CHAPTER 8

Food for Thought: The Globalization of Agriculture

INTRODUCTION

Unlike most of the chapters in this book, which focus on a single big idea in human geography, this chapter deals with two of them. This chapter looks at agriculture and the traditional geographic idea of how and what people farm in different places. It also looks at the contemporary idea of **globalization**—the increasing tendency for distant places and people to link together in a global market by fast, cheap transportation and communication (Figure 8.1). These old and new ideas will come together to explain how the forces of globalization are changing local agricultural systems in Latin America.

Students need to know more about agriculture for three reasons. First, much of the land surface of the planet is devoted to agriculture. Even some of earth's water bodies are being farmed. Second, although only 2 percent of Americans are farmers, half of all families in less-developed countries (LDCs) earn their living by

Figure 8.1 A Coca-Cola advertisement in Vietnam demonstrates the contemporary idea of globalization.

farming. Third, agriculture is a major contributor to environmental change in the form of pesticide and fertilizer runoff, soil erosion, fresh water depletion, damming of rivers for irrigation purposes, and deforestation (Figure 8.2).

It is important to recognize that **agriculture**, defined as intentional planting of crops and raising of domesticated animals (**livestock**), is not synonymous with food production (Figure 8.3). Some crops and livestock are raised for nonfood purposes: corn for ethanol, rubber for tires, and minks for fur coats. Likewise, many food (and nonfood) products are produced from plants and animals through methods other than agriculture. They can be artificially synthesized—as are Nutrasweet® (a sweetener), Tang® (a breakfast drink), and Simplesse® (a fat-free oil)—or collected from nature via **hunting and gathering** of wild plants and animals. Hunting and gathering usually brings to mind a primitive, preagricultural society that is rapidly disappearing from the earth, but if you think about it, most fishing and forestry are in fact modern-day forms of hunting wild fish and gathering wild trees. Sometimes agriculture overlaps hunting and gathering (not shown in Figure 8.3), blurring the distinction between the two, as when people prune or weed around wild plants from which they gather food, or when people throw food scraps to attract wild animals. The true distinction between agriculture and hunting and gathering is not the technological level but whether humans raise the plants and animals or they grow wild. Therefore, forestry and fishing, while usually a modern-day form of hunting and gathering, *can also be* forms of agriculture if the trees are planted (agroforestry) and the fish raised in enclosures (aquaculture). Finally, Figure 8.3 also makes it clear

Figure 8.2 Irrigated fields in Oregon. Damming of rivers for irrigation purposes is a major contributor to environmental change.

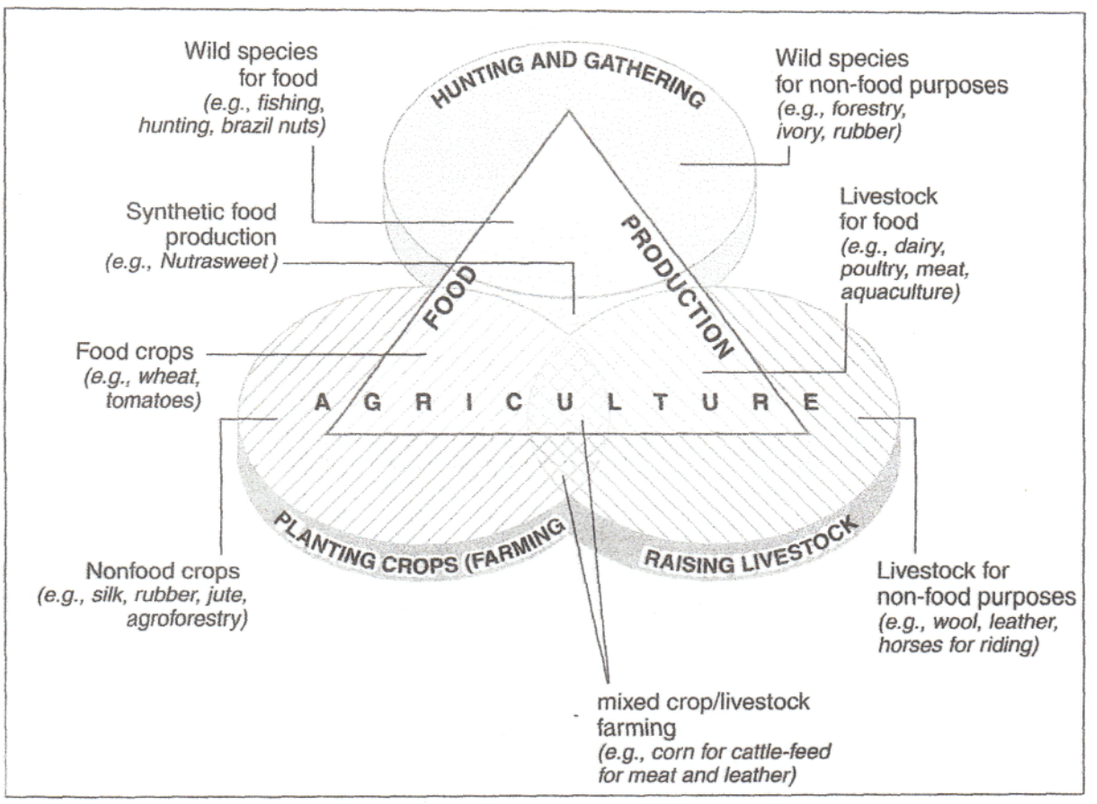

Figure 8.3 The relationship between agriculture and food production.

that growing crops and raising livestock can overlap in **mixed farming** systems that grow crops for the purpose of feeding livestock.

Over the course of human history, three periods of technological change have led to the agricultural system we see today. In the **first agricultural revolution** during the Neolithic era some 8 to 14 thousand years ago, humans first planted and harvested edible plants and domesticated wild animals. The Fertile Crescent (see Chapter 2) was one important area of agricultural origins, but archaeological evidence points also to other and perhaps earlier source regions in China, Southeast Asia, the Indus Valley (present-day Pakistan), the Ethiopian highlands, West Africa, the Andes Mountains of South America, and Central America (Figure 8.4). From these source regions, agriculture diffused (see Chapter 3) to other peoples around the world.

Numerous innovations have been made over the millennia to the basic idea of burying a seed in the ground and harvesting the results. Traditional innovations that we now take for granted include **irrigation** to deliver water to fields, plowing to loosen and turn the soil, fencing to keep animals out of fields, building terraces to provide level fields on hillsides, fertilizing with plant and animal waste, and weeding. Also important were various cultural and political practices, such as land tenure (private in some regions, communal in others), and division of labor (between humans and animals, men and women, adults and children, and among different occupations).

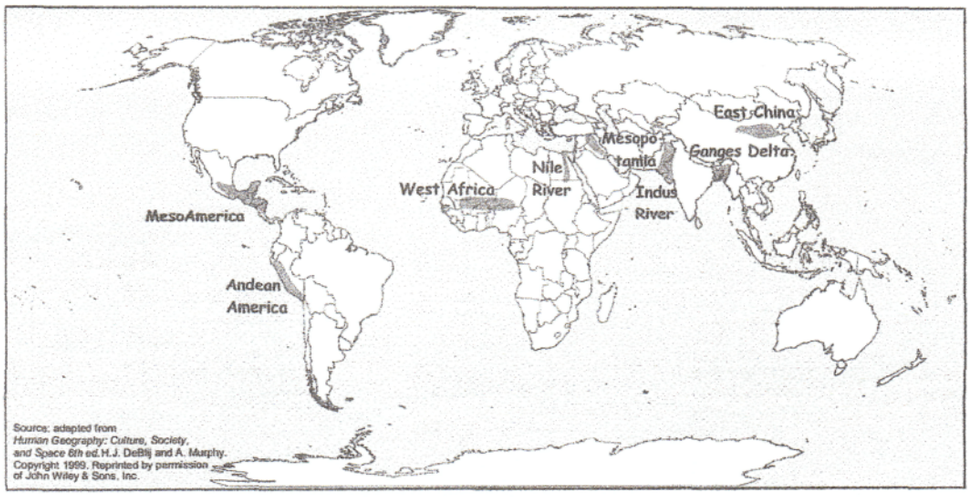

Figure 8.4 Probable culture hearths and origins of agriculture.

A **second agricultural revolution** began in Western Europe in the 1600s. The second phase of agrotechnological change, which intensified agriculture in the sense of promoting higher yields per acre and per farmer, helped feed the growing urban populations in European cities. The second revolution actually began before the invention of machines with ideas such as crop rotation for sustaining soil fertility, increased use of fertilizers, and improved collars for draft animals to pull heavier plows. Then, in the nineteenth and early twentieth centuries, the Industrial Revolution introduced tractors for plowing soil, reapers for cutting crops, threshers for separating grain from stalks, and motors for pumping water to do the work of people and animals, not to mention better transport, storage, and barbed wire fencing. Industrially produced chemicals for fertilizers, herbicides (weed killers), and pesticides (insect killers) were also introduced in the twentieth century.

A dramatic **third agricultural revolution** began in the 1960s and continues to this day. The **Green Revolution**, as it is now known, introduced and diffused hybrid strains of staple grains by cross-pollinating different native strains of grain. These hybrids, known by names such as miracle rice and miracle wheat, mature in a shorter time period than conventional seeds, which means that farmers can grow an extra crop each year. Hybrid crops also are able to withstand less-than-ideal environmental conditions, respond better to chemical fertilizers, and provide more nutrition. Yields in both more-developed countries (MDCs) and LDCs increased by 50 to 100 percent in the space of a few years, which allowed global food production to keep pace with the exponential growth of population in the twentieth century. Unfortunately, the benefits of the Green Revolution have not spread to farmers everywhere; poor farmers lack the savings to invest in seeds, fertilizers, and pesticides. Critics also decry the Green Revolution's reliance on artificial fertilizers made from fossil fuels, the less-flavorful grains, and the focus on corn, wheat, and rice, none of which are important crops in Africa.

The science of genetic engineering has breathed new life into the Green Revolution. Instead of crossing two varieties of plant or animal and hoping that a desirable combination of characteristics will emerge in some individuals of the next generation, genetic engineers leave little to chance. They identify the particular genes

on the DNA molecules that produce the desirable characteristic and splice the gene directly into the chromosomes of the other plant or animal. Genetically engineered products are already on the market, mainly corn and soybeans that perform very well with particular weed-killing herbicides. The "Holy Grail" of bioengineering is to identify the gene that allows legume crops to take nitrogen out of the air instead of through their roots and splice it into crops such as rice and wheat, which will eliminate the major need for chemical fertilizers. As is often the case, however, technological change carries risks, and some environmentalists and consumers are concerned about the effect of these "unnatural" crops on human health and on other species, such as Monarch butterflies that pollinate corn. European consumers in particular have rejected genetically engineered crops, forcing U.S. farmers to carefully separate genetically engineered from traditional crops.

Geographers look at the spatial variation in *what* crops or livestock are produced and *how* they are produced. The natural environment plays an important role in determining what can be grown where (see the agricultural regions map layer on the CD in Activity 1). Rice needs more water than corn and wheat. Wine-quality grapes need cool, wet winters and hot, dry summers. Citrus crops can be ruined by a winter freeze, whereas dairy cattle can thrive in cold and hilly areas. Tea and cacao (cocoa) are tropical crops, and, as we all know, Folgers® coffee is "mountain grown®." The physical environment alone does not, however, determine what is grown. If bananas, a plant native to the tropics, can be grown in Iceland in geothermally heated greenhouses (they can and they are!), then surely we must realize that climate is only one factor that determines where crops are grown. In fact, much of the farmland in the world is suitable for a variety of crops, and new varieties of grapes and rice are proving successful outside their traditional climate zones.

Culture is a second factor determining what is grown where. No meal is complete without rice in East and South Asia or corn tortillas in Mexico, whereas in Europe, the United States, and Canada, restaurants automatically serve bread made of wheat with every meal. Although it is true that traditional diets evolved based on available local ingredients, migration of cultural groups spread certain crops and livestock to other regions. Islamic and Jewish rules against eating pork, for instance, are not due to any difficulty of raising pigs in arid regions.

A third factor is economic. Rational farmers produce the crop that makes the greatest profit in any particular location. A German landowner, Johann Heinrich von Thünen, wrote a still-classic work of economic geography in 1826 detailing how agriculture was organized into a series of concentric rings around each town. In von Thünen's model, climate and soils are assumed not to vary among sites. Location relative to the market determines what crops are grown. The farther a farm is from the market, the more transportation costs eat into the farmer's profits. Therefore, the agricultural land closest to the market will be the most valuable, all else being equal, and distant land will be least valuable. Different crops will be grown at different distances from the major metropolitan markets depending on factors such as **yield** (tons per acre per year), market price, production cost, and unit transport cost per ton. Generally speaking, crops with the highest annual transportation costs for an acre's worth of annual production, such as vegetables, eggs, and milk, tend to be produced in the regions immediately surrounding the market. Crops with low annual transportation costs, such as forestry (one crop every 20 to 50 years) or wheat (only the actual grains, not the stalks, are transported), can afford to be located far from markets. Other crops fall somewhere between. Thus, crops are not necessarily grown in

their ideal bioclimate. Although wheat is better suited to the Ohio River valley, it is mainly grown in the Great Plains because other crops can make a greater profit in the Ohio Valley and few crops besides wheat can make a profit in the Plains.

The focus in Activity 1 is on *how* crops are grown in different parts of the world. As you will see, the same crop can be grown in remarkably different ways. The first distinction in agricultural methods is between labor-intensive and capital-intensive agriculture. **Capital** refers to goods that are used in the production of other goods, such as machinery, tools, facilities, vehicles, and transport facilities. **Labor-intensive agriculture** employs large numbers of people and relatively little capital to produce a given amount of output. Some capital, such as hoes and plows and baskets and wells, is employed but not much, and most work is done by hand. **Capital-intensive agriculture** allows a single farmer to produce as much as 100 labor-intensive farmers by substituting capital for labor. By using tractors for plowing, seed drills for planting, airplanes for spreading fertilizers, "combines" for reaping (cutting the plants) and threshing (separating the grains from the stalks), silos for storage, and railroads for transport, nearly every step of the agricultural process can be automated. Whether a region uses capital-intensive or labor-intensive methods depends largely on the price of capital and labor. As countries develop (see Chapter 7), wages increase, people have fewer children, people save more money, and bank loans become easier to obtain. As a result, labor becomes more scarce and capital more abundant. Farmers gradually automate their production process and become more capital intensive.

The second distinction, between intensive and extensive agriculture, refers to the intensity of land use. **Intensive agriculture** yields a large amount of output per acre through concentrated application of labor and/or capital, usually to small landholdings. In contrast, **extensive agriculture** yields a much smaller output per acre as farmers or ranchers spread their labor and capital over large areas of land. Intensity of land use depends on several factors including the price of land (higher price, more intensive use) and the population density (more people per square mile, more intensive use). The intensive-extensive spectrum is largely independent of the capital-intensive–labor-intensive spectrum. Thus, intensive land use can be capital intensive as in greenhouses and hydroponics or labor intensive as in rice paddies with hundreds of workers per acre. Similarly, extensive land use can be capital intensive for a U.S. wheat farmer with a 500-acre farm and gigantic farm equipment or labor intensive for a nomadic goat herder ranging over many square miles.

A third distinction is between commercial and subsistence agriculture, and it, like the others, involves shades of gray. In pure **subsistence agriculture**, farmers and ranchers produce animals or crops to feed their families. Families and villages are nearly self-sufficient and do not depend on trade with other regions. In pure **commercial agriculture**, farmers and ranchers sell all of their output for money and buy their families' food at stores. Most subsistence farmers today sell some of their excess output on the market and link to other regions for specialized products. Similarly, many commercial farmers consume small amounts of output themselves. Generally speaking, regions shift from subsistence to commercial agriculture as a result of increasing wealth, trade, and specialization within the entire economy (i.e., as a result of development; see Chapter 7). However, political factors also play a role. Colonialism forced local people to convert from subsistence farming to commercial farming in order to pay colonial taxes in cash. Similarly, Chinese communism forced farmers into self-sufficient village communes in the 1950s to 1970s until

a new regime let farmers sell their output for a profit in the 1980s. Today, nearly pure subsistence farming is practiced in only some parts of Latin America, Africa, and Southeast Asia. However, farmers in nearly all LDCs subsist at least partly on their own production.

A fourth distinction is between sedentary and nomadic forms of agriculture. **Sedentary** refers to farmers and ranchers who live and work in a single location, whereas nomadic refers to production that shifts from place to place. **Nomadism** is usually associated with livestock herders who move from place to place in search of fresh pasture. As noted in Chapter 2 (the Middle East), nomadism is not random wandering but a systematic movement pattern among proven locations. Nomadic herding can be horizontal, from one water source to another, or vertical, from lowlands in the winter to highlands in the summer (also known as *transhumance*). However, in tropical rainforests, a nomadic form of farming has also evolved. Better known as **shifting cultivation**, farmers work the land for several years before moving on to another area. They cut the undergrowth and burn it, and the resulting ash provides a short-term source of fertilizer to the relatively infertile rainforest soils. Although the term *slash-and-burn* suggests otherwise, this can be a sustainable form of agriculture that will not erode the soil as long as the farmers stay for only a few years, do not return for several decades, and leave enough large trees standing to keep the soil from eroding. Nomadism is an adaption to life in difficult environments where sedentary agriculture would quickly exhaust water and soil resources.

A fifth broad categorization of agricultural systems is between irrigated and nonirrigated lands. **Irrigation** simply refers to artificial watering of farmland; it has many forms, including wells, tunnels, diversion channels, spraying, drip systems, and dams of all sizes. Irrigation is necessary in arid lands and areas with uncertain or seasonal precipitation.

Beyond these five universal dimensions, many other forms of agriculture relate to land ownership. Within commercial forms of agriculture, many organizational types exist: family farms, tenant farmers, sharecroppers, plantations, state-owned farms, garden plots, and agribusiness. Family farms are the traditional North American farm. In many parts of the world, however, most farmers rent their land and struggle to produce enough to pay the rent and still have enough to feed themselves and set some aside for next season's seed. A variation on tenant farming is *sharecropping*, by which farmers pay rent in the form of a percentage of the crop, which allows the farmers to share the risk with landowners. Located in LDCs, **plantations** are mainly historical leftovers from colonialism. They produce tropical crops such as bananas, cotton, rubber, coffee, cocoa, and peanuts by labor-intensive methods for export to MDCs. Individuals or corporations from MDCs still own many plantations, but local landowners or even local governments have taken over some and continue to exploit local labor.

Socialist countries have experimented with many forms of farming on state-owned land. Workers can be collectivized into cooperatives or communes, rent from the state, be employed on state-run farms, or some other variation. In some such countries, workers are given small garden plots for their own use, which they farm very intensively. Yields from these backyard, quasi-private plots, which are also found in Latin America, can be several times higher than those achieved on the state farms because the worker gets to keep the proceeds. *Land reform* is a general term encompassing policies designed to give more of the population access to land that they can manage and steward themselves.

Finally, **agribusiness**, an industrialized, corporate form of agriculture, is organized into integrated networks of agricultural inputs and outputs beginning with seed, fertilizer, and pesticide production all the way through to processing and distributing food consumables. A small number of large corporations rather than a large number of independent farmers control agribusiness.

Similar to multinational industrial companies, telecommunications companies, and financial institutions, agribusinesses are increasingly extending their sources, sales, and power over a global network. The globalization of agriculture brings benefits to consumers in the MDCs of North America, Europe, Japan, and Australia (see Activity 2), but it also creates many negative local effects in peripheral LDCs (Activity 3). As the chief beneficiaries of globalized agriculture, we should be aware of these effects.