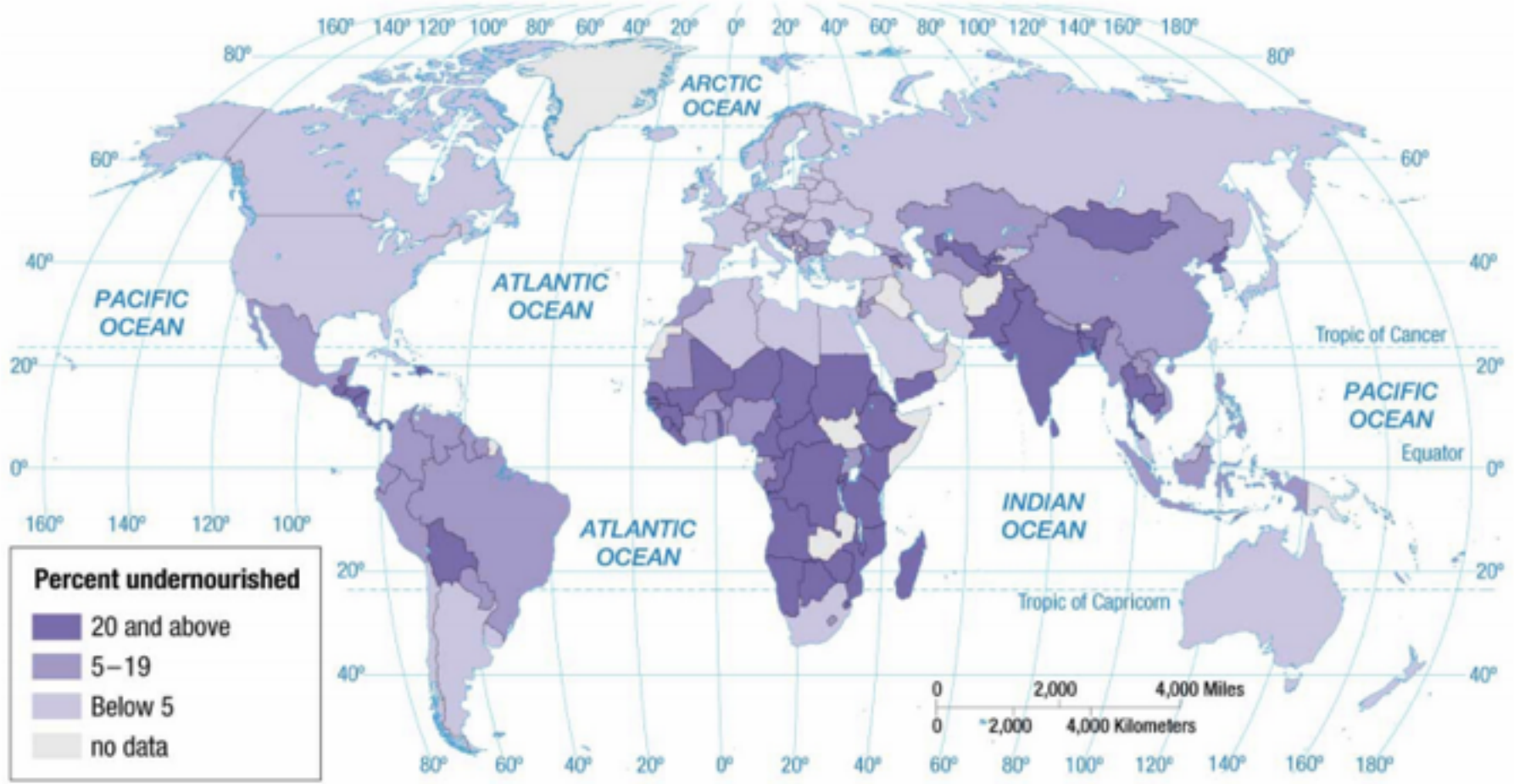
Why Do People Consume Different Foods?

- Nutrition and Hunger
  - *Undernourishment* is dietary energy consumption that is continuously below the minimum requirement for maintaining a healthy life and carrying out light physical activity.
    - UN estimates 850 million people in world are undernourished.
      - 99% located in developing countries
    - Worldwide, the total number of undernourished people has not changed much in several decades.

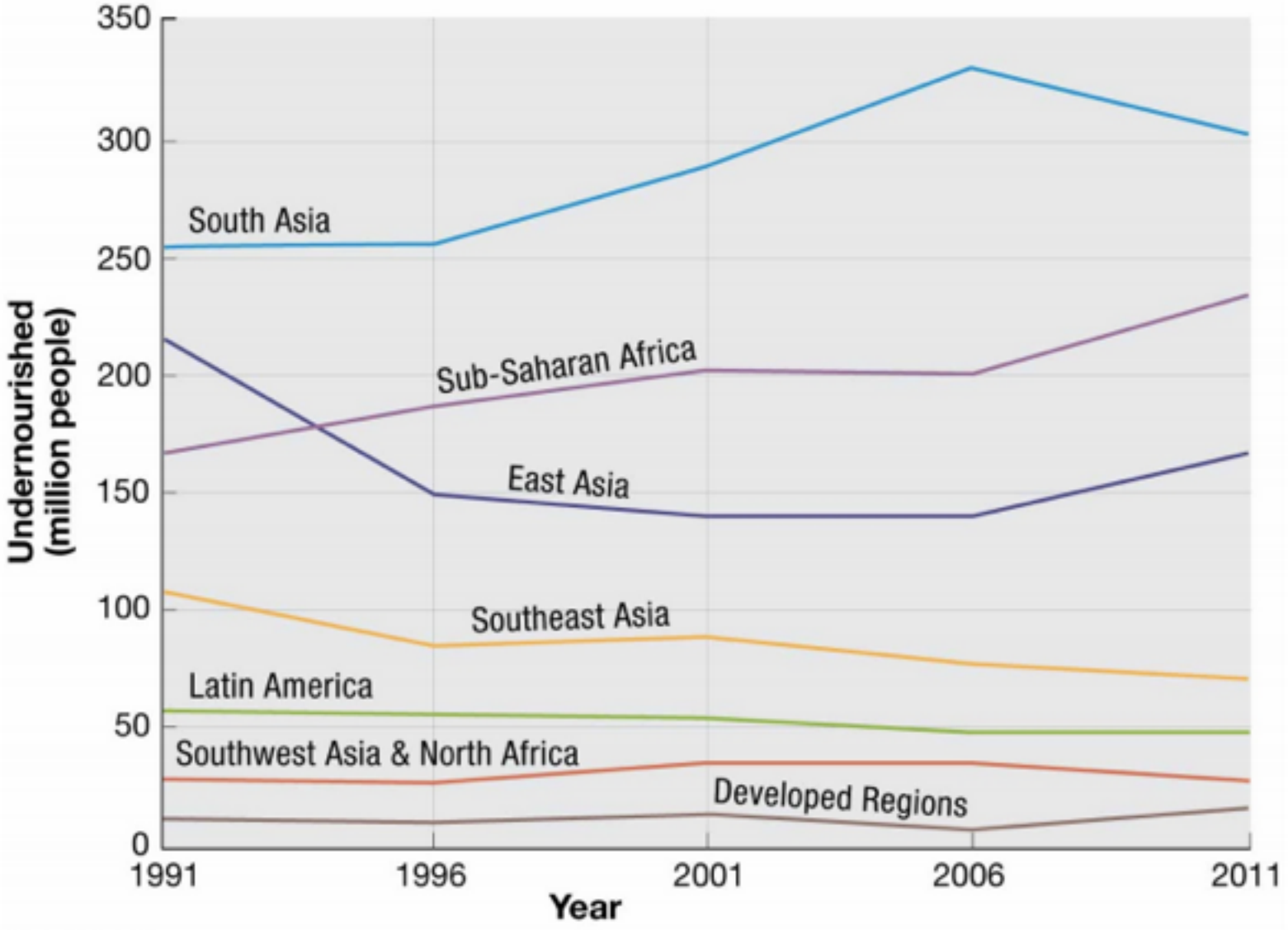
Distribution of Under Nourishment



Extent of Under Nourishment



Change in Under Nourishment



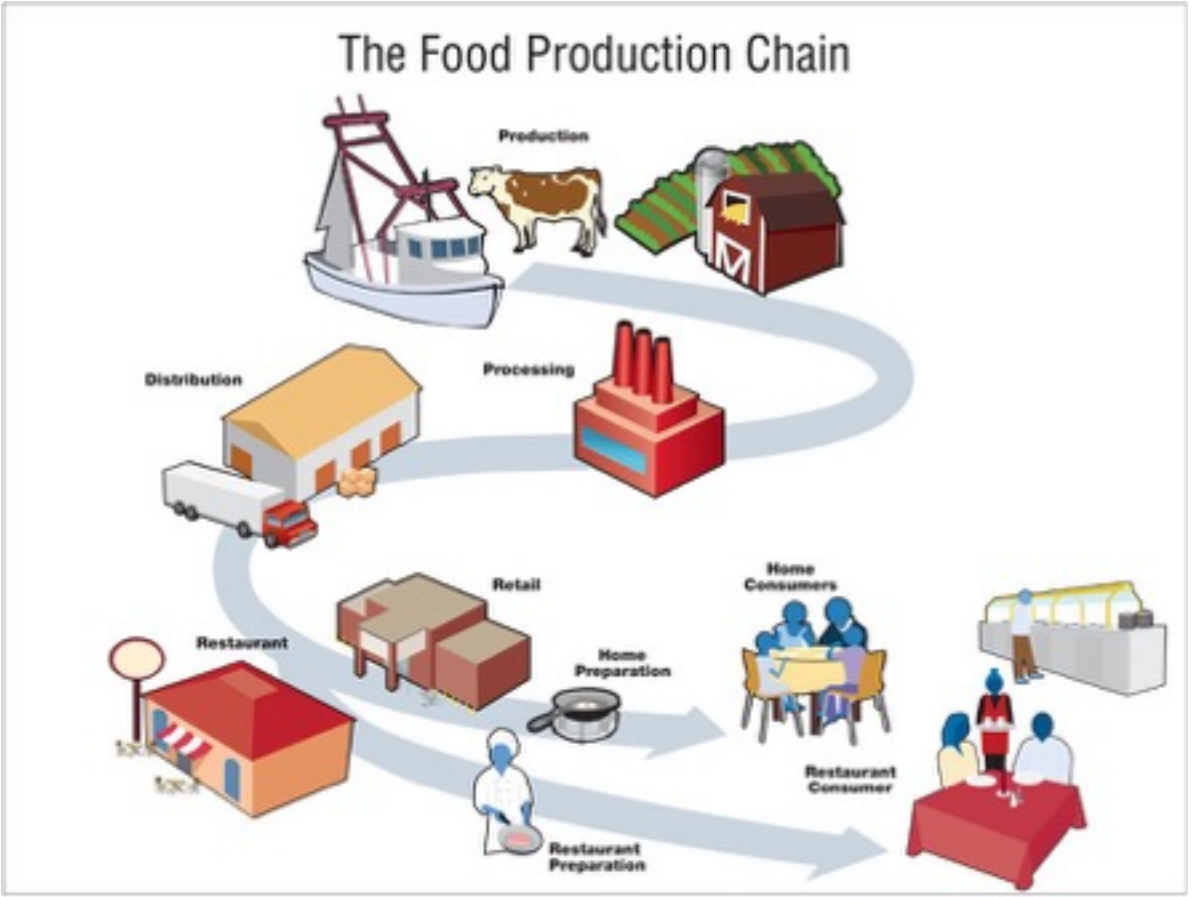
COMMERCIAL AGRICULTURE

Commercial Agriculture

- **Defn. –** agriculture undertaken primarily to generate products for sale off of the farm.

Commercial Agriculture

Agribusiness - Refers to the relationship between businesses and agricultural producers



Intensive commercial agriculture

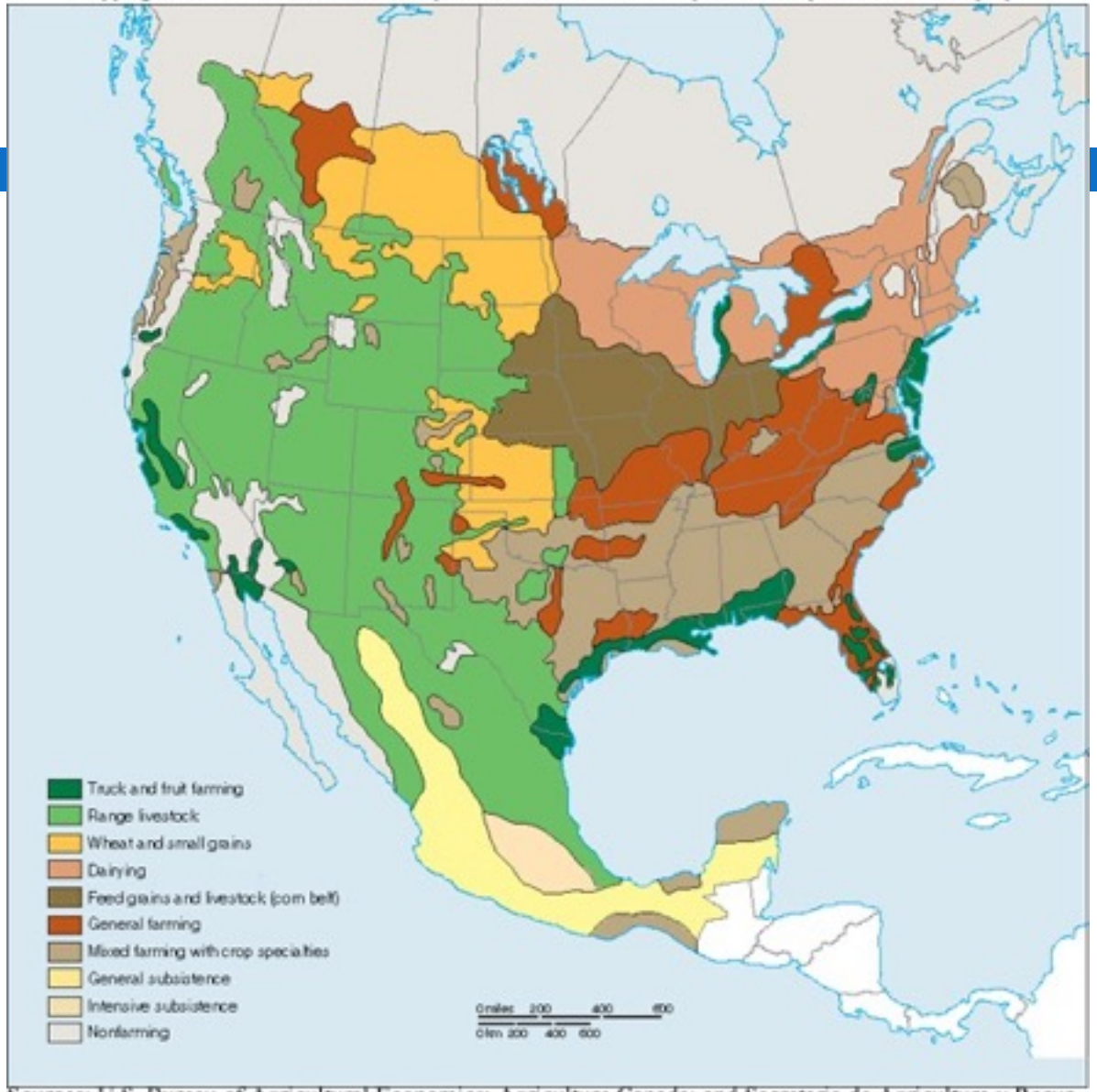
- High yields, high market value
- Highly perishable
- Limited field size, repeat plantings

Extensive Commercial Agriculture

- Farther from market, cheaper land
- Large land size required
- Dry farming / Livestock ranching
- Low labor requirements
- Poor land quality

Where is Agriculture Distributed?

- Agriculture in Developed Regions
  - Mixed Crop and Livestock Farming
    - Most distinctive characteristic is the integration of crops and livestock.
      - Most of the crops are fed to animals instead of humans.
    - Typical example devotes nearly all land area to growing crops but derives more than ¾ of its income from the sale of animal products. e.g. beef and eggs
    - Permits farmers to distribute the workload more evenly through the year, because crops require less attention, aside from planting and harvesting them.
    - Typically involves *crop rotation*, practice of rotating use of different fields from crop to crop each year to avoid exhausting the soil.



Sources: U.S. Bureau of Agricultural Economics; Agriculture Canada; and Secretaria de Agricultura y Recursos Hidraulicos, Mexico.

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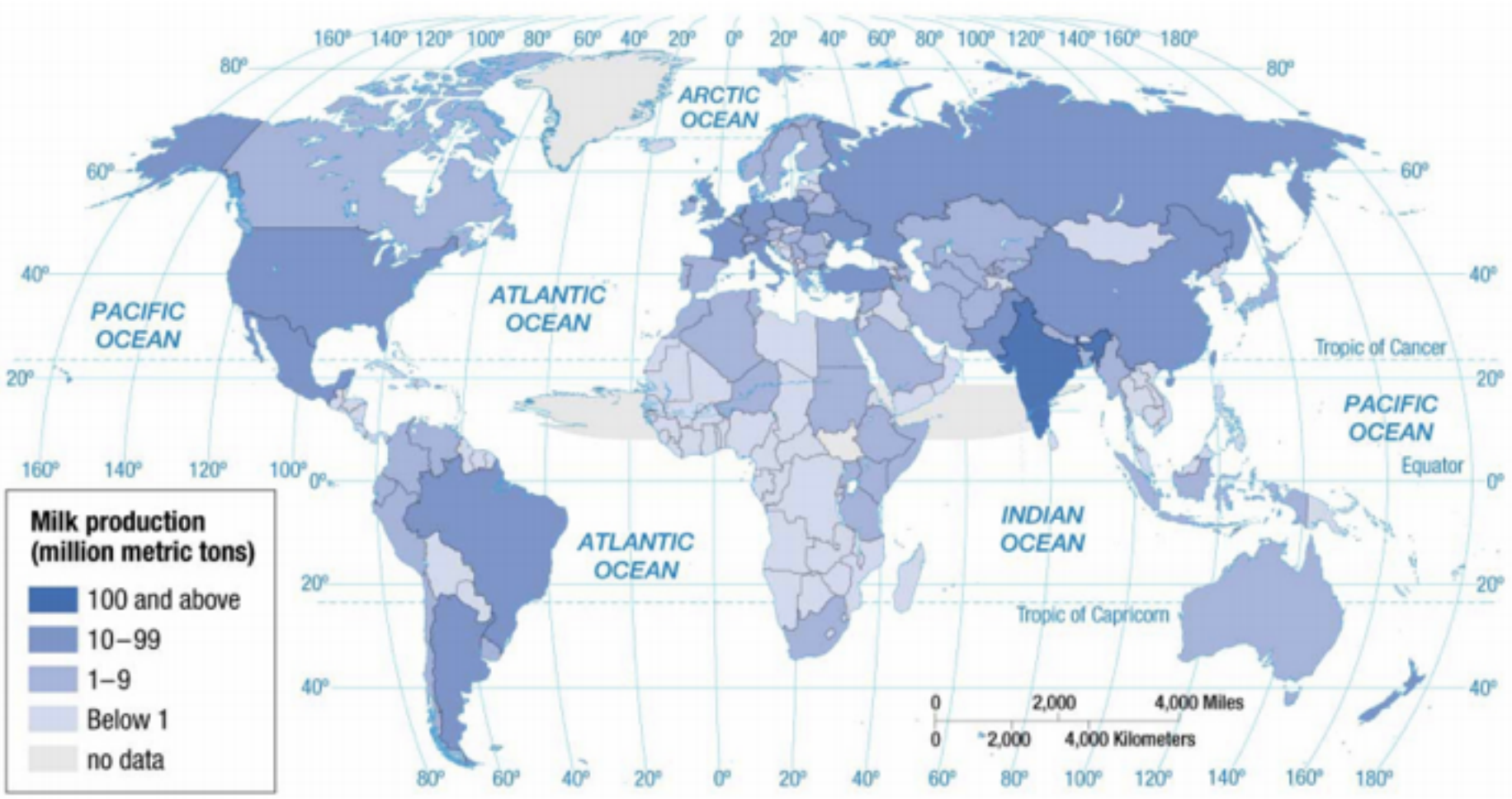
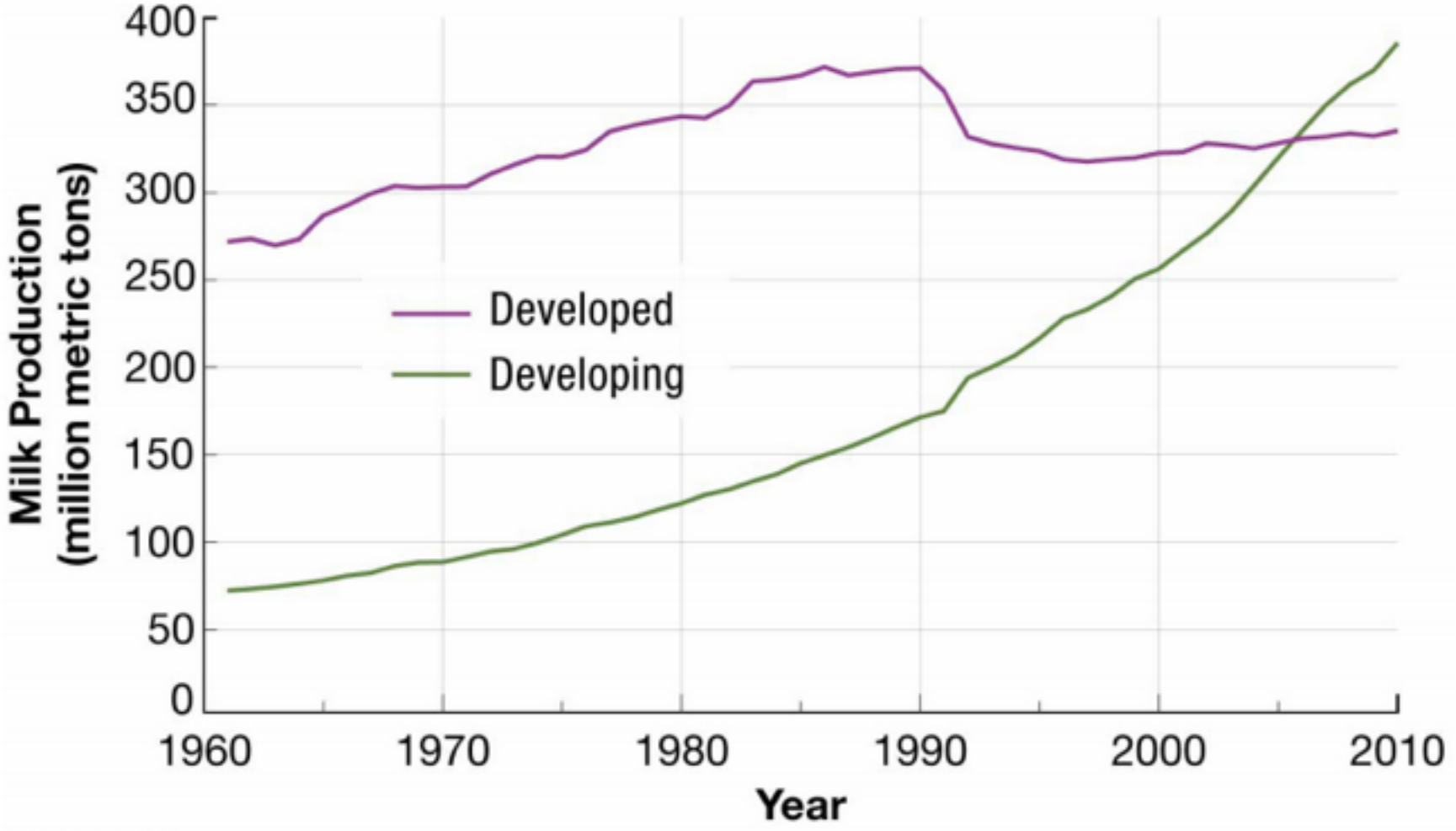
Dairy Farm

Milk Production



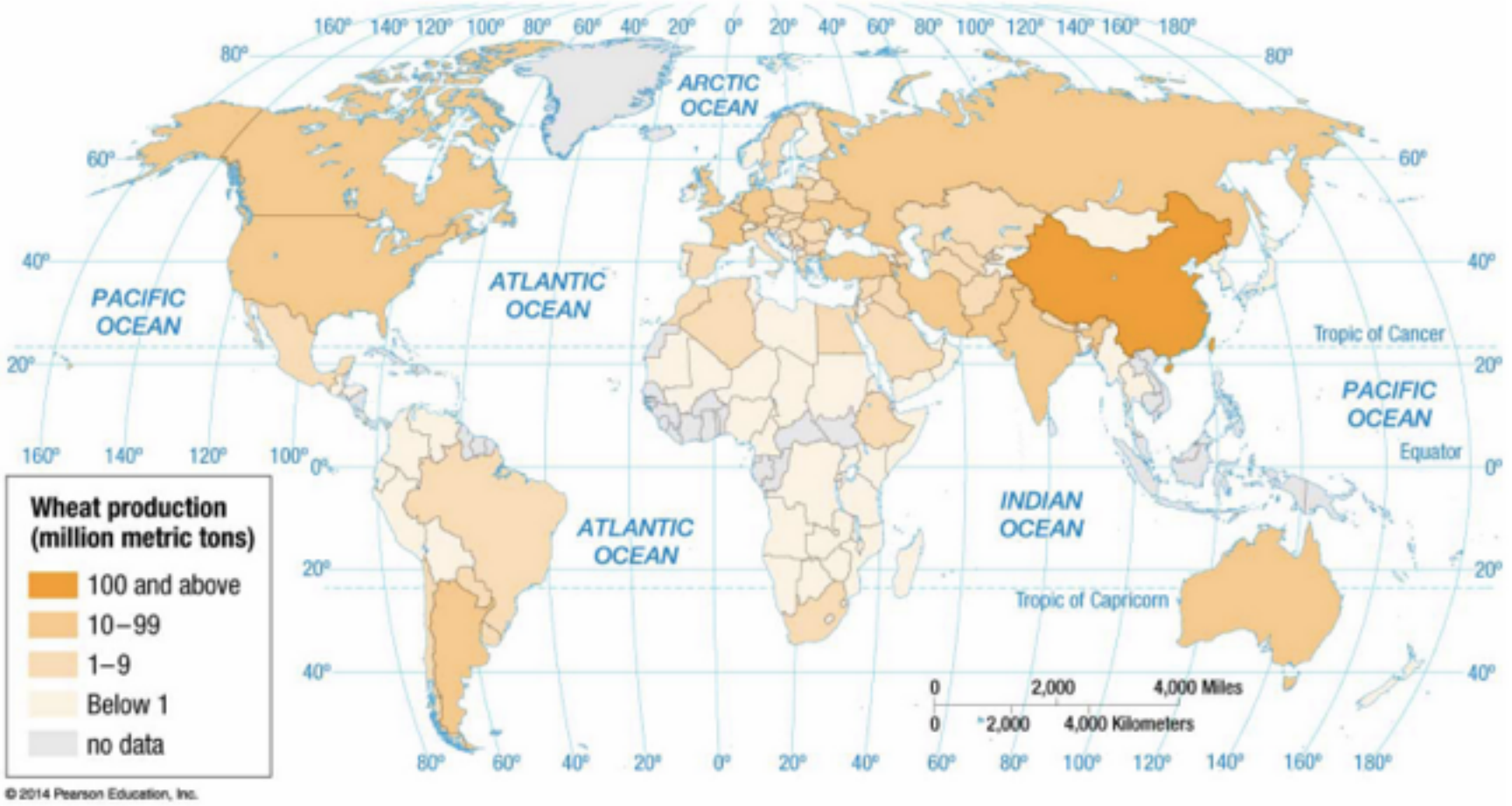
Changing Milk Production



Where is Agriculture Distributed?

- Agriculture in Developed Regions
  - Grain Farming
    - Distinguished from mixed crop and livestock farming, because crops are grown primarily for human consumption.
    - Farms sell their output to manufacturers of food products, such as breakfast cereals and bread.
    - Characteristics of a Typical Grain Farm
      - Heavily mechanized
      - Farms large in areal extent
      - Oriented to consumer preferences

Wheat Production

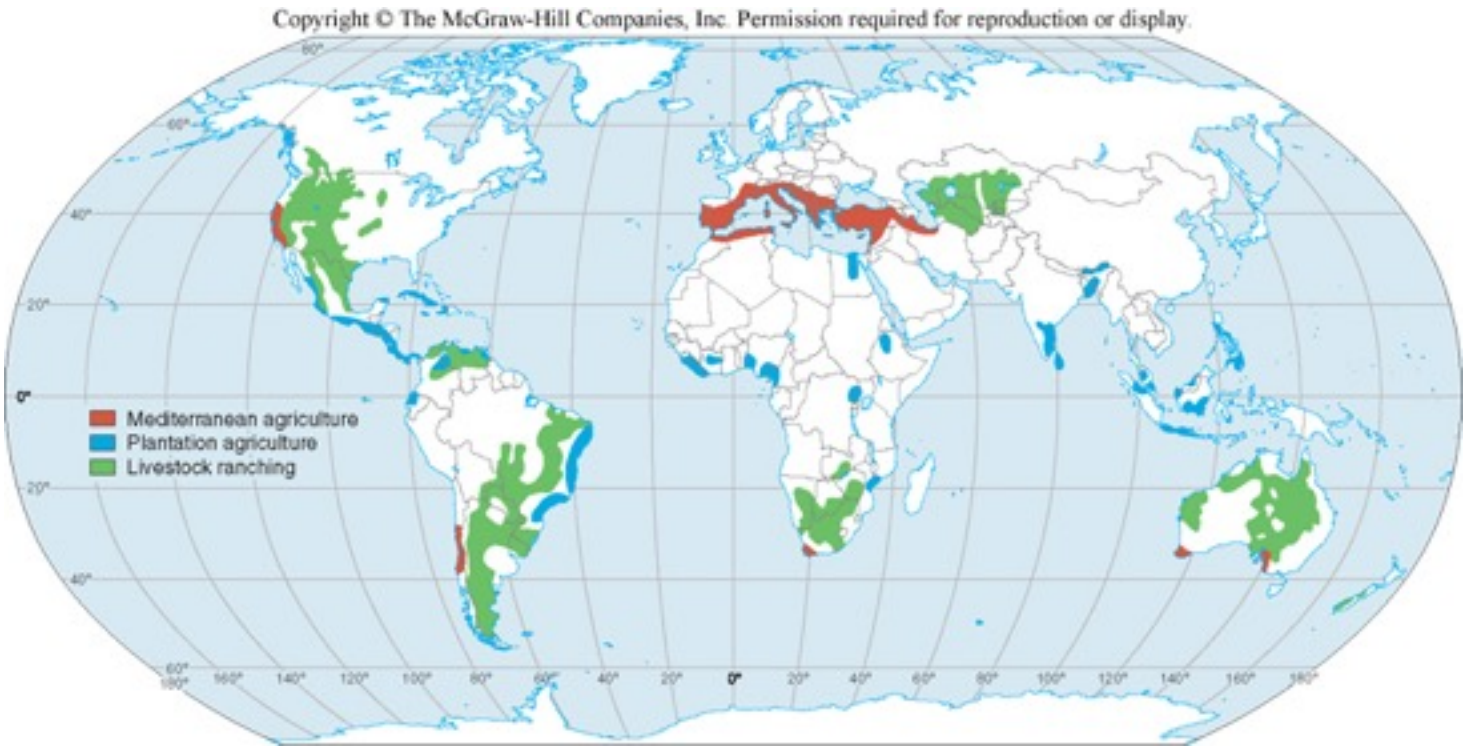


Where is Agriculture Distributed?

- Agriculture in Developed Regions
  - Livestock Ranching
    - *Ranching* is the commercial grazing of livestock over an extensive area.
    - Well suited for semiarid or arid land
    - Practiced in developed countries where vegetation is too sparse and soil too poor to support crops.
    - Historically, ranchers sought to move their cattle from Texas to Chicago, because the cattle were worth more money farther north.
    - Today, ranching has become part of the meat-processing industry where new methods of breeding and sources of water and feed are embraced.

Horticulture - Mediterranean

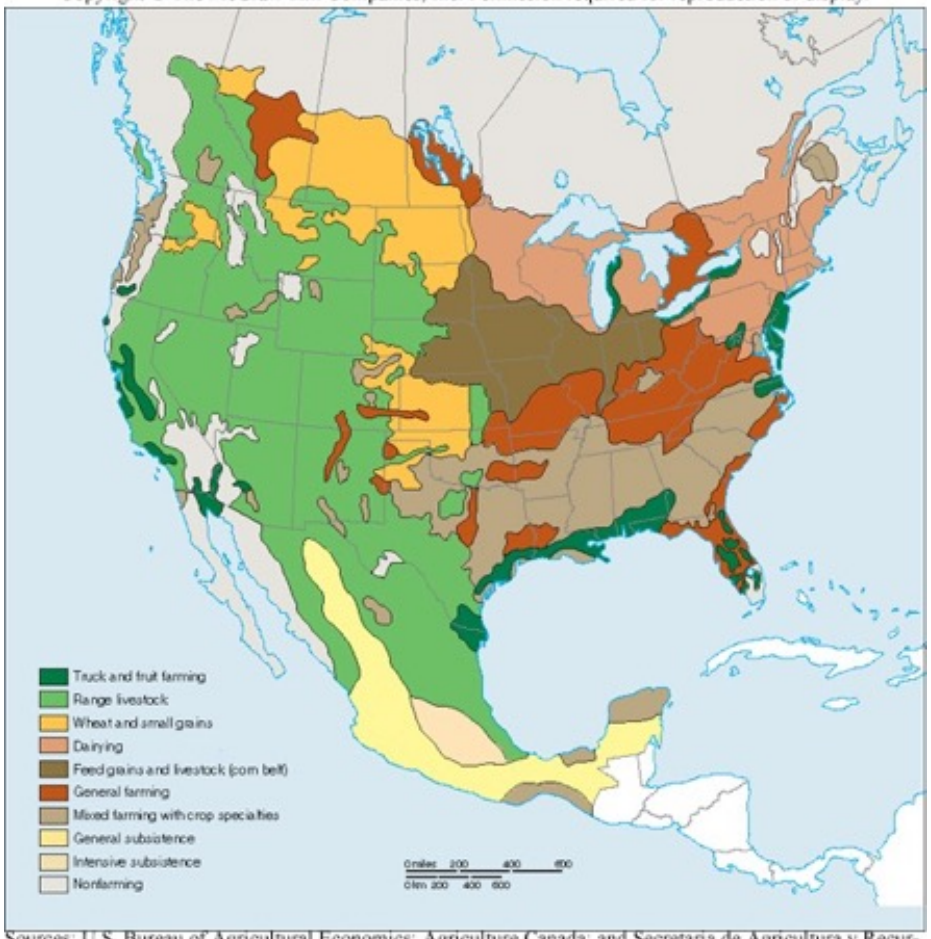
Present in Mediterranean climates around the Mediterranean sea (Greece, Italy, France, and North Africa), California, Chile, Australia
Horticulture is common-growing of fruits, vegetables, and flowers
Associated with Olives and Grapes



Commercial Gardening and Fruit Farming

- Intensive form of Agriculture
- Most common is Southeast United States
- Foods are highly perishable
- **Truck Farming -** growing crops on large scale to be shipped to far away regions
- Hire Migrant workers to reduce cost

Truck Farming



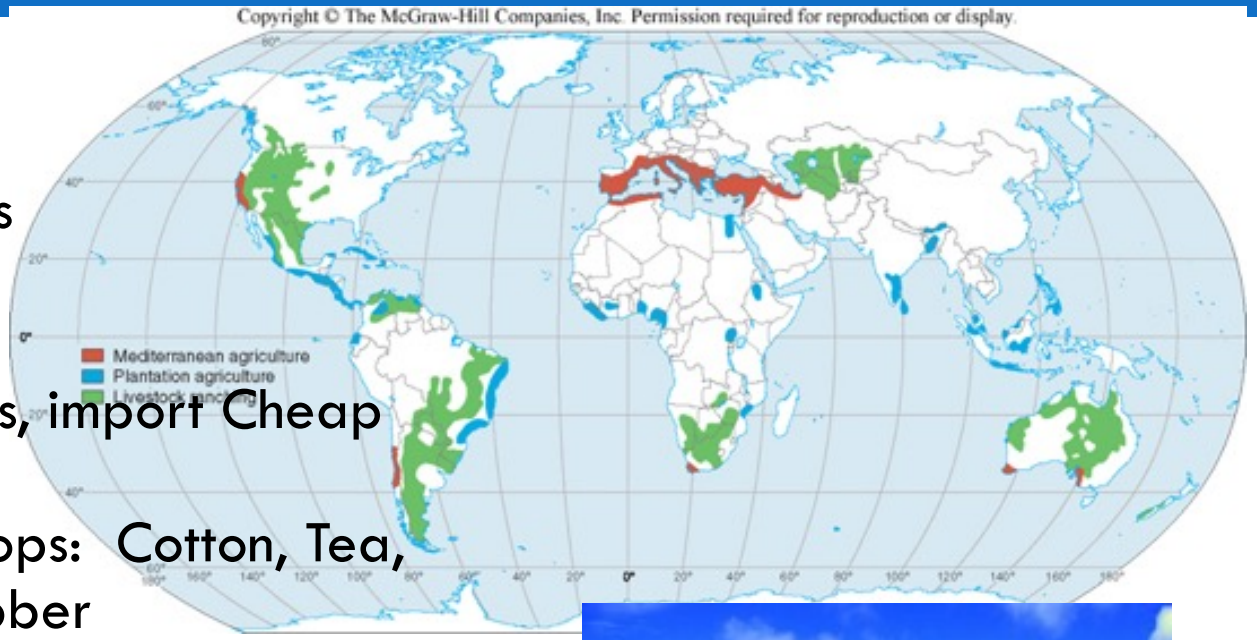
Sources: U.S. Bureau of Agricultural Economics; Agriculture Canada; and Secretaria de Agricultura y Recursos Hidraulicos, Mexico.

Plantation Farming

Plantation farming is a form of commercial agriculture found in developing countries. Plantations specialize in one or two crops. This photo is from a coffee plantation.

Plantation Farming

- Extensive
- Tropical Climates
- LDC or MDC?
- Why???
- Isolated locations, import Cheap Labor
- Grow Luxury Crops: Cotton, Tea, Sugar Cane, Rubber



Sugarcane Plantation- Mauritius

Suitcase Farms

- Farms where the work is done by migrants
- The farmer doesn't live at the farm
- No one is at the farm unless it is planting or harvest season

Arguments

- Pro

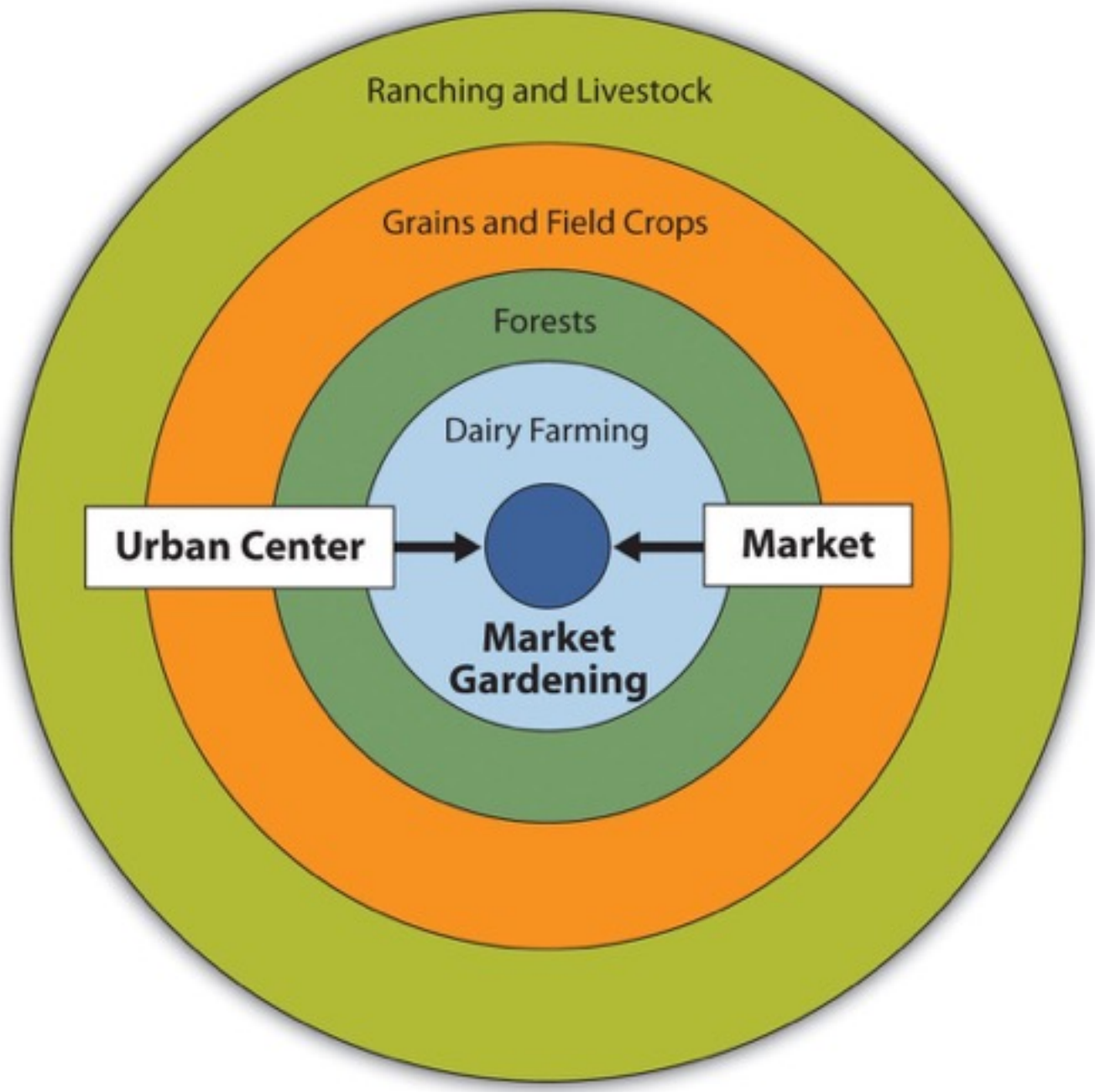
http://www.cleanvideosearch.com/media/action/yt/watch?videoId=qXdEmQkYlek

- Con

http://www.cleanvideosearch.com/media/action/yt/watch?videoId=IMOAaciER6o

Von Thünen's Agricultural Land Use Model (1783 -1850)

- J.H. Von Thunen developed the *Von Thunen model of Agricultural land* use in 1826. His model suggested that agricultural activities are oriented in space due to their proximity to an urban center and the price of rent.


Ranching and Livestock
Grains and Field Crops
Forests
Dairy Farming
Urban Center
Market
Market Gardening

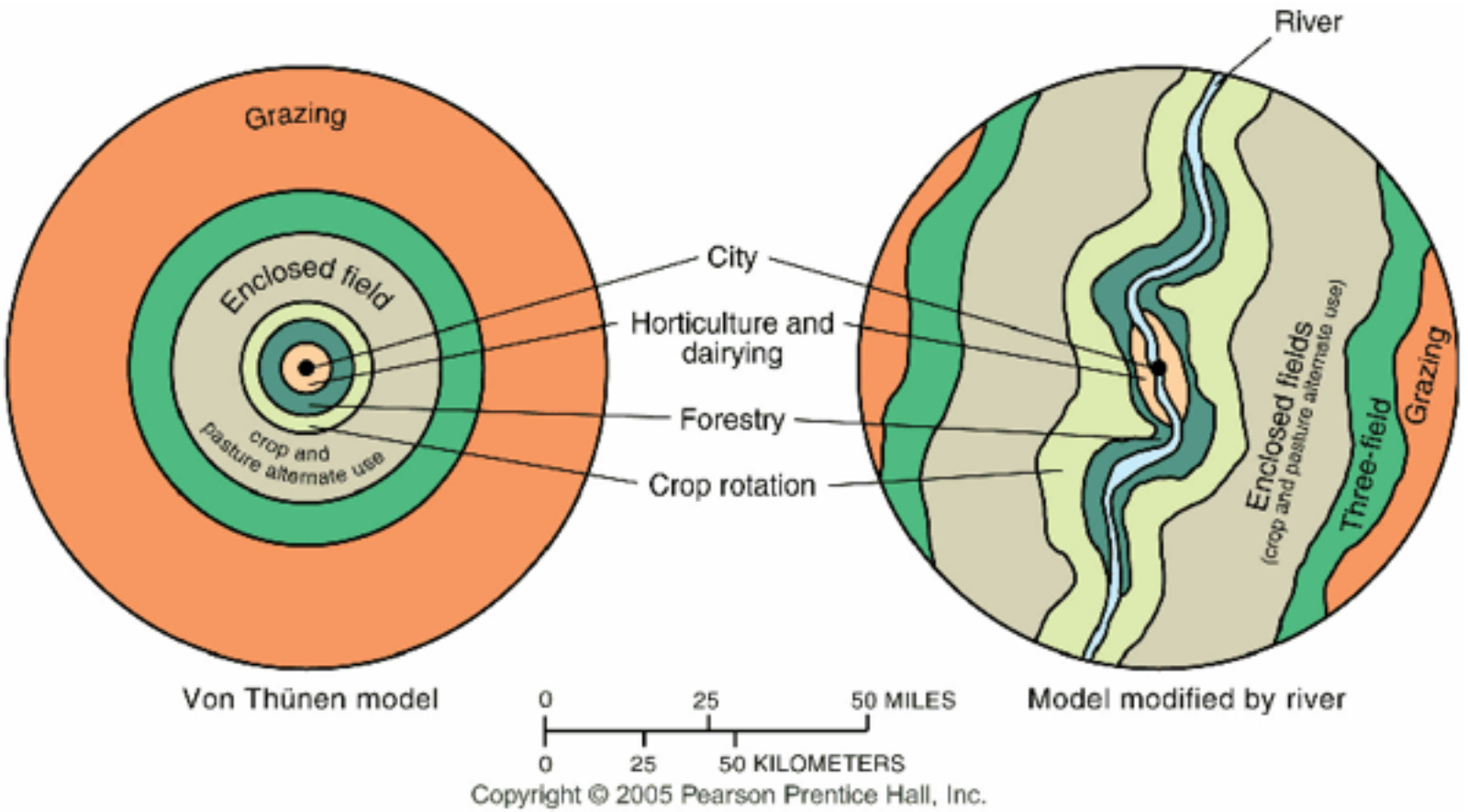
Von Thunen Model

- **Land near market =** high-value crops, intensive land use b/c rent is higher
- **Land farther away from market** = low-value crops, extensive land use b/c rent is lower

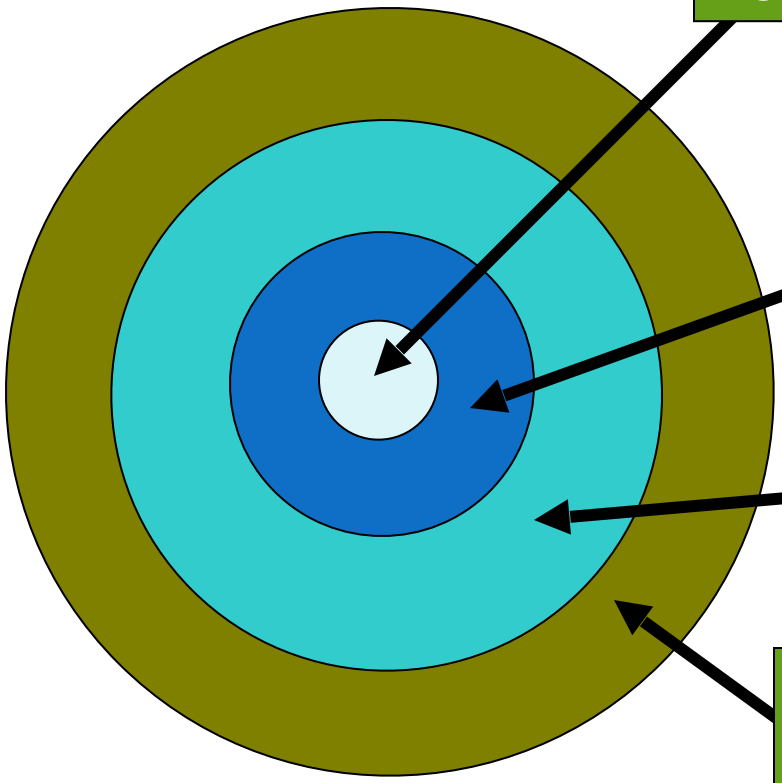
Von Thunen Model

- **The model can be affected by: topography, soil fertility, climate, changes in market**

Von Thunen Model Modified



Simplified von Thünen Model of Agricultural Land Use (1826)



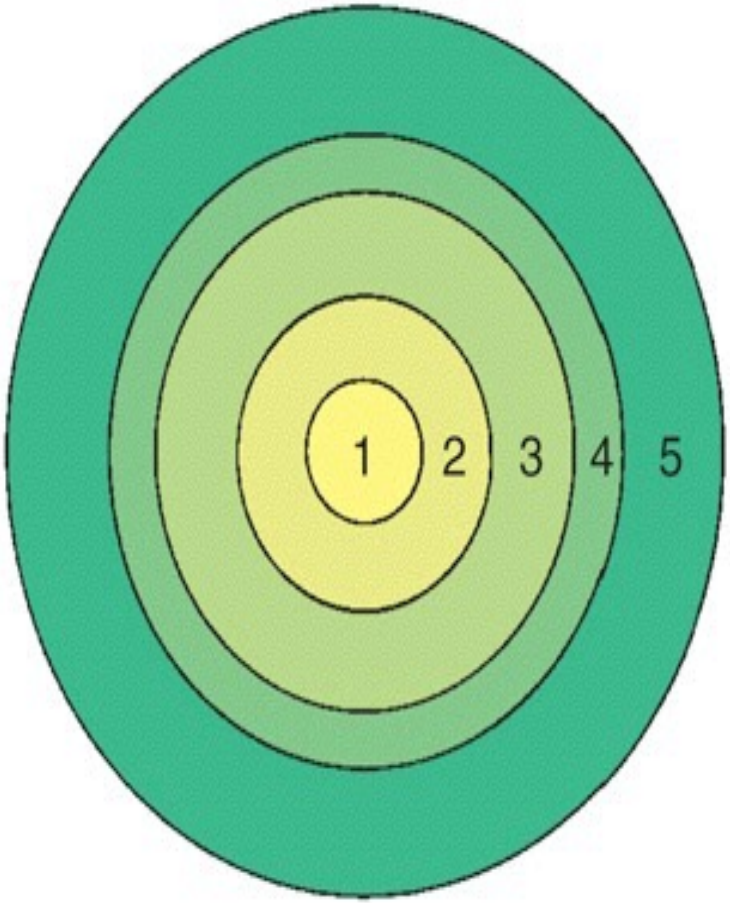
Urban market

High transportation cost items
(vegetables, eggs, dairy, flowers)
Intensive land use - high land rent

Medium transportation cost items
(corn, soybeans, mixed farming)
More extensive land use - medium rent

Lowest transportation cost items
(forestry, wheat, livestock ranching)
Most extensive land use - lowest land rent

1. Dairying and market gardening
2. Specialty farming
3. Cash grain and livestock
4. Mixed farming
5. Extensive grain farming or stock raising



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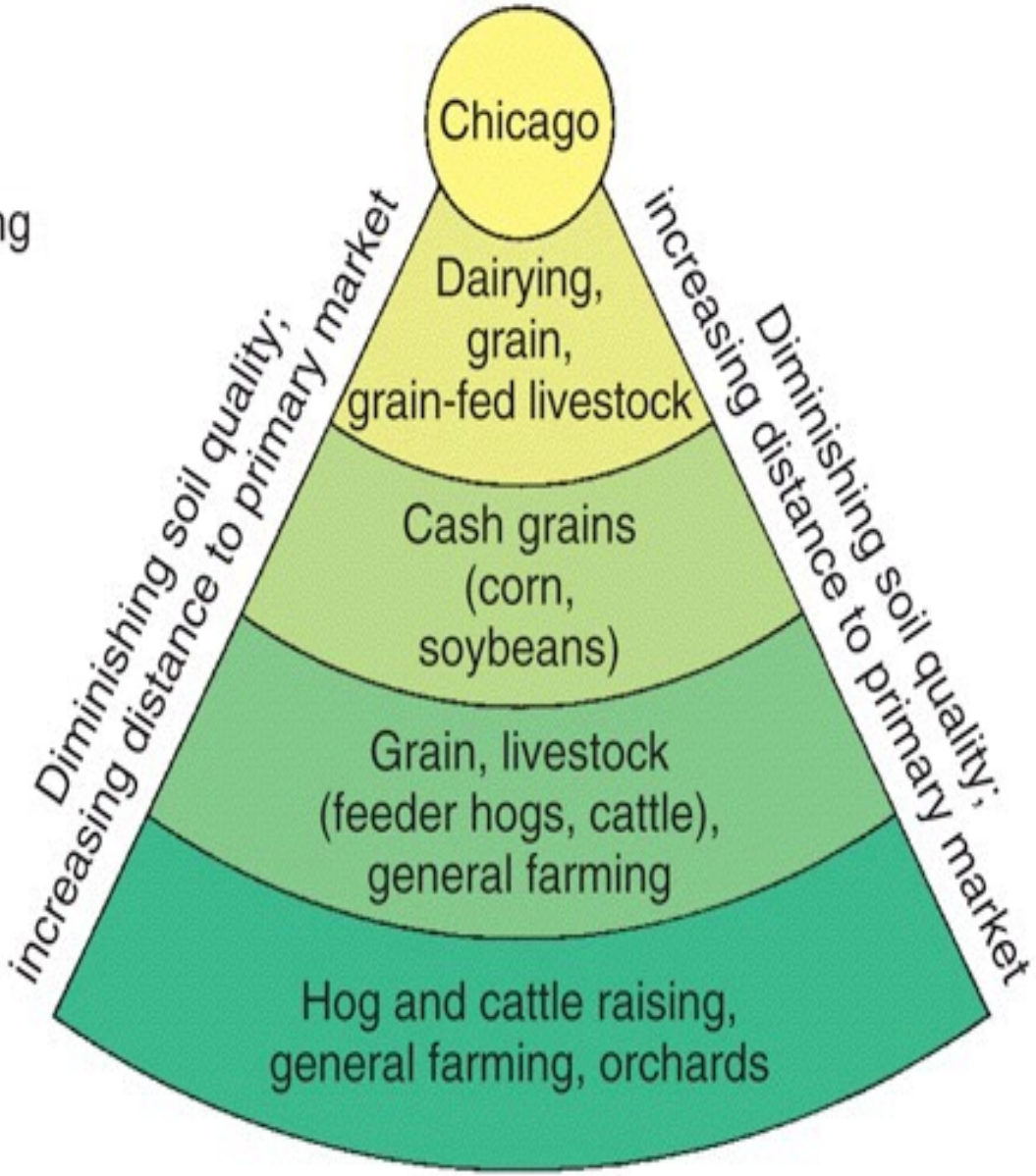
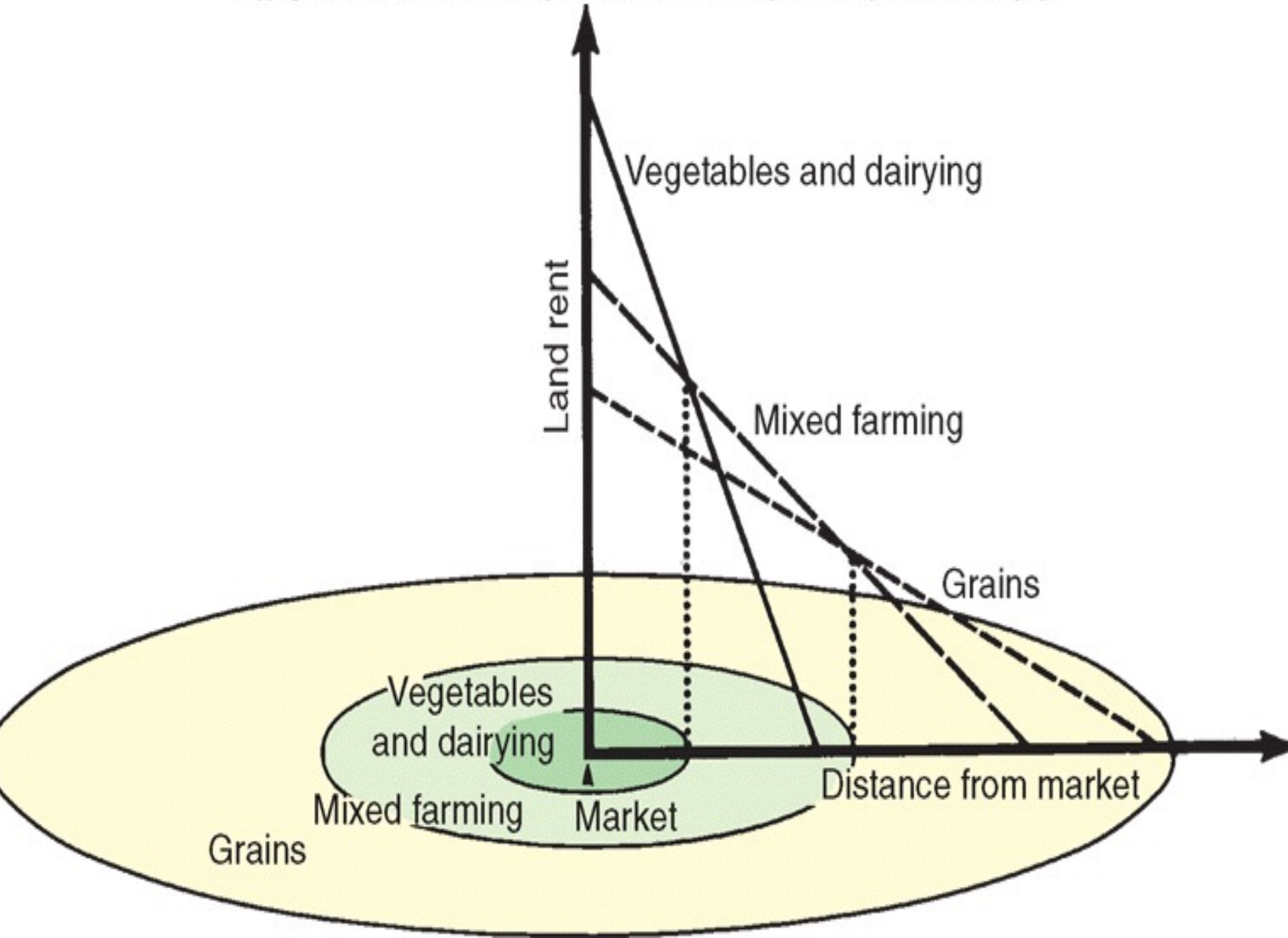


(b)

Source: (b) Modified with permission from Bernd Andreae, Farming Development and Space: A World Agricultural Geography, trans. Howard F. Gregor (Berlin; Hawthorne, N.Y.: Walter de Gruyter and Co., 1981).

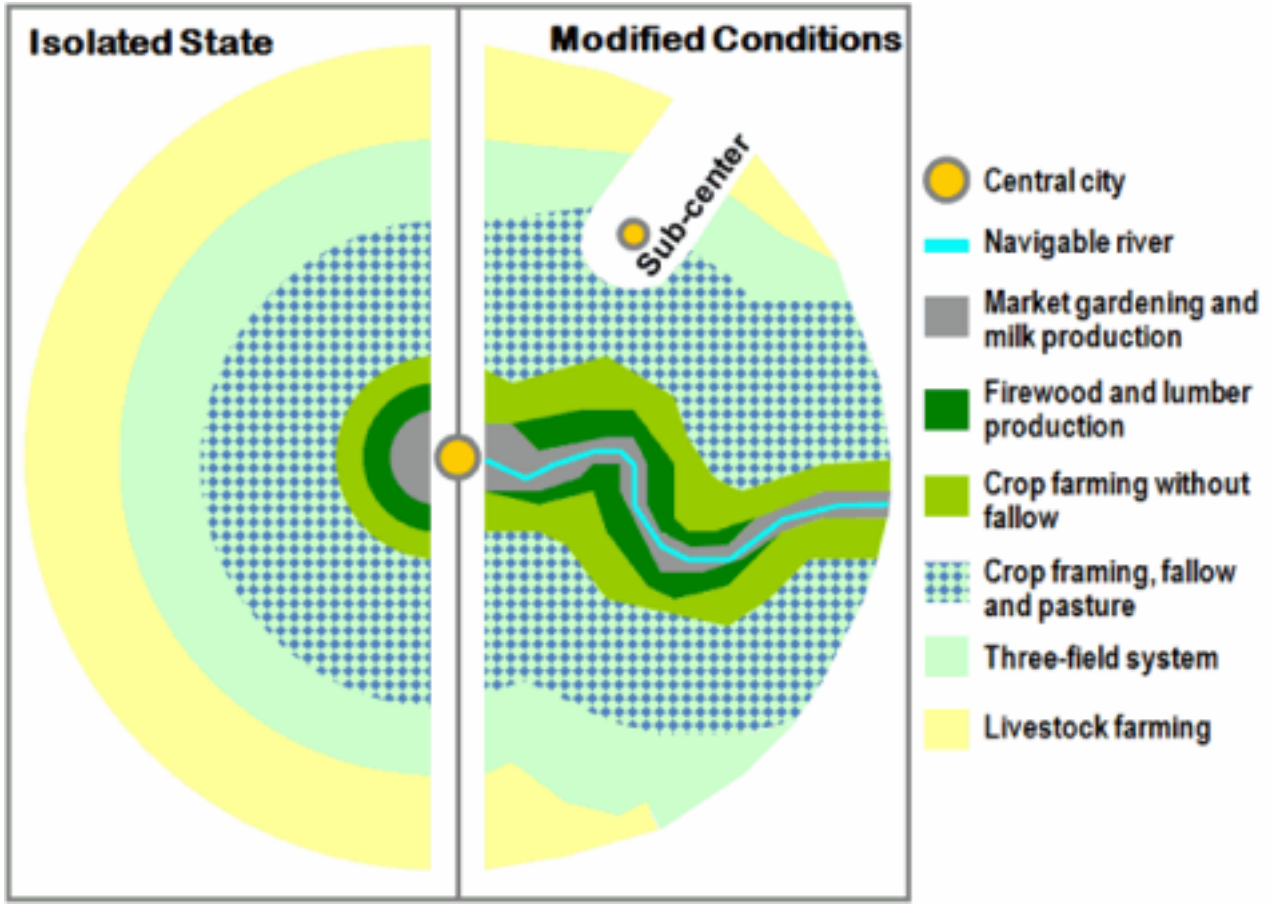


Von Thünen's Assumptions

- **Isolation.** One isolated market in an isolated state with no interactions (trade) with the outside.
- **Land characteristics.** Land surrounding the market is entirely flat and its fertility uniform.
- **Transportation.** No transport infrastructures (roads or rivers) and farmers are transporting their production to the market using horses and carts.

Factors affecting the model:

- **Topography**
- **Soil fertility**
- **Climate**
- **Changes in market**



Growing food for fuel?

- Biomass- an alternate fuel source (as opposed to mineral fuels/fossil fuels) produced from decaying plant matter. Ex. Ethanol
  - Ethanol is created by decaying plant matter
    - US-Corn
    - South America- Sugar Cane

PROBLEMS FACED BY FARMERS

Challenges for MDC Farmers

Problem

- Overproduction- Due to the green revolution (pesticides, fertilizers) farmers can produce much more food than is needed

Solution

- Gov. pays farmers when crop prices are low - subsidy
- Farmers are encouraged to plant less
- Gov. buys surplus and sells it or donates it to foreign countries

Challenges for MDC Farmers

Problem

- It is difficult to sustain the land

Solution

- Sustainable Agriculture- Maintains and enhances the environment
  - Organic Farming
  - Fewer Pesticides and Chemicals
  - Protecting the soil from erosion through ridge tillage
  - Better integration of crops and livestock

Challenges for LDC Farmers

Problem

- Population is growing rapidly

Solution

- New farming methods with plows and manure (Not very effective)
- Land is left fallow for shorter periods of time

Challenges for LDC Farmers

Problem

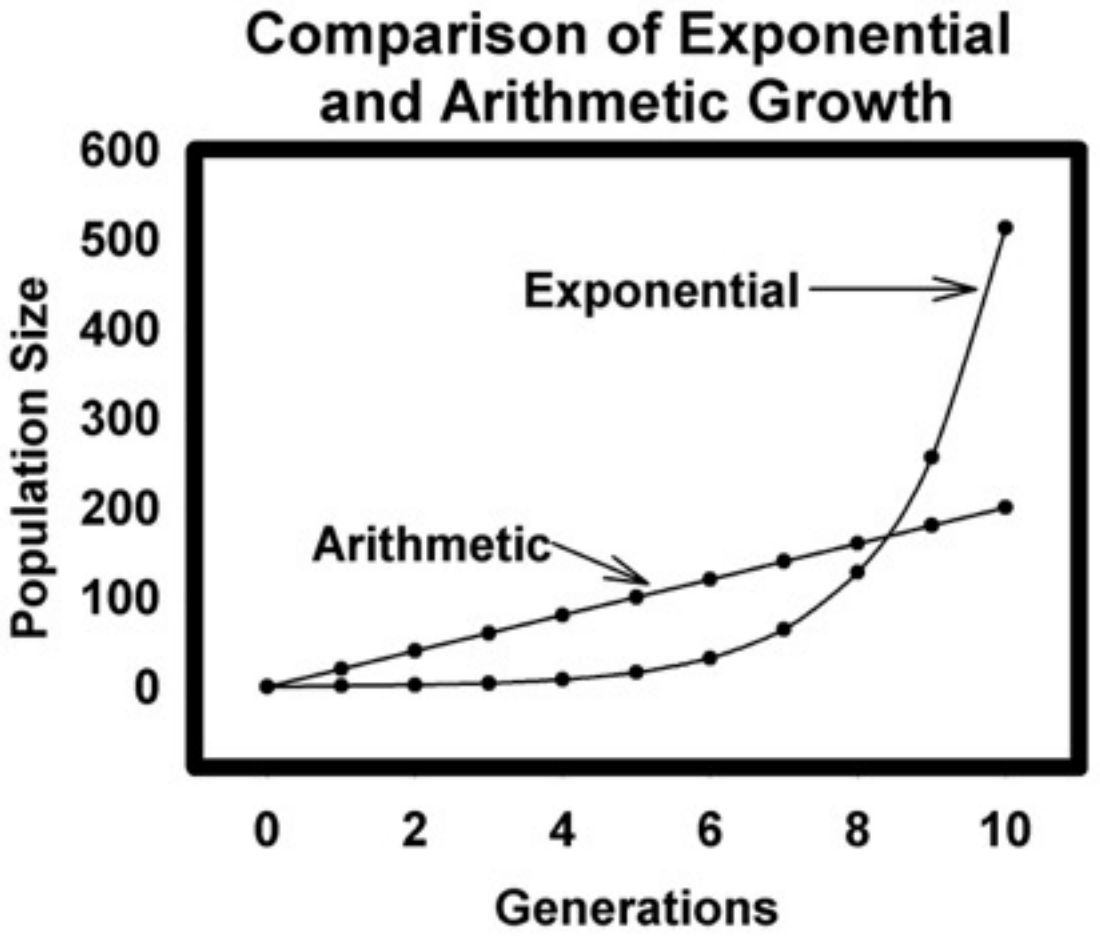
- Technology is expensive and comes from MDCs
  - What are examples of this technology

Solution

- Grow export crops to raise money
  - Coffee
  - Sugar
  - Cocaine!
  - Opium!

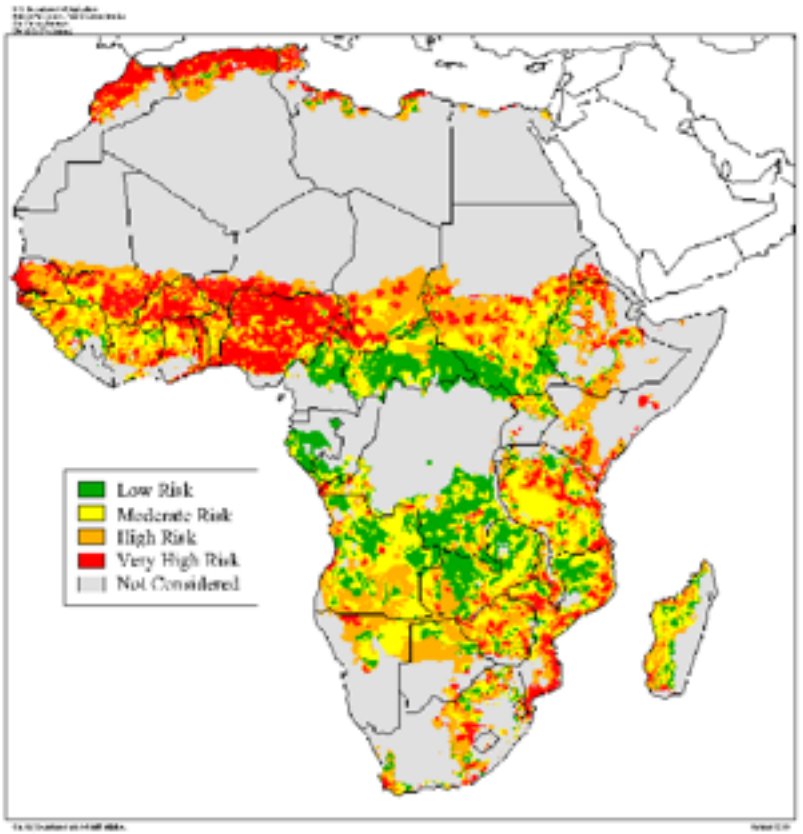
CREATING A SUSTAINABLE FOOD SUPPLY

What are we looking at???



Creating a Sustainable Food Supply

- Increase land by **preventing desertification,** which is caused by over cultivation and overgrazing



How to Increase Food Supply?

- Increase productivity by improving **biotechnology** (Green Revolution)
  - **biotechnology -** scientific techniques used to improve plants, animals and microorganisms.
  - Create heartier plants
  - Larger Yields in smaller fields
  - Shorter grow times
  - require less h2o and fertilizer

How to Increase Food Supply?

- Earth's food supply will need to almost double by 2060 (why?)
  - **Aquaculture** - farming aquatic plants and animals. Ex: seaweed, kelp, fish, shellfish, and algae

How to Increase Food Supply

- Identify, sell, and popularize new food sources
- Increase exports from MDCs to LDCs
- Continue improvement of sustainable farming worldwide