

Agriculture, the Environment, and Globalization

LEARNING OBJECTIVES

1. Define desertification and salinization.
2. Distinguish between sustainable agriculture and organic agriculture.
3. Explain how agriculture has been affected by globalization.
4. Summarize the causes of the recent global food crisis.

Agriculture and the environment are intimately interconnected. Soil or climatic conditions in an area can influence decisions about what to grow or how to use the land. At the same time, the practice of agriculture can have a significant impact on the environment. Since the first agricultural revolution, clearing forests and draining wetlands have been

common strategies for increasing the acreage devoted to cropland.

Human actions as well as changes in climate can contribute to desertification. Overgrazing damages vegetation, while poor crop management depletes the soil's fertility. Both of these practices can create environments that are unable to sustain the herds or crops that they once did.

Irrigation can have a detrimental effect on the environment, even though it is usually thought of as a strategy for expanding agriculture. If irrigation draws on groundwater aquifers, water usage has to be monitored so that the aquifer is not depleted. In soils

desertification
The creation of desertlike conditions in nondesert areas through human and/or environmental causes.

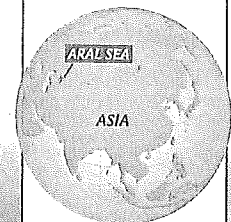
WHAT A GEOGRAPHER SEES

The Shrinking Aral Sea

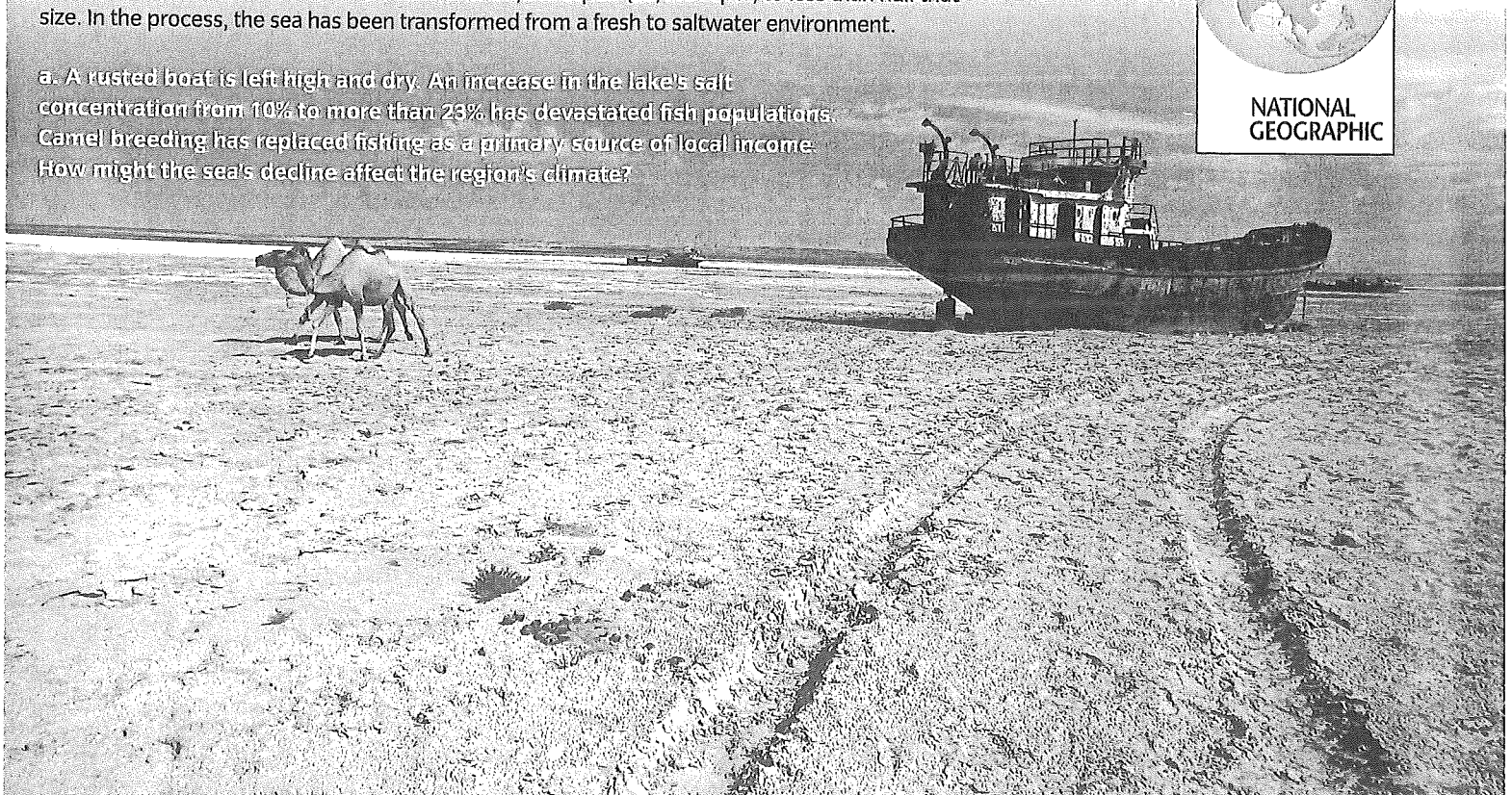
For more than 40 years, water has been diverted from the rivers that feed the Aral Sea in Central Asia to irrigate land for cotton and rice production. As a result, the lake has lost more than 60% of its water and has shrunk from over 65,000 sq km (25,000 sq mi) to less than half that size. In the process, the sea has been transformed from a fresh to saltwater environment.

a. A rusted boat is left high and dry. An increase in the lake's salt concentration from 10% to more than 23% has devastated fish populations. Camel breeding has replaced fishing as a primary source of local income. How might the sea's decline affect the region's climate?

Global Locator



NATIONAL GEOGRAPHIC



that drain poorly, irrigation can lead to waterlogging and crop death. When irrigation is used in arid and semiarid regions where evaporation rates are high, salinization becomes an issue and can result in decreased productivity (see *What a Geographer Sees*).

Applications of chemical fertilizers, herbicides, pesticides, and fungicides also have an impact on the environment. The production of fertilizers such as ammonia uses large amounts of energy. In addition, runoff from fields treated with other chemicals used in commercial farming can pollute surface water and groundwater supplies.

salinization The accumulation of salts on or in the soil.

sustainable agriculture Farming practices that carefully manage natural resources and minimize adverse effects on the environment while maintaining farm profits.

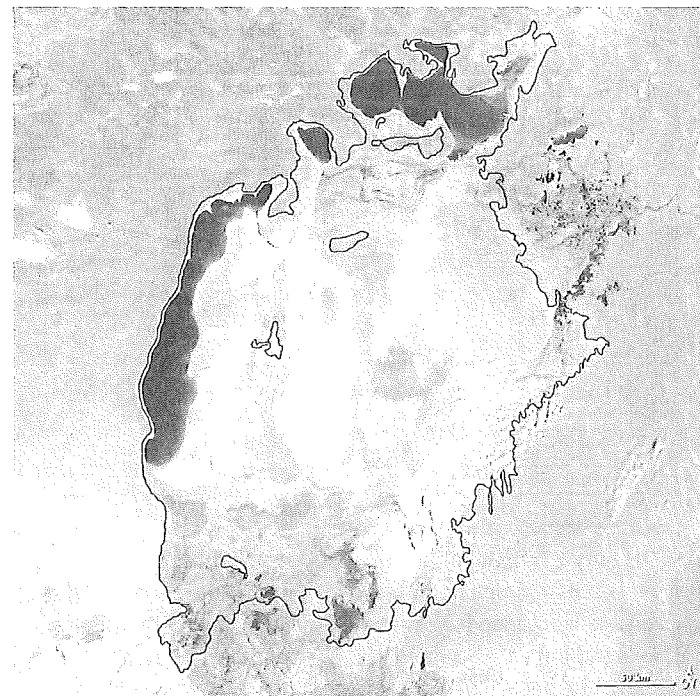
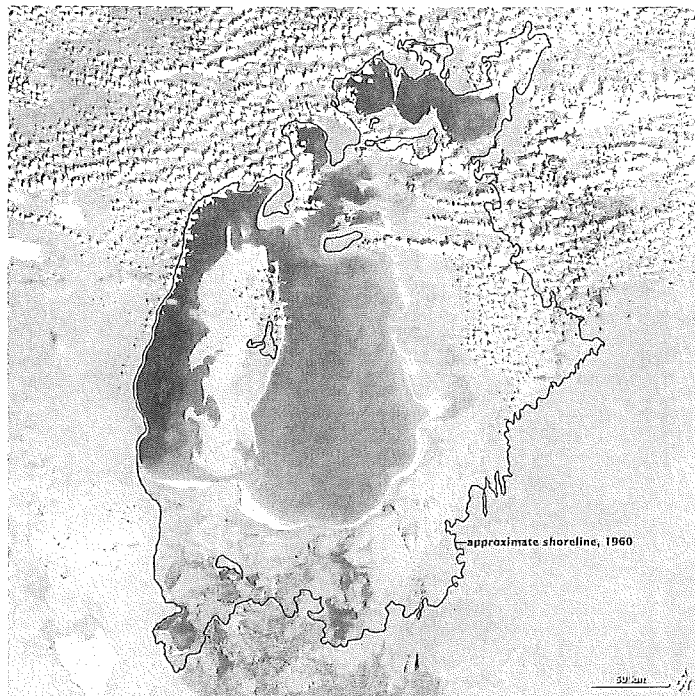
As a result, there is growing interest in sustainable agriculture. Examples of sustainable farming practices include measures taken to conserve soil and water resources, such as contour plowing, strip cropping, and the establishment of filter or buffer strips. *Contour plowing* follows the slopes in a field, rather than cutting across them. *Strip cropping* alternates the planting of row crops, such as cotton, with bands of sod crops, such as alfalfa or soybeans. *Filter strips* or *buffer strips* are belts of vegetation that surround fields and act to prevent runoff.

No-till farming also encourages sustainable land use. *No-till farming* avoids agitating the soil with tractor-drawn implements that remove weeds, mix in fertilizers, or shape the soil for seeding—all of which can lead to erosion. Crop rotations that help prevent disease or pest problems, and actions taken to reduce reliance on fossil fuels, especially petroleum, are also sustainable practices.

Sustainable Agriculture

The environmental impacts of agriculture, especially large-scale commercial agriculture, have prompted experts to question its ability to provide for future generations. As a

b. Satellite images illustrate the lake's reduction from 2000 to 2009 and relative to the shoreline in 1960. Soil from the exposed lake beds feeds salt particles and pesticide residues into dust storms. The resulting pollution has been linked to respiratory problems for those who live in the region. The lake's increased salinity reduces crop yields in the fields that are irrigated with the diverted water.



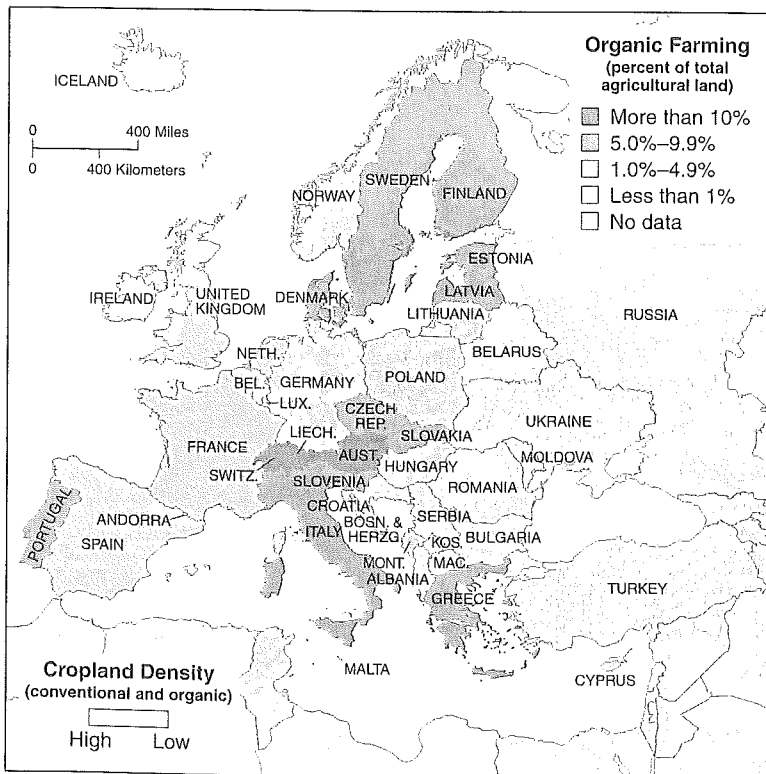
Precision agriculture employs technologies such as the global positioning system (GPS) and aerial imagery to measure and map the spatial variation in environmental conditions within a field. Soil fertility is rarely uniform across an agricultural field, for example. Mapping the site-specific soil conditions reveals the geography of soil nutrients in a field. This information can then be used to calibrate farm machinery to apply fertilizer at variable rates, releasing more in those areas where the soil is deficient in nutrients. Precision agriculture can also be used to manage pesticide applications, determine the best sowing density, and more accurately predict crop yields. In that they are closely tied to effective soil and field management, certain precision agriculture techniques can support sustainable practices. It should be noted, however, that some

experts contest the association of precision agriculture with sustainability, in part because precision agriculture often uses synthetic chemicals that require large amounts of energy to manufacture.

organic agriculture A farming system that promotes sustainable and biodiverse ecosystems and relies on natural ecological processes and cycles, as opposed to synthetic inputs such as pesticides.

Another expression of concern about the sustainability of agriculture involves the growing demand for organic agriculture. Organic agriculture accounts for a very small share of all agricultural products sold; however it is the fastest growing sector of agriculture today. Globally, Australia, Argentina, and Brazil have the largest areas under organic management, but the highest percentages of organic land are consistently found in Europe. This is partly the result of agricultural policies in Europe that have subsidized organic farming. At present, most of the organic farm products from Africa and Latin America are exported (Figure 11.17).

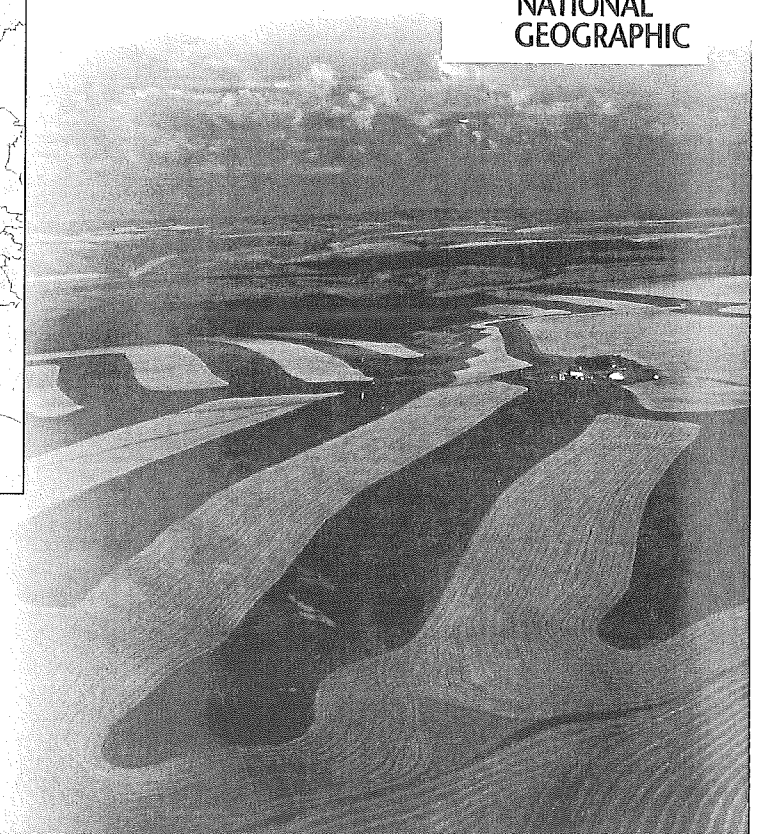
Sustainable agricultural practices • Figure 11.17



a. Organic farming in Europe
 Nearly 25% of all organically managed land is in Europe. Tiny Liechtenstein boasts the highest proportion—29%—of its agricultural land used for organic farming, followed by Austria and Switzerland with 13% and 11%, respectively. What other regional patterns are evident on the map?

b. Soil conservation techniques
 Contour plowing and strip cropping in the Palouse region of eastern Oregon and Washington create a distinctive agricultural landscape. Dark fallow strips ready to be sown alternate with strips of wheat stubble. The wheat stubble aids water infiltration and prevents the soil from freezing.

NATIONAL GEOGRAPHIC



Globalization and Agriculture

Our ability to purchase grapes from Chile, tea from Sri Lanka, or apples from New Zealand at grocery stores here in the United States is certainly one expression of the globalization of agriculture. Although globalization brings increased trade and access to a greater variety of agricultural products, it is also clear that the globalization of agriculture creates significant challenges, especially for poorer countries. We can glimpse this problem through the workings of the World Trade Organization (WTO), discussed briefly in Chapter 2.

The WTO seeks to make trade freer through the removal of tariffs and other policies that distort the market. Although the least developed countries have been given longer time frames to dismantle trade barriers, it is still reasonable to ask how a smaller and much poorer country such as Jamaica can compete with a country like the United States in terms of producing and selling its agricultural goods. One particular issue that creates an unlevel playing field and that the WTO has been slow to address involves government subsidies to farmers. Poorer countries cannot provide such subsidies. Thus, their farmers bear a higher share of the production costs, and this translates into higher prices for their agricultural products. Many trade experts have argued that domestic subsidies create severe market distortions and prevent free trade in agricultural goods.

The globalization of agriculture also affects diets. Patterns of food consumption are changing as the availability of processed foods increases. Asian diets, specifically those of the urban and middle classes, are becoming westernized and are contributing to a **nutrition transition**—a shift characterized by a decline in the consumption of rice and an increase in meat, wheat-based food products, and convenience foods. Although Asian diets now include a greater variety of foodstuffs, many of these items also have more fats and refined sugars, with the potential for adverse health consequences, including obesity and diabetes. To find a photo gallery of other examples of the diffusion of Western, and specifically American, foods and beverages, see *Where Geographers Click*.

Over the past decade, developing countries in East and Southeast Asia, Latin America, and Africa have also witnessed the rapid spread of supermarkets. This

Where Geographers CLICK

Cultural Landscapes from Around the World

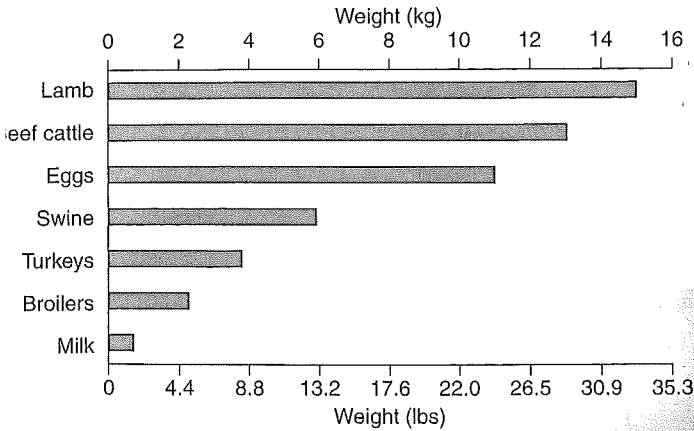
<http://www2.geog.okstate.edu/users/lightfoot/lightfoot.html>



Use the photographs on this website to track the diffusion of products such as Frosted Flakes and Coca-Cola.

supermarket revolution affects the way that fruits and vegetables are grown and sold throughout world. Although supermarkets can lower food prices for consumers, small retailers often cannot compete with them. In addition, supermarket chains are often just as likely to source their products from distant rather than local suppliers, with negative consequences for the local agricultural sector.

Agriculture and resource use • Figure 11.18

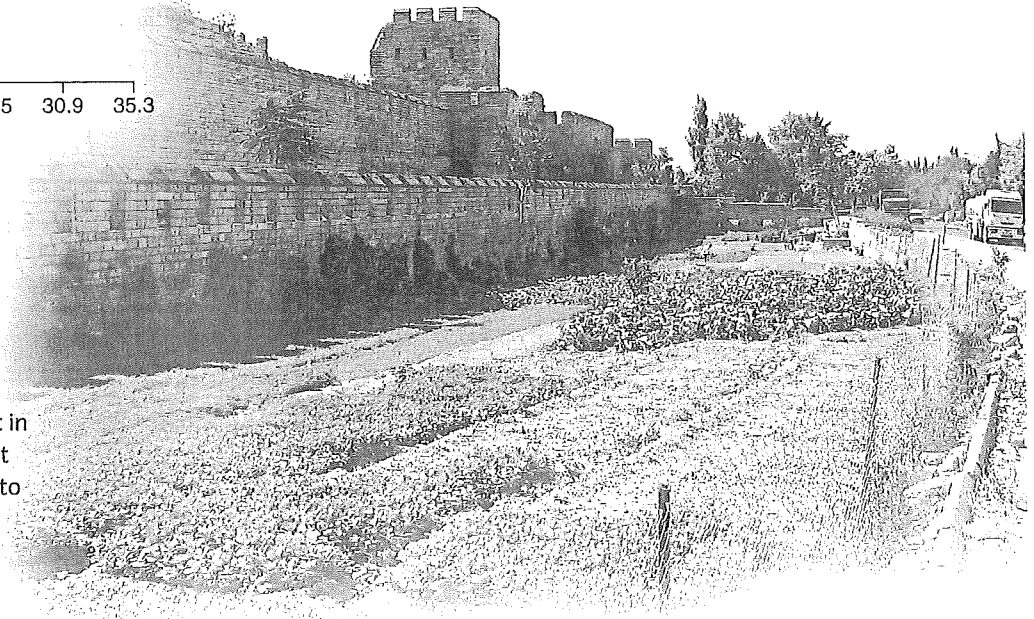


a. Amount of grain needed to produce 1 kilogram (2.2 pounds) of meat or other animal product

Livestock are inefficient producers of protein and, as shown by this graph, must consume inordinate amounts of grain to generate adequate weight gain to produce meat. Should our agricultural practices change in times of food crisis, so that grain that is processed into feed for animals could be used instead to feed people? (Source: Data from USDA, 2001.)

b. Urban agriculture

In Istanbul, Turkey, spaces devoted to urban agriculture are called *bostans*. These *bostans* are next to the old city walls. Urban agriculture exists in cities around the world but in recent years has been heralded as an important mechanism for improving nutrition and access to fresh produce among the urban poor.



The Global Food Crisis

Food prices worldwide increased, on average, by 43% in the year from March 2007 to March 2008, setting in motion a **global food crisis**. How can this happen when enough food is produced to feed each person? The answer is complicated and involves a mix of diverse factors.

Late 2006 saw unseasonable droughts in grain-producing countries. Rising oil prices also contributed to increasing costs of fertilizers and fuel. A related and contributing

factor involved increased production of biofuels, especially the use of corn to produce ethanol. Although biofuels are renewable and reduce reliance on fossil fuels, farmlands and crops must be diverted away from food production to generate biofuels. Rising consumer demand also increased pressure on the grain market. These developments, coupled with declines in food stockpiles, all contributed to a dramatic worldwide rise in food prices. When food prices rise, the poor—who spend a disproportionate

biofuel Fuel derived from renewable biological material, such as plant matter.

share of their income on food—suffer the most. Such food crises raise questions not only about the efficiency of certain agricultural practices but also about strategies that might help people reduce their vulnerability to them. One practice that could help improve future food security at the household level is **urban agriculture** the use of vacant lots, rooftops, balconies, or other spaces to raise food for the household or neighborhood (Figure 11.18).

CONCEPT CHECK

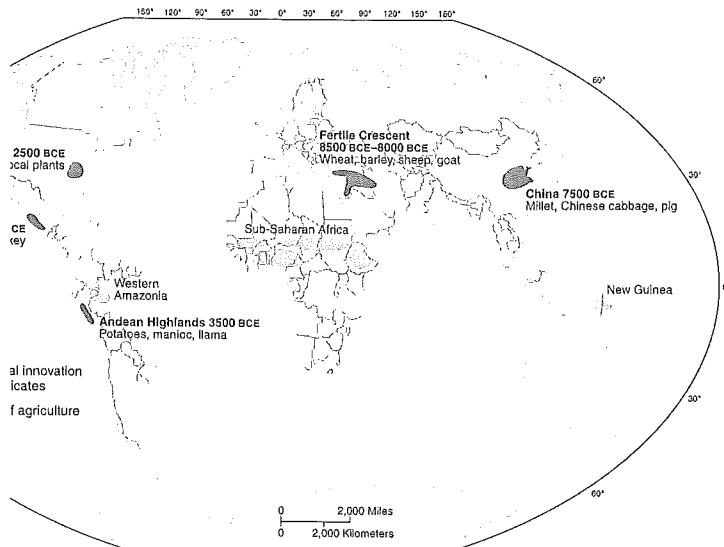
STOP

1. How are desertification and salinization related to changes in the Aral Sea?
2. What are some specific techniques associated with sustainable agriculture, and why are they beneficial to the environment?
3. Why might the globalization of agriculture be considered a mixed blessing?
4. What triggered the recent global food crisis?

Agriculture: Origins and Revolutions 326

- **Agriculture** is an economic activity centered on the purposeful tending of crops and livestock in order to procure food and fiber for human use or consumption. Prior to the development of agriculture, people subsisted by **hunting and gathering**, which still forms the basis of some livelihoods today.
- Three agricultural revolutions have transformed human geographies, including both social and environmental dynamics. The rise of farming about 11,000 years ago, made possible by the domestication of plants and animals in at least five hearths and numerous secondary centers, shown here, marked the **first agricultural revolution**.

Hearths of agriculture • Figure 11.2

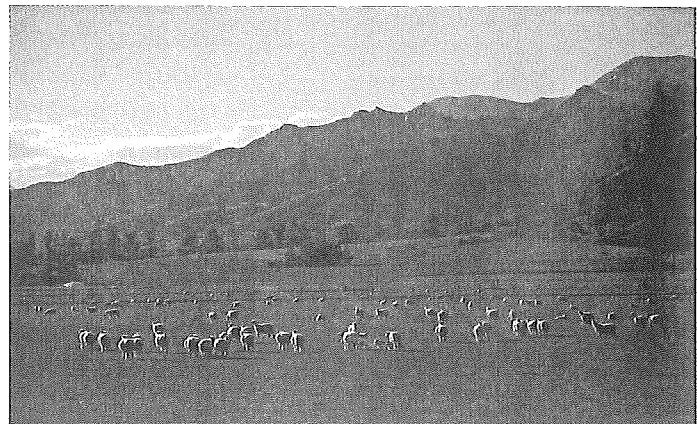


- The **second agricultural revolution** began in Europe during the Middle Ages and was prolonged because of developments during the Industrial Revolution. Innovations that made the second agricultural revolution possible include the development of the moldboard plow, the horse collar, and the **four-course system of crop rotation**.
- The **third agricultural revolution** began in the 20th century and is still underway. It is associated with the development of the internal combustion engine and greater reliance on chemical applications and **agro-biotech** practices.
- The **Green Revolution** and the **Gene Revolution** are both associated with the third agricultural revolution. The Green Revolution involved increased grain production in certain developing regions as a result of high-yielding, fertilizer- and irrigation-dependent varieties of wheat, rice, and corn. The **Gene Revolution** is marked by the shift toward greater control of the research, development, intellectual property rights, and genetic engineering of highly specialized agricultural products.

Agricultural Systems 333

- Many different types of agriculture are practiced in the world, and they can be placed along a continuum from **subsistence agriculture** to **commercial agriculture**.
- There are four major types of subsistence agriculture. **Shifting cultivation** is practiced in the humid tropics, whereas **pastoralism** remains confined to arid and semiarid regions. Both of these agricultural systems support low population densities. **Wet rice farming**, which prevails in more humid parts of Asia, and **smallholder crop and livestock farming**, which takes place in regions too dry to support wet farming, are both forms of **intensive agriculture**.
- Today, commercial agriculture is one component in an interconnected system of food production that involves farmers, processors, distributors, and retailers. Vertical integration has become a defining feature of **agribusiness** and has led to greater involvement of corporations in farming. Corporations increasingly participate in the technical aspects of crop and stock management, as well as processing agricultural products and moving them to market.
- Specialization has had a strong impact on commercial agriculture. **Plantation agriculture** is practiced in tropical and subtropical areas and has a strong presence in developing regions. **Commercial gardening** is a kind of **truck farming** and is increasingly associated with large, specialized farms. **Mediterranean agriculture** is closely associated with the production of tree and vine crops. Within the United States, dry-lot dairies have altered the geography of **commercial dairy farming**. **Factory farms** and **feedlots** are changing farming practices in **mixed crop and livestock farming** regions. **Commercial grain farming** occurs in the temperate grassland regions of North and South America, Australia, and eastern Europe and Russia. The practice of **livestock ranching**, a type of extensive agriculture, tends to be spatially associated with regions that are drier and/or more remote from major markets, as in New Zealand (see photo).

Extensive agriculture • Figure 11.15



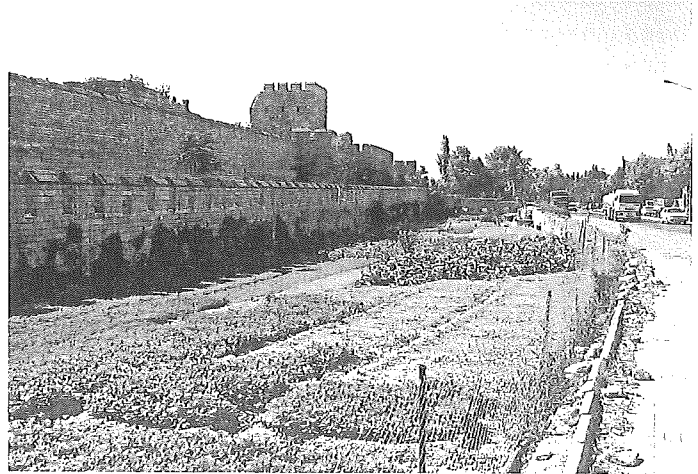
- The **von Thünen model** helps to depict the relationship between location, or nearness to the market, and how land is used for commercial agriculture.

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- All types of agriculture transform the environment. The nature and extent of the impact on the environment differs from place to place and from farmer to farmer. Soil degradation and the impacts of climate change are serious issues that all farmers confront. **Desertification**, whether caused by human or climatic factors, can prohibit the practice of agriculture. Irrigation brings another set of impacts.
- **Sustainable agriculture** and **organic agriculture** have developed in response to concerns about the adverse impacts that commercial farming can have on the environment. Although **precision agriculture** was not developed strictly for reasons of sustainability, some aspects of it support the careful management of resources.
- Globalization has had an impact on food consumption and agricultural practices around the world. Many cities in the developing world are experiencing a **nutrition transition** as Western, high-fat foods are gaining popularity. Westernized diets are becoming increasingly popular in Asia, placing greater demands on wheat production. Developing countries in Asia, Latin America, and Africa have also seen a rapid rise in supermarkets over the past decade, which has had important consequences for local farmers and retailers.

- Unseasonable droughts in grain-producing nations, rising oil prices, the conversion to **biofuels** and changing dietary patterns around the globe contributed to the **global food crisis** of 2008. That year an increase in food prices had a significant impact on producers and consumers around the world.
- **Urban agriculture**, glimpsed here, could help improve future food security at the scale of the household.

Agriculture and resource use • Figure 11.18



Key Terms

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