

Agriculture

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What Is Agriculture, and Where did Agriculture Begin?

Agriculture is the deliberate tending of crops and livestock to produce food, feed, fiber, and fuel. When we think about agriculture, we tend to think about the production of foodstuffs for humans. Grain is also used for *feed*, grains fed directly to livestock. Raising livestock for their milk, eggs, or meat makes up a large segment of U.S. agriculture. Feed also comes from the remnants of biofuel production, and in 2009, 25 percent of all grain produced in the United States was used to produce fuel for cars, not for human or animal consumption.

A common way of classifying economic activities is to focus on what is being produced. Economic activities that involve the extraction of economically valuable products from the earth, including agriculture, ranching, hunting and gathering, fishing, forestry, mining, and quarrying, are called **primary economic activities**. Both the growing of food or feed and the raising of livestock are considered primary economic activities. Activities that take a primary product and change it into something else such as toys, ships, processed foods, chemicals, and buildings are **secondary economic activities**. Manufacturing is the principal secondary economic activity. **Tertiary economic activities** are those service industries that connect producers to consumers and facilitate commerce and trade or help people meet their needs. People who work as bankers, lawyers, doctors, teachers, nurses, salespeople, clerks, and secretaries belong to the tertiary sector. Some analysts separate specialized services into **quaternary** and **quinary economic activities**, distinguishing between those services concerned with information or the exchange of money or goods (quaternary) and those tied to research or higher education (quinary). In this chapter, however, for simplicity's sake we limit ourselves to three categories: primary, secondary, and a broadly conceived tertiary or service sector.

By classifying economic activities into sectors and analyzing the percentage of the population employed in each sector, we can gain insight into how the production of goods is organized, as well as the employment structures of different societies. As we explained in our discussions of world-systems theory in Chapters 8 and 10, the story of any product (such as wheat or rice) can be better illuminated by focusing on how the good is produced (the kinds of technology, research, wages, and education that go into its production), rather than focusing simply on what is produced. Examining the proportion of people employed in a given economic sector gives us a basic idea of how the good is produced. For example, in Guatemala the agriculture sector accounts for 13.5 percent of the country's gross domestic product (GDP), yet 50 percent of the labor force is employed in agriculture. Contrast that with Canada, where the agriculture sector accounts for 2.3 percent of GDP and only 2 percent of the labor force is employed in agriculture. The tertiary sector in Canada accounts for 75 percent of the labor force and over 71 percent of GDP, and the tertiary sector in Guatemala accounts for 35 percent of the labor force and 62 percent of the country's GDP.

These data do not tell us exactly how goods are produced, but they are revealing. The high proportion of the labor force involved in agriculture in Guatemala (relative to the role of agriculture in the GDP) tells us that agriculture is still quite labor dependent in Guatemala, implying a lack of mechanization. In Canada, the United States, and the rest of the global economic core, agriculture is produced on a large scale for commercial consumption. When agricultural goods are produced in these ways, the number of people working directly in the field is quite small. In the United States, less than 2 percent of the workforce is involved in agricultural production. Thousands of others participate in supporting agricultural production by working in the tertiary sector as research scientists for universities, seed companies, or chemical (antibiotics, pesticides, and herbicides) producers; as lobbyists for industry groups such as wheat producers or cattle ranchers; as engineers who design farm implements; as the people who sell and repair the implements; and as owners and clerks at retail establishments where farmers buy other farm and nonfarm goods.

In the United States, total agricultural production is at an all-time high, but the proportion of the labor force in agriculture is at an all-time low. Mechanization and efficiencies created by new technologies have led to a significant decrease in the number of workers needed in agricultural production. In 1950, one farmer in the United States produced enough to feed 27 people; today, one farmer in the United States produces enough to feed 135 people. The mechanization of agriculture goes beyond machinery such as combines and harvesters. New technologies include hybrid seeds and genetically engineered crops, pesticides, and herbicides, all of which are designed to increase yields. The drive toward economic efficiency has meant that the average size of farms (acres in production) in the United States has been growing, regardless of the kind of agricultural good produced. The U.S. Department of Agriculture keeps data showing the dollar value of agricultural production. The farms with the highest total production have at least \$500,000 in annual production in 2007 dollars. These high-producing farms accounted for 53.7 percent of agricultural goods produced in 2007 (compared with 28.9

percent in 1989).

Agriculture in the United States has changed enormously in the last decade. A recent study by the National Research Council of the U.S. National Academy of Sciences identifies four major issues that affect food security worldwide: “1) varying abilities to balance production and consumption across regions and countries, 2) accelerating conversions of agricultural land to urban uses, 3) increasingly energy-intensive food production methods in a world of shrinking fossil fuel resources, and 4) expanding use of food crops for biofuel production.” Agricultural production changes rapidly as farmers worldwide react to price fluctuations in fossil fuels, seeds, fertilizers, crops, and land.

To set the stage for understanding the contemporary agriculture picture, in the next section of the chapter, we discuss how people lived before the origins of agriculture and the circumstances that gave rise to the domestication of plants and animals many millennia ago.

Hunting, Gathering, and Fishing

Before the advent of agriculture, hunting, gathering, and fishing were the most common means of subsistence throughout the world. Of course, what people hunted or gathered depended on where they lived. North America provides a good example of the diversity of regional specializations among hunter-gatherers. The oak forests of parts of North America provided an abundant harvest of nuts, sometimes enough to last more than a full year; American Indian communities living in and around these forests therefore collected and stored this food source. Other American Indians living near the Pacific Ocean became adept at salmon fishing. The bison herds of the Great Plains provided sustenance, and so bison served as a focal point for many plains cultures. In the colder climates of North America, people followed the migrations of the caribou herds. In the north, in the coastal zone stretching from present-day Alaska to Russia, the Aleut developed specialized techniques for fishing and for sea mammal hunting.

The size of hunting and gathering clans varied according to climate and resource availability. Hunting and gathering communities in areas of abundance could support larger populations. People living on the margins of forests could gather food in the forest when hunting yielded poor results and then return to hunting when circumstances improved.

Terrain and Tools

Before developing agriculture, hunter-gatherers worked on perfecting tools, controlling fires, and adapting environments to their needs. The first tools used in hunting were simple clubs—tree limbs that were thin at one end and thick and heavy at the other. The use of bone and stone and the development of spears made hunting far more effective. The fashioning of stone into hand axes and, later, handle axes was a crucial innovation that enabled hunters to skin their prey and cut the meat; it also made it possible to cut down trees and build better shelters and tools.

The controlled use of fire was another important early achievement of human communities. The first opportunities to control fire were offered by natural conditions (lightning, spontaneous combustion of surface-heated coal). Archaeological digs of ancient settlement sites suggest that people would capture a fire caused accidentally and would work to keep the fire burning continuously. Later, people learned that fire could be generated by rapid hand rotation of a wooden stick in a small hole surrounded by dry tinder. Fire became the focal point of settlements, and the campfire took on symbolic and functional importance. It was a means of making foods digestible, and it was used to drive animals into traps or over cliffs.

In addition to hunting game on land, humans harvested shellfish, trapped fish by cutting small patches of standing water off from the open sea, and invented tools to catch fish, including harpoons, hooks, and baskets.

Using tools and fire, human communities altered their environments, which helped to establish more reliable food supplies. Along with hunting and gathering, early humans were adept at keeping track of the migration cycles of fish and other animals. American Indians along the Pacific Coast and on Arctic shores, the Ainu of Japan and coastal East Asia, and communities in coastal western Europe caught salmon as they swam up rivers and negotiated rapids and falls. Archaeologists have found huge accumulations of fish bones at prehistoric sites near salmon runs.

Hunter-gatherers migrated to take advantage of cyclical movements of animals and to avoid exhausting the supply of edible plants in any one area. After the summer salmon runs, people hunted deer during the fall and again in the spring, taking advantage of seasonal movements to trap deer where they crossed rivers or in narrow valleys. During the winter, people lived off dried meat and other stored foods.

The First Agricultural Revolution

Out of areas of plenty came agriculture, the deliberate tending of crops and livestock to produce food, feed,

fiber, and fuel. Geographer Carl Sauer believed the experiments necessary to establish agriculture and settle in one place would occur in lands of plenty. Only in such places could people afford to experiment with raising plants or take the time to capture animals and breed them for domestication. Sauer studied the geography of the First Agricultural Revolution, focusing on the location of agriculture hearths and what kinds of agricultural innovations took place in those hearths.

Where did **plant domestication** begin? Sauer, who spent a lifetime studying cultural origins and diffusion, suggested that Southeast and South Asia may have been the scene, more than 14,000 years ago, of the first domestication of tropical plants. There, he believed, the combination of human settlements, forest margins, and fresh water streams may have given rise to the earliest planned cultivation of **root crops**—crops that are reproduced by cultivating either the roots or cuttings from the plants (such as tubers, including manioc or cassava, yams, and sweet potatoes in the tropics). A similar but later development may have taken place in northwestern South America.

The planned cultivation of **seed crops**, plants that are reproduced by cultivating seeds, is a more complex process, involving seed selection, sowing, watering, and well-timed harvesting. Again, the practice seems to have developed in more than one area and at different times. Some scholars believe that the first domestication of seed plants occurred in the Nile River Valley in North Africa, but the majority view is that this crucial development took place in a region of Southwest Asia (also called the Fertile Crescent), through which flow the two major rivers of present-day Iraq: the Tigris and the Euphrates (Fig. 11.3). The cultivation of seed crops marked the beginning of what has been called the **First Agricultural Revolution**.

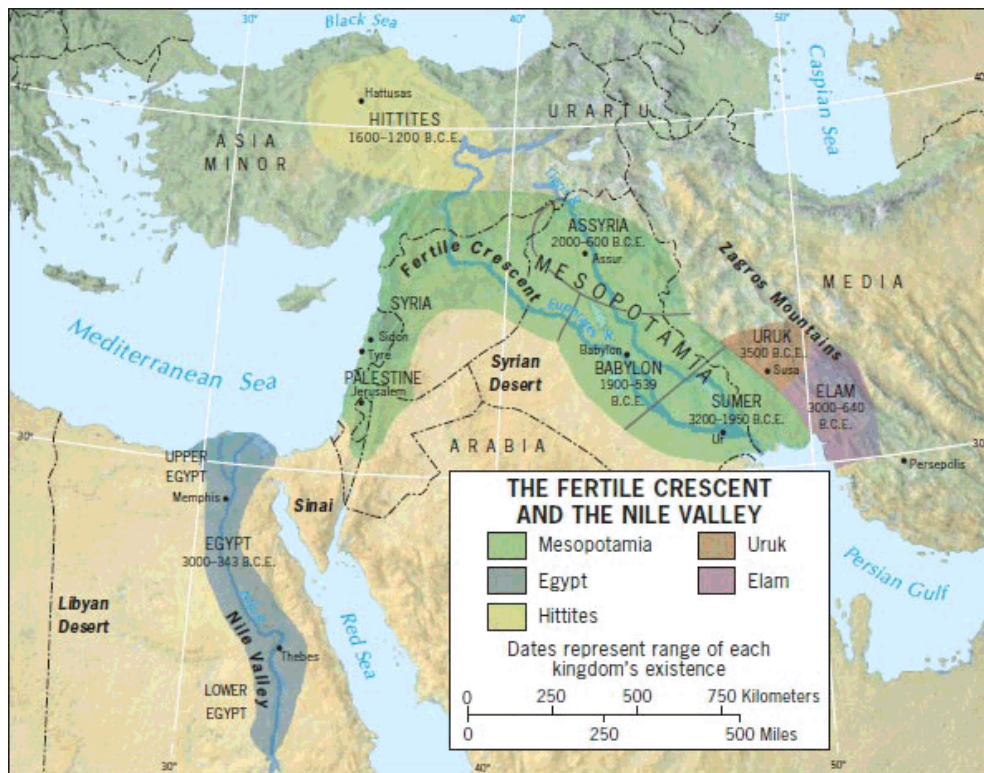


Figure 11.3

The Fertile Crescent and Nile River Valley.

The Fertile Crescent and Nile River Valley were two hearths of the first agricultural revolution. Modern political boundaries are shown for reference. © E. H. Fouberg, A. B. Murphy, H. J. de Blij, and John Wiley & Sons, Inc.

Archaeologists note that a number of changes occurred in Southwest Asia along with plant domestication. First, the plants themselves changed because people would choose seeds from the largest, heartiest plants to save for planting, yielding domesticated plants that grew larger over time than their counterparts in the wild. Archaeologists in Southwest Asia have found preserved seeds, which tell them which plants were being domesticated and when. The grain crops wheat and barley grew well in the warm Southwest Asian climate. Soon, people found that the river-inundated plains of Mesopotamia provided irrigable fields for farming. Agriculture provided a reliable food source, and grain surpluses enabled people to store grain for long-term distribution and use and to settle permanently in one place. In the process, the population of settlements began to increase.

Figure 11.4 depicts the global distribution of plant domestication hearths. In Southeast Asia (Region 1), taro, yams, and bananas were the leading food plants. In Southwest Asia (Region 4), plant domestication centered on wheat, barley, and other grains. In the Mesoamerican region (Region 6), the basic plants were maize (corn), squashes, and several kinds of beans.

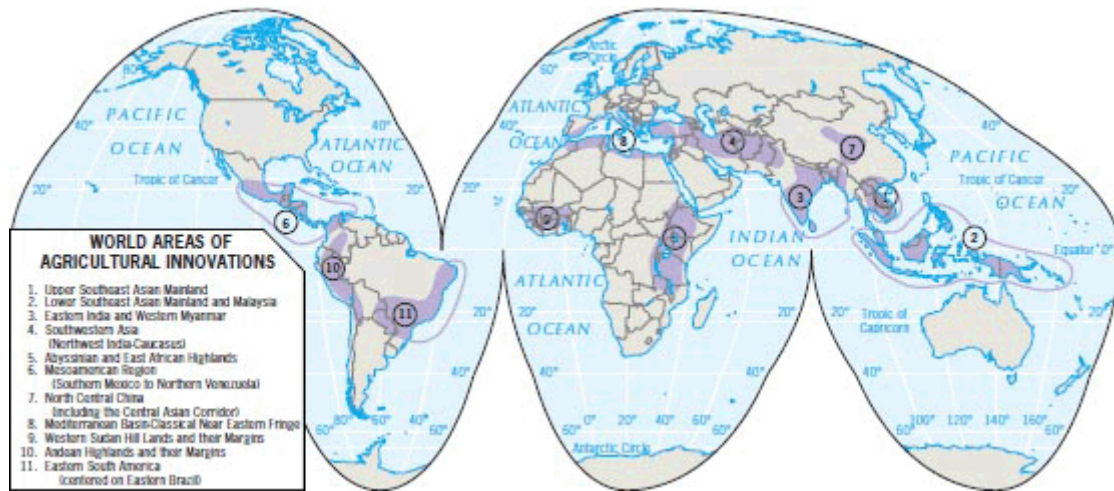


Figure 11.4

World Areas of Agricultural Innovations.

Cultural geographer Carl Sauer identified 11 areas where agricultural innovations occurred. *Adapted with permission from: C. O. Sauer, Agricultural Origins and Dispersals. New York: American Geographical Society, 1952, p. 24.*

Archaeologists continually find new sites to excavate, and as places are analyzed further, academics revise their assumptions about the timing of the emergence of agricultural hearths. The Central China hearth (Region 7) has recently attracted greater attention because new evidence supports a much earlier development of agriculture in this region—so early, in fact, that Chinese farmers may have been among the world's first. Another agricultural source region lies in West Africa (Region 9). Archaeological research on agriculture in this area is relatively recent, and analysts are not certain whether agriculture developed independently there.

Table 11.1 may be overwhelming at first glance, but it is worth careful attention. It reveals the enormous range of crops that were cultivated around the world, as well as how, at various times and in different locales, particular groups of crops became the mainstays of life. Soon the knowledge needed to farm such crops diffused outward from these agricultural hearths. For example, both millet and sorghum diffused from the West African region—millet to India and sorghum to China.

Table 11.1. Chief Source Regions of Important Crop Plant Domestications. Adapted with permission from: J. E. Spencer and W. L. Thomas, *Introducing Cultural Geography*, 1978, John Wiley & Sons, Inc.

| A. Primary Regions of Domestications | | | | | | | | | | |
|---|----------------|----------------|----------------|----------------|---------------|--------------|----------------|--|--|--|
| 1. The Upper Southeast Asian Mainlands | | | | | | | | | | |
| Citrus fruits* | Bamboos* | Yams* | Rices* | Eugenias* | Lichi | Teas | Ramie | | | |
| Bananas* | Taros* | Cabbages* | Beans* | Job's tears | Longan | Tung oils | Water chestnut | | | |
| 2. Lower Southeast Asian Mainland and Malaysia (including New Guinea) | | | | | | | | | | |
| Citrus fruits* | Taros* | Pandanuses | Breadfruits | Lanzones | Vine peppers* | Nutmeg | Areca | | | |
| Bananas* | Yams* | Cucumbers* | Jackfruits | Durian | Gingers* | Clove | Cardamom | | | |
| Bamboos* | Almonds* | Sugarcanes | Cocorns | Rambutan | Brinjals* | | | | | |
| 3. Eastern India and Western Burma | | | | | | | | | | |
| Bananas* | Beans* | Millet* | Grams | Vine peppers* | Mangoes | Safflower | Lotus | | | |
| Yams* | Rices* | Sorghums* | Eggplants | Gingers* | Kapok* | Jute | Turmeric | | | |
| Taros* | Amaranths* | Peas* | Brinjals* | Palms* | Indigo | Sunn | Hemp | | | |
| 4. Southwestern Asia (Northwest India-Caucasus) | | | | | | | | | | |
| Soft wheats* | Peas* | Rye* | Beets* | Hemp | Soft Pears* | Pomegranates | Walnuts | | | |
| Barleys* | Oil seeds* | Onions | Spinach | Apples | Cherries* | Grapes* | Melons | | | |
| Lentils* | Poppies | Carrots* | Sesames | Almonds* | Plums* | Jujubes* | Tamarind | | | |
| Beans* | Oats* | Turnips | Flax | Peaches* | Figs | Pistachio | Alfalfa | | | |
| 5. Ethiopian and East African Highlands | | | | | | | | | | |
| Hard wheats* | Sorghums* | Barleys | Beans* | Oil seeds* | Melons* | Coffees | Okras | | | |
| Millet* | Rices* | Peas* | Vetches | Cucumbers* | Gourds* | Castor beans | Cottons* | | | |
| 6. Meso-American Region (Southern Mexico to Northern Venezuela) | | | | | | | | | | |
| Maizes | Taros* | Tomatoes* | Avocados | Muskamelons | Cottons* | | | | | |
| Amaranths* | Sweet potatoes | Chili peppers | Sapotes | Palms* | Agaves | | | | | |
| Beans* | Squashes | Custard apples | Plums* | Manioc | Kapok | | | | | |
| B. Secondary Regions of Domestications | | | | | | | | | | |
| 7. North-Central China (including the Central Asian corridor) | | | | | | | | | | |
| Millet* | Soybeans | Naked oat* | Mulberries | Bush cherries* | Peaches* | | | | | |
| Barleys* | Cabbages* | Mustards | Persimmons | Hard pears* | Jujubes* | | | | | |
| Beckheats | Radishes* | Rhubarb | Plums* | Apricots | | | | | | |
| 8. Mediterranean Basin—Classical Near Eastern Fringe | | | | | | | | | | |
| Barleys* | Lentils* | Grapes* | Dates | Parsnips | Lettuces | Carrots* | Sugar beet | | | |
| Oats* | Peas* | Olives | Carrots | Asparagus | Celeries | Garlic | Leek | | | |
| 9. Western Sudan Hill Lands and Their Margins | | | | | | | | | | |
| Sorghums* | Rices* | Yams* | Peas* | Melons* | Oil palms | Kola nut | | | | |
| Millet* | Fonio | Beans* | Oil seeds* | Gourds* | Tamarind* | | | | | |
| 10. Andean Highlands and Their Margins | | | | | | | | | | |
| White potatoes | Tomatoes* | Beans* | Quinoa | Cubio | Ulluco | | | | | |
| Pumpkins | Strawberries | Papays | Oca | Arroacha | | | | | | |
| 11. Eastern South America (centered on eastern Brazil) | | | | | | | | | | |
| Taros* | Peanuts | Cashew nut | Cacao | Cottons* | | | | | | |
| Beans* | Pineapples | Brazil nut | Passion fruits | Tobaccos | | | | | | |

Source: J. E. Spencer and W. L. Thomas, *Introducing Cultural Geography*, 1978. Reproduced by permission from John Wiley & Sons.
 *The asterisk indicates domestication of related species or hybridized development of new species during domestication in some other region or regions. Some of these secondary domestications were later than in the original region, but evidence of chronologic priority seldom is clear-cut.
 The plural rendering of the crop name indicates that several different varieties/species either were involved in initial domestication or followed thereafter.
 The term *oil seeds* indicates several varieties or species of small-seeded crop plants grown for the production of edible oils, without further breakdown.
 In regions 2 and 3 the brinjals refer to the spicy members of the eggplant group used in curries, whereas in region 3 the eggplants refer to the sweet vegetable members.
 None of the regional lists attempts a complete listing of all crop plants/species domesticated within the region.
 The table has been compiled from a wide variety of sources.

In many cases, what we now think of as centers of production of particular crops are not the places where those crops were originally domesticated. The corn (maize) we associate with the American Corn Belt diffused from Mesoamerica (Region 6) into North America. Later, the Portuguese brought it across the Atlantic, and corn became a staple in much of Africa. The white potato we associate with Ireland and Idaho came originally from the Andean highlands but was brought to Europe in the 1600s where it became a staple from Ireland to the eastern expanses of the North European Plain. The banana we associate with Mesoamerica came from Southeast Asia, as did a variety of yams. Diffusion of crops and seeds was greatly accelerated by worldwide trade and communications networks established with the development of mercantilism and European colonialism.

Domestication of Animals

Some scholars believe that animal domestication began earlier than plant cultivation, but others argue that animal domestication began as recently as 8000 years ago—well after crop agriculture. Whichever is the case, goats, pigs, and sheep became part of a rapidly growing array of domesticated animals, and in captivity they changed considerably from their wild state. As with the growing of root crops, the notion of **animal domestication** must have emerged over time, in stages.

The process of animal domestication began as people became more sedentary. People kept animals for ceremonial purposes as well as for pets or for other reasons. Quite possibly, animals attached themselves to human settlements as scavengers (foraging through garbage near human settlements) and even for protection against predators, thus reinforcing the idea that they might be tamed and kept. Orphaned young probably were adopted as pets; some wild animals were docile and easily penned up. Goats were domesticated in the Zagros Mountains (in the Fertile Crescent) as long as 10,000 years ago; sheep some 9500 years ago in Anatolia (Turkey); and pigs and cattle shortly thereafter. The advantages of animal domestication—their use as beasts of burden, as a source of meat, and as providers of milk—stimulated the rapid diffusion of this idea among interlinked places and gave the sedentary farmers of Southwest Asia and elsewhere a new measure of security.

Archaeological research indicates that when animals such as wild cattle are penned in a corral, they undergo physical changes over time. In a pen, animals are protected from predators, allowing the survival of animals that would have been killed in the wild. Our domestic versions of the goat, the pig, the cow, and the horse differ considerably from those first kept by our ancestors. In early animal domestication, people chose the more docile, often smaller animals to breed. Archaeologists discern the beginnings of animal domestication in a region by inspecting the bones of excavated animals. They look for places where bones get smaller over time, as this usually indicates early domestication.

As with plant domestication, archaeologists can use the combination of bone fragments and tools to identify general areas where the domestication of particular animals occurred. In Southwest Asia and adjacent parts of the Mediterranean basin, people domesticated the goat, sheep, and camel. Southeast Asians domesticated

several kinds of pigs, the water buffalo, chickens, and some water fowl (ducks, geese). In East India and West Burma (South Asia), people domesticated cattle, and cattle came to occupy an important place in the regional culture. In Central Asia, people domesticated the yak, horse, some species of goats, and sheep. In the Mesoamerica and the Andean Highlands, early Americans domesticated the llama and alpaca, along with a species of pig and the turkey.

Some species of animals may have been domesticated almost simultaneously in different places. The water buffalo, for example, was probably domesticated in both Southeast and South Asia during the same period. Camels were domesticated in both western and eastern ends of Southwest Asia. The pig was domesticated in numerous areas. Different species of cattle were domesticated in regions other than South Asia. Dogs and cats attached themselves to human settlements very early (they may have been the first animals to be domesticated) and in widely separated regions. Single, specific hearths can be pinpointed for only a few animals, including the llama and the alpaca, the yak, the turkey, and the reindeer.

Efforts to domesticate animals continue today. In East Africa, people are attempting to domesticate the eland, to serve as a source of meat in a region where a stable protein source is greatly needed. Several experimental stations in the savanna are trying to find ways to domesticate Africa's wildlife. They have had some success with a species of eland, but less so with various species of gazelles; they have been unable to domesticate the buffalo (Fig. 11.5). In fact, throughout the world only some 40 species of higher animals have ever been domesticated—and most of these were domesticated long ago. Jared Diamond, author of *Guns, Germs, and Steel*, explains that only five domesticated mammals are important throughout the world: the cow, sheep, goat, pig, and horse. According to Diamond, if we select only the big (over 100 pounds), herbivorous, terrestrial animals, we have 148 species that meet these criteria in the “wild.” Only 14 of those 148 have been domesticated successfully, and each of these 14 was domesticated at least 4500 years ago. Modern attempts at animal domestication, even those driven by knowledgeable geneticists, have failed because of problems with the animal's diet, growth rate, breeding, disposition, or social structure.

Thus, the process of animal domestication, set in motion more than 8000 (and perhaps as long as 14,000) years ago, continues. The integrated use of domesticated plants and domesticated animals eased the work burden for early farmers. Animal waste fertilized crops, animals pulled plows, and crops fed animals. The first place where domesticated plants and animals were successfully integrated was Southwest Asia (the Fertile Crescent).

Field Note

“Attempts to tame wildlife started in ancient times, and still continue. At Hunter's Lodge on the Nairobi-Mombasa road, we met an agricultural officer who reported that an animal domestication experiment station was located not far into the bush, about 10 miles south. On his invitation, we spent the next day observing this work. In some herds, domestic animals (goats) were combined with wild gazelles, all penned together in a large enclosure. This was not working well; all day the gazelles seek to escape. By comparison, these eland were docile, manageable, and in good health. Importantly, they also were reproducing in captivity. Here, our host describes the program.”



Figure 11.5 Nairobi, Kenya.

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Subsistence Agriculture

Subsistence agriculture—growing only enough food to survive—was the norm throughout most of human history. Subsistence farmers often hold land in common; surpluses are shared by all the members of the community; accumulation of personal wealth is restricted; and individual advancement at the cost of the group as a whole is limited. Subsistence agriculture declined during the 1900s with the diffusion of industrialized agriculture and the goal of constantly increasing production both to feed growing populations and to sell more agricultural goods. The United States and other industrialized countries sought to move farmers “beyond” subsistence into industrialized production as part of development programs begun in the 1960s (see Chapter 10).

A return to subsistence agriculture has taken hold in parts of the world where farmers feel production for the global market has not benefited them either financially or culturally. For example, indigenous people in the southern Mexican states of Oaxaca, Chiapas, and Guerrero have largely returned to subsistence agriculture. *The Nation* reported in 2010 that Zapatista farmers have “in effect chosen to withdraw from the national economy, some weaning themselves off expensive chemical fertilizers and subsisting on corn they can grow, harvest, and barter.”

Some subsistence farmers are sedentary, living in one place throughout the year, but many others move from place to place in search of better land. The latter engage in a form of agriculture known as **shifting cultivation**. This type of agriculture is found primarily in tropical and subtropical zones, where traditional farmers had to abandon plots of land after the soil became infertile. Once stripped of their natural vegetative cover and deprived of the constant input of nutrients from decaying vegetative matter on the forest floor, soils in these regions can quickly lose their nutrients as rain water leaches out organic matter. Faced with these circumstances, farmers move to another parcel of land, clear the vegetation, turn the soil, and try again. Shifting cultivation gave ancient farmers opportunities to experiment with various plants, to learn the effects of weeding and crop care, to cope with environmental vagaries, and to discern the decreased fertility of soil after sustained farming.

With shifting cultivation, parcels of land are worked successively. The farmers first clear vegetation from a parcel of land. Next they plant crops that are native to the region: tubers in the humid, warm tropical areas, grains in the more humid subtropics, and vegetables and fruits in cooler zones. When the village grows too large and the distance to usable land becomes too great, part of the village's population may establish a new settlement some distance away. Population densities in areas of shifting agriculture cannot be very high; therefore, shifting cultivation continues only in areas where population densities are low.

One specific kind of shifting cultivation is **slash-and-burn agriculture** (also called swidden, milpa, or patch agriculture), reflecting the central role of the controlled use of fire in places where this technique is used. Trees are cut down and all existing vegetation is burned off. In slash-and-burn, farmers use tools (machetes and knives) to slash down trees and tall vegetation, and then burn the vegetation on the ground. A layer of ash from the fire settles on the ground and contributes to the soil's fertility.

As we discuss in the next section, agriculture has fundamentally changed since shifting cultivation was the global norm, but hundreds of millions of farmers continue to practice some form of subsistence agriculture.

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