

Food and Agriculture

10

Learning Outcomes

After reading, studying, and discussing the chapter, students should be able to:

Learning Outcome 10.1.1: Identify the major crop and livestock hearths.

Learning Outcome 10.1.2: Describe the major differences between subsistence and commercial agriculture.

Learning Outcome 10.2.1: Explain the differences between developed and developing countries in food consumption.

Learning Outcome 10.2.2: Explain the global distribution of undernourishment.

Learning Outcome 10.3.1: Identify the 11 major agricultural regions.

Learning Outcome 10.3.2: Explain how pastoral nomadism works in the dry lands of developing regions.

Learning Outcome 10.3.3: Explain how shifting cultivation works in the tropics of developing regions.

Learning Outcome 10.3.4: Explain how intensive subsistence farming works in the high population concentrations of developing regions.

Learning Outcome 10.3.5: Describe reasons for growing crops other than wet rice in intensive subsistence regions.

Learning Outcome 10.3.6: Describe how mixed crop and livestock farming works.

Learning Outcome 10.3.7: Describe how dairy farming and commercial gardening work.

Learning Outcome 10.3.8: Describe how grain and Mediterranean farming work.

Learning Outcome 10.3.9: Describe how livestock ranching works.

Learning Outcome 10.4.1: Describe the impact of population growth and trade on farming in developing countries.

Learning Outcome 10.4.2: Understand distinctive challenges for developing countries to increase food supply.

Learning Outcome 10.4.3: Explain the impact of overproduction and market access on farming in developed countries.

Learning Outcome 10.4.4: Explain the contribution of expanding exports and farmland to world food supply.

Learning Outcome 10.4.5: Describe the contribution of fishing to world food supply.

Learning Outcome 10.4.6: Describe the contribution of higher productivity to world food supply.

Learning Outcome 10.4.7: Describe the role of sustainable agriculture in world food supply.

Chapter Outline

Agricultural practices vary greatly across the world by environmental conditions and level of development. The culture considers the origin and diffusion of agriculture before considering the differences between LDC and MDC agriculture.

Key Issue 1: Where Did Agriculture Originate?

Hunters and Gatherers Before the invention of agriculture, all humans obtained food through hunting for animals, fishing, and gathering plants. Hunters and gatherers lived in small groups of usually fewer than 50 persons because a larger number would quickly exhaust the available resources within walking distance. The group traveled frequently, establishing new home bases or camps. The direction and frequency of migration depended on the movement of game and the seasonal growth of plants at various locations. Today, a quarter-million people still survive by hunting and gathering, rather than agriculture.

Agricultural Revolution The agricultural revolution was the time when humans first domesticated plants and animals, and no longer relied entirely on hunting and gathering. By growing plants and raising animals, humans created larger and more stable sources of food, so more people could survive. Scientists do not agree on whether the agricultural revolution originated primarily because the last ice age ended or people started wanting to live in a permanent settlement. The agricultural revolution originated in multiple hearths around the world. Those agricultural hearths are Southwest Asia, East Asia, sub-Saharan Africa, and Latin America.

Animals were domesticated in multiple hearths as well. Inhabitants of Southwest Asia may have been the first to integrate cultivation of crops, with domestication of herd animals such as cattle, sheep, and goats. The horse is considered to have been domesticated in Central Asia. These animals were used to prepare the land before planting seeds. They were also fed the harvested crop. This integration of plants and animals is a fundamental element of modern agriculture.

Percentage of Farmers in the Labor Force In developing countries most people work in **subsistence agriculture**, which is the production of food primarily for consumption by the farmer's family. Very few people in developing countries work in **commercial agriculture** which is the production of food primarily for sales off the farm. In developing countries, around 5 percent of workers are engaged directly

in farming, compared to 44 percent in developing countries. Both push and pull factors have contributed to the decline of farmers in the United States. People were pushed away from farms by lack of opportunity to earn a decent income and at the same time they were pulled to higher-paying jobs in urban areas.

Use of Machinery Beginning in the late eighteenth century, factories produced farm machinery. Inventions in farming in the nineteenth and twentieth century made farming less dependent on human and animal power. The building of railroads in the nineteenth century and highways and trucks in the twentieth century have enabled farmers to transport crops and livestock farther and faster. Experiments conducted in university laboratories, industry, and research organizations generate new fertilizers, herbicides, hybrid plants, animal breeds, and farming practices that produce higher crop yields and healthier animals.

Farm Size The average farm is relatively large in commercial agriculture. Combines, pickers, and other machinery perform most efficiently at very large scales and their considerable expense cannot be justified on a small farm. Farmers spend hundreds of thousands of dollars to buy or rent land and machinery before beginning operations. Commercial farmers frequently expand their holdings by renting nearby fields. The amount of land devoted to agriculture has increased in the United States primarily due to irrigation and reclamation.

Key Issue 2: Why Do People Consume Different Foods?

Total Consumption of Food The amount of food that an individual consumes is known as **dietary energy consumption**. The unit measurement of dietary energy is the calorie in the United States. Most humans derive most of their calories through consumption of a **cereal grain**. A cereal grain is a grass that yields grain for food and the **grain** is the seed from a cereal grass. The three leading cereal grains are wheat, rice, and corn. These three grains together account for 90 percent of all grain production and more than 40 percent of all dietary energy consumed worldwide.

Source of Nutrients Protein is a nutrient needed for growth and maintenance of the human body. Many food sources provide protein of varying quantity and quality. One of the most fundamental difference between developed and developing regions is the primary source of protein. In developed countries, the leading source of protein is meat products, including beef, pork, and poultry. In most developing countries, cereal grains provide the largest share of protein.

Dietary Energy Needs To maintain a moderate level of physical activity, an average individual needs to consume at least 1,800 calories per day. Average consumption worldwide is approximately 2,800 calories per day. People in developed countries are consuming 3,600 calories a day. In sub-Saharan Africa average daily consumption is 2,400 calories a day. Some people in sub-Saharan Africa are not getting enough to eat and have to spend a high percentage of their income to obtain food.

Undernourishment Dietary energy consumption that is continuously below the minimum requirement for maintaining a healthy life and carrying out light physical activity is called **undernourishment**. The UN estimates that 99 percent of the world's undernourished people are in developing countries. India has

the largest number of undernourished people, followed by China. One-fourth of the population in sub-Saharan Africa and one-fifth in population in South Asia are undernourished.

Africa's Food-Supply Struggle Since 1961, food production has increased substantially in sub-Saharan Africa, but so has population. As a result, food production per capita has changed little in half a century. With rapid population growth, farmers overplanted, and herd size increased beyond the capacity of the land to support animals. Animals overgrazed the limited vegetation and clustered at scarce water sources.

Key Issue 3: Where Is Agriculture Distributed?

Pastoral Nomadism Pastoral nomadism is a form of subsistence agriculture based on the herding of domesticated animals. Pastoral nomads live primarily in the large belt of arid and semiarid land that includes Central and Southwest Asia and North Africa. The animals provide milk, and their skins and hair are used for clothing and tents. Pastoral nomads consume mostly grain and not meat because their animals are usually not slaughtered. Pastoral nomads mostly obtain grain from farmers in exchange for animal products but have been known to plant crops in some circumstances. The camel is the most highly desired animal in North Africa and Southwest Asia, along with sheep and goats.

Pastoral nomads do not wander randomly across the landscape but have a strong sense of territoriality. The goal of each nomad is to control a territory large enough to contain the forage and water needed for survival. The precise migration patterns evolve from intimate knowledge of the area's physical and cultural characteristics. Pastoral nomadism is now generally recognized as an offshoot of sedentary agriculture, not a primitive precursor of it. It is simply a practical way of surviving on land that receives too little rain for the cultivation of crops.

Shifting Cultivation People who practice **shifting cultivation** generally live in small villages in the tropics and grow food on the surrounding land. Before planting, they must remove the vegetation that typically covers tropical land. On a windless day the vegetation is burned. The rains wash the fresh ashes into the soil, providing needed nutrients. The cleared area, known as **swidden**, is prepared by hand, perhaps with the help of a simple implement such as a hoe. The cleared land can support crops only briefly, usually three years or less. Soil nutrients are rapidly depleted and the land becomes too infertile to nourish crops. When the swidden is no longer fertile, villagers identify a new site and begin clearing it.

Most families grow only for their own needs, so one swidden may contain a large variety of intermingled crops, which are harvested individually at the best time. A "farm field" appears much more chaotic than do fields in developed countries where a single crop is grown over an extensive area. Traditionally, land was owned by the village as a whole rather than separately by each resident. The chief or ruling council allocated a patch of land to each family and allowed them to retain the output. Today, private individuals now own the land in some communities, especially in Latin America.

Developing countries see shifting cultivation as an inefficient way to grow food. Compared to other forms of agriculture, shifting cultivation can support only a small population in an area without causing environmental damage. Many people consider shifting agriculture to be the most environmentally sound approach for agriculture in the tropics. Practices used in other forms of agriculture, such as applying fertilizers and pesticides and permanently clearing fields, may damage the soil, cause severe erosion, and upset balanced ecosystems.

Intensive Subsistence with Wet Rice Dominant The term **wet rice** refers to rice planted on dryland in a nursery and then moved as seedlings to a flooded field to promote growth. The typical farm in Asia's intensive subsistence agriculture regions is much smaller than farms elsewhere in the world. Because agricultural density is so high in parts of East and South Asia, families must produce enough food for their survival from a very small area of land. Most of this work is done by hand or animals rather than the machines, in part due to abundant labor, but largely from lack of funds to buy equipment. The consumers of the rice also perform the work, and all family members contribute to the effort.

A flooded rice field is called a **sawah** in Indonesia, but Europeans and North Americans incorrectly call a flooded rice field a **paddy**. Wet rice is most easily grown on flat land because the plants are submerged in water much of the time. Most wet-rice cultivation takes place in river valleys and deltas. One method of developing additional land suitable for growing rice is to terrace the hillsides of river valleys. Land is used even more intensively in parts of Asia by obtaining two harvests per year from one field, a process known as **double cropping**.

Intensive Subsistence with Wet Rice Not Dominant Agriculture in much of the interior of India and northeastern China is devoted to crops other than wet rice. Wheat is the most important crop, followed by barley. In addition, some crops are grown in order to be sold for cash, such as cotton, flax, hemp, and tobacco. Land is used intensively and worked primarily by human power, with the assistance of some hand implements and animals. In milder parts of the region where wet rice does not dominate, more than one harvest can be obtained some years through skilled use of **crop rotation**, which is the practice of rotating use of different fields from crop to crop each year to avoid exhausting the soil.

Plantation Farming A **plantation** is a large farm in a developing country that specializes in one or two crops. Although generally situated in developing countries, plantations are often owned or occupied by Europeans and North Americans, and they grow crops for sale primarily to developed countries. Crops are normally processed at the plantation before being shipped because processed goods are less bulky and therefore cheaper to ship. Among the most important crops grown on plantations are cotton, sugarcane, coffee, rubber, and tobacco. Also produced in large quantities are cocoa, jute, bananas, tea, coconuts, and palm oil.

Agriculture in Developed Regions The system of commercial farming found in developed countries has been called **agribusiness** because the family farm is not an isolated activity but is integrated into a large food-production industry. Agricultural products are not sold directly to consumers, but to food processing companies. Around 20 percent of U.S. laborers work in food production and services related to agribusiness—food processing, packaging, storing, distributing, and retailing. Agribusiness encompasses such diverse enterprises as tractor manufacturing, fertilizer production, and seed distribution.

Mixed Crop and Livestock Farming Most of the crops on a mixed crop and livestock farm are fed to animals rather than consumed directly by humans. In turn, livestock supply manure to improve soil fertility to grow more crops. A typical mixed crop and livestock farm devotes nearly all land area to growing crops but derives more than three-fourths of its income from the sale of animal products, such as beef, milk, and eggs. Mixed crops and livestock farms permit farmers to distribute the workload more evenly through the year. In the United States, corn is the most frequently planted crop because it

generates higher yields per area than do other crops. Soybeans are the second most important crop in the United States. Corn and soybeans are commonly fed to livestock.

Dairy Farming Dairy farmers, like other commercial farmers, usually do not sell their products directly to the consumers. Instead they generally sell their milk to wholesalers, who distribute it in turn to retailers. In general, the farther the farm is from large urban concentrations, the smaller is the percentage of output devoted to fresh milk. Farms located farther from consumers are more likely to sell their output to processors to make butter, cheese, or dried, evaporated, and condensed milk. The reason is that these products keep fresh longer than milk does and therefore can be safely shipped from remote farms.

Commercial Gardening and Fruit Farming This type of agriculture is called **truck farming**. Truck farms grow many of the fruits and vegetables that consumers in developed countries demand. Some of these fruits and vegetables are sold fresh to consumers, but most are sold to large processors for canning or freezing. Truck farms are usually large-scale operations that take full advantage of machines at every stage of the growing process. Labor costs are kept down by hiring migrant farm workers who work for very low wages. Farms tend to specialize in a few crops, and a handful of farms may dominate national output of some fruits and vegetables.

Grain Farming A grain is a seed from various grasses, such as wheat, corn, oats, barley, rice, millet, and others. Commercial grain agriculture is distinguished from mixed crop and livestock farming because crops on a grain farm are grown primarily for consumption by humans rather than livestock. Commercial grain farmers sell their output to manufacturers of food products, such as breakfast cereals and breads. Wheat is the most important grain because it is used to make bread flour. Wheat can be stored relatively easily without spoiling. Because wheat has a relatively high value per unit weight, it can be shipped profitably from remote farms to market.

Large-scale grain production like other commercial farming ventures in developed countries, is heavily mechanized, conducted on large farms, and oriented to consumer preferences. The McCormick **reaper** (a machine that cuts grain standing in a field), which was invented in the 1830s, first permitted large scale wheat production. Today the **combine** machine performs in one operation the three tasks of reaping, threshing, and cleaning. The southern Plains states typically grow **winter wheat** and the northern Plains states typically grow **spring wheat**.

Mediterranean Agriculture Most crops in the Mediterranean lands are grown for human consumption rather than animal feed. **Horticulture**—which is the growing of fruits, vegetables, and flowers—and tree crops form the commercial base of Mediterranean farming. The hilly landscape typically found in a Mediterranean climate encourages farmers to plant a variety of crops within one farming area. Typically, the three most important crops grown in Mediterranean agriculture are grapes, olives, and wheat. A large portion of California farmland is devoted to fruit and vegetable horticulture, which supplies a large portion of the citrus fruits, tree nuts, and deciduous fruits consumed in the United States.

Livestock Ranching Cattle ranching expanded in the United States during the 1860s because of the demand for beef in East Coast cities. Cattle ranching declined in importance during the 1880s, after it came in conflict with sedentary agriculture. The early cattle ranchers in the West owned little land, only cattle. The U.S. government, which owned most of the land used for open grazing, began to sell it to farmers growing crops, leaving cattle ranchers with no legal claim to it. The ranchers now had to buy or

lease land to accommodate their cattle. Large cattle ranches were established on land that was too dry to support crops.

Commercial ranching is conducted in several developed countries besides the United States, and increasingly in developing countries. As with other forms of commercial agriculture, the growth of ranching has been in developing countries. China is the leading producer of meat, ahead of the United States, and Brazil is third. China passed the United States as the world's leading meat producer in 1990 and now produces twice as much meat. Developed countries were responsible for only one-third of world meat production in 2010, compared to two-thirds in 1980.

Key Issue 4: Why Do Farmers Face Economic Difficulties?

Subsistence Farming and Population Growth For hundreds if not thousands of years, subsistence farming in developing countries yielded enough food for people living in rural villages to survive, assuming that no drought, flood, or other natural disasters occurred. Suddenly in the late twentieth century, developing countries needed to provide enough food for a rapidly increasing population as well as for urban residents, who cannot grow their own food. Subsistence farmers had to increase the supply of food by adopting new farming methods and leaving farm land fallow for shorter periods of time.

Subsistence Farming and International Trade To expand production, subsistence farmers need higher yield seeds, fertilizers, pesticides, and machinery. For many African and Asian countries, the main way to obtain agricultural supplies is to import them from other countries. Most developed countries raise funds through the sale of crops in developed countries. Consumers in developed countries are willing to pay high prices for fruits and vegetables that would otherwise be out of season or for crops such as coffee and tea that cannot be grown in developed countries because of climate. The more land that is devoted to growing export crops, the less that is available to grow crops for domestic consumption.

Drug Crops The export crops chosen in some developing countries are those that can be converted to drugs. Cocaine is derived from coca leaf. Heroin is derived from raw opium gum, which is produced by the opium poppy plant. Marijuana is produced from the *Cannabis sativa* plant.

Overproduction in Commercial Farming Commercial farmers suffer from low incomes because they are capable of producing much more food than is demanded by consumers in developed countries. Although the food supply has increased in developed countries, the demand has remained constant because the market for most products is already saturated. The U.S. government tries to encourage farmers to avoid producing crops that are in excess supply. The government will pay farmers when certain commodity prices are low and buy surplus production. The surplus crops are sold or donated to foreign countries.

Importance of Access to Markets Because the purpose of commercial farming is to sell produce off the farm, the distance from the farm to the market influences the farmer's choice of crop to plant. A commercial farmer initially considers which crops to cultivate and which animals to raise based on market location. A farmer would make a profit growing wheat on land located less than 10,000 kilometers from the market. Beyond 10,000 kilometers, wheat is not profitable because the cost of transporting it

exceeds the gross profit. Farms located closer to market tend to select crops with higher transportation costs, whereas more distant farms are more likely to select crops that can be transported less expensively.

Increase Exports from Countries with Surpluses Agricultural products are moving primarily from the Western Hemisphere to the Eastern Hemisphere. Latin America, led by Brazil and Argentina, is by far the leading region for the export of agricultural products. Food production has not been able to keep up with rapid population growth in most parts of the Eastern Hemisphere. Japan is by far the leading importer of food, followed by the United Kingdom, China, and Russia. Trade in food has increased rapidly, especially since 2000, exceeding \$1 billion for the first time in 2008.

Expanding Agricultural Land World food production has increased primarily by expanding the amount of land devoted to agriculture. Sparsely inhabited land suitable for agriculture was available in western North America, central Russia, and Argentina's pampas in the late eighteenth century and early nineteenth centuries. Today few scientists believe that further expansion of agricultural land can feed the growing world population. In recent decades population has increased much more than agricultural land. In some regions, farmland is abandoned for lack of water and because of excessively salinity. Urbanization can also reduce the amount of **prime agricultural land**.

Expanding Fishing The capture of wild fish and other seafood living in the waters is called fishing. **Aquaculture** or **aquafarming** is the cultivation of seafood under controlled conditions. Human consumption of fish and seafood has increased from 27 million metric tons in 1960 to 110 million metric tons in 2010. Still, fish and seafood account for only 1 percent of all calories consumed by humans. The capture of wild fish in the oceans and lakes has stagnated since the 1990s, despite population growth and the increased demand to consume fish.

Increased Productivity The invention and rapid diffusion of more productive agricultural techniques during the 1970s and 1980s is called the **green revolution**. The green revolution involves two main practices: the introduction of new higher-yield seeds and the expanded use of fertilizers. The new miracle seeds were diffused rapidly around the world. To take full advantage of the new miracle seeds, farmers must use more fertilizer and machinery. Farmers need tractors and irrigation pumps to make the most effective use of the new miracle seeds. In developing countries, farmers cannot afford such equipment, fertilizers, and even the fuel for the tractors.

Beginning in the nineteenth century, the science of genetics expanded the understanding of how to manipulate plants and animals to secure dominance of the most favorable traits. Genetic modification (GM), the genetic composition of an organism is not merely studied, it is actually altered. GM involves mixing genetic material of two or more species that would otherwise not mix in nature. GM is especially widespread in the United States. The United States has urged sub-Saharan African countries to increase their food supply in part through increased use of GM crops and livestock. There is strong opposition to GM crops in some African countries.

Sustainable Agriculture Some commercial farmers are converting their operations to **sustainable agriculture**, which are agricultural practices that preserve and enhance environmental quality. Sustainable agriculture protects soil in part through **ridge tillage**, which is a system of planting crops on ridge tops. Ridge tillage compares favorably with conventional farming for yields while lowering the cost of production. Ridge tillage will tend to increase organic matter, improve water holding capacity, and

usually cause more earthworms. Although more labor intensive than other systems, ridge tillage is profitable on a per-acre basis.

In conventional agriculture, seeds often are genetically modified to survive when herbicides and insecticides are sprayed on fields to kill weeds and insects. Sustainable agriculture involves the application of limited if any herbicides to control weeds. In principle, farmers can control weeds without chemicals, although doing so requires additional time and expense that few farmers can afford. Researchers have found that combining mechanical weed control with some chemicals yields higher returns per acre than relying solely on one of the two methods.

Many farmers in the mixed crop and livestock region actually choose to only grow crops or raise more animals than the crops they grow can feed. They sell their crops off the farm or purchase feed for their animals from outside suppliers. Sustainable agriculture attempts to integrate the growing of crops and the raising of livestock as much as possible at the level of the individual farm. Integration of crops and livestock reflects a return to the historical practice of mixed crop and livestock farming, in which growing crops and raising animals were regarded as complementary activities on the farm. This was the common practice for centuries, until the mid-1900s, when technology, government policy, and economics encouraged farmers to become more specialized.

Introducing the Chapter

Chapter 10 starts the first three chapters on the three sectors of the economy (agriculture, industry, and services). Start with a review of these sectors as they are introduced in Chapter 9.

The chapter reveals the isolation of North Americans from agriculture, as most are not employed in agricultural jobs.

Icebreakers

The Meatrix (themeatrix.com)

This online Flash animation is an entertaining, accessible criticism of industrial meat production. The first presentation reveals the changes to farming practices in the late twentieth century.

Students should be advised that the presentation is biased against agribusiness practices. Recommend that students write down the four major points of the presentation and invite their comments after showing the segment or segments.

Challenges to Comprehension

City Slickers

Depending on the location of your school, students may nearly be devoid of any knowledge of agriculture. This is different from previous chapters in that every previous chapter had an element which students could understand in personal terms: not so with this topic for urban and suburban residents. Use this lack of awareness as a point of teaching for how far removed from the land our society has become.

Assignments

Review/Reflection Questions

- Which of Whittlesey's regions is the "odd duck" in that it doesn't fit perfectly into commercial or subsistence categories?
- When you shop for food, do you think about where it came from? Does this bother you now that you think about it? Why or why not?
- Pick one of the following common household foods (hamburger, banana, coffee, or apple) and trace its production, movement, and processing until you purchase it.
- Why do you think Europeans generally avoid genetically modified food while Americans generally do not?
- A major criticism of rich countries regarding international trade and development is that the richest countries in the world also offer the greatest agricultural subsidies to their farmers. How would ending rich-country agricultural subsidies help the less developed world?

Recipe Analysis Assignment

Have the students follow the directions below.

- Select a recipe that is associated with a particular culture, ethnic, nation, or other type of region. The best candidate is one of your favorite family recipes that has been passed down through the generations.
- Write the individual ingredients for the recipe in detail (as if from scratch). If you don't have a copy of the recipe you will need to interview a person that does by phone or e-mail.
- Research on the Internet where the ingredients were originally domesticated. If there are certain ingredients that have not been domesticated, find their natural habitat (shrimp, cranberries, etc.). Research the domestication of animals (cows, chickens, etc.).
- Create a map showing the diffusion of the ingredients into your recipe region. Print a blank world map of the Internet.
- Write a 1–2 page analysis of your research, including how your region's food has been influenced by diffusion/ migration (the Old Silk Road or Columbian Exchange). Discuss the climate and land use of the region where your ethnic dish is from.

Thinking Geographically Questions

10.1: Compare agricultural hearths with the origin of Indo-European (Figures 5-19 and 5-20). What similarities appear between the diffusion of language and of agriculture?

The Sedentary Farmer theory of the diffusion of the Indo-European language family also explains how agriculture diffused from the Southwest Asian agricultural hearth. The Indo-European language family diffused from Southwest Asia to Europe and farther east into Asia. Sedentary agriculture diffused through the exact same path. Some experts think that the Indo-European language triumphed because its speakers became more prosperous by growing their own food instead of relying on hunting.

10.2: Compare world distributions of wheat, rice, and maize production. To what extent do differences derive from environmental conditions and to what extent from food preferences and other social customs?

Wheat grows well in semiarid climates and rice grows well in tropical climates. Maize is grown in climates that get an adequate but not overly abundant amount of rainfall. Oftentimes if a particular grain flourishes in an area, it becomes the staple of the local diet. Rice is part of many Asian dishes and maize is found in many Mexican dishes. These grains become part of the local customs of the environments they thrive in.

10.3: Review the concept of overpopulation (the number of people in an area exceeding the capacity of the environment to support life at a decent standard of living). What agricultural regions have relatively limited capacities to support intensive food production? Which of these regions face rapid population growth?

The agricultural region that has the most limited capacity to support intensive food production is pastoral nomadism. For pastoral nomadism to be successful the area needs to have a low arithmetic density. Pastoral nomads are found in arid regions and they cannot succeed if they are limited to small areas. Areas that pastoral nomads occupy are not usually facing rapid population growth, so they are in no danger of exceeding their carrying capacity.

Shifting cultivation also has a limited capacity to support intensive food production. The cleared land can only support crops for three years or less before it must be abandoned for a decade or more. Having to constantly clear new land for cultivation limits how much food can be grown at particular time. Some of the regions where shifting agriculture is the main agricultural method are facing rapid population growth. Shifting agriculture is found primarily in Latin America, sub-Saharan Africa, and Southeast Asia. These regions generally have high natural increase rates.

10.4: New Zealand once sold nearly all its dairy products to the British, but since the United Kingdom joined the European Union in 1973, New Zealand has been forced to find other markets. What are some other examples of countries that have restricted their agricultural production in the face of increased global interdependence and regional cooperation?

The North American Free Trade Agreement (NAFTA) has hurt Mexico's corn farmers. Government subsidized corn coming from huge mechanized farms in the United States has made it impossible for small Mexican farmers to compete. The U.S. grown corn no longer faces the tariffs it once did, so it is unprofitable for Mexican corn farmers to produce a large corn surplus. Without a large surplus, very little corn grown in Mexico will be sold on the international market. NAFTA has probably affected some of the farmers in the United States who grow fresh fruits and vegetables, because Mexico can produce many fruits and vegetables year round because of their mild winter temperatures. The fruits and vegetables grown in Mexico no longer face tariffs when entering the United States.

Pause and Reflect Questions

10.1.1: Which crops appear to have reached the present-day United States first, according to

Figure 10-3?

The crops that appear to have entered the United States first are squash, pepper, cassava, cotton, lima bean, maize, potato, and sweet potato.

10.1.2: Which of the three main cereal grains is most prevalent in your diet?

Wheat is the most prevalent grain in my diet. I think the average American consumes wheat more than any other grain because flour-based foods are so popular in this country.

10.2.2: How many kilocalories are in a Big Mac? You can use Google to find the answer. How does one Big Mac compare to the daily caloric intake of the average African?

A Big Mac has 550 calories. The average person in Sub-Saharan Africa consumes an average of 2,400 calories a day. One Big Mac is almost one-quarter of the amount of calories that the average African consumes in a day.

10.3.1: In which agricultural region do you live?

I live in the Mediterranean agricultural region.

10.3.2: A few trees are growing in the background in Figure 10-21. What natural resource needs to be present so that trees can grow? Why would the village in this image be situated near this resource?

Trees need water and are oftentimes found near streams and lakes in arid environments. People also need water and they tend to locate near streams and lakes in arid environments.

10.3.3: How does rapid population growth in sub-Saharan Africa make it difficult to practice shifting cultivation there?

The cleared fields are only fertile for 3 years or less. The people in sub-Saharan Africa have to constantly keep clearing new fields to keep up with population growth.

10.3.4: Which tasks in growing rice appear to be done by women and which by men?

It appears from the photographs in the book that the men prepare the field. The women grow the seedlings in a nursery and transplant them into the flooded field. The men then harvest the rice.

10.3.5: What foods do you consume that are grown on plantations?

I consume coffee, cocoa, sugar, bananas, tea, and coconuts. These agricultural products are often grown on plantations. Rubber and cotton is found in many of the manufactured goods that I purchase and they are also often grown on plantations.

10.3.6: What are the principle differences between harvesting of maize in the United States (Figure 10-34) and harvesting of rice in China (Figure 10-28)?

Corn harvesting in the United States is much more mechanized and less labor intensive than rice harvesting in China.

10.3.7: Look on the label of your milk carton. How far away from you is the dairy?

The dairy that produces the milk is about 80 miles away from my home.

10.3.8: At least 1 million metric tons of wine is produced in eight countries (Argentina, Australia, China, France, Italy, South Africa, Spain, and the United States). Referring to Figures 4-22 and 10-18, which one of eight countries does not appear to have Mediterranean agriculture?

China does not have Mediterranean climate.

10.3.9: What are two most important ranched animals, according to Figure 10-45?

Cattle and sheep are the two most important ranched animals.

10.4.1: Why does the consumption of cocaine and heroin occur in developed countries?

Developed countries have more affluence. Many people in affluent countries have disposable income to spend on things that are not necessities.

10.4.2: If the price of wheat dropped to \$200 per ton, what would be the maximum distance that the wheat could be profitably shipped?

If wheat dropped to \$200 per ton it could only be shipped 8,000 kilometers from farm to market and still be profitable.

10.4.3: By itself, GIS can't rank the relative importance of the various factors in protecting farmland. Policy makers and the public must make value judgments. Do you think that prime soils, significant environmental features, and high population growth should be valued the same or differently in deciding what farmland to protect?

I think prime soils should be valued by far the most. Good soils are in limited supply and lands with fertile soils need to be protected and not paved over.

10.4.4: Should Chicago's canals be shut to protect the Great Lakes from Asian carp? Why or why not?

They have to shut the canals to protect the Great Lakes. Look at what the Zebra Mussels have done to the Great Lakes already. I guess if you believe that the Great Lakes are doomed anyway than maybe don't shut the canals.

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10.4.5: What are the benefits and drawbacks for sub-Saharan Africa to plant more genetically modified crops?

I think that Africans should avoid genetically modified crops if possible. Africa does not want to deal with patent attorneys from Monsanto. They don't want to be dependent on the United States for seeds. They also need to be able to export food to other countries to increase the gross national product of countries in the region.

10.4.6: Are you willing to pay more for food that is organically produced? Why or why not?

No. I would rather buy the cheaper nonorganic food. I can then use the money I saved by buying the less expensive food to travel.

Google Earth Questions

GOOGLE EARTH 10.1: Little Andaman Island is home to approximately 100 Onge people, who traditionally live by hunting and gathering. More than 90 percent of the land area of the island appears to be dense forests. Why is this type of land cover especially suitable habitat for animals being hunted?

Dense forests offer good habitat for many animals.

GOOGLE EARTH 10.2: Fly to Jungle Jim's in Fairfield, Ohio, at 30,000 square meters, possibly the largest supermarket in the United States. Under Find Businesses, type Kroger. Move to the nearest Kroger to the west of Jungle Jim's. How many square meters is it?

7,000 square meters.

GOOGLE EARTH 10.3: Terraces for planting rice are carved into the hillsides surrounding the village of Banaue, Philippines. What step in growing rice, as described in Learning Outcome 10.3.4, makes it necessary to terrace the hillsides?

Flooding.

GOOGLE EARTH 10.4: The eastern end of the Chicago Sanitary and Ship Canal joins with the Chicago River near the center of Chicago. The canal was constructed to provide the only water link between the Great Lakes and the Mississippi River. If Asian carp now migrating up the Mississippi River are to be prevented from reaching Lake Michigan, the canal will have to be blocked. What is the approximate distance between the end of the canal at the Chicago River and Lake Michigan?

8¼ kilometers.

Resources

Aquaculture

Covered in the text on page 360, aquaculture is a growing and sometimes controversial source of the world's protein. NOAA's Fisheries Service hosts an informative site on aquaculture in the United States. The media site is at aquaculture.noaa.gov/.

United States Department of Agriculture

The USDA has extensive resources online, from environmental issues to rural development. Their main portal is at www.usda.gov/.

Farm Subsidy Database

The Environmental Working Group's Farm Subsidy Database, online at www.ewg.org/farm/, provides resources and references to farm subsidies in every U.S. state as well as summary statistics. It provides a revealing look at how much U.S. taxpayers pay indirectly for their food to be inexpensive in the supermarket.

Office of the United States Trade Representative

The Office of the U.S. Trade Representative serves as a bulldog for American trade policy. The website promotes U.S. trade policy, defending everything from the North American Free Trade Agreement to development through trade at www.ustr.gov/. This site is also relevant to Chapters 10–12.

Connections between Chapters

Back to Chapters 4 and 9

A number of food items that are consumed in popular culture (Chapter 4) are produced in plantations. This is fertile grounds for a discussion on the role of popular fads, development, and the agricultural sector in relation to international trade. For example, consider coffee, bananas, shrimp, or out-of-season asparagus, and apples—all are imported to North America.

Chapter 9 introduces the concept of measuring development by measuring the percentage of people working in each sector of the economy. Review this concept upon finishing Chapter 10.

Forward to Chapter 11

The connections between Chapters 10–12 are more obvious as they involve the three sectors of the economy. Agribusiness represents clear connections between agriculture, industry, and services. In fact subsistence farmers are not connected with the rest of the economy is a critical component of development for LDCs.