

Chapter 9

Food and

Agriculture

Food and Agriculture: Key Issues

1. Where Did Agriculture Originate?
2. Why Do People Consume Different Foods?
3. Where Is Agriculture Distributed?
4. Why Do Farmers Face Sustainability Challenges?

Key Issue 1: Where Did Agriculture Originate?

1.1 Introducing Food and Agriculture

1.2 Subsistence and Commercial Agriculture

Introducing Food and Agriculture

Agricultural Revolution

- Environmental and cultural factors: end of ice age, preference for settlement
- Agriculture hearths developed from local plants and animals.

Agriculture Hearths

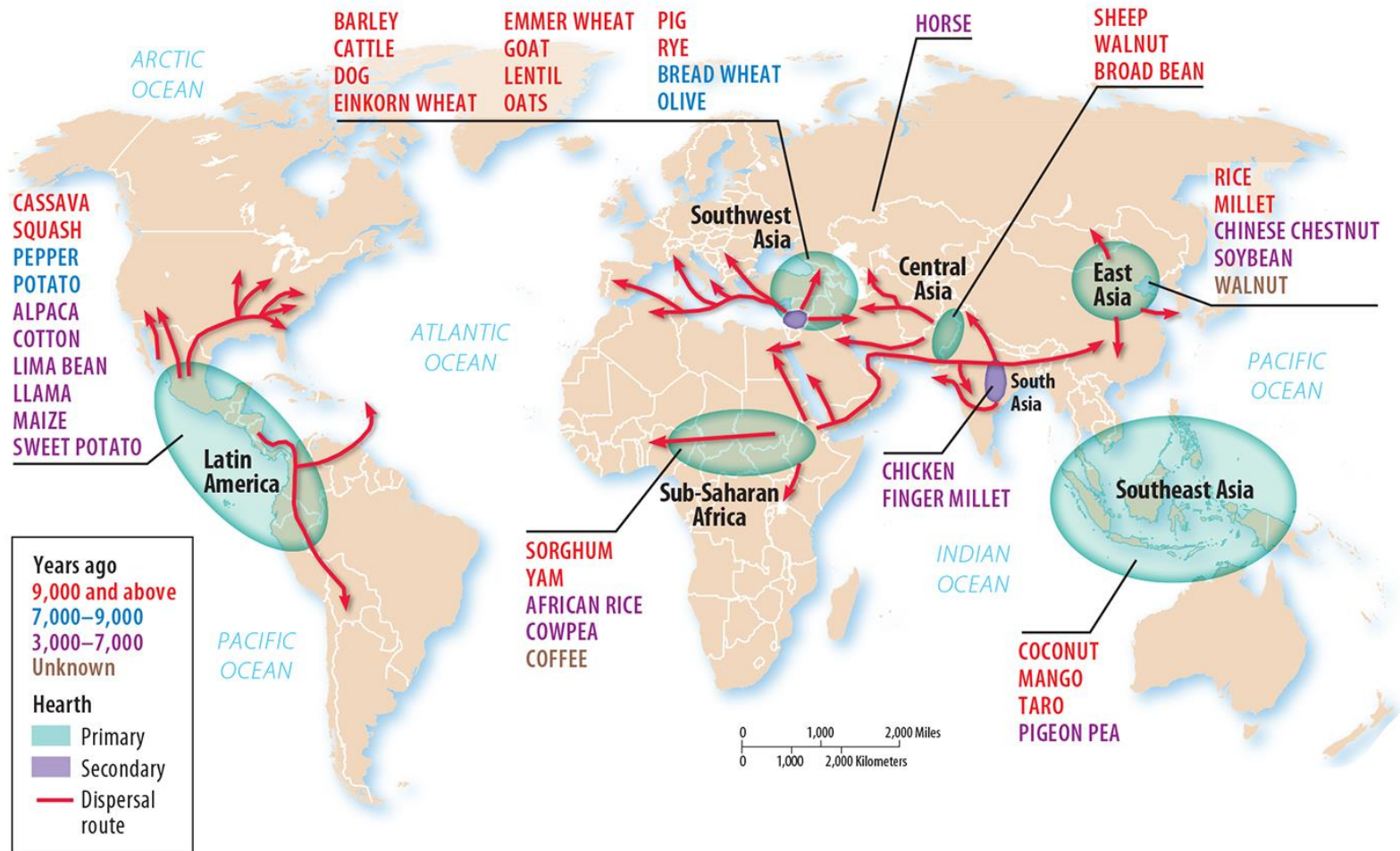
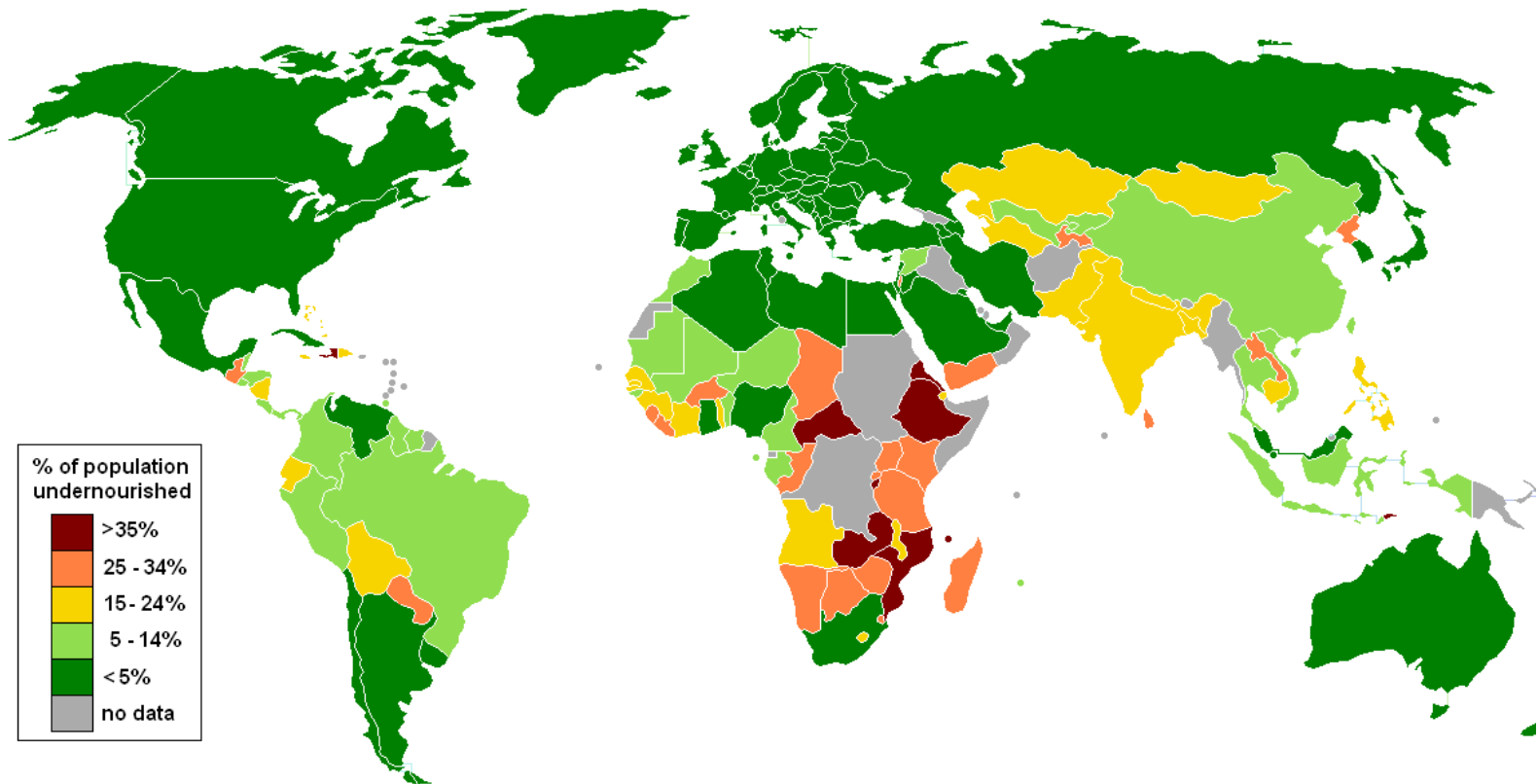


Figure 9-2: Multiple hearths emerged from locally available plants and animals.

Developed versus Developing World

1. Physical Environment
2. Types of crops grown
3. Stability of food supplies
4. Technology and tools
5. Methods of production



Whittlesey's Agricultural Regions

Developing World

1. Pastoral Nomadism
2. Shifting Cultivation
3. Intensive Subsistence, wet rice dominant
4. Intensive Subsistence, other than rice dominant
5. Plantation

Developed World

1. Mixed Crop and Livestock
2. Dairying
3. Grain
4. Ranching
5. Mediterranean
6. Commercial Gardening

What type of agriculture is being represented in each of the following images?























If you were a farmer, what type of agriculture would you do in each of the following locations?







DCH



Subsistence and Commercial Agriculture

- Percentage of farmers: high in subsistence, low in commercial
- Role of machinery, science, technology: low in subsistence, high in commercial
- Farm size: commercial generally much larger than subsistence

Agricultural Workers

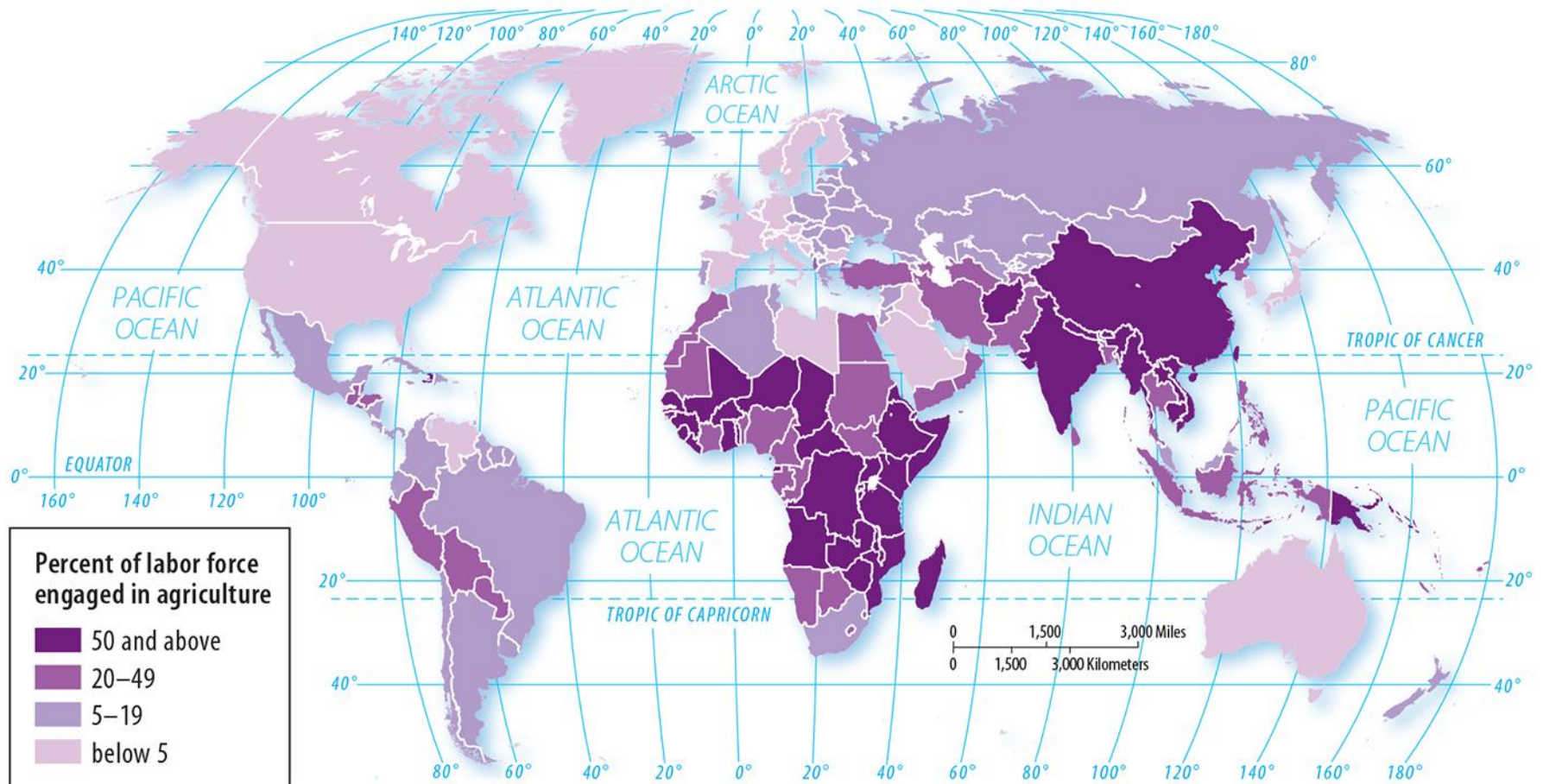


Figure 9-3: Developing countries have a higher percentage of the labor force engaged in agriculture, primarily subsistence.

Farmland Per Tractor

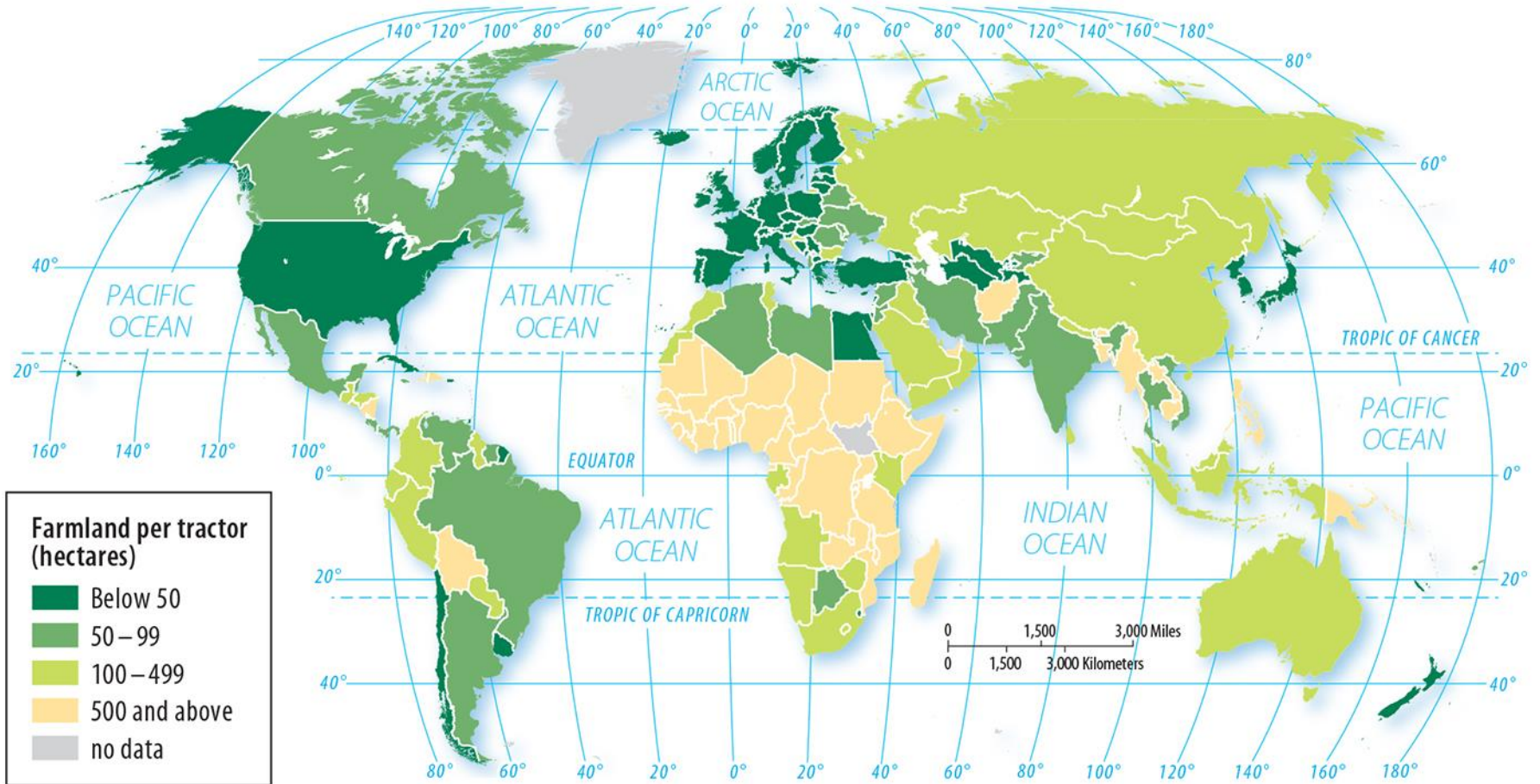


Figure 9-4: Small amounts of farmland per tractor indicate a strong role of machinery in agriculture.

Key Issue 2: Why Do People Consume Different Foods?

2.1 Diet and Nutrition

2.2 Source of Nutrients

Diet and Nutrition

- People in developed countries eat more from different sources than people in developing countries.
- Climate affects what can be grown.
- Culture determines food choices too.

Dietary Energy by Source

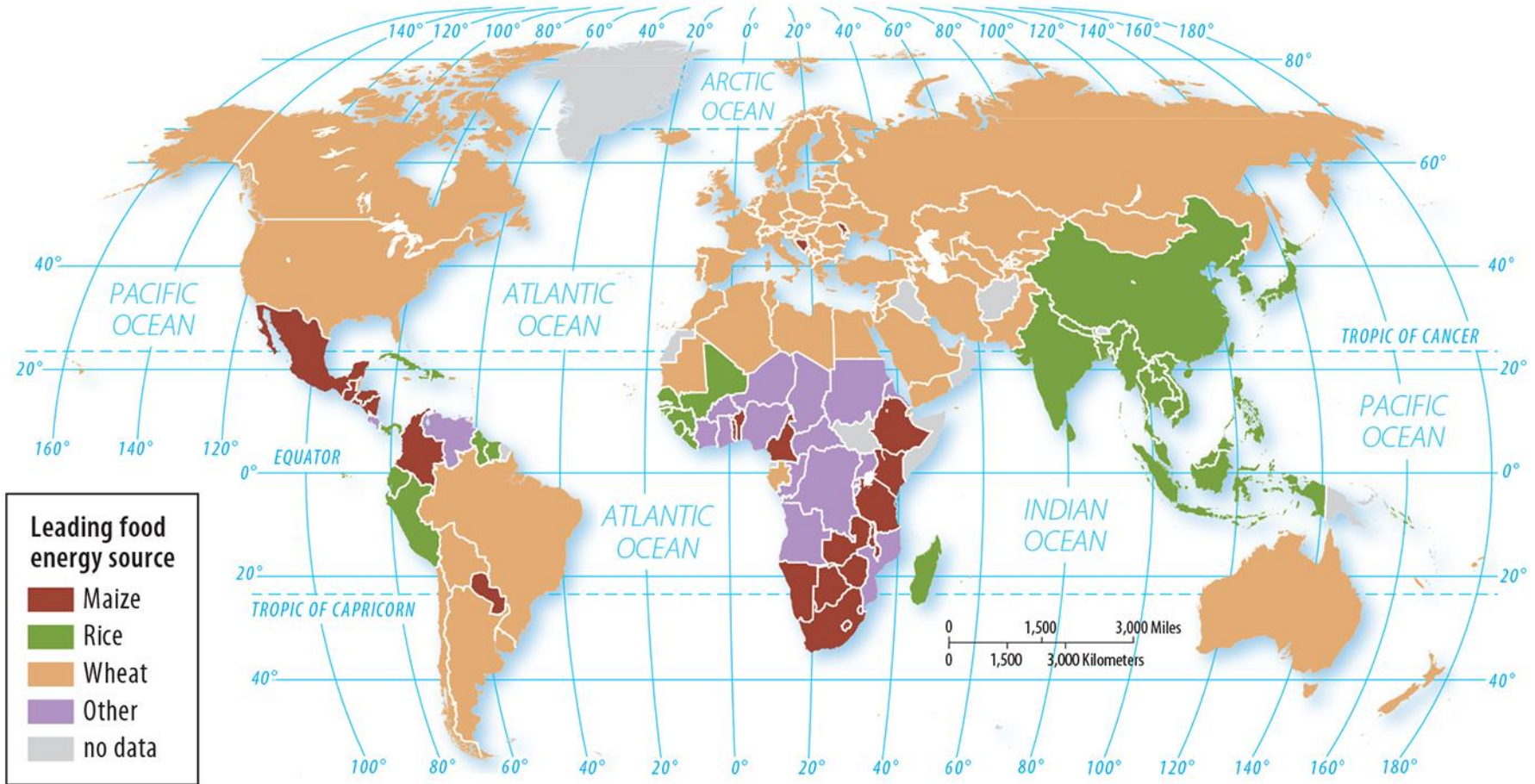


Figure 9-6: The largest source of calories varies by country, with maize, rice, and wheat being the most important. Maize is called corn in the United States and Canada.

Dietary Energy Consumption

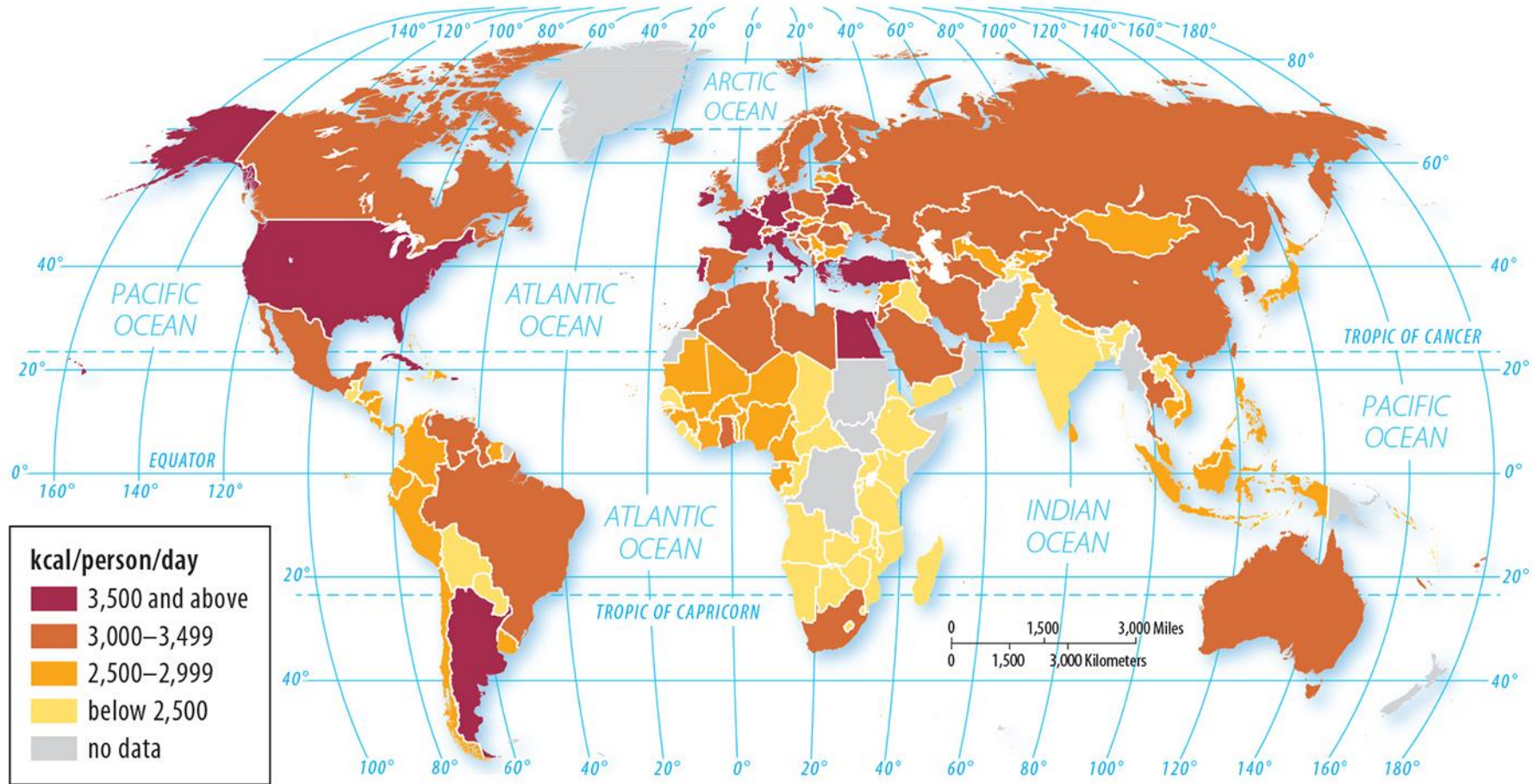


Figure 9-7: Developed countries consume more calories per person on average than many developing countries.

Income Spent on Food

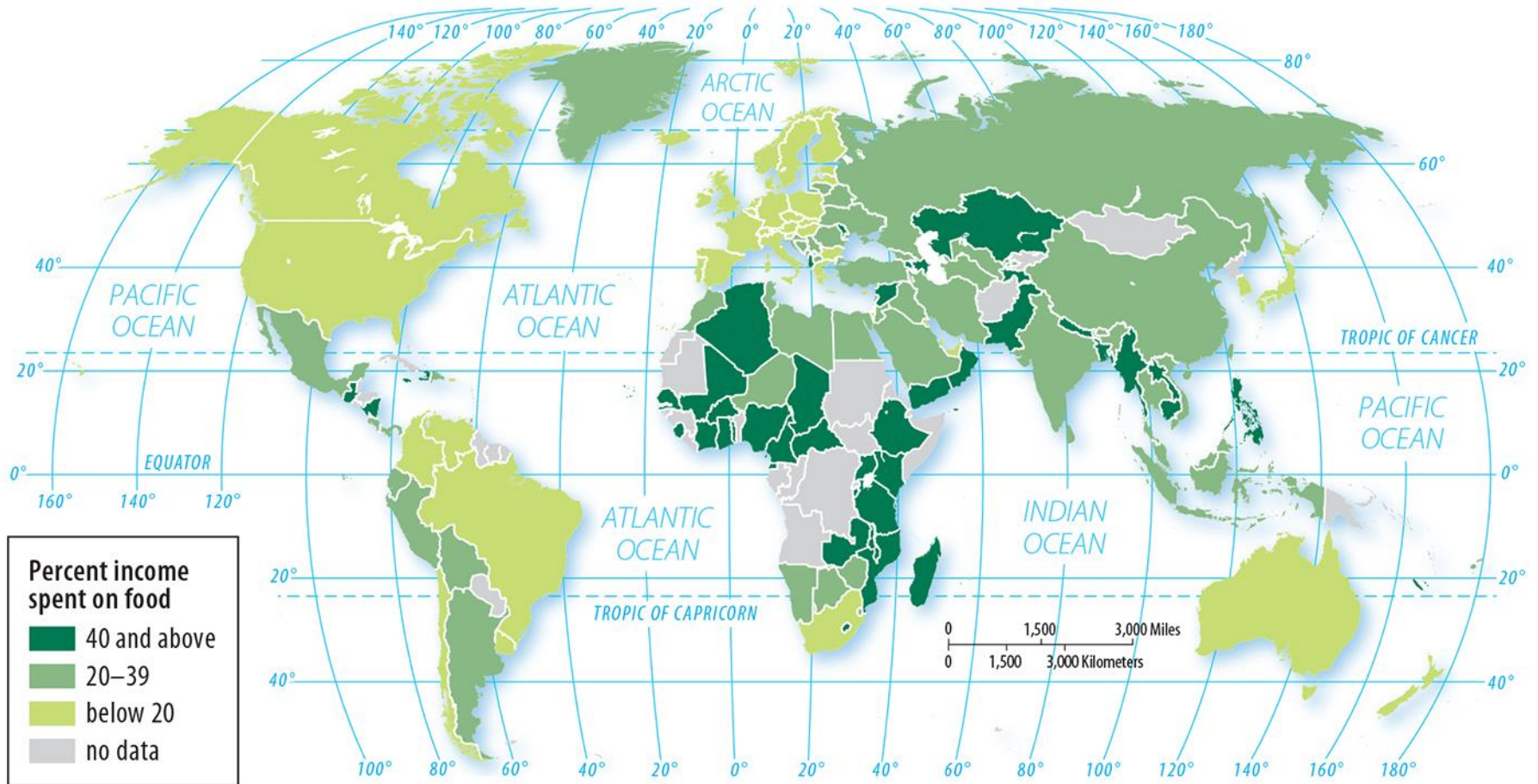


Figure 9-8: A greater percentage of income is spent on food in developing countries.

Protein from Meat

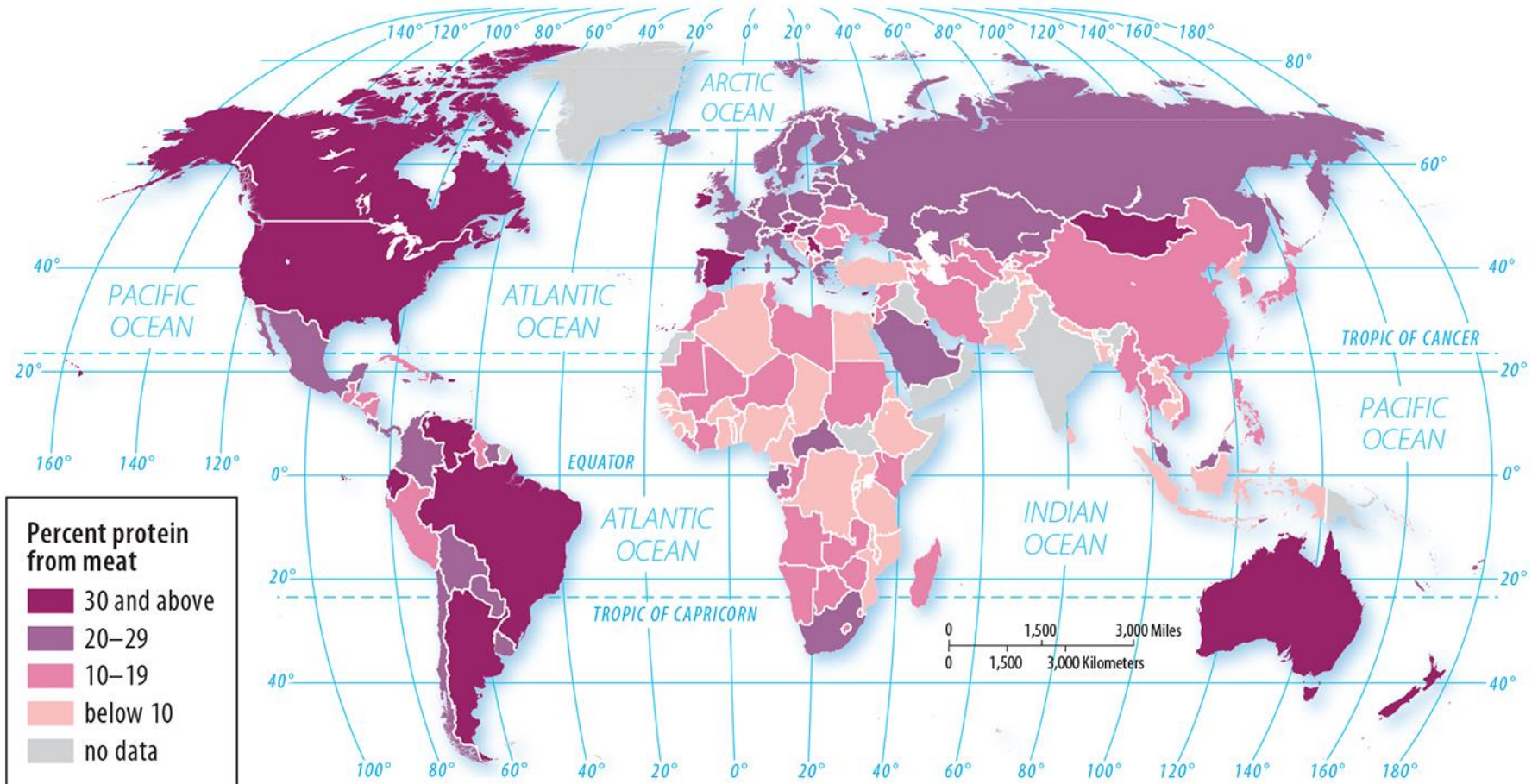


Figure 9-11: A greater percentage of protein comes from meat for people in developed countries.

Protein by Source

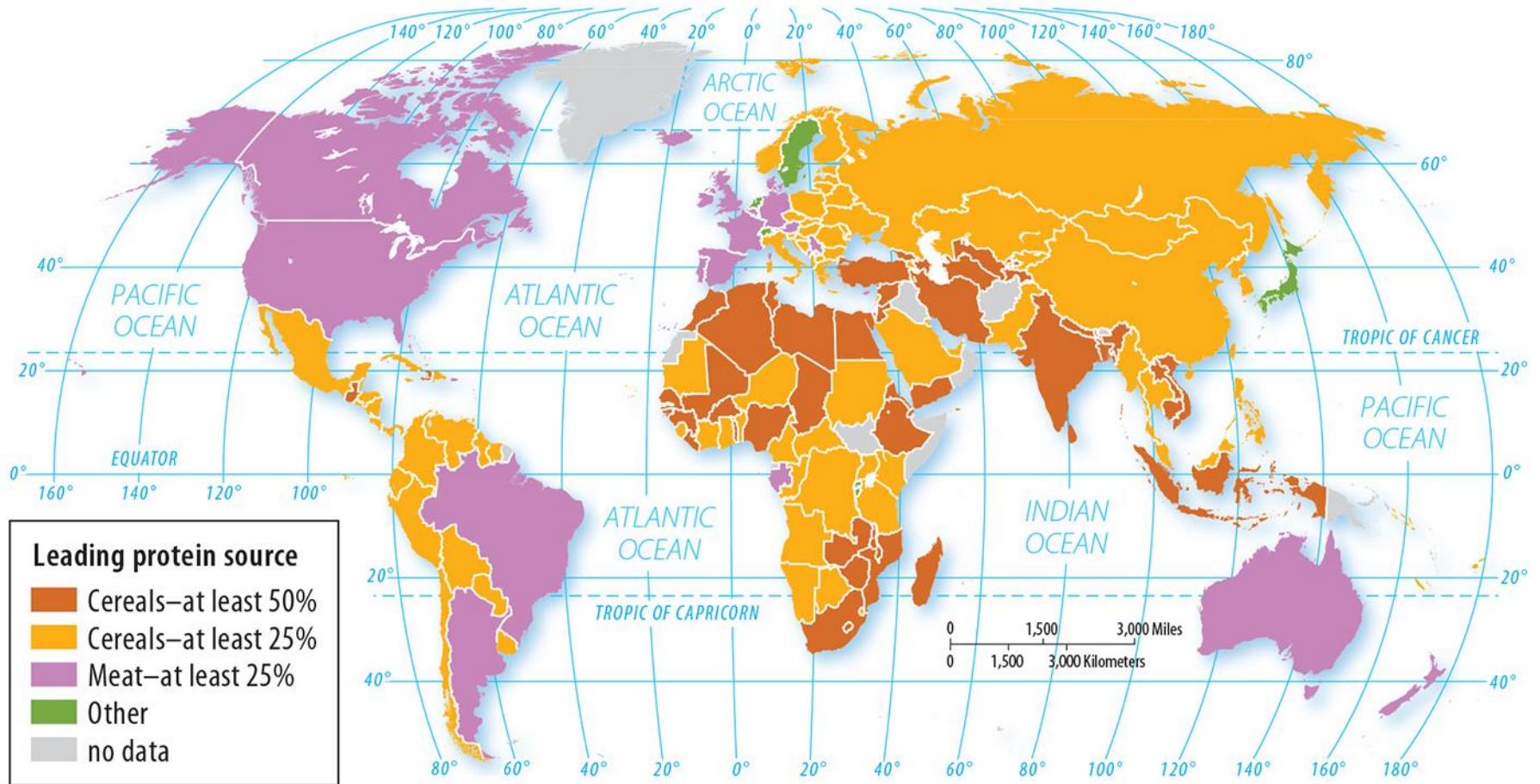


Figure 9-12: Cereals are the leading source of protein in developing countries.

Key Issue 3: Where Is Agriculture Distributed?

3.1 Agricultural Regions and Climate

3.2 Subsistence Agriculture in Dry Regions

3.3 Subsistence Agriculture in Tropical Regions

3.4 Subsistence Agriculture in Population Concentrations

3.5 Fishing

3.6 Commercial Agriculture: Crop-based

3.7 Commercial Agriculture: Mixed Crop and Livestock

3.8 Commercial Agriculture: Animal-based

Agricultural Regions and Climate

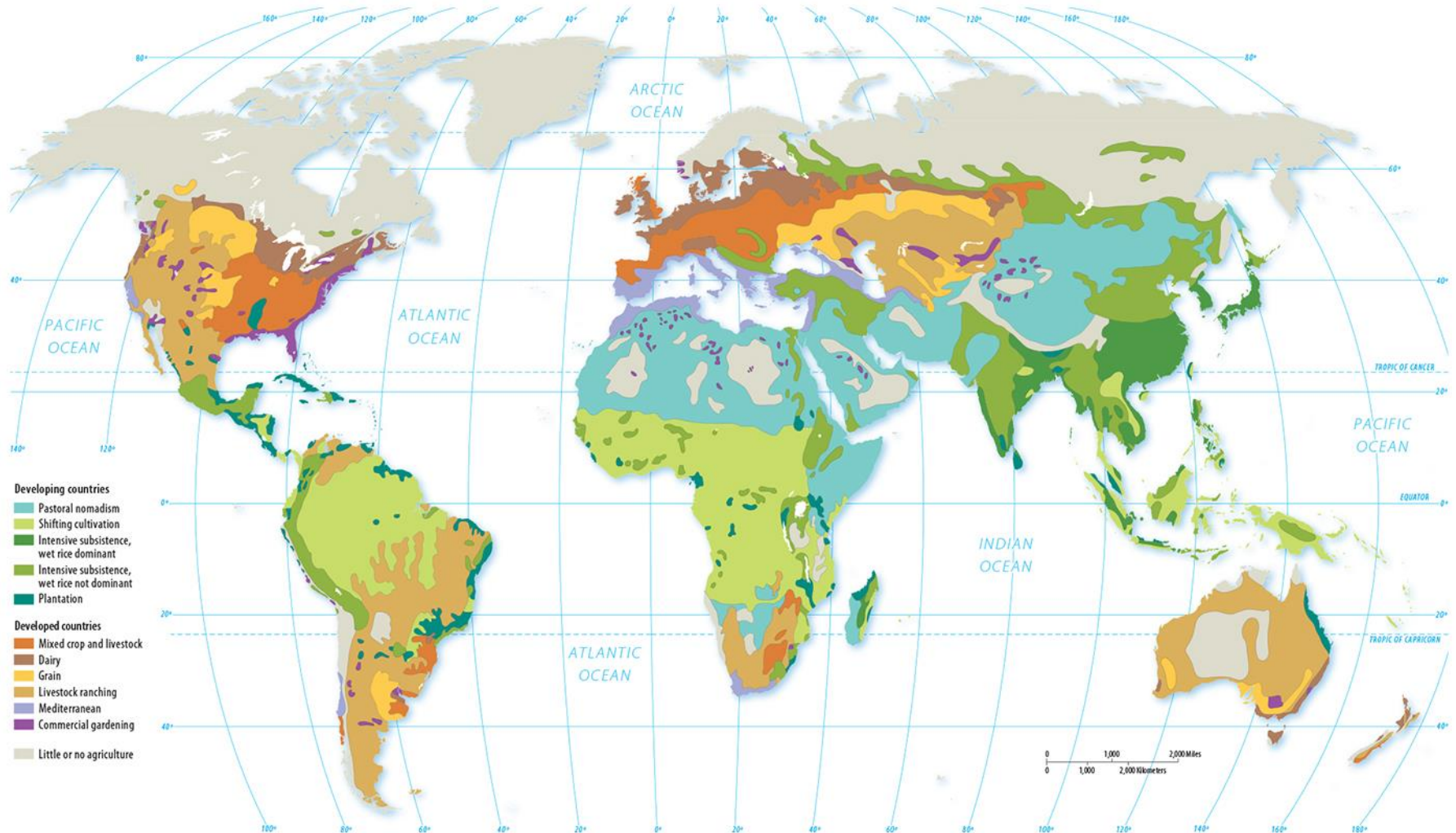


Figure 9-13: Agriculture around the world can be classified into 11 regions based on the commercial/subsistence divide and other characteristics.

Agricultural Regions in Developing Countries

- Intensive subsistence, wet-rice dominant
- Intensive subsistence, crops other than rice
- Pastoral nomadism
- Shifting cultivation
- Plantation: an exception because it is commercial

Subsistence Agriculture in Dry Regions



Figure 9-16: Pastoral nomadism is a subsistence agricultural practice where animals are herded across lands too dry to grow crops.

Subsistence Agriculture in the Tropics



Figures 9-17 and 9-18: Found in tropical climates where soils are usually low in nutrients, shifting cultivation involves slashing and burning the forest (left, in Mozambique) before planting crops for a few years (right, in Côte d'Ivoire).

Subsistence Agriculture in Population Concentrations

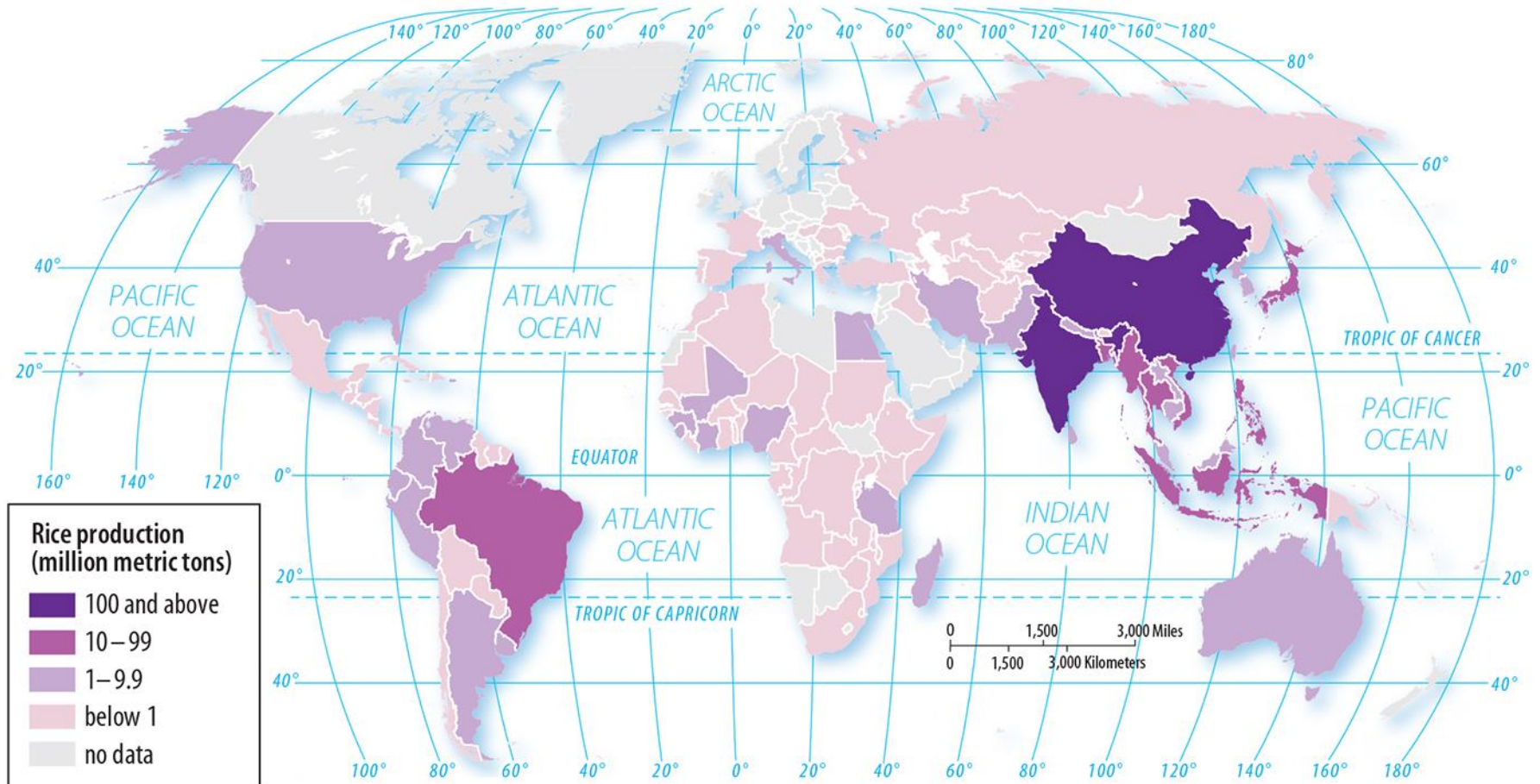


Figure 9-19: Rice is an especially popular crop in Asia to grow with intensive subsistence. Other crops may be grown with intensive subsistence based on climate or cultural preferences.

Major Fishing Regions

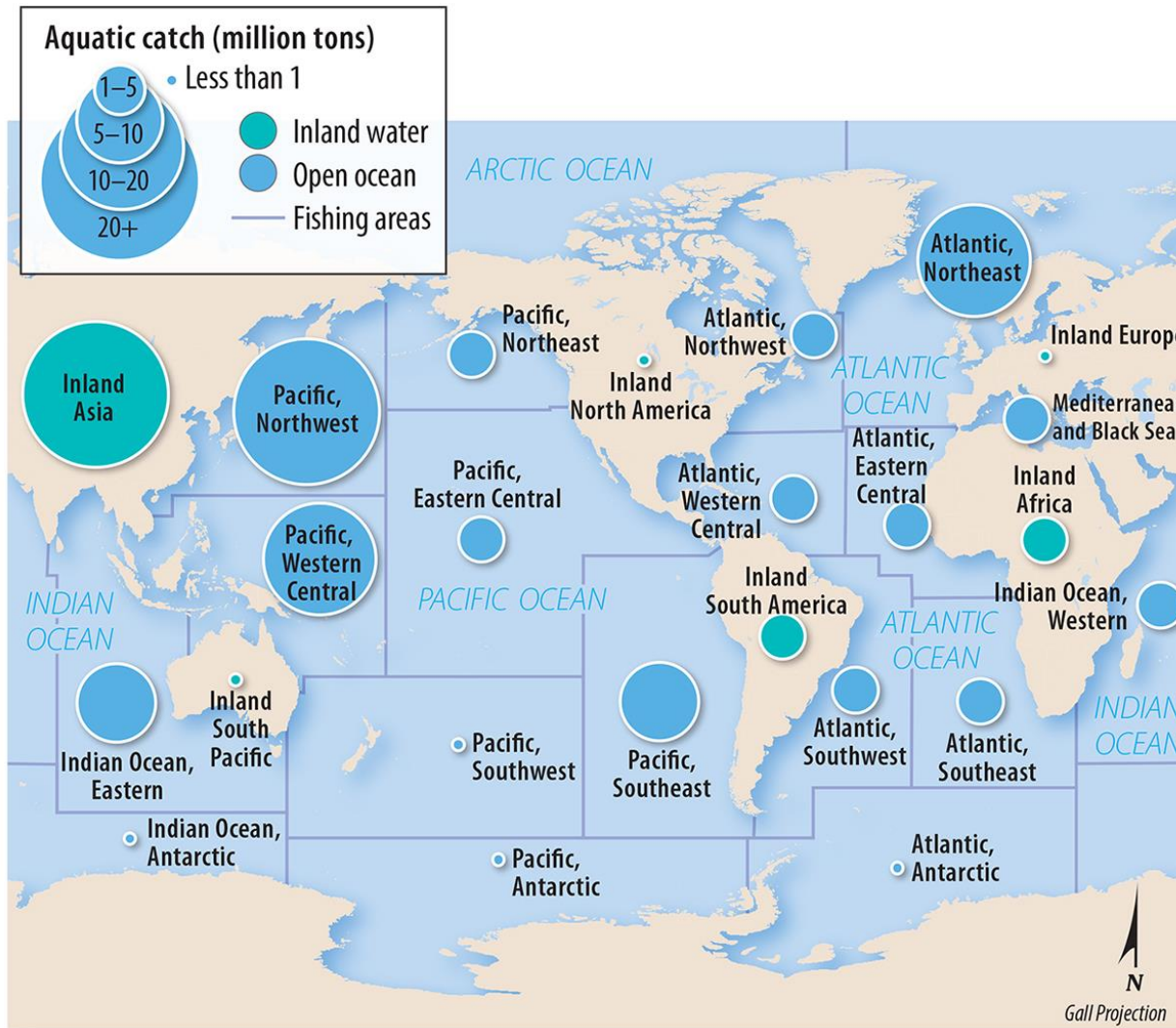
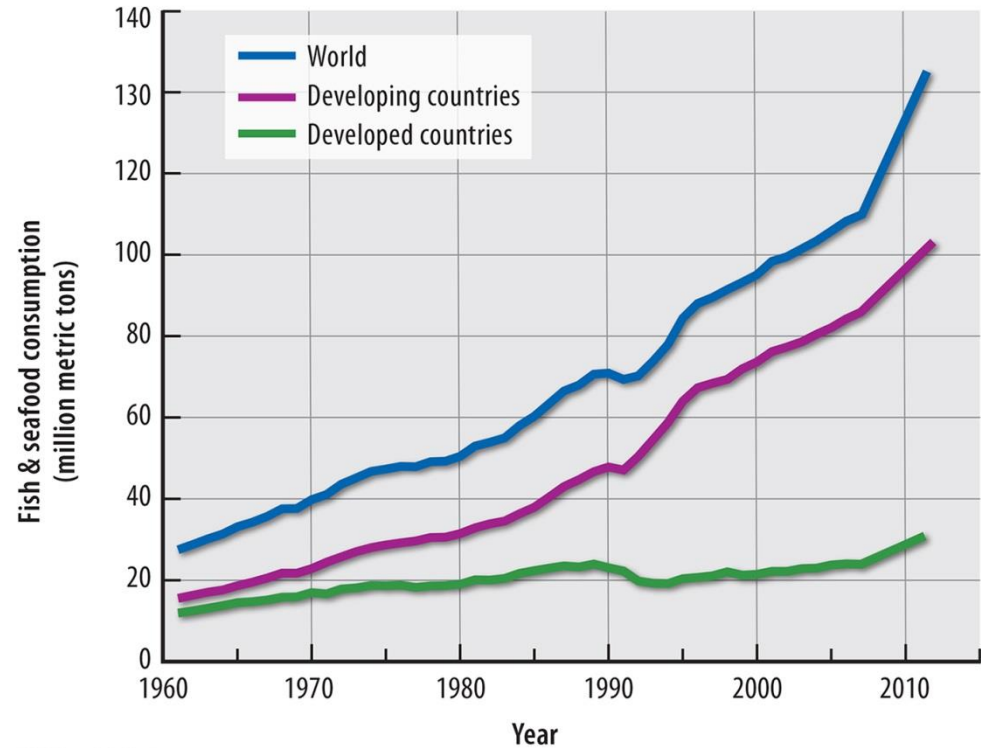
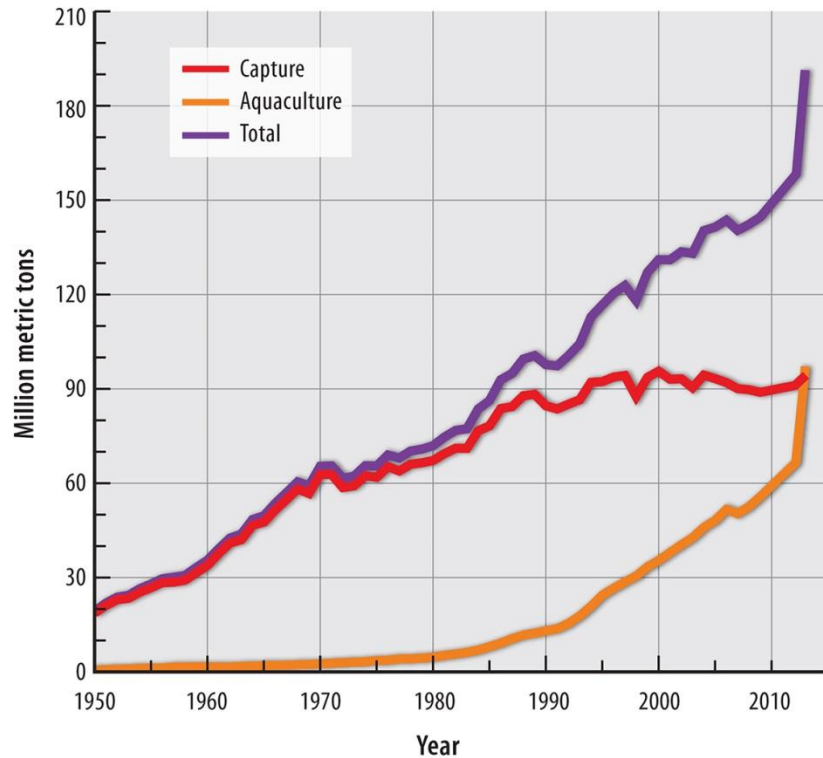


Figure 9-24: Fishing is practiced both commercially and in subsistence.

Growth in Fishing



Figures 9-26 and 9-27: Fish production (left) and human consumption of fish (right) have increased dramatically. Increases since 1990 are from aquaculture, raising concerns about overfishing.

Fish Production

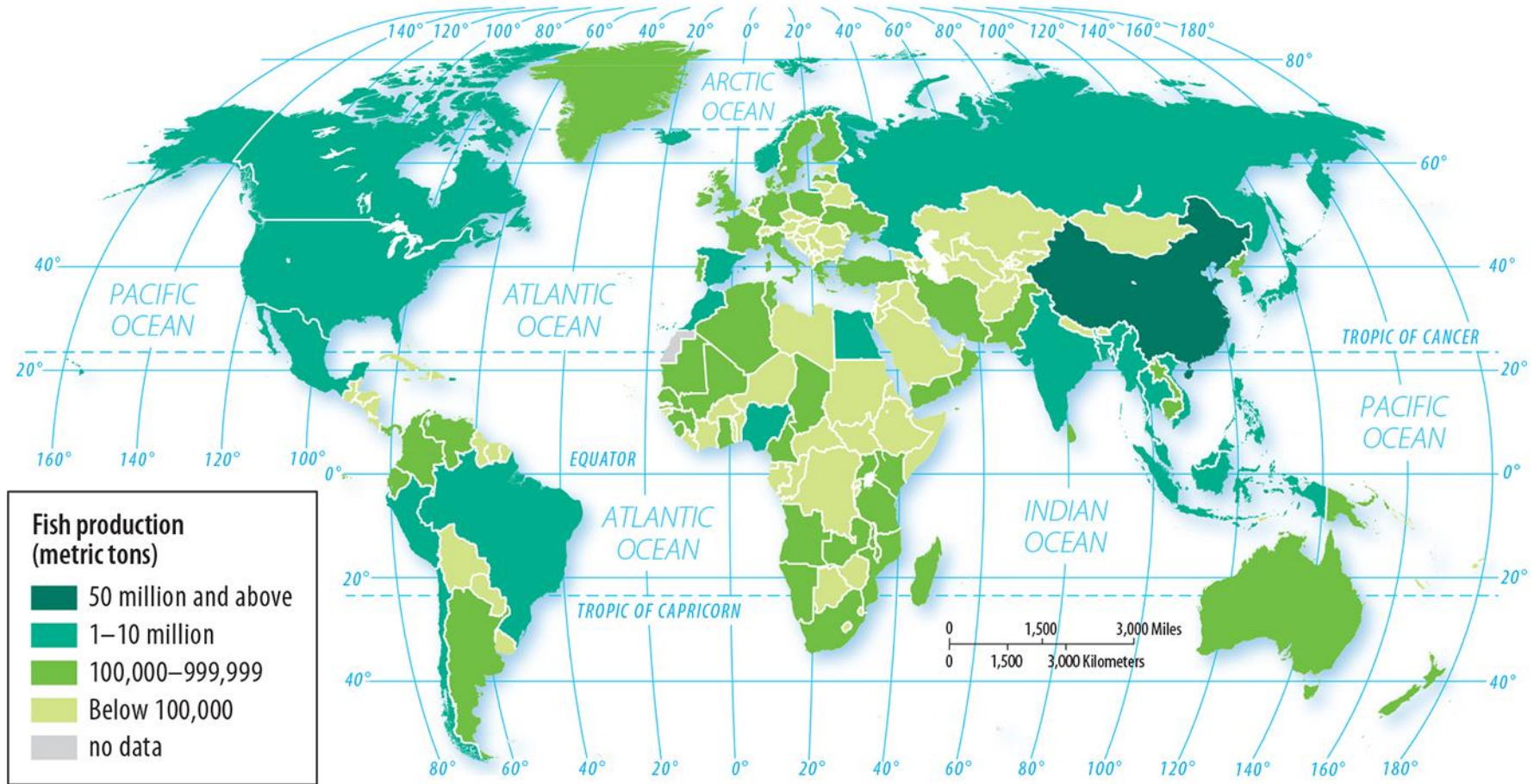


Figure 9-29: China accounts for one-third of fish production in the world.

Agricultural Regions in Developed Countries

- Mixed crop and livestock
- Dairying
- Grain
- Ranching
- Mediterranean
- Commercial gardening

Commercial Agriculture: Crop-based

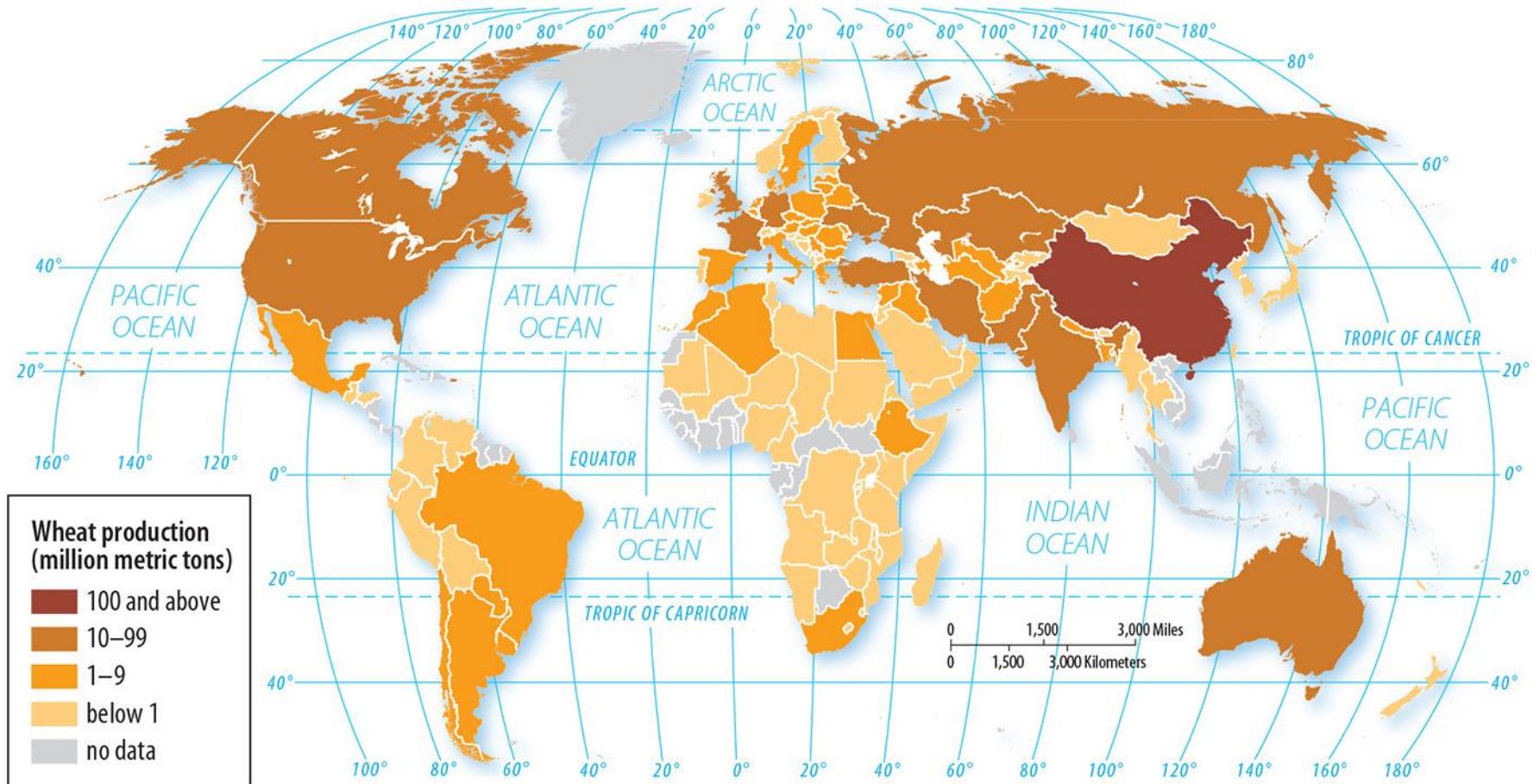


Figure 9-30: Commercial grain farming includes the production of wheat in developed countries. Developing countries also produce wheat through intensive subsistence.

Commercial Agriculture: Crop-based: Mediterranean



Figure 9-31: The Mediterranean climate region and agricultural type features extensive production of crops like grapes (here pictured in Italy), olives, and tree nuts.

Commercial Agriculture: Crop-based: Commercial Gardening and Fruit Farming



Figure 9-32: Commercial gardening and fruit farming, also known as truck farming, includes peanut farming.

Commercial Agriculture: Mixed Crop and Livestock

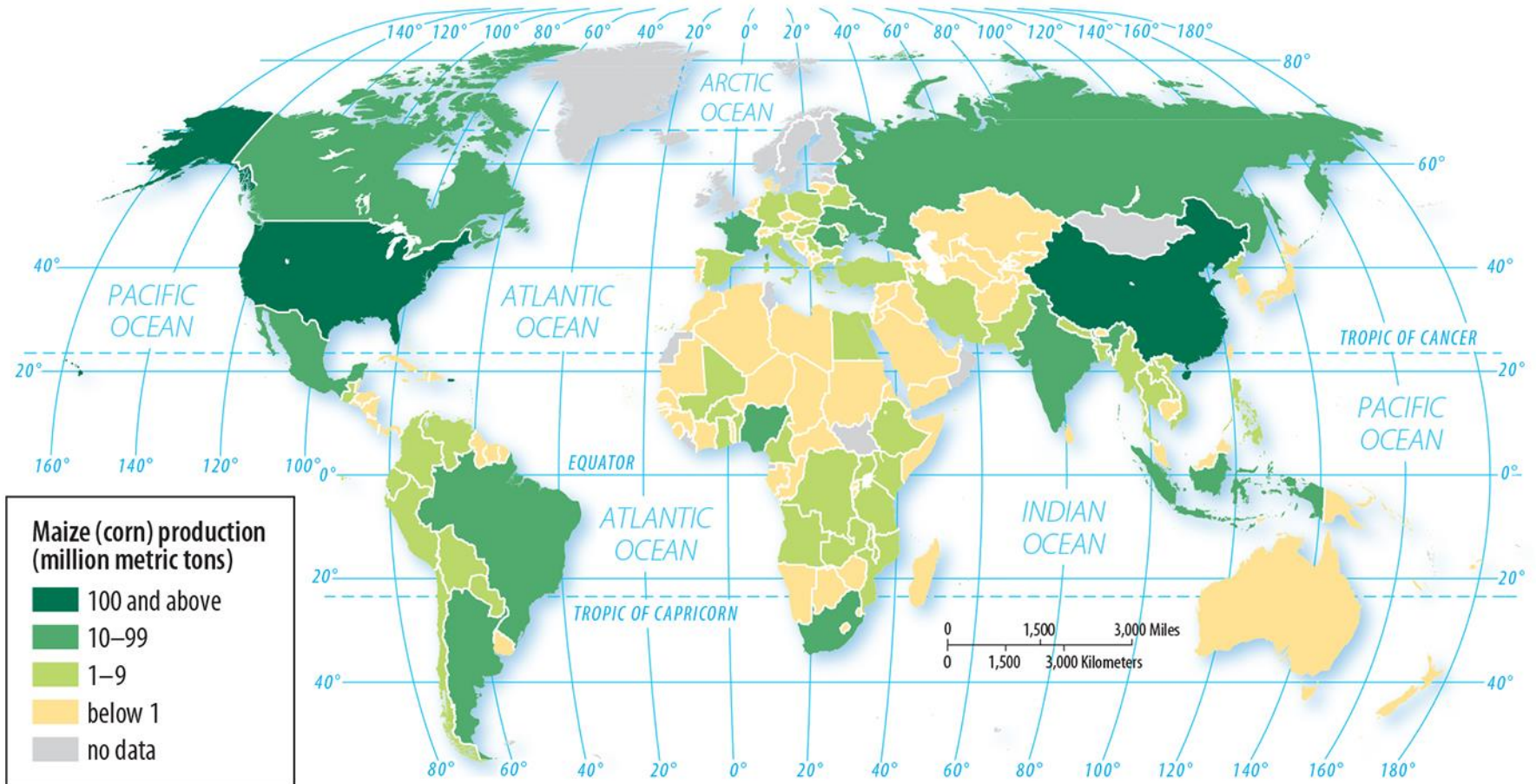


Figure 9-33: In many countries, corn is grown to feed livestock more often than for direct human consumption.

Challenges for Farmers In Developed Countries

- Importance of Access to Markets
 - The von Thünen model helps to explain the importance of proximity to market in the choice of crops on commercial farms.
 - Specific crops are grown in different rings around cities
 - 1st ring: Highly perishable foods e.g. milk
 - 2nd ring: Items more difficult to transport e.g. wood
 - 3rd ring: Various crops and pasture lands
 - 4th ring: Spacious lands for animal grazing.
 - von Thünen's model can be scaled up for national and global markets.

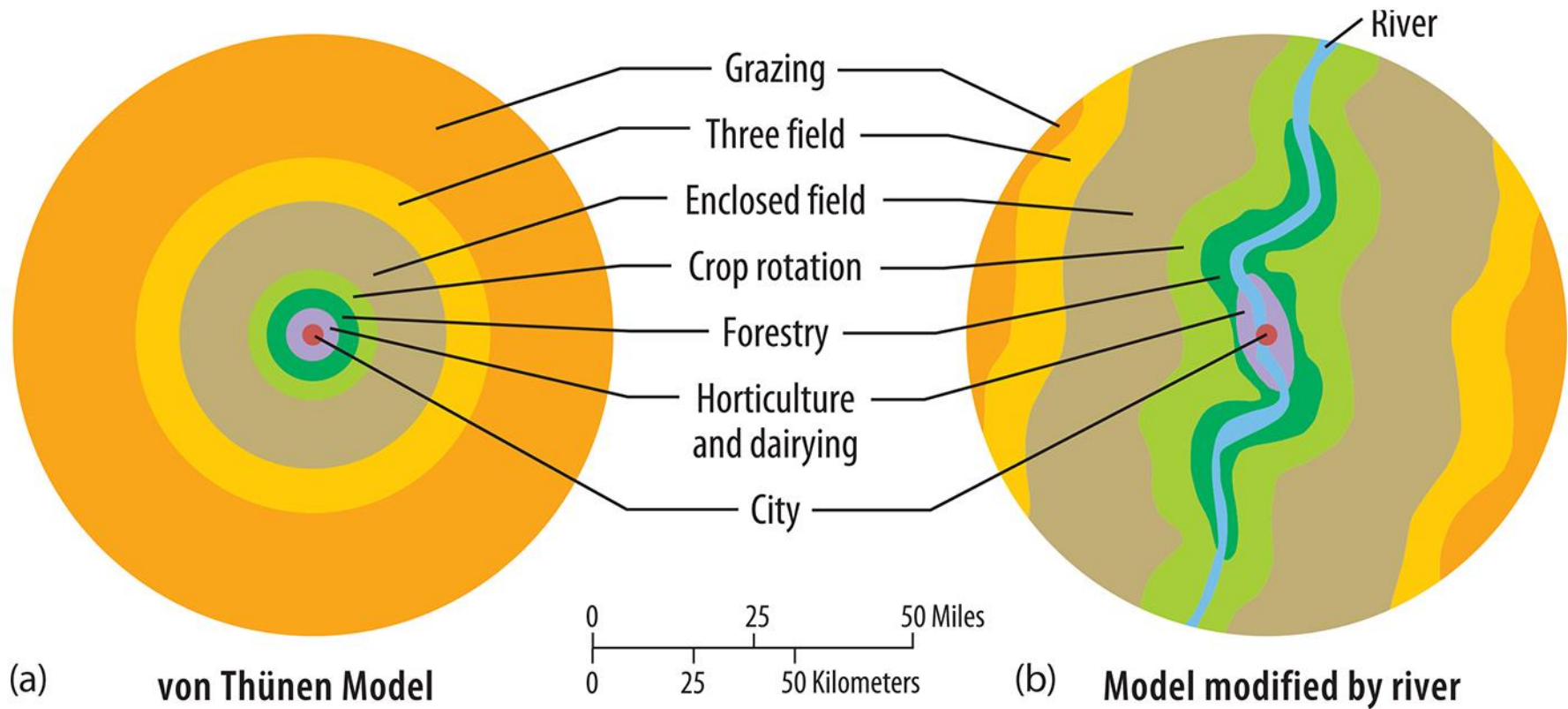
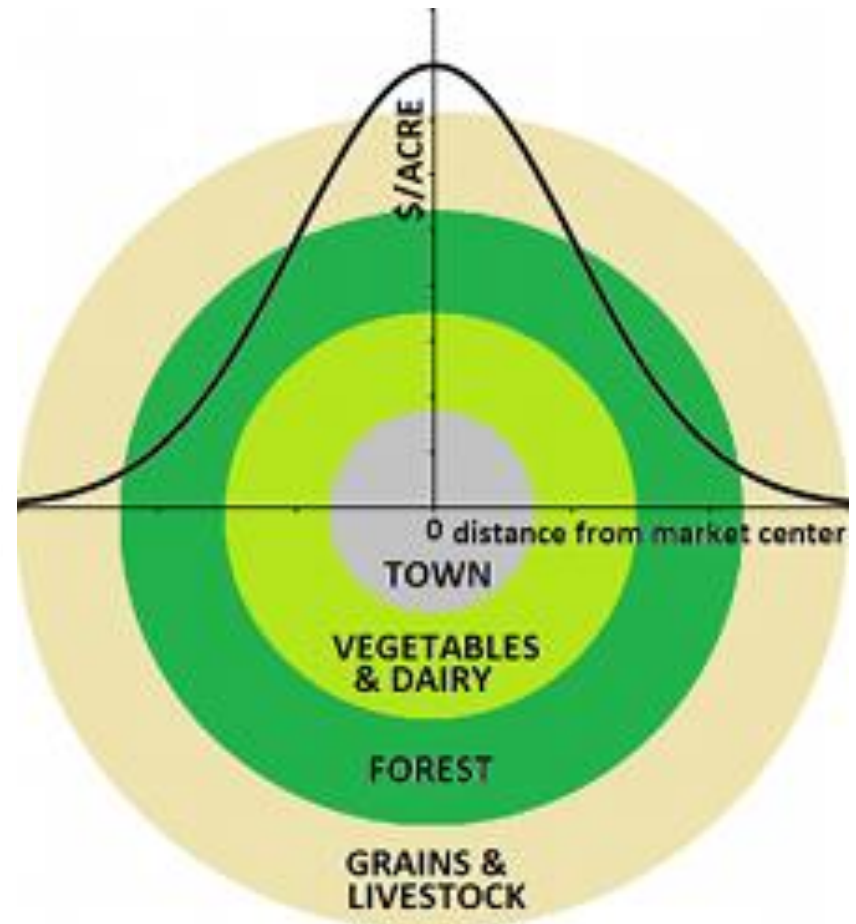
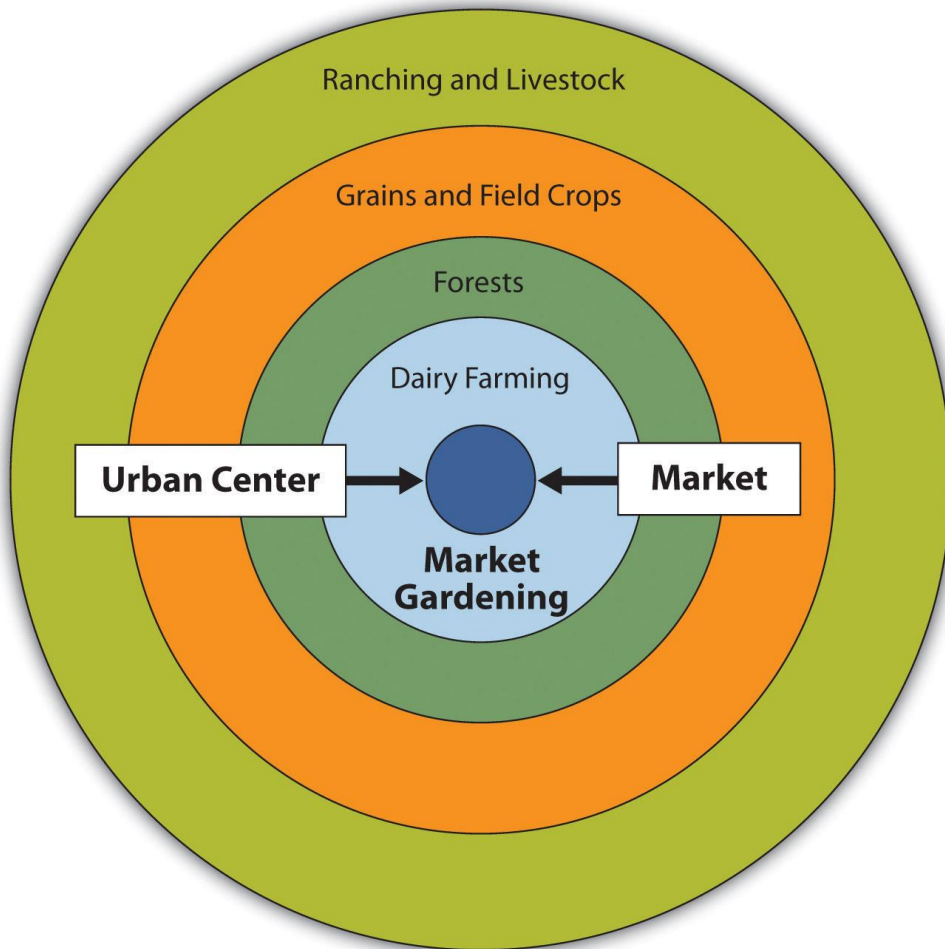


Figure 9-35: Von Thünen modeled the location of agricultural activities based on the value of products and their transportation cost.

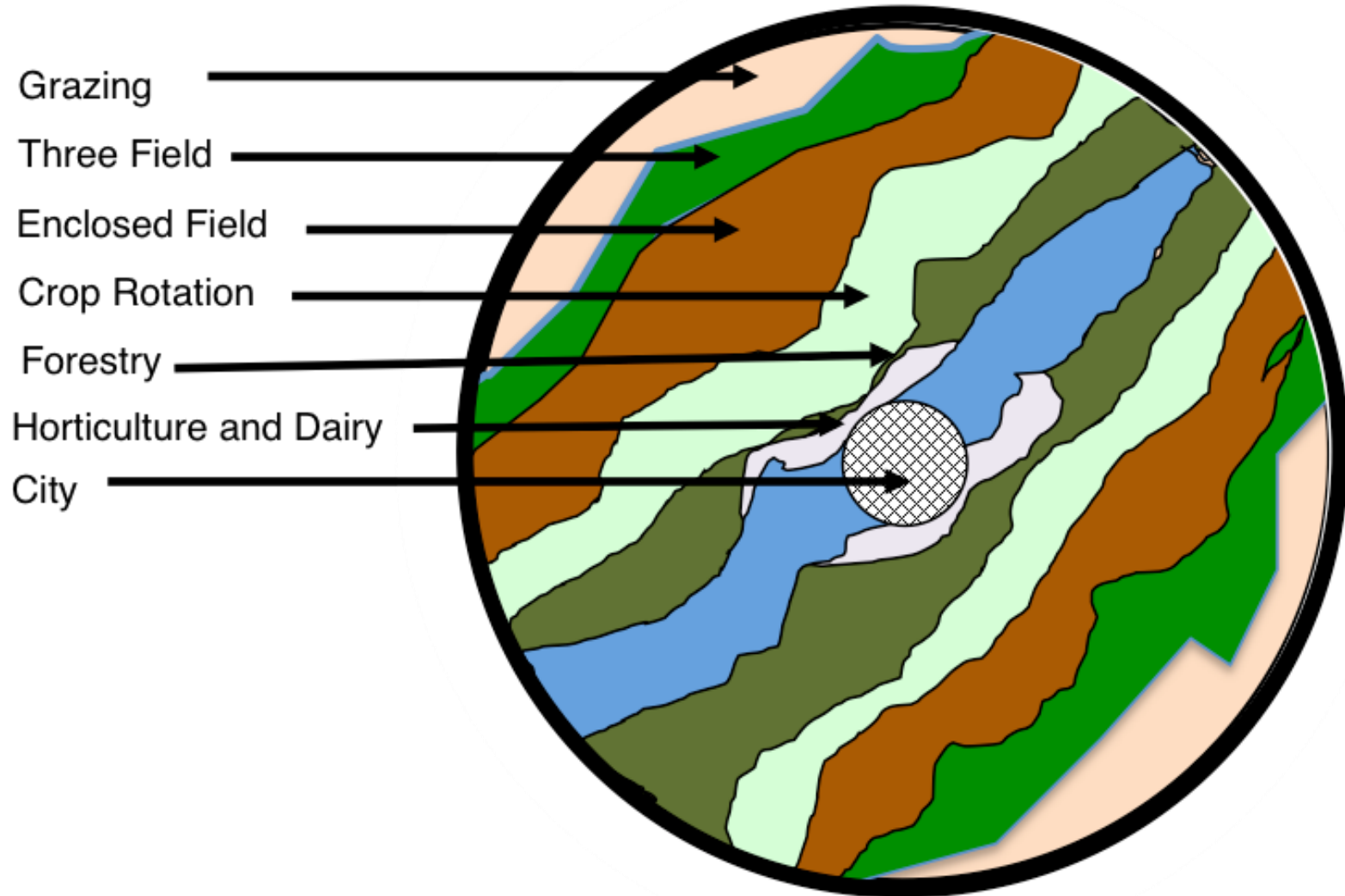
Von Thunen Model

$$P=V-(E+T)$$

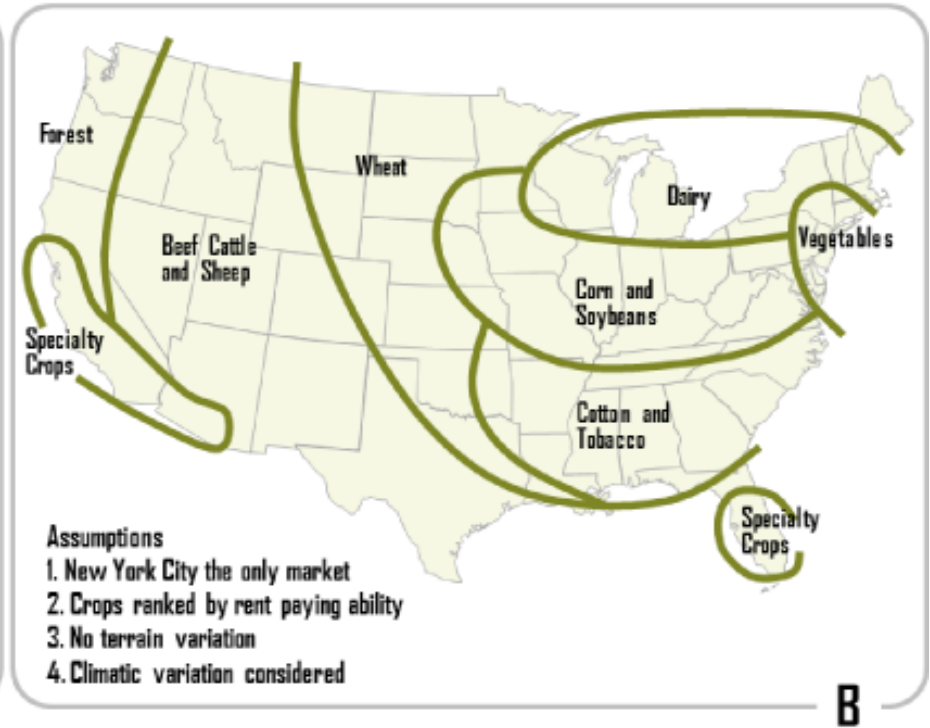
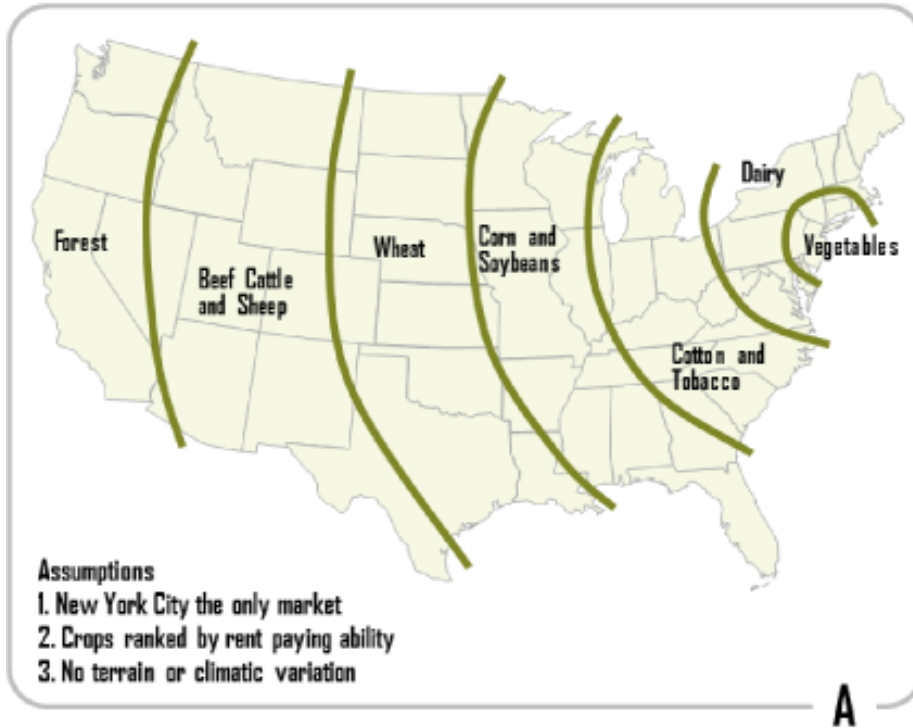
Profit P = Value of his produce (V) MINUS
[production expenses (E) + transport cost(T)]



Von Thunen Model

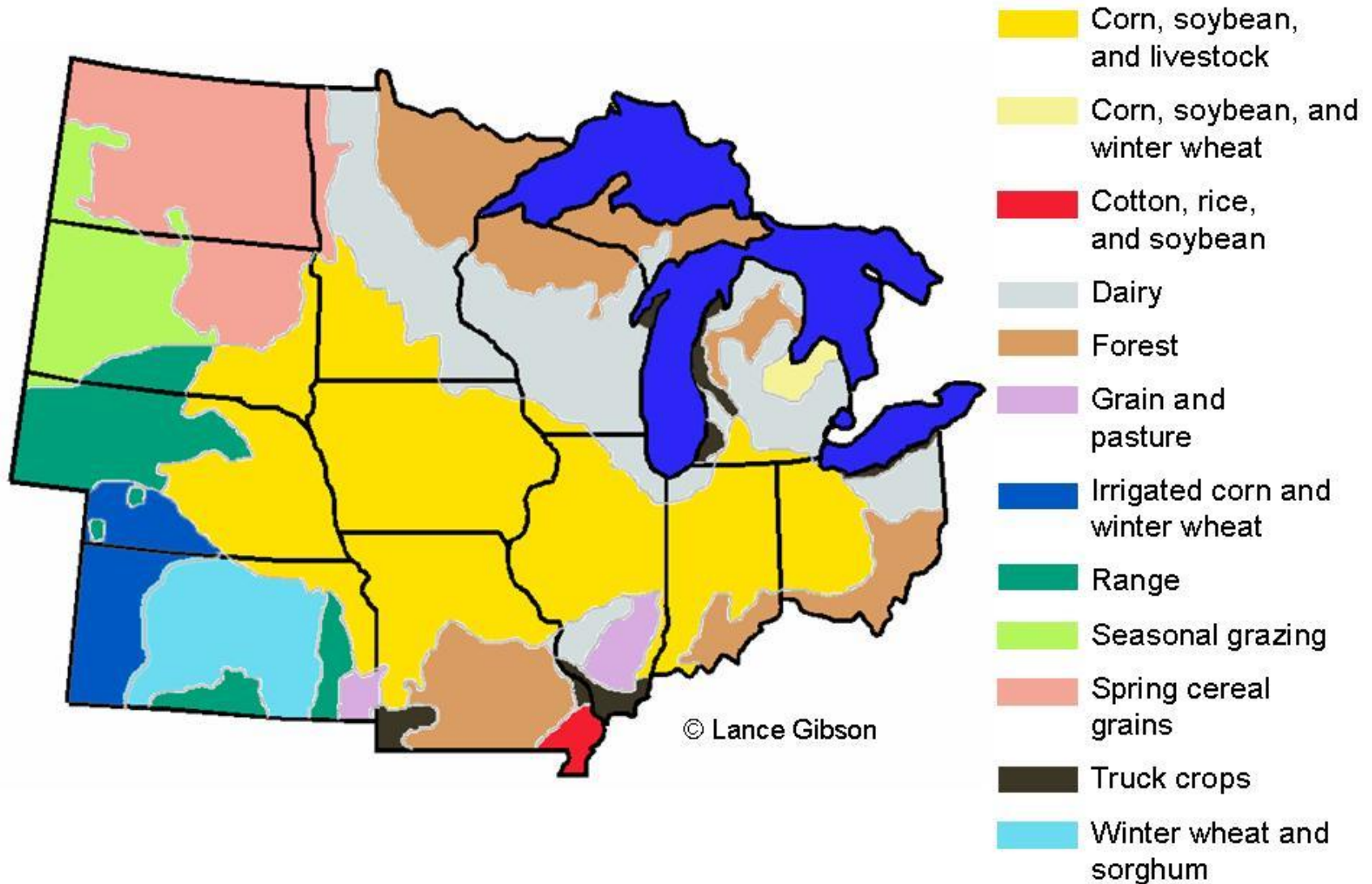


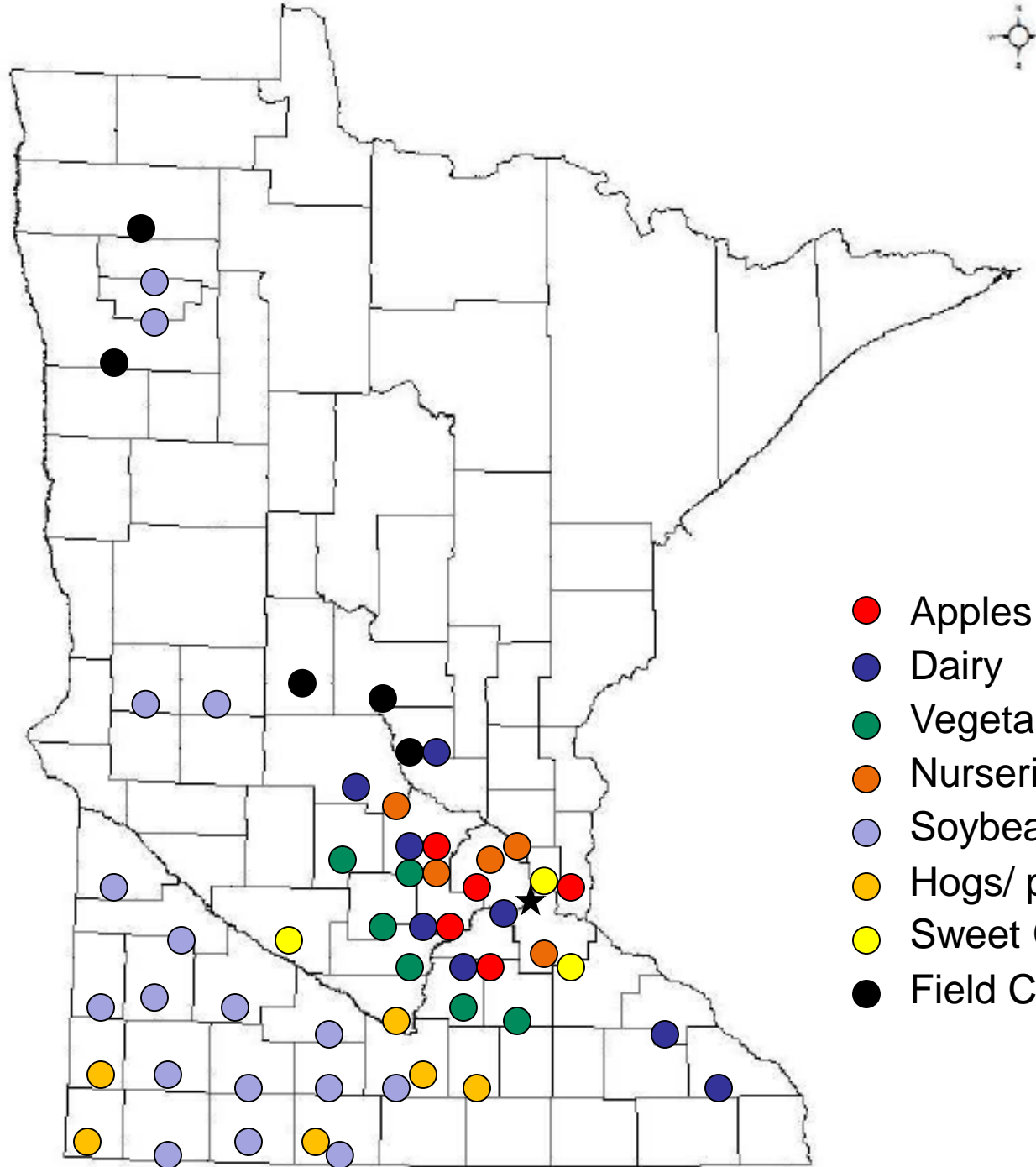
Von Thunen Model



Von Thunen Model

Farming Regions of the North Central U.S.





- Apples
- Dairy
- Vegetables
- Nurseries
- Soybeans
- Hogs/ pigs
- Sweet Corn/ Peas
- Field Corn

Problems with Von Thunen

- City is located centrally within an "Isolated State"
 - Self sufficient and has no external influences.
 - Surrounded by an unoccupied wilderness.
 - Land is completely flat and has no rivers or mountains to interrupt the terrain.
 - Soil quality and climate are consistent throughout.
 - Farmers transport their own goods to market via oxcart, across land, directly to the central city.
Therefore, there are no roads.
 - Farmers act to maximize profits.

Commercial Agriculture: Animal-based Dairy

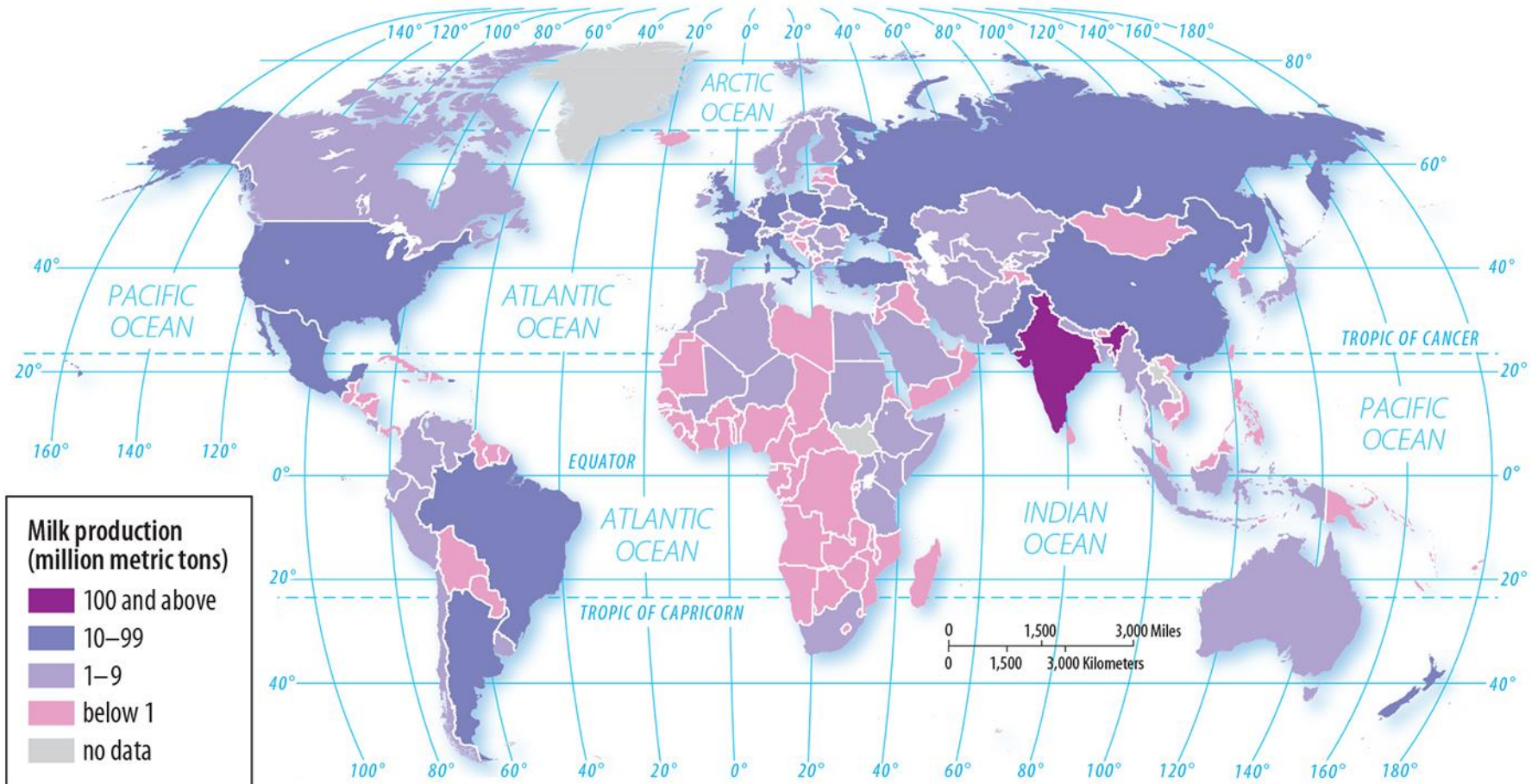


Figure 9-36: India is the world's leading milk producer, but dairy is an important commercial agricultural practice in developed regions, especially North America and Europe.

Commercial Agriculture: Animal-based Livestock Ranching

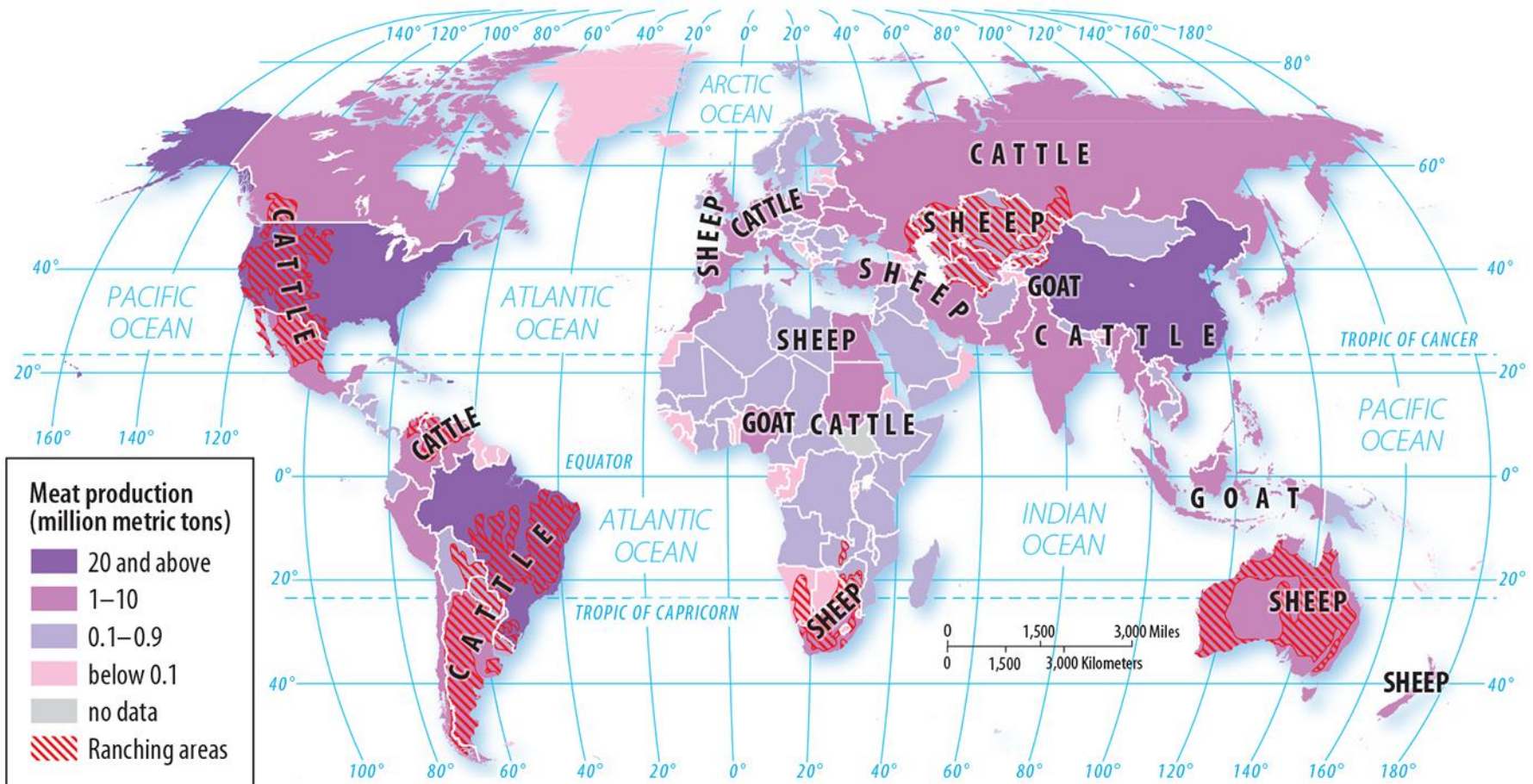


Figure 9-38: The type of animal raised depends on cultural preferences and climate. Developing countries are increasing meat production; China is the world's largest meat producer.

Key Issue 4: Why Do Farmers Face Sustainability Challenges?

- 4.1 Losing Agricultural Land
- 4.2 Improving Agricultural Productivity
- 4.3 Conserving Agricultural Resources
- 4.4 Applying Biotechnology to Agriculture
- 4.5 Global Food Trade
- 4.6 Global Agriculture and Undernourishment
- 4.7 Sustainable Agriculture

Losing Agricultural Land

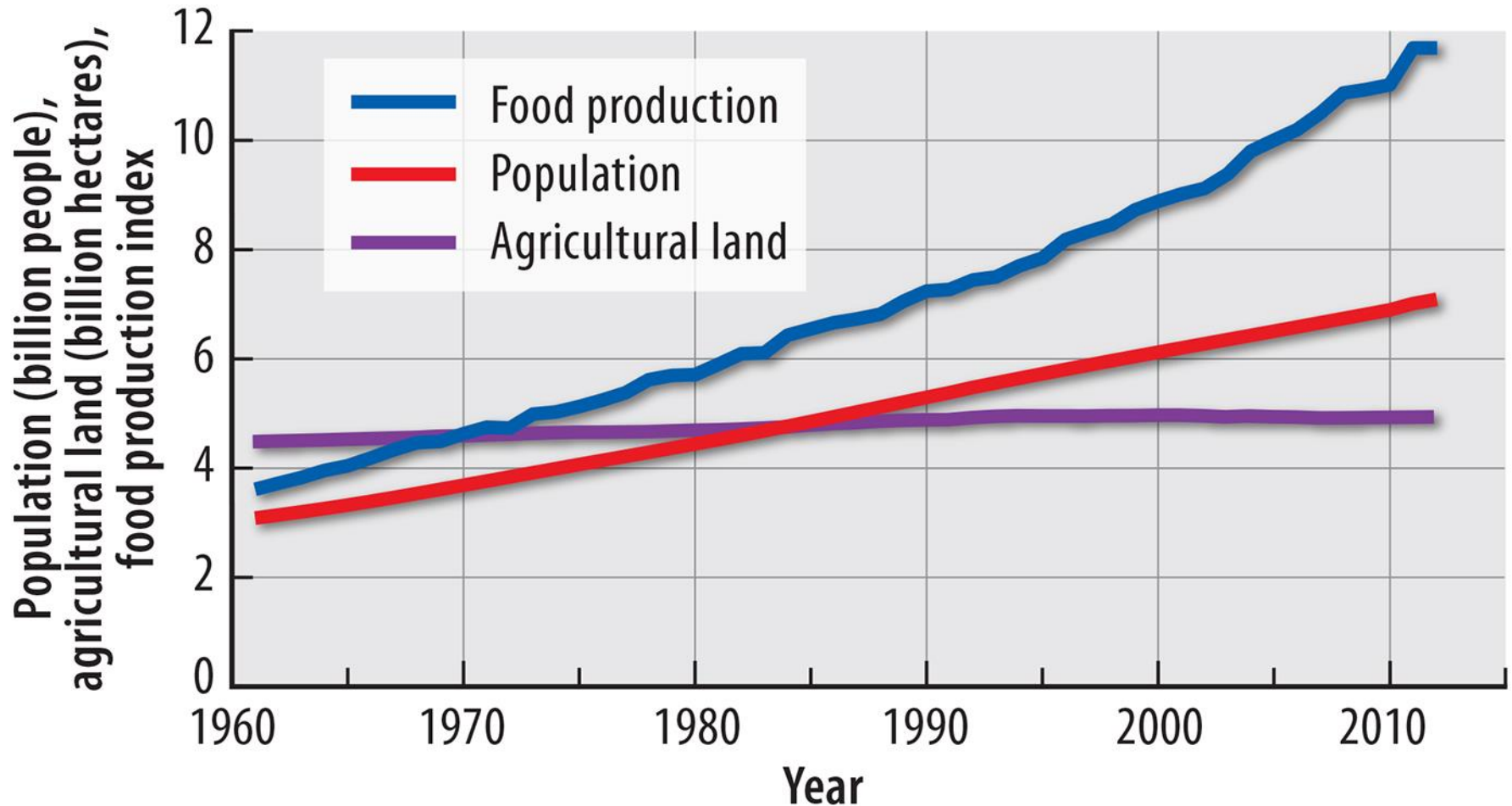


Figure 9-39: Food production has kept up with population growth despite very little increase in agricultural land. Agricultural land is threatened by urbanization and desertification.

Threats to Farmland in Maryland

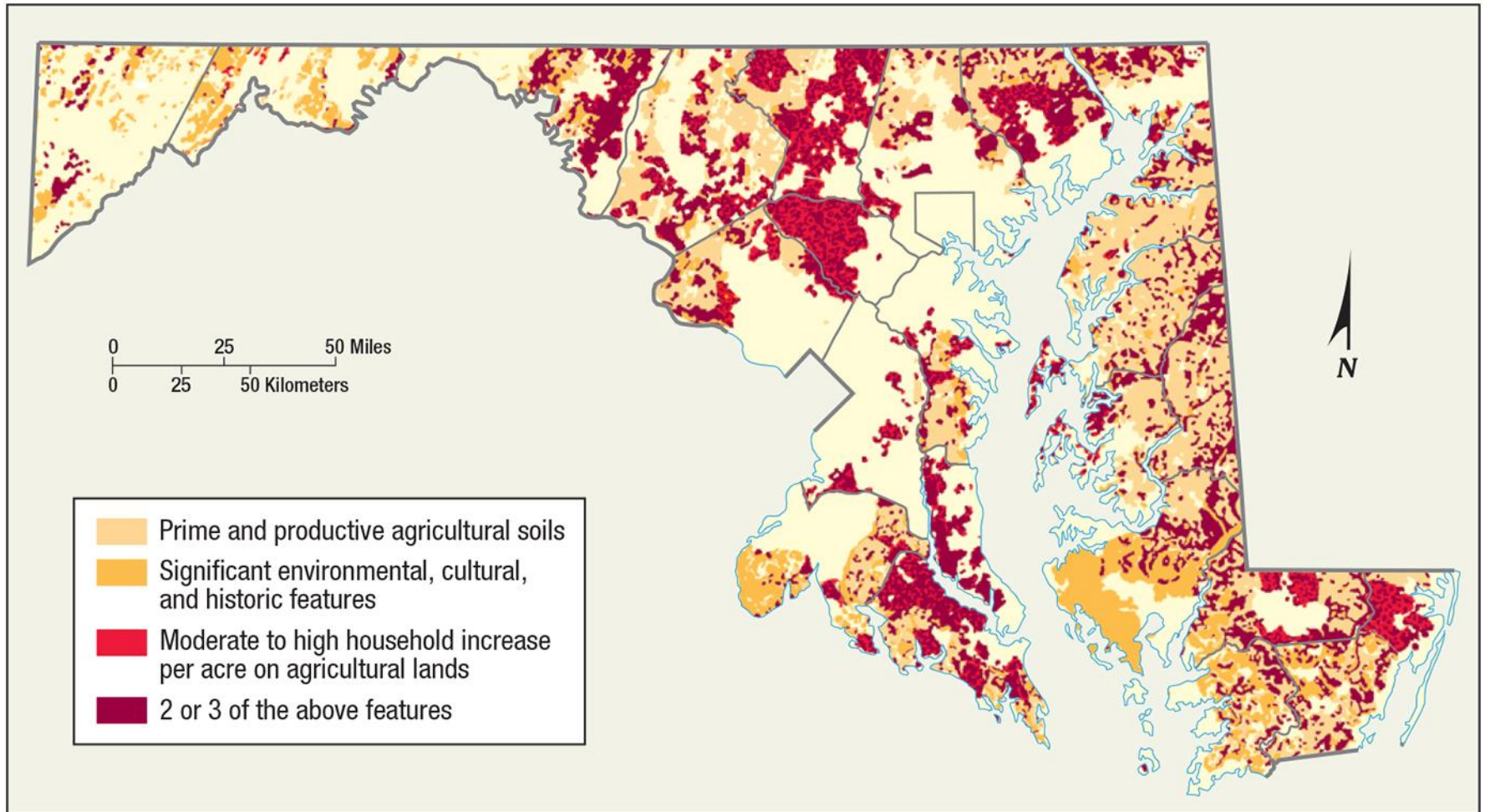


Figure 9-40: Considerable amounts of Maryland's prime farmland is threatened by urbanization.

Desertification Hazard

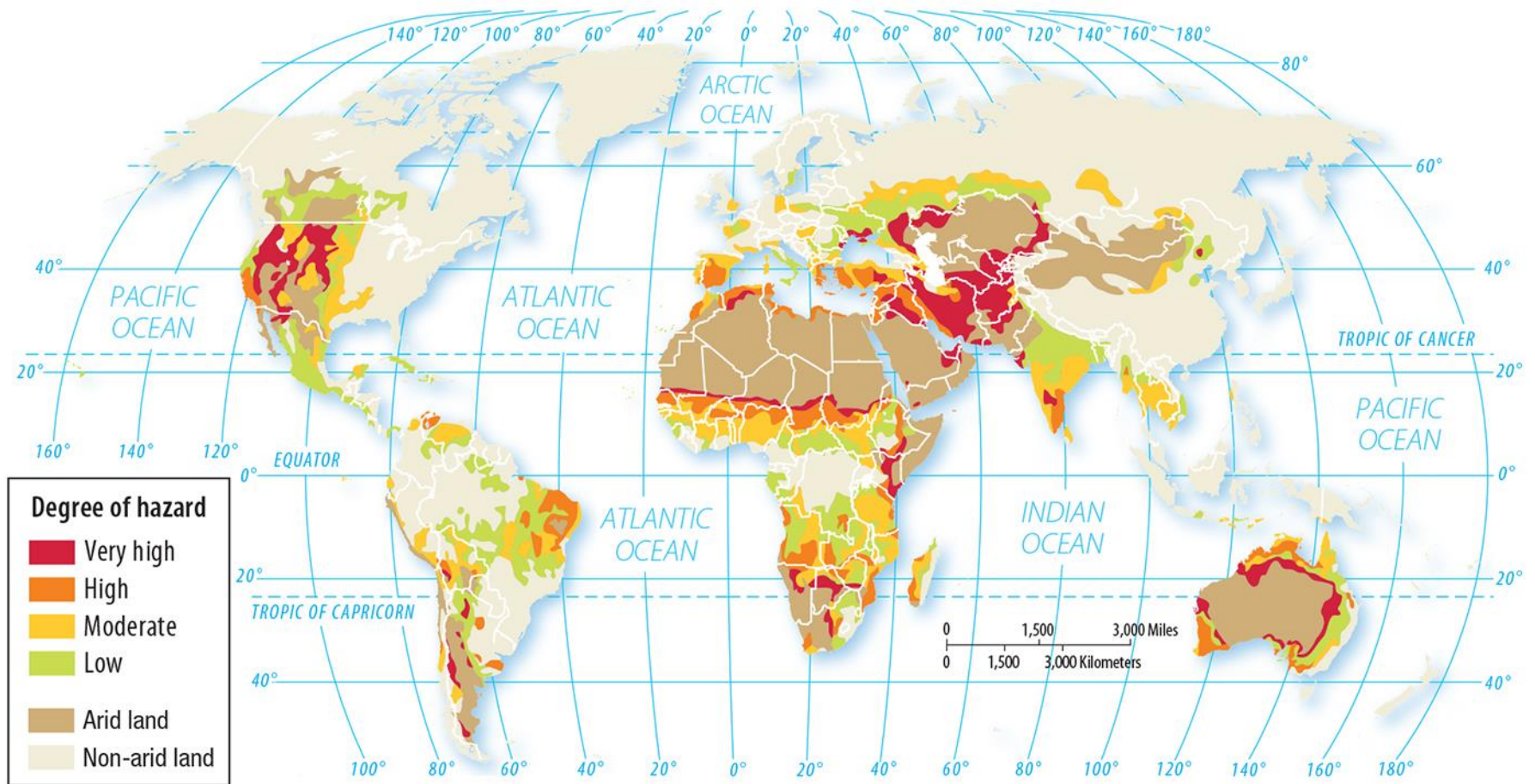


Figure 9-41: Dry lands are at high risk of desertification.

Improving Agricultural Productivity

Agricultural production has increased faster than farmland.

- Subsistence intensification: land worked more intensively
- Green revolution: selective breeding, fertilizers
- Increased technology in commercial agriculture

Green Revolution



Figure 9-43: The International Rice Research Institute's selective breeding programs have developed high-yielding varieties of rice.

U.S. Dairy Productivity

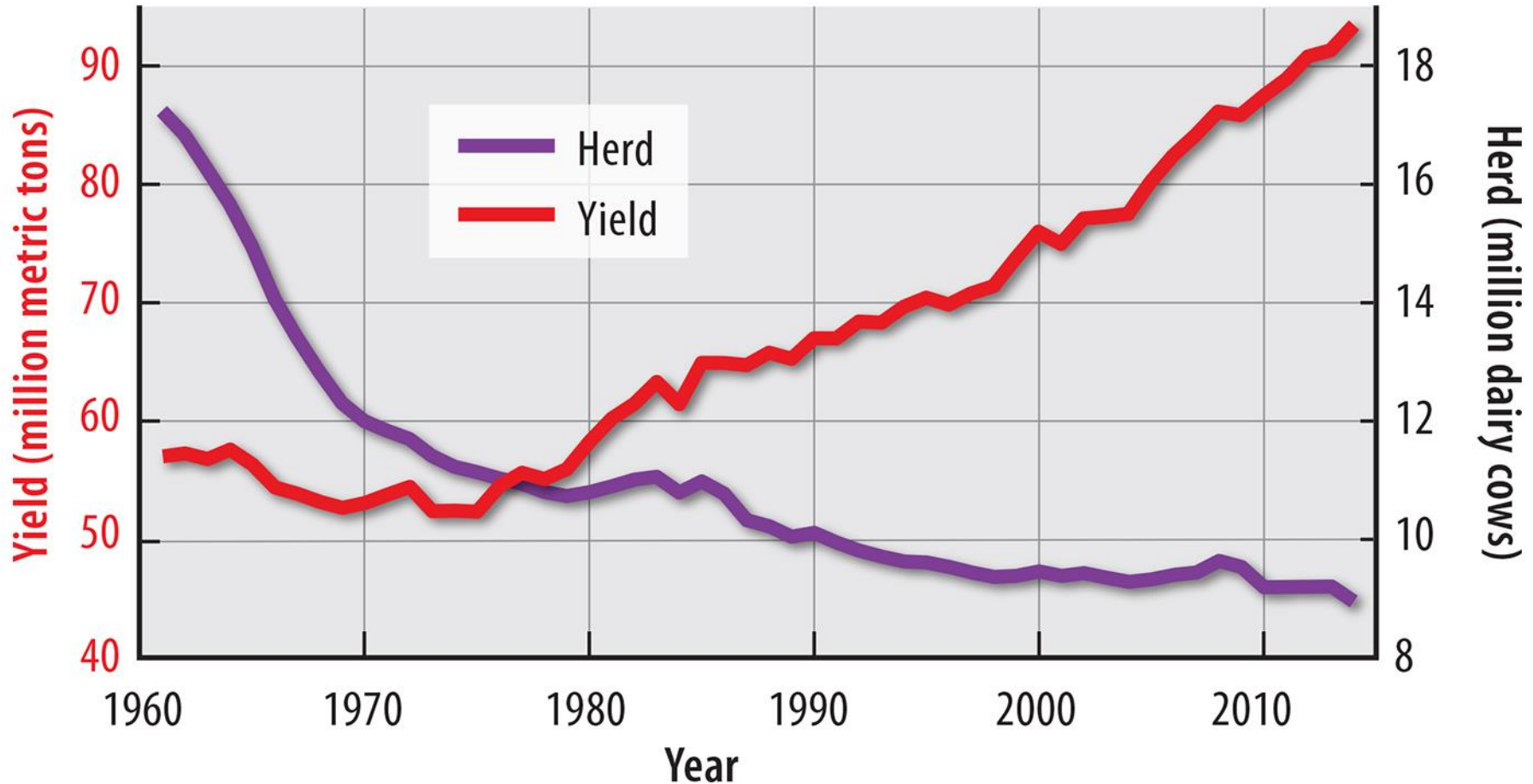


Figure 9-44: The amount of milk per cow has increased in the United States.

Agriculture and Water in California



Figure 9-45: California's use of irrigation for agriculture is especially apparent after several years of drought.

Sustainable Land Management



Figure 9-46: Alternatives to traditional commercial agriculture practices include “no tillage,” shown here, in which harvest residue is not removed before planting a new crop.

Biotechnology: Genetically Modified Crops

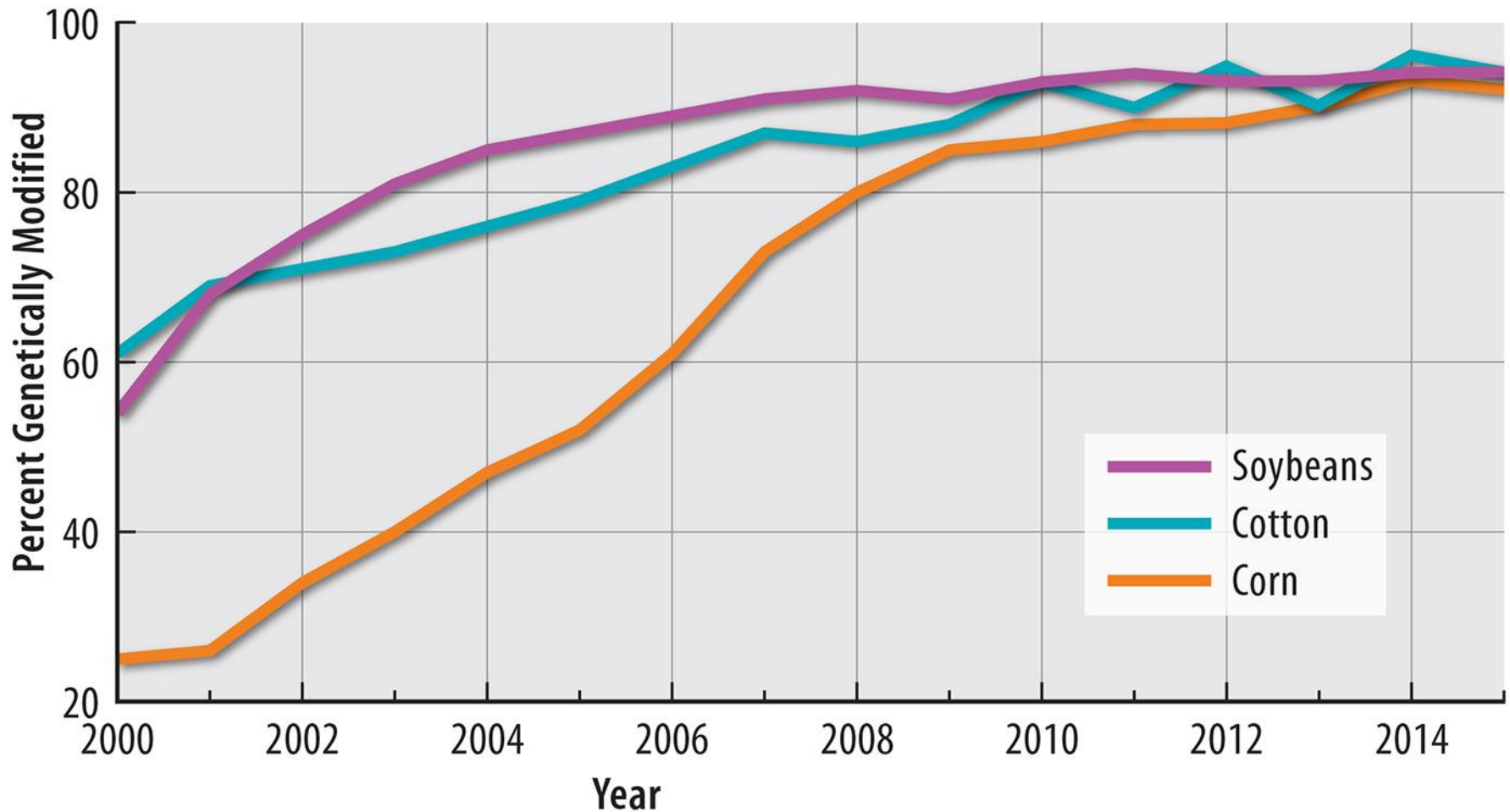
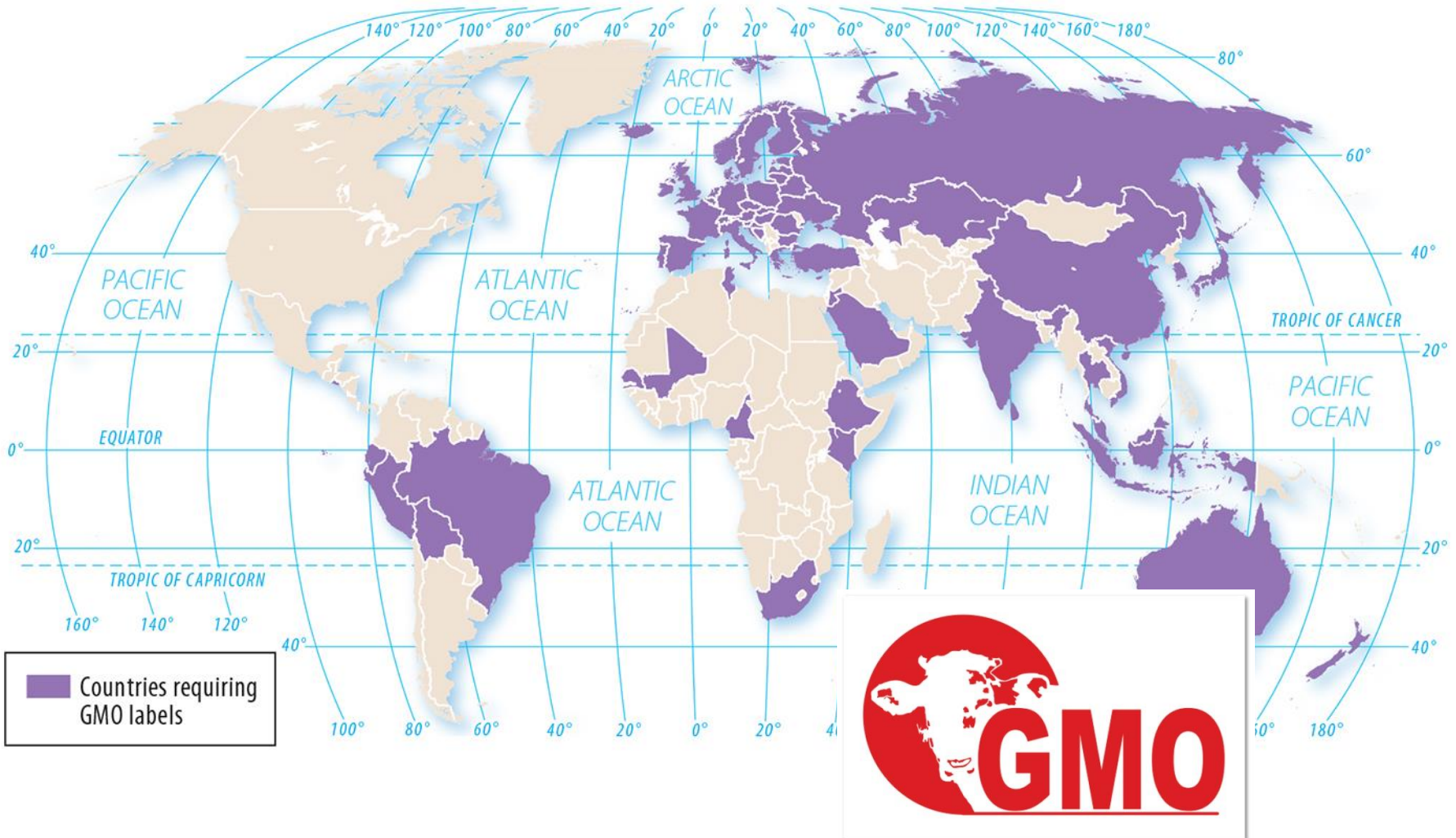


Figure 9-47: In the United States, an increasing percentage of grains are genetically modified.

Biotechnology: GMOs



Figures 9-48 and 9-49: Many countries require genetically modified organisms (GMOs) to be labeled, as in the European label shown inset.

Global Food Trade

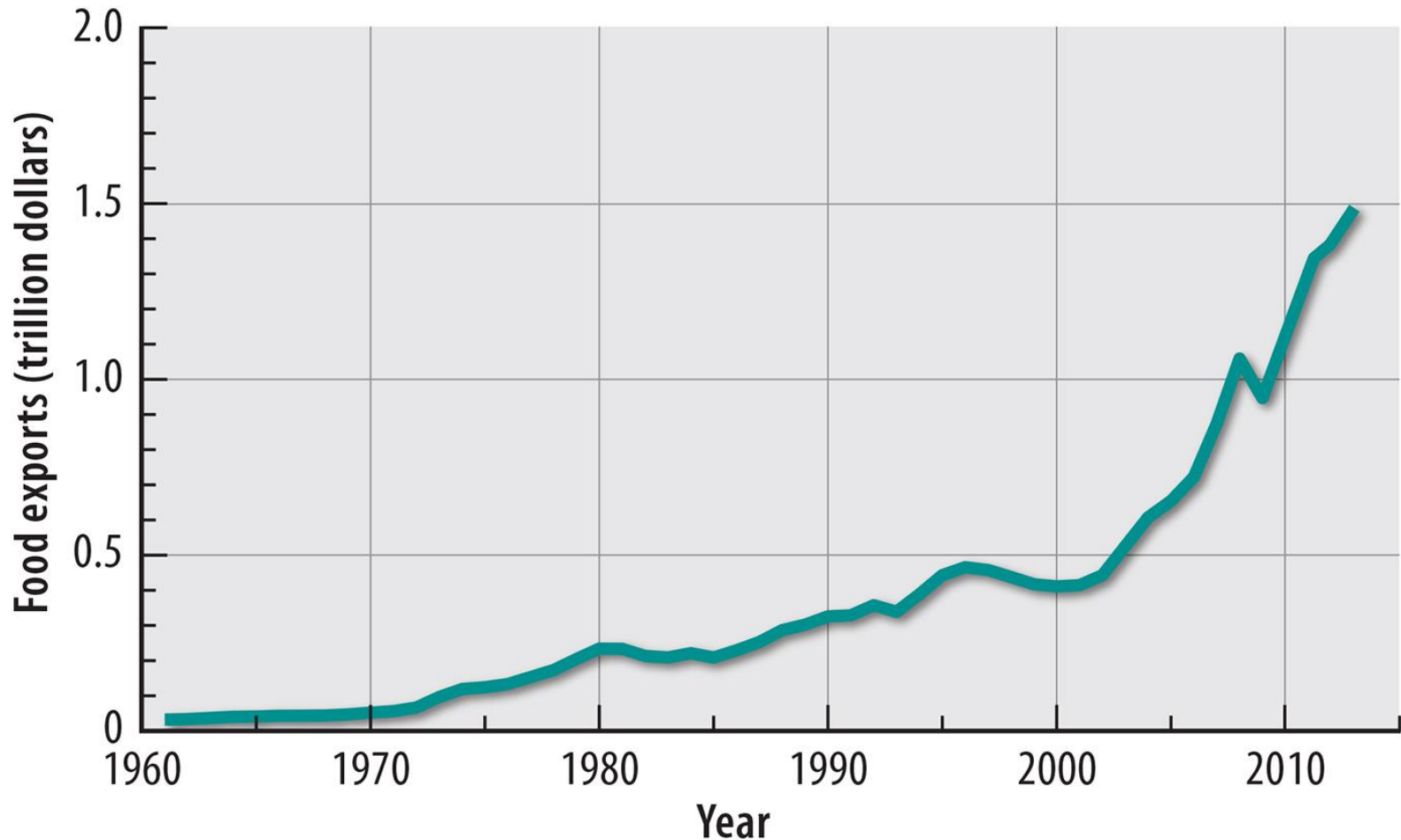


Figure 9-51: The value of agricultural exports has increased to \$1.3 trillion in 2012.

Global Food Trade

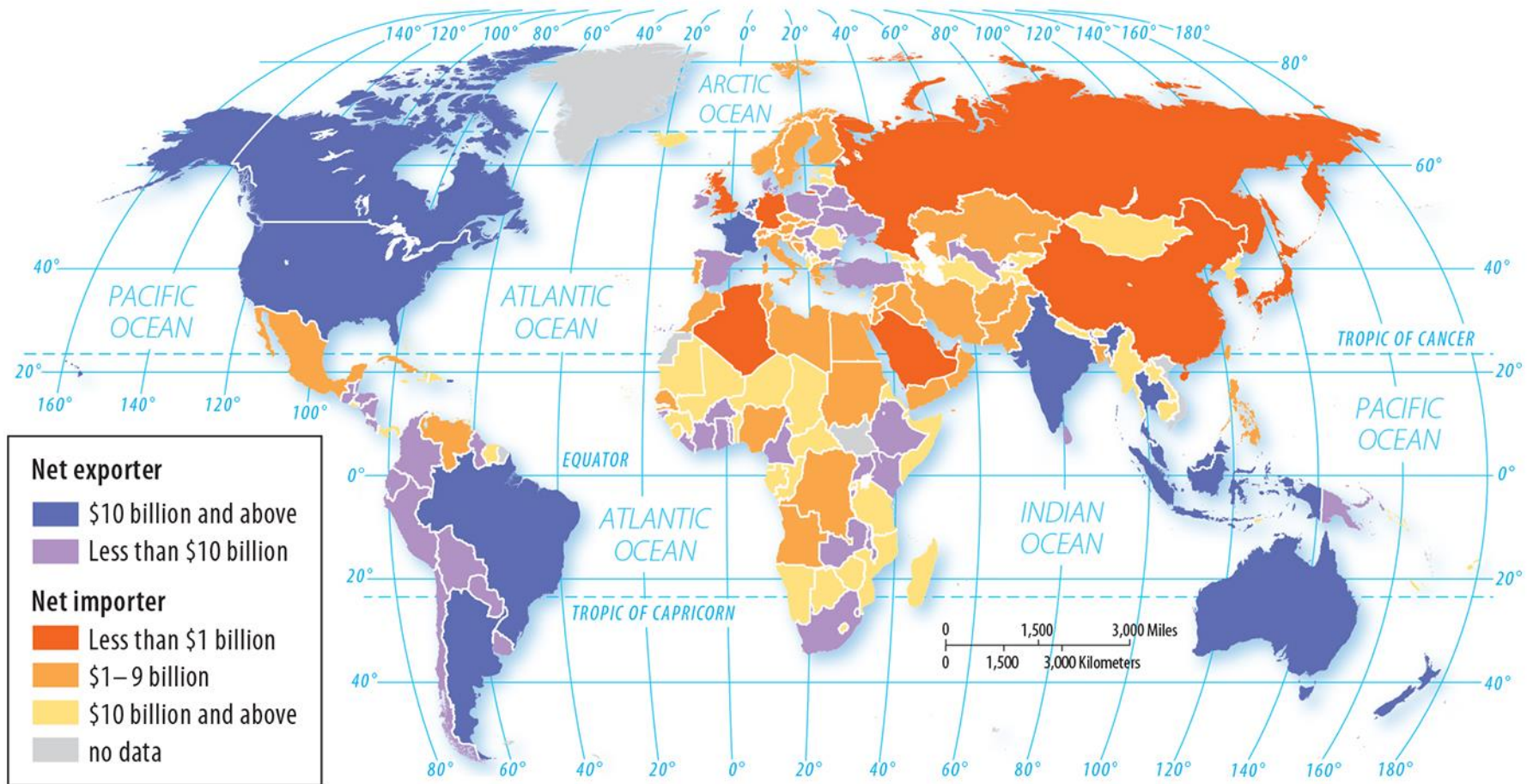


Figure 9-52: The Western Hemisphere has many states that export food, while Europe and Asia have many importers.

Global Drug Trade

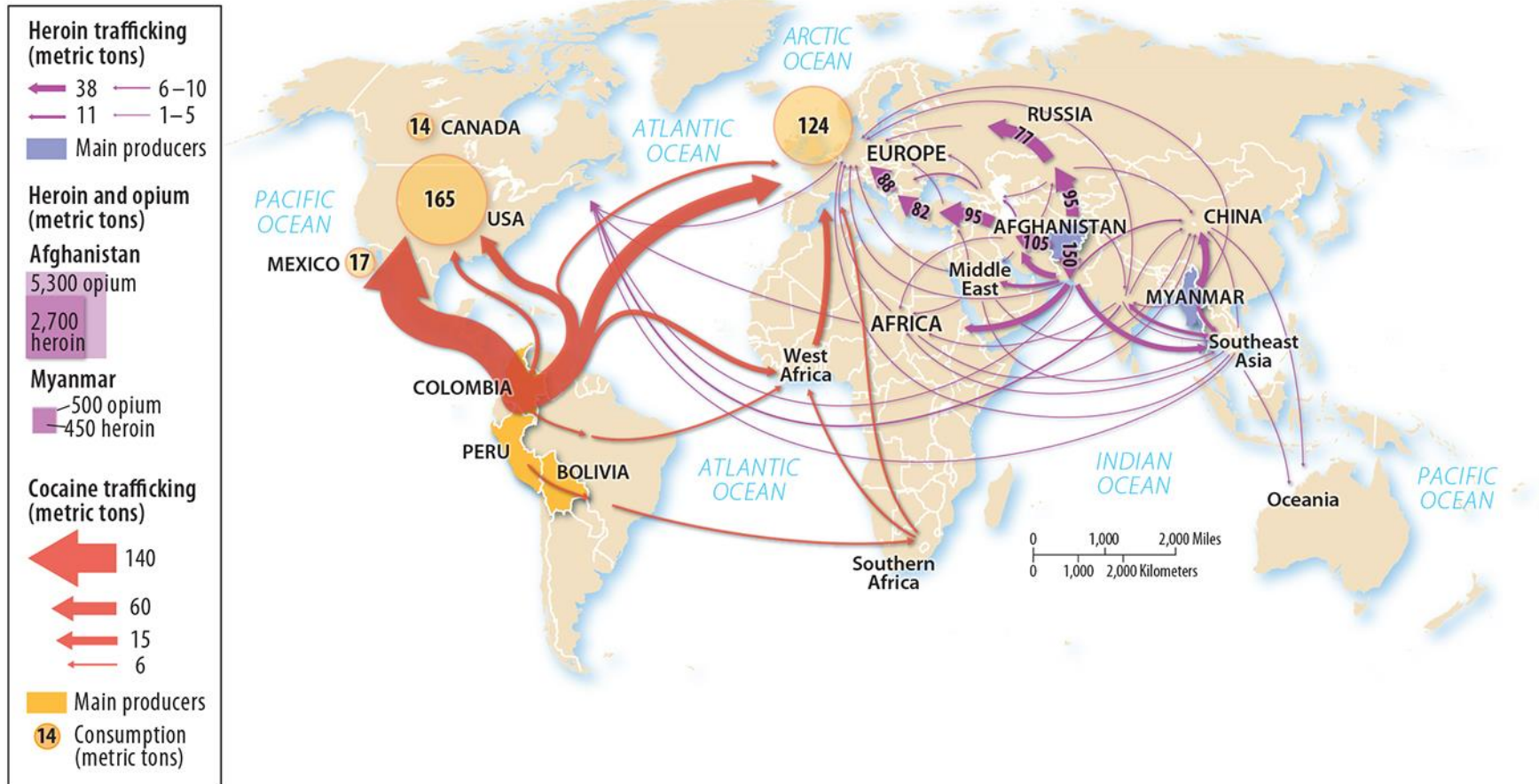


Figure 9-53: Drug crops grown in the developing world are trafficked (illegally traded) to developed countries in North America and Europe.

Agriculture and Undernourishment

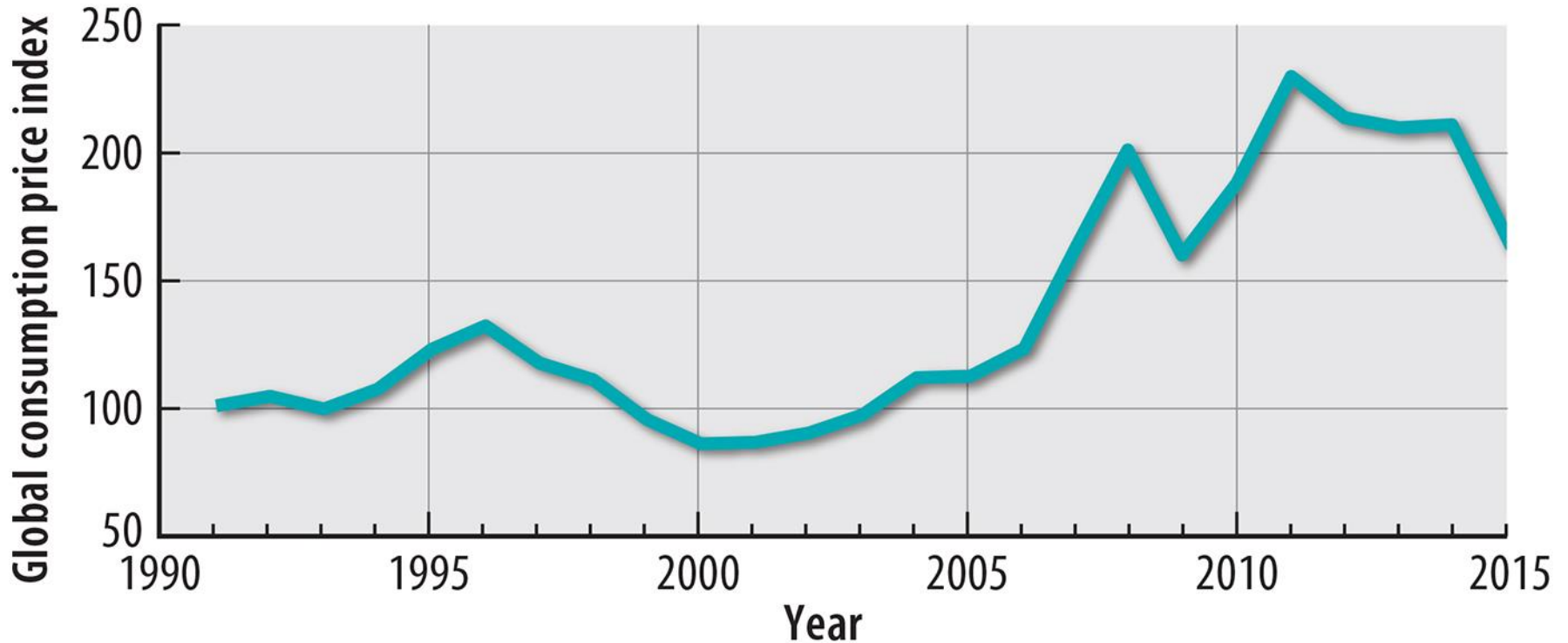


Figure 9-54: Increasing food prices represent a challenge to food supply, especially for people who spend a significant percentage of their income on food.

Population and Food in Africa

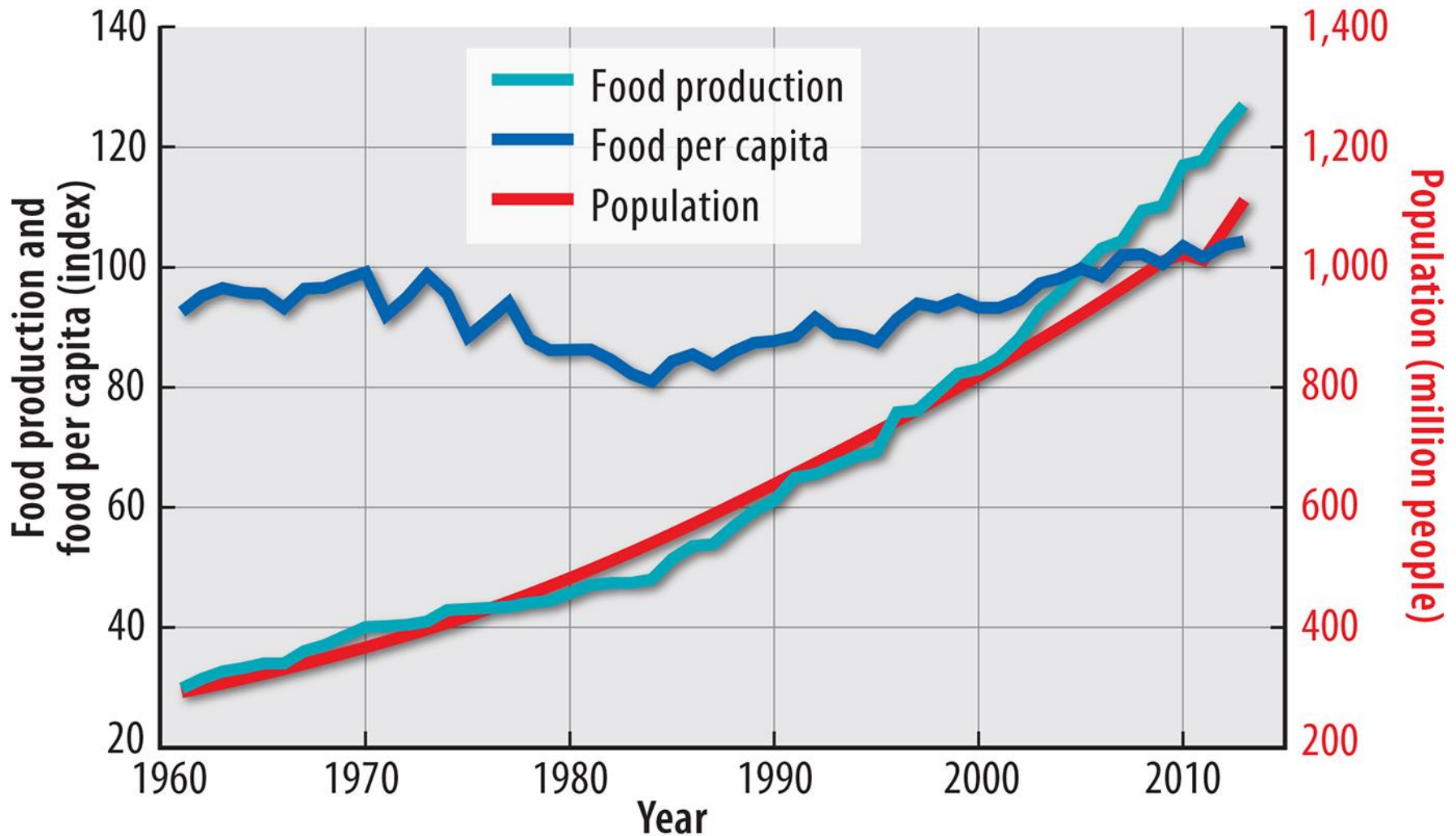


Figure 9-55: In Africa, increases in food supply have barely kept up with population growth.

Undernourishment by Country

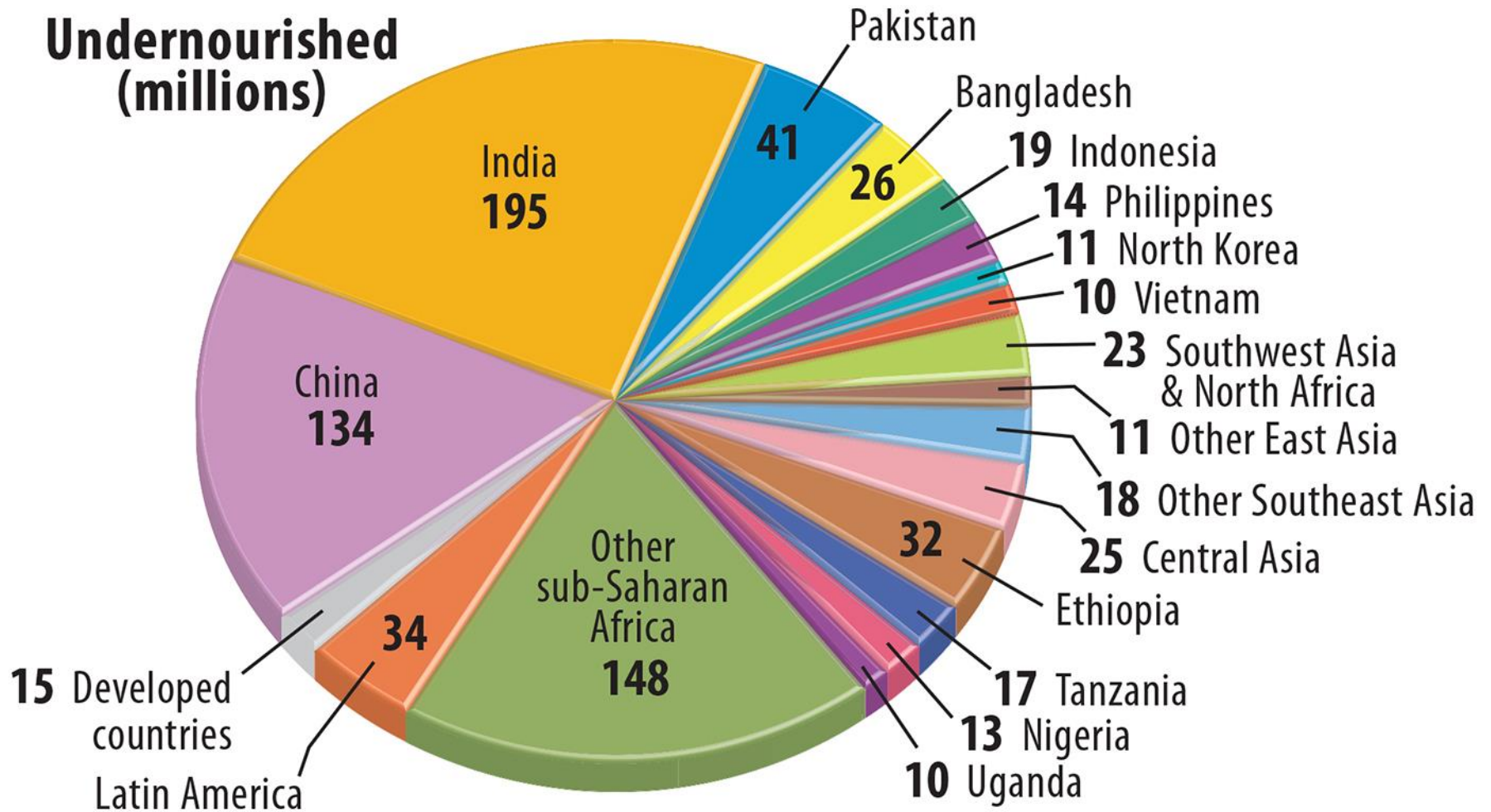


Figure 9-56: India and China have the largest numbers of undernourished people.

Change in Undernourishment

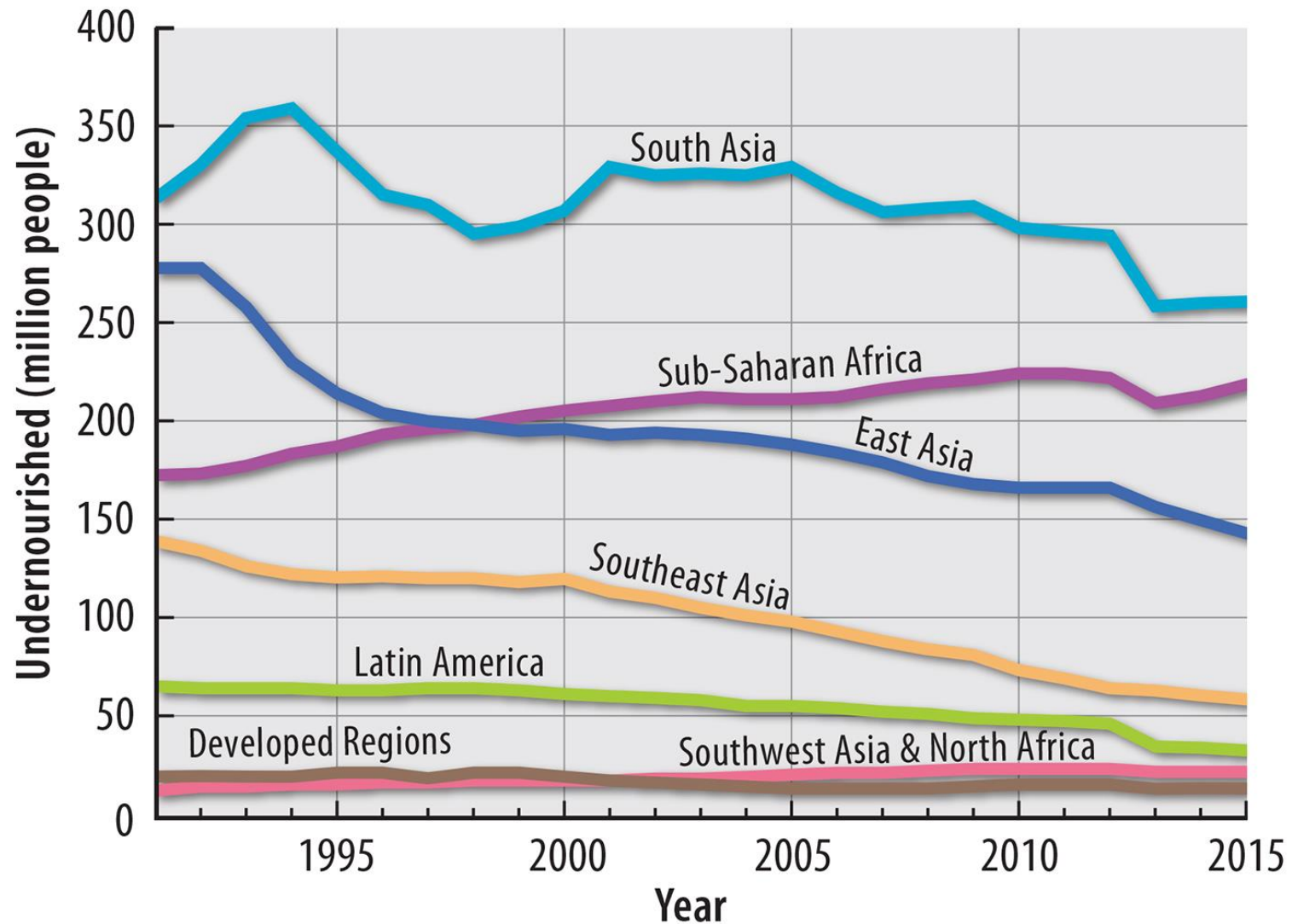


Figure 9-58: Undernourishment has decreased since 1990 in every world region except sub-Saharan Africa.

Sustainable Agriculture

Concerns over environment and health leading to:

- Organic farming: reduced herbicides, pesticides, antibiotics; no GMOs
- Pesticides on produce may present health threat.
- Government policies to help farmers may affect sustainability too.

Organic Farming

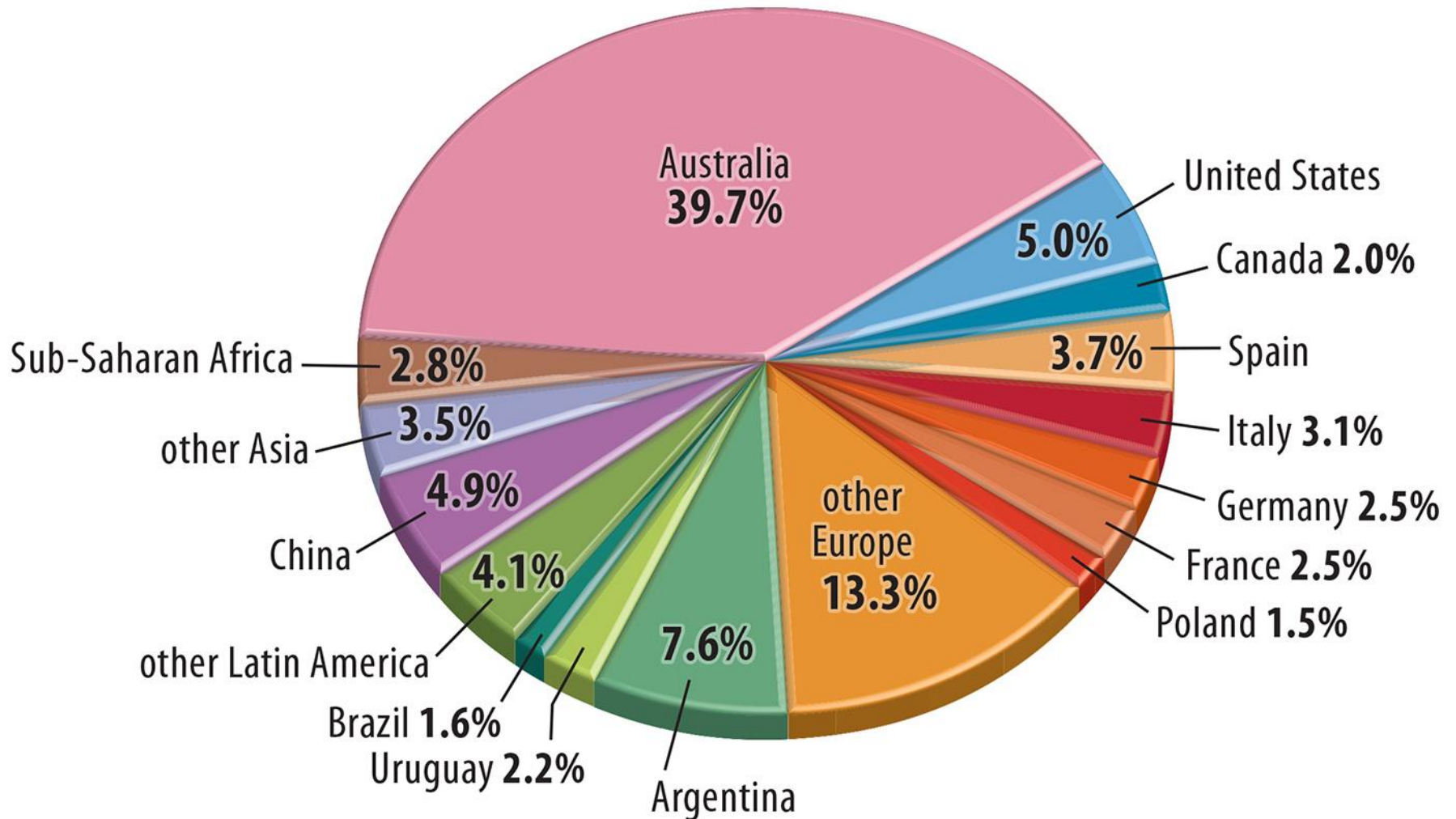


Figure 9-59: Australia has a large share of the world's organic farming; Europe is also an important region.