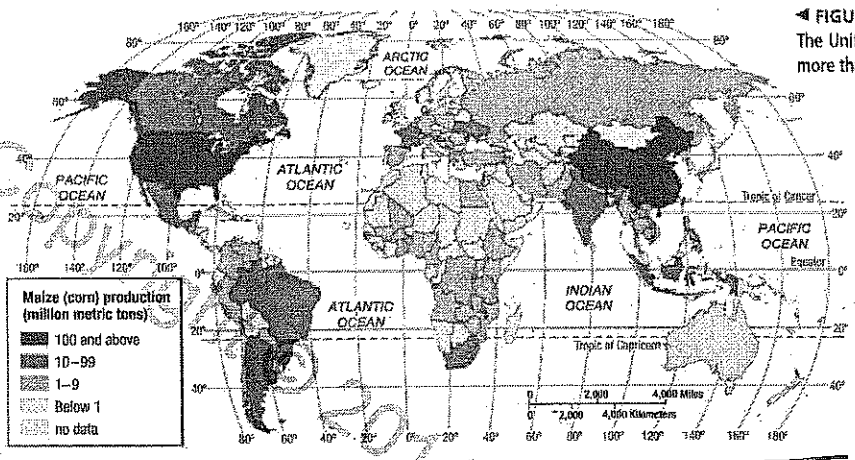
Group 1



◀ FIGURE 10-35 MAIZE (CORN) PRODUCTION
The United States produces nearly 40 percent and China more than 20 percent of the world total.

certain nutrients but restore others. Crop rotation contrasts with shifting cultivation, in which nutrients depleted from a field are restored only by leaving the field fallow (uncropped) for many years. With shifting cultivation, in any given year, crops cannot be planted in most of an area's fields, so overall production is much lower than in mixed commercial farming.

A two-field crop-rotation system was developed in Northern Europe as early as the fifth century. A cereal grain, such as oats, wheat, rye, or barley, was planted in Field A one year, while Field B was left fallow. The following year, Field B was planted, and Field A was left fallow, and so forth. Beginning in the eighth century, a three-field system was introduced. The first field was planted with a winter cereal, the second was planted with a spring cereal, and the third was left fallow. As a result, each field yielded four harvests every six years, compared to three every six years under the two-field system.

A four-field system was introduced in Europe during the eighteenth century. The first year, the farmer could plant a root crop (such as turnips) in Field A, a cereal in Field B, a "rest" crop (such as clover, which helps restore the field) in Field C, and a cereal in Field D. The second year, the farmer might select a cereal for Field A, a rest crop for Field B, a cereal for Field C, and a root for Field D. The rotation would continue for two more years before the cycle would start again. Each field thus passed through a cycle of four crops—root, cereal, rest crop, and another cereal.

Cereals such as wheat and barley were sold for flour and beer production, and straw (the stalks remaining after the heads of wheat are threshed) was retained for animal bedding. Root crops such as turnips were fed to the animals during the winter. Clover and other rest crops were used for cattle grazing and for restoring nitrogen to the soil.

Pause and Reflect 10.3.6

What are the principal differences between harvesting of maize in the United States (Figure 10-34) and harvesting of rice in Thailand (Figure 10-28)?

Start

COMMERCIAL GARDENING AND FRUIT FARMING

Commercial gardening and fruit farming is the predominant type of agriculture in the southeastern United States. The region has a long growing season and humid climate, and it is accessible to the large markets of New York, Philadelphia, Washington, and other eastern U.S. urban areas. The type of agriculture practiced in this region is frequently called **truck farming**, from the Middle English word *truck*, meaning "bartering" or "exchange of commodities." Truck farms grow many of the fruits and vegetables that consumers in developed countries demand, such as apples, asparagus, cherries, lettuce, mushrooms, and tomatoes. 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 highly efficient large-scale operations that take full advantage of machines at every stage of the growing process. Truck farmers are willing to experiment with new varieties, seeds, fertilizers, and other inputs to maximize efficiency. Labor costs are kept down by hiring migrant farm workers, some of whom are undocumented immigrants from Mexico 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.

A form of truck farming called specialty farming has spread to New England, among other places. Farmers are profitably growing crops that have limited but increasing demand among affluent consumers, such as asparagus, peppers, mushrooms, strawberries, and nursery plants. Specialty farming represents a profitable alternative for New England farmers at a time when dairy farming is declining because of relatively high operating costs and low milk prices.

Group 1 - Part 2

KEY ISSUE 4

Why Do Farmers Face Economic Difficulties?

- Challenges for Farmers in Developing Countries
- Challenges for Farmers in Developed Countries
- Strategies to Increase the World's Food Supply
- Sustainable Agriculture

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

Commercial farmers in developed countries and subsistence farmers in developing countries face comparable challenges. Farmers in both developing and developed countries have difficulty generating enough income to continue farming. The underlying reasons, though, are different. Commercial farmers can produce a surplus of food, whereas many subsistence farmers are barely able to produce enough food to survive.

Challenges for Farmers in Developing Countries

Two issues discussed in earlier chapters influence the choice of crops planted by subsistence farmers in developing countries:

- Subsistence farmers must feed an increasing number of people because of rapid population growth in developing countries (discussed in Chapter 2).
- Farmers who have traditionally practiced subsistence farming are pressured to grow food for export instead of for direct consumption due to the adoption of the international trade approach to development (discussed in Chapter 9).

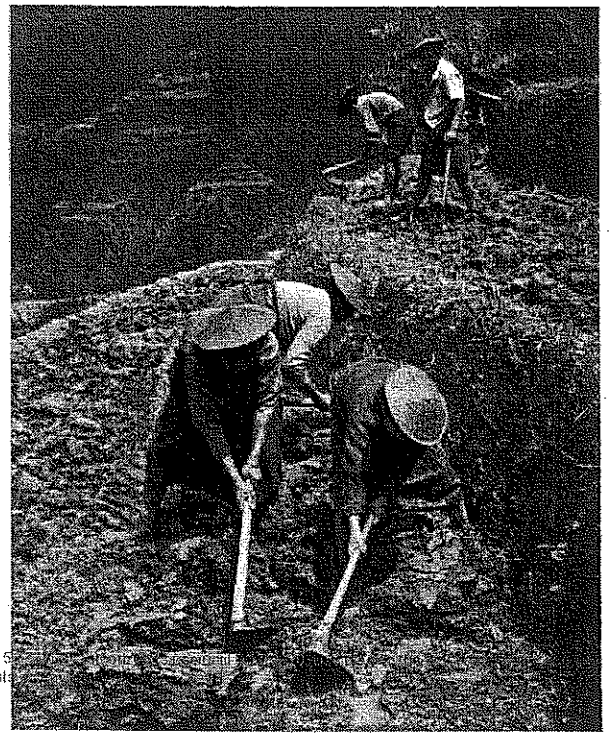
SUBSISTENCE FARMING AND POPULATION GROWTH

Population growth influences the distribution of types of subsistence farming, according to economist Ester Boserup. It compels subsistence farmers to consider new farming approaches that produce enough food to take care of the additional people.

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 disaster occurred. Suddenly in the late twentieth century, developing countries needed to provide enough food for a rapidly increasing population as well as for the growing number of urban residents who cannot grow their own food. According to Boserup, subsistence farmers increase the supply of food through intensification of production, achieved in two ways:

- New farming methods are adopted. Plows replace axes and sticks. More weeding is done, more manure is applied, more terraces are carved out of hillsides, and more irrigation ditches are dug (Figure 10-45). The additional labor needed to perform these operations comes from the population growth. The farmland yields more food per area of land, but with the growing population, output per person remains about the same.
- Land is left fallow for shorter periods. This expands the amount of land area devoted to growing crops at any given time. Boserup identified five basic stages in the intensification of farmland:
  - Forest fallow. Fields are cleared and utilized for up to 2 years and left fallow for more than 20 years, long enough for the forest to grow back.
  - Bush fallow. Fields are cleared and utilized for up to 8 years and left fallow for up to 10 years, long enough for small trees and bushes to grow back.

▼ **FIGURE 10-45 INTENSIVE FARMING METHODS** Hillsides in Radi, Bhutan, are terraced into fields for intensive planting of rice.



- **Short fallow.** Fields are cleared and utilized for perhaps 2 years (Boserup was uncertain) and left fallow for up to 2 years, long enough for wild grasses to grow back.
- **Annual cropping.** Fields are used every year and rotated between legumes and roots.
- **Multi-cropping.** Fields are used several times a year and never left fallow.

Contrast shifting cultivation, practiced in regions of low population density, such as sub-Saharan Africa, with intensive subsistence agriculture, practiced in regions of high population density, such as East Asia. Under shifting cultivation, cleared fields are utilized for a couple years and then left fallow for 20 years or more. This type of agriculture supports a small population living at low density. As the number of people living in an area increases (that is, as the population density increases) and more food must be grown, fields will be left fallow for shorter periods of time. Eventually, farmers achieve the very intensive use of farmland characteristic of areas of high population density.

SUBSISTENCE FARMING AND INTERNATIONAL TRADE

To expand production, subsistence farmers need higher-yield seeds, fertilizer, pesticides, and machinery. Some needed supplies can be secured by trading food with urban dwellers. For many African and Asian countries, though, the main way to obtain agricultural supplies is to import them from other countries. However, subsistence farmers lack the money to buy agricultural equipment and materials from developed countries.

To generate the funds they need to buy agricultural supplies, developing countries must produce something they can sell in developed countries. The developing countries sell some manufactured goods (see Chapter 11), but most 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 the climate.

In a developing country such as Kenya, families may divide by gender between traditional subsistence agriculture and contributing to international trade. Women practice most of the subsistence agriculture—that is, growing food for their families to consume—in addition to the tasks of cooking, cleaning, and carrying water from wells. Men may work for wages, either growing crops for export or at jobs in distant cities. Because men in Kenya frequently do not share the wages with their families, many women try to generate income for the household by making clothes, jewelry, baked goods, and other objects for sale in local markets.

The sale of export crops brings a developing country foreign currency, a portion of which can be used to buy agricultural supplies. But governments in developing countries face a dilemma: The more land that is devoted to growing export crops, the less that is available to grow crops for domestic consumption. Rather than help to increase productivity, the funds generated through the sale of export crops may be needed to feed the people who switched from subsistence farming to growing export crops.

Pause and Reflect 10.4.1

What is an example of a product available in supermarkets in the United States that was exported from a developing country?

Group 1 stop

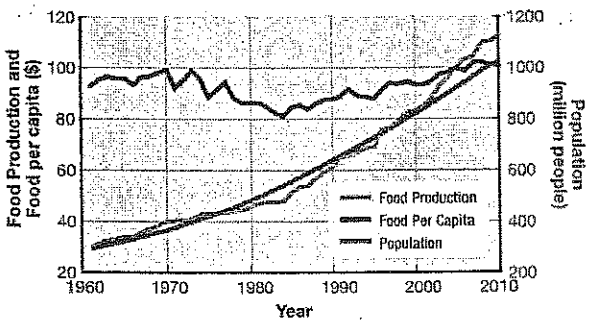
AFRICA'S FOOD-SUPPLY STRUGGLE

group 2 start

Sub-Saharan Africa is struggling to keep food production ahead of population growth. Since 1961, food production has increased substantially in sub-Saharan Africa, but so has population (Figure 10-46). As a result, food production per capita has changed little in a half-century.

The threat of famine is particularly severe in the Horn of Africa and the Sahel. Traditionally, this region supported limited agriculture. With rapid population growth, farmers overplanted, and herd size increased beyond the capacity of the land to support the animals. Animals overgrazed the limited vegetation and clustered at scarce water sources.

Government policies have aggravated the food-shortage crisis. To make food affordable for urban residents, governments keep agricultural prices low. Constrained by price controls, farmers are unable to sell their commodities at a profit and therefore have little incentive to increase production.



▲ **FIGURE 10-46 POPULATION AND FOOD IN AFRICA** Food production is increasing at about the same rate as population in Africa. As a result, food production per capita is staying about the same.