

Types of Agriculture

Agricultural activities can be categorized in two ways. The first category includes *subsistence farming* and *cash-crop farming*. Subsistence farming is the dominant form of agriculture in much of the Periphery and even some parts of the New Core. Subsistence farmers grow crops and raise livestock to meet the immediate food needs of their families. They usually produce many different agricultural products on small acreages. Any surplus products are sold or traded to meet other needs of the family. In contrast, cash-crop farmers specialize in producing only one or two products even if they have very large farms. Their products are sold on open world and local markets. These farmers might not consume any of the products they produce. For example, a dairy farmer who produces hundreds of litres of milk a day might buy milk at the local supermarket.

The second category of agriculture includes *intensive farming* and *extensive farming*. Intensive farming takes place on a relatively small amount of land that is worked with a great deal of labour, machinery, and high inputs of such things as fertilizers, pesticides, and water. The results are high yields of product per hectare. Typical forms of intensive farming in Canada include fruit and vegetable growing, and vineyards in such places as the Okanagan Valley in central British Columbia, the Annapolis Valley of Nova Scotia, and the Niagara Escarpment region and Holland Marsh in Ontario. Intensive farming also includes hog factory farms, and livestock feedlots where animals are penned and fattened in small fields.

Extensive farming, in contrast, takes place on a relatively large amount of land that is worked with a limited amount of labour and smaller inputs of fertilizers, pesticides, and water. The results are lower yields of product per hectare, but because farm sizes are so large, the farmer can still make a profit. Examples in Canada include grain and oilseed farming, and ranching in the

West, and most forms of *mixed farming* (growing crops and raising animals) in eastern Canada. Although we have talked about four distinct types of farming here, in reality, farming exists on a continuum between subsistence and cash cropping and between intensive and extensive farming (see Figure 10-7).

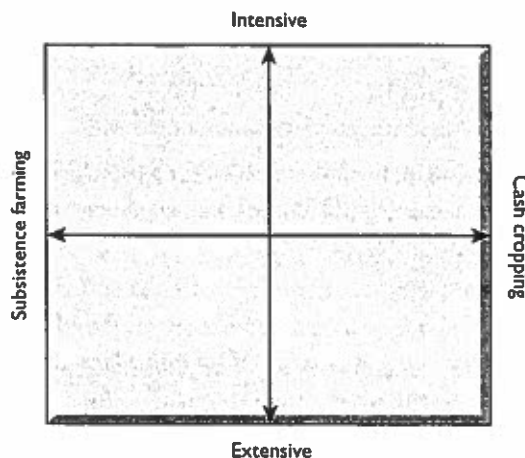


Figure 10-7 Every type of agriculture in the world can be located somewhere on this diagram.

Did You Know?

- Nomads still travel from place to place with their herds of camels, goats, sheep, cattle, and horses in parts of North Africa, the Middle East, and Central Asia. This type of agriculture is declining as governments, in an effort to control the nomads, force them into settlements.
- Most farmers living in East, South, and Southeast Asia practise intensive subsistence agriculture. Small plots are worked primarily with human labour to produce high yields, particularly of rice.

The Green Revolution

The **Green Revolution** began in 1943 when the Rockefeller Foundation, at the request of the Mexican government, established an agricultural research station in Mexico to develop more productive varieties of wheat that could be used to feed the rapidly growing population of the country. The basic idea behind this initiative was that the selective breeding methods that had greatly improved agricultural productivity in the

developed world could be used with equal success in developing countries.

Dr. Norman Borlaug, who won the 1970 Nobel Peace Prize for his efforts, was head of the research station. Borlaug and his colleagues wanted to produce **high-yield varieties (HYVs)** of wheat that could be used to increase food production in Mexico and eventually throughout the developing world. HYVs are crops



Figure 10–8 In northern India, dwarf wheat crops like this one increased grain supplies and helped save millions of people from malnutrition.

specially bred or selected to have an increased growth rate, increased percentage of usable plant parts, or increased resistance to crop diseases.

Compared to the varieties of wheat that were being grown in Mexico, the new varieties developed by the researchers had a number of things in common:

- They were smaller (see Figure 10–8). Dwarf plants focus more of their energy on growing their seeds (the part of the plant that we eat) and less on growing their stems, which are useless as food.
- They responded better to the use of farming inputs like fertilizer, pesticides, and irrigation.
- They grew faster. In suitable areas, a variety that grows faster allows the same land to be used for more than one crop per year.

The success of the wheat project in Mexico encouraged other researchers to develop high-yield varieties of rice at the International Rice Research Institute (IRRI) in the Philippines. Ultimately, 15 research institutes were set up, each specializing in some crop or aspect of food production in the developing world.

Successes of the Green Revolution

In the decades after World War II, experts predicted massive famines as the world's population exploded. The Green Revolution helped prevent this. In the countries of the developing world especially, the Green Revolution reduced food-supply problems. With more food available to feed their growing populations, developing countries were able to use more of their limited resources to develop social and economic programs (for instance, family-planning education and better

healthcare systems). These programs allowed countries to take control of their burgeoning populations. In effect, the Green Revolution helped countries in the New Core and Periphery work through demographic transition (see Chapter 5).

Between 1950 and 1999, global grain production increased by 170 percent on the same amount of land. If conventional farming techniques had been used, millions of hectares of forest and natural grassland would have been used to increase the cropland required to produce enough food to meet the growing population.

Worldwide, food production increased 20 percent more quickly than did the population. On average, prices for wheat and rice declined by 70 percent. This meant that all but the poorest people had better diets than before the Green Revolution.

GLOBALIZATION

Worldwide, food production increased 20 percent more quickly than did the population.

Why didn't this increased food production solve the world's hunger problem?

Concerns About the Green Revolution

While no one disputes its role in boosting world food production, critics have expressed some concerns about the Green Revolution.

- It used a modern Western model for agriculture that involves costly inputs such as chemical fertilizers, pesticides, and irrigation. Many poor farmers on small plots could not afford these inputs. The Green Revolution actually benefitted wealthy farmers, but often harmed the poorest (see Figure 10–9).
- The Green Revolution led to a dramatic **loss of genetic diversity**, which, in turn, threatened the global food supply. Some varieties of the same crop are susceptible to weed and insect damage, while others are not. Consequently, it's a good idea to plant as many varieties as possible. If one or two varieties fail as a result of disease or a pest invasion, the many other varieties that survive will provide the food that is needed. However, if only one or two highly developed varieties are planted, and both are wiped out, then there is no other crop to fall back on. The Green Revolution promoted only a few highly developed varieties of wheat, rice, and corn, and these came to replace the hundreds of native varieties that had been previously grown in developing countries.

	Before the Green Revolution		After the Green Revolution	
	Poor Farmer	Wealthier Farmer	Poor Farmer	Wealthier Farmer
Yield (units per hectare)	20 ×	20 ×	20 ×	50 ×
Price (per unit)	10 =	10 =	7 =	7 =
Income per hectare	200	200	140	350

Figure 10-9 The Green Revolution actually harmed the poorest farmers, since they could not afford to take advantage of new varieties of crops.

The Green Revolution produced a system of agriculture that is not as environmentally sustainable as traditional agriculture. Although traditional mixed cropping provided relatively stable yields for centuries, yields from HYV crops declined significantly in only a few decades. These decreasing yields occurred because of losses due to insect and plant pests, and because HYVs caused a decline in soil fertility that cannot be made up entirely by the addition of chemical fertilizers.

SUSTAINABILITY

The Green Revolution produced a system of agriculture that is not as environmentally sustainable as traditional agriculture.

Do the high yields that are produced by HYV crops for a few decades outweigh the environmental impacts that occur from their use?

Some critics suggest that self-interest prompted the developed countries to fund research that supported the Green Revolution. The creation of Western-style agriculture opened huge new markets for the makers of fertilizers, pesticides, farm equipment, and other products, almost all of which came from companies in developed countries.

The Green Revolution focused initially on research related to farming in areas with the most fertile soils and reliable rainfall. This research was of little help to people who lived in arid and semi-arid regions. Africans, for example, benefitted very little from the



Read more about the failure of the Green Revolution in Africa at the link on our Web site.

Green Revolution. Here, most of the soil is infertile because of excessive leaching, and 71 percent of the continent consists of arid and semi-arid areas.

The Green Revolution focused on developing varieties of wheat, rice, and maize (corn). It did not benefit the poor in Africa and other countries who relied on diets whose staples were millet, sorghum, cassava, and yams.


The mechanization promoted by the Green Revolution reduced the number of agricultural jobs in developing countries.

Women farmers, who grow much of the food in developing countries, did not have the money or access to financing to purchase equipment and the seeds of newly developed varieties of crops.

Upon receiving the Nobel Peace Prize in 1970, Dr. Borlaug stated that the Green Revolution was only a “temporary success” because boosting yields on existing cropland is only part of the solution to world hunger; slowing population growth is the other part. He further stated that the Green Revolution would provide the world with “breathing space” until population growth came under control. In recent years, the world’s population has increased annually at 2.2 percent, while global food production has increased at an annual rate of only 1.3 percent. How can the *disparity* (difference or gap) between food production and population growth be addressed when the amount of land suitable for growing crops is *finite* (limited)?

In 2006, the director of the Food and Agriculture Organization (FAO) addressed the problem by calling for a second Green Revolution. His vision was to feed the world’s growing population while preserving natural resources and the environment. He realized, however,

In the News



Find out more about **Dr. Norman Borlaug** by creating a profile on him that focuses on his role in the Green Revolution. Use the example on page 14 to guide you.

that the extra yearly one billion tonnes of cereals that would have to be produced by 2050 would have to be grown in an environment threatened by climate change.

What would a second Green Revolution look like? Would farmers use fewer high-performance crop

varieties and concentrate more on the efficient use of natural resources? Would they plant genetically modified crops, or adopt organic farming techniques? These and other issues are examined in the next section, "Food Production Issues."

CASE STUDY

Alliance for a Green Revolution in Africa

In 2006, the Bill and Melinda Gates Foundation and the Rockefeller Foundation formed an alliance that would develop a "Green Revolution" in Africa, where the original Green Revolution had had little impact. The Alliance aims to dramatically increase the productivity of small African farms.

The use of traditional seeds and farming techniques has not been particularly effective in increasing the African food supply. In the 15 years prior to 2007, the number of Africans living below the poverty line (US\$1/day) increased by 50 percent. To alleviate this poverty and low agricultural productivity, new seeds and new agricultural techniques will be given to millions of small-scale farmers—the majority of them women working on farms smaller than one hectare—in order that they may grow enough food to feed their families (see Figure 10–10).

The initial investment of US\$150 million (US\$100 million from the Bill and Melinda Gates Foundation; the remainder from the Rockefeller Foundation) will support the Program for Africa's Seed Systems (PASS). PASS endeavours to improve the availability and variety of seeds that produce higher yields in sub-Saharan Africa. It has five goals:

- To develop improved varieties of African crops that provide higher yields for small farmers by using conventional methods of plant breeding. PASS's research programs take into consideration the differences in local pests, diseases, rainfall patterns, soil properties, and the needs of local small farm communities.
- To train a new generation of African crop scientists who will become the crop breeders and agricultural scientists on which the seed system will depend for growth and productivity.
- To ensure that improved seeds reach small farmers. In the past, the lack of an effective seed delivery program, poor rural transportation, and a lack of money limited the small farmer's access to improved seeds. PASS will ensure that the improved crop varieties are produced and distributed through private and public channels so farmers can adopt them.

- To develop a network of African agro-dealers that will act as a conduit for seeds, fertilizers, chemicals, and knowledge for small farmers.
- To monitor, evaluate, and manage the projects to ensure that they are carried out effectively.

In 2007, former UN Secretary-General Kofi Annan became the first chairperson of AGRA. His task is to build broad political and economic support across Africa for this new approach to a Green Revolution.

Questions

1. a) What organizations founded the Alliance for a Green Revolution in Africa (AGRA)?
b) What is AGRA's main goal?
c) What steps is it taking to achieve this goal?
2. Do you think the five-point program of PASS is an effective way of improving the availability and variety of seeds in sub-Saharan Africa? Explain.

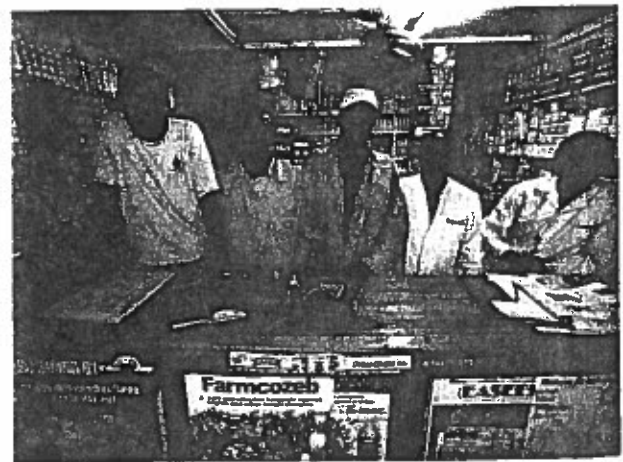


Figure 10–10 AGRA's goal is to replace traditional seeds and farming techniques. New seeds, such as those provided by these Kenyan agro-dealers, will increase Africa's food supply.